SOIL, WATER, AND THE STATE:

THE CONSERVATION-INDUSTRIAL COMPLEX AND AMERICAN AGRICULTURE SINCE 1920

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Abstract

"Soil, Water, and the State" examines the history of soil and water conservation in the United States since 1920 through the lens of the *conservation-industrial complex*: a vast network of parties who shared economic, political, and (in some cases) moral interests in promoting and implementing soil and water conservation. During the twentieth century, the network's ranks included government agencies, conservation professionals, land grant universities, farmers, conservation districts, politicians, and the farm-equipment and agrochemical industries. This dissertation argues that the conservation-industrial complex represented a powerful and resilient alliance that adapted to changing national priorities as well as to specific environmental conditions. These adaptations lent the complex a vitality that propelled the ideas, policies, and practices of utilitarian conservation, and the relationships of an associative state, throughout the twentieth century.

Much of the appeal of the conservation-industrial complex stemmed from its decentralized, associative character. Soil and water conservation depended largely on the increased authorities of the federal government, particularly within the US Department of Agriculture (USDA). Yet, by filtering its powers through a federal-state-local framework, the USDA created an "associative state" that guarded against backlash from the antistatism endemic to American political culture. The conservation-industrial complex also enjoyed support from the private sector, specifically from industrial manufacturers whose interests were advanced by federal conservation programs.

"Soil, Water, and the State" studies conservation from both cultural and material perspectives. Part I traces the evolving discourse of soil and water conservation during the twentieth century as a window into the changing meanings and policies of conservation at the national level. A key conclusion from these chapters is that, as farmers adopted the capital- and input-intensive methods of industrialized agriculture, conservation discourse encouraged them to see

economic production and environmental protection as compatible, and even mutually constructive. Part II explores how leaders in the conservation-industrial complex implemented their programs and practices on the ground, both nationwide and in the Upper and Lower Mississippi River Valley, by enlisting technology, farmers, and politics. The technological, social, and political relationships within the conservation-industrial complex were mediated by various geological, climatic, biological, and hydrologic forces of the natural world. This project therefore demonstrates the centrality of the natural world to the broader contours of US history.

Acknowledgements

This dissertation is to a significant degree a product of the gracious help I have received over the past several years. First, this project would have suffered without the guidance and training of the outstanding current and former environmental history faculty at the University of Kansas. Karl Brooks welcomed me to KU and helped me navigate the first semesters of graduate school. Greg Cushman introduced me to environmental history and taught me the benefits of interdisciplinary research and perspectives. While Ed Russell arrived after I had finished coursework, our conversations have shaped instrumentally the way I think and write about history. Above all, this project bears the influence of Don Worster and Sara Gregg. Don's classes were the most foundational in my time at KU, and he has always been gracious with his time and insights. Indeed, it was upon his suggestion that I first started exploring the history of soil and water conservation. Finally, Sara has been a top-notch advisor. She has dedicated countless hours meeting with me and reading my work—unfailingly supportive, yet always challenging me to improve. Sara has molded me into a professional and put me in a position to succeed. I owe her a debt of gratitude.

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For Angie

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INTRODUCTION

Beyond the Dust Bowl: Re-Historicizing Soil and Water Conservation through the Conservation-Industrial Complex

Chances are good that when people think of soil erosion and conservation in US history, their minds gravitate immediately to the Dust Bowl and the New Deal. Representing at once an event, a region, an environmental disaster, and a parable, the dust storms that ravaged the Great Plains during the 1930s loom large in American cultural memory. This was a time, explains historian Donald Worster, "when the earth ran amok." Yet, it was also a time when, as the narrative goes, the nation learned the importance of practicing soil and water conservation. The "black blizzards" of the 1930s inspired a number of cultural icons—John Steinbeck's writing, Dorothea Lange's photography, Pare Lorentz's films, Alexandre Hogue's paintings, and Woody Guthrie's music—that remain etched indelibly on the public mind. More recently, the production studio of Ken Burns, an arbiter of American culture, canonized the Dust Bowl with a memorable documentary. Historians have also elevated the Dust Bowl to privileged status through scores of monographs and articles that, for over thirty years, have engaged in a vibrant debate over the causes (and thus the meaning) of the disaster.[1]

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[1] Donald Worster, *Dust Bowl: The Southern Plains in the 1930s*, 25th anniversary edition (New York: Oxford University Press, 2004), 13. On one side of the debate is Worster, who argues that, at its roots, capitalism was to blame for the Dust Bowl. For a similar interpretation designed for the general public, see Timothy Egan, *The Worst Hard Time: The Untold Story of Those Who Survived the Great American Dust Bowl* (Boston: Houghton Mifflin, 2006). On the other side are several historians whose main concerns seem to be Worster's transparent moral agenda. See Geoff Cunfer, *On the Great Plains: Agriculture and Environment* (College Station: Texas A&M Press, 2005); Pamela Riney-Kehrberg, *Rooted in Dust: Surviving Drought and Depression in Southwestern Kansas* (Lawrence: University Press of Kansas, 1994); Pamela Riney-Kehrberg, et al., "Historians' Reaction to the Documentary, *The Dust Bowl*," *Agricultural History* 88 (Spring 2014): 262-288; and Kenneth Sylvester and Geoff Cunfer, "An Unremembered Diversity: Mixed Husbandry and the American Grasslands," *Agricultural History* 83 (Summer 2009): 352-383. For other examinations of the Dust Bowl, see Paul Bonnifield, *The Dust Bowl: Men, Dirt, and Depression* (Albequerque: University of New Mexico Press, 1979); R. Douglas Hurt, *The Dust Bowl: An Agricultural and Social History* (Chicago: Nelson-Hall, 1981); and William Cronon, "A Place for Stories: Nature, History, and Narrative," *Journal of American History* 78 (March 1992): 1347-1376. For an exception to historians' typical association of conservation on the Plains with the New Deal, see Helms, "Conserving the Plains: The Soil Conservation Service in the Great Plains," *Agricultural History* 64 (Spring 1990): 58-73.

The Dust Bowl certainly offers an important and useful symbol of the nationwide push for soil and water conservation, but its primacy in cultural memory also poses a number of problems. To begin with, the Dust Bowl narrative typically paints a picture of top-down federal intervention in the form of the agricultural welfare state.[2] While Washington certainly increased its involvement in American agriculture in response to the disaster, it often did so through more decentralized means. Second, the Dust Bowl was an especially dramatic product of *wind* erosion in a semiarid environment, but throughout most of the country, erosion by *water* has proven far more serious and enduring. Consequently, the Dust Bowl narrative creates a baseline for severe erosion that is measured by cataclysmic dust storms, not muddied streams and rivers. Indeed, in the fall of 1934, on the heels of the most severe dust storms until that point, Soil Erosion Service chief Hugh Hammond Bennett still maintained, "Erosion by water [is] the major evil. Land impoverishment by rainwash is an even more serious economic problem than that of wind erosion."[3] Even the water-erosion equivalent of a black blizzard, a gaping gully, does not seem to attract national concern, for without blowing detached soil into and onto cities thousands of miles away, the effects of a gully seem much more localized.

The final major trouble with associating the Dust Bowl so closely with erosion nationwide is that its association with the "Dirty Thirties" reduces the problem of erosion, and the concomitant need for conservation, to a specific event or set of events, rather than recognizing both as ongoing processes. Just as erosion was not isolated to the Great Plains, neither did it end with the 1930s. Of course, as we shall see, many Americans recognized this—particularly farmers, conservation

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[2] See Worster, *Dust Bowl*, especially chapter 10. For more on the agricultural welfare state, see Sarah T. Phillips, *This Land, This Nation: Conservation, Rural America, and the New Deal* (New York: Cambridge University Press, 2007), chapter 2; and Adam D. Sheingate, *The Rise of the Agricultural Welfare State: Institutions and Interest Group Power in the United States, France, and Japan* (Princeton: Princeton University Press, 2001).

[3] Bennett, "Soil Erosion—a National Menace," *Scientific Monthly* 39 (November 1934), 388. On the severity of the dust storms of spring 1934, see Worster, *Dust Bowl*, 13-14.

officials, agricultural researchers, politicians, policymakers, industry leaders, and a handful of historians. Yet, people continue to allude casually to the Dust Bowl as a shorthand for the dangers in eschewing conservation practices.[4] To be sure, as an environmental disaster and an ecological cataclysm worthy of scholarly and public attention, the Dust Bowl offers a tremendously useful symbol, but it does not and cannot stand in for the entire history of soil and water conservation in the twentieth-century United States.[5]

This project seeks to re-historicize soil and water conservation by exploring its evolution throughout the twentieth century, both before and after the Dust Bowl of the 1930s. Several historians have examined the nascent yet important conservation efforts that took place primarily at the local or state levels in the nineteenth and early twentieth centuries. But we lack a sustained examination of conservation since the 1920s, when the push for national conservation—and thus state intervention—began in earnest. In 1929, the federal government took its first official steps

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[4] The Dust Bowl narrative has been so conflated with soil and water conservation that it seems to have altered the memory of those who lived through the period. For instance, in southwestern Wisconsin (where the erosion problem stems from water, not wind), one elderly proponent of conservation recalled in 2008 his experiences in the 1930s. "There were 3 days that we did not see the sun," recalled Ernest Haugen. "There was a thick layer of dust on the kitchen table. There was dust on everything—cupboards and floors and chairs." It is possible that this dust storm occurred in early May 1934, a time when, according to historian Michael J. Goc, a major dust storm from the Great Plains rolled through several counties to the northeast of Haugen's home. This storm reportedly carried enough soil to bury crops and even fence posts. While such products of wind erosion were extreme rarities in Wisconsin, especially compared to the more common water erosion, this event nevertheless stuck in Haugen's memory as representative of the dangers of eschewing soil conservation. Such an association between conservation and the Dust Bowl was already established by 1970. That year, a USDA official from Georgia spoke before a Denver, Colorado, audience: "Most of us here can recall the dust storms of the 1930's. We can remember how the sun was virtually eclipsed at mid-day—how clouds of dust enveloped our homes, offices, and other buildings—and how the stuff seeped in through every crack around our doors and windows. *This occurred even on the eastern seaboard*—1000 miles from the source, the western farm States." Haugen, "Speech Delivered at Coon Creek 75th Anniversary," 25 April 2008, 4; Natural Resources Conservation Service Historical Files, Madison, Wisconsin; Michael J. Goc, "The Wisconsin Dust Bowl," *Wisconsin Magazine of History* 73 (Spring 1990): 174-179; J. Phil Campbell, "The Environmental Challenge," Address to the 17th National Watershed Congress, 8 June 1970, 5; b6f23; Eugene Butler papers, Special Collections Department, Mississippi State University Libraries.

[5] In a 1940 speech, Hugh Hammond Bennett articulated the emblematic value of the Dust Bowl. A dust storm, he told a Milwaukee, Wisconsin, crowd, "is a symbol of the type of land use that no nation can afford to countenance." Bennett, "Developing Enlightened Public Opinion in Conservation," Address to the Assembly on Use of Human and Natural Resources in Education, 78th Annual Meeting of the National Education Association, 2 July 1940, 4; box 5; A96-21, C. R. Ashford Papers, University Archives, Mississippi State University, Mississippi State, Mississippi.

toward nationwide soil and water conservation. Four years later, Congress created the Soil Erosion Service as a temporary erosion-control agency, which Congress elevated to a permanent agency, the Soil Conservation Service (SCS), in 1935. Many accounts of soil and water conservation stop here or shortly thereafter, perhaps implicitly taking for granted the continued influence of conservation policy over the next six decades.[6]

Congress continued to finance soil and water conservation throughout the twentieth century, to the tune of nearly $100 billion.[7] Indeed, the Soil Conservation Service outlasted all other New Deal conservation agencies, even the widely popular and much higher-profile Civilian Conservation Corps.[8] Surely, memories of an environmental disaster—even one with the severity of the Dust Bowl—cannot alone explain this sustained commitment of federal largesse toward conservation. This is particularly true in light of the antistatism engrained in American political culture. How and why, then, did soil and water conservation thrive throughout the twentieth century? How did this expansion of state authority proceed without incurring the debilitating backlash of American antistatism? How and why was conservation so adaptable to the diversity of environmental conditions in the United States?

The answer, I argue, lies in the *conservation-industrial complex*. I have developed this term to explain the vast network of parties who shared economic, political, and (in some cases) moral interests in promoting and implementing soil and water conservation. Throughout the twentieth

[6] See, for instance, Steven Stoll, *Larding the Lean Earth: Soil and Society in Nineteenth-Century America* (New York: Hill and Wang, 2002); Paul S. Sutter, "What Gullies Mean: Georgia's 'Little Grand Canyon' and Southern Environmental History," *Journal of Southern History* 76 (August 2010): 579-616; Paul S. Sutter, *Let Us Now Praise Famous Gullies: Georgia's "Little Grand Canyon" and the Soils of the South* (Athens: University of Georgia Press, forthcoming 2015); Phillips, *This Land, This Nation*; Samuel Stalcup, "Public Interest, Private Lands: Soil Conservation in the United States, 1890-1940," (PhD diss., University of Oklahoma, 2014); and Sam Stalcup, et al., "Reflections on One Hundred and Fifty Years of the United States Department of Agriculture," *Agricultural History* 87 (Summer 2013), 343-349.

[7] By 2010, federal soil and water conservation expenditures totaled approximately $110 billion. George A. Pavelis, et al., *Soil and Water Conservation Expenditures by USDA Agencies, 1935-2010* (Washington, D.C.: USDA Natural Resources Conservation Service, 2011).

[8] On the history of the Civilian Conservation Corps, see Neil M. Maher, *Nature's New Deal: The Civilian Conservation Corps and the Roots of the American Environmental Movement* (New York: Oxford University Press, 2008).

century, the ranks of the conservation-industrial complex grew to include government agencies, conservation technicians and evangelists, land-grant universities, farmers and their organizations (particularly conservation districts), politicians, and the farm-equipment and agrochemical industries. The multifaceted character of the network ensured that the "complex" as a whole would maintain a relatively low profile, for federal largesse (in the form of financial and technical assistance) was diffused through a variety of channels. The parties of the complex piloted the culture of conservation, constantly redefining the meaning of their mission in response to shifting national priorities and concerns. They also cultivated the technologies, social relationships, and powerful congressional allies that the conservation-industrial complex needed in order to succeed. These three elements—technology, social relationships, and politics—formed the foundation of the complex. Importantly, each was shaped in important ways by various geological, climatic, and biological forces of the natural world. In short, the conservation-industrial complex represented a powerful and resilient alliance whose vitality propelled the ideas, policies, and practices of utilitarian conservation in American agriculture throughout the twentieth century.

Two characteristics of the conservation-industrial complex were particularly instrumental to its success. First, its various parties remained committed to a wholly utilitarian brand of conservation, one that pursued simultaneously the goals of economic production and environmental protection. Especially after World War II, the conservation-industrial complex sought to conserve resources primarily for the purposes of sustained economic development—a goal compatible with the central concerns of agricultural capitalism and industrialized farming. The second significant feature of the complex was its decentralized, associative character. Soil and water conservation depended on an increasingly active state to research conservation practices and to provide the technical and financial assistance necessary to implement them on the nation's farms, but this expansion of the federal government proceeded in a low-profile manner. Instead of concentrating conservation affairs solely in the hands of the Soil Conservation Service, the conservation-industrial complex filtered federal largesse through and to a number of intermediaries whose interests were advanced by this government intervention. Consequently, groups who often eyed the expansion of the national government with suspicion, if not outright hostility—including farmers and private industry—tended to view government in this arrangement as a friend rather than a foe.

"Soil, Water, and the State" intervenes in three main bodies of literature. First, it adds to the institutional historiography of the American state by arguing for the primacy of an "associative state" model of state building. While scholars typically recognize how the associative state thrived in the 1920s and early 1930s as the federal government relied on private associations to achieve national priorities, the conservation-industrial complex represented a type of associationalism that both lasted *throughout* the twentieth century and included the sort of shared public authority we typically label *federalism*. Second, this project offers a case study in the history of utilitarian conservation after World War II, a period in which the lion's share of environmental historians' attention has been dedicated to explaining the multifaceted rise of environmentalism. Whereas the ideas, practices, and policies of interwar conservation merged a concern for natural and human resources that might initially suggest a progression toward "environmental" values, those of postwar conservation prioritized maximum sustained output far above any concern for keeping people on the land. Finally, "Soil, Water, and the State" contributes to the historiography on industrialized agriculture. It argues that soil and water conservation discourse and practices enabled farmers to see environmental protection as fully compatible with the gains in production made possible by industrial methods.

In tracing the evolution of soil and water conservation, this project treats conservation as both a cultural phenomenon—dependent on changing sets of ideas and meanings—and as a set of material relationships between humans and the natural world. Each was essential to the success of the conservation-industrial complex beyond the Dust Bowl. In order to secure the participation and support of the broader public, conservation evangelists framed the meaning of their efforts in ways that resonated with Americans' existing concerns. Conservation advocates believed the public needed to know what was at stake and consequently developed compelling narratives that linked conservation with national priorities.

Yet, ideas alone did not translate into action. The conservation-industrial complex's relationship with the material environment also determined its success, primarily in three contexts. The complex depended on practical technologies that were well adapted to specific environmental conditions; on the voluntary participation of farmers, which relied on their working relationships with each other, with conservation technicians and researchers, and with the unique ecological requirements of their farms; and on sustained support from politicians in Congress who were eager to help their constituents solve the particular environmental challenges prevailing in their districts. By tying together the cultural meanings, technologies, social relationships, and politics of the conservation-industrial complex with specific material realities rooted in the environment, "Soil, Water, and the State" demonstrates the centrality of the natural world to the broader contours of US history.[9]

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Many readers will have already anticipated that the concept of the conservation-industrial complex draws on the more familiar concept of the "military-industrial complex," the scholarship on which is expansive. The military-industrial complex offers a useful starting point for understanding the evolution of soil and water conservation, for it presents a classic "iron triangle" of

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[9] In such a manner, "Soil, Water, and the State" joins other scholarship that advocates more "neo-materialism" in environmental history. See, for instance, Timothy James LeCain, "An Impure Nature: Memory and the Neo-Materialist Flip at America's Biggest Toxic Superfund Site," *Global Environment: A Journal of History and Natural and Social Sciences* no. 11 (2013): 16-41. See also LeCain, *Mass Destruction: The Men and Giant Mines that Wired America and Scarred the Planet* (New Brunswick: Rutgers University Press, 2009).

mutually beneficial linkages between government agencies, legislators, and private industry. These allies enlisted the support and active participation of many other sectors in society, including universities. Because so many parties had vested economic and political interests in arming for war and defense, the complex as a whole developed an almost unassailable momentum and power that ensured its survival.[10]

Similar arrangements were at work in the conservation-industrial complex, which flourished during the same period as its military counterpart, but whose structure was more diffused and amorphous. Consequently, this network represented more of a web than a triangle (Figure 1). The conservation-industrial complex included the three sides of an iron triangle—legislators, private industry (particularly the farm-equipment and agrochemical industries), and government agencies (especially the Soil Conservation Service of the US Department of Agriculture, or USDA). But it also comprised a variety of other actors. These included individual farmers, conservation researchers in the USDA and at land-grant universities, farm and conservation organizations and their lobbyists (such as the Soil Conservation Society of America and the National Association of Conservation Districts), the contractors who installed conservation structures on private lands, and soil and water conservation districts.[11]

In order to visualize how the parties of the conservation-industrial complex converged to foster soil and water conservation, we can look at elements of the Soil Conservation Service's widely

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[10] A comprehensive treatment of the debates within the literature on the military-industrial complex is beyond the pale of this project. For recent studies, however, see Katherine C. Epstein, *Torpedo: Inventing the Military-Industrial Complex in the United States and Great Britain* (Cambridge: Harvard University Press, 2014); James T. Sparrow, *Warfare State: World War II Americans and the Age of Big Government* (New York: Oxford University Press, 2011); James Ledbetter, *Unwarranted Influence: Dwight D. Eisenhower and the Military-Industrial Complex* (New Haven: Yale University Press, 2011); and Edmund Russell, *War and Nature: Fighting Humans and Insects with Chemicals from World War I to* Silent Spring (New York: Cambridge University Press, 2001). On the role of universities in the military-industrial complex, see Stuart W. Leslie, *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford* (New York: Columbia University Press, 1993). For an early critique of this power structure, see C. Wright Mills, *The Power Elite* new edition (New York: Oxford University Press, 2000).

[11] As I have suggested, the natural world is also an actor in this story. But I do not consider it part of the conservation-industrial complex because, lacking intent, nature did not have a political, economic, or moral interest in promoting soil and water conservation.

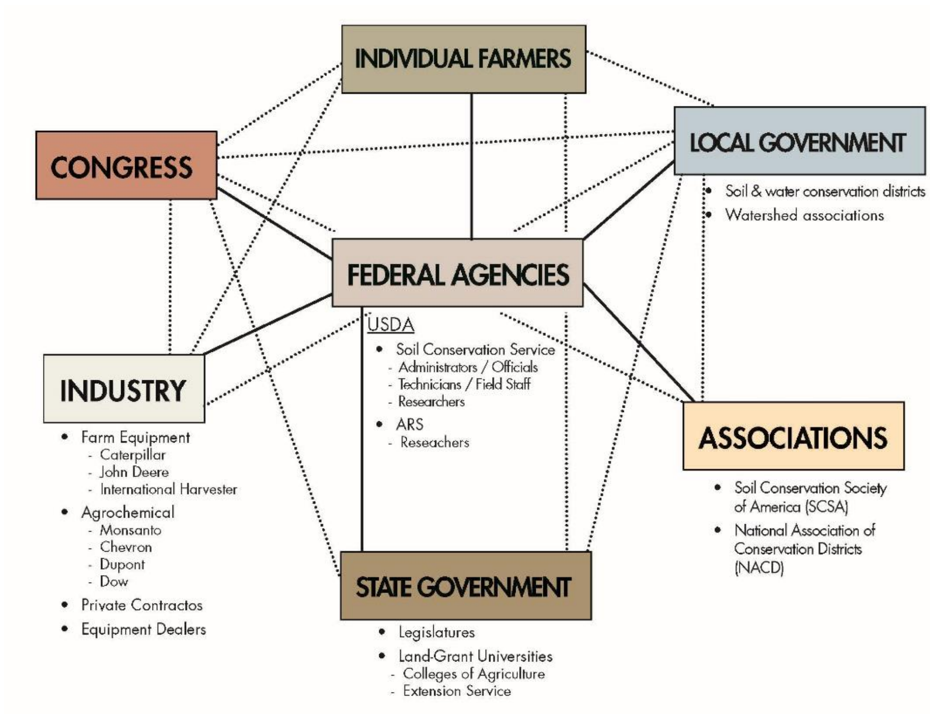

Figure 1: The major nodes and relationships within the conservation-industrial complex. Design credit: Angie Nygren.

popular Small Watershed Program, a subject explored in detail in Chapter 2. First, the watershed program involved the three sides of an iron triangle. Congress passed the initial legislation in 1954, provided the program ample funding, and subsequently expanded its authorities on several occasions; the USDA lobbied Congress for these authorities and administered the program; and the farm-equipment industry advertised the program and supplied the earth-moving machinery on which much of the work depended. Second, the Small Watershed Program required that local sponsors share in project costs and bear responsibility for subsequent maintenance. A watershed project sponsor was often a soil conservation district, an official unit of local government organized and controlled by farmers. Finally, eligibility for a floodwater-retention reservoir, the centerpiece of the watershed program, mandated that at least fifty percent of the land above the reservoir be protected by soil conservation practices. This required practical conservation techniques, which USDA and university researchers had labored to perfect since the 1920s. It also required the voluntary participation of individual farmers and landowners, and it often involved assistance from private contractors who possessed the technical expertise and the expensive machinery needed to implement conservation measures such as terraces or farm ponds. In short, the Small Watershed Program, like other soil and water conservation initiatives, relied on a vast web of participants that constituted the conservation-industrial complex.

Of crucial importance to the success of the conservation-industrial complex were soil and water conservation districts. These formal units of local government provided the mechanisms through which the Soil Conservation Service channeled assistance to individual farmers. They embodied neither the top-down imposition of federal power that some scholars have suggested, nor the spontaneous grassroots planning that the SCS boasted.[12] Instead, from creation through implementation, conservation districts were a hybrid of federal, state, and local authority. In 1937, the USDA drafted a model law for state legislatures to use when authorizing the creation of conservation districts. Once authorized, farmers could self-organize into a district through which they would receive technical and financial assistance from the SCS. Agency officials worked exhaustively to persuade farmers to form a district and guided them through the legal steps involved. In effect, the three levels of government comingled, making it difficult to tell precisely where one's duties left off and the other's began.

One of the creators of the model conservation-district law argued that such a federalist system was by design. While the term *federalism* might suggest "a rigid separation of power among the Federal Government, the state government, and the local governments," claimed USDA attorney Philip Glick,

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[12] For a critique of conservation districts, see Worster, *Dust Bowl*, 219-220. For the standard narrative promulgated by the SCS regarding the democratic nature of soil conservation districts, see Glenn K. Rule, *Soil Conservation Districts in Action on the Land*, USDA Miscellaneous Publication 448 (Washington, D.C.: Government Printing Office, 1941). Sam Stalcup draws similar conclusions in "Public Interest, Private Lands," 259-272.

> That isn't the kind of governmental system that American federalism has become in practice. Actually, instead of a layer-cake form of government, with three layers—Federal, state, and local—we have a marble cake form of government in that governmental powers interpenetrate…. We do far more through cooperative action by the Federal Government, the state government, and the local governments, than we do separately.[13]

Such an approach modified the federalism of the USDA's land-grant university and extension systems, which lodged more power at the state level, by essentially streamlining the interactions between federal and local governments.[14] This distinctly integrated arrangement—a "marble cake" rather than a "layer cake"—amounted to a highly effective strategy for expanding and dispensing federal funding and expertise in a manner that would not incur the backlash of antistatist sentiment. Farmers received the benefits of big government, but the state remained largely out of sight.[15]

"Soil, Water, and the State" thus offers a window into the evolution of the twentieth-century American state and its relations with civil society. Specifically, I argue that the "associative state" was longer lasting, broader, and had far greater influence in American statecraft than many scholars have recognized. An "associative state" is one in which the federal government filters its authority and governing power through decentralized channels to public and private intermediaries. Whereas

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[13] Douglas Helms, *The Preparation of the Standard State Soil Conservation Districts Law: An Interview with Philip M. Glick* (Washington, D.C.: USDA Soil Conservation Service, 1990), 19.

[14] On the rise of federal experiment stations and agricultural science, see Alan I. Marcus, *Agricultural Science and the Quest for Legitimacy: Farmers, Agricultural Colleges, and Experiment Stations, 1870-1890* (Ames: Iowa State University Press, 1985); Charles E. Rosenberg, *No Other Gods: On Science and American Social Thought*, revised and expanded ed. (Baltimore: Johns Hopkins University Press, 1997), chapters 8, 9, and 11; A. Hunter Dupree, *Science in the Federal Government: A History of Policies and Activities to 1940* (Cambridge: The Belknap Press of Harvard University Press, 1957), chapter 8; T. Swann Harding, *Two Blades of Grass: A History of Scientific Development in the U.S. Department of Agriculture* (Norman: University of Oklahoma Press, 1947); and Mark D. Hersey, "'What We Need is a Crop Ecologist': Ecology and Agricultural Science in Progressive-Era America," *Agricultural History* 85 (Summer 2011): 297-321. On the creation of a network of federal agricultural extension, see Roy V. Scott, *The Reluctant Farmer: The Rise of Agricultural Extension to 1914* (Urbana: University of Illinois Press, 1970); Alfred Charles True, *A History of Agricultural Extension Work in the United States, 1785-1923* (New York: Arno Press, 1969); and Joseph Cannon Bailey, *Seaman A. Knapp: Schoolmaster of American Agriculture* (1945; New York: Arno Press, 1971). For an up-close treatment of agricultural science and extension in Alabama, specifically targeting African American clientele, see Mark D. Hersey, *My Work is that of Conservation: An Environmental Biography of George Washington Carver* (Athens: University of Georgia Press, 2011), especially chapter 6.

[15] I borrow the phrase "out of sight" from Brian Balogh, whose ideas on the American state infuse this dissertation. See Brian Balogh, *A Government out of Sight: The Mystery of National Authority in Nineteenth-Century America* (New York: Cambridge University Press, 2009). For more on the creation and operation of conservation districts, see Douglas Helms, "Conservation Districts—Getting to the Roots," in *7th ISCO Conference Sydney: People Protecting Their Land: Sydney, Australia, 27-30 Sept. 1992: Proceedings* (Sydney: International Soil Conservation Organization, 1992), 299-303.

an "administrative state" governs more directly through a regulatory bureaucracy, an associative state establishes cooperative and voluntary arrangements with those through which it funnels its power. Especially when compared to an administrative state, an associative state is far less conspicuous, even to the point of near invisibility. In conservation, however, it was precisely such an arrangement that fostered the expansion of federal authority. In other words, the conservation-industrial complex was a manifestation of an associative order that disguised the growth of a "stronger" state behind the façade of a "weak" one.[16]

Although scholars have examined the importance of associative arrangements to American state building, their treatments have generally been limited on two related fronts. First, they have tended to define the associative order rather narrowly as a set of arrangements wherein the federal government filtered authority to private business associations, rather than taking a more expansive view of the associative state that also encompasses relationships with state and local governments. Second, as a result historians have typically located the existence of the associative order in the 1920s and early 1930s, ignoring its presence before and after the interwar period.[17] This oversight is

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[16] I say "stronger" to distinguish myself from the "strong" state/"weak" state debate, which measures a "strong" state by its regulatory, bureaucratic character, rather than by the changes it achieved. Other scholars—primarily social scientists, but increasingly historians, as well—have also challenged the false dualism inherent to this debate. For instance, see Peter Baldwin, "Beyond Weak and Strong: Rethinking the State in Comparative Policy History," *Journal of Policy History* 17 no. 1 (2005): 12-33; Peter Baldwin, *The Narcissism of Minor Differences: How America and Europe are Alike* (New York: Oxford University Press, 2009); William J. Novak, "The Myth of the 'Weak' American State," *American Historical Review* 113 (June 2008): 752-772; Karen M. O'Neill, *Rivers by Design: State Power and the Origins of U.S. Flood Control* (Durham: Duke University Press, 2006); Elisabeth S. Clemens, "Lineages of the Rube Goldberg State: Building and Blurring Public Programs, 1900-1940," in *Rethinking Political Institutions: The Art of the State*, eds. Ian Shapiro, et al. (New York: New York University Press, 2006), 187-215; and Adam Sheingate, "Why Can't Americans See the State?" *The Forum* 7 no. 4 (2009): 1-14. The debate over "weak" and "strong" states, which typically places the United States in the former category and European nation-states in the latter, stems from Max Weber's ideal-type definition of fully autonomous, bureaucratic states. It became revitalized in the early 1980s with the interdisciplinary push to "bring the state back in." See Max Weber, *The Theory of Social and Economic Organization*, transl. A. M. Henderson and Talcott Parsons, ed. Talcott Parsons (New York: Oxford University Press, 1947; New York: Free Press, 1964); Peter B. Evans, Dietrich Rueschemeyer, and Theda Skocpol, *Bringing the State Back In* (New York: Cambridge University Press, 1985). On the growth of an administrative state in the United States, see Stephen Skowronek, *Building a New American State: The Expansion of National Administrative Capacities, 1877-1920* (New York: Cambridge University Press, 1982).

[17] For the long-term centrality of the associative order before and after the interwar period, see Balogh, *A Government out of Sight*; and Brian Balogh, *The Associational State: American Governance in the Twentieth Century* (University of Pennsylvania Press, 2015).

due largely to the early work of Ellis Hawley, who so effectively coupled associationalism with Herbert Hoover that other scholars have apparently taken for granted that Franklin Roosevelt's administration represented a rejection of Hoover as well as of his governing style. Alan Brinkley, for instance, suggests "the bankruptcy of the associational vision" was proven by the mid-1930s.[18] A number of scholars have examined the associative order specifically within the USDA, but their focus remains primarily in the interwar period.[19] Consequently, by defining the associative state

[18] Brinkley, "The Late New Deal and the Idea of the State," in *Liberalism and Its Discontents* ed. Alan Brinkley (Cambridge: Harvard University Press, 1998), 40; Hawley, *The New Deal and the Problem of Monopoly: A Study in Economic Ambivalence* (Princeton: Princeton University Press, 1966); Hawley, *The Great War and the Search for a Modern Order: A History of the American People and Their Institutions, 1917-1933* (New York: St. Martin's Press, 1979); and Hawley, "Herbert Hoover, the Commerce Secretariat, and the Vision of an 'Associative State,' 1921-1928," *Journal of American History* 61 (June 1974): 116-140. For a study that sees greater continuity between the Hoover and Roosevelt administrations, see Sara M. Gregg, *Managing the Mountains: Land Use Planning, the New Deal, and the Creation of a Federal Landscape in Appalachia* (New Haven: Yale University Press, 2010). Hawley later called on historians to "rethink our views about the growth of government since the New Deal" in light of Americans' persistent "anti-bureaucratic tradition," but this has resulted in few studies that specifically recognize the continuity of the associative order in the postwar United States. Kenneth Finegold and Theda Skocpol similarly tie associationalism solely to Hoover. At the same time, however, they conclude that the New Deal ultimately created not a centralized regulatory state, but a "Broker State" defined by a "a collection of subsystems linking partially autonomous bureaucratic agencies, special support in Congress, and organizations representing well-bounded socioeconomic interests." Ellis W. Hawley, "The New Deal State and the Anti-Bureaucratic Tradition," in *The New Deal and Its Legacy: Critique and Reappraisal* ed. Robert Eden (New York: Greenwood Press, 1989), 89; Finegold and Skocpol, *State and Party in America's New Deal* (Madison: University of Wisconsin Press, 1995), quoted on 20. See also Brinkley, *The End of Reform: New Deal Liberalism in Recession and War* (New York: Alfred A. Knopf, 1995), 5, 34-37, 44-47; Steve Fraser and Gary Gerstle, eds., *The Rise and Fall of the New Deal Order, 1930-1980* (Princeton: Princeton University Press, 1989); and Marc Allen Eisner, *From Warfare State to Welfare State: World War I, Compensatory State Building, and the Limits of the Modern Order* (University Park: Pennsylvania State University Press, 2000). Finegold and Skocpol borrow the term "Broker State" from Otis Graham, who in turn appropriated it from John Chamberlain. See Otis L. Graham, Jr., *Toward a Planned Society: From Roosevelt to Nixon* (New York: Oxford University Press), 65; John Chamberlain, *The American Stakes* (New York: Carrick & Evans, 1940).

[19] See David E. Hamilton, *From New Day to New Deal: American Farm Policy from Hoover to Roosevelt, 1928-1933* (Chapel Hill: University of North Carolina Press, 1991); and Hamilton, "Building the Associative State: The Department of Agriculture and American State-Building," *Agricultural History* 64 (Spring 1990): 207-218. While Jess Gilbert does not label the USDA an "associative state," he describes it in such terms. For instance, he sees New Deal agricultural policymakers as modernists who believed in the power of state bureaucracy and planning to deliver reform, but as "participatory democrats" who valued local knowledge systems. In such a manner, he challenges James C. Scott's ideas that the USDA represented "high-modern" state-building that, in an effort to make society and the land more "legible," oppressed local traditions. See Gilbert, "Low Modernism and the Agrarian New Deal: A Different Kind of State," in *Fighting for the Farm: Rural America Transformed*, ed. Jane Adams (Philadelphia: University of Pennsylvania Press, 2003), 131; Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998), 196-201. See also Jess Gilbert and Carolyn Howe, "Beyond 'State vs. Society': Theories of the State and New Deal Agricultural Policies," *American Sociological Review* 56 (April 1991): 204-220. Scott's ideas are based considerably on those of Deborah Fitzgerald and Theodore Porter. See Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003); and Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1995).

narrowly as relationships between the federal government and private business associations, many scholars have failed to see the continuity of the associative order beyond the New Deal.

Recently, other scholars have recognized how the associative order did not represent an interwar anomaly, but largely characterized the whole of American state building. These scholars challenge the Weberian notion of an ideal-type state characterized by "an administrative and legal order" that "claims binding authority…over the members of the state, the citizens…[and] over all action taking place in the area of its jurisdiction."[20] For instance, Elisabeth Clemens argues that, contrary to this clean, rational theory of statecraft, the American state in practice amounted to "an immensely complex tangle of indirect incentives, cross-cutting regulations, overlapping jurisdictions, delegated responsibility, and diffuse accountability. Simply put, the modern American state is a mess." In his synthesis of nineteenth-century American governance, Brian Balogh demonstrates that through associative frameworks reaching back even to the nation's founding, "the United States governed *differently* from other industrialized [nation-states], but did not necessarily govern *less*." In Balogh's analysis, the assumption that a large federal government emerged only during the twentieth century is flawed, for Washington was just as active in local affairs during the previous century. It just remained inconspicuous.[21]

"Soil, Water, and the State" joins this literature in seeing greater continuity in the associative order. It examines how an expansion of federal authority developed through a low-profile associative state that channeled federal largesse through a nationwide network of public and private actors. Decentralization reigned supreme. In effect, the associative order expressed in the

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[20] Weber, *Theory of Social and Economic Organization*, 156.

[21] Clemens, "Lineages of the Rube Goldberg State," 187; Balogh, *Government Out of Sight*, 2, emphasis original. Balogh further explores these ideas in Balogh, *The Associational State*. See also Hawley, "The New Deal State," 81; Sparrow, *Warfare State*, especially 7-11.

conservation-industrial complex combined the "marble cake" federalism described by Philip Glick with the active support and endorsement of the private sector.

Associative arrangements helped endear an enlarged state to those who might seem among the most resistant, or even hostile to government intervention in private affairs—especially farmers.[22] While many farmers had adopted soil conservation methods throughout American history, a broader embrace of such practices accelerated in the 1930s and beyond with the advent of direct federal financial and technical assistance for conservation.[23] To encapsulate the tension between farmers' perceived individualism and their dependence on federal support, historian Andrew Duffin offers the construct of "agrarian liberals"—farmers who were "eager to drink from the federal trough all the while maintaining a veneer of independence…. They wanted the support of an expanding federal safety net when it served their needs *and* they clung to an outdated myth of independence."[24] Such a construct aptly describes the contradictory culture of American farming, but Duffin overlooks the more probing question of how American farmers were able to reconcile what seems like such a glaring inconsistency.

The present study argues that farmers were not self-delusional, nor did they maintain this contradiction solely out of cold economic self-interest. Rather, farmers could accept federal assistance for conservation (as well as for other purposes) because the entire system was designed to hide or downplay the presence of Washington. Indeed, one of the defining strengths of the

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[22] The agrarian movements of the late-nineteenth and early-twentieth centuries called for a stronger state, but on a more limited statutory (as opposed to discretionary) basis. In the process, as Elizabeth Sanders demonstrates, "social forces profoundly hostile to bureaucracy nevertheless instigated the creation of a bureaucratic state." Sanders, *Roots of Reform: Farmers, Workers, and the American State, 1877-1917* (Chicago: University of Chicago Press, 1999), 6. On the currents of antistatism coursing through the nation's political culture, see Gary Wills, *A Necessary Evil: A History of American Distrust of Government* (New York: Simon & Schuster, 1999); and Barry D. Karl, *The Uneasy State: The United States from 1915 to 1945* (Chicago: University of Chicago Press, 1983). On the role of antistatism in twentieth-century US environmental politics, see Brian Allen Drake, *Loving Nature, Fearing the State: Environmentalism and Antigovernment Politics before Reagan* (Seattle: University of Washington Press, 2013).

[23] For early practitioners of soil conservation, see Stoll, *Larding the Lean Earth*; Angus McDonald, *Early American Soil Conservationists*, USDA Miscellaneous Publication 449 (Washington, D.C.: Government Printing Office, 1941).

[24] Andrew P. Duffin, *Plowed Under: Agriculture and Environment in the Palouse* (Seattle: University of Washington Press, 2007), 9, emphasis original.

associative order, according to Brian Balogh, was that it "capitalized on the collective impulse inherent in the commonwealth tradition without abandoning the classical liberal commitment to individual rights." As it was "filtered through the associative order," writes Balogh, "federal support seemed less threatening—even traditional." In other words, farmers accepted federal intervention in private affairs, all the while retaining their Jeffersonian self-image, because the conservation-industrial complex inserted the federal government inconspicuously into local affairs. The role of the federal government in soil and water conservation remained "hidden in plain sight," sufficiently intermingled with local initiatives that it did not arouse the ire of antistatism.[25] The expansion of federal authority in conservation thereby proceeded in a nonthreatening and politically viable manner.

The conservation of natural resources had represented a primary means of expanding federal authority as far back as the Progressive Era. Historians have demonstrated how utilitarianism emerged in several forms before the late nineteenth century, both in the United States and abroad.[26] Yet, it was not until the Progressive Era that utilitarian conservation in the US became institutionalized and nationalized by the state. Theodore Roosevelt summarized the thrust of this style of environmental protection in "The New Nationalism," a speech delivered in August 1910. "Conservation means development as much as it does protection," Roosevelt proclaimed to his

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[25] Balogh, *Government Out of Sight*, 4, 383. Other aspects of federal assistance in agriculture were also distributed through local channels. For an in-depth examination of how this decentralized power structure fostered institutional racism within the US Department of Agriculture, see Pete Daniel, *Dispossession: Discrimination Against African American Farmers in the Age of Civil Rights* (Chapel Hill: University of North Carolina Press, 2013).

[26] For antecedents in the United States and colonial North America, see Stoll, *Larding the Lean Earth*; Richard W. Judd, *The Untilled Garden: Natural History and the Spirit of Conservation in America, 1740-1840* (New York: Cambridge University Press, 2009); and Judd, *Common Lands, Common People: The Origins of Conservation in Northern New England* (Cambridge: Harvard University Press, 1997). For global antecedents, see Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860* (Cambridge: Cambridge University Press, 1995); Ramachandra Guha, *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya*, expanded ed. (Berkeley: University of California Press, 1989); and Gregory Barton, *Empire Forestry and the Origins of Environmentalism* (Cambridge: Cambridge University Press, 2002).

Kansas audience. "I recognize the right and duty of this generation to develop and use the natural resources of our land; but I do not recognize the right to waste them."[27] Roosevelt's two principles—development and efficiency—at first blush appear synonymous, for both involve the protection of natural resources for the purpose of sustained human production. A subtle yet significant difference distinguishes the two, however. Efficiency allows for and facilitates economic growth; development requires it. And, as the title of Roosevelt's speech indicates, conservation required greater intervention by the federal government.

Historians are familiar with how utilitarian conservation resulted in an expansion of centralized state authority. Long the classic treatment of Progressive Era conservation, Samuel Hays' 1959 *Conservation and the Gospel of Efficiency* explores how numerous federal agencies emerged between 1890 and 1920 to manage the nation's water, forest, and rangeland resources—particularly on public lands—more efficiently for the purposes of sustained economic development. Historians have subsequently examined the inner workings of conservation, particularly the degree to which this new administrative state often developed in an undemocratic manner.[28]

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[27] Theodore Roosevelt, "The New Nationalism," in *American Progressivism: A Reader* eds. Ronald J. Pestritto and William J. Atto (Lanham, Maryland: Lexington Books, 2008), 218.

[28] Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920* (1959; Pittsburgh: University of Pittsburgh Press, 1999). On the "hidden history" of conservation, see Karl Jacoby, *Crimes Against Nature: Squatters, Poachers, Thieves, and the Hidden History of American Conservation* (Berkeley: University of California Press, 2001); Louis S. Warren, *The Hunter's Game: Poachers and Conservationists in Twentieth-Century America* (New Haven: Yale University Press, 1997); and Benjamin Heber Johnson, "Conservation, Subsistence, and Class at the Birth of Superior National Forest," *Environmental History* 4 (January 1999): 80-99. Sara Gregg presents a similar picture of federal authority supplanting local land-use regimes (and displacing local land users), although she is less biting in her critique of this process. See Gregg, *Managing the Mountains*. Alternatively, Brian Balogh argues that Gifford Pinchot, the quintessential utilitarian conservationist of the Progressive Era, created a vast regulatory apparatus not through government edicts or compulsion, but "by relying upon private and voluntary resources wherever possible" and by "framing his programs in the rhetoric of the market." See Balogh, "Scientific Forestry and the Roots of the Modern Administrative State: Gifford Pinchot's Path to Progressive Reform," *Environmental History* 7 (April 2002): 216. See also Bruce J. Schulman, "Governing Nature, Nurturing Government: Resource Management and the Development of the American State, 1900-1912," *Journal of Policy History* 17 no. 4 (2005): 375-403. Char Miller offers a more traditional view of Pinchot, arguing that "alongside…[Pinchot's] regulatory effort was the rise of a national administrative structure within the United States, in which the executive branch dominated the other two branches of the federal government." Miller, *Gifford Pinchot and the Making of Modern Environmentalism* (Washington, D.C.: Island Books, 2001). For other works that pair conservation and resource development during this period with the rise of state authority, see Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (New York: Oxford University Press, 1985); and Donald

Scholars have also examined the intersections of state development and conservation during the interwar period. Sarah Phillips, for instance, demonstrates how a wide array of New Deal land-use planning initiatives "established the justification for an expanded federal reach and an enlarged federal government"—a process critical to the building of a liberal, Democratic coalition. In his examination of the Civilian Conservation Corps (CCC), Neil Maher comes to a similar conclusion, arguing that conservation "altered American politics by introducing the New Deal to the American public in ways that raised popular support for Roosevelt's liberal welfare state." Whereas the overtly statist character of land-use planning and the CCC helped ensure their demise once the emergency of the Great Depression had passed, the associative order proved far more adaptable to shifting political winds.[29] Federal soil and water conservation weathered periodic budget cuts and political attacks, and its low profile and shared governance helped ensure that it would thrive beyond the New Deal and, indeed, throughout the twentieth century.

For years, most studies examined soil and water conservation primarily from a policy perspective. Led by former SCS historian Douglas Helms, these scholars wrote many articles and a few longer pieces that illuminate the passage of landmark conservation laws and the various

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Pisani, *Water, Land, and Law in the West: The Limits of Public Policy, 1850-1920* (Lawrence: University Press of Kansas, 1996). Frank Uekötter argues that Progressive Era conservation was part of a broader modernization, which implicitly involved increased state authority. See Uekötter, "Conservation: America's Environmental Modernism?" in *Fractured Modernity: America Confronts Modern Times, 1890s to 1940s*, eds. Thomas Welskopp and Alan Lessoff (München: R. Oldenbourg Verlag, 2012), especially pp. 87-89.

[29] Phillips notes the decentralized and voluntary aspects of interwar conservation as revealing "both the potential and the limits of the liberal conservation regime." Phillips, *This Land, This Nation*, 3, 82; Maher, *Nature's New Deal*, 6. Another centerpiece of interwar conservation that lasted beyond the New Deal was rangeland management. See Matthew Pearce, "Discontent on the Range: Uncovering the Origins of Public Grazing Lands Politics," (PhD diss., University of Oklahoma, 2014). Sara Gregg makes similar points but does not emphasize the political dimensions, tracing how conservation programs transformed "stretches of the Appalachian Mountains from a vernacular agrarian landscape to [a] federally managed forest." Gregg, *Managing the Mountains*, ix. Donald J. Pisani gives a somewhat perfunctory treatment of the decentralized nature of interwar conservation in "The Many Faces of Conservation: Natural Resources and the American State, 1900-1940," in *Taking Stock: American Government in the Twentieth Century*, eds. Morton Keller and R. Shep Melnick (New York: Woodrow Wilson Center Press and Cambridge University Press, 1999), 148-151, 154-155.

activities in which the Soil Conservation Service engaged.[30] The present project builds on this literature with a broader narrative that integrates conservation more thoroughly into the cultural and political concerns of US society. What "Soil, Water, and the State" sacrifices in detailed discussions of policy, it gains in deeper appreciation of how conservation officials defined their mission as central to American life and how this meaning of conservation changed over time.

Recent scholarship on soil and water conservation has expanded to include an array of analytical frameworks. In his study of conservation before 1940, for instance, Samuel Stalcup, argues persuasively that the central feature in the rise of nationwide soil and water conservation was how Americans gradually "sought to protect the public interest in the private use of land."[31] Paul Sutter's research on Georgia's "Little Grand Canyon" provides a compelling window into the history of soil erosion and conservation in the US South with important implications for our understanding of conservation nationwide.[32] Whereas Sutter and Stalcup end their studies around World War II or shortly thereafter, Andrew Duffin's exploration of agriculture and conservation in the Palouse region of Washington and Idaho spans the twentieth century. Yet, Duffin's research demonstrates the limits of extrapolating regional variations to the national level. In the Palouse, conservation technicians represented the thwarted heroes who tried in vain to restrain production-oriented policies and thereby reduce erosion.[33] At the national level, I argue, conservation technicians

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[30] For compilations of Helms' writings, see Helms, ed., *Readings in the History of the Soil Conservation Service* (Washington, D.C.: USDA Soil Conservation Service, 1992); and Samuel Stalcup, ed., *He Loved to Carry the Message: The Collected Writings of Douglas Helms* (Raleigh, NC: Lulu.com, 2012). See also Douglas Helms, "Hugh Hammond Bennett and the Creation of the Soil Erosion Service," *Journal of Soil and Water Conservation* 64 (March/April 2009): 68A-74A; and Douglas Helms, "Hugh Hammond Bennett and the Creation of the Soil Conservation Service," *Journal of Soil and Water Conservation* 65 (March/April 2010): 37A-47A. See also D. Harper Simms, *The Soil Conservation Service* (New York: Praeger Publishers, 1970).

[31] Stalcup, "Public Interest, Private Lands," x. See also Stalcup, et al., "Reflections on One Hundred and Fifty Years of the United States Department of Agriculture," *Agricultural History* 87 (Summer 2013): 343-349.

[32] Sutter, "What Gullies Mean"; Sutter, *Let Us Now Praise Famous Gullies*.

[33] Duffin, *Plowed Under*. For a similar treatment of soil conservationists, see Randal S. Beeman and James A. Pritchard, *A Green and Permanent Land: Ecology and Agriculture in the Twentieth Century* (Lawrence: University Press of Kansas, 2001), chapters 2 and 3.

typically did not seek to stymie the maximized production of industrial agriculture. They tried to guarantee it.

In recent years, scholars have grown increasingly interested in historicizing agricultural industrialization—the process in which farming became less reliant on human and animal labor, and more dependent on capital to purchase land, machinery, high-yielding seeds (and other organisms), chemical fertilizers, pesticides, and other expensive technologies. This transition began in the late nineteenth century and accelerated gradually until World War II, when most scholars would agree agricultural industrialization started proceeding more rapidly. Historians have examined this process from a variety of perspectives: not only the ideas, technologies, and business structures that facilitated this farming regime, but also in case studies of how it unfolded in specific places.[34]

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[34] On the ideas that promoted more businesslike and specialized farming, see Fitzgerald, *Every Farm a Factory*; David B. Danbom, *The Resisted Revolution: Urban America and the Industrialization of Agriculture, 1900-1930* (Ames: Iowa State University Press, 1979); Laurie Winn Carlson, *William J. Spillman and the Birth of Agricultural Economics* (Columbia: University of Missouri Press, 2005); and Joshua M. Nygren, "In Pursuit of Conservative Reform: Social Darwinism, the Agricultural Ladder, and the Lessons of European Tenancy," *Agricultural History* 89 (Winter 2015): 75-101. On the creation of higher-yielding hybrid organisms through breeding and genetic modifications, see Alan L. Olmstead and Paul W. Rhode, *Creating Abundance: Biological Innovation and American Agricultural Development* (New York: Cambridge University Press, 2008); Susan Schrepfer and Philip Scranton, eds., *Industrializing Organisms: Introducing Evolutionary History* (London: Routledge, 2003); John H. Perkins, *Geopolitics and the Green Revolution: Wheat, Genes, and the Cold War* (New York: Oxford University Press, 1997); and Deborah Fitzgerald, *The Business of Breeding: Hybrid Corn in Illinois, 1890-1940* (Ithaca: Cornell University Press, 1990). On the growing availability of guano and other fertilizers see Gregory T. Cushman, *Guano and the Opening of the Pacific World: A Global Ecological History* (New York: Cambridge University Press, 2013); Hugh S. Gorman, *The Story of N: A Social History of the Nitrogen Cycle and the Challenge of Sustainability* (New Brunswick: Rutgers University Press, 2013); and Vaclav Smil, *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production* (Cambridge: MIT Press, 2001). For two differing accounts of how Americans came to accept agricultural science—one top down, the other bottom up, see Margaret W. Rossiter, *The Emergence of Agricultural Science: Justus Liebig and the Americans, 1840-80* (New Haven: Yale University Press, 1975); and Benjamin R. Cohen, *Notes from the Ground: Science, Soil, and Society in the American Countryside* (New Haven: Yale University Press, 2009). On pesticides, their development, and their application in the United States and elsewhere, see Pete Daniel, *Toxic Drift: Pesticides and Health in the Post-World War II South*, (Baton Rouge: Louisiana State University Press in association with Smithsonian Institution, 2005); Angus Wright, *The Death of Ramón González: The Modern Agricultural Dilemma*, rev. ed. (Austin: University of Texas Press, 2005); Russell, *War and Nature*; Linda Nash, *Inescapable Ecologies: A History of Environment, Disease, and Knowledge* (Berkeley: University of California Press, 2006), chapters 4-5; and David Douglas Vail, "Guardians of Abundance: Aerial Application, Agricultural Chemicals, and Toxicity in the Postwar Prairie West" (PhD dissertation, Kansas State University, 2012). On growth hormones in animals and their effect on human bodies, see Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES* (New Haven: Yale University Press, 2010). For an exploration of vertical integration within livestock and poultry agriculture after World War II, see John Fraser Hart, *The Changing Scale of American Agriculture* (Charlottesville: University of Virginia Press, 2003). For explorations that integrate a number of these perspectives in a single place, see Duffin, *Plowed Under*; Steven Stoll, *The Fruits of Natural Advantage: Making the Industrial Countryside in California* (Berkeley: University of California Press, 1998); and J. L. Anderson, *Industrializing the Corn Belt: Agriculture, Technology, and Environment, 1945-1972* (DeKalb, Ill.: Northern Illinois University Press, 2009).

Critics of industrialized agriculture, as well as many historians, assume that farmers embraced these new ideas and methods of farming because they prioritized economic production over environmental protection.[35] "Soil, Water, and the State," however, demonstrates how conservation enabled and encouraged many agricultural producers to view these two goals not in opposition, but as mutually constitutive. For most of its history, the conservation-industrial complex shared the same production-oriented discourse as many other agents of industrialization. It also counted as some of its most vocal proponents the farm-equipment and agro-chemical industries, which stood to profit by the machines and chemicals needed to implement many conservation practices. Conservation rhetoric, in sum, promised farmers they could enjoy the bounty of the land—and of modern industrial agriculture—without skinning it in the process.

While improved productivity always guided the conservation-industrial complex, it did not dominate soil and water conservation until World War II. During the 1920s and 1930s, conservation apostles promoted their programs primarily as a means of furnishing economic security for farmers who were in jeopardy of losing their land amid the dislocations of economic depression. The conservation of natural resources was inseparable from the conservation of human resources. This changed with the acceleration of two interrelated processes during and after World War II: agricultural industrialization and rural depopulation. Technological and policy changes decreased the need for farm labor, and social and cultural patterns drew rural people to cities and suburbs. Whereas half of Americans lived in the country in 1920, that number had dwindled to roughly eight percent by the early 1960s.[36]

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[35] See, for instance, Nash, *Inescapable Ecologies*, 134; Duffin, *Plowed Under*; and the essays in Andrew Kimbrell, ed. *The Fatal Harvest Reader: The Tragedy of Industrial Agriculture* (Washington, D.C.: Island Press, 2002).

[36] Sarah T. Phillips et al., "Reflections on One Hundred and Fifty Years of the United States Department of Agriculture," *Agricultural History* 87 (Summer 2013): 316. For an overview of the related technological and demographic changes, see David B. Danbom, *Born in the Country: A History of Rural America* (Baltimore: Johns Hopkins University Press, 2006), chap. 11.

The conservation-industrial complex responded to the de-peopling of rural America by abandoning its interwar goal of keeping farmers on the land. Instead, conservation policy targeted widespread economic growth with the promise of "maximum, sustained yields."[37] SCS director Hugh Hammond Bennett demonstrated these new priorities in a 1947 article, tellingly titled, "Development of Natural Resources: The Coming Technological Revolution on the Land." Conservation technology, Bennett maintained, could now raise overall standards of living "by increasing the per-acre, per-farm, and per-nation supply of food and fiber." This emphasis on fueling widespread consumption came at a cost, however, for those who valued well-populated rural communities. "Farming will become an expert profession," predicted Bennett. "The in-expert and inept will be forced off the land."[38] Rather than viewing the countryside as a home to people, postwar conservation policy framed it almost entirely as a place for production.

With the interwar social justification for conservation increasingly defunct thanks to rural depopulation, postwar conservation advocates championed their programs' importance to the rising consumer society. The parties of the conservation-industrial complex came to define the *raison d'être* for soil and water conservation as guaranteeing the material abundance at the core of the consumer society. Conserving and developing soil and water resources, the idea went, ensured the nation it would have sufficient raw materials to satisfy Americans' growing consumer appetites. If a consumer society was, as historian Gregory Summers defines it, "a world in which the role of nature as a means of production had all but disappeared from the ordinary experience of daily life," then postwar conservation was part of the disappearing act. No longer concerned with maintaining a

[37] Hugh Hammond Bennett, "Adjustment of Agriculture to Its Environment," *Annals of the Association of American Geographers* 33 (December 1943): 164.

[38] H. H. Bennett, "Development of Natural Resources: The Coming Technological Revolution on the Land," *Science* 105 (3 January 1947): 3–4.

well-populated countryside, conservation policymakers strove to make sure farmers remaining on the land could continue producing abundantly for time immemorial.[39]

The divorce of natural and human resources after World War II points to new insights in the history of utilitarian conservation. Whereas interwar conservation once existed as "terra incognita" in environmental historiography, scholars now recognize that the heart of conservation in the 1920s and 1930s was the merging of concern for human and natural resources.[40] Some historians have suggested this dual concern for people and land signaled a transition from Progressive Era conservation and its emphasis on sustained production to postwar environmentalism and its concern for quality of life and consumption.[41] Yet, the conservation-industrial complex's subordination of people to productivity after World War II actually resulted in a body of interests who shared more in common with Gifford Pinchot than with Rachel Carson. Rural depopulation precluded the social base needed for what historians typically consider a *movement*, but utilitarian ideas, practices, and policies continued to thrive throughout the twentieth century—a feature of

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39 Summers, *Consuming Nature: Environmentalism in the Fox River Valley, 1850-1950* (Lawrence: University Press of Kansas, 2006), 7. For a seminal treatment of the centrality of consumerism to American life after World War II, see Lizabeth Cohen, *A Consumers' Republic: The Politics of Mass Consumption in Postwar America* (New York: Vintage Books, 2003).

40 Paul S. Sutter, "Terra Incognita: The Neglected History of Interwar Environmental Thought and Politics," *Reviews in American History* 29 (June 2001): 289-297. The conservation movement during this period integrated social concerns with traditional economic prerogatives. While historians dispute the degree to which interwar conservation differed from the Progressive Era—Sarah Phillips, for instance, suggests a clean break, while Sara Gregg demonstrates greater continuity—they nevertheless agree that the period between the two world wars gave rise to a different set of concerns than those that prevailed in the previous era. See Phillips, *This Land, This Nation*; Gregg, *Managing the Mountains*. One of the earliest and most vocal calls for the distinctiveness of interwar conservation was Paul Sutter's *Driven Wild: How the Fight against Automobiles Launched the Modern Wilderness Movement* (Seattle: University of Washington Press, 2002). See also Kendrick A. Clements, *Hoover, Conservation, and Consumerism: Engineering the Good Life* (Lawrence: University Press of Kansas, 2000); David B. Woolner and Henry L. Henderson, eds. *FDR and the Environment* (New York: Palgrave Macmillan, 2005); and Joshua M. Nygren, "A Producers' Republic: Rural Zoning, Land Use, and Citizenship in the Great Lakes Cutover, 1920-1940," *Michigan Historical Review* (Spring 2014): 1-26. Historians long assumed that utilitarian conservation remained relatively unchanged from the Progressive Era until after World War II. See, for instance, Samuel P. Hays, *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955-1985* (New York: Cambridge University Press, 1987); and Mark W. T. Harvey, *A Symbol of Wilderness: Echo Park and the American Conservation Movement* (1994; Seattle: University of Washington Press, 2000).

41 Maher, *Nature's New Deal*.

environmental history that has, with a few exceptions, gone unexamined.[42] Scholars have paid due attention to the multifold origins and evolution of environmentalism, which, as a social movement, supplanted conservation after World War II.[43] Conservation remained strong, however, among the ever-shrinking number of Americans who worked ever-larger parcels of the nation's land, seventy percent of which is privately owned. "Soil, Water, and the State" therefore traces how conservation ideas, practices, and policies continued to shape the political and physical landscapes of the United States throughout the twentieth century, surviving the rise of environmentalism even while precipitating and responding to it.

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"Soil, Water, and the State" is divided into two parts, each comprising three chapters. Part I tells a national story of the conservation-industrial complex since 1920. It focuses on the changing ideas and policies of soil and water conservation by exploring how key figures in the conservation-industrial complex, particularly in the Soil Conservation Service, defined their purpose. When

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[42] An important recent exception is the work of Laura Kolar, who traces the evolution of USDA conservation policies into the 1970s. Kolar, "Conserving the Country in Postwar America: Federal Conservation Policy from Eisenhower to Nixon" (PhD diss., University of Virginia, 2011); Kolar, "'Selling' the Farm: New Frontier Conservation and the USDA Farm Recreation Policies of the 1960s," *Agricultural History* 86 (Winter 2012): 55-77. Histories of environmental management have also explored how conservation evolved during the age of environmentalism, particularly involving forest and water management. See Paul W. Hirt, *A Conspiracy of Optimism: Management of the National Forests since World War Two* (Lincoln: University of Nebraska Press, 1994); Nancy Langston, *Where Land & Water Meet: A Western Landscape Transformed* (Seattle: University of Washington Press, 2003); and Nancy Langston, *Forest Dreams, Forest Nightmares: The Paradox of Old Growth in the Inland West* (Seattle: University of Washington Press, 1995).

[43] The historiography of environmentalism is vast. Good starting points for the movement's social foundations include Adam Rome, *The Genius of Earth Day: How a 1970 Teach-In Unexpectedly Made the First Green Generation* (New York: Hill and Wang, 2013); Adam Rome, *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (New York: Cambridge University Press, 2001); Adam Rome, "'Give Earth a Chance': The Environmental Movement and the Sixties," *Journal of American History* 90 (September 2003): 525-554; and Robert Gottlieb, *Forcing the Spring: The Transformation of the American Environmental Movement*, revised and updated edition (Washington, D.C.: Island Press, 2005). A widely influential explanation for postwar conservation came from historian Samuel P. Hays, who in 1987 argued, "Conservation gave way to environment after World War II amid a rising interest in the quality of life beyond efficiency in production." Hays, *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955-1985* (New York: Cambridge University Press, 1987), 3. See also Hays, *A History of Environmental Politics since 1945* (Pittsburgh: University of Pittsburgh Press, 2000). For histories that accept Hays' framework, see Hal Rothman, *The Greening of a Nation?: Environmentalism in the United States since 1945* (Fort Worth, Tex.: Harcourt Brace, 1998); Thomas Robertson, *The Malthusian Moment: Global Population Growth and the Birth of American Environmentalism* (New Brunswick: Rutgers University Press, 2012), xiv; and Maher, *Nature's New Deal*, 5-6.

conservation officials advocated their programs, it asks, what did they say it would achieve? How and why did these definitions change over time? These sorts of questions are important, for they move the narrative of conservation beyond solely the policy realm and into American culture. In order to sell their programs to the American public, conservation apostles understood that they needed to demonstrate what was at stake. The meaning of conservation was therefore a critical element in the success of the conservation-industrial complex.

Chapter 1 examines these themes in the formative years of the national push for soil and water conservation. Here I argue that between 1920 and 1950, conservation evangelist and SCS director Hugh Hammond Bennett defined the meaning of conservation through the idea of security, specifically national security. Mirroring ideas popular in the Progressive Era as well as in the interwar period, Bennett believed that the fate of societies was tied to their stewardship of natural resources. In the throes of the Great Depression, soil conservation offered the nation security by keeping farmers on their land. During World War II, however, the meaning of security came to be defined by the compatibility of conservation methods with maximized production, which aligned the conservation-industrial complex more completely with the ascendant regime of industrialized agriculture. The advent of soil conservation districts in the late 1930s facilitated the success of conservation; they decentralized federal authority by establishing a cooperative framework with farmers while simultaneously centralizing authority for conservation within the Department of Agriculture.

In Chapter 2, I examine how the definition of conservation adapted to the unprecedented prosperity of the postwar United States. Between 1950 and 1970, conservation officials came to define the value of their programs according to their ability to guarantee abundance for the nation. As the nation's population and consumer appetites grew, so did its pressures on the natural world. The conservation-industrial complex came to see its mission as regulating soil and (especially) water resources in order to safeguard mass production. The USDA's Small Watershed Program was instrumental in this effort by broadening the authority of federal conservation agencies. As with soil conservation districts, however, this authority was filtered through the associative order, which increased the appeal of the conservation-industrial complex to farm-equipment manufacturers, farmers, private contractors, and urban and suburban Americans looking for flood control and outdoor recreation opportunities.

Between 1970 and 1990, however, the conservation-industrial complex faced a number of crises that challenged its popularity. Chapter 3 traces how the complex responded to controversies over stream channelization, renewed awareness of and concern for soil erosion, and the growing dilemma of nonpoint source water pollution. These crises elicited a reshuffling of the power structure within the conservation-industrial complex. Previously, the Soil Conservation Service enjoyed primacy over the discourse of conservation, but in the 1970s and 1980s, its institutional legitimacy was challenged by environmentalists as well as by old stalwarts of the conservation-industrial complex. In effect, this signaled a transition in soil and water conservation from institutional politics to interest group politics. Gradually, the meaning of conservation moved toward environmental quality, even while the complex retained its wholly utilitarian character.

Part II departs from this chronological structure and examines soil and water conservation as it was implemented on the ground. I adopt a case study approach to explore three of the most critical elements of the conservation-industrial complex: technology, farmers, and politicians. I argue that each of these was necessary for soil and water conservation to become as widespread as it did. These three chapters illustrate that conservation amounted to more than a set of abstract ideas; instead, it represented a set of tangible relationships between humans and the natural world. Technology, social relationships with farming, and conservation politics were each mediated in important ways by topographical, climatological, hydrological, and biological features of the natural world. Part II therefore demonstrates the potential of integrating materialist perspectives into the more familiar treatments of technological, social, and political history.

Chapter 4 examines the creation of practical and effective conservation technologies at a national scale throughout the twentieth century. I treat technology broadly as both physical hardware and associated practices. Specifically, this chapter traces how conservation researchers refined terracing and conservation tillage—two of the most important conservation technologies—into workable, replicable technologies that farmers could install reliably in the unique environmental conditions of their farms. The central question, I argue, was how to control the erosive power of running and falling water. By controlling this natural power, conservation researchers lent the conservation-industrial complex social and political power, for it enabled them to convince farmers and politicians to adopt and support soil and water conservation. These technologies also afforded the complex economic power, for they opened up entirely new markets for farm-equipment manufacturers and (in the case of conservation tillage) the agrochemical industry. In other words, technology helped make the complex industrial.

The final two chapters take a place-based approach, exploring conservation in the Upper and Lower Mississippi River Valley throughout the twentieth century. Chapter 5 focuses on the role of the farmer in the Driftless Area of southwestern Wisconsin and adjoining states, home to what many people in conservation circles consider a success story. I argue that this success revolved primarily around farmers: conservation research was inspired by and designed specifically for agricultural producers; conservation technicians established amiable working relationships with farmers; producers convinced one another of the efficacy of conservation methods; and conservation technologies and federal assistance each aligned with the biological needs of the crops and animals farmers wished to raise. However, this chapter also demonstrates the limits of a "success story" narrative, suggesting that there were many instances where farmers did not embrace conservation due to incompatibilities in their relationships with conservation agents or with the biological requirements of their crops. Nevertheless, this in-depth look at the importance of farmers in perhaps the most well-known case of conservation success speaks to the significance of the associative order in the conservation-industrial complex.

Chapter 6 examines the final piece of the conservation-industrial complex: congressional politics. The Yazoo River basin of northern Mississippi does not enjoy the same reputation in conservation circles as does the Driftless Area of Wisconsin, even though it was home to a number of exceptionally well-funded conservation initiatives throughout the twentieth century. I argue that conservation in the Yazoo Basin was propelled by a series of chain reactions between the physical environment and politicians in Congress—especially Jamie Whitten, the Mississippi Democrat who dominated federal agricultural policy for over four decades from his chairmanship of the powerful House Agriculture Appropriations Subcommittee. Whitten was eager to deliver federal pork to alleviate his constituents' needs and concerns, which often concerned soil erosion and the sedimentation of streams and lakes. Yet, every time he used his clout to bring federal conservation to his district, those efforts triggered chain reactions in the Yazoo watershed that then elicited calls for greater federal intervention. Although Whitten wielded extraordinary influence in Congress and within the USDA, his story provides a window into the various avenues open to politicians who wanted to use soil and water conservation to protect and develop natural resources for their constituents. And in order for the conservation-industrial complex to thrive, it needed allies in Congress who were willing and able to unloose the federal dollars on which conservation programs depended.

These various dimensions of the conservation-industrial complex—political, social, technological, cultural, and environmental—converged to create institutions, ideas, and practices committed to soil and water conservation. This complex proved remarkably powerful and resilient throughout the twentieth century, due largely to its associative structure and to its dual pursuit of economic production and environmental protection. "Soil, Water, and the State" thus demonstrates the vitality of the associative state and of utilitarian conservation throughout the twentieth century, and it explains how farmers and policymakers could reconcile industrialized agriculture with stewardship of the land. Finally, this project reminds us that soil and water are inseparable from the state. The natural world, as it exists in our minds as well as in reality, infuses and shapes all aspects of human life—and, consequently, all of human history.

PART I

THE DISCOURSE OF CONSERVATION

1

A Wellspring of Security:
Hugh Hammond Bennett & the Origins of the Conservation-Industrial Complex, 1920-1950

On Monday night, 14 August 1939, the chief of the Soil Conservation Service (SCS) took to the airwaves of NBC radio with an ominous message for the nation's listeners. "Tonight," Hugh Hammond Bennett cautioned, "the United States is a declining nation—in the sense that our most basic asset, our one most indispensable national resource—the land—is being impoverished by erosion faster than we have been able to establish defense measures." While many Americans might very well have had a "feeling of false security with respect to the permanence of our agriculture," he warned, the land "is not secure!… The opportunity for a man to make a living by the land is not secure!… Our country, our civilization, *cannot survive* if this waste of soil is permitted to continue." Bennett acknowledged he was "painting a black picture…but I've done it purposely." He hoped not only to impress upon his audience the severity of erosion, but also to direct national attention to the network of allies working to practice and implement soil conservation. This network included federal and state agencies, conservation field technicians, and "farmers joining together, locally," in soil conservation districts. These parties shared a common objective of protecting topsoil, the "thin line of defense that stands between security and national weakness and decadence." Given the high stakes, Bennett assured his listeners, "we have too much patriotism, too much business sense," to jeopardize the resources that undergirded American freedom and prosperity.[1]

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[1] Bennett, "This is Your Land," Address arranged by the *Washington Star*, broadcast over NBC radio, 14 August 1939, 1-3, 5; b10f27, Hugh Hammond Bennett Papers, MS 164, Special Collections Department, Iowa State University Library [hereafter cited BP]. Emphasis original.

Although Bennett never used the term, when he spoke of the network of agencies, professionals, and farmers fighting erosion, he was describing central nodes in the burgeoning conservation-industrial complex. With the exception of soil conservation districts—official units of local government that state legislatures began authorizing only two years earlier—the SCS chief spent little time outlining the other members of the complex. Instead, most of his talk underscored the threat of soil erosion to the United States and its security. In fact, this idea represented the central theme in conservation discourse between 1920 and 1950. Why did Hugh Bennett stress national security with such regularity? How did this rhetoric foster the construction of the conservation-industrial complex? How and why did the ideal of security help the complex adapt to changing economic and political conditions?

Bennett's emphasis on national security proved a highly effective rhetorical strategy. The association of American civilization with the fate of its soil highlighted what was at stake should the nation fail to support conservation programs. This concept built on Progressive Era precedents that linked societies and natural resources, and it corresponded to a broader set of ideas that suggested the economic, social, and environmental problems plaguing the United States during the interwar period were all intertwined. The ideal of stability also fostered the construction of the conservation-industrial complex. As Bennett's radio address suggested, national security appealed to an American patriotism that could resonate with almost anyone, including the farm-equipment industry who saw in federal conservation programs opportunities to further their economic interests. Moreover, this concept translated easily into the language of democracy, which became especially relevant as the Department of Agriculture established an associative order through soil conservation districts. Finally, national security provided a highly malleable concept with which to adapt soil and water conservation to the rapidly changing conditions in the United States during and after World War II. In short, by defining the need for agricultural conservation in terms of national security, Hugh

Bennett established a compelling justification for the sustained public and private support of soil and water conservation that facilitated the development of the conservation-industrial complex.

Bennett was ideally suited to lead the crusade for soil and water conservation. Born in 1881, he was raised on a 1,200-acre plantation outside of Wadesboro, North Carolina, developing a commanding presence as he matured—"six feet one, broad of shoulder, brown and sinewy, handsome and vibrant…[with an] easy southern drawl," wrote his biographer. In 1903, Bennett began his career as soil surveyor in the USDA Bureau of Soils, a position through which he continually encountered the ravages of soil erosion. These experiences figured strongly in Bennett's mission in the 1920s to awaken the nation to the threat of erosion, an effort that soon reaped reward. Bennett directed the USDA erosion-control research that Congress authorized in 1929, the temporary Soil Erosion Service (SES) that it launched in 1933, and the Soil Conservation Service from its creation in 1935 until his phased retirement began in 1951. The command of soil science that he cultivated early in his career lent his subsequent rhetoric, which might otherwise register as bombast, a credibility that few could match. Indeed, Bennett was a master synthesizer. Much of his influence derived from his ability to unify diverse threads of thought—scientific literature as well as past and contemporary iterations of the idea that soils and societies were linked—coherently into a rational yet morally compelling narrative designed to generate support for the conservation-industrial complex.[2]

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[2] Wellington Brink, *Big Hugh: The Father of Soil Conservation* (New York: Macmillan, 1951), 13. For more on Bennett's biography and its influence on his career, see Paul S. Sutter, *Let Us Now Praise Famous Gullies: Georgia's "Little Grand Canyon" and the Soils of the South* (Athens: University of Georgia Press, forthcoming 2015); Samuel Stalcup, "Public Interest, Private Lands: Soil Conservation in the United States, 1890-1940," (PhD diss., University of Oklahoma, 2014), chapters 2 and 3. On Bennett's ability to publicize science in a compelling manner, see Kevin C. Armitage, "The Soil Doctor: Hugh Hammond Bennett, Soil Conservation, and the Search for a Democratic Science," in *New Natures: Joining Environmental History with Science and Technology Studies* eds. Dolly Jørgensen, Finn Arne Jørgensen, and Sara B. Pritchard (Pittsburgh: University of Pittsburgh Press, 2013), 87-102. On the creation of the SES and SCS, see Douglas Helms, "Hugh Hammond Bennett and the Creation of the Soil Erosion Service," *Journal of Soil and Water Conservation* 64 (March/April 2009): 68A-74A; and Douglas Helms, "Hugh Hammond Bennett and the Creation of the Soil Conservation Service," *Journal of Soil and Water Conservation* 65 (March/April 2010): 37A-47A. For examples of Bennett's

Between 1920 and 1950, both the public and private dimensions of the conservation-industrial complex came into being. In the public sphere, Bennett helped generate an expansion of federal authority in soil and water conservation that proceeded primarily through decentralized, federalist channels. The principal means by which this occurred was through experiment stations and soil conservation districts. In 1929, Congress passed an amendment introduced by Texas Representative James Buchanan to an appropriations bill, allocating $160,000 to the USDA to investigate soil erosion "independently or in cooperation with other branches of the Government, State agencies, counties, farm organizations, associations of business men, or individuals." In practice, the Department cooperated with state land-grant universities to establish erosion-control experiment stations, thereby repurposing the associative structure of the land-grant complex to the new imperatives of soil conservation.[3]

With the onset of Franklin Roosevelt's New Deal in 1933, the USDA and the Department of the Interior experimented with erosion-control demonstration projects, a strategy with the potential to foster an administrative state in the conservation-industrial complex. By 1935, however, Hugh Bennett and other USDA leaders realized the political impracticality of using demonstration projects, which involved considerable investment of federal resources and personnel, to spread

early work as a soil scientist, see Hugh Hammond Bennett, *The Soils and Agriculture of the Southern States* (New York: Macmillan, 1921); and Hugh H. Bennett and Robert V. Allison, *The Soils of Cuba* (Washington, D.C.: Tropical Plant Research Foundation, 1928). For contemporaries who similarly associated the fate of American society with the fate of its resources, see Henry A. Wallace, *New Frontiers* (New York: Reynal & Hitchcock, 1934); and Stuart Chase, *Rich Land, Poor Land: A Study of Waste in the Natural Resources of America* (New York: Whittlesey House, 1936).

[3] *Congressional Record*, 70th Cong., 2d sess., 1928, 70, pt. 1:843. For more on these experiment stations, see Stalcup, "Public Interest, Private Lands," chapter 4. For more on the history of USDA cooperation with land-grant universities in the late nineteenth and early twentieth century, see Alan I. Marcus, *Agricultural Science and the Quest for Legitimacy: Farmers, Agricultural Colleges, and Experiment Stations, 1870-1890* (Ames: Iowa State University Press, 1985); Charles E. Rosenberg, *No Other Gods: On Science and American Social Thought*, revised and expanded ed. (Baltimore: Johns Hopkins University Press, 1997), chapters 8, 9, and 11; A. Hunter Dupree, *Science in the Federal Government: A History of Policies and Activities to 1940* (Cambridge: The Belknap Press of Harvard University Press, 1957), chapter 8; T. Swann Harding, *Two Blades of Grass: A History of Scientific Development in the U.S. Department of Agriculture* (Norman: University of Oklahoma Press, 1947); and Mark D. Hersey, "'What We Need is a Crop Ecologist': Ecology and Agricultural Science in Progressive-Era America," *Agricultural History* 85 (Summer 2011): 297-321.

conservation across the entire country. Instead, they developed the mechanism of a "conservation district," a unit of local government through which the USDA could channel conservation assistance. Whereas the federal government maintained a high profile in demonstration projects—as reflected by widespread concerns that the government might dictate land uses against farmers' wishes—soil conservation districts presented an ideal means through which the state could exercise influence while remaining out of sight.[4] The pursuit of national security through soil and water conservation certainly called for an expansion of federal authority, but it developed through an associative rather than an administrative order.[5]

The second quarter of the twentieth century also witnessed the rise of the private dimension of the conservation-industrial complex. Specifically, conservation researchers and officials in the farm-equipment industry kept in close contact concerning the technologies being developed at experiment stations. Researchers realized that the practicality of their techniques depended in part on compatibility with existing farm practices, which were growing increasingly mechanized.[6] Machine manufacturers, such as John Deere and International Harvester, were interested in conservation practices because soil and water conservation presented a new market for their products. These companies also served the important role of promoting conservation in their advertisements (often by drawing on SCS rhetoric of national security) and occasionally donating

[4] For examples of fears that the government would dictate the land uses of cooperating farmers, see Neil M. Maher, *Nature's New Deal: The Civilian Conservation Corps and the Roots of the American Environmental Movement* (New York: Oxford University Press, 2008), 122; Maher, "'Crazy-Quilt Farming on Round Land': The Great Depression, the Soil Conservation Service, and the Politics of Landscape Change on the Great Plains during the New Deal Era," *Western Historical Quarterly* 31 (Autumn 2000): 334; and Renae Anderson, "Coon Valley Days," *Wisconsin Academy Review* 48 (Spring 2002): 45.

[5] Historian Sarah Phillips rightly sees in such an arrangement the seeds of postwar economic growth. "The kind of state building [New Deal policy] put in place," she argues, "relied on voluntary measures and short-term financial benefits. These methods do not restrain economic expansion, but encourage it; they do not put a brake on consumers' needs and wants, but accelerate their accumulation." While she sees this as an unintended consequence of New Deal conservation, I argue that these results were entirely intentional by the 1940s. It wasn't simply that conservation advocates did not forsee such results, but that their goals changed with the onset of World War II. Phillips, *This Land, This Nation*, 241.

[6] See Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003), especially chapter 3.

funds for conservation operations. In such a manner, the state and private industry collaboratively engineered the idea that conservation and industrialized agriculture were mutually compatible.

This compatibility grew more important during and after World War II, when federal policies encouraged increased production to meet wartime needs and to safeguard postwar prosperity. The war had an important effect on soil and water conservation. Whereas Bennett and others promoted conservation during the 1920s and 1930s as a way to protect natural and human resources—keeping soil and people on the farm—the focus shifted increasingly during the 1940s away from fostering social stability in rural America. Instead, Bennett came to define the purpose of conservation as achieving "maximum, sustained yield," with the likelihood that "the inexpert and inept will be forced off the land."[7] In the 1940s, national security was best served by boosting production, no matter the costs.

Despite these changes, the discourse of conservation remained remarkably constant. From Bennett's perspective, the purpose of his crusade was to foster national security on a permanent basis.[8] Bennett rarely defined what he meant by *nation* or *civilization*—these terms functioned as

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[7] Bennett, "Adjustment of Agriculture to Its Environment," *Annals of the Association of American Geographers* 33 (December 1943): 164; Bennett, "Development of Natural Resources: The Coming Technological Revolution on the Land," *Science* 105 (3 January 1947): 4. The unified protection of human and natural resources was a hallmark of the conservation movement between the two world wars. See Sara M. Gregg, *Managing the Mountains: Land Use Planning, the New Deal, and the Creation of a Federal Landscape in Appalachia* (New Haven: Yale University Press, 2010); Sarah T. Phillips, *This Land, This Nation: Conservation, Rural America, and the New Deal* (New York: Cambridge University Press, 2007); Maher, *Nature's New Deal*; Paul S. Sutter, *Driven Wild: How the Fight against Automobiles Launched the Modern Wilderness Movement* (Seattle: University of Washington Press, 2002); Sutter, "Terra Incognita: The Neglected History of Interwar Environmental Thought and Politics," *Reviews in American History* 29 (June 2001): 289-297; Kendrick A. Clements, *Hoover, Conservation, and Consumerism: Engineering the Good Life* (Lawrence: University Press of Kansas, 2000); David B. Woolner and Henry L. Henderson, eds. *FDR and the Environment* (New York: Palgrave Macmillan, 2005); and Joshua M. Nygren, "A Producers' Republic: Rural Zoning, Land Use, and Citizenship in the Great Lakes Cutover, 1920-1940," *Michigan Historical Review* (Spring 2014): 1-26. For more on the depopulation of the countryside in response to federal policies, see Michael Johnston Grant, *Down and Out on the Family Farm: Rural Rehabilitation in the Great Plains, 1929-1945* (Lincoln: University of Nebraska Press, 2002). Other New Deal programs, such as public works, similarly lost their social impetus during and after World War II. See Jason Scott Smith, *Building New Deal Liberalism: The Political Economy of Public Works, 1933-1956* (New York: Cambridge University Press, 2006).

[8] Kevin Armitage has also pointed out that security was an important concept for Bennett, but he takes a rather narrow approach to security. In Armitage's estimation, security for Bennett functioned primarily as a rhetorical device (a "frame") used to argue that funding conservation was as important as funding the military. See Armitage, "The Soil Doctor," 94-96, 99. See also Stalcup, "Public Interest, Private Lands," 126-134.

proxies for American people, the nation-state, and national values such as freedom and democracy—but this ambiguity played to his advantage, placing at risk whatever Americans held dear about their society. The ideal of security blended seamlessly with a guiding principle of Franklin Roosevelt's New Deal, which was to restore stability to Americans' lives still reeling from the economic dislocations of the Great Depression.[9] Yet, the notion that the fate of civilizations was tied to their treatment of natural resources had deep roots, reaching back to conservationists of the nineteenth century. In fact, it was this idea that lent the conservation-industrial complex discursive continuity even amid the tremendous political, economic, and social changes coursing through American agriculture between 1920 and 1950.

Linking Soil and Society before the Conservation-Industrial Complex

Hugh Bennett's association of soil, society, and security germinated during his childhood in North Carolina. By most accounts, Bennett's family led a comfortable existence. He and his eight siblings enjoyed "security and close-knit family love and loyalty at home," according to his biographer. His father helped ensure that stability by terracing his fields in an effort, he told his son, "to keep the land from washing away." Outside of his home, however, plantation owners and their children faced the prospects of disorder as they reckoned with the legacy of southern land use. Whereas many nineteenth-century southerners moved west when faced with soil exhaustion, by the end of the century migrants like his brother Norfleet discovered that the western outlet no longer offered a viable alternative. With the land eroding from underneath them and nowhere else to go, Hugh Bennett observed around him an incredible "restlessness…induced by the sense of uncertainty." Bennett's background as a child of the South stuck with him. It taught him that just

[9] See David M. Kennedy, *Freedom from Fear: The American People in Depression and War, 1929-1945* (New York: Oxford University Press, 1999).

as his father's soil conservation yielded stability for his family, his neighbors' soil erosion bred insecurity for themselves and, by extension, for all of southern society.[10] This lesson was but one example of a long tradition of Americans associating the state of natural resources with the wellbeing of society.

During the early nineteenth century, for instance, an influential minority of eastern farmers linked the political power and economic welfare of their states to improved stewardship of the soil. Led by farmers and planters like John Lorain of Pennsylvania and Edmund Ruffin of South Carolina, these gentlemen farmers urged their brethren to adopt better farming methods that would safeguard eastern agriculture and the entire eastern polity. If farmers and planters rendered their lands unfit for agriculture, they reasoned, westward expansion would accelerate and thereby dilute eastern economic and political influence. In short, these reformers believed that the wellbeing of their society was a direct function of the soil on which it rested.[11]

Growing up amid this eastern angst was a Vermonter named George Perkins Marsh, a highly influential author who helped spark the utilitarian conservation movement in the United States. In his 1864 masterpiece, *Man and Nature*, Marsh illustrated not just how people had permanently manipulated and often despoiled the natural world, but also how this had profound and lasting negative impacts on human society. Although he focused primarily on forests rather than on farmlands, he argued that the trend of humans eroding their land and livelihoods had been repeated

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[10] Brink, *Big Hugh*, pp. 26-47; quoted on pp. 28, 29, and 31. For more on Bennett's upbringing, see Stalcup, "Public Interest, Private Lands," 73-77. Paul Sutter has provided the best recent treatment of soils in southern history. See Sutter, "What Gullies Mean: Georgia's 'Little Grand Canyon' and Southern Environmental History," *Journal of Southern History* 76 (August 2010): 579-616; Sutter, *Let Us Now Praise Famous Gullies*. See also Douglas Helms, "Soil and Southern History," *Agricultural History* 74 (Autumn 2000): 723-758; Carville Earle, "The Myth of the Southern Soil Miner: Macrohistory, Agricultural Innovation, and Environmental Change," in *The Ends of the Earth: Perspectives on Modern Environmental History* ed. Donald Worster (Cambridge: Cambridge University Press, 1988), 175-210. Donald Worster makes a similar argument that Bennett's southern heritage and experience influenced his thoughts on soil erosion and agricultural reform. See Donald Worster, "A Sense of Soil," in *The Wealth of Nature: Environmental History and the Ecological Imagination* (New York: Oxford University Press, 1993), 72.

[11] Steven Stoll, *Larding the Lean Earth: Soil and Society in Nineteenth-Century America* (New York: Hill and Wang, 2002). For more on antebellum farmers' reception to agricultural science and an "improvement" ethic, see Benjamin R. Cohen, *Notes from the Ground: Science, Soil, and Society in the American Countryside* (New Haven: Yale University Press, 2009).

throughout world history. Writing in Rome as the US ambassador to Italy, Marsh concluded in his book that more than half of the Old World was "either deserted by civilized man and surrendered to hopeless desolation, or at least greatly reduced in both productiveness and population." This process occurred throughout the ancient Roman Empire as well as in the Middle East. "The earth is fast becoming an unfit home for its noblest inhabitant," Marsh concluded, jeopardizing human civilization and threatening "the depravation, barbarism, and perhaps even extinction of the species."[12] At the core of one of the foundational texts of utilitarian conservation was thus the unmistakable conviction that human civilizations rise and fall with the natural resources on which they depend.

In the coming decades, Marsh's ideas of the connections between natural resources and human societies would be recycled, honed, and reapplied to a variety of circumstances. Historians are familiar with the Progressive Era efforts to foster efficient federal management and development of natural resources—especially water, rangelands, and forests—under the banner of conservation. These efforts had their expression most notably in the West, where the federal government sought to put an end to the tradition of disposing of the public domain and instead sought to achieve "wise use" through the technocratic management of public lands by scientific experts in the federal bureaucracy. By focusing on the Progressive conservation movement as it was applied to public lands, however, historians have until recently overlooked the ways that Marsh's ideas manifested during this period in efforts to conserve the soil.[13]

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[12] George Perkins Marsh, *Man and Nature: Or, Physical Geography as Modified by Human Action* ed. David Lowenthal (1864; Cambridge: Harvard University Press, 1965), 9, 43. For more on Marsh's life, see David Lowenthal, *George Perkins Marsh: Prophet of Conservation* (Seattle: University of Washington Press, 2000). Historian Steven Stoll argues that Marsh's upbringing in Vermont was critical to the development of his ideas on conservation. Stoll, *Larding the Lean Earth*, 172-182.

[13] For examples of the standard treatment of Progressive Era conservation, see Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920* (1959; Pittsburgh: University of Pittsburgh Press, 1999); Harold K. Steen, *The U.S. Forest Service: A History* (Seattle: University of Washington Press, 1976); Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (New York: Oxford University Press, 1985);

The idea that civilizations depended on their soil never gained as much popularity during the Progressive Era as did its corollary for forests and water, but the importance of soil conservation did not go ignored. As early as 1891, Harvard geology professor Nathaniel Southgate Shaler articulated an ethic toward the soil based on humanity's material dependence on its products. "When we perceive that civilization rests on the food-giving capacities of the soil," he wrote, "when we perceive that all the future advance of our kind depends upon the preservation and enhancement of its fertility, we…[recognize an] obligation [that] bids us nurture and care for this part of the earth with an exceeding tenderness and affection." Shaler presented the soil as a connection to past and future, for "it is enriched with the dust of our progenitors, and is teeming with the life which is to come." Humanity's obligation toward the soil was not just a practical concern; it represented the ethics of intergenerational responsibility. Should people renounce this responsibility, Shaler later warned, the fall of past civilizations signaled the price society would pay for soil erosion and exhaustion. In lands surrounding the Mediterranean, for example, "the pauperizing influences arising from the wasting away and the chemical exhaustion of the frail earth" had cut arable lands in half.[14] Not only was the earth pauperized, but also human civilization.

Given this Progressive Era awareness of how soil erosion jeopardized American society, it is curious why the United States did not witness a national campaign to conserve soil as it did to

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Donald J. Pisani, *Water and American Government: The Reclamation Bureau, National Water Policy, and the West, 1902-1935* (Berkeley: University of California Press, 2002); Donald J. Pisani, *From the Family Farm to Agribusiness: The Irrigation Crusade in California and the West, 1850-1931* (Berkeley: University of California Press, 1984); and William D. Rowley, *U.S. Forest Service Grazing and Rangelands: A History* (College Station: Texas A&M University Press, 1985). For recent explorations of soil conservation during this period, see Stalcup, "Public Interest, Private Lands," chapters 1-2; Stoll, *Larding the Lean Earth*, 180-181; Sutter, *Let Us Now Praise Famous Gullies*. Hugh Bennett rarely borrowed from Marsh directly, but he was familiar with his predecessor's ideas. For example, see Bennett, *Soil Conservation* (New York: McGraw-Hill, 1939), 899.

[14] Shaler, *The Origin and Nature of Soils* (Washington, D.C.: GPO, 1892), 345; Shaler, *Man and the Earth* (New York: Fox, Duffield, and Company, 1906), 124. In 1896, Shaler also argued that if "mankind cannot devise and enforce ways of dealing with the earth which will preserve this source of life, we must look forward to the time—remote it may be, yet clearly discernible—when our kind, having wasted its greatest inheritance, will fade from the earth because of the ruin it has accomplished."' Shaler, "The Economic Aspects of Soil Erosion, *National Geographic Magazine* 7 (November 1896): 374, as quoted in Stalcup, "Public Interest, Private Lands," 35. For more on Shaler's concern for soil erosion, and that of a contemporary, Thomas Chrowder Chamberlain, see Stalcup, "Public Interest, Private Lands," 33-46.

conserve forests or water. Historian Samuel Stalcup offers a couple answers. First was the primacy of private property. He argues that Shaler and others placed their faith in farmers' "enlightened self interest" to protect their soil, considering agricultural lands distinctly different from the public forests and waterways that attracted other conservationists' attention. Second, Stalcup suggests soil conservation failed to attract sustained attention during this period because "conservation of the soil requires knowledge of the soil." In other words, until the state had greater knowledge of the types and condition of the nation's soils, it would be unable to intervene in an effort to protect them. Even though the USDA's main objective was to help farmers increase production rather than decrease erosion, one of its primary duties in the early twentieth century was dispatching soil surveyors like Hugh Bennett to map and classify the soils of the nation.[15]

Another reason that the state did not involve itself with agricultural conservation during the Progressive Era is that USDA leadership, particularly Bennett's boss Milton Whitney, the chief of the Bureau of Soils, prioritized soil fertility over the physical body of soil.[16] In a now-notorious declaration from 1909—made famous largely by Hugh Bennett's efforts to demolish it as rubbish and by subsequent historians' use of it as a baseline against which to measure the evolution of soil conservation—Whitney announced that soil erosion and exhaustion presented nothing to be feared.[17] "The soil," Whitney proclaimed, "is the one indestructible, immutable asset that the Nation possesses. It is the one resource that cannot be exhausted; that cannot be used up." The context of this statement, however, suggests that its consequence has often been exaggerated. His primary focus was dispelling the notion that soil *fertility*, not the physical body of soil, was indestructible.[18]

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[15] Stalcup, "Public Interest, Private Lands," chapters 1-2, quoted on 42, 47.

[16] The forgoing discussion was inspired by the work of Paul Sutter, who explores how prevailing theories of soil and soil fertility shaped USDA (in)attention to erosion. See Sutter, *Let Us Now Praise Famous Gullies*.

[17] For examples of historians who treat the statement in such a manner, see Worster, *Dust Bowl*, 213; Armitage, "The Soil Doctor," 93-94.

[18] Whitney clarified his focus on soil fertility as separate from erosion, writing that "it is very much to be doubted whether there have been any measureable fundamental chemical changes in the mineral soil material of the

In fact, Whitney was aware that erosion could ravage a soil body, acknowledging that "soils…frequently deteriorate through erosion where the top soil is removed, leaving the infertile subsoil as the medium of growth." Nevertheless, the net effect of erosion in Whitney's eyes amounted to a wash. For example, while he recognized that erosion caused temporary hardships for upland cotton farms in the South, he claimed that the eroded sediment retained its nutrients and then "forms the fertile rice lands of the deltas of the rivers."[19] As a result, one farmer's waste was simply another's bounty, and there was no need to rush into action. Whitney's research remained focused on soil fertility, and his agency's outreach efforts were limited to helping farmers use the Soil Survey to choose the crops best suited to their soils.[20]

As a soil surveyor in the Bureau of Soils, Hugh Bennett tried to convince Whitney of the severity of erosion. Bennett's recollections of his boss indicate that the latter approached erosion cautiously, resistant to the idea that erosion demanded concerted attention. As head of the Soil Erosion Service in 1934, he recalled,

> My old chief, Professor Milton Whitney, used to tell me that…nature would tend to cure the scars of erosion…. I was unable to succedd [*sic*] in convincing him that he was under estimating the seriousness of the problem…. Professor Whitney usually wound up the discussions about getting something started by saying, "Bennett, I don't think the time is quite ripe for getting into action with this problem."[21]

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lands that we actually cultivate, *save such as are brought about by erosion by wind or water*." Whitney, *Soils of the United States, Based upon the Work of the Bureau of Soils to January 1, 1908*, United States Department of Agriculture Bureau of Soils Bulletin 55 (Washington: GPO, 1909), 66, 71-72, emphasis added. For more evidence of Whitney's preoccupation with soil fertility, see also Whitney, *Soil and Civilization: A Modern Concept of the Soil and the Historical Development of Agriculture* (New York: D. Van Nostrand Company, 1925). For examples of historians who treat the statement in such a manner, see Worster, *Dust Bowl*, 213; Armitage, "The Soil Doctor," 93-94.

19 Whitney, *Soils of the United States*, 62, 77. Historian Mart Stewart shows how rice fields on the Georgia coast in the middle of the nineteenth century often did benefit from upstream erosion in the Piedmont, but within a few decades such erosion was already causing problems by clogging harbors with sediments. See Mart A. Stewart *"What Nature Suffers to Groe": Life, Labor, and Landscape on the Georgia Coast, 1680-1920* (Athens: University of Georgia Press, 2002), 154-155 and 230-231.

20 See Stalcup, "Public Interest, Private Lands," chapter 2.

21 Bennett to Frank Bohn, 24 August 1934; Box 10, "Boa-Bol 21" Folder; Correspondence of Hugh Hammond Bennett, ca. 1912-49; Records of Officials, Record Group 114; National Archives at College Park, College Park, MD (NACP).

The root of the problem as Bennett saw it was Whitney's excessive preoccupation with soil fertility, such that the boss failed to realize that fertilizers are "all of no avail if we permit the whole body of the soil with its contained elements of nutrition to wash off the slopes."[22] Bennett's fruitless efforts to change Whitney's mind would have lasting consequences.

When the conservationist began his anti-erosion campaign in earnest during the mid-1920s, on the eve of Whitney's retirement, he had so thoroughly defined the central issue as the protection of the physical body of soil that the brand of soil and water conservation he spread throughout the nation paid little heed to maintaining soil fertility. His landmark 1928 publication, *Soil Erosion a National Menace*, began by arguing that "the plant-food elements removed by crops…can be restored in the form of fertilizers, manures, and soil-improving crops turned under; but the soil that is washed out of fields cannot be restored" except by centuries-long soil formation processes.[23] This mindset was part logical recognition of the nature of physical soil compared to soil fertility, part reaction against his former boss's intransigence. Bennett felt the need to overcome Whitney's inertia so deeply that he prioritized the protection of the soil body exclusively over that of soil fertility. While it is unlikely that the voluntary system of soil conservation that would soon develop would have been able to stymie the rise of chemical fertilizers in American agriculture, Bennett's experience with Milton Whitney helped ensure that the burgeoning conservation-industrial complex would prioritize the conservation of soil bodies rather than soil nutrients.[24]

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[22] Bennett to Bohn, 24 August 1934.

[23] Bennett and W. R. Chapline, *Soil Erosion a National Menace*, USDA Circular 33 (Washington, D.C.: Government Printing Office, April 1928), 2. Whitney retired in June 1927. See Delvin S. Fanning and Mary Christine Balluff Fanning, "Milton Whitney: Soil Survey Pioneer," *Soil Survey Horizons* 42:3 (2001), 86.

[24] This helped ensure that *nutrient cycling* (a process of on-site energy recycling) would not fall under the umbrella of soil and water conservation. Instead, conservation would remain compatible with the emerging regime of industrialized agriculture that was dedicated to *throughput* (a one-way flow of energy from the extraction of raw materials to the disposal of waste) via commercial fertilizers usually imported from afar. For more on the differences between nutrient cycling and throughput, and the rise of throughput-oriented agriculture the world over, see Gregory T. Cushman, *Guano and the Opening of the Pacific World: A Global Ecological History* (Cambridge: Cambridge University Press, 2013), 9-14.

A "Campaign of Mournful Howling": The Origins of the Conservation-Industrial Complex

When Hugh Bennett began his crusade for nationwide soil conservation in the 1920s, he had not yet seized on the value of national security as an organizing concept for his rhetoric. He spoke of the economic damages wrought by erosion to American agriculture, but it was not until the end of the decade that he began regularly framing those damages as direct threats to national security.[25] In the meantime, Bennett defined the need for conservation largely in economic terms, which helped endear his mission to industrial manufacturers. Those companies developed a close relationship with the USDA in conservation affairs, especially after the Department's entry into research and development in 1929. This research was typically conducted in association with state land-grant universities, which had been studying erosion for several years. In such a manner, Bennett's efforts in the 1920s to awaken the nation to soil erosion helped foster the creation of both the private and public dimensions of the conservation-industrial complex.

Although he witnessed the social and economic costs of erosion on his neighbors' farms as a boy in North Carolina and throughout the American South as a soil surveyor in the early twentieth century, it was not until 1921 that he took his first steps in what would become a lifelong public campaign against erosion. That year, he presented a paper at the Southern Forestry Congress in which he detailed the destruction of erosion in the US South. But rather than attributing erosion to the traditional cause of deforestation, which foresters since the time of George Perkins Marsh would have recognized, he ascribed it to agriculture. "Throughout the Coastal Plain and Piedmont regions," he told his forester audience, "there are here and there areas of eroded rolling lands…which are abviously [*sic*] not adapted to farming on account of topographic

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[25] This was despite Bennett's long-standing recognition of the importance of soils to American society. In 1909, for instance, he believed that "any thought of the future of the nation suggests the absolute necessity not simply of conserving the soil [fertility], but of increasing its power to produce beyond past and present averages." Bennett, "Making Better Use of Our Soils," *American Review of Reviews* 40 (September 1909): 313.

unfavorableness." Bennett cited a number of soil surveys that had reported "extreme types of gullied, hilly, and stony lands" ill-suited for farming but still producing pine trees.[26] As Sam Stalcup has argued, these conclusions represented a milestone in Bennett's gradual realization that the purpose of conservation was to align land use to the physical properties of soils. In the next few years, this idea crystallized as Bennett served overseas as a foreign expert to Central America and the Caribbean. By the time he returned to the United States from Cuba in June 1926, he was ready to resume his crusade to awaken the nation to the costs of soil erosion.[27]

When Bennett raised the alarm about erosion, he framed the issue squarely in economic terms. This would become a recurring strategy for the crusader, even as he began emphasizing national security in the 1930s. Considering the dearth of attention to soil erosion before 1926, however, Bennett's news likely came as a surprise to many of the policymakers, politicians, and agricultural researchers who first heard it. He started his campaign by tackling soil scientists' preoccupation with soil fertility and "plant-food material," estimating that erosion annually washed away 126 billion pounds of nutrients compared to 5.9 billion pounds "permanently removed by crops."[28] This hampered the productivity of the eroded fields, Bennett proclaimed, at the same time that it damaged valley lands with sedimentation.

Bennett also introduced to the public the differences between the striking yet scattered gully erosion and the more common sheet erosion. "While the more violent types of erosion which form gullies into which houses topple…attract the attention of land owners," he warned that most Americans were blind to the "sheet erosion [that] is quietly wasting the lands of the country and

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[26] Bennett, "The Classification of Forest and Farm Lands in the Southern States," *Proceedings of the Third Southern Forestry Congress*, (New Orleans: John J. Weihing Printing Co., 1921), 74, 77.

[27] Stalcup, "Public Interest, Private Lands," 91-104. Stalcup points out that some of the primary beneficiaries of Bennett's overseas missions were US companies. For more on the role of US fruit companies in Honduras, see John Soluri, *Banana Cultures: Agriculture, Consumption, and Environmental Change in Honduras and the United States* (Austin: University of Texas Press, 2005).

[28] "Erosion Costs Farmers $200,000,000 Annually," *USDA Official Record* 5 no. 46 (17 November 1926), 1-2.

impoverishing the farmers on a scale much more vast," imperiling nearly every county in the nation.[29] By elevating the threat of sheet erosion to the same plane as the more obvious dangers posed by gullying, Bennett effectively presented erosion as a problem of national proportions. Equally important, his message was getting out. On 28 December 1926, he reported to a colleague, "I am much pleased at a number of editorials that have appeared in various papers since my little campaign of mournful howling…was begun" six months earlier.[30]

For the next few years, Bennett continued to emphasize the economic toll of erosion. In his 1928 *Soil Erosion a National Menace*, for instance, he harped especially on the "wastage" of both soil and nutrients through farming mismanagement, which amounted to "an immediate loss to the farmer…[and] a loss to posterity."[31] Contrary to this waste, conservation methods developed by farmers and refined by state university researchers (especially terraces) promised "efficient" use of soil resources (see Chapter 4).[32] Bennett even invoked specters of the agricultural equivalent of a "timber famine," claiming that while "we are not on the verge of a land shortage…we are getting

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[29] "Erosion Costs Farmers," 1-2.

[30] Bennett to Dr. [A. F.] Woods, 28 December 1926, Box 1197, Erosion Folder; General Correspondence of the Office of the Secretary, 1906-70; Records of the Office of the Secretary of Agriculture, RG 16; NACP.

[31] Bennett and Chapline, *Soil Erosion a National Menace*, 2, 11. Bennett's emphasis on posterity echoed the core principle of the Progressive Era conservation movement, which Gifford Pinchot popularized as seeking "the greatest good, for the greatest number, for the longest run." Pinchot biographer Char Miller explains that this quote appeared in a 1905 letter ghostwritten by Pinchot to himself from Secretary of Agriculture James Wilson. Miller also points out that the phrase borrowed language from W. J. McGee, the head of the Bureau of American Ethnology, and philosopher Jeremy Bentham. See Miller, *Gifford Pinchot and the Making of Modern Environmentalism* (Washington, D.C.: Island Press, 2001), 155, 406-407 n13. Pinchot acknowledged in his autobiography his debt to McGee for the concept behind the phrase. See Pinchot, *Breaking New Ground* (New York: Harcourt, Brace, and Co., 1947), 326. See also Charles Richard Van Hise, *The Conservation of Natural Resources in the United States* (New York: Macmillan, 1910), 1.

[32] Bennett and Chapline, *Soil Erosion a National Menace*, 17, 19. Bennett touched upon efficiency in several future publications, including "The Wasting Heritage of the Nation," *Scientific Monthly* 27 (August 1928): 97-124; "The Geographical Relation of Soil Erosion to Land Productivity," *Geographical Review* 18 (October 1928): 579-605; "The Quantitative Study of Erosion Technique and Some Preliminary Results," *Geographical Review* 23 (July 1933): 423-432. By 1936, Bennett had latched onto the concept of efficiency to an even greater degree. "Farming to-day," he wrote, "must be as efficient as a city industry. The program of the Soil Conservation Service aims primarily at the establishment of agriculture on precisely such a basis of efficiency." Bennett, "Waste by Wind and Water," *Scientific Monthly* 42 (February 1936): 175.

much closer…than has been generally supposed."[33] In short, by the late 1920s Bennett had thoroughly defined the need for soil conservation in economic terms, apparently confident that public investment in erosion control would require tangible benefits.

Bennett's efforts began to pay off in 1929. In March 1929, a five-person "Committee on Soil Erosion" (representing the USDA's Bureau of Public Roads, Bureau of Chemistry and Soils, and Forest Service, as well as the state experiment stations in New Jersey and Texas) issued a report they had been crafting for months. The report, which drew heavily on Bennett's ideas, called for the creation of a soil-erosion and moisture-conservation research network under the auspices of the USDA. The proposal called for eighteen strategically located erosion experiment stations, ten of which were ultimately established. The committee recognized that the three representative USDA agencies as well as land-grant institutions had been studying soil erosion for years, but "more or less independently." "The time has now arrived," the committee concluded, "when this information should be brought together and correlated with a view to working out national plans for a study of the methods of erosion control."[34] In the eyes of the committee members, this called for cooperative arrangements between the USDA and land grant universities.

Congress agreed. In December 1928, Representative James Buchanan of Texas, influenced by Bennett's preaching against soil erosion, had introduced an appropriations amendment allotting $160,000 to the USDA for erosion-control investigations. One of the amendment's most impassioned supporters, Texas Representative Luther A. Johnson, articulated some of the

[33] Bennett, "The Cost and Control of Soil Erosion," Radio talk on NBC radio affiliates, 3 September 1930; Box 4, "Newspaper Clippings & Publicity" Folder, 3; Miscellaneous Administrative Files concerning Soil and Water Conservation Investigations, ca. 1929-38; Records of the Office of Research, RG 114; NACP.

[34] USDA Committee on Soil Erosion, "A Program for Soil Erosion, Moisture Conservation, and Stream Regulation Research: First Report of the Committee on Soil Erosion," (Washington, D.C.: 25 March 1929); Box 2, "Committee on Soil Erosion" Folder, 5; Miscellaneous Administrative Files concerning Soil and Water Conservation Investigations, ca. 1929-38; Records of the Office of Research, RG 114; NACP. Bennett's boss, A. G. McCall, was one of the representatives on the committee. The early pages of the report were highly derivative of Bennett's *Soil Erosion a National Menace*, sometimes even borrowing his exact language.

motivations behind the measure. "The problem of soil erosion," Johnson proclaimed in committee hearings, "is not confined to any one State or group of States, but in every State of the American Union where there are agricultural lands the question will sooner or later have to be dealt with." He added, "The money appropriated under this amendment is an investment that will pay vast dividends. Its purpose is to preserve the greatest material asset of the Nation—our agricultural lands." Johnson also echoed Progressive Era notions of security, predicting, "When these [lands] are gone the wealth of the Nation will vanish…. Let us preserve these lands not only for our own use and for those of this generation," he urged Congress, "but for the use of our children and for those who shall live after us." On 18 December 1928, the committee accepted what became known as the Buchanan Amendment, the purpose of which was stated clearly:

> To enable the Secretary of Agriculture to make investigation…of the causes of soil erosion and the possibility of increasing the absorption of rainfall by the soil in the United States, and to devise means to be employed in the preservation of the soil, the prevention or control of destructive erosion and the conservation of rainfall by terracing or other means, independently or in cooperation with other branches of the Government, State agencies, counties, farm organizations, associations of business men, or individuals.[35]

Congress passed Buchanan Amendment as part of the appropriations bill on 16 February 1929, inaugurating an associative order consisting of federal and state partnerships dedicated to developing greater knowledge about soil erosion and its prevention.

For the next four years, Bennett directed the research at the ten experiment stations throughout the country. The technologies and knowledge produced at these stations represented a vital cog in the emerging conservation-industrial complex, without which soil and water conservation would have lost the practicality it needed to be embraced by farmers (see Chapter 4). Moreover, the Committee on Soil Erosion had stipulated in their initial plan that the stations should "make the results of the work immediately available to as many farmers and other interested persons

[35] *Congressional Record*, 70th Cong., 2d sess., 1928, 70, pt. 1:843-844.

as possible," and researchers fulfilled this mandate by publishing bulletins and welcoming visitors to the experiment farms.[36] USDA officials were quick to point out the value of these stations to visiting farmers. In December 1931, for instance, the Bureau of Chemistry and Soils beamed that the experiment station at Bethany, Missouri, had hosted over two thousand visitors that year, reporting that "all are impressed" when personally given the chance to visualize the results of conservation methods.[37] The experiment stations thus conducted not only research, but also public outreach. In the process, researchers aimed to convince farmers to give conservation a shot, thereby broadening the conservation-industrial complex.

Experiment stations also broadened the membership of the conservation-industrial complex to include private industry. USDA researchers and industry representatives kept in close contact concerning the development of technical systems to fight erosion.[38] Experiment stations offered particularly useful proving grounds for farm-equipment manufacturers to determine machine compatibility with conservation designs, especially terraces. In 1932, for instance, USDA engineer Lewis A. Jones advised the annual meeting of the American Society of Agricultural Engineers that three years of research at experiment stations had revealed how "much of the farm machinery now on the market is not sufficiently flexible to operate efficiently over terraced land." Solutions would

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[36] USDA Committee on Soil Erosion, "A Program for Soil Erosion, Moisture Conservation, and Stream Regulation Research," 8-9.

[37] "Bethany Station Demonstrates Striking Damage from Erosion," *C&S Contact* 1 no. 1 (15 December 1931): 13; box 2; Item 97; RG 114; NACP. Visitors were reportedly struck by the amount of soil collected in bins from traditionally cultivated plots relative to the much smaller amount collected from conservation plots.

[38] As the Bureau of Chemistry and Soils reported in 1931, for example, "the National Soil Erosion Committee, while in Oklahoma on October 12 for the inspection of the work at the Guthrie Station, met with the State Soil Conservation Committee and a group of interested public officials and private company representatives." "Items from the Red Plains Erosion Station at Guthrie," *C&S Contact* 1 no. 1 (15 December 1931): 10.

require only minor design adjustments, Jones reassured, thus "it would seem good business for the manufacturers" to make the necessary modifications.[39]

Other businesses also saw opportunities to benefit from experiment station research. Shortly after the passage of the Buchanan Amendment, for instance, the Portland Cement Association wrote to the USDA for information on the establishment of experiment stations. "Our organization is vitally interested in soil erosion prevention," the lobbyist contended, having constructed at the Guthrie, Oklahoma, station "a number of concrete tanks to catch run-off water."[40] Even fertilizer companies supported USDA soil conservation efforts out of the belief that "if soil erosion can be prevented…farmers will be able to use considerably more fertilizer at a profit than they have used in the past."[41] Market opportunities apparently made quick converts to the conservation crusade. And the emerging conservation-industrial complex offered myriad such opportunities, for industry as well as for farmers.

"A Permanent Agriculture to Support a Permanent Nation"

The inauguration of Franklin Delano Roosevelt to the presidency in 1933 marked the beginnings of expanded federal involvement in agricultural conservation. Roosevelt's New Deal began with a flourishing of new agencies dedicated in part or entirely to addressing soil erosion, including the Public Works Administration, the Civilian Conservation Corps, and, most notably, the Soil Erosion Service, an emergency agency that Congress made permanent with the 1935 creation of the Soil Conservation Service. The SES and SCS shared the central goal of the New Deal: to

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[39] Jones, "The Engineer and the Control of Erosion," 23 June 1932, 12; box 4; Item 152; RG 114; NACP. See also Hugh Hammond Bennett, *Report of the Chief of the Soil Conservation Service, 1935* (Washington, D.C.: Government Printing Office, 1935), 37. For more on this topic, see Chapter 4.

[40] W. D. McAllan to A. G. McCall, 21 June 1929; box 6; Item 97; RG 114; NACP.

[41] H. R. Smalley (of the National Fertilizer Association) to A. G. McCall, 25 July 1929; b4; Item 97; RG 114; NACP. Perhaps Smalley believed that conservation measures would prevent farms from becoming rendered useless by erosion, thereby keeping land in production and in need of fertilizers.

stabilize Americans' lives, which in agricultural policy meant keeping farmers on their land.[42] This express goal fostered a discourse of conservation oriented around the idea of national security. Soil conservation would yield, in Hugh Bennett's words, "a permanently productive land for a permanent agriculture to support a permanent nation."[43] In other words, the purpose of conservation in the 1930s was to maintain farmers' security on their land, which cumulatively would ensure the prosperity and security of the nation as a whole.

At the same time that the USDA increased its involvement in erosion control, the calamity of the Dust Bowl was ravaging the Great Plains. This might suggest that the dust storms on the plains, the product of wind erosion, were the driving force behind the emergence of a nationwide soil conservation movement, but this is only partially true. For years, Hugh Bennett had tried to awaken the public to the dangers of water erosion, with steady but limited success. He had long considered wind erosion to be a lesser threat—early in his crusade, he hardly mentioned it at all—largely because of its geographical isolation to the arid and semiarid US.[44] Even after the Dust Bowl forced its way into popular consciousness, the conservationist continued this refrain. In November 1934, Bennett told readers of *Scientific Monthly* that, despite the "'dry blizzard' of sun-obscuring yellow dust" from the plains that hit the Northeast six months earlier, "erosion by water [is] the

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[42] On the centrality of stability to New Deal policy, Kennedy, *Freedom from Fear*. Many historians have noted that the modernizing impulses of New Deal agricultural policy often worked at cross-purposed with the goal of social stability in rural America. Sarah Phillips, for instance, notes that New Deal planners "fused efficiency, equity, and sustainability in a manner that only in retrospect proved paradoxical: they hoped to preserve the family farm by modernizing it." Phillips, *This Land, This Nation*, 41.

[43] Bennett, "Adjustment of Agriculture to Its Environment," *Annals of the Association of American Geographers* 33 (December 1943), 183. Some historians have found in this quest for permanence the roots of ecological agriculture. Most notably, Randal S. Beeman and James A. Pritchard point out that Bennett was part of a broader push for agricultural permanence in the 1930s and 1940s. While they do well to situate Bennett in the context of many other contemporary writers who also pursued similar ideals, Beeman and Pritchard miss the ultimate goal of Bennett's version of permanence. Bennett was certainly a part of a vaguely defined push for "permanent agriculture" that may have contributed to the rise of ecological agriculture, but he also contributed to the production-oriented goals of postwar industrialized agriculture. Beeman and Pritchard, *A Green and Permanent Land*, especially pp. 9-85.

[44] This is somewhat of a generalization, for even the humid half of the country could experience a rare dust storm during times of drought. For example, see Michael J. Goc, "The Wisconsin Dust Bowl," *Wisconsin Magazine of History* 73 (Spring 1990): 162-201.

major evil. Land impoverishment by rainwash is an even more serious economic problem than that of wind erosion."[45] Within a few months, however, Bennett would realize that he could leverage the apocalyptic character of the Dust Bowl in service of his mission to establish soil conservation as a permanent activity of the federal government.

On 2 April 1935, Bennett found himself in front of the Senate Public Lands Committee testifying for a bill to make the Soil Erosion Service a permanent USDA agency. The SCS chief knew that a dust storm from the Great Plains was on its way to Washington, D.C. Historian Kevin Armitage describes how the event became remembered in agency folklore: Bennett intentionally "belabored points, adding nuanced and specific answers to questions meant to elicit a concise response…. Eventually the sky darkened; one senator wondered if a rainstorm had descended on the capital. Many senators walked over to the window, where they witnessed not the sodden thunderclouds of a rainstorm, but a thick blanket of dust settling over the capital city."[46] Bennett's theatrics paid off. By the end of the month, the temporary SES had become the permanent SCS.

His experience in Congress seems to have taught Bennett a valuable lesson. Whereas he previously based his justifications for a federal system of conservation on the prevalence of water erosion throughout the country, he realized that a cataclysmic (though rarer) event such as a dust storm made much better copy. In the aftermath of his testimony and the disastrous dust storms of 1935, Bennett increasingly employed the Dust Bowl as a symbol for all erosion problems of the 1930s, thereby establishing a half-true origins story about conservation that has ultimately proved to have an incredibly long life.[47] Much of the vitality of this legend stems from the stark feelings of

[45] Bennett, "Soil Erosion—a National Menace," *Scientific Monthly* 39 (November 1934), 386, 388.

[46] Armitage, "The Soil Doctor," 98-99. Former SCS historian Douglas Helms investigated the veracity of this dramatic account and concluded most of its features to be accurate. The one aspect he was unable to confirm was whether or not Bennett intentionally delayed the hearing while waiting for the dust to arrive. See Helms, "Conserving the Plains: The Soil Conservation Service in the Great Plains," *Agricultural History* 64 (Spring 1990): 59n2.

[47] In a 1940 speech, Hugh Hammond Bennett articulated the emblematic value of the Dust Bowl. A dust storm, he told a Milwaukee, Wisconsin, crowd, "is a symbol of the type of land use that no nation can afford to

insecurity rendered by walls of dust floating halfway across the country. Bennett exploited this insecurity in 1935 when he wrote, "The world is strewn with civilizations whose basis of continuance has been destroyed by erosion."[48] As Americans observed their state of affairs in the 1930s, many considered it distinctly possible that the United States could continue the trend.

Proponents of conservation in industry adopted this discourse of insecurity. In a 1937 report to the American Engineering Council, an official from Caterpillar Tractor laid out "a cycle" wherein rising standards of living place increasing pressures on land, which then causes erosion. "Uncontrolled erosion," he argued, "will destroy civilization."[49] Other companies echoed this refrain. St. Louis Southwestern Railway Lines, whose business depended on transporting agricultural products, created a poster probably in the 1930s explaining how soil conservation would help the farmer, his community, and the nation as a whole (Figure 2). "Anchor your acres," the company exhorted Texas farmers. "Save the surface soil and you save all!" By taking care of the land through measures such as terraces, a farmer could prevent "distress to the farm home, ruin to the business centers, and decay to the nation."[50] In other words, if each farmer practiced proper husbandry toward his resources, the cumulative effect would be security for the community and nation.

The concomitant crises of the Great Depression and the Dust Bowl of the 1930s provided a context that lent increasing vitality to Bennett's linkages of soils and civilizations, which he had

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countenance." Bennett, "Developing Enlightened Public Opinion in Conservation," Address to the Assembly on Use of Human and Natural Resources in Education, 78th Annual Meeting of the National Education Association, 2 July 1940, 4; box 5; A96-21, C. R. Ashford Papers, University Archives, Mississippi State University, Mississippi State, Mississippi (hereafter "Ashford Papers").

[48] Bennett, "Facing the Erosion Problem," *Science* 81 (5 April 1935): 322. For other references by Bennett to past civilizations that declined due to erosion, see Bennett and Chapline, *Erosion a National Menace*, 23; Bennett, "Our Vanishing Farm Lands," *North American Review* 228 (August 1929): 170; Bennett, *Soil Conservation*, 16-54, 899-939; and Hugh Hammond Bennett and William Clayton Pryor, *This Land We Defend* (New York: Longmans, Green, and Co., 1943), 4, 101.

[49] L. J. Fletcher, "Supplement to Report of Committee on Conservation and Utilization of Natural Resources," 1937 Annual Meeting of the American Engineering Council, Washington, D.C., 15-16 January 1937, 2; attached to Fletcher to M. L. Wilson, 26 January 1937; b2638; RG 16; NACP.

[50] St. Louis Southwestern Railway Lines, "Anchor Your Acres"; Box 4; Item 97; RG 114; NACP.

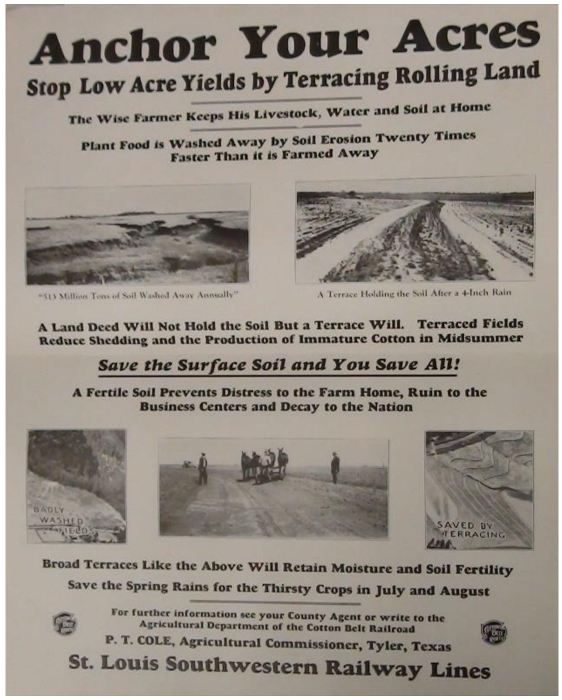

Figure 2: As this placard (ca. early 1930s) suggests, private industry also defined the need for conservation in terms of security. Source: National Archives, College Park, Maryland.

begun articulating in the late 1920s. Each of these crises conjured images of American decline. Bennett did not dispel these visions but instead exploited them to his advantage. Should the United States fail to face the erosion menace quickly and thoroughly, he predicted national ruin, often invoking patriotism to avert such calamity. "No American, comprehending the danger," Bennett told his national readership in 1929, "will refuse to join in national combat against the evil that lowered the Roman standard from its high place, brought depopulation to Asia Minor, afflicted much of China with indescribable poverty, and is now adding rapidly to our already large area of abandoned farm land and devastated ranges."[51] The alternative was clear. If the US foundered in its conservation effort, "this great nation of ours eventually would become…a decadent nation too poor to be adequately self-sustaining."[52] The SCS chief consequently implored not just farmers, but

[51] Bennett, "Our Vanishing Farm Lands," 170.

[52] Bennett, "Soil Conservation and Citizenship," address to Southwest Illinois Teachers Conference, East St. Louis, Illinois, 5 April 1946, 1, b37f1, BP.

teachers, bankers, businesspeople, and, indeed, the entire nation to rally behind soil and water conservation to protect national security and wellbeing.

Part of what made Bennett's sermonizing so compelling was that he was not preaching alone. His notion that abuse of natural resource could topple American civilization rested on a foundation established decades earlier by the likes of George Perkins Marsh and Nathaniel Southgate Shaler, and it tapped into a contemporary current widespread among intellectuals, policymakers, and politicians during the 1930s. For example, in a 1939 survey of worldwide erosion, British scientists G. V. Jacks and R. O. Whyte maintained that "the ultimate consequence of unchecked soil erosion…must be national extinction…for whatever other essential raw material a nation may dispense with, it cannot exist without fertile soil."[53] Stuart Chase, an American economist, shared this sentiment, arguing in 1936, "The strength of our nation is due to the continent of North America. It has molded us, nourished us, [and] fed its abundant vitality into our veins…. Shall we destroy it?"[54] President Roosevelt stated the idea most succinctly: "The Nation that destroys its soil destroys itself."[55]

Although this broader context helped advance Bennett's efforts, to be truly convincing the crusader needed concrete examples. For these he turned to one of his top assistants, Walter Clay Lowdermilk, whose studies of ancient civilizations provided Bennett tangible visions of what might

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[53] G.V. Jacks and R.O. Whyte, *The Rape of the Earth: A World Survey of Soil Erosion* (London: Faber and Faber Ltd., 1939), 21. Jacks and Whyte published the same book in the United States under different title. See Jacks and Whyte, *Vanishing Lands: A World Survey of Soil Erosion* (New York: Doubleday, 1939).

[54] Chase, *Rich Land, Poor Land*, 350. Chase applies this principle directly to soil on pp. 342-346. For more on similar efforts to derive lessons from the global history of erosion, see Randal S. Beeman and James A. Pritchard, *A Green and Permanent Land: Ecology and Agriculture in the Twentieth Century* (Lawrence: University Press of Kansas, 2001), 11-18.

[55] Roosevelt wrote (or perhaps enlisted an underling such as Bennett to ghostwrite) this line in a letter to governors encouraging them to authorize the creation of soil conservation districts in their respective states. The full letter appeared in a press release slated for publication beginning 27 February 1937. See Stephen Early [Assistant Secretary to the President], Press Release, 26 February 1937, Box 2, "Memoranda regarding Districts Law" Folder; Records of the Soil Conservation Service District Reports and Agreements, 1936-1967; Records Relating to the Organization and Cooperative Agreements with Soil Conservation Districts, RG 114, NACP. See also George Dykhuizen, *Soil Conservation: A Philosopher's Viewpoint* (Burlington, Vt.: Vermont Agricultural Extension Service, 1938), especially pp. 5-6.

befall the United States through unchecked erosion. Lowdermilk trained as a forester and accepted a job in 1922 at the University of Nanking in China, where he studied flooding on the Yellow River. He discovered that soil erosion, caused by the deforestation and cultivation of hillsides, had exacerbated flooding by reducing the capacity of river channels through sedimentation. The worst of these floods occurred in 1852. Lowdermilk later recalled that by the time he left China in 1927, "the full and fateful significance of soil erosion [had been] burned into my consciousness." Given that severity, he "resolved to…devote my lifetime to study of ways to conserve the lands on which mankind depends."[56] His investigations would help substantiate Hugh Bennett's claims that soil conservation was needed for the sake of the nation.

In 1938 and 1939, with Bennett's blessing, Lowdermilk traveled to Europe, Africa, and the Middle East to study past civilizations' relationships to the land. The forester-turned-soil conservationist traveled over 28,000 miles by automobile to discover ways to "profit by failures and achievements of the Old World in our national movement for the conservation of land."[57] Lowdermilk interpreted the results of these journeys as the story of human civilization writ large. In places like Egypt and Mesopotamia, agriculture had enabled greater production of food to support larger populations, which then enabled economic specialization and the division of labor. From Lowdermilk's perspective, soil erosion jeopardized the very foundations of agriculture, and thereby of human civilization. The results were deaths of societies. He traveled through "the morgues of former prosperous areas, now desolate and depopulated," he explained, surveying "the ruins of once great cities, ruins of civilizations and flourishing cultures, strewn like weather beaten skeletons in the

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[56] Walter Clay Lowdermilk, *Conquest of the Land through 7,000 Years*, USDA Soil Conservation Service Agriculture Information Bulletin 99 (1953; Washington: GPO, 1994), 13-15, quoted on pp. 13, 15. See also J. Douglas Helms, "Walter Lowdermilk's Journey: Forester to Land Conservationist," *Environmental Review* 8 (Summer 1984): 132-145; and J. Douglas Helms, "A Centennial Profile: Walter Clay Lowdermilk," *Journal of Soil and Water Conservation* 43 (4): 286-287.

[57] Lowdermilk, "Lessons from the Old World to the Americas in Land Use," in *Annual Report of the Board of Regents of the Smithsonian Institution, 1943* (Washington: GPO, 1944), 413.

graveyard of their erosion destroyed lands, which today are studded with tombstone-like ruins of their irrigation and agricultural works." The conservationist spent his journey documenting how soil erosion had rendered cradles of civilization into "graveyard[s] of empire."[58] While this imagery of death might seem hyperbolic, the scientific character of his research lent his studies an important air of credibility.

Erosion wrought this destruction in a number of ways, Lowdermilk claimed. In places like Jerash, Jordan, "the ruins of [a] once-powerful city of Greek and Roman culture are buried to a depth of 13 feet with erosional debris washed from eroding slopes." Meanwhile, the settlements in northern Syria's "graveyard of a 'hundred dead cities'…have not been buried, but have been left high and stark by the removal of soil," making human habitation impossible. In Mesopotamia, the primary culprit was the siltation of irrigation canals with soil washed from the hills. Lowdermilk determined that through proto-conservation measures, northern Africa was able to serve as "the granary of Rome." But subsequent overgrazing and failure to maintain terraces and water cisterns impaired the region's productivity. "Unleashed and uncontrolled soil erosion," he concluded, "is sufficient to undermine a civilization."[59] These studies provided Bennett convincing evidence that that his prophecies for a United States without soil conservation had a number of historical precedents.

Bennett drew on Lowdermilk's ideas in a number of forums, but part of his genius lay in his ability to preach about the gloomy lessons of history with an extremely moralistic, even religious tone while never alienating his farmer audience. He contended that the history of the New World, especially the United States, was one of a paradise lost. Whereas Native Americans to his mind

[58] Walter Clay Lowdermilk, "The Eleventh Commandment," presented before the Sixth Pacific Science Congress of the Pacific Science Association Session of 1939 in Berkeley, California, 3, 6; Box 1, Folder 4; Miscellaneous Papers of Walter Clay Lowdermilk, 1926-39; Records of Officials, RG 114; NACP; Lowdermilk, *Conquest of the Land* (1953), 2.

[59] Lowdermilk, *Conquest of the Land* (1953), 9, 16, 19.

exhibited universally harmonious relationships with the natural world, Bennett suggested that Euroamerican colonists and farmers disrupted the balance. Many of the founders of the United States had realized "the dangers of erosion and…took active steps to prevent soil washing on their own lands," Bennett argued. "But this conservation fervor was short-lived."[60] According to this narrative, the vast western frontier had facilitated democracy, wealth, and security, but it also sowed seeds of national destruction by fostering wasteful relationships to natural resources. "In all the history of the world," Bennett opened his 1939 magnum opus, *Soil Conservation*,

> No people ever build so fast and yet so well…. All that they finally built upon this continent is founded in [the] faith—that here there would be opportunity and independence and security for any man. Those things are the power and the hope of this democracy. And they have sprung, very largely, from the goodness of our land, its capacity to produce rewardingly. Yet with astonishing improvidence, Americans have plundered the resource that made it possible to realize their dream…. Not mere soil is going down the slopes…. Opportunity, security, the chance for a man to make a living from the land—these are going too. It is to preserve them…that we must defend the soil.[61]

Bennett effectively heaped both praise and condemnation on nineteenth-century Americans. They had created both the conditions for twentieth-century prosperity as well as the wasteful mentalities and practices that threatened its undoing. Bennett's patriotic rhetoric provided a valuable vehicle for his moralizing, for he could exhort his audiences to abandon the ways of their forerunners in order to protect what those predecessors had established.

The problem as Bennett framed it was not that early farmers sinned wantonly, but that they knew not what they did. He charged farmers with operating under "a false philosophy of plenty, a myth of inexhaustibility," leading them to plow up hillsides, destabilize stream banks, and otherwise

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[60] Bennett, *Soils and Security* (Washington, D.C.: GPO, 1941), 5. Bennett cited George Washington and Thomas Jefferson in particular. Others in the Soil Conservation Service elaborated on this theme. See Angus McDonald, *Early American Soil Conservationists*, USDA Miscellaneous Publication 449 (Washington, D.C.: Government Printing Office, 1941).

[61] Bennett, *Soil Conservation*, v.

expose soil to the torrents of water and wind.[62] The SCS chief charged that while this process had garnered great short-term wealth, its "unplanned, haphazard, [and] reckless" treatment of soil also produced a wastefulness that threatened the stability of the land, of agriculture, and of the nation.[63] "We have been more prodigal of our heritage of natural resources than any other people in the world," he lamented. Especially regarding soil, "we have been living in a fool's paradise."[64] Bennett's narrative therefore situated American farmers not as original sinners doomed to continued failure, but rather as those who, having never heard the gospel, were simply lost.

Hugh Bennett's gospel revolved around the science developed at erosion experiment stations. These techniques offered an intelligent form of farming to supplant the methods of "fools." The SCS chief championed soil conservation as an approach that combined the practicality of the farm with the research of the lab—"common sense farming with scientific methods." "The day of unintelligent farming is past," he proclaimed. The solution was to replace the "wasteful land-use practices" of yesteryear, "haphazardly applied to the land…[with] various conservation practices scientifically fitted to the needs and physical characteristics of the land and the climatic environment."[65] Only then could the land and all it offered be secure.

The appeal of conservation through Bennett's Soil Conservation Service was its sensible practicality. As one historian has put it, the agency and its director offered "salvation through technique."[66] In the late 1920s and early 1930s, Bennett peddled terracing as the preferred method to keep "both the water and the soil…in the fields and pastures where they belong" (Chapter 4).[67] With ever more research, however, the toolbox of erosion-control techniques burgeoned to include

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62 Bennett, *Soil Conservation*, 3.

63 Bennett, "Soil Erosion—a National Menace," 388.

64 Bennett, "Wildlife and Erosion Control," presented before the 31st Annual Convention of the National Association of Audubon Societies, New York, 29 October 29 1935, 4, b10f9, BP.

65 Bennett, "Waste by Wind and Water," 175; Bennett, "Adjustment of Agriculture to Its Environment," 163, 177. For more on the importance of science to Bennett's mission, see Armitage, "The Soil Doctor."

66 Worster, *Dust Bowl*, 211.

67 Bennett, "The Geographical Relation of Soil Erosion to Land Productivity," 604.

a wide variety of measures: contour plowing, strip-cropping, check dams, grassed waterways, and windbreaks, to name a few. But these technologies did not simply spread on their own. If conservation was going to foster national security, Hugh Bennett and other federal officials recognized the need for mechanisms to spread conservation practices to farmers. The character of these arrangements had important consequences for the relationship between the state and civil society.

From Demonstration Projects to Conservation Districts

Putting conservation technologies into widespread practice required strategies beyond those offered by the USDA's ten experiment farms. Those stations could hope to reach only a small fraction of the nation's farmers. The creation of the Soil Erosion Service, an emergency action agency in the Department of the Interior, in 1933 offered an opportunity for more direct federal involvement in conservation through demonstration projects. These projects were short lived, however. When the Soil Conservation Service was launched as a USDA agency in 1935, Department officials realized that demonstration projects were impractical for a permanent basis. To take their place, the USDA invented the soil conservation district, a mechanism for delivering the promises of security to American farmers in a manner wholly consistent with the nation's democratic ideals and its anti-bureaucratic, associative tradition.

The federal government maintained an active, highly visible role in erosion-control demonstration projects. Between 1933 and 1935, the SES established forty demonstration projects spanning over 43 million acres of land.[68] The basic structure of a project was guided by cooperative agreements signed between farmers and the SES. Farmers agreed to follow for five years a farm plan designed in conjunction with SES technicians and to furnish certain materials, such as stones or

[68] The number of projects ultimately numbered 182. Stalcup, "Public Interest, Private Lands," 265, 325-327.

lumber, that might be needed to implement conservation practices. In exchange, they received a number of benefits from federal agencies. First, they had access to federal brains and brawn, as SES technicians supplied necessary expertise for designing complex conservation plans and the Civilian Conservation Corps lent farmers the manual labor needed to plant trees, build check dams, create terraces, and so on. Second, the SES also supplied free of charge the essential materials in a farm plan—such as seedlings for reforesting steep slopes, limestone to lower the acidity of soils and prepare them to grow erosion-reducing crops, and the seeds to grow these crops. For all these benefits, farmers also agreed to participate in federal studies and to welcome visitors to observe their operations, all in an effort by the SES to demonstrate the practicality and effectiveness of conservation farming. Whether by CCC boys roaming the town, SES technicians enrolling farmers in the program, or the physical landscape taking on an entirely new appearance, wherever a demonstration project was in operation, the federal government maintained a conspicuous presence.[69]

In successful demonstration projects, SES agents tended to work closely with farmers and instilled in them a sense of ownership over their farm plans, despite the government's high profile (see Chapter 5). Yet, if the benefits of soil conservation were to become permanent and widespread, demonstration projects would need to be continuous and far-reaching, perhaps in every county of the nation. This posed insurmountable challenges. First, not all communities would be receptive to a perceived intrusion of the federal government in local affairs. Second, the amount of labor, materials, and expertise furnished by Washington in these projects risked making them prohibitively expensive and politically vulnerable—especially as the emergency of the Great Depression faded.

[69] Neil Maher makes similar points about soil conservation demonstration projects serving as a conduit for introducing the New Deal to Americans. See Maher, *Nature's New Deal*, 115-131; Maher, "'Crazy-Quilt Farming.'" On the creation and operation of demonstration projects, see Helms, "Hugh Hammond Bennett and the Creation of the Soil Conservation Service," 37A-40A; and Stalcup, "Public Interest, Private Lands," 214-233. See also Chapter 5.

After Congress made soil conservation a permanent activity of the federal government with the creation of the Soil Conservation Service in 1935, Hugh Bennett and other federal officials began searching for a more viable alternative to demonstration projects for delivering conservation (and its attendant promise of security) to the nation's farmers. Critics had already been complaining that the demonstration model was overly centralized. For instance, a representative from Caterpillar Tractor Company wrote to the USDA in 1935 expressing general support of support of soil conservation, but warned, "There is going to be a great demand for decentralization of Federal activities…. Nothing but trouble will result from a further carrying out of the so-called demonstration small watershed plan of operations."[70] USDA officials were starting to realize that if the burgeoning system of soil and water conservation was to achieve its potential, the federal government's presence needed to become less conspicuous and more consistent with the United States' associative, decentralized political tradition.

In the summer of 1935, a few months after the creation of the Soil Conservation Service, USDA Assistant Secretary Milburn L. Wilson and attorney Philip M. Glick began working on model legislation for soil conservation districts. Wilson was a strong advocate of an associative vision wherein the federal government modernized agriculture through a participatory democracy. Glick shared Wilson's sentiments, later reflecting that American federalism operated less as "a layer-cake form of government"—with rigid separations between federal, state, and local governments—than as a "a marble cake form of government" in which "governmental powers interpenetrate." The model legislation that Wilson and Glick drafted, the Standard State Soil Conservation Act, embodied this associational vision. State legislatures would pass the law, enabling landowners to create special districts via referendum. These districts would serve as the vehicles through which the SCS could

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[70] Leonard J. Fletcher to M. L. Wilson, 23 May 1935, as quoted in Robert J. Morgan, *Governing Soil Conservation: Thirty Years of the New Decentralization* (Baltimore: Johns Hopkins Press for Resources for the Future, Inc., 1965), 27.

filter federal assistance to local farmers. Because farmers created soil conservation districts by the ballot, they lent the conservation mission a much more palpable foundation in democratic values. As President Roosevelt wrote to state governors when transmitting the model law in February 1937, "such legislation is imperative to enable farmers to take the necessary cooperative action" with one another and with the Soil Conservation Service.[71]

Soil conservation districts proved immensely popular. Arkansas passed the first enabling legislation in March 1937, and within a few years thirty-seven states had followed suit. By the end of 1940, 435 soil conservation districts scattered the nation, encompassing approximately 271 million acres. The number of districts swelled to 1,500 by April 1946, comprising over sixty percent of the nation's farms. In 1949, the Soil Conservation Service could boast a sprawling network of conservation districts through which it could execute soil and water conservation (Figure 3).[72]

The appeal of conservation districts rested largely on their ability to render inconspicuous the federal government's role in soil and water conservation. Hugh Bennett's discourse reflected this shift. While in the late 1920s and early 1930s he had called for increased USDA involvement in and attention to soil erosion, by the late 1930s he increasingly trumpeted "the assumption of land-use responsibility by local people" working in cooperation with the SCS. "There is a limit beyond which we in the Government can go," he told Georgia conservation advocates in 1942. "Any movement…undertaken by the people without their understanding, their willingness, and their participation cannot succeed. In that principle lies the permanency and vitality of democracy."[73] As

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[71] Douglas Helms, *The Preparation of the Standard State Soil Conservation Districts Law: An Interview with Philip M. Glick* (Washington, D.C.: USDA Soil Conservation Service, 1990), 19; Early, Press Release, 26 February 1937. See also Stalcup, "Public Interest, Private Lands," 259-272. For more on Wilson's advocacy of participatory democracy, see Jess Gilbert, "Low Modernism and the Agrarian New Deal: A Different Kind of State," in *Fighting for the Farm: Rural America Transformed* ed. Jane Adams (Philadelphia: University of Pennsylvania Press, 2003), 129-146.

[72] Hugh Hammond Bennett, "A New Farm Movement Takes Rapid Root," *Soil Conservation* 6 (February-March 1941): 192; Stalcup, "Public Interest, Private Lands," 265-266, 270. See also W. Robert Parks, *Soil Conservation Districts in Action* (Ames: Iowa State College Press, 1952).

[73] Bennett, "The Land and the People," *Scientific Monthly* 48 (June 1939): 535; Bennett, "The South Tomorrow," Address to the Friends of the Land, Atlanta, Georgia, 11 June 1942, 17-18; box 5; Ashford Papers.

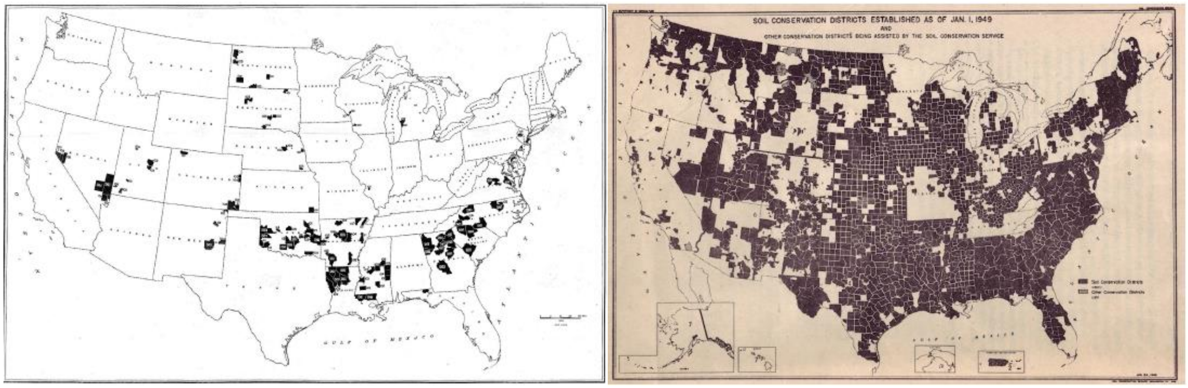

Figure 3: Maps of conservation districts organized in 1938 (left) and 1949 (right). Source: Douglas Helms Collection, National Agricultural Library, Beltsville, Maryland, as appearing in Stalcup, "Public Interest, Private Lands," 266, 270.

soil conservation districts became the primary mechanism for implementing federal assistance in conservation during the late 1930s and early 1940s, Bennett increasingly emphasized this theme of individual responsibility paired with the technical assistance offered by his agency. In effect, the genius of this arrangement was that it established in the soil conservation district a new institution as the focal point in conservation. Whereas demonstration projects placed the onus on the federal government to demonstrate the effectiveness of conservation with the help of farmers, districts highlighted the responsibility of farmers to practice conservation with the help of the government.

Soil conservation districts fostered an associative state not only through federalist arrangements between national, state, and local governments, but also by establishing a framework for greater participation on the part of private industry. The rhetoric of individual responsibility and democracy appealed to industry leaders eager to leverage patriotism in the service of profitmaking. Just as Hugh Bennett described the operation of conservation districts as "democracy at its best," for instance, John Deere praised districts for being comprised "of *local people*, by *local people*, for *local people*." In a mid-century magazine advertisement, the company heralded districts as democratic conduits of free-market capitalism (Figure 4). "They are local people doing that which they should do, voluntarily," the copy proclaimed, "with no infringement of rights and liberties, with scarcely a

Figure 4: In this advertisement, John Deere conflated American values with soil and water conservation, even finding "more than physical resemblance" between the appearances of "a contour-stropped field and the red and white stripes of Old Glory." Source: C. R. Ashford Papers, University Archives, Mississippi State University.

law, rule, regulation, or tax." In other words, a district represented "a bit of the freedom of enterprise that made America a land of opportunity and abundance."[74] Soil conservation districts offered the burgeoning conservation-industrial complex a framework in which it was easy to cloak the omnipresence of federal research and expertise behind a far more benign veil of individual initiative and democratic values.

[74] Bennett, "A New Farm Movement," 195; John Deere, "Where Visions Grace the Sky, Freedom Shall Bless the Land," emphasis original; box 9, Ashford Papers. It remains unclear precisely when and in which magazines this advertisement ran.

The farm-equipment industry supported conservation districts not only from afar, but also through close working relationships established with district officials. In 1944, E. C. McArthur, the president of the South Carolina Association of Soil Conservation District Supervisors who two years later became the first president of the National Association of Conservation Districts, explained how conservation made for strong relationships with industry officials. The previous year, McArthur led "a number of farm machinery manufacturers" on a tour through the Piedmont "to show them the great need of conservation practices within the region." McArthur also met with machinery dealers with the same objective. The dealers subsequently requested photographs of conservation practices to use in advertisements and which they "placed in conspicuous places." Finally, McArthur was proud of his outreach efforts with International Harvester Company officials, who "invited me to a confidential showing of pre-production machinery"—certainly indicative of a close working relationship. "I had several interesting conferences with these representatives," McArthur explained in his annual report, culminating in the company's donation to the state supervisors $10,000 for assistance in installing conservation practices.[75] Through moral as well as tangible support, the farm-equipment industry was quickly becoming an invested member of the conservation-industrial complex.

Although private industry and SCS officials saw great promise in soil conservation districts, others saw only a threat. Indeed, the Soil Conservation Service had to overcome the strenuous objections of its cousin in the USDA, the Extension Service. As historian Sam Stalcup has shown, Extension officials interpreted the soil conservation district framework as a competitor to their duties—not only because SCS technicians would be working through districts to help farmers install

[75] McArthur, Annual Report for 1943, 2-3, attached to McArthur to H. H. Bennett, 26 January 1944; box 39, Item 21; RG 114; NACP. For more on McArthur and his leadership of the NACD, see R. Neil Sampson, *For Love of the Land: A History of the National Association of Conservation Districts* (League City, Tex.: National Association of Conservation Districts, 1985), 45-64.

conservation systems, but also because many of the early districts were organized according to watershed boundaries, which transcended and subverted the Extension Service's county-based organization. Federal Extension officials claimed that conservation districts duplicated their legal authority under the 1914 Smith-Lever Act, and thus the Extension Service ought to have sole responsibility for working with farmers.[76]

The growing popularity of soil conservation districts allowed the Soil Conservation Service to outmaneuver the Extension Service. If the strength of the Extension network was its decentralized structure—federal assistance filtered through land-grant universities and county agricultural agents—then the conservation-district framework proved even more effective. In such an arrangement, USDA delivered its authority straight to individual farmers through institutions that were, as Hugh Bennett put it, "farmer-formed and farmer-run."[77] Conservation districts, in other words, enabled the SCS to solidify its authority over agricultural conservation by beating the Extension Service at its own game.

One result of the shift from demonstration projects to conservation districts was an expansion of the SCS budget. One of the chief complaints of demonstration projects, which were constrained to a small number scattered about the nation, was that "the Federal Government [is] not treating all farmers alike."[78] Many conservationists anticipated that this isolated geography was holding back public funding for spreading conservation. In March 1937, for example, Noble Clark, an assistant direct of the University of Wisconsin Agricultural Experiment Station, noted the difficulty in convincing farmers to adopt conservation methods without "an adequate check…. Demonstration areas…now [cover] not more than 5% of the farms in the [country]. I do not

[76] Stalcup, "Public Interest, Private Lands," 268-269. See also Morgan, *Governing Soil Conservation*, 88-98; Charles M. Hardin, *The Politics of Agriculture: Soil Conservation and the Struggle for Power in Rural America*. (Glencoe, Ill.: The Free Press, 1952), 54-84.

[77] Bennett, "A New Farm Movement," 194.

[78] Fletcher to Wilson, 23 May 1935.

believe that any of us are going to be so silver-tongued in our discussion with Congress or the [state] legislature[s] that we are going to do the other 95% in the next five years, because there is not money enough to do it."[79] From Clark's perspective, SCS demonstrations offered few benefits to politicians whose constituents were unable to visit the projects.

Soil conservation districts removed these obstacles. Their decentralized geography made SCS assistance available on a vastly expanded scale, which meant that more politicians' constituents stood to benefit from soil and water conservation. In 1952, political scientist Charles M. Hardin noted the significance of the system in which the SCS received federal dollars and then disseminated it to districts. "This method," Hardin determined, "has proved the most efficient ratchet for jacking up the SCS budget."[80] With the help of soil conservation districts, federal expenditures on technical and financial assistance between 1935 and 1950, totaled over 5.6 billion dollars—the equivalent of over 75 billion dollars today.[81] In short, the mechanism of the soil conservation district broadened the appeal of agricultural conservation to industry, farmers, and politicians, thereby fostering an expansion of the conservation-industrial complex.

World War II, National Security, and the Changing Goals of Conservation

During the 1930s, the primary goal of the Soil Conservation Service was to help keep farmers on their land, which would garner individual security for farm families and collective security for the nation. Hugh Hammond Bennett sometimes relied on a profit motive to generate

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79 Clark, as quoted in "Report on Conference Held at La Crosse, Wisconsin, to Discuss Research Work in Soil Conservation, March 22 & 23, 1937," 16; box 4; Otto R. Zeasman Papers, 1925-1966 Series 9/22/10 26G8, University of Wisconsin-Madison Steenbock Library, University Archives (hereafter referred to as "Zeasman Papers").

80 Hardin, *Politics of Agriculture*, 89.

81 The equivalent is in 2009 dollars. George A. Pavelis, Douglas Helms, and Sam Stalcup, "Datasheet, USDA Conservation Expenditures, 1936-2010," data spreadsheet received from George A. Pavelis via email to author, 27 September 2013. These data were published in George A. Pavelis, et al., *Soil and Water Conservation Expenditures by USDA Agencies, 1935-2010* (Washington, D.C.: USDA NRCS, 2011).

support and participation in the conservation-industrial complex. As early as 1928, he argued that, despite the upfront costs, "when terraces are properly built…they will pay their way many times over."[82] Likewise, in 1939 he told his readers that conservation techniques "eventually bring about, in most instances, a larger return per acre in terms of crops or income."[83] But as Bennett told a group of Texas farmers in 1940, "Even if no financial dividends were involved…conservation of our most basic natural resource would be eminently worth the price. After all, it is impossible to place a cash value on the productive soils of a nation."[84] His primary goal before World War II was gaining security for American society by helping "men who farm the land…make a living."[85] As depression gave way to war, however, Bennett's discourse on security began to change, as did the goals of the conservation-industrial complex.

For years, Bennett had adopted the common New Deal strategy of coloring his language with war metaphors.[86] After Pearl Harbor, martial rhetoric helped him shore up the Soil Conservation Service's position in a nation whose priorities were rapidly changing. Bennett had long defined soil conservation as "combat" against an "enemy," an "attack upon [a] vicious form of land impairment and destruction."[87] In 1928, for instance, he illustrated the severity of loessial erosion by comparing it to the destruction of land in World War I. If neglected, these soils will "melt away with rain, almost like sugar, forming broad and deep gullies that invade the countryside

[82] Bennett, "The Geographical Relation of Soil Erosion to Land Productivity," 605. See also Bennett, "The Wasting Heritage of the Nation," 122; and Bennett, "Our Vanishing Farm Lands," 177.

[83] Bennett, *Soil Conservation*, 335.

[84] Bennett, "Permanent Systems of Farming," address to the 13th Annual Meeting of the Texas Agricultural Workers' Association, Dallas, Texas, 12 January 1940, 8-9, b10f30, BP.

[85] Bennett, *Soil Conservation*, 313.

[86] On the prevalence of "the analogue of war" to New Deal rhetoric, see William E. Leuchtenburg's revised essay, "The New Deal and the Analogue of War," in Leuchtenburg, *The FDR Years on Roosevelt and His Legacy* (New York: Columbia University Press, 1995), 35-75.

[87] Bennett, "The Problem of Soil Erosion," 170. See also Bennett and Chapline, *Soil Erosion a National Menace*, 22; Bennett, "Our Vanishing Farm Lands," 170; Bennett, "Soil Erosion—A National Menace," 388, 400; Bennett, "Facing the Erosion Problem," 325; and Bennett, "Attacking Soil Erosion on a Nation-Wide Front," presented before the 29th Annual Meeting of the American Society of Agricultural Engineers, Athens, Georgia, 19 June 1935, 13, b10f7, BP.

with far greater desolation than that wrought by shell-fire, trench, or mine upon the fields of France."[88] All of his interwar military rhetoric smoothed Bennett's transition into World War II, for he already possessed a fully articulated vocabulary with which to describe soil conservation's place in wartime America. In his 1943 book, *This Land We Defend*, Bennett reasserted the similarities between erosion and the current war: "There is a striking parallel between our war effort and the nation's fight to save one of our basic resources so vital to national defense—the soil. We didn't believe the signs of erosion danger either."[89] Just as national security was jeopardized by the Axis Powers, it faced a similar threat at home in the form of soil erosion.

In Bennett's mind, however, the crisis extended beyond mere rhetoric and analogies: national security and the freedom it provided were at stake. "Food, shelter, and clothing are products of the land," he maintained, "and without them we could have no security. Without security there would be no freedom." Referencing President Franklin Roosevelt's famous "Four Freedoms" speech, Bennett yet again highlighted soil conservation's consonance with national priorities. "'Freedom of speech and expression, freedom of worship, freedom from want, freedom from fear.' These freedoms, this security in a world too insecure, must be preserved. And we dare not forget the source of all these things—this peace, security, and freedom: Foremost and fundamental is the preservation of the land."[90] Bennett thus successfully altered the meaning of soil conservation, ensuring its continued vitality within a nation at war.

The war elicited a concerted push for increased production, as well, and this required a redefinition of conservation and its relationship to productivity. In January 1936, the Supreme

[88] Bennett, "The Wasting Heritage of the Nation," 115.

[89] Bennett and Pryor, *This Land We Defend*, viii.

[90] Bennett and Pryor, *This Land We Defend*, 6, 9. He echoed this in a 1943 speech, explaining, "Taking care of the land—husbanding it and cherishing it and fighting for it—will help keep us free and permanent and great." See Bennett, "Conservation Farming is High Production Farming," remarks before group of landowners, Athens, Georgia, 1 March 1943, 14, b10f47, BP.

Court had invalidated the Agricultural Adjustment Act (AAA), the centerpiece of New Deal efforts to reduce agricultural surpluses. In a rush to patch together new farming policies before planting season, Congress passed the Soil Conservation and Domestic Allotment Act (SCDA) at the end of February. This law framed soil conservation as a means of reducing agricultural production. As AAA director H. R. Tolley explained, "Whereas prior to the Supreme Court decision, adjustment of acreage and production had been the primary objective [of the AAA] defined by law, and soil conservation and farm management had been by-products, after the decision the latter became the primary function under [the SCDA] law, with production adjustment as a by-product."[91] Congress had therefore enlisted soil conservation not as a means to boost production, but to reduce it.

Hugh Bennett regarded this development ambivalently, not wanting conservation to be pigeonholed as a production-*reducing* measure. In an article in February 1936 issue of *Scientific Monthly*—written at a time when he was certainly aware of the proposals that found their way into the SCDA—Bennett wrote, "There is nothing incompatible or inconsistent between adjustment of production and conservation of natural resources." But he also cautioned that surplus reduction must be paired with better markets and greater efficiency in farming. "While we find it essential to control production," he warned, "we must at the same time exert every effort to lower production costs, widen markets, improve quality of products and…maintain our basic resource, the soil." Furthermore, Bennett wrote just pages later that adopting conservation "does not mean that production will be impaired. On the contrary…protection of the soil is compatible with production."[92] His ability to describe conservation in one breath as compatible with reducing

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[91] Tolley quoted in Donald C. Blaisdell, *Government and Agriculture: The Growth of Federal Farm Aid* (New York: Farrar and Rinehart, 1940), 48. As historian Sam Stalcup notes, this law had the additional effect of initiating the Agricultural Conservation Program (ACP), which paid farmers to practice soil conservation. At first, "the range of activities funded by the ACP was limited, but over time its scope was expanded to support a long list of conservation practices." See Stalcup, "Reflections on One Hundred and Fifty Years," 347-348.

[92] Bennett, "Waste by Wind and Water," 173, 175.

production, and in another with increasing production, reflected the tensions within New Deal farm policy as much as it embodied Bennett's faith in conservation as a tremendously flexible tool. Such flexibility would be a necessary feature of soil and water conservation if it were going to be a truly permanent program.

The need to reduce agricultural surpluses vanished with the arrival of the Second World War. The USDA removed production restrictions, and Bennett redefined his program accordingly. In 1943, he rejected any notion that conservation meant "a miserly hoarding of all natural resources for possible use at some vague time in the future."[93] As he explained in March 1942 to the Southern States Conference convened in Alabama, soil and water conservation during and after the war had to be about production. The nation was engaged in "total war," Bennett told the crowd.

> The farmer's job in this war is to produce, and produce, and produce…. And he has to keep on producing…for a long time to come, because when the fighting is over, comes the peace…. Millions will be starving, sick, homeless—war-wrecked humans awaiting succor from the fields of America. Food is what hungry people need first, and we farmers here in America are going to have to produce *that* food from *our* soil…. *The best way to meet our wartime production goals is by conserving…America's soil and water.*[94]

As national priorities gravitated away from social security for Americans and toward wartime and postwar obligations, so did the discourse of conservation.

Throughout the war, Bennett identified conservation as a way to achieve food security. The nation now found itself "in the hour of its greatest food crisis since Valley Forge," he proclaimed in 1944, and he maintained that the only way to resolve the crisis without suffering major damages was to apply intelligent, scientific farming.[95] Rather than "going hog-wild and plowing up every acre in sight" as farmers had during the First World War, Bennett argued, "men can always do more with

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[93] Bennett and Pryor, *This Land We Defend*, 48-49.

[94] Bennett, "Meeting Production Needs Through Soil Conservation," address to the Southern States Conference, Auburn, Alabama, 27 March 1942, 1-2, b10f37, BP. Emphases original. See also Bennett and Pryor, *This Land We Defend*, vii-viii, 101, 179.

[95] Bennett, "Food Comes from Soil," *Geographical Review* 34 (January 1944), 71.

brains than with muscle…. We can produce more by conservation farming than by farming the old hit-or-miss-way."[96] The studies conducted at experiment stations corroborated this point. In 1944, Bennett reported that conservation measures achieved "at least 20 per cent" yield increases, but often higher. Researchers at the Clarinda, Iowa, station, for example, found that six years of conservation farming yielded an average of thirty bushels of corn per acre, compared to only eighteen bushels per acre (a sixty-seven percent difference) where conservation was not practiced.[97]

The calls for increased production experienced a brief hiatus at war's end. In 1946, USDA policymakers debated the extent to which federal policy should encourage elevated levels of production. Bennett responded in typical fashion: he adapted soil and water conservation to fit the needs of the nation, this time by emphasizing his program's flexibility. He acknowledged conservation's ability to boost production, but "more important…[is] the flexibility that soil conservation gives the farmer in his year-to-year operations. With such a planned program on his farm…the farmer is better able to fit his operations in any year to changing market or other demands." Bennett reasoned that, because conservation plans adapted different crops to different types of land, the farmer could more readily amend his acreages as needed.[98] Just as conservation was proving sufficiently malleable to meet varying market demands, it was also supple enough to satisfy rapidly changing national priorities.

Despite this brief flirtation with reducing farm outputs, it soon became clear that USDA policy would continue to promote high levels of production by opening up new markets for farm products. By the late 1940s, the conservation Bennett promoted was one that held the promise of being simultaneously productive and protective. There was nothing inconsistent between the two,

[96] Bennett, "Meeting Production Needs Through Soil Conservation," 4. For more on the World War I plow-up, see Worster, *Dust Bowl*, 89.
[97] Bennett, "Food Comes from Soil," 71.
[98] Bennett, "Soil Conservation Today and Tomorrow," address at the first meeting of the St. Louis, Mo. Regional chapter of Friends of the Land, 5 April 1946, 7-8, b37f3, BP.

he promised. In fact, continued productivity *depended* on maintaining adequate protection of soil and water. In 1947, Bennett saw in conservation techniques the key to maintaining agriculture in "a permanently productive state under maximum use." The following year, he argued that "the duty of the land to produce increases constantly" in the face of a growing population and a booming "industry [that] is continually calling for more and more of the raw products of the soil."[99] The only way the United States and the rest of the world could meet the new postwar challenges, Bennett argued, was to implement widespread soil and water conservation. "To me, conservation is a fundamental part of the moral, social, economic, and physical fibre of the United States—and the world," he declared in 1949. "It is essential to any future prospect of peace and plenty."[100] In other words, by the late 1940s, Bennett had come to value conservation less as a means for ensuring social stability in rural America and more as a vehicle for maximum production *ad infinitum*.

The Soil Conservation Service's allies in industry reflected this changing discourse of conservation. According to the John Deere Company (Figure 5), conservation allowed farmers to "eat their cake…and <u>have</u> it, too!" Conservation amounted to a "double-barreled program," enabling farmers to reduce erosion and still "raise bigger yields and enjoy better incomes than ever before." The company appealed to more than cold self-interest, however, for the association of conservation with human civilization remained strong. Soil conservation represented "a gilt-edged investment in America," claimed John Deere. Increased production through conservation promised to "maintain our economic well-being and safeguard our national security."[101] Even though the

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[99] Bennett, "The Coming Technological Revolution," 3; Bennett, "Soil Conservation in a Hungry World," 311. For another postwar advocacy for sustaining maximum production indefinitely, see Bennett, "Soil and Water Relationships in Western Political Economy," *Western Political Quarterly* 1 (December 1948), 404.

[100] Bennett, "What Soil Conservation Means to Me," manuscript with handwritten notes, possibly unpublished, 28 July 1949, 1, b2(a)f4, BP.

[101] John Deere, "Farmers <u>Can</u> Eat Their Cake…and <u>Have</u> It, Too!"; Box 9, Ashford Papers. It remains unclear when or where this ad first appeared.

Figure 5: John Deere advertisement (ca. late 1940s?) promising economic production and effective protection of the land through soil conservation. Source: C. R. Ashford Papers, University Archives, Mississippi State University.

threats of the Great Depression and World War II had passed, the discourse of the conservation-industrial complex remained tied to national security.

Conclusion

Between 1920 and 1950, soil and water conservation had evolved from a fledgling campaign largely ignored by the Progressive Era conservation movement into a central facet of federal agricultural policy. In the process, a host of parties—soil scientists, engineers, bureaucratic officials, land-grant universities, and the agriculture industry—converged to form the conservation-industrial complex. The governmental side of this complex was structured in the tradition of American federalism, with federal, state, and local governments interacting in through experiment stations as well as soil conservation districts. This federal authority was thus decentralized at the same time that it expanded through the entirely novel activity of conservation research and outreach.

In the wake of this low-profile expansion of federal authority, a number of markets emerged in which private industry was eager to partake. Most notably, farm machinery manufacturers emerged as a strong proponent of soil and water conservation. Their most visible activities involved advertising conservation, often by drawing on Soil Conservation Service rhetoric of patriotism, profitmaking, or national security. But the farm-equipment industry also contributed to the SCS mission by donating to conservation districts, establishing close working relationships with conservation officials, and by supplying the machinery that helped make new technologies practical. Just as the conservation-industrial complex developed in a manner nonthreatening to Americans' traditional political sensibilities, it also fostered many of the economic goals of private industry. In other words, it represented a quintessential associative order.

The promise of lucrative markets for private industry, however, would have been insufficient in generating enough support to establish agricultural conservation as a permanent activity of the federal government. Hugh Hammond Bennett understood that the public needed to know what was at stake, which to his mind was nothing short of American civilization. Soil erosion was a national problem requiring a national solution lest it trigger national decline, he told his audiences. While Bennett was a master salesman and the association of soils and civilization made for an effective sales pitch, there is no reason to think his predictions were disingenuous, for he was drawing on a deep conservation tradition linking the fate of civilizations to the state of their natural resources. The SCS chief drew not only precedents established decades earlier by George Perkins Marsh and Nathaniel Southgate Shaler, but also on ideas that permeated American political culture during the interwar period.

An examination of Bennett's discourse on security reveals how the goals of utilitarian conservation changed between 1920 and 1950. Whereas soil and water conservation was designed to provide social and economic stability before World War II—primarily by keeping farmers on their land—during and after the war it took on new definition of security that would be made possible by "maximum, sustained yields."[102] From Bennett's perspective, the only way to ensure the prosperity that postwar Americans cherished so dearly, especially after a decade of depression, was to manage the nation's natural resources for continual economic development. In such a manner, he anticipated the dominant objective of the conservation-industrial complex for the next quarter century.

Bennett foreshadowed other post-World War II issues as well, most notably a growing concern for global and domestic overpopulation. In the late 1940s and early 1950s, Bennett joined a rising chorus of neo-Malthusians who feared that the world's skyrocketing human population growth would press natural resources beyond their limits and send civilizations spiraling into ruin. In the words of Fairfield Osborn, who along with William Vogt were the two most influential neo-Malthusians of the immediate postwar era, "the tide of the earth's population is rising, the reservoir of the earth's living resources is falling." Conservationists needed to respond to this growing emergency to redirect American society away from "the same dusty perilous road once traveled to its dead end by other mighty and splendid nations."[103] Here were ideas Bennett could appreciate.

In fact, Bennett was making these points before Osborn's and Vogt's writings became popularized. "Time is running out," he warned in speech in October 1946, "between the impending pincers of an increasing population and a dwindling area of productive land." Bennett repeated this

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[102] Bennett, "Adjustment of Agriculture to Its Environment," 164.

[103] Fairfield Osborn, *Our Plundered Planet* (Boston: Little, Brown and Company, 1948), 193, 201. See also William Vogt, *Road to Survival* (New York: William Sloan Associates, Inc., 1948). For more on the emergence of postwar neo-Malthusianism, see Thomas Robertson, *The Malthusian Moment: Global Population Growth and the Birth of American Environmentalism* (New Brunswick: Rutgers University Press, 2012).

message often in the following years, framing it in dualistic terms. "The sides are firmly drawn," he stated matter-of-factly. "On the one side, we are faced with a steadily increasing population…. On the other side, we can see our remaining area of productive land shrinking steadily before the onslaught of erosion." This scenario left the United States with "the choice of two courses, namely: (1) to become a declining nation or (2) to continue to be a vigorous, permanent nation. The first choice is what we will become without soil conservation; the second choice is what we can achieve with…soil conservation."[104] In Bennett's eyes, regardless of the circumstances, the fate of the nation was tied to the fate of its soil.

By the time Bennett retired from the Soil Conservation Service in 1951, he had helped orchestrate a vast system of soil and water conservation that was remaking the political and physical landscapes of the United States. While the association between soils and societies would remain an undercurrent in conservation discourse after Bennett's retirement, it was supplanted by positive visions more befitting a nation enjoying unprecedented prosperity.[105] From 1950 to 1970, the guiding principle of the conservation-industrial complex was guaranteeing abundance.

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[104] Bennett, "Development of Natural Resources," 3; Bennett, "Soil Conservation in the World Ahead," address before Soil Conservation Society of America annual meeting, 12 December 1946, 1, b37f11, BP; Bennett, "Soil Conservation in Our Economy," address at the Symposium on Conservation and a Stable Society in Chicago, Illinois, 31 December 1947, 6, b11f36, BP.

[105] This idea lost primacy in the institutional discourse of Soil Conservation Service leadership, but it remained strong among conservation writers more generally. For examples, see Tom Dale and Vernon Gill Carter, *Topsoil and Civilization* (Norman: University of Oklahoma Press, 1955); Vernon Gill Carter and Tom Dale, *Topsoil and Civilization* rev. ed. (Norman: University of Oklahoma Press, 1974); and David R. Montgomery, *Dirt: The Erosion of Civilizations* (Berkeley: University of California Press, 2007).

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Guaranteeing Abundance: Watersheds, the Associative State, and the Conservation of More, 1950-1970

In April 1960, the Caterpillar Tractor Company ran a two-page, full-color advertisement in a range of popular magazines, including *Newsweek*, *Time*, and *Saturday Evening Post* (Figure 6). The ad said very little about Caterpillar machinery, focusing instead on the growing demands for water and the ability of the conservation-industrial complex to conserve it through the USDA's Small Watershed Program. The idyllic scene that dominated the advertisement represented the USDA program, "a co-operative endeavor of federal, state, and local governments and of farm and city people living in a common watershed." In the image, trees and grass clothe hillsides that still bear the scars of past erosion. Contour strip-cropping, terraces, and crop rotations cover the verdant landscape. In the foreground are two farm ponds—one completed, the other under construction—that the text tells us "collect and store water for dry periods." A series of earthen dams stretch inconspicuously across the river valleys high in the hills, serving the same purpose. These structures impound water in reservoirs, helping to neutralize the menacing thunderstorm that looms high in the watershed.

Despite the threat of flooding posed by such a storm, life downstream in the small town and city carries on as normal. The largest reservoir not only protects the city from floods, but it also generates electricity and offers a playground for beach-goers and water-skiers. Moreover, the city stores plenty of water for municipal needs, which are sizable considering the humming industrial and business sectors lining the river. Equally important, the text explains, millions of children like the featured "Baby Robert" are growing up quickly and will expect the same, if not better, standards of

Figure 6: Caterpillar Tractor Co. magazine advertisement from 1960. The image embodied the heart of soil and water conservation between 1945 and 1970—from watershed conservation and the control of water, to the population boom and economic growth. Source: National Archives, College Park, Maryland.

living as their parents. Everything in this idealized landscape was made possible by the coordinated control of the hydrosphere, ensuring the right amount of water—neither too much nor too little—for everyone's needs.[1]

This advertisement embodies the expanding character of the conservation-industrial complex between 1950 and 1970. Whereas before World War II conservationists focused primarily on stemming and preventing soil erosion, after the war they turned increasingly toward regulating the hydrosphere. Conserving water became as important as husbanding soil. The farm ponds and reservoirs pictured in the Caterpillar ad represented the tens of thousands of structures created throughout the country with the assistance of the USDA's Soil Conservation Service (SCS). These structures were designed to control floods, to provide dependable sources of water for industry and municipalities, and to facilitate irrigation. Additionally, soil and water conservation broadened to include outdoor recreation, as suggested by Caterpillar's portrayal of people at play on the large reservoir. Finally, the ad helped the SCS with the difficult task of familiarizing the broader public with the concept of a watershed.[2] By 1970, the start of a decade in which the conservation-industrial complex would face a several crises, members of the complex had expanded their mission to include a seemingly endless array of new activities. How and why did the scope of soil and water conservation expand in the postwar era? What effect did this have on the discourse of the conservation-industrial complex?

Conservation expanded after World War II in response to a host of developments: a post-New Deal rejection of centralized government; widespread population growth; national policies that

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[1] Caterpillar, "Can We Double Our Water Supply … and Quickly?" magazine advertisement in *Newsweek*, *U.S. News & World Report*, *Time*, and *Saturday Evening Post*, April 1960; Box 10; Item 67; Record Group (RG) 114; National Archives at College Park, MD (NACP).

[2] In 1957, for instance, an SCS official asked his peers, "Have you ever noticed the confused look on some people's faces when you mention 'watersheds'? It happens too often…. The idea is…hard to visualize unless folks can see it in one picture." Gordon S. Smith, "Infrared Photos—To Show a Watershed," *Soil Conservation* 32 (December 1957): 100.

prioritized economic growth like never before, and new technologies that facilitated it; and an effort to bridge the divide between city and country. One of the primary ways the Soil Conservation Service lent conceptual and administrative cohesiveness to its expanding reach was through the concept of the watershed, particularly as embodied in the agency's Small Watershed Program. This expansion in federal authority embodied the associative order of the conservation-industrial complex, enjoying widespread popularity among farmers, business leaders, civic organizations, municipalities, and private industry. Between 1950 and 1970, the conservation-industrial complex was defined by *more*: more government authority in natural resource affairs, designed to achieve greater economic development and fuel the consumption patterns of a growing population. In short, postwar soil and water conservationists constructed a narrative that placed themselves as the guarantors of abundance for present and future generations.

The conservation-industrial complex after 1950 built on the foundations established in previous decades. Soil conservation districts continued to represent the primary mechanism through which the Soil Conservation Service delivered technical assistance to individual farmers. Starting in 1954 with the creation of the Small Watershed Program, however, the agency replicated and expanded this associative order by filtering federal assistance through districts and other organizations who served as sponsors for watershed projects. The SCS also retained and broadened its close relationships with private industry. The farm-equipment industry continued to be a conservation mainstay, but the enlarged scope of SCS activities after World War II offered even greater prospects for manufacturers and dealers to benefit by supporting soil and water conservation. New members of the conservation-industrial complex during this period included private contractors, a group that gained so much business from conservation that it forced the Soil Conservation Service to change watershed policies. Finally, this period saw the rise of the National Association of Conservation Districts (NACD), a lobby organization representing the nation's conservation districts. While the NACD lent valuable support to the conservation-industrial complex during the 1950s and 1960s, its leadership role became most pronounced after 1970.[3]

Although the transition toward guaranteeing abundance began during World War II under the leadership of Hugh Hammond Bennett, it accelerated after his retirement from the SCS in 1951. Bennett was succeeded briefly by Robert Salter and then by Donald Williams, who directed the agency from 1953 to 1969.[4] Williams, the son of a South Dakota agricultural researcher, rose through the ranks of the SCS and as agency chief crystallized the agency's transition from providing security to guaranteeing abundance. His background and training as a water and irrigation engineer was evident in the direction the agency took in the 1950s and 1960s. Increasingly, the SCS viewed natural resources systematically and mechanistically, pursuing economic production through the coordinated development of soil and (especially) water. Williams' speeches and writings paint a telling picture of this evolving conservation mission. Nobody held greater sway over the day-to-day operations of the conservation-industrial complex during the Eisenhower, Kennedy, and Johnson presidencies than did Donald Williams.

Williams took the reins of the SCS at a moment when political tides were shifting. In the late 1940s and early 1950s, people throughout the country began reconsidering the centralized character of governance that marked many New Deal programs besides soil and water

[3] The NACD began in 1946 when a number of individual conservation districts failed to convince congressional allies and President Truman to allocate surplus war machinery to districts. Despite close relationships with several representatives, an NACD official later wrote, "it was apparent [to district leaders] that they lost simply because they were in an unorganized group speaking with many voices rather than one." The organization called itself by many names: initially the National Association of Soil Conservation District Governing Officials, the National Association of Soil Conservation Districts from 1947 until 1962, and the National Association of Soil and Water Conservation Districts from 1962 to 1970. In 1970, it rechristened itself the NACD, which I have chosen to adopt for simplicity's sake. R. Neil Sampson, *For Love of the Land: A History of the National Association of Conservation Districts* (League City, Tex.: National Association of Conservation Districts, 1985), 45, 56.

[4] Salter reportedly requested reassignment to research duties "for reasons of health." Simms, *The Soil Conservation Service* (New York: Praeger, 1970), 128.

conservation.[5] The decentralized, associative order that the conservation-industrial complex had developed during the interwar period enjoyed pronounced popularity after World War II, particularly with the election of President Dwight D. Eisenhower. The diffused federal authority inherent to the complex complemented one of the Eisenhower Administration's guiding principles: "Government is not the *master* of the people. It is the *servant* of the people."[6] While this rhetoric lent itself to visions of a smaller central government, through the sharing of power Washington actually expanded its activities and authorities. As a result, the conservation-industrial complex swelled with federal dollars and expertise, but in a manner that seemed wholly consistent with the antistatism endemic to American political culture.

The broadening of the conservation-industrial complex was also propelled by skyrocketing global birthrates. The postwar population boom ushered in a wave of neo-Malthusianism—a resuscitation of the ideas of eighteenth-century theorist Thomas Malthus, who had postulated that human populations grew faster than food supplies, a process that would inevitably elicit wars, famines, and epidemics. While historian Thomas Robertson finds in the postwar revitalization of Malthusianism some roots of American environmentalism, he overlooks the extent to which neo-

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[5] While never a universal phenomenon, many Americans saw in the postwar United States—particularly the widespread economic growth and the Cold War—reasons to roll back many of the overtly statist aspects of the New Deal. See Karl Boyd Brooks, *Public Power, Private Dams: The Hells Canyon High Dam Controversy* (Seattle: University of Washington Press, 2006); Shane Hamilton, *Trucking Country: The Road to America's Wal-Mart Economy* (Princeton: Princeton University Press, 2008), especially chapters 3 and 4; Jonathan Bell, *The Liberal State on Trial: The Cold War and American Politics in the Truman Years* (New York: Columbia University Press, 2004); Aaron L. Friedberg, *In the Shadow of the Garrison State: America's Anti-Statism and Its Cold War Grand Strategy* (Princeton: Princeton University Press, 2000); Elizabeth A. Fones-Wolf, *Selling Free Enterprise: The Business Assault on Labor and Liberalism, 1945-60* (Urbana: University of Illinois Press, 1994); and Alan Brinkley, "Legacies of World War II," in *Liberalism and Its Discontents* ed. Alan Brinkley (Cambridge: Harvard University Press, 1998), 97. Even within liberalism, the retreat from the centralizing tendencies associated with Franklin Roosevelt began before the New Deal was over. See Alan Brinkley, *The End of Reform: New Deal Liberalism in Recession and War* (New York: Alfred A. Knopf, 1995).

[6] Earl L. Butz, "Conservation for All the People," address at Minnesota Soil Conservation Field Days and Championship Plow Matches on the Trosvik Brothers' Farm near Rothsay, Minnesota (17 September 1955), 4; b2; Item 26; RG 114; NACP. Emphasis original.

Malthusian ideas also energized utilitarian conservationists.[7] Both environmentalists and conservationists recognized the limits of natural resources. Yet, whereas the former responded with campaigns to restrain economic and population growth, the latter hoped to transcend limits. Conservation technicians responded to the sharp climb in birthrates by devising ways to make limited natural resources do more. Efficient use and the development of soil and water promised to unlock abundance even for a population that continued to grow. If Caterpillar's Baby Robert was going to enjoy equal or better standards of living than his parents, the conservation-industrial complex decided it needed to conserve and develop more than just soil.

While decentralization ensured minimal resistance to conservation and population growth provided an additional impetus, the prospects for unprecedented prosperity lent it even greater appeal. Utilitarians in the SCS promised that their programs would foster economic growth, an omnipresent objective in the postwar period.[8] While politicians from the Left and the Right might have disagreed on the means, the legitimacy of economic growth as an end unto itself was rarely a matter of serious debate. Given the primacy of growth, it comes as no surprise that one of conservationists' most common and persuasive justifications for their broadening reach was that it yielded tangible economic benefits for individuals and society. SCS officials enumerated various ways they fostered economic growth. While they echoed interwar and wartime manifestos that soil conservation measures (terracing, strip cropping, and contour farming, for example) boosted crop yields, their greatest innovation after the war was their focus on methods to conserve water.

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[7] Thomas Robertson, *The Malthusian Moment: Global Population Growth and the Birth of American Environmentalism* (New Brunswick: Rutgers University Press, 2012); Thomas Robert Malthus, *An Essay on the Principle of Population*, ed. Donald Winch (1803; Cambridge: Cambridge University Press, 1992). For more on concern for population growth in the United States and abroad during the twentieth century, see Derek S. Hoff, *The State and the Stork: The Population Debate and Policy Making in US History* (Chicago: University of Chicago Press, 2012), chapters 4-7; Gregory T. Cushman, *Guano and the Opening of the Pacific World: A Global Ecological History* (New York: Cambridge University Press, 2013), chapters 7-10; and Alison Bashford, Global Population: History, Geopolitics, and Life on Earth (New York: Columbia University Press, 2014), part IV.

[8] See, for instance, Robert M. Collins, *More: The Politics of Economic Growth in Postwar America* (New York: Oxford University Press, 2000).

After World War II, soil and water conservationists repeatedly referred to water as a "limiting factor" on economic abundance. By more thoroughly regulating the hydrosphere through flood control, irrigation, and drainage—and by providing farmers, industry, and municipalities with more steady, predictable water supplies—conservation technicians promised to contribute to one of the nation's top priorities. Indeed, to many postwar Americans, economic growth through the control of water represented conservation's greatest utility. Conservation apostles promised that, as the number of conservation activities grew, so would the economy.[9]

The most useful tool for making sense of the SCS's broadening mission (conceptually as well as administratively) was the concept of the watershed. As an SCS information specialist explained in 1957, a watershed is "an area drained by a stream or lake" that could range from "a few acres [to] several million acres."[10] Because all terrestrial activities take place in a watershed, watershed conservation offered a convenient way to package the broadening mission of the SCS. "It seems to me," Donald Williams explained in 1954, "that the term 'watershed conservation' is broad enough to include almost any phase of conservation."[11] The agency's Small Watershed Program reinforced older soil conservation activities at the same time that it facilitated newer water conservation measures.[12] What's more, the watershed concept spanned both rural and urban areas, making it an

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[9] For more on the water crisis in postwar America, see Martin V. Melosi, *The Sanitary City: Environmental Services in Urban America from Colonial Times to the Present*, abridged ed. (Pittsburgh: University of Pittsburgh Press, 2008), chapter 15; Christopher J. Manganiello, "Dam Crazy with Wild Consequences: Artificial Lakes and Natural Rivers in the American South, 1845-1990" (PhD diss., University of Georgia, 2010), chapters 4-5. For a contemporary treatment, see Arthur H. Carhart, *Water—or Your Life* (Philadelphia: J. B. Lippincott Company, 1951).

[10] Smith, "Infrared Photos," 100.

[11] Williams, "What is Watershed Conservation?" Address at General Session of North American Wildlife Conference in Chicago, Illinois (9 March 1954), 1; b1; Item 26; RG 114; NACP.

[12] The watershed program is still in operation today, and project sponsors have received from Congress a total of over $7.1 billion for financial and technical assistance, which amounts to nearly $20 billion in 2009 figures. (The exact figures according to agency officials are 7,107,636,000 historical dollars and 19.676 billion 2009 dollars.) By the first decade of the twenty-first century, this funding had facilitated the construction of over 11,000 dams in 2,000 watershed projects across 47 states. The financial figures come from George A. Pavelis, Douglas Helms, and Sam Stalcup, "Datasheet, USDA Conservation Expenditures, 1936-2010," data spreadsheet received from George A. Pavelis via email to author, 27 September 2013. These data were published in George A. Pavelis, et al., *Soil and Water Conservation Expenditures by USDA Agencies, 1935-2010* (Washington, D.C.: USDA NRCS, 2011). For the number of dams and

ideal framework to implement the SCS's postwar mission to bridge the divides between city and countryside. Nationwide, in other words, the watershed was at the heart of the conservation-industrial complex between 1950 and 1970.

The Small Watershed Program and the Associative State

On 13 December 1954, the chief of the Soil Conservation Service kicked off an agricultural conference by extolling the potential of a brand new USDA program. Donald Williams lauded the Small Watershed Program, which had been initiated earlier that year by Public Law (P. L.) 566, as "a means for bringing the *water* element into balance with the *soil* element in our national soil and water conservation program." Williams explained the basic premise behind the watershed program: "Water management must begin where the rain hits the earth and the snow begins to melt." Rather than regulate water only once it reached a handful of major rivers, this strategy promised to manage it on the thousands of streams and tributaries of smaller watersheds. Befitting its decentralized approach to water management, the SCS administered the watershed program in decentralized fashion. The law's "primary objective," Williams declared, "is to provide the basis for local groups of people to cooperate with and receive assistance from the Federal Government in solving their flood prevention and water management problems."[13] The Soil Conservation Service described the Small Watershed Program as a democratic combination of individual responsibility, community cooperation, and the guidance of federal expertise.

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projects, see G. J. Hanson, et al., "A Look at the Engineering Challenges of the USDA Small Watershed Program," *Publications from USDA-ARS/UNL Faculty*. Paper 278 (2007), 1677, accessed 6 November 2013, http://digitalcommons.unl.edu/usdaarsfacpub/278/.

[13] Williams, "The New Watershed Protection and Flood Prevention Program," Talk delivered at the Land and Water Use Conference in conjunction with the American Farm Bureau Federation annual meeting, New York City, 13 December 1954, 1, 3; b1; Item 26; RG 114; NACP. Emphasis original.

The Small Watershed Program both reinforced older conservation practices and facilitated new ones. Eligibility for a watershed project required that at least fifty percent of a watershed be under "land treatment"—the term given to traditional soil conservation practices like terracing, strip-cropping, and contour farming. P. L. 566 also mandated a favorable cost-benefit ratio. Because of its decentralized character, the watershed program offered something for everyone, including politicians eager to secure federal projects for their home districts. Consequently, Congress amended the watershed program three times between 1954 and 1962 in order to increase opportunities for securing a watershed project. Whereas flood control was the initial economic driver for projects, congressional amendments expanded permissible benefits to include irrigation, drainage, industrial and municipal water supply, wildlife habitat, and outdoor recreation.[14]

Many advocates of watershed conservation praised such an approach for delivering conservation not only to individuals, but also to communities. As an SCS planning official noted in 1950, federal agencies "have focused attention almost entirely on the individual farmer and the individual farm unit, and haven't done too much to aid farmers on group problems." By the end of the 1940s, however, over three hundred communities nationwide had organized watershed associations, often in collaboration with soil conservation districts, in an effort to coordinate the management of the hydrosphere along watershed lines. This upwelling of demand ultimately helped facilitate the creation and operation of the Small Watershed Program, particularly as associations and districts emerged as primary sponsors of watershed projects. In 1957, Donald Williams remarked that this shift from individual to community clientele represented "probably the most significant

[14] On the initial terms of the law, see Public Law 566, 83rd Cong., 2d sess., 4 August 1954; "Questions and Answers Pertaining to the Watershed Protection and Flood Prevention Act"; b60f1; Walter Sillers, Jr. Papers, M004, Delta State University Archives and Museum, Cleveland, Mississippi (hereafter "Sillers Papers"). On the updates to the law, see USDA Soil Conservation Service, *Multiple-Purpose Watershed Projects under Public Law 566*, PA-575 (Washington, D.C.: Government Printing Office, 1968); and Donald A. Williams, "Objectives and Progress in Watershed Protection and Flood Prevention Programs," Address at Annual Meeting of the American Society of Agricultural Engineers, Miami Beach, Florida, 23-26 June 1963, 1-3; n7; Item 26; RG 114; NACP.

development" in postwar conservation, for it drove the broadening scope of the conservation-industrial complex.[15]

The Small Watershed Program was the USDA's first permanent, nationwide flood-control program, but it built on important precedents. In the 1936 and 1944 Flood Control Acts, Congress authorized and funded eleven Department of Agriculture flood-prevention pilot projects scattered throughout the country. The foundational idea was that, by increasing the absorption of water into the soil through soil conservation practices, less water would run off the land and contribute to flooding on major waterways downstream. Although these pilot projects would prove this idea wrong, the projects proved tremendously popular—especially in the two projects located in the Yazoo River basin of Mississippi (see Chapter 6). In fact, Representative Jamie Whitten, whose district straddled the Yazoo projects, considered his constituents' experiences so worthwhile that he wanted to extend the principle to the entire nation. He was reportedly responsible for inserting a plank on watershed conservation into the party platform at the 1952 Democratic National Convention. The following year, Whitten helped steer the House Appropriations Subcommittee on Agriculture toward a $5 million appropriation for demonstration watershed-conservation projects, even though Congress was then, as one observer noted, "hellbent on economy." These projects would play a key role in the passage of P. L. 566, for they helped demonstrate the appeal of flood-protection and economic development available through USDA watershed conservation.[16]

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[15] Carl B. Brown, quoted in "Minutes from Soil Conservation Research-Operations Conference," State College, Mississippi, 13 February 1950, 11; A96-21, C. R. Ashford Papers, University Archives, Mississippi State University, Mississippi State, Mississippi (hereafter "Ashford Papers"); [Williams], "A Year of Progress," *Soil Conservation* 22 (June 1957): 256-259. On the growth of watershed associations, see Sampson, *For Love of the Land*, 132.

[16] Arthur Maass, "Protecting Nature's Reservoir," *Public Policy* 5 (1954): 71. For Whitten's role in the committee hearings that initiated the legislation for the pilot program in 1953, see House Subcommittee on Agriculture Appropriations, *Department of Agriculture Appropriations for 1954: Hearings before the Subcommittee of the Committee on Appropriations, House of Representatives*, 83rd Cong., 1st sess., 1953, pt. 4:1910-1918 and pt. 5:592-593, 616-617, and 645-648. The 1953 pilot program was the last in a long line of developments after the 1936 Flood Control Act that led ultimately to the USDA practicing flood control on a national basis. See Douglas Helms, "Small Watersheds and the USDA: Legacy of the Flood Control Act of 1936," in *Readings in the History of the Soil Conservation Service*, ed. Douglas Helms

Before the passage of P. L. 566, however, watershed advocates had to engage with an ongoing debate over how flood control ought to be conducted—and who ought to do it. Proponents of the "downstream" model supported the Army Corps of Engineers, which generally sought flood control along main rivers by constructing levees or large flood-retention reservoirs. Their main contention with the USDA's plans for an "upstream" flood-control approach was not that it was unnecessary, but that it duplicated engineering duties in the federal government and siphoned funding from Corps projects.[17]

From the other perspective, advocates of the SCS's upstream approach characterized the Corps' projects as folly. The nation had already spent billions of dollars on downstream flood control, agrarian Louis Bromfield wrote, "when all the time it must have been easily evident even to a kindergarten child with a pile of sand and a watering can that one does not stop floods at the bottoms of rivers but high up on their tributaries and in the forests and cow pastures." Upstream flood-control advocates argued that soil conservation, when combined with small flood-retarding dams, helped restore what humans had damaged by clearing the land of its native vegetation.[18] In his 1954 book, *Big Dam Foolishness*, Elmer Peterson juxtaposed the Corps of Engineers' "monopoly on flood control" with the USDA's more "democratic process" of cooperating with state governments, local communities, and soil conservation districts to reduce flood dangers.[19] The debate over upstream and downstream flood control, it turns out, revolved around humans' relationships with the state as much as it did their relationships with nature.

(Washington, D.C.: USDA Soil Conservation Service, 1992), 96-109. Helms credits the publication of a USDA document for inspiring the 1936 legislative provisions that initiated what would become USDA flood control. See H. S. Person, *Little Waters: A Study of Headwater Streams & Other Little Waters, Their Use and Relations to Land* (Washington, D.C.: GPO, 1936).

[17] See Luna B. Leopold and Thomas Maddock, Jr., *The Flood Control Controversy: Big Dams, Little Dams, and Land Management* (New York: Ronald Press, 1954), especially pp. 83-154.

[18] Bromfield, *Out of the Earth* (New York: Harper & Brothers, 1950), 151; Paul B. Sears, introduction to *Big Dam Foolishness: The Problem of Modern Flood Control and Water Storage*, by Elmer T. Peterson (New York: Devin-Adair, 1954), vi.

[19] Peterson, *Big Dam Foolishness*, 32-33.

When viewed from this perspective, the Soil Conservation Service's small, earthen flood-retention dams take on a profound meaning. Historians have recognized how the massive concrete dams of the New Deal era represented monuments to the centralized, bureaucratic state.[20] In a similar manner, the dams that served as the backbone for the Small Watershed Program also represented the type of decentralized, associative state embodied in the conservation-industrial complex. Whereas massive structures such as the Hoover Dam were overt representations of state power, the smaller, more inconspicuous, and more dispersed SCS dams (such as those tucked away in the hills of Caterpillar's watershed advertisement) symbolized the diffused federal authority of the associative state. Their lower profile was by design, for the parties in the conservation-industrial complex preferred a government that remained out of sight.

When soil and water conservationists advocated their upstream approach to flood control, they were calling not for less federal activity, but for government expansion in a different form. They deemed the best approaches those that privileged local and individual responsibility. "Conservation is a teamwork job," Donald Williams explained in 1953. "It can only be accomplished by harmonious working relations of government and farmers." Such relationships were necessary, he alleged, because the only alternatives were authoritarian conservation and no conservation. "A national conservation program," Williams continued, "cannot have force in a democracy unless it is accepted as the individual responsibility of the man who uses and manages the

[20] See, for example, David E. Nye, *American Technological Sublime* (Cambridge: MIT Press, 1994); Donald C. Jackson, *Pastoral and Monumental: Dams, Postcards, and the American Landscape* (Pittsburgh: University of Pittsburgh Press, 2013); and Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (New York: Oxford University Press, 1985), especially 279-281. For more on the construction of large dams in the New Deal and immediate postwar eras, see Brooks, *Public Power, Private Dams*; David P. Billington and Donald C. Jackson, *Big Dams of the New Deal Era: A Confluence of Engineering and Politics* (Norman: University of Oklahoma Press, 2006); and Donald C. Jackson, *Building the Ultimate Dam: John S. Eastwood and the Control of Water in the West* (Lawrence: University Press of Kansas, 1995).

resources."[21] Soil and water conservationists thus preached two potentially contradictory values—teamwork and individualism—as one.

SCS officials resolved this apparent inconsistency by pointing to the place of expertise in soil and water conservation. Individual farmers were responsible for conserving their soil and water resources, to be sure, but over the preceding decades, conservation had become an expert profession. Speaking to a group of southeast Missouri farmers in 1956, Williams challenged outdated and "questionable 'conservation' efforts [such] as piling a load or two of brush and straw into a gully and tossing a couple of old mower wheels on top to hold it down." Likewise, he declared, "Water conservation involves considerably more than scooping out a pond in the corner of a pasture somewhere," because such haphazard actions often failed to take into account various aspects of hydrology on the farm and in the watershed.[22] Put simply, soil and water problems required "skills and knowledge that farmers cannot be expected to possess."[23] Thus, while farmers had an individual responsibility to pursue conservation, Williams argued they needed to partner with the Soil Conservation Service to fulfill it.

Small watershed projects were clear embodiments of the conservation-industrial complex. They blended public and private initiative to the extent that it was hard to tell where one stopped and the other began. While the process of launching a project was never identical, some patterns emerged. Take the projects on Smock Creek (Green County) and Mill Creek (Richland County) in southwestern Wisconsin. Each began with local farmers or business leaders forming a watershed association to address local problems, such as soil erosion and flooding. While this suggests "the spontaneous development of all-important initiative and responsibility" that the SCS loved to

[21] Williams, "More Effective Service in Soil and Water Conservation," 16 November 1953, 8, 4; b1; Item 26; RG 114; NACP.

[22] Williams, "Banking on Soil and Water Conservation," Address at Delta Farm Exposition Field Day near Marston in New Madrid County, Missouri (20 July 1956), 2; b3; Item 26; RG 114; NACP.

[23] Williams, "More Effective Service in Soil and Water Conservationists," 3.

promote, agency technicians typically "came to these early meetings" to guide farmers through the technical and legal details of practicing conservation and launching a watershed association. Perhaps the first meetings were even suggested by SCS staff, who knew that if they could "sell conservation to [the] natural leader [of neighborhood groups]…the rest of the members of the group would follow."[24]

After watershed associations were formed, the more technical aspects of the projects began. Glenn Laughlin, a University of Wisconsin scholar who studied the Mill Creek project, discovered that it was at this point that locals generally deferred to SCS expertise and leadership. The SCS typically distributed questionnaires to ascertain local opinion, but Laughlin observed the agency posed leading questions. The surveys "suggest the local responses; local people are inclined to accept what is suggested to them by conservation specialists…. The effect is psychologically constructive. Local people are made to feel that they were consulted and they had a part in formulating the project's Work Plan."[25] To a certain extent, they had. Yet, the line separating the state and the citizen in watershed projects proved blurry. It was precisely this relative invisibility of the federal government that lent the Small Watershed Program—and the conservation-industrial complex more broadly—much of its vitality.

This decentralized, federalist character of the Small Watershed Program also afforded SCS officials a powerful buffer against outside criticism. Because the state was so intertwined with local action, the Soil Conservation Service realized it could easily respond to complaints by highlighting

[24] Laughlin, "The Activities and Interrelations of Local Watershed Associations and Governmental Agencies Involved in Soil and Water Conservation in Wisconsin Under Public Law 566 Projects" (PhD diss., University of Wisconsin-Madison, 1965), 320-327; A. B. Foster, "Cooperation on a Watershed," *Soil Conservation* 22 (August 1956): 13; Roy H. Dingle, *Nothing But Conservation* (Richland Center, Wisc.: Roy H. Dingle, 1993), 183. For an example outside of Wisconsin where the SCS promoted watershed projects as "the spontaneous development of all-important local initiative and responsibility," see Donald Williams, "The New Watershed Protection and Flood Prevention Program," address at Cowanesque River Watershed Association and Tioga County Soil Conservation District Field Day in Academy Corners, Pennsylvania, 11 September 1954, 2; b1; Item 26; RG 114; NACP.

[25] Laughlin, "Activities and Interrelations," 394.

the role of the community and downplaying its own leadership. Having failed to prevent the USDA's upstream approach from being codified, for instance, the Army Corps of Engineers in the 1950s tried to annex the SCS's dam-construction duties. The SCS responded by presenting itself as a power-sharing agency and the Corps as a power-grabbing one. "Sound watershed projects, including construction of headwater dams," Williams stated unequivocally in 1955, "should be local projects with Federal participation rather than Federal-public works construction projects."[26] The SCS chief also rallied support among the public. "None of our conservation undertakings…is an arbitrary 'government program,'" he told a group of Nebraska farmers in 1954. "They are your programs."[27] Given the widespread wariness to federal overreach in the early 1950s, these were comforting messages.

Conservation officials also relied on the cooperative framework to avert responsibility for the negative consequences of watershed projects. Watershed dams—whether for flood control, wildlife habitat, or outdoor recreation—inevitably flooded someone's land. Many farmers resented losing their property, even if it purportedly benefited the larger community. For instance, when a watershed association in southwest Wisconsin threatened to take her family's land through the power of eminent domain, Mrs. Robert Carlson appealed to her congressman for assistance. "We live in a wonderful country," Carlson posited, "but if these small watersheds are going to be

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[26] Williams, "There is Work to Do," 19 September 1955, 8; b2; Item 26; RG 114; NACP. For an example of a Corps challenge to the watershed program, see U. S. Army Corps of Engineers, "Public Law 566 and Efforts to Amend It: A Brief Discussion of the Engineering Program of the Department of Agriculture and of Current Attempts to Broaden that Program," 7 May 1956, 9, 8; b19; Item 218; RG 114; NACP.

[27] Williams, "Making Watershed Programs Click," 20 October 1954, 13; b1; Item 26; RG 114; NACP. Williams repeated this sentiment continually. For example, in 1958 he told a convention of conservation contractors that "today's soil and water conservation program isn't a 'government job' by any means. It is a responsibility being shared on an increasing scale by individual, local and state interests of many kinds--among them conservation contractors and the farm and earth moving equipment people, who are in effect your teammates in getting the physical part of the conservation job done." Williams, "Growing Importance of Conservation Contracting," Address at 7th Annual Meeting of National Land Improvement Contractors' Association of America in Toledo, Ohio, 28 February 1958, 11; b5; Item 26; RG 114; NACP.

permitted to put our country on a par with Russia, I think it's time something was done about it."[28] In these situations, the Soil Conservation Service responded that its hands were tied. "A watershed development is strictly a local undertaking, with Federal and State technical and financial assistance," was its standard reply. "All decisions…are made by the sponsoring local organization."[29] The beauty of such a response was that it was true. The conservation-industrial complex had created in the Small Watershed Program a system in which federal authority was filtered through local channels. This type of framework was fully consistent with Americans' anti-bureaucratic traditions. And, as Carlson discovered, it insulated the SCS from critics who saw in the program unwanted intervention by the state, whether local or federal.

The decentralized character of watershed conservation thus served a vital purpose. The Small Watershed Program proved enormously popular. Indeed, in its first five years, the USDA had approved over two hundred watershed projects encompassing nearly 12.5 million acres—a fraction of the 86 million acres of land proposed in the 1,204 submitted applications.[30] In a political climate weary of New Deal-style centralization, the Small Watershed Program packaged the expansion of federal influence as a benign process that served rather than subjugated individuals and local communities. Farmers and small towns could thereby retain their independence and remain the beneficiaries of expert knowledge and government largesse, two critical ingredients of postwar prosperity.

[28] Carlson to Johnson, 20 April 1959; b1; Item 218; RG 114; NACP.

[29] W. W. Russell to Martin Gunderson, 30 March 1964; b13; Item 218; RG 114; NACP.

[30] Charles H. Lloyd, "Progress in Watersheds for Conservation and Flood Prevention," *Soil Conservation* 25 (December 1959): 105.

Malthusianism and Scarcity in a World of Abundance

As the United States entered a period of unprecedented prosperity after World War II, soil and water conservationists were faced with a problem. Their movement had initially gained traction in the throes of the Great Depression and its corresponding scarcity. Indeed, scarcity had always been at the root of conservation efforts. How could conservation evangelists preserve a sense of scarcity when Americans enjoyed previously unimaginable abundance?

They found one answer in the wave of neo-Malthusianism that swept the nation in the postwar period. As global birthrates soared after war's end, a number of commentators began worrying that human populations might exceed the world's carrying capacity.[31] From the late 1940s through the 1960s, conservation officials shared a genuine concern that overpopulation would soon lead to widespread famine, disease, and conflict over resources. SCS officials also found in neo-Malthusianism a powerful narrative that allowed conservation to expand amidst unprecedented abundance. In addition to natural resource conservation, the guarantee of abundance for future generations required the conservation of a sense of limits.

As Hugh Hammond Bennett's evolving rhetoric revealed, the objectives of the conservation-industrial complex changed with the onset of war. Conservation advocates after World War II increasingly justified the protection of natural resources because they provided not only the necessities of life, but also the niceties. In his inaugural address to state conservationists in 1953, recently appointed SCS chief Donald Williams explained that conservation programs were crucial "to maintaining the kind of an agricultural plant that can successfully meet the demands of growing

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[31] See Robertson, *The Malthusian Moment*; Gregory T. Cushman, *Guano and the Opening of the Pacific World: A Global Ecological History* (Cambridge: Cambridge University Press, 2013), chapters 8-9; John H. Perkins, *Geopolitics and the Green Revolution: Wheat, Genes, and the Cold War* (New York: Oxford University Press, 1997), 120-124 and 131-139.The two most famous contemporary treatments from the early postwar era are Fairfield Osborn, *Our Plundered Planet* (Boston: Little, Brown and Company, 1948); and William Vogt, *Road to Survival* (New York: William Sloan Associates, Inc., 1948).

population and an expanding economy."[32] Two years later, Williams' Malthusian theme had become more pronounced. "Our post-war crop of babies are still children," he announced at a conference in 1955, "and have not yet developed their full appetites." Conservation officials "have an obligation to take a long-term view of our resources in terms of population growth."[33] While land-treatment measures also helped satiate the baby boom's appetite, water management gained increasing priority among conservationists. "The need is clear," Williams stated in 1967. "Not only is the world's population growing rapidly, there is a rising demand among people everywhere for a better way of life. An adequate, well-managed water supply is a basic requirement if this demand is to be met."[34] In the face of growing population pressures on natural resources, the role of conservation technicians was not to encourage moderated consumption. Rather, it was to develop resources more effectively in order to sustain high levels of production.

If the conservation-industrial complex failed in this regard, the consequences appeared grim. On a visit to India in 1960, Williams witnessed the sort of dizzying over-crowdedness and poverty that could materialize when population growth was paired with insufficient natural resources. Although he had read about "the unspeakable misery of the homeless thousands in that unhappy land," he returned certain that "you simply cannot *know*—you cannot *realize*—the tragedy of land poverty until you see it with your own eyes." "The plight of India," Williams explained to a crowd in Bakersfield, California, "is not merely a matter of number of people and area of land…. Soil and water resources in India are not being used to their full potentiality." The Indian example drove home to Williams the "importance of using and caring for those resources in a way to keep them

[32] Williams, "More Effective Service in Soil and Water Conservation," 2.

[33] Williams, "The Nation's Use of Our Agricultural Lands," Address at Annual Meeting of the National Reclamation Association in Lincoln, Nebraska, 26 October 1955, 2; b2; Item 26; RG 114; NACP.

[34] Williams, "Modern Water Management to Assure Needed Supplies in a Peaceful World," Address at International Conference on Water for Peace in Washington, D.C., 25 May 1967, 8; b9; Item 26; RG 114; NACP.

productive through the generations." If American abundance was to last into the future, soil and water conservation needed to protect natural resources for, and from, an ever-growing population.[35]

As Williams' lesson suggests, an ethic of intergenerational responsibility increasingly pervaded utilitarian discussions about population growth. People like Williams focused on safeguarding abundance for themselves, but they also strove to secure similar, if not greater, wealth and comforts for future generations. "We have to measure tomorrow's demands on our agricultural resources," Williams cautioned Oregon conservation district officials, "not in terms of today's abundant production, but in terms of the needs of an estimated 230 million people in the U.S. by 1975…. Obviously, then, the principles governing soil and water and related resource conservation are having to be broadened as we move into the space-age future."[36] In other words, the nation faced not only a growing population, but also one with unprecedented expectations of what constituted the good life. Conservation, in order to serve the needs of present and future populations, needed to expand its reach and consider new ways to manage natural resources. From Williams' perspective, it was impossible to separate abundance, conservation, and ethics.

Williams' understanding of intergenerational responsibility was also rooted in his Christian faith. In 1954, the National Association of Soil Conservation Districts assumed leadership for an annual tradition called "Soil Stewardship Sunday," an ecumenical effort to dedicate one week of church services to promoting the Christian ethic of stewardship toward natural resources.[37] In the 1960s, Williams used these annual occasions to associate soil and water conservation with ethical

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[35] Williams, "New Patterns in Resource Use," address at National Reclamation Association in Bakersfield, California, 17 November 1960, 1; b6; Item 26; RG 114; NACP. Emphasis original.

[36] Williams, "Keeping Pace with Today's Broadening Conservation Concept," Address at Annual Meeting of the Oregon Association of Soil Conservation Districts in Salem, Oregon, 5 November 1959, 2-3; b6; Item 26; RG 114; NACP.

[37] A Texas periodical, *Farm and Ranch Magazine*, began sponsoring a "Soil and Soul Sunday" in 1946, but the magazine turned over the program to the NACD in 1954. See Sampson, *For Love of the Land*, 94; Williams, "The Challenge of Growth," Address at the Observance of Rural Life Sunday at Union Methodist Church in Washington, D.C., 23 May 1965, 1; b7; Item 26; RG114; NACP.

relationships toward God and human beings. Stewardship, he explained in 1963, meant both protection and production. "It is up to us, as good stewards, to develop the potential richness of our soil and water resources. Conserve them we must, but conserving them means using them to fulfill our needs. Future generations will thus be grateful for the blessings that have been ours and are theirs." All people, he concluded, "have been endowed with a great trust" to use their resources wisely.[38] To squander that trust would be moral folly, not only toward the living who depended on those resources, but also toward those generations yet to come.

The growing population of the postwar generation expanded not only numerically, but also geographically into cities and suburbs. While historians have argued that the Soil Conservation Service fostered environmentalism by working to reduce soil erosion from new suburban building sites, the agency's primary concern with the spread of cities remained how they were eating up valuable farmland (Figure 7).[39] Donald Williams noted in 1957 that urban sprawl typically "has shown a complete disregard whether it builds on infertile farmland or on that best able to efficiently produce foodstuffs year after year." The threat of food scarcity persisted despite current agricultural surpluses, for "our population continues to skyrocket, [and] we are faced with the fact that the land available to feed these extra mouths keeps dwindling." Suburban development also triggered the "previously unthought-of problems" of "water supply and priorities of use, flood prevention and control…and recreational or 'breathing' space." Given the breadth of the challenges that suburban expansion generated, the holism of the Small Watershed Program once again proved attractive. Watershed conservation was "especially well adapted for use in coping with some of the [nation's] urbanization problems," Williams explained in 1957, for it offered a unified system of land

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[38] Williams, "The Challenge of the Future," Statement for Use in Connections with Soil Stewardship Week, 19-26 May 1963, 1; b7; Item 26; RG 114; NACP.

[39] Adam Rome, *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (Cambridge: Cambridge University Press, 2001), especially pp. 200-209, 217-219.

Figure 7: Soil and water conservationists were far more concerned with suburbanization in the 1950s because it consumed "choice farm lands" than because it caused erosion. As attention to water pollution from agriculture mounted during the 1960s, however, the Soil Conservation Service would increasingly blame homebuilders in an effort to shift the blame away from farmers. Source: Felix Summers, "The Big Push!" in A. B. Beaumont, "A Look at Urbanization," *Soil Conservation* 24 (August 1958): 3.

management encompassing urban, suburban, and rural America.[40] To conservation officials, suburbanization and the baby boom belied the notion that abundance was guaranteed to last. Americans needed to be aware that scarcity lurked just around the corner but also that soil and water conservation could guide the way to perennial abundance.

[40] Williams and Peter Farb, "Our Farmlands are Shrinking," *Coronet* (May 1957), 148; Williams, "Rurban Land Use – A National Problem," Talk at Annual Meeting of the Hoosier Chapter of the Soil Conservation Society of America in Lafayette, Indiana, 8 January 1960, 1; b6; Item 26; RG 114; NACP; Williams, "Conserving the Land In Between," Address at the Annual Meeting of the Virginia Citizens Planning Association in Virginia Beach, Virginia, 7 May 1957, 12; b4; Item 26; RG 114; NACP. See also Williams, "Urbanization of Productive Farm Land," *Soil Conservation* 22 (October 1956): 60-65; and John M. Cross, "One Man's Farm—Another Man's Highway," *Soil Conservation* 23 (September 1957): 47-48;

Small Watersheds, Big Economy

Neo-Malthusianism was not the only idea policymakers leveraged in an effort to make sure Americans' enthusiasm for conservation did not wane after World War II. As the United States transitioned from a world of want into a world of wealth, the conservation-industrial complex guaranteed its programs' survival by presenting them as keys to economic growth. Conservation was partially responsible for American abundance, they claimed, and it was necessary if that abundance was going to last. As USDA Secretary Orville Freeman put it in 1962, "Soil and water management contributes to the rate of economic growth, stimulates the economy of local communities, and contributes basically to the development of rural areas."[41] Conservation regulated the natural world to render it more predictable, more manageable, and more profitable. Consequently, postwar proponents of soil and water conservation promised that the dreams of infinite economic growth could become reality, even in a world of finite resources.

The most defining feature of utilitarian apostles' broadening postwar mission was the attention paid to water. Insufficient water represented the greatest threat to economic growth. "More and more," Donald Williams explained in 1954, "water is becoming a primary limiting factor in the development of cities, industries, and agriculture throughout this country."[42] Cities needed water for the daily living of growing populations; industry required water as a raw material for nearly every product; and agriculture required more water to withstand drought and quench thirsty crops and livestock. Each of these sectors also stood to benefit by protection from floodwaters that threatened to destroy property and disrupt economic life. "Water," Williams suggested in 1963, "may well prove to be the lid or ceiling on our national economy."[43]

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[41] Freeman, "Cooperation with Soil and Water Conservation Districts," Secretary's Memorandum No. 1488, 1 February 1962, 5; b1; Item 42a; RG 114; NACP.

[42] Williams, "New Watershed Protection and Flood Prevention Program" (December 1954), 1.

[43] Williams, "Annual Message to State Conservationists," 19 August 1963, 3; b7; Item 26; RG 114; NACP.

The solution for the conservation-industrial complex was to regulate water more thoroughly. Water unused was water wasted. Members of the complex therefore promoted the Small Watershed Program as a way to achieve "the maximum utilization of all water from the time rain and snow falls upon the land until the water finds its way again to the sea." Watershed conservation, declared members of the complex, allowed farmers to have "the water you need when you want it—and not…too much water when and where you don't need it." In other words, the conservation-industrial complex worked to "keep water a servant of man all the way to the oceans."[44]

The central facet of the Soil Conservation Service's water conservation program was flood control. By guarding against flood risks, conservation technicians protected investments in roads, buildings, and machinery. Flood control also facilitated intensive farming on fertile, less erodible floodplains where otherwise "only…a low level of production is being obtained from the land" (see Chapter 6).[45] The SCS deployed a number of strategies designed to stem the effect of floods: earthen flood-retention dams on small rivers to create new lakes; smaller dams on individual farms to create farm ponds; and stream channelization, a body of techniques that straightened, deepened, widened, constricted, or otherwise cleared obstructions from channels to make water flow faster out of the watershed. As some members of a Wisconsin community believed in the 1950s, "If you just

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[44] Williams, "The Nation's Use of Our Agricultural Lands," 10; Williams, "Our Expanding Farm and Ranch Conservation Job," Address at Annual Meeting of Oregon Association of Soil Conservation Districts in Pendleton, Oregon, 1 December 1955, 4; b2; Item 26; RG 114; NACP; Donald Williams, "The Professional Conservationist of Tomorrow," Address at 13th Annual Meeting of the Soil Conservation Society of America in Asheville, North Carolina, 22 October 1958, 4; b5; Item 26; RG 114; NACP. Caterpillar Tractor expressed these same sentiments in its 1960 watershed advertisement, as did an SCS film from 1955. See Caterpillar Tractor, "Can We Double Our Water Supply"; and USDA Soil Conservation Service, *From the Ridge to the River: The Story of a Watershed* (Washington, D.C.: Motion Picture Service, [1955]), available from the Prelinger Archives (San Francisco, California) via https://ia601007.us.archive.org/2/items/6044_From_the_Ridge_to_the_River_The_Story_of_a_Watershed_00_01_01_22/6044_From_the_Ridge_to_the_River_The_Story_of_a_Watershed_00_01_01_22.m4v.

[45] Erwin C. Ford, et al., "Floods—and a Program to Alleviate Them," *USDA Yearbook of Agriculture 1955: Water* (Washington, DC: GPO, 1955), 171-176; Harry A. Steele and Kirk M. Sandals, "A Law that Puts Responsibility at Home," *USDA Yearbook of Agriculture 1955: Water* (Washington, DC: GPO, 1955), 165-166; Howard Matson, "Soil and Water Management Under the Complete Watershed Program," Paper presented at the annual meeting of the American Society of Agricultural Engineers in Kansas City, Missouri, June 1952, 2-3; b24; Item 218; RG 114; NACP.

straighten the crick, the water will get away down the valley, and we won't have any more flood problems."[46] While SCS stream channelization policies would spark tremendous controversy by the early 1970s, during the previous two decades Americans embraced it as a way to free farmers and communities from the floods that threatened increased productivity.

Much of the appeal for SCS flood control was generated by the heavy costs of widespread flooding in the 1950s. Indeed, one of the forces that enabled the passage of P. L. 566 in 1954 was the disastrous flooding the previous few years in Kansas (the home state of the bill's co-sponsor, Clifford Hope), Missouri, and Nebraska.[47] The Midwestern floods of the early 1950s had similar effects on small-town and rural America. For example, from 1951 to 1954, the village of Boaz, Wisconsin suffered four consecutive years of flooding with damages "conservatively estimated" at over two hundred thousand dollars.[48] Fifty miles to the south in Platteville, Wisconsin, Janice Bonin wrote to the SCS in 1954 seeking "information on the control of streams. The Little Platte River, which floods, flows thru our farm and quite near the farm buildings."[49] In 1958, an Arkansas farm wife lobbied the USDA for a watershed project on the Cach River. "I lost a crop last year on account of flood watters [*sic*]," Lucy Tubbs wrote, "and so did my neighbors…. Don't no [*sic*] if [we] will get a crop this year or not."[50] Flooding disrupted life and stymied economic growth at the individual as well as community levels, and the conservation-industrial complex promised to help mitigate these risks through more complete water management.

Soil and water conservation afforded other ways to produce abundantly as well. First, conservation leaders argued that by protecting natural resources, they were protecting the massive

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[46] Roy H. Dingle, *Nothing But Conservation* (Richland Center, Wisc.: Roy H. Dingle, 1993), 206-207. Dingle, who was writing in the 1990s, was paraphrasing arguments made in the 1950s by officials in the town of Boaz. Stream channelization grew increasingly controversial by the late 1960s, as we will see in chapter 3.

[47] Peterson, *Big Dam Foolishness*; Douglas Helms, "Conserving the Plains: The Soil Conservation Service in the Great Plains," *Agricultural History* 64 (Spring 1990), 70-71.

[48] Laughlin, "Activities and Interrelations," 322-324; Dingle, *Nothing But Conservation*, 203-204.

[49] Bonin to Young, 17 December 1954; b1; Item 218; RG 114; NACP.

[50] Tubbs to Benson, 20 March 1958; b1; Item 218; RG 114; NACP.

postwar investments in agriculture. As early as 1946, Hugh Bennett had argued, "Improved varieties, hybrid seed, insect and disease control, improved machinery…[the] breeding and managing of livestock, and improved marketing practices are of but temporary value to the individual farmer who is losing his soil and water resources." Donald Williams echoed this refrain seven years later, describing that "all our efforts to improve crops, reduce costs, and expand markets" depended on the material foundation of soil and water. Conservation farming was thus "indispensable to a healthy, producing American agriculture."[51] Second, and more directly connected to agricultural industrialization, conservation officials presented soil and water conservation as a facilitator of the burgeoning Green Revolution. This revolution, led by future Nobel laureate Norman Borlaug, introduced to the world new crops engineered to produce greater yields. To serve their purpose, however, these "high-yield varieties" (HYVs) depended on dramatically intensified application of fertilizers and on steady availability of water.[52] Although they rarely spoke explicitly of HYVs or the Green Revolution, SCS technicians saw themselves as the underwriters of what the revolution needed to flourish.

With the increased demand for water and fertilizers in agriculture, researchers found a new reason for soil husbandry. They would conserve soil to not only guard against erosion, but also to protect soil structure and "soil-water-plant relationships." Scientists were coming to discover that a well-developed soil structure—neither too compact and cemented nor too loose and

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[51] Bennett to Clinton B. Anderson, 4 January 1946, 19; box 1; Item 21; RG 114; NACP; Williams, "More Effective Service in Soil and Water Conservation," 2; Williams, "Local-State-Federal Teamwork is Conservation Key," Address at 15th Annual Meeting of the Alabama Association of Soil Conservation District Supervisors, 13 January 1958, 3; b5; Item 26; RG 114; NACP.

[52] Perkins, *Geopolitics and the Green Revolution*, 256. In addition to Perkins, for more on the social and geopolitical dimensions of the revolution, see Cushman, *Guano and the Opening of the Pacific World*. On hybrid corn in the first half of the century, see Deborah Fitzgerald, *The Business of Breeding: Hybrid Corn in Illinois, 1890-1940* (Ithaca: Cornell University Press, 1990).

unaggregated—facilitates the ability of plant roots to absorb water and nutrients.[53] As Donald Williams put it in 1955, "We [must] use measures to take care of the structure of the soil; otherwise, it won't take in the water needed. Very shallow soils, for example, won't hold enough moisture for growing corn…even if we put on fertilizer, and even if we irrigate."[54] In other words, "for each soil, plant nutrients and water must be brought into optimum balance."[55] With the advent of HYV crops, plants became increasingly vulnerable to deficits in nutrients and water, making the integrity of soil structure ever more paramount.

This emerging preoccupation with soil structure and "soil-water-plant relationships" reinforced the Soil Conservation Service's longstanding prioritization of physical soil over soil fertility. As long as farmers had enough money to buy fertilizers, the protection of soil structure would open the doors to increased productivity. According to SCS researcher Charles Kellogg,

> We are little concerned here in the United States any more about the natural fertility of our soils…. We are now much more concerned with the physical condition of soils—their structure, depth, and water relations. Given light and temperature, a soil with good physical structure is so responsive to our modern methods of fertilization and water control that 'inherent' or 'native' fertility is becoming relatively unimportant to the skillful manager with capital at his command. We are not only getting high production from such soils, we are getting it very efficiently.[56]

In other words, if the SCS could show farmers how to protect their soil structure and provide them abundant water, innate soil fertility was meaningless and the possibilities for production were endless.

Conservation technicians also sought to underwrite the hydrologic foundations of industrializing agriculture. Most importantly, the SCS strove to make sure farmers had on-hand a ready supply of

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[53] Nyle C. Brady and Ray R. Weil, *Elements of the Nature and Properties of Soils*, 3rd ed. (Boston: Prentice Hall, 2010), 96-97, 104-105, 110-114, and 169-170.

[54] Williams, "Our Soil and Water Conservation Action Program," Address at Annual Meeting of the Arkansas Association of Soil Conservation Districts in Little Rock, Arkansas, 4 April 1955, 5; b2; Item 26; RG 114; NACP.

[55] Williams, "The Professional Conservationist of Tomorrow," 3.

[56] Charles A. Kellogg, "World Food and Agricultural Potentialities," Address before the American Economic Association in New York City, 29 December 1955, 3; b2; Item 26; RG 114; NACP.

water for irrigation. Nationwide, the agency's most significant and popular irrigation measure was the farm pond, which field personnel designed and private contractors created by constructing earthen dams over small streams (Figure 8). The agency began promoting ponds in the late 1930s to serve a variety of purposes, but after World War II, it championed their economic potential with greater regularity.[57] Wisconsin SCS agent Roy Dingle recalled that as his agency's involvement in flood control grew, federal subsidies for pond construction expanded under the idea that "each dam we built reduced the danger of floods." In time, however, Dingle came to realize that, given the small size of these ponds, "the flood control value of a little dam…was hardly discernible. It was almost like the person who pissed in the ocean and said, 'Every little bit helps.'"[58] Although ponds had negligible impacts on large-scale flooding, they did provide some defense from the inundation of farmers' individual fields, and a source of irrigation water during dry years, which in turn protected other capital investments.

As agriculture became more productive (but, because of increasingly water-intensive crop varieties, also more vulnerable to drought) after World War II, conservation advocates realized that farm ponds could facilitate irrigation. "Almost every section of the country frequently has dry spells that damage crops or make it necessary to haul water for livestock," began a 1949 USDA leaflet. "A good farm pond will often help prevent such damage and inconvenience."[59] In regions that received abundant but inconsistent annual rainfall, such as the Southeast, farm ponds helped make sure farmers had access to water during peak growing seasons. "More intensive agriculture," Donald Williams announced in 1967, "will require considerably more water for irrigation—even in the

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[57] For a sampling of pre-war references to farm ponds for irrigation, see R. W. Oberlin, "Farm Ponds Pass Critical Tests," *Soil Conservation* 2 (March 1937): 210-211; Cecil N. Davis, "Utilizing Farm Ponds for Wildlife," *Soil Conservation* 4 (March 1939): 230-232; and H. G. Jepson, "Farm Ponds in Soil and Moisture Conservation," *Soil Conservation* 5 (October 1939), 77-78.

[58] Dingle, *Nothing But Conservation*, 173.

[59] USDA, *How to Build a Farm Pond*, Leaflet No. 259 (Washington, D.C.: GPO, 1949), 1.

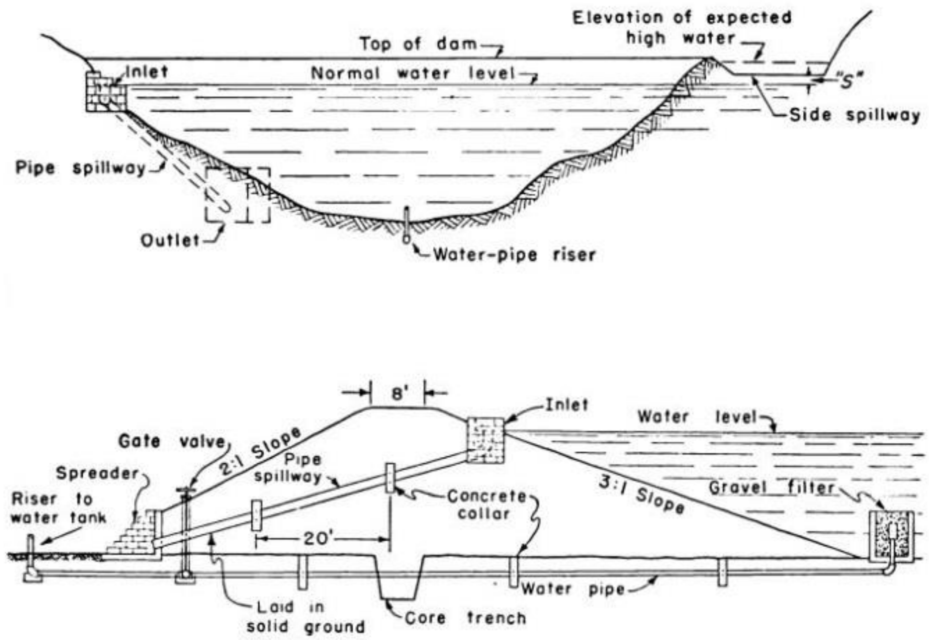

Figure 8: Profile and cross-section of a typical farm pond. Adapted from USDA, *How to Build a Farm Pond*, Leaflet No. 259 (Washington, D.C.: Government Printing Office, 1949), 5.

humid regions…where an ample annual rainfall does not always satisfy seasonal demands." Policymakers needed to realize that "water is not consistently plentiful. It is plentiful [only] if it is properly managed—stored when there is a surplus; used judiciously so that it is not wasted; providedwith the necessary means of distribution to where it is needed."[60] Farm ponds served this purpose, giving farmers greater (though never complete) spatial and temporal control over the water on their land.

Throughout the postwar period, farm people from across the country came to realize these benefits for themselves. The magazine *Soil Conservation*, the mouthpiece of the SCS, reported that a cucumber farmer from Lancaster County, Pennsylvania, like other eastern truck farmers, faced the 1950 drought with "no fear … because he knew he had enough water [from his pond] to meet

[60] Williams, "Managing Our Water Supply," Address at Southern Water Resources Conference in Biloxi, Mississippi, 14 July 1967, 4, 5; b9; Item 26; RG 114; NACP.

irrigation needs."[61] One Massachusetts farmer cooperated with the SCS to construct six ponds for pasture irrigation, while another had "almost lost his shirt" before the USDA helped him build a pond with enough water to irrigate his vegetables "8 to 10 hours daily" in the height of summer.[62] Elsewhere, South Carolina farmers reported that their ponds helped replenish underground wells, and a California hay-farmer noted a five-fold increase in yields after building an irrigation pond.[63] By 1963, the USDA reported that new farm ponds were being constructed at a rate of 60,000 per year, adding to the over one million ponds already scattered across the country.[64] Measured by their numbers and their influence on agricultural production, these structures represented one of the most significant (but also one of the most underappreciated) agricultural conservation innovations in the postwar United States.

Farmers who began irrigating after World War II also encountered a new challenge. Irrigation carried the risks of waterlogging and soil salinization, for crops could not typically consume all the water applied to a field. Conservation technicians hoped to alleviate these dangers through drainage, which they considered "a necessary part of every irrigation system."[65] As the SCS's drainage work escalated in the 1950s and 1960s—funded largely by P. L. 566—it drew increasing ire from sportsmen's groups and wildlife conservationists for destroying waterfowl habitat. Yet, these competing water narratives would not reach a crescendo until the late 1960s, leaving the agency's drainage policies relatively uninhibited for the time being.[66]

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[61] "Cucumbers," *Soil Conservation* 16 (November 1950), 95. See also "Pond Licked Drought," *Soil Conservation* 16 (October 1950), 50.

[62] "Six-Pond Dairy Farm," *Soil Conservation* 16 (May 1951), 237; "Wide Range of Land Use in One Massachusetts Area," *Soil Conservation* 19 (April 1954), 210.

[63] "The Wells Came Back," *Soil Conservation* 20 (December 1954), 98; Herb Boddy, "Water Storage Was Good Business," *Soil Conservation* 19 (August 1953), 3-4.

[64] USDA, *Rural Recreation: New Opportunities on Private Land*, Misc. Publication No. 930 (Washington, D.C.: GPO, 1963), [10].

[65] Williams, "The Nation's Use of Our Agricultural Lands," 12. See also Ronald C. Reeve, "Drainage of Irrigated Lands," *Soil Conservation* 23 (August 1957): 12-15.

[66] For more, see chapter 3; Ann Vileisis, *Discovering the Unknown Landscape: A History of America's Wetlands* (Washington, D.C.: Island Press, 1997), 182-186, 196-201, and 244-252.

The SCS defended drainage as an erosion-control and productivity measure. According to this rationale, expelling water from flat, wet areas would result in better land use. Farmers could shift row-crop production from hills to flatlands, and they could move pastures from floodplains and other damp areas to hillsides. This promised to reduce erosion and yield higher profits to boot. Drainage thus not only expanded the scope of soil and water conservation activities; it also transformed the geography of agriculture. Although some farmers continued to plow on hillsides, especially when crop prices were high, the dominant pattern in American farming became row-cropped (and often irrigated) floodplains and wooded or grazed hillsides.[67] While irrigation and drainage struck some observers as purely measures designed to increase productivity, the SCS defended them as efficient uses of resources.[68] When it came to matters of efficiency, the line separating economic production and environmental protection became increasingly vague, and often it disappeared entirely.

"Earthmoving Machines…Designed to Fit Every Need"

The economic benefits of the Small Watershed Program were not limited to farmers. As Caterpillar Tractor's interest in conservation suggested, they also accrued to private industry. Federal watershed programs opened new markets to the farm-equipment industry—manufacturers, dealers, and private contractors. Machinery manufacturers had been active supporters of soil and water conservation since the late 1920s, but their commitment to the conservation-industrial

[67] Conservationists relied repeatedly on this reasoning to legitimize drainage and occasionally used it to justify irrigation. For instance, see Williams, "Conservation Irrigation and Tomorrow's Food and Water Needs," 15 March 1960, 7; b6; Item 26; RG 114; NACP; Williams, "New Patterns in Resource Use," 17 November 1960, 3; b6; Item 26; RG 114; NACP; Dingle, *Nothing but Conservation*, 172-173; SCS, *Soil and Water Conservation in Mississippi* (Jackson, Miss.: Soil Conservation Service, 1960), 7; and Claude D. Crowley, "They Farm the Bottomlands Again," *Soil Conservation* 26 (January 1960): 140-141. For an example of farmers continuing to plow hillsides in addition to floodplains, see Leonard C. Johnson, *Soil Conservation in Wisconsin: Birth to Rebirth* (Madison: University of Wisconsin—Madison Department of Soil Science, 1991), 143.

[68] Williams, "Conservation Irrigation," 1.

complex blossomed after World War II as technicians took earthmoving to entirely new scales with the construction of farm ponds, flood-retention reservoirs, and drainage ditches funded and facilitated by the Small Watershed Program. Joining the companies and dealers who produced and sold machinery after 1950 were new members to the complex, private contractors. While in most cases watershed conservation structures were designed by SCS staff, the actual construction work was performed by private parties who possessed the engineering know-how and the machinery needed to put SCS plans on the land. Just as the Small Watershed Program expanded the scope of soil and water conservation, it also broadened the base of the conservation-industrial complex.

Donald Williams appreciated the contributions heavy machinery made to the expanding conservation mission. Whereas the "horse-drawn equipment still most commonly used" in the 1920s and 1930s limited the scope of conservation activities, he explained in 1961, "tractor power brought the development of farm implements and earthmoving machines…designed to fit every need." The proliferation of this specialized, powerful equipment made it possible and practical to reshape the surface of the earth at unprecedented scales, whether by creating terraces and filling gullies or digging farm ponds and damming small waterways. The sprawling reach of the Small Watershed Program depended largely on this machinery. "Earthmoving," as Williams understood, opened "the way for conservation to move more effectively and faster beyond individual farm and ranch boundaries into the country's 8,300 small watersheds."[69] For example, in 1955 alone—the year before Congress first expanded the scope of the program—small watershed projects in South Carolina involved the movement of nearly 15 million cubic yards of soil from 3,266 farm ponds, 298 miles of drainage ditches, and 1,958 miles of terraces. A train carrying all of this soil and traveling continuously at sixty miles per hour would take eighteen hours before the train passed a single point. All of this work depended on heavy earthmoving machinery: 175 draglines, 315 crawler tractors and

[69] Williams, "Technology and Machines Speed Conservation," *Soil Conservation* 27 (October 1961): 51.

bulldozers, and 115 scrapers, besides myriad farm tractors. The following year, SCS programs nationwide accounted for over half a billion cubic yards of earth moving.[70] Clearly, without the availability of heavy machinery, the ability of conservation technicians to regulate the hydrosphere would have been severely constrained.

Befitting the associative character of the conservation-industrial complex, private industry benefited from soil and water conservation as much as federal programs did from heavy machinery. Equipment dealers were quick to appreciate the value of soil and water conservation to their businesses. In the 1940s, some of dealers' most valued customers were soil conservation districts whose governing boards purchased machines and rented them to farmers. Harry Archer, a machinery dealer from Liberty, Texas, found that his customer base soon expanded to farmers themselves, in no small part because the regulation of soil and water allowed farmers to "enjoy a more reliable income year after year." Archer discovered that as more farmers participated in conservation districts, "we sell more machinery." From his perspective, the entire community also prospered, reflecting the "new vigor that came to our land." When Archer pointed out that he now saw "two blades of quality grass where one grew before," he made no distinction between increases in production from conservation or from other advancements in agricultural science.[71] But that was precisely the point: soil and water conservation seemed perfectly compatible with the emerging regime of industrialized agriculture. As dealers like Archer realized that soil and water conservation helped conserve and develop the natural resources at the basis of their economic and community wellbeing, support for the conservation-industrial complex continued to grow.

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[70] James L. Aull, "Earth Moving for Soil and Water Conservation," *Soil Conservation* 22 (September 1956): 32; Donald A. Williams, "Growing Importance of Conservation Contracting," Address at Seventh Annual Meeting of the National Land Improvement Contractors' Association of America, in Toledo, Ohio, 28 February 1958, 6-7; box 5; Item 26; RG 114; NACP.

[71] Harry W. Archer, "Machinery Dealer finds SCD Brings More Business—Better Community Life," *Soil Conservation* 27 (December 1961): 118-119.

Soil and water conservation, aided by the expansive capacities of the Small Watershed Program, also enjoyed the support of private contractors in the postwar years. In the late 1950s, Donald Williams noticed that that private contracting had ballooned since 1950 as the scope of soil and water conservation broadened. By 1957, SCS engineers were in such high demand that the agency encouraged farmers, conservation districts, and watershed associations to hire private engineers whenever possible.[72] Speaking in 1958 before a professional association of land contractors, Williams observed how "the variety of conservation undertakings offers particular advantages to the conservation contractor." For instance, contractors could spend their summers working on watershed projects, and after the fall harvest, they could begin constructing terraces or perform other field-level conservation activities. This sort of arrangement lent weight to William's proclamation that "today's soil and water conservation program isn't a 'government job' by any means."[73] Put another way, the Soil Conservation Service's reliance on private contractors to implement conservation practices bolstered the associative order of the conservation-industrial complex.

By the early 1960s, conservation contractors had organized into political force with enough power to threaten the structure of the conservation-industrial complex. In 1963, the National Society of Professional Engineers was in the midst of a lobbying campaign to convince Congress to limit federal engineering work to federal projects, which Williams feared would "greatly reduce, if not eliminate" SCS engineering duties in the associative watershed projects. Local sponsors of watershed projects could choose whether they worked with agency or private engineers. Williams learned that it was common for SCS field agents to recommend government engineers because

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72 Williams, "A Bigger Job for Engineers in Conservation," Address at the Annual Meeting of the American Society of Agricultural Engineers, in East Lansing, Michigan, 26 June 1957, 6; Box 4; Item 26; RG 114; NACP.

73 Williams, "Growing Importance of Conservation Contracting," 9, 11. In addition to the Small Watershed Program, Williams noted the opportunities for private contractors through the Great Plains Conservation Program, which started in 1956. For more on the latter program, see Helms, "Conserving the Plains."

those services "are free." While "we have every reason to believe that [SCS] activities…have and will continue to increase the workload for private engineers," he told state officials that August, he nevertheless ordered field staff to discontinue its practices. Moreover, the Williams considered it "in the national interest" to allow private engineers a monopoly over the municipal and industrial water supply components of small watershed projects. This compromise satisfied conservation contractors, and four years later engineering organizations remained "in general agreement with the stand we have taken."[74] As this episode demonstrates, many of the relationships in the conservation-industrial complex would remain strong only insofar as each party remained satisfied with its share of the federal pie.

The Soil Conservation Service had long enjoyed an amiable relationship with the farm machinery industry, and this was increasingly true after World War II. Various manufacturers cooperated with the SCS to create promotional materials and how-to films that praised conservation while marketing their machines. By 1945, for instance, J. I. Case had created a series of twelve-minute motion pictures in collaboration with SCS officials on topics such as "Soil and Life," "Broad Base Terracing," and "Building a Pond."[75] Several years later, when rallying support for watershed conservation, the agency reached out to the machinery industry for help. In 1951, an SCS employee, Rodney Radford, contacted the Allis-Chalmers Manufacturing Company to solicit sponsorship on a promotional film titled "The Community Watershed." Radford pitched the film on its theme of decentralization and its "strong 'American way of life' message," an association he was certain would

[74] Williams, "Annual Message to State Conservationists," in Salt Lake City, Utah, 19 August 1963, 18-19; box 7; Item 26; RG 114; NACP; Williams, "Annual Message to State Conservationists," in Athens, Georgia, 18 September 1967, 12; box 9; Item 26; RG 114; NACP.

[75] J. I. Case, Co., *Build a Pond with Your Own Farm Power* (Racine, Wisconsin: J. I. Case, 1945), 16, attached to J. C. Dykes to F. A. Wirt, 12 October 1945; b39, Item 21; RG 114; NACP.

"be the desire of any American corporation."[76] The farm-equipment industry's interest in promoting conservation remained strong into the next decade, with hundreds of thousands of dollars being spent each year on advertisements ranging from magazine spots and radio programs to brochures and filmstrips.[77]

No corporation was more active in its cooperation with the SCS than Caterpillar Tractor Company. The company was in regular contact with the SCS regarding what it once called "our united goal of good soil and water conservation."[78] Caterpillar had a pecuniary interest in staying abreast of the latest conservation measures—which were growing increasingly mechanized—and, in turn, the company helped promote SCS programs with the weapon of modern advertising. In fact, Caterpillar's full-colored advertisement that opened this chapter comprised part of a larger series of spots the company purchased in the 1950s and 1960s.

Appearing in farm and trade journals as well as popular periodicals, Caterpillar's advertisements borrowed liberally from SCS doctrine. In farming journals, for instance, one ad associated proper soil structure with other features of industrialized agriculture. "The big challenge facing today's conservationist," it read, "[is] the job of bringing up the seed bed on par with the rest of the farm program—with hybrids, fertilizers, insecticides, miracle drugs." Another announced that land forming (a set of practices involving substantial earthmoving) was "as important to your farming future as hybrid crop varieties, commercial fertilizers, and insecticides." These techniques were often part of watershed conservation, but in popular magazines Caterpillar also advertised the Small Watershed Program itself. One eye-catching ad displayed a beleaguered man stacking

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76 Radford to C. N. Karr, 14 September 1951; b1; Item 206; RG 114; NACP. The SCS produced a film with this messaging in 1955, but the film does not credit any machinery manufacturer as a sponsor. See SCS, *From the Ridge to the River*.

77 W. J. Klein, "Farm Equipment Industry Invests Heavily in Furthering Soil and Water Conservation," *Soil Conservation* 28 (November 1962): 84.

78 Elmer Smith to R. Neil Lane, 29 July 1963; b5; Item 218; RG 114; NACP.

Figure 9: A beleaguered man—exhausted from the "destructive cycle" of drought and flood—is featured in this Caterpillar Tractor advertisement promoting the Soil Conservation Service's watershed program. Source: National Archives, College Park, Maryland.

sandbags against rising floodwaters (Figure 9). The text promoted watershed conservation as a solution to the "destructive cycle" of flood and drought, a way "for communities to collect their rainfall in times of plenty in order to fill their needs in times of drought."[79] In 1962, an SCS official wrote to Caterpillar praising the company's "excellent work" in furthering "the cause of soil and water conservation."[80]

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[79] Caterpillar, "Pennies Per Yard," magazine advertisement in *Journal of Soil & Water Conservation* (January 1959) and *Agricultural Engineering* (February 1959), Thomson Advertising, Inc.; and Caterpillar, "Land Forming," magazine advertisement in *Capper's Farmer* (April 1959), Thomson Advertising, Inc.; Caterpillar, "…And Others Pray for Rain," magazine advertisement in *The Saturday Evening Post*, *Time*, *Newsweek*, and *U.S. News & World Report*. Each of these advertisements is housed in Box 9; Item 67; RG 114; NACP.

[80] R. Neil Lane to Elmer Smith, 28 November 1962; Box 18; Item 218; RG 114; NACP.

Through these advertisements, Caterpillar not only marketed its own brand but also sowed the seeds of utilitarian conservation in the minds of millions of readers. The broadening reach of the federal government through conservation carried with it broadened markets for machinery manufacturers. The expansiveness of the Small Watershed Program proved especially tantalizing fodder for the industrial side of the conservation complex. As Donald Williams put it in 1967, "the watershed program is big business."[81]

Bridging the Urban-Rural Divide

As the soil and water conservation movement expanded its set of practices in the postwar period, it also broadened its targeted clientele. No longer would the conservation-industrial complex focus solely on rural America. If lives of abundance were to be realized for all, conservation officials and technicians would have to take a cue from the watershed concept and bridge the rural-urban divide. "The newer watershed framework in conservation," Williams emphasized in 1955, "will be a means of making our conservation efforts broader, and still more effective and permanent." The watershed served as a model not just for managing natural resources effectively, but also for bringing non-farm interests into the conservation-industrial complex. He predicted that watersheds could bring "industry and other urban interests into partnership with farmers and ranchers more than ever before."[82] Conservation planners aimed to build this partnership by extending to each group that which the other typically enjoyed. Urbanites would benefit directly from the conservation techniques of the countryside and would have ready access to outdoor recreation opportunities in rural America. Meanwhile, rural people would be able to afford the sort of creature

[81] Williams, "Annual Message to State Conservationists" (1967), 21.
[82] Williams, "Our Expanding Farm and Ranch Conservation Job," 6.

comforts that typically marked city living. Between 1950 and 1970, conservation leaders aimed to erode once and for all the timeless boundary separating urban and rural life.[83]

The broadening of conservation clientele to include urbanites was in part a calculated response to demographic changes buffeting rural America. USDA officials were well aware that farm populations were shrinking at the very time that federal farm assistance was growing. Indeed, by the early 1960s, farmers represented roughly eight percent of the nation's population, but agriculture was the third largest federal budget item—nearly twenty percent of which was dedicated specifically to technical and financial conservation assistance. Moreover, the public was beginning to notice this disparity between population and budget.[84] It was therefore politically shrewd to defend the mounting agricultural and conservation budgets as beneficial to every American, not just those residing in the countryside or rural towns, lest these services fall victim to the budgetary axe.

But the urban messaging of the conservation-industrial complex amounted to more than a shallow attempt to maintain political relevance. Conservation advocates promoted their postwar agenda, particularly the Small Watershed Program, as a boon to city dwellers. Water resources were under mounting pressures as rural industrialization pushed people from the countryside and urban industrialization drew them to cities. These trends led to heightened demand for water, and conservation officials considered it their duty to make sure both city and countryside had sufficient supplies. Donald Williams explained in 1965 that the upstream reservoirs of the Small Watershed Program offered "opportunities…for municipal and industrial uses to meet needs for water to

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[83] For more on the interconnections between urban and rural life through conservation, see Laura R. Kolar, "'Selling' the Farm: New Frontier Conservation and the USDA Farm Recreation Policies of the 1960s," *Agricultural History* 86 (Winter 2012): 55-77; and Kolar, "Conserving the Country in Postwar America: Federal Conservation Policy from Eisenhower to Nixon" (PhD diss., University of Virginia, 2011).

[84] Sarah T. Phillips, et al., "Reflections on One Hundred and Fifty Years of the United States Department of Agriculture," *Agricultural History* 87 (Summer 2013): 315-317. For more on the USDA's historical conservation expenditures, see Pavelis, et al., *Soil and Water Conservation Expenditures*; and US Office of Management and Budget, *Historical Tables: Budget of the U.S. Government, Fiscal Year 2013* (Washington, D.C.: GPO, 2010), 56, accessed 13 December 2013, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2013/assets/hist.pdf.

attract new industries."[85] With proper management, there would be plenty of water to go around; conservation leaders simply needed to make their programs multipurpose.

One of the most heralded models of multipurpose conservation was the Muskingum Watershed Conservancy District in central Ohio. Local citizens had formed the district in 1933 largely as an attempt to prevent the sorts of destructive flooding that twenty years earlier had swept through the Muskingum River, a tributary of the Ohio River. In 1950, famed Ohio writer and agrarian Louis Bromfield popularized the Muskingum story in his agrarian treatise, *Out of the Earth*. Bromfield praised the district for its creation of "increasingly new wealth" through not only rejuvenated agriculture and forestry, but also the burgeoning industrial and tourism sectors that watershed conservation made possible.[86] The multipurpose character of Muskingum's conservation meant that the same system of water control that managed floods also attracted industry and furnished outdoor recreation for industrial workers. Caterpillar Tractor even sponsored an advertisement featuring the Muskingum Valley, "the valley that once hated water" (Figure 10). The valley's progress was made possible by water conservation, the company suggested. "Control of water has brought new industry," the copy read, "[and] thousands of new jobs…. Industry no longer shuns the Muskingum country." By catalyzing the process, "flood control…was the key to economic growth."[87] Controlling water in the name of conservation spawned prosperity and brought together urban and rural lifestyles as never before.

Conservation proponents found perhaps the greatest appeal for growing industry through soil and water conservation in the South. After World War II, southern cities increasingly faced periodic water shortages, even though the region receives abundant annual rainfall. As the president

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[85] Williams, "Conserving the Land In Between," 1-2; Williams, "Questions for Discussion on Agriculture USA," 4 December 1965, 5; b7; Item 26; RG 114; NACP.

[86] Bromfield, *Out of the Earth*, 153, 148-149; see also pp. 147-156.

[87] Caterpillar, "The Valley that Once Hated Water," magazine advertisement in *Saturday Evening Post* (10 February 1962); b9; Item 67; RG 114; NACP.

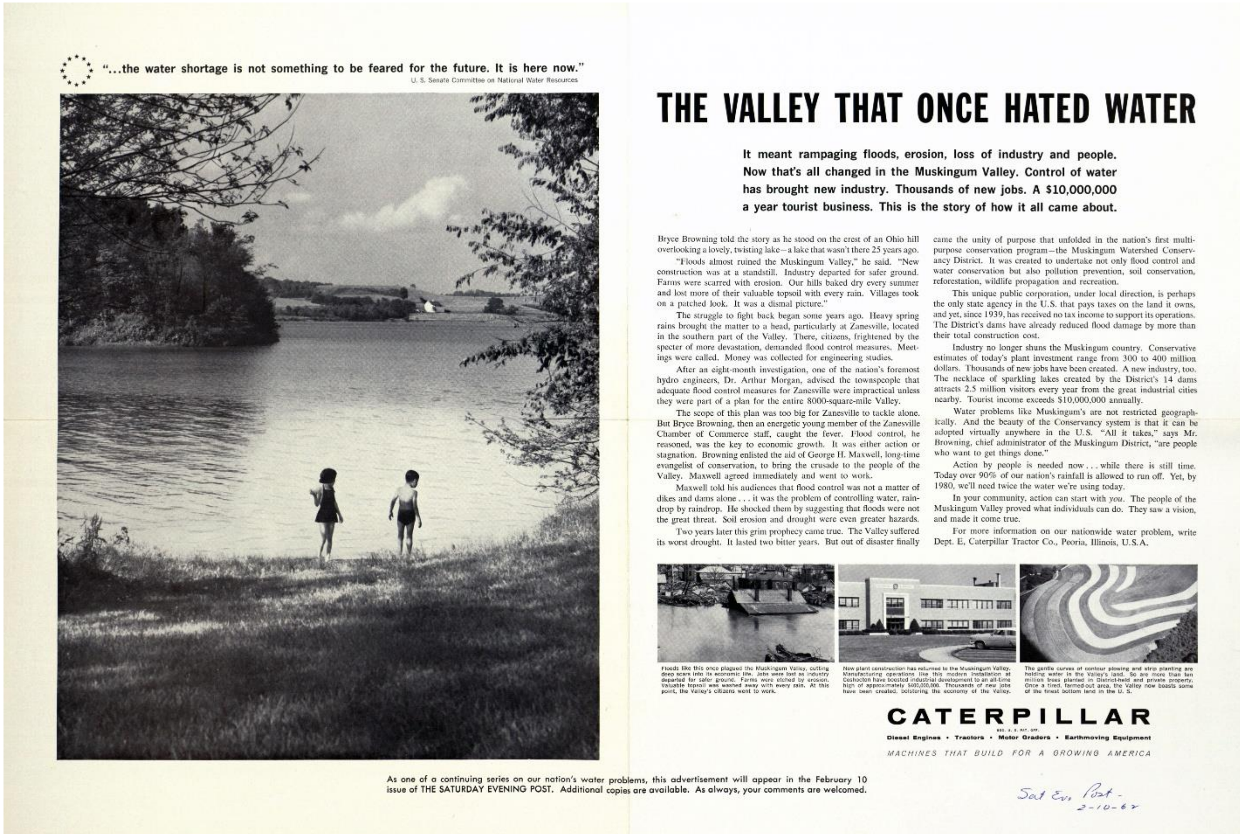

Figure 10: The Muskingum Watershed Conservancy District in Ohio represented a model of multipurpose conservation that could bridge the urban-rural divide. Source: National Archives.

of Mississippi Association of Soil Conservation District Commissioners explained in 1953, "We are blessed with good rainfall…but it is not evenly distributed. We have too much at times, too little at other times." Water deficits emerged for a variety of reasons. When a city in Grenada County, Mississippi, drilled a deep well, for instance, the result was a syphoning of water from private wells, which then ran dry. Elsewhere in the county, a state committee reported, businesses installed air conditioning units, which placed "a heavy demand on the city's water supply." As the South urbanized and industrialized, transforming from the Cotton Belt to the Sun Belt, southern cities placed increasing pressures on their water supplies.[88]

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[88] Mississippi Inter-Organizational Committee on Water Resources, "The Beneficial Use of Water in Mississippi: A Preliminary Report on the Historical, Physical, and Legal Aspects of Water Problems in the State,"

Conservation officials realized the opportunities for watershed conservation to circumvent the seasonality of southern water, thereby making possible the New South. In the late nineteenth century, Atlanta editor Henry W. Grady called for a "New South" to rise from the ashes of the Civil War by diversifying the region's dependence on an agricultural economy through industrialization. Grady's vision never fully materialized until the 1930s and 1940s when the federal government integrated the region more completely into the national economy.[89] By 1962, Donald Williams beamed, "a new South is finally bursting into full reality…. [A] new day is dawning in the South…[which] can be developed into a great agricultural and industrial empire." In addition to praising the revitalization of agriculture, Williams heralded "the phenomenal growth of Southern industry." "If we are to advance agriculturally and industrially," the SCS chief proclaimed, quoting Mississippi Governor Ross Burnett, "we must make the best use of every drop of water that falls on our soil." Only then could the South complete the transition from "the Nation's No. 1 economic problem" into its "No. 1 economic opportunity." With the help of soil and water conservation, Williams maintained, "the South has risen" again.[90] The region no longer represented the nation's rural backwater. It was an emerging industrial powerhouse.

December 1953, quoted on viii and x-xi; b60f1; Sillers Papers. See Bruce J. Schulman, *From Cotton Belt to Sun Belt: Federal Policy, Economic Development, and the Transformation of the South, 1938-1980* (New York: Oxford University Press, 1991). For more on water scarcity in the South, see Christopher J. Manganiello, *Southern Water, Southern Power: Energy, Environment, and Insecurity* (Chapel Hill: University of North Carolina Press, forthcoming 2015); based on his dissertation, "Dam Crazy with Wild Consequences: Artificial Lakes and Natural Rivers in the American South, 1845-1990" (PhD diss., University of Georgia, 2010).

[89] For more on southern industrialization and the pursuit of the New South, see Gavin Wright, *Old South, New South: Revolutions in the Southern Economy Since the Civil War* (New York: Basic Books, 1986); James C. Cobb, *The Selling of the South: The Southern Crusade for Industrial Development* 2nd ed. (Urbana: University of Illinois Press, 1993), especially chapter 1; Connie L. Lester, "Balancing Agriculture with Industry: Capital, Labor, and the Public Good in Mississippi's Home-Grown New Deal," *Journal of Mississippi History* 70 (Fall 2008): 235-263; and William Bryan, "Nature and the New South: Economic Development in an Age of Conservation, 1877-1929," (PhD diss., Pennsylvania State University, 2013).

[90] Williams, "Conservation and the New South," Address at Annual Meeting of the Mississippi Association of Soil Conservation District Commissioners in Jackson, Mississippi, 9 January 1962, 4-5; b7; Item 26; RG 114; NACP. See also Schulman, *From Cotton Belt to Sun Belt.*

In the South and elsewhere, conservation technicians helped weave together rural and urban America by extending their water conservation methods not just to industries, but also to municipalities. Postwar city dwellers and suburbanites placed increased demands on municipal water supplies through a variety of daily tasks, such as cooking, bathing, drinking, cleaning, and lawn watering. In 1956, Congress amended P. L. 566 to include municipal water supply as an authorized activity of the Small Watershed Program. Soon, Williams began promoting soil and water conservation to cities as a means of meeting their heightened water needs.[91] By the late 1960s, SCS officials and townspeople throughout the country trumpeted the results of places like Lincoln, Arkansas, where watershed conservation reportedly facilitated in-migration of people and companies, including "a new cement mixing plant," a poultry processing plant, and other "businesses that must have water."[92] The nation's sustained economic development depended on reliable sources of water, and the conservation-industrial complex was going to supply them.

If soil and water conservation was directed toward furnishing for towns and cities the conservation measures that rural America enjoyed, it also was designed to extend to the countryside the material comforts enjoyed in urban areas. Under the Kennedy administration, the USDA launched its Rural Areas Development (RAD) program, an effort to solve a host of interrelated social, economic, and environmental problems plaguing urban and rural America. Secretary of Agriculture Orville Freeman described the basic goals of RAD as, first, "[moving] economic opportunity into rural areas," and, second, encouraging farmers to "use the land, not idle it—[because] resources must be used in ways that conserve and serve the needs of all people, rural and

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[91] Williams, "Municipal Water Supplies in Small Watershed Projects," manuscript for the American Municipal Association, January 1957; b4; Item 26; RG 114; NACP; Williams, "Conserving the Land in Between."

[92] C. C. Karnes, quoted in Hollis R. Williams, "Rural-Urban Community Development," Address to the Agri Club of Southern State College in Magnolia, Arkansas, 22 November 1968, 6-8; b1; Item 203; RG 114; NACP. See also Willis J. Ridenour, "Watershed Conservation Insures City Water Supply," *Soil Conservation* 28 (April 1963): 201-202; and [SCS], "More Water, More Business," *Soil Conservation* 30 (April 1965): 199-201.

urban." In essence, the SCS found in the 1960s yet another utility for its programs: alleviating "the plight of the have-nots," whether they lived in "the urban slum [or] the rural backwater."[93] As historian Laura Kolar has shown, these objectives emerged from policymakers' shared belief that "rural and urban America's fates were intertwined." The countryside therefore had an important role to play in broader national politics, particularly in the context of Lyndon Johnson's efforts to eradicate poverty and establish the Great Society.[94]

The conservation-industrial complex also sought to unite urban and rural America by making the countryside hospitable to tourists from the city. Conservation proponents had acknowledged the benefits of recreation in the past, but their advocacy assumed unprecedented gusto after Congress added recreation to the Small Watershed Program with its 1962 amendment to P. L. 566. Recreation offered rural Americans, opportunities to generate on-farm income even if they lacked the resources, abilities, or desire to compete successfully in a progressively industrialized agricultural economy. It also held the potential to "build regard, respect, and good will [among non-farm people] for rural America."[95] To urban and suburban Americans, many farms were well equipped for the activities they desired: hunting, fishing, camping, swimming, and so on.[96] From Donald Williams' perspective, private lands represented "the only answer to our current growing need for [outdoor recreation] facilities to serve our growing population." Urbanites' demand for recreation also offered a clear reminder that "conservation problems are no longer farm problems only. They extend beyond the rural lands into the towns and cities."[97] During the 1950s and 1960s,

[93] Freeman quoted in Donald Williams, "Challenges in Human and Resource Development," Address at First Annual Conference of Professional Workers, Tuskegee, Alabama, 2 December 1963, 3; b7; Item 26; RG 114; NACP; Donald Williams, "Change or Atrophy!" Address at 23rd Annual Meeting of the Soil Conservation Society of America, Athens, Georgia, 19 August 1968, 2; b10; Item 26; RG 114; NACP.

[94] Kolar, "Conserving the Countryside," 14.

[95] Williams, "Annual Message to State Conservationists" (1963), 5.

[96] USDA, *Rural Recreation: New Opportunities on Private Land*, Misc. Publication No. 930 (Washington, D.C.: GPO, 1963).

[97] Williams, "Summary of Talk at Wisconsin Farm Progress Days in Viroqua, Wisconsin, 27 July 1963, 1; b7; Item 26; RG 114; NACP. For more on the USDA's outdoor recreation activities, see Kolar, "'Selling' the Farm."

the conservation-industrial complex worked hard to extend the benefits of a prosperous nation to all Americans, regardless of where they lived.

One of the primary attractions of the countryside to city and suburban people was rural beauty, a feature of soil and water conservation that officials emphasized with increasing regularity after World War II. "There's no finer sight in all the world," Assistant Secretary of Agriculture Earl Butz told a gathering of Minnesota farmers in 1955, "than a piece of land that is farmed the conservation way."[98] Despite this growing attention to aesthetics, the conservation-industrial complex remained utilitarian at its core. USDA policy in the 1960s sought the social and economic revitalization of the countryside as a means of stemming the rural exodus to cities and suburbs. These efforts included a "special emphasis [on] making rural America a better place to live by encouraging land owners to beautify their properties…and to improve the esthetic quality of the landscape."[99] If the countryside would continue to be a place worth living during the 1960s and beyond, conservation needed to bridge the gap between utility and beauty just as it had the urban-rural divide. Aesthetics no longer represented a byproduct of conservation, a luxury that practical-minded technicians could afford to neglect. As a top SCS official explained, "The beauty of America and the bounty of America go hand in hand. We need not lose one to gain the other." Beauty was not superfluous to utility; it *was* utility.[100]

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[98] Butz, "Conservation for All the People," 1. See also Williams, "We Can See Conservation on the Land," Summary of Talk at the 20th Birthday Celebration of York County Soil Conservation District in Mount Wolf, Pennsylvania, 13 August 1959, 1; b6; Item 26; RG 114; NACP.

[99] USDA SCS, *Conservation Highlights, 1965* (Washington, D.C.: USDA, 1966).

[100] Gladwin E. Young, "Preservation of Natural Beauty," *Soil Conservation* 30 (February 1965): 165. Laura Kolar argues similarly in "'Selling' the Farm."

Conclusion

As the conservation-industrial complex expanded its activities beyond soil erosion control between 1950 and 1970, it promised a number of benefits to American society. It offered an alternative to the Army Corps of Engineers' flood-control schemes in a manner much more consistent with the United States' tradition of associative state building. Proponents of conservation also advocated their program as a means of forestalling Malthusian doom indefinitely. By increasing the productivity of land and water, soil and water conservation could circumvent environmental limits and satisfy the insatiable appetites of a growing population. Soil and water conservationists also strove to close one of the most enduring divisions in human history, the gap separating urban and rural societies.

Finally, the most pervasive objective of the conservation-industrial complex was the cultivation of continued economic growth in a world of finite resources. This focus on economic development permeated all activities of the complex, broadening its membership to include not only farmers, but also cities, factories, farm machinery manufacturers and dealers, and private contractors. Advocates of soil and water conservation took it as their task to underwrite the material foundations of American prosperity, guaranteeing abundance for all Americans—urban and rural, present and future.

The history of the conservation-industrial complex between 1950 and 1970 demonstrates how utilitarian conservation evolved after World War II. Conservation advocates abandoned their previous emphasis on keeping farmers on the land. Their social objectives became abstracted to the level of the entire consumer society. All Americans, not just farmers, would benefit from conservation through the consumption of goods produced by a smaller number of producers or through the consumption of experiences facilitated by outdoor recreation and rural beauty.

Recreation and beauty, traditionally considered quality of life" concerns associated solely with environmentalism, could thus serve decidedly utilitarian purposes.[101]

This did not mean, however, that the environmental movement had no bearing on soil and water conservation. By the end of the 1960s, the conservation-industrial complex was on the brink of a series of crises. For over two decades, the complex had pursued economic development with an unrelenting vigor, which endeared it to a nation enjoying unprecedented prosperity. At the beginning of the so-called "environmental decade," however, this vision of environmental protection seemed increasingly problematic. The challenge for the conservation-industrial complex would be adapting to these concerns without sacrificing the utilitarian vision that was responsible for its inception, development, and widespread support.

[101] Laura Kolar makes a similar point in "Conserving the Countryside."

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Toward Environmental Quality:
Channelization, Erosion, and Pollution amid Crises of Legitimacy, 1970-1990

December 1969 marked the dawn of a new era for the conservation-industrial complex. That month, *Field & Stream* published "Where Conservation is a Bad Word," an exposé of the Soil Conservation Service's Small Watershed Program. Whereas the agency had long "stood for the salvation of the landscape," the authors proclaimed, "almost as much to be revered as church-going and truth," it had betrayed its reputation by engaging in a nationwide policy of stream channelization and wetlands drainage under the banner of "watershed protection." Rather than protecting nature, these policies resulted in what the authors called "the death of streams, literally the extinction of nature." The article prompted a bevy of protests against the SCS from people who held a different definition of conservation, one that did not involve "rampaging up and down the stream beds of this country turning rivers into unsightly drainage ditches, and destroying fish and game habitat on a wholesale basis." The *Field & Stream* piece was followed by other outcries in the popular press, each of which presented a similar view of the SCS. Whereas the agency's technicians were once "the ones in white hats," in the eyes of many Americans they had now become the villains.[1]

Two decades later, much of this had changed, and utilitarian conservationists and environmentalists had learned to coexist, and in some cases even cooperate. The same groups that in the early 1970s challenged the SCS and stream channelization more generally, such as the

[1] Ben B. Blackburn and George Laycock, "Where Conservation is a Bad Word," *Field & Stream* 74 (December 1969): 12-14, 58-62; quoted on 12-13; William F. King to Glenn R. Davis, 16 February 1970; b5290 [1970]; Record Group (RG) 16; National Archives at College Park, MD (NACP). See also John Modson, "A Plague on All Your Rivers," *Audubon Magazine* 74 (September 1972): 30-41; and James Nathan Miller and Robert Simmons, "Crisis on Our Rivers," *Reader's Digest* 97 (December 1970): 78-83.

Audubon Society and the Sierra Club, by 1985 formed a "conservation coalition" with farm-conservation groups such as the National Association of Conservation Districts. This coalition lobbied Congress to pass the Food Security Act of 1985 (also referred to as the 1985 Farm Bill), which drew praise from conservationists as well as environmentalists for simultaneously addressing economic and environmental goals in agriculture. The virtually unassailable postwar reputation of soil and water conservationists had deteriorated during the early 1970s, only to experience a resurgence by the mid-1980s with the passage of the Food Security Act. A few years later, a conservation-policy advocate suggested US agricultural policy was in the midst of an "environmental era."[2] These drastic changes beg several questions: how and why did soil and water conservationists lose and then redeem their status as guardians of the environment? How did these experiences transform the meaning of conservation? Finally, to what extent was praise for the 1985 Farm Bill matched subsequently by results in its administration?

The arc of the conservation-industrial complex between 1970 and 1990 pointed towards environmental quality. Throughout this period, conservation policymakers in the SCS and its allied organizations gradually embraced the notion that traditionally "environmental" concerns, such as pollution control, were compatible with the agency's ongoing utilitarian objectives. The SCS did not arrive at this conclusion easily, however. The agency accepted a redefined meaning of conservation only after its authority was challenged in a string of conflicts involving stream channelization, soil erosion, and agricultural water pollution. These crises of elicited a reorientation within the conservation-industrial complex. No longer did the Soil Conservation Service enjoy a monopoly on

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[2] Kenneth A. Cook, "The Environmental Era of U.S. Agricultural Policy," *Journal of Soil and Water Conservation* [*JSWC*] 44 (1989): 362-366. For the conservation coalition, see Douglas Helms, "New Authorities and New Roles: SCS and the 1985 Farm Bill," in *Readings in the History of the Soil Conservation Service*, ed. Douglas Helms (Washington, D.C.: GPO, 1992), 162-164. For the Audubon Society's and Sierra Club's earlier opposition to the SCS and stream channelization more generally, see Modson, "A Plague on All Your Rivers"; and Rita Rousseau, "Channelization Alternatives Favored by Sierra Club," *Lawrence [Kansas] Journal-World* (2 February 1972), 24.

expertise in soil and water conservation matters. Competing knowledge on many fronts forced the SCS and the rest of the conservation-industrial complex to address environmental concerns, first with rhetoric and later with substance. Later, the administration of the 1985 Farm Bill demonstrated the limits of reforming a system whose ideological and institutional frameworks were defined by utilitarianism. Between 1970 and 1990, crises of legitimacy moved the conservation-industrial complex towards environmental quality, even as it retained its thoroughly utilitarian mission.

The changing discourse of conservation during these two decades accompanied transformations in the power structure of the conservation-industrial complex. Whereas before 1970 soil and water conservation was guided by *institutional* politics—the Soil Conservation Service operating through soil conservation districts, for instance—after 1970 *interest group* politics increasingly shaped conservation policy and discourse. The SCS's crises of legitimacy created a discursive power vacuum that formerly deferential groups such as the National Association of Conservation Districts (NACD) stepped in to fill. Curiously, the industrial side of the conservation-industrial complex emerged from these trials relatively unscathed. Most critics of soil and water conservation volleyed criticisms not at private industry, whose interest in production-oriented policies seemed natural, but at the Soil Conservation Service and its institutional allies, who seemed more pliable to interest group politics. In fact, the crises of legitimacy in many ways advanced the interests of the agricultural industry. By identifying weaknesses in current conservation systems, critics helped fuel the rise of complex, capital-intensive conservation tillage technologies. In short, as the public face of the conservation-industrial complex, the Soil Conservation Service bore the brunt of the criticism volleyed against soil and water conservation during the 1970s and 1980s.

As the trifold crises of channelization, erosion, and water pollution accelerated in the 1970s, the SCS lost its monopoly over information and authority in conservation matters. Paralleling a similar process that happened contemporaneously in nuclear power, new interest groups emerged with their own expertise to challenge the programs and policies of the Soil Conservation Service. While the interest groups varied, they shared a strategy of wielding scientific research to challenge federal policies. One of the most important types of reports were the environmental impact statements mandated by the National Environmental Policy Act of 1969 (NEPA), which offered wildlife proponents a powerful tool for contesting SCS stream channelization projects and preventing some of their worst ecological side effects. Likewise, journalists fueled the erosion controversy of the late 1970s by publicizing federal studies reporting that soil erosion was proceeding at alarming rates. These critiques relied on an intricate equation developed by the USDA to foster federal conservation planning, and in the process reporters effectively appropriated a tool of state influence in order to challenge state authority.[3]

The institutional critiques of the Soil Conservation Service that emerged as the agency came under fire from outside groups were exacerbated by a discursive instability over the meaning of conservation. Since World War II, the SCS had framed its mission as guaranteeing material abundance for current and future generations. Yet as it faced increased scrutiny from

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[3] Here I am drawing on the ideas of Brian Balogh, who uses nuclear power as a model of interactions between the American state and civil society during the twentieth century. See *Chain Reaction: Expert Debate and Public Participation in American Commercial Nuclear Power, 1945-1975* (New York: Cambridge University Press, 1991). This is not the only instance in postwar environmental politics wherein interest groups applied their own expertise to challenge projects proposed by expert institutions. It also unfolded in battles between the Bureau of Reclamation and wilderness enthusiasts in the 1950s over the damming of Echo Park National Monument. See Mark T. W. Harvey, *A Symbol of Wilderness: Echo Park and the American Conservation Movement* (1994; Seattle: University of Washington Press, 2000). For more on NEPA and environmental impact statements, see Richard N. L. Andrews, *Managing the Environment, Managing Ourselves: A History of American Environmental Policy* 2nd ed. (New Haven: Yale University Press, 2006), 286-289. Karl Brooks emphasizes that two of the more important precursors to NEPA were the Administrative Procedure Act ("the most important environmental law hardly anyone has heard of") and the Wildlife Coordination Act of 1945-1946. See Brooks, *Before Earth Day: The Origins of American Environmental Law, 1945-1970* (Lawrence: University Press of Kansas, 2009), quoted on 38. For the social construction of regulatory science, which informed but was distinct from environmental impact statements, within the Environmental Protection Agency and its scientific advisory boards, see Sheila Jasanoff, *The Fifth Branch: Science Advisors as Policymakers* (Cambridge: Harvard University Press, 1990). On channelization and its effects on local hydrology and ecosystems, see Ellen E. Wohl, *Disconnected Rivers: Linking Rivers to Landscapes* (New Haven: Yale University Press, 2004), 185-215; Nancy Langston, *Where Land and Water Meet: A Western Landscape Transformed* (Seattle: University of Washington Press, 2003), 104-106; and Ann Vileisis, *Discovering the Unknown Landscape: A History of America's Wetlands* (Washington, D.C.: Island Press, 1997), 244-252. On the importance of quantification to the rise of state power, see Theodore M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1995); James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998).

environmentalists as well as its allies within the conservation-industrial complex, the agency lost its ability to define its own purpose. The SCS clung to its old meaning for much of the 1970s, but the onset of the erosion crisis in 1977 rendered that definition untenable. Only by responding to external concerns did the SCS move toward a new meaning of conservation: environmental quality. By the mid-1980s, the conservation-industrial complex had rededicated itself to merging its old goal of economic development with its new objective of environmental quality. Although the SCS's rhetoric of environmental quality satisfied many of its opponents, the implementation of this policy on the ground proved, for a variety of reasons, far more difficult than the pursuit of economic production.

The interest groups that forced this redefinition of conservation after 1970 varied. The major opponents of stream channelization in the early 1970s were wildlife enthusiasts. During the late 1970s and early 1980s, environmental reporters as well as old SCS allies, most notably the NACD, propelled awareness of ongoing rates of erosion.[4] These groups, together with the Environmental Protection Agency, also forced the conservation-industrial complex to elevate agricultural water pollution as a primary concern.

The history of the Soil Conservation Service and its partners in the conservation-industrial complex during the late twentieth century departs from the standard chronology of American environmental politics. Historians typically treat the 1970s—the so-called "environmental decade"—as a period of widespread accord that resulted in a suite of environmental legislation and a political consensus that unraveled only amid the divisiveness of the 1980s and 1990s.[5] When

[4] For a history of the NACD, see R. Neil Sampson, *For Love of the Land: A History of the National Association of Conservation Districts* (League City, Tex.: National Association of Conservation Districts, 1985).

[5] See Paul Sabin, *The Bet: Paul Ehrlich, Julian Simon, and Our Gamble over Earth's Future* (New Haven: Yale University Press, 2013); Brian Allen Drake, *Loving Nature, Fearing the State: Environmentalism and Antigovernment Politics before Reagan* (Seattle: University of Washington Press, 2013); Andrews, *Managing the Environment*; Hal Rothman, *The Greening of a Nation?: Environmentalism in the United States since 1945* (Fort Worth, Tex.: Harcourt Brace, 1998); Samuel P. Hays, *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955-1985* (New York: Cambridge University Press, 1987);

analyzed through the lens of soil and water conservation policy, however, the pattern was reversed. The 1970s were an age of acrimony between utilitarians and environmentalists, and the 1980s a time of relative harmony. A study of environmental politics from the perspective of utilitarian conservation, particularly within the realm of agricultural policy, reveals the limits of historians' current frameworks and reinforces the importance of expanding our examinations of conservation beyond the Progressive and interwar periods.

Between 1970 and 1990, the conservation-industrial complex experienced a string of crises followed by a resurgence in public esteem. The Soil Conservation Service weathered the controversies by revising its policies, sometimes begrudgingly, in response to its critics' concerns over stream channelization, soil erosion, and water pollution. This transformation culminated in the 1985 Farm Bill, signaling a growing embrace of environmental quality within a movement that continued to prioritize production. Although the conservation-industrial complex moved *toward* environmental quality, at its core it remained committed to economic development.

"The Current Fever Pitch": The Channelization Controversy, 1969-1972

When *Field & Stream* suggested in 1969 that, in some places, "conservation is a bad word," the conservation-industrial complex was not ready to concede defeat. Since the end of World War II, soil and water conservation apostles had seen it as their duty to guarantee material abundance for the nation. Achieving abundance required the regulation of the natural world, especially the hydrosphere, which frequently involved stream channelization as part of broader watershed management. Initially, utilitarian conservationists dismissed the channelization uproar (and the environmental movement that spawned it) as a passing fad, confident in their record of

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C. Brant Short, *Ronald Reagan and the Public Lands: America's Conservation Debate, 1979-1984* (College Station: Texas A&M University Press, 1989); and William Cronon, "When the G.O.P. was Green," *New York Times*, 8 January 2001.

environmental protection. "When the current fever pitch dies down," Kenneth Grant postulated in 1970, "I believe the SCS will be in there pitching for the environment as it has for decades."[6] Within a few years, however, environmental activists had forced the SCS to consider both environmentalists and their concerns in its project planning.

Stream channelization was one of many components of the SCS's Small Watershed Program, a program that had enjoyed tremendous popularity throughout the 1950s and 1960s. The Army Corps of Engineers had a long history of channelizing larger rivers, most notably the thoroughly engineered Los Angeles River, but the SCS brought this practice to the nation's smaller waterways. Channelization involved straightening, deepening, or clearing debris from streams, all with the goal of expediting the flow of water out of the watershed; the fewer bends or obstructions in a stream, the quicker water would move (Figure 11). The SCS therefore classified it as a flood-control measure. Channelization often coincided with the drainage of wetlands, soggy farm fields, and riparian landscapes. Drainage added to the volume of waterways, necessitating a quicker movement through the hydrologic system in order to avoid additional flooding.[7]

Channelization had long attracted criticism in certain circles for its disruption to ecosystems. One argument was that it was ineffective at flood control because it merely funneled floodwaters to people living downstream. "Straightening a stream," Aldo Leopold opined in 1935, "is like shipping vagrants—a very successful method of passing trouble from one place to the next. It solves nothing

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[6] Grant, "The SCS Today and Tomorrow," Speech at a Meeting of SCS Professional Employees in Madison, Wisconsin, 4 June 1970, 10; b1; Item 27; RG 114; NACP.

[7] For more on the Small Watershed Program, see Chapter 2. On the rationale for channelization and its relationship to wetlands, see Wohl, *Disconnected Rivers*, 185-187. On the Army Corps of Engineers' channelization of the Los Angeles River between 1935 and 1959, which accelerated after a disastrous flood in 1938, see Blake Gumprecht, *The Los Angeles River: Its Life, Death, and Possible Rebirth* (Baltimore: Johns Hopkins University Press, 1999), chapter 5; and Gumprecht, "Who Killed the Los Angeles River?" in *Land of Sunshine: An Environmental History of Metropolitan Los Angeles* ed. William Deverell and Greg Hise (Pittsburgh: University of Pittsburgh Press, 2005), 115-134. A systems-level embodiment of the notion that floods were best controlled by "speeding floods to the sea" is illustrated in W. E. Elam, *Speeding Floods to the Sea; or, the Evolution of Flood Control Engineering on the Mississippi River* (New York: Hobson Book Press, 1946). Elam worked as an engineer on the Mississippi Levee Board.

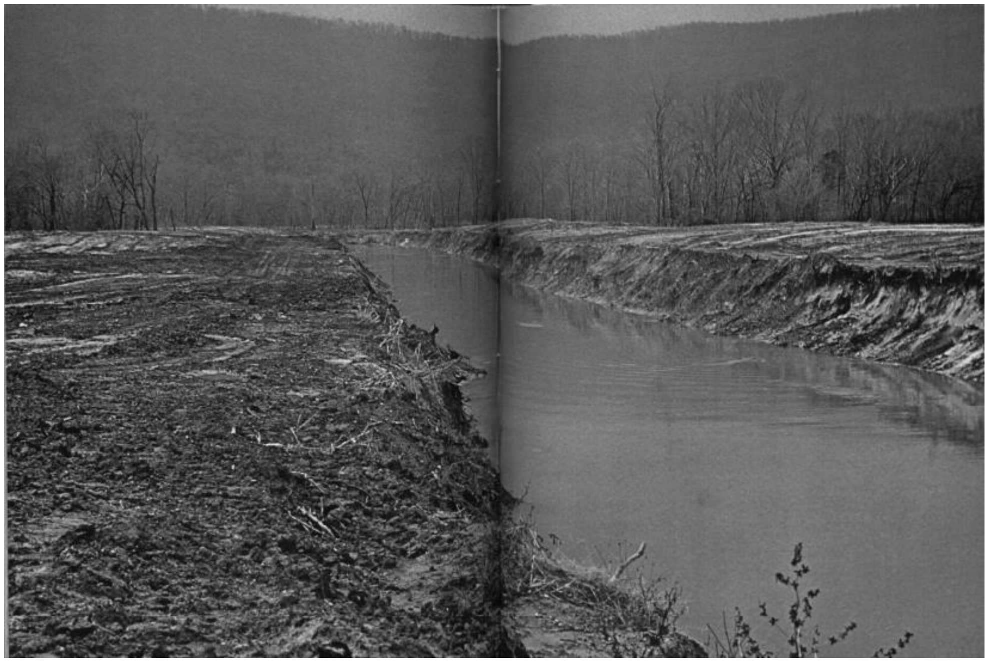

Figure 11: This image, which appeared in a 1972 Audubon Magazine article, portrays a recently channelized stream (location unknown). Channelization—which involved straightening, deepening, widening, or clearing debris from a stream channel—drew the ire of environmentalist and wildlife groups for destroying the aquatic and surrounding terrestrial ecosystems. This image is indicative of critics' use of aesthetics in their opposition to channelization, for these stream banks would have regrown vegetation within a matter of years, giving the scene a more "natural" appearance. Source: Modson, "A Plague on All Your Rivers," 36-37.

in any collective sense." Moreover, channelization exacerbated stream channel erosion and sedimentation problems. The increased velocity of water scoured waterway channels, leading to collapsing stream banks in channelized portions and accumulating sediment in slower-moving, unchannelized stretches. Finally, critics charged that channelization impaired fish and wildlife populations by destroying habitat. In 1968, for instance, a fish and wildlife conservationist from Mississippi predicted that an impending channelization project would increase stream sedimentation and turbidity, which would "smother out fish food organisms and fish eggs" and transform the stream's fish population from bass, bream, and catfish "to a sucker-minnow population." Although biologists challenged local stream channelization projects in the immediate postwar era, it was not until the 1970s that their arguments assumed the momentum needed to challenge SCS policies on a national basis.[8]

The mounting evidence of the destruction of fish and wildlife habitat gave critics their most persuasive arguments against channelization. By the late 1960s, wildlife enthusiasts comprised a core component of the burgeoning environmental movement.[9] Many of these channelization opponents took a purist view of the natural world, which led them to frame their arguments in terms of absolutes. According to this mentality, channelization transformed bountiful streams into barren wastelands, spelling the death of ecosystems. In addition to the *Field & Stream* exposé, both *Reader's Digest* and *Audubon Magazine* published articles deploring the SCS for its nationwide program of "execution," calling "gutterization…the engineers' death sentence for a living river." Relying on a handful of studies that reported reduction in fish populations after channelization, critics juxtaposed the imagery of a natural, lively stream with "a perfectly engineered drainage ditch, an arrow-straight gash across the countryside that is almost totally devoid of life in its waters and along its banks." True conservation, the idea went, should protect nature, not sterilize it.[10]

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[8] Leopold, "Coon Valley: An Adventure in Cooperative Conservation," *American Forests* 41 (May 1935): 208; Billy Joe Cross to Festus Bailey, 8 September 1968; b31; Item 213; RG 114; NACP. For the effect of channelization on streambank stability and fish and wildlife populations, see Wohl, *Disconnected Rivers*, 189-198. The SCS was aware of the destabilizing nature of channel work, but believed the problem was solvable through engineering. See Robert P. Apmann, "Research Seeks Best Techniques for Stabilizing Stream Channels," *Soil Conservation* 29 (April 1964): 199-201. The SCS applied this same engineering, technology-centric mentality toward wildlife habitat. "New ways need to be found," pronounced an agency official in 1966, "to increase yields of wildlife comparable to the yields of other products of land and water," such as beef, lumber, and crops. Gladwin E. Young, "What About Farm Drainage?" *Soil Conservation* 32 (December 1966): 112.

[9] Adam Rome, *The Genius of Earth Day: How a 1970 Teach-In Unexpectedly Made the First Green Generation* (New York: Hill and Wang, 2013), 47-53.

[10] Blackburn and Laycock, "Where Conservation is a Bad Word," 12, 14; Modson, "A Plague on All Your Rivers," 31; Miller and Simmons, "Crisis on Our Rivers," 79. The concept of ecosystem health was relatively new at this time. Oxford University botanist A. G. Tansley coined the term in 1935 out of a desire to rid ecology of its organismic roots. In the 1950s, G. Evelyn Hutchinson and his protégés—particularly Eugene and Howard Odum—developed a notion of ecosystem health that led to a return of organismic thinking. See Donald Worster, *Nature's Economy: A History of Ecological Ideas* 2nd ed. (Cambridge: CUP, 1994), 302-312, 362-367.

The opponents of the SCS condemned not only what they believed was a perverse conservation mission, but also the federal government's leadership in it. They cited bureaucratic inefficiencies, criticizing the USDA for draining wetlands while the Department of Interior protected them. They also accused the SCS of opening more land to production through drainage and channelization at the same time other USDA programs struggled to rein in chronic surpluses by paying farmers *not* to produce.[11] Moreover, channelization opponents criticized parties within the conservation-industrial complex, especially soil conservation districts, for cloaking federal influence in a veneer of democracy. Conservation districts did not develop as organically as the SCS typically suggested, one critic charged, because local people

> Are generally coaxed into the endeavor every step of the way by the National Association of Conservation Districts, a lobby group, and…the local construction and development companies. For each successful effort, the local district rises in stature, the construction company gets a contract, and the developers get a chance to build on formerly marshy, useless land. The farmers rarely fight the proceedings since they incur relatively few costs and stand to pick up more acreage of cultivated land. The only losers are those without a voice—the taxpayers and wildlife and streams.[12]

Channelization foes thus attacked not only the ecological consequences of the practice, but also what they considered the anti-democratic, political and economic systems that lent it strength.

The Soil Conservation Service had heard many of these complaints before and felt ready to rebuff them. Throughout the immediate postwar era, for example, critics complained that SCS drainage efforts exacerbated already chronic crop surpluses, which glutted markets and drove down prices. The agency responded in 1956 with the official policy that it would furnish assistance for drainage "primarily for increasing the efficiency of land use on farms or ranches" to rehabilitate or improve existing drainage networks, or to construct "new drainage systems to serve existing crop

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[11] See, for instance, Blackburn and Laycock, "Where Conservation is a Bad Word," 14, 62; Herman, "Waterway Wrangle," 17. See also Vileisis, *Discovering the Unknown Landscape*, 244-252.

[12] Peter Harnick, as quoted in Modson, "A Plague on All Your Rivers," 34. See also Miller and Simmons, "Crisis on Our Rivers," 82.

and pasture land." Under these terms, the SCS would reject assistance if a project's "primary purpose…is to bring additional land into production."[13] When opponents lobbied the USDA to stop small watershed projects, the SCS retorted that it was simply helping local people execute local decisions, and thus was absolved of blame.[14] Agency officials marshalled similar defenses in the early 1970s, but they were stymied when the channelization controversy did not go away.

Utilitarian leaders remained motivated by the principles that had long guided the conservation-industrial complex: enhancing natural systems and their utility for humans. "It is important," the USDA responded to channelization critics, "that the needs of people…be considered along with the needs of fish and wildlife." Conservation administrators believed that this approach frequently benefited animals as well as humans. If people would "look at each [channelization] project on an individual basis," SCS chief Kenneth Grant alleged, they would find several instances where the practice actually resulted in "a marked improvement in the fishery resource." "When we channelize a river," echoed an agency official in Georgia, "we aren't ruining it. We're improving it." This ethic of improvement stemmed from many utilitarian conservationists' views of wild rivers as inefficient rivers, of wetlands as wastelands, and of land and water as substances best kept discrete. "Personally, when I see a swamp," explained Hollis Williams, a director of the Small Watershed Program, "I think of snakes, water moccasins, and mosquitoes. And I think how nice it would be to drain that swamp and build a quiet lake, where a man could fish with his boy and…swim without fear."[15] In other words, channelization marked an improvement because it helped maximize the economic and recreational utility of water.

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[13] D. A. Williams, "Biology Memorandum SCS-2," 30 March 1956, 2; b3; Item 249; RG 114; NACP.

[14] For example, see W. W. Russell to Martin Gunderson, 30 March 1964; b13; Item 218; RG 114; NACP.

[15] J. Phil Campbell to [no addressee], 7 July 1971; b5477 [1977]; RG 16; NACP; "The Role of Channels in Total Water Management: An Interview with Kenneth E. Grant, Administrator, Soil Conservation Service," *Soil Conservation* 38 (September 1972), 21; Robert Oertel and Hollis R. Williams, as quoted in Herman, "Waterway Wrangle," 1, 17. Within hours of this article appearing in the *Wall Street Journal*, Williams received a message from Rep. Jamie Whitten, the powerful Democrat from Mississippi, who "said to tell you he was 'proud of the way you handled yourself in the Wall

Apostles of utility charged not only that channelization improved upon nature, but also that, in some cases, it actually restored natural conditions. The Alcovy River in the Georgia Piedmont, an epicenter of the channelization controversy, was one such case. In 1970, geographer Stanley Trimble published a paper in the *Bulletin of the Georgia Academy of Sciences* in which, drawing on historical land records and sediment analysis, he argued that the wetlands adjacent to the Alcovy were of recent origin. Eroded sediment from nineteenth-century farming accumulated in the channel, causing the river to overspill its banks into the adjacent floodplain, creating a new wetland where none had been before agricultural settlement. These conclusions gained additional attention because an SCS channelization project on the Alcovy River was highlighted in the *Field & Stream* piece that precipitated the channelization controversy.[16]

Trimble's study armed soil and water conservationists with a ready defense against channelization critics who, in the Alcovy basin and elsewhere, appealed to the notion of despoiled natural purity. "In [the Alcovy] watershed," Kenneth Grant told a group of college students in 1971, "swamps and marshes are not natural, nor are they thousands of years old. They are clearly the result of man's misuse of the land."[17] By this measure, draining the wetlands into a channelized

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Street Journal article.'" "Memorandum of Call," 19 July 1971; b3; Item 203; RG 114; NACP. For more on Whitten's political support for conservation, see chapter 6. Such an improvement ethic has roots reaching back as far as the Early Republic. See Benjamin R. Cohen, *Notes from the Ground: Science, Soil, and Society in the American Countryside* (New Haven: Yale University Press, 2009).

16 For more on sedimentation problems in the South, see Chapter 6. The Trimble study originally appeared in the 1970 volume of *Bulletin of the Georgia Academy of Sciences* and is reprinted as Stanley W. Trimble, "The Alcovy River Swamps: The Result of Culturally Accelerated Sedimentation," in *The American Environment: Interpretations of Past Geographies* eds. Lary M. Dilsaver and Craig E. Colten (Lanham, Maryland: Rowman & Littlefield, 1992), 21-32. See also Trimble, *Man-Induced Soil Erosion on the Southern Piedmont, 1700-1970* ([Ankeny, Ia.]: Soil Conservation Society of America, 1974), 75-77. One of Trimble's mentors, Stafford C. Happ, drew similar conclusions in Mississippi in the 1930s and 1940s. See Happ, et al., *Some Principles of Accelerated Stream and Valley Sedimentation*, Technical Bulletin No. 695 (Washington, D.C.: USDA, May 1940), 23. For more on Trimble and Happ, see Chapters 5 and 6, respectively. For the process of designing and implementing a channelization project on a nearby watershed in the 1950s and 1960s, see Eugene C. Buie and Carroll A. Reese, "Watersheds Call for Major Engineering Planning," *Soil Conservation* 26 (July 1961): 276-278.

17 Grant, "Environmental Quality—Facts and Fiction," Commencement Address at the Thompson School of Applied Science, University of New Hampshire, 23 May 1971, 14; b2; Item 27; RG 114; NACP. For other examples of this line of reasoning, see Kenneth E. Grant, "Channel Improvement in Watershed Projects," Summary Statement at hearings of the Subcommittee on Conservation and Natural Resources (House Committee on Government Operations)

Alcovy was not hurting the ecosystem, but righting past wrongs. In essence, SCS officials replaced environmentalists' simplistic narrative with one of their own. The agency neglected the likelihood that even though nineteenth-century Georgians created the conditions for a twentieth-century wetland, flora and fauna had subsequently adapted to this new hybrid ecosystem.

The channelization controversy also drew out two common rhetorical devices that experts in the conservation-industrial complex deployed in effort to retain their legitimacy. First, SCS officials and their allies tried to coopt the momentum of environmentalism by presenting themselves and farmers as the original environmentalists. "The environment has become a 'new crusade,'" Grant told SCS staff in 1972, "but it is not a new cause. You and conservation district leaders have been working at environmental improvement for many years."[18] The problem, he explained, was that "*nobody knows about it*."[19] Grant was fond of quoting Leland DuVall, a columnist from Arkansas who bemoaned how the accomplished SCS "finds itself relegated to a seat in the back row while vociferous adolescent groups…monopolize the spotlight." These narratives featured the idea that environmentalists would be better off consulting the sermons of older conservation prophets like Hugh Hammond Bennett. "After all," suggested DuVall, "everything has been said before, and their energies would be more useful in doing the job at hand than in warning of the wrath to come."[20] Proponents of utilitarianism felt that just as natural resources ought to be put to productive use, the same applied to the efforts of environmental agitators who sought to disrupt the status quo.

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in Washington, D.C., 3 June 1971, 3-4; b2; Item 27; RG 114; NACP; James H. Canterberry, "Channelization—The Farmer's Friend," *Soil Conservation* 38 (September 1972), 23-24; and Roy H. Dingle, *Nothing But Conservation* (Richland Center, Wis.: Hynek Printing, 1993?), 172-173.

[18] Grant, "SCS Today and in the Next Decade," Speech at a meeting of SCS professional employees in Denver, Colorado, 25 January 1972, 2; b2; Item 27; RG 114; NACP.

[19] Grant, "Learning to Live with Change," Address at the 26th Annual Meeting of Mississippi Association of Soil and Water Conservation District Commissioners in Jackson, Mississippi, 1 December 1970, 17 (emphasis original); b1; Item 27; RG 114; NACP.

[20] DuVall, as quoted in Grant, "SCS Today and Tomorrow," 7; and in "It's Been Said," *Soil Conservation* 36 (December 1970), 118.

To a certain degree, it is understandable why utilitarians and their allies chafed under the environmentalists' challenges. Throughout the 1950s and 1960s, for instance, SCS technicians had applied ecological principles to the Small Watershed Program, which was premised on an understanding that actions taken in one part of a watershed could have consequences miles downstream. "We have learned to look at the landscape as a whole," an SCS official explained in 1958. "[We] consider at each point the interrelationships of soils, water, plants, animals, and people. Such an ecological viewpoint guides both the marshalling of our technical skills and the treatment of our natural resources."[21] What conservationists failed to grasp, however, was that principles of ecology were changing. The SCS's version of ecology emerged from an economic ethos that, according to Donald Worster, "[found] in nature a utilitarian, materialistic promise," but the ecology at the heart of much of the environmental movement emphasized "a moral ideal of togetherness and a warning to science not to mistake…the trees for the forest." Therefore, when the head of the SCS called in 1967 for a holistic perspective because "a narrow piece-meal approach dealing with one resource…at a time cannot…meet the needs for resource development today," his ecological rhetoric pointed to a much different outcome than that of environmentalists. One version of ecology would promote "resource development," and the other worked to restrain it.[22]

In addition to laying claim to the title of original environmentalist, the second rhetorical device conservation agents wielded to maintain their authority was to frame environmentalists as impractical radicals. Whereas soil and water conservationists saw themselves as pursuing "sustained economic development and rational resource use," they labeled many environmentalists

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[21] Donald A. Williams, "Vegetation [for?] Erosion Control—Technical and Social Methods for Its Effective Use," Address to the Seventh Technical Meeting of the International Union for Conservation of Nature and Natural Resources, Athens, Greece, 11-19 September 1958, 1; b5; Item 26; RG 114; NACP. See also Williams, "Land and People," Address at the 15th Annual Meeting of the Soil Conservation Society of America, Guelph, Ontario, 29 August 1960, 2-3; b6; Item 26; RG 114; NACP.

[22] Donald A. Williams, "Annual Message to State Conservationists," in Athens, Georgia, 18 September 1967, 8; b9; Item 26; RG 114; NACP; Worster, *Nature's Economy*, chapters 14-15, quoted on 315, 319.

"extremists…[who] react to every environmental threat—real or imagined—in a highly emotional manner."[23] Conservation technicians "look upon our work as *applied ecology*," they claimed. This represented to them a more practical and "balanced" approach to environmental problems that was based on "all of the facts, not just emotional response." Utilitarian conservationists tended to share the view of Robert Oertel, an SCS agent from Georgia, who considered the channelization controversy a fight over progress. "Many…ecologists aren't true conservationists," Oertel argued. "They're preservationists. They want to preserve everything just the way it was back in the time of Adam and Eve. And if we followed that kind of thinking, that's just where we'd be, back in the Stone Age."[24] In short, utilitarian conservationists realized that the greatest threat to their authority in the early 1970s came from the growing science of ecology, and they did everything in their power to discredit that which jeopardized their legitimacy.

Given SCS officials' protection of their authority, environmentalists had a hard time terminating channelization through persuasion. Instead, they relied on the law. In June 1971, the chair of the House Subcommittee on Conservation and Natural Resources, Henry Reuss of Wisconsin, held committee hearings on channelization and tried to force a one-year budgetary moratorium on all channelization projects. When that effort failed, environmental groups sued the

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[23] Grant, "Environmental Quality—Facts and Fiction," 6; see also Douglas Helms oral history interview of Herbert Flueck, 22 September 1982, 81, NRCS Historical Files, Madison, Wisconsin. This distinction had deep roots in the history of ecology and its ongoing tension between rationalism and Romanticism that Donald Worster explores throughout *Nature's Economy*. This charge of emotionalism might have also carried a gendered subtext. Adam Rome has demonstrated that dominant gender expectations in the Progressive Era helped constrain the possibilities for men to engage in the protection of "soft" environmental assets, such as beauty and wildlife. Rome argues that this barrier began to be breached by about 1960, but it remains likely that many charges of emotionalism were designed to emasculate male environmentalists. See Rome, "'Political Hermaphrodites': Gender and Environmental Reform in Progressive America," *Environmental History* 11 (July 2006): 440-463. For middle-class women's leadership in the grassroots environmental movement, see Rome, *Genius of Earth Day*, 29-37; and Rome, "'Give Earth a Chance': The Environmental Movement and the Sixties," Journal of American History 90 (September 2003): 534-541.

[24] Hollis Williams, "Our Environment," Address at the Annual Convention of the Georgia Association of Soil and Water Conservation District Supervisors in Savannah, Georgia, 7 December 1970, 12, emphasis original; b3; Item 203; RG 114; NACP; Grant, "Focusing on Current Priorities," Annual Message to the Conference of State Conservationists in Stateline, Nevada, 8 October 1973, 3; b2; Item 27; RG 114; NACP; and Grant, "Environmental Quality—Facts and Fiction," 14; Oertel, as quoted in Herman, "Waterway Wrangle," 1.

SCS for failure to comply with the NEPA mandate that each federally funded project include an environmental impact statement (EIS).[25]

In November 1971, the recently founded Natural Resources Defense Council used one of its first lawsuits to halt a watershed project in North Carolina until the SCS issued an EIS. The Soil Conservation Service argued that an impact statement was unnecessary because the project had been authorized before the passage of NEPA. The court ruled in favor of the plaintiffs, and when the SCS submitted a shoddy EIS in 1972, the judges ordered the agency to create a more thorough statement—a process that ultimately consumed five years' time. These legal proceedings had a substantial effect by the time the project commenced in 1978, cutting the extent of channelization tenfold—from sixty-six miles down to a mere seven miles.[26] The lesson to the Soil Conservation Service was clear: if it wanted to avoid mounting court battles and project delays, it could no longer dismiss environmentalists or their concerns.

In June 1972, SCS chief Kenneth Grant ordered all agency personnel to craft high quality EISs for all channelization projects, effectively conceding that his agency had lost its monopoly on information pertaining to channelization. EISs, he explained, had become "probably the most visible documents by which many people are going to become associated with the Service." Grant confessed that while he disagreed with the court's ruling, the agency had also grown arrogant—particularly regarding the unassailability of the conservation-industrial complex. "We told ourselves…over and over [that] we were developing a program to help carry out what local people wanted, and there was real magic in that…. Perhaps there was even too much magic," Grant

[25] For the report that emerged from these hearings, see House Conservation and Natural Resources Subcommittee, *Stream Channelization: What Federally Financed Draglines and Bulldozers Do to Our Nation's Streams*, 93rd Cong., 1st sess., 27 September 1973, H. Rept. 93-530. See also Vileisis, *Discovering the Unknown Landscape*, 249-252; Sampson, *For Love of the Land*, 216-217.

[26] Albert Coffey, "Stream Improvement: The Chicod Creek Episode," *Journal of Soil and Water Conservation* [hereafter: *JSWC*] 37 (March-April 1982): 80-82; Vileisis, *Discovering the Unknown Landscape*, 249-252; Sampson, *For Love of the Land*, 216-217.

intimated, for they had genuinely believed they were operating in the interests of all Americans. He now accepted that local people did not comprise the SCS's sole constituency, for environmentalists also had "a right to be considered," even if they "over-reacted." Finally, Grant warned his staff to avoid "falling into the trap of a simplistic approach which…is lining up the environmentalists on one side and the conservationist or developer on the other side."[27] Just as Grant acknowledged that soil and water conservation was synonymous with economic development, he also realized that utilitarian and non-economic brands of environmental protection needed to coexist.

Grant's 1972 instructions to his staff etched the first cracks in the SCS's resistance to channelization critics. Thenceforth, tensions gradually eased, largely due to the mediating force of the National Association of Conservation Districts (NACD). The NACD—an important cog in the conservation-industrial complex—remained a staunch supporter of the SCS and of channelization in 1973, calling "extremism…a disservice to reason and the cause of conservation." Later that year, Representative Henry Reuss's committee issued a scathing report that condemned channelization as "overused, with inadequate consideration—and sometimes none at all—given to the adverse environmental effects it produces." In 1976, however, the NACD orchestrated a meeting between the SCS and the Fish and Wildlife Service, the Environmental Protection Agency, and the President's Council on Environmental Quality in order to devise "mutually acceptable" guidelines for stream channelization projects. Although critics continued to denounce patrons of channelization in Congress, such as Jamie Whitten of Mississippi, by the end of the 1970s the bureaucratic contentiousness surrounding stream channelization was largely in the past.[28]

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[27] Grant, "SCS Responsibilities under NEPA," Remarks at the Workshop on the Preparation of Environmental Statements in Fort Worth, Texas, 27 June 1972, 3, 5, 7, 11; b2; Item 27; RG 114; NACP.

[28] Quoted in Sampson, *For Love of the Land*, 217-218; House Conservation and Natural Resources Subcommittee, *Stream Channelization*, 8. For an example of attacks on congressional representatives, including a suggestion that Americans "start naming floods after members of Congress" who promoted channelization and thereby exacerbated flooding, see Johanna Neuman, "Flood Control Charges Denied by Politicians," *Jackson Clarion-Ledger* (25 April 1979), sec. A, p. 1, 7.

From the "Great Plow-Up" to the "Great Wash-Away": The Erosion Crisis of the 1970s-80s

The channelization controversy had forced the conservation-industrial complex to consider (albeit begrudgingly) environmentalists' concerns in project planning, but this did not spell the end of the problems for soil and water conservationists. In fact, in the late 1970s the agency's reputation grew worse. On top of its questionable environmental record, new studies revealed that the SCS was failing in its old standby, erosion control. What's more, SCS officials thought they had taken all steps to prevent a renewed erosion crisis.

The erosion crisis originated in 1972 with the onset of a production boom in American agriculture. Agricultural and economic historians are generally familiar with these events. In 1972, Secretary of Agriculture Earl Butz orchestrated the sale of nineteen million metric tons of grain to the Soviet Union, the single largest transaction of farm goods in world history and an event that spawned an export age of US farming. Butz and President Nixon hoped to increase farm incomes through free-market principles, encouraging American farmers to maximize production in order to meet heightened global demand and generate a warming of Cold War tensions. Heightened exports diminished domestic food supplies, driving up food prices and eliciting more pressure on the USDA to allow increased production—to plow "fencerow to fencerow," as Butz purportedly put it. Between 1973 and 1974, the USDA terminated its payments to farmers for idling cropland, incentivizing the production of over thirty-five million acres of marginal land that, just a few years earlier, had not been plowed. By decade's end, the value of American farm exports mushroomed nearly six-fold, from seven billion dollars in 1970 to forty-one billion dollars in 1980.[29]

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[29] Butz is often credited with encouraging "fencerow to fencerow" production, but I have been unable to find a single instance where he used this phrase. It was certainly in the lexicon of farmers and conservationists in the mid-1970s, and the USDA definitely promoted this mentality, but it remains unclear whether Butz ever used these words. He may have written this to Assistant USDA Secretary Robert W. Long in a letter dated 10 October 1974. See Tim Lehman, "Failed Land Reform: The Politics of the 1981 National Agricultural Lands Study," *Environmental History Review* 14 (Spring-Summer 1990): 147 n16. For the figures, see Osha Gray Davidson, *Broken Heartland: The Rise of America's Rural Ghetto*, expanded edition (Iowa City: University of Iowa Press, 1996), 31-32; John Fraser Hart, *The Land that Feeds*

Various members of the conservation-industrial complex eyed this transition with suspicion, particularly after Earl Butz's July 1973 announcement that the USDA was terminating its acreage-restriction payments to farmers. A number of observers worried that the loss of these payments would lead to increased production and heightened erosion. In August 1973, for instance, the Agricultural Research Service circulated an interdepartmental "Early Warning Report" detailing the likelihood of increased erosion, sedimentation, and water pollution. That same month, the head of the Great Plains Agricultural Council notified the USDA that, while the organization was "glad" that farmers could enjoy relaxed acreage controls, it worried that "to encourage all out production without some caution…could result in a serious set-back to land conservation." People in the USDA agreed. As one official explained to a gathering of Iowa conservation district commissioners, "This is no time to have a Great Plow-Up followed by a Great Wash-Away."[30]

Responding to these concerns in October 1973, the Soil Conservation Service launched a campaign it dubbed "Produce More, Protect More" (PMPM), which Secretary Butz designated the

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Us (New York: W. W. Norton, 1991), 358-361; and Earl Butz, Excerpts from talk at Agway, Inc., 19 October 1973; b1; Item 72; RG 114; NACP. For the effect of the export boom on food prices, see Shane Hamilton, *Trucking Country: The Road to America's Wal-Mart Economy* (Princeton: Princeton University Press, 2008), 152-153; and "New Surge in Groceries," *Time* (4 February 1974), 68-69. For the effect of the plow-up on land use and erosion, see Tim Lehman, *Public Values, Private Lands: Farmland Preservation Policy, 1933-1985* (Chapel Hill: University of North Carolina Press, 1995), 59-61. For other aspects of the plow-up, see Pete Daniel, *Breaking the Land: The Transformation of Cotton, Tobacco, and Rice Cultures since 1880* (Urbana: University of Illinois Press, 1985), 288-289; David B. Danbom, *Born in the Country: A History of Rural America* 2nd ed. (Baltimore: Johns Hopkins University Press, 2006), 251-253; and Vileisis, *Discovering the Unknown Landscape*, 294-295. For the social toll of the plow-up, see Kathryn Marie Dudley, *Debt and Dispossession: Farm Loss in America's Heartland* (Chicago: University of Chicago Press, 2000). The most well-known popular treatment of the plow-up and industrialized agriculture is Michael Pollan, *The Omnivore's Dilemma: A Natural History of Four Meals* (New York: Penguin, 2006), chapter 2. Gregory Cushman situates the plow-up in the context of decades of neo-Malthusian fears of overpopulation and dwindling global food supplies. See Cushman, *Guano and the Opening of the Pacific World: A Global Ecological History* (New York: Cambridge University Press, 2013), chapters 7-10, especially pp. 338-339.

30 Agricultural Research Service, "Early Warning Report," 27 August 1973, 2; b2; Item 72; RG 114; NACP; J. Orville Young to Earl Butz, 13 August 1973; b2; Item 72; RG 114; NACP. Robert W. Long, Excerpts from a Speech to the Iowa Association of Soil Conservation District Commissioners in Des Moines, Iowa, 10 September 1973; b1; Item 72; RG 114; NACP. See also Eugene Butler, "How Much Environmental Protection Can We Afford?" 2; b2f1; Eugene Butler papers, Special Collections Department, Mississippi State University Libraries. The USDA also warned of another Dust Bowl, but because the speaker was in Iowa, a humid state, he used the imagery of water erosion. On the potential for another Dust Bowl, see "Protect Land While Expanding Farm Production, Butz Urges," USDA News Release, 5 October 1973; attached to Kenneth Grant, Advisory Memo INF-60, 7 December 1973; b1; Item 72; RG 114; NACP.

agency's "first priority" for the coming year.[31] In effect, this program represented an experiment in the compatibility between a fully industrialized regime of agriculture and a system of voluntary soil and water conservation. The underlying philosophy of PMPM was that, as Butz explained in 1974, "there should be no conflict between full production and sound conservation…. They are complementary."[32] The SCS was confident in the techniques it had developed over the past forty years, and the "Great Plow-Up" of the 1970s presented the first opportunity in agency history to test how well its methods and farmers' commitment to conservation would hold up in the face of unleashed production. When this experiment ultimately failed, it led the SCS and its allies to reexamine the line separating environmental protection and economic production, especially because they had invested so much energy into making PMPM succeed.

"Produce More, Protect More" consisted of both increased technical assistance and an intensified promotional campaign. While it is difficult to document the degree to which the SCS increased technical assistance to farmers, its advertising efforts certainly accelerated. The educational offensive had two goals: to convince farmers to practice conservation amid the production boom, and to "respotlight [*sic*] the farmer as the Nation's number one practical ecologist."[33] "Produce More, Protect More" thus extended the SCS strategy established during the channelization controversy of discrediting what utilitarians considered impractical ecology, while simultaneously coopting the title of ecologist—and its attendant authority.

Radio advertisements held the greatest potential to achieve these goals because, unlike television spots, they tended to be longer and offered greater potential for developing a storyline.

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[31] USDA, "Protect Land While Expanding Farm Production."

[32] Butz and Kenneth Grant reasoned that increased production would increase farmers' profits, allowing them to reinvest in conservation technology. Earl Butz, "Full Production with Conservation," *Soil Conservation* 39 (April 1974), 4; Kenneth E. Grant, "Produce and Protect," *Soil Conservation* 39 (November 1973), 2.

[33] SCS, "Sample letter to Allis Chalmers [sic], International Harvester, John Deere, and Caterpillar," 1 November 1973; b1; Item 72; RG 114; NACP.

Two ads illustrate the dual goals of PMPM. The first, a nostalgic spot designed to rebrand the farmer as nature's pragmatic caretaker, featured a "Vermont old timer" reminiscing about his childhood. "My father and his neighbors were doing something to improve the environment," he recalled. "Only they didn't call it the environment then…they called it home." The second spot, a "serious, reflective" piece targeting agricultural producers, presented a farmer recalling his boyhood in the Dust Bowl, when farmers "plowed right up to the fenceposts [*sic*] and the soil blew away in big clouds of dust…. Well, we're smarter now…. We're producing *and* protecting on the same land." Although farmers saw the resurgence of the same sort of fencerow-to-fencerow production that caused the Dust Bowl, the Soil Conservation Service promised that this time, with "good soil conservation methods," things would be different.[34]

Within a few years, the SCS was forced to acknowledge that it had been wrong. In 1977, a number of forces converged to challenge the legitimacy of the Soil Conservation Service as an effective institution for controlling soil erosion. First, in an effort to achieve bureaucratic efficiency, Senators Bob Dole and Herman Talmadge in late 1976 demanded that the USDA provide proof its conservation programs achieved its affirmed goals of conserving natural resources. The Department was forced to admit it had none to offer.[35] Second, concurrent with the Dole and Talmadge oversight, the General Accounting Office (GAO) issued a damning report in February 1977. The report's muted language concealed the gravity of the accusations. USDA programs were supposed to excel at soil conservation, but the GAO determined that they had not been "as effective as they

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[34] The specific markets for which these ads were designed is not clear. "Soil Conservation Service Public Service Radio Spot," [n.d.]; b2; Item 27; RG 114; NACP; "Produce and Protect," [n.d.]; b2; RG 114; NACP. Donald Worster argues that the Dust Bowl resulted not simply from improper farming techniques, but from a capitalist culture dedicated to supporting and encouraging a vision of nature as capital waiting to be extracted to accumulate individual wealth. Worster, *Dust Bowl*.

[35] See Sandra S. Batie, "Soil Conservation in the 1980s: A Historical Perspective," *Agricultural History* 59 (April 1985), 117-118; Lawrence W. Libby, "Accountability Revamps Plans for Managing Our Resources," *Using Our Natural Resources: 1983 USDA Yearbook of Agriculture* (Washington, D.C.: GPO, 1983), 549-550; and Lehman, *Public Values, Private Lands*, 159-160.

could be in establishing enduring soil conservation practices and reducing erosion to tolerable levels." The GAO criticized the Soil Conservation Service specifically for its "passive approach" of working with farmers solely on a voluntary basis rather than "seeking out and offering assistance to those having the most severe erosion control problems."[36] Third, the negative publicity surrounding the agency's lapses fostered the passage of the 1977 Soil and Water Resources Conservation Act (RCA). The RCA ordered the Department of Agriculture to conduct periodic appraisals of the nation's natural resources. Collectively, Dole and Talmadge's congressional oversight, the GAO report, and the RCA created the political and bureaucratic climate for the collapse of SCS legitimacy.

These externally imposed political mandates drove a wedge into the conservation-industrial complex, making the Soil Conservation Service appear rudderless in a sea of its own incompetence. The GAO's 1977 report, for instance, estimated that, based on a sample of 283 randomly selected farms in ten states, eighty-four percent of the nation's farms suffered soil erosion higher than the Soil Conservation Service's established "tolerable" annual soil loss of five tons per acre. Moreover, instead of focusing on erosion control, the GAO concluded, the USDA's conservation initiatives tended to prioritize increased production.[37] R. Mel Davis, who succeeded Kenneth Grant as SCS administrator, conceded in 1978 that many of his agency's programs "have not been aimed at long-

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[36] United States General Accounting Office, *To Protect Tomorrow's Food Supply, Soil Conservation Needs Priority Attention* (Washington, D.C.: General Accounting Office, 1977), i-ii, 4

[37] Later studies, however, suggested that the national average was closer to 40 percent. GAO, *To Protect Tomorrow's Food Supply*, i; Lehman, *Public Values, Private Lands*, 160. The Soil Conservation Service estimated the average annual T-value in the United States to be around 5 tons per acre, but some critics charged that under typical agricultural conditions, annual soil formation took place at only 1.5 tons per acre. (One ton of soil spread over an acre is equivalent to approximately 1/50 of an inch, or about the thickness of a sheet of paper; ten tons of soil spread over an acre is roughly equivalent to the thickness of a dime.) The 5 tons/acre/year figure was purportedly a rough estimate, determined by scientists in the 1950s and 1960s based on informal observations and experiences rather than formal scientific experiments. Ken Cook, "Soil Loss: A Question of Values," *JSWC* 37 (March-April 1982): 89-92. For the 1.5 tons/acre/year, see David Pimentel, et al., "Land Degradation: Effects on Food and Energy Resources," *Science* 194 (8 October 1976), 150.

range soil and water conservation. I can't disagree with the GAO reports."[38] A major reason Davis was unable to challenge these conclusions was that they were based on the agency's own data.

In 1965, USDA researchers Walter Wischmeier and Dwight Smith introduced the Universal Soil Loss Equation (USLE), an obscure, complex mathematical equation designed to foster greater knowledge of field-level conditions across the diverse environments of the United States. Bearing all the marks of a reductionist, technocratic approach to environmental problems, USLE converted into numerical values a variety of factors—rainfall, erodibility of soil, the length and gradient of a slope, crop choice, and conservation practices—that influenced soil loss in a given area. Before USLE, measuring soil loss in fields was elusive, particularly for sheet erosion, which did not lend well to the sorts of volumetric estimates that technicians used to quantify gully erosion. The equation, however, provided a reliable and revolutionary tool with which to quantify soil sheet erosion at scales ranging from an individual farm field to an entire region.[39]

This quantification also facilitated resource planning, an important component of technocratic governance. USLE enabled policymakers to establish specific "soil-loss tolerances," or "T-values," to use as benchmarks in efforts to manage soil erosion. Wischmeier and Smith defined these tolerances, as "the maximum rate of soil erosion that will permit a high level of crop productivity to be sustained economically and indefinitely." Without USLE (and its cousin for use in arid environments, the Wind Erosion Equation), conservationists would have been severely

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[38] Davis, as quoted in James Risser's Pulitzer Prize-winning newspaper series on soil erosion appearing in the *Des Moines Register* in 1978. The series was republished in full under the title "Soil Erosion Creates a Crisis Down on the Farm," in *Conservation Foundation Letter* (December 1978), quoted on 9.

[39] Another important element of USLE was that its definition of "soil loss" encompassed any soil that was dislodged, whether it ended up in the next furrow or in the Gulf of Mexico. Wischmeier and Smith, *Predicting Rainfall-Erosion Losses from Cropland East of the Rocky Mountains: Guide for Selection of Practices for Soil and Water Conservation*, USDA Agriculture Handbook 282 (Washington, D.C.: GPO, 1965), 1-3, 38. Although some historians have mentioned USLE and T-values, few seem to have realized the revolutionary impact of this equation. For more on the history of USLE, see L. Donald Meyer and William C. Moldenhauer, "Soil Erosion by Water: The Research Experience," *Agricultural History* 59 (April 1985): 197-199.

hamstrung in their abilities to provide solid appraisals of soil resources and to set measurable goals for managing soil erosion. USLE effectively standardized the topographical, climatic, and land-use diversity of a specific place into a single unit of analysis that made peoples' relationship with the natural world legible from afar. This increased knowledge, in turn, enhanced the ability of the conservation-industrial complex to govern soil and water conservation on fields throughout the country.[40]

While USLE facilitated greater governmental influence in conservation, critics of the SCS co-opted this tool of state influence and wielded it to challenge state legitimacy. The 1977 GAO report that sparked public outcry over erosion, for instance, relied on the equation to identify an alarming scale of erosion. The same year, in response to a congressional mandate levied in the Rural Development Act of 1972, the Soil Conservation Service published a national inventory based on USLE that revealed national soil loss of four billion tons per year, far exceeding expectations. Although the USDA had supported the 1972 provision because these sorts of inventories formed "the foundation for [the] wise land use and treatment of the Nation's land resources" on which the SCS had established its credibility, these studies ultimately had the opposite effect. Once journalists

[40] Wischmeier and Smith, *Predicting Rainfall-Erosion Losses*, 1-2. In an effort to develop a more accurate formula, many agricultural experiment stations conducted experiments after the 1960s to calculate reliable values to insert into USLE equations. These experiments led to greater standardization. "The USLE was a good guide for planning experiments," explained a team of Mississippi researchers in 1996, "but, more importantly, research results from such experiments could be compared directly. The standard USLE plot was a major contributor to obtaining comparable data from other researchers and different locations." See K. C. McGregor, et al., *Cooperative Soil Conservation Studies at Holly Springs 1956-1996*, Bulletin 1004 ([Mississippi State, Miss.]: Mississippi Agricultural and Forestry Experiment Station, June 1996), http://msucares.com/pubs/bulletins/b1044.htm.

Many scholars have traced how collecting data has facilitated governance and state-formation. Theodore Porter, for instance, argues that "quantification is a technology of distance…well suited for communication that goes beyond the boundaries of locality and community." Ix. Perhaps more influential within the humanities is James C. Scott, who draws on Porter. Scott argues that state formation has typically been facilitated by rationalizing complex societies and environments into more simplified, legible forms, by "standardizing what was a social [and environmental] hieroglyph into a legible and administratively more convenient format." See Porter, *Trust in Numbers*, ix, chapter 4; Scott, *Seeing Like a State*; 3.

got their hands on the damning reports, the Soil Conservation Service faced another crisis of legitimacy.[41]

Many of the nation's leading newspapers, magazines, and academic journals—including *Science*, the *New York Times*, *Atlantic*, *Newsweek*, the *Christian Science Monitor*, and *Smithsonian*—published articles during the late 1970s and early 1980s on the renewed erosion crisis. A common theme in these articles was that, despite over 15 billion dollars of federal funding dedicated to soil and water conservation since the 1930s, soil erosion continued at such high levels that it was "worse than the Dust Bowl."[42] Armed with the quantitative, USLE-derived data from government studies, journalists charged that whereas the nation lost approximately 3 billion tons of soil per year in the 1930s, it was losing 4 billion tons in the 1970s.[43] What mattered most, however, was not the exact amount of erosion. Rather, it was the perception that the SCS had failed at the one task in which it should have excelled.

In the face of this perceived futility, other members of the conservation-industrial complex assumed leadership over the discourse of conservation. In November 1979, for instance, the

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[41] House Committee on Agriculture, *Rural Development Act of 1972*, 92nd Cong., 2d sess., 16 February 1972, H. Rept. 92-835, 13; GAO, *To Protect Tomorrow's Food Supply*. On the 1977 report, the National Resources Inventories, see R. Neil Sampson, *Farmland or Wasteland: A Time to Choose; Overcoming the Threat to America's Farm and Food Future* (Emmaus, Penn.: Rodale Press, 1981), 345-349, 360. For other reports, see USDA, *Soil and Water Resources Conservation Act: 1980 Appraisal: Soil, Water, and Related Resources in the United States*, Parts I and II (Washington, D.C.: GPO, 1981); and General Accounting Office, *Agriculture's Soil Conservation Programs Miss Full Potential in the Fight Against Soil Erosion: Report to the Congress by the Comptroller General of the United States* (Washington, D.C.: US General Accounting Office, 1983).

[42] For the "worse than the Dust Bowl" narrative, see James Risser, "A Renewed Threat of Soil Erosion: It's Worse than the Dust Bowl," *Smithsonian* 11 (March 1981), 124; Ann Crittenden, "Soil Erosion Threatens U.S. Farms' Output," *New York Times* (26 October 1980), 1; and Tom Morganthau, et al., "The Disappearing Land," *Newsweek* (23 August 1982): 22 incl. For other examples, see Luther J. Carter, "Soil Erosion: The Problem Persists Despite the Billions Spent on It," *Science* 196 (22 April 1977): 409-411; Crittenden, "Lack of U.S. Funds Cited in Fight against Erosion," *New York Times* (27 October 1980), D1, D4; Michael Lenehan, "Will the Corn Belt End Up in the Rivers?" *Atlantic* 248 (December 1981): 22-25; Lauren Soth, "Are Americans [*sic*] Farmer's [*sic*] 'Exporting' Their Topsoil?" *Christian Science Monitor* (3 June 1981); and Robert Warrick, "Soil Erosion: The Silent Farm Crisis," *Los Angeles Times* (25 December 1985). At least two books detailing the renewed threat of erosion also appeared around this time. See Sampson, *Farmland or Wasteland*; and Sandra S. Batie, *Soil Erosion: Crisis in America's Croplands?* (Washington, D.C.: The Conservation Foundation, 1983).

[43] Sandra Batie, however, determined that the 1970s figure was more likely closer to 3 billion, suggesting merely a lack of improvement in erosion-control. Batie, *Soil Erosion*, 33.

National Association of Conservation Districts—together with a conservation professionals' organization, the Soil Conservation Society of America—held a conference to assess the causes of and solutions to the present dilemma. The organizations considered it their "highest goal…to do what agencies and institutions many times find it hard to do for themselves: to get the facts, to question, to criticize, and to make suggestions for improvement."[44] With the SCS faltering, its allies in the conservation-industrial complex emerged to shore up the meaning of conservation.

One of the more powerful narratives constructed by the conservation-industrial complex, particularly by the NACD, was that conservationists' failure to prevent erosion was simply a matter of supply and demand. Lyle Bauer, a Kansan and the president of the NACD, reasoned in 1979 that, despite the leadership of Hugh Hammond Bennett in the 1930s and 1940s, the postwar period was "not particularly good for the development of a strong conservation ethic in this country. Too many people saw our problem as having too many soil and water resources," a problem of plenty revealed in chronic crop surpluses. "And no one treasures or conserves anything they have in surplus." With the perception of widespread availability of resources, demand for conservation faltered; nobody could be blamed for not caring for the natural world.[45]

This framework appealed to many conservationists within and outside of the SCS, for it absolved them of any shortcomings by appealing to ostensibly natural economic laws. According to this idea, soil and water conservationists had not lost sight of Bennett's vision; "he was just a little ahead of his time." In the late 1970s, however, history had apparently caught up with Bennett. "We appear to be entering an entirely new era," Bauer opined, "one in which the scarcity of land and

[44] William C. Moldenhauer, "Preface," in *Soil Conservation Policies: An Assessment* ed. Soil Conservation Society of America (Ankeny, Ia: SCSA, 1979), xvi.

[45] Lyle Bauer, "Foreword" to Soil Conservation Society of America, *Soil Conservation Policies: An Assessment* (Ankeny, Iowa: SCSA, 1979), xi-xii. I borrow the phrase "problem of plenty" from R. Douglas Hurt, *Problems of Plenty: The American Farmer in the Twentieth Century* (Chicago: Ivan R. Dee, 2002).

water may, for the first time, be an important factor in our national economy." Given the utilitarian, developmentalist bent of the NACD, it is perhaps unsurprising that its leadership viewed the past in wholly economic terms.[46]

The problem with Bauer's narrative was that it relied on either conservationists' willful ignorance or their amnesia. It omitted the reality that, throughout the immediate postwar period, the Soil Conservation Service strived to associate its mission with abundance. Twenty years earlier, for instance, the SCS director advised state officials to promote conservation "in terms of expansion potentials for industry, for recreation, and for other population requirements. It no longer suffices merely to point with alarm at the specter of erosion."[47] Conservation had not lost its way after World War II; it operated just as it was supposed to. Utilitarians in the 1950s and 1960s strove to guarantee the very abundance that utilitarians in the 1970s and 1980s diagnosed as the root of their problems.

Other members of the conservation-industrial complex, especially farmers and field technicians, explained the erosion crisis as a product of prevailing economic conditions. The stagflation and energy crisis of the 1970s contributed to the mounting costs for land, equipment, and labor faced by agriculturists. Because of high land prices and indebtedness, an Iowa State University agricultural economist suggested, farmers "look upon farming as a real estate game. They buy the land and farm the hell out of it to meet their heavy payments," confident that they could sell even eroded land at a profit. Sometimes agricultural producers, often with loans and mortgages to pay, wanted to practice conservation but did not. As one farmer put it, they were "educated about

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[46] Ibid., xi-xii. For subsequent manifestations of this narrative, see SCS, *America's Soil and Water: Condition and Trends* ([Washington, D.C.]: USDA SCS, December 1980); and Sampson, *Farmland or Wasteland*, xviii, 15, 62, 94. For other perceptions of limits in this period, see Richard J. Barnett, *The Lean Years: Politics in the Age of Scarcity* (New York: Simon and Schuster, 1980). See also W. Carl Biven, *Jimmy Carter's Economy: Policy in an Age of Limits* (Chapel Hill: UNC Press, 2002); Robert M. Collins, *More: The Politics of Economic Growth in Postwar America* (New York: OUP, 2000), chapter 5; and Lehman, *Public Values, Private Lands*.

[47] Donald A. Williams, "Conservation Leadership in a Changing World," Address at Annual Conference for State Conservationists, 31 August 1959, 2; b6; Item 26; RG 114; NACP.

conservation, but education doesn't put it on the land; money does." Finally, SCS field technicians noticed that "today's enormous equipment" rendered obsolete older conservation measures such as terraces and contour plowing, "so the big farmers just plow straight up and down the slopes, and the soil just runs right off." The principles of soil and water conservation seemed poorly matched against a regime of capital-intensive, technology-intensive industrialized farming that drove farmers into debt and discouraged long-term planning. In short, the farming methods developed by the conservation-industrial complex earlier in the century were incompatible with the broader system of industrialized agriculture that accelerated in the 1970s.[48]

As the practicality of older conservation technologies crumbled, a new technology grew ascendant. Conservation tillage—the most developed form of which was "no-till"—offered farmers a method of production well adapted to industrialized agriculture. This method helped prevent erosion not by terraces or contour furrows that collapsed under or obstructed the movement of large machinery, but by injecting seed and fertilizers directly into the soil and maintaining a protective layer of vegetation over the soil year-round. Conservation tillage also required large, expensive machinery and depended on chemical herbicides (rather than mechanical cultivation) to control weeds. Finally, typical field preparation required separate trips across the field for plowing, fertilizing, and planting seed, but tillage combined these activities into one—an important cost-saver in a time of mounting fuel prices. In short, no-till and other conservation tillage techniques were ideally suited for a regime of industrialized agriculture that encouraged greater technological investment (and debt) to solve the economic woes of American agriculture in the 1970s and 1980s.

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[48] Earl Heady, as quoted in Crittenden, "Soil Erosion," 55; Ervin Koos, as quoted in Risser, "A Renewed Threat of Soil Erosion," 127; Stephen Black, an SCS agent from Missouri, as quoted in Crittenden, "Soil Erosion," 55. See also Sampson, *Farmland or Wasteland*, 49, 57-59. For more on farmers' mounting debts in the 1970s and 1980s, and the social toll they exacted, see Dudley, *Debt and Dispossession*; Davidson, *Broken Heartland*. A similar process, whereby debt followed industrialization, unfolded in Mexico. See Angus Wright, *The Death of Ramón González: The Modern Agricultural Dilemma*, rev. ed. (Austin: University of Texas Press, 2005), especially chapter 9.

Many farmers were slow to embrace this technology, however, for the aesthetics of no-till appeared "trashy" to those accustomed to valuing clean-tilled soil. As a result, cultural beliefs competed with economic forces in farmers' decisions whether to invest in no-till technology, stick with older conservation methods, or risk disastrous soil erosion by forgoing conservation altogether.[49]

Just as the 1970s energy crisis made conservation tillage more attractive to farmers, it also provided the conservation-industrial complex a framework for understanding the concomitant erosion crisis. Academics, farmers, conservation apostles, and politicians all understood that the nation's renewed erosion crisis stemmed from the geopolitical effort to balance US trade deficits with agricultural exports. One of the earliest proponents of this analysis, a soil scientist at Texas A&M University, suggested the US was exchanging recent solar energy in crops for ancient solar energy in oil, an arrangement that might be preferable if not for elevated rates of erosion.[50] Many involved with conservation shared this idea. "We are trading our soil for oil," explained a Missouri farmer. Marty Strange, a proponent of rural redevelopment, put it similarly. "We've become like a third world country," he said, "mining our natural resources in order to pay for our imports."[51] As OPEC countries withheld oil and American farmers increased agricultural production to pay for it, Senator John Culver of Iowa remarked, "it would be the ultimate irony if…[we] ran out of topsoil before they ran out of oil."[52] Conservation advocates roundly began to question the strategy of balancing trade deficits on the back of the land.

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[49] I engage with conservation tillage in greater detail in Chapter 4.

[50] Cornelius H. M. van Bavel, "Soil and Oil," *Science* 197 (15 July 1977), 213.

[51] Robert Shoemyer and Marty Strange, as quoted in Crittenden, "Soil Erosion," 55. See also Soth, "Are American Farmers 'Exporting' Their Topsoil?"; Risser, "A Renewed Threat of Soil Erosion," 124-126; and Sampson, *Farmland or Wasteland*, 35.

[52] Culver, "Soil Conservation: A Partial Commitment is Not Enough," in *Soil Conservation Policies: An Assessment* ed. Soil Conservation Society of America (Ankeny, Ia: SCSA, 1979), 4. For more on the effect of the OPEC oil embargo on American life, see Mark Fiege, *The Republic of Nature: An Environmental History of the United States* (Seattle: University of Washington Press, 2012), chapter 9; Paul Sabin, "Crisis and Continuity in U.S. Oil Politics, 1965-180," *Journal of American History* 99 (June 2012), 183-185; David S. Painter, "Oil and the American Century," *Journal of American*

The association between soil and oil fostered a common language between utilitarian conservationists and environmentalists, the language of limits. "Both soil and petroleum are formed by geological processes," one observer noted. While conserved soil "can be used and reused indefinitely," excessive erosion makes soil "essentially nonrenewable."[53] Other agricultural issues in the late 1970s and 1980s also drove home a sense of limits. For instance, a number of observers worried that American agriculture was losing land not only to soil erosion, but also to urban and suburban development. A nationwide "farmland preservation" movement emerged that sought to prevent a loss of agricultural land that, as a USDA report described, "for practical purposes…is irreversible."[54] Everywhere they looked, members of the conservation-industrial complex saw limits looming on the horizon for American agriculture.

To be sure, the shared vocabulary never extended to an entirely shared worldview, for utilitarian conservationists remained far more committed to economic development than many in the environmental movement would have been comfortable with. Put another way, when soil and water conservationists spoke of limits, their purpose was not to warn of "limits to growth" on a finite planet, but to avert such an economic catastrophe through better planning and efficient technology.[55] As the vice president of the NACD emphasized in 1981, "trying to 'preserve' farmland is not to prevent its effective economic use in the future but to guarantee it."[56] Nevertheless, the recognition of limits in the conservation-industrial complex established a means of

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History 99 (June 2012), 33-36; Brian Black, *Crude Reality: Petroleum in World History* (Lanham, Maryland: Rowman & Littlefield, 2012), 187-196.; and Schulman, *The Seventies*, 125-128.

[53] John Timmons, as paraphrased in Soth, "Are American Farmers Exporting Their Topsoil?" See also Sampson, *Farmland or Wasteland*, 33.

[54] NALS, *National Agricultural Lands Study: Executive Summary of Final Report* (Washington, D.C.: GPO, January 1981), 6. For a comprehensive study of the farmland preservation movement and its language of limits, see Lehman, *Public Values, Private Lands*, especially 167-173. See also M. Rupert Cutler, "The Peril of Vanishing Lands," *New York Times* (1 July 1980), sec. A, p. 19.

[55] Here I am referring to the famous environmentalist creed, *The Limits to Growth*, which admittedly had far greater influence in Europe than in the United States. See Donella H. Meadows, et al., *The Limits to Growth; A Report for the Club of Rome's Project on the Predicament of Mankind* (New York: Universe Books, 1972).

[56] Sampson, *Farmland or Wasteland*, 5.

communication between two philosophies that, just years earlier, had struggled to find common rhetorical ground.

The erosion crisis had challenged SCS legitimacy. Despite its efforts through the "Produce More, Protect More" publicity campaign to prevent soil erosion, the agency's own equation suggested it had failed miserably. This institutional instability was accompanied by discursive instability as the SCS lost its primacy in defining the meaning of soil and water conservation. Other groups, many of whom had previously deferred to SCS leadership, stepped into the breach and offered their own explanations for the erosion crisis. These groups' narratives established a language of limits, but borne out of the conservation-industrial complex as they were, they retained their decidedly utilitarian perspective. Yet, this language of limits helped establish a common ground with environmentalists, which became progressively important as the discourse of soil and water conservation emphasized environmental quality through conservationists' increased attention to agricultural water pollution.

From Quantity to Quality: Water Conservation & Nonpoint Source Pollution

Before 1970, the conservation-industrial complex paid increasing attention to water conservation. It focused specifically on providing Americans with the right amount of water, neither too little nor too much, in order to guarantee material abundance for a nation with a growing population and a growing appetite. With increasing national attention to agricultural water pollution after 1970, this focus began to shift from water quantity toward water quality. The Soil Conservation Service was initially reluctant to take meaningful steps to reduce water pollution, but the same was not true for other members of the conservation-industrial complex. In particular, the National Association of Conservation Districts formed a partnership with the Environmental Protection Agency (EPA) in 1971 to encourage pollution control measures on the nation's farms.

The crisis of legitimacy that accompanied the erosion controversy in the SCS, however, provided the impetus for the USDA to take increased steps toward pollution control during the late 1970s and early 1980s.

The nature of agricultural water pollution complicated governmental remediation efforts. Unlike "point source" pollution, which is easily traced to a single source, agriculture is generally responsible for "nonpoint source" pollution. "Nonpoint pollution," as many researchers called it, includes eroded sediment (the chief water pollutant, by volume), fertilizers and pesticides attached to soil particles or suspended in farm runoff, and animal wastes that leach out of barns, fields, or manure ponds. Because of its highly decentralized geography, agricultural water pollution presented regulators with enormous political and logistical difficulties. As Congress would later determine, any attempt to impose regulations would not only prove politically unpalatable, but efforts to enforce them would also be prohibitively expensive. Meanwhile, the costs of nonpoint source pollution—which include eutrophication, hypoxia, increased water turbidity, aquatic habitat loss and death, impaired navigation, and increased flood risks—continued to mount.[57]

As early as 1960, Congress classified not only agrochemicals, but also sediments, as water pollutants. Throughout the 1960s and 1970s, the Soil Conservation Service made great efforts to reduce stream sedimentation, particularly when it originated from suburban development or when it clogged channels and exacerbated flooding on valuable rural bottomlands (see Chapter 6).[58] Yet, the

[57] Because most toxic pesticides are highly regulated, the most troublesome form of nonpoint source pollution is chemical fertilizers and nutrients such as animal wastes. These nutrients spawn algal blooms which, upon dying, sink to the bottom of the waterway where they decompose. Decomposition consumes oxygen, which leads to hypoxic water conditions and leads to the death of aquatic life. For examples of researchers adopting the shorthand of "nonpoint pollution," see John G. Konrad, et al., "Nonpoint Pollution Control: The Wisconsin Experience," *JSWC* 40 no. 1 (1985): 55-61; and Donald J. Epp and James S. Shortie, "Agricultural Nonpoint Pollution Control: Voluntary or Mandatory?" *JSWC* 40 no. 1 (1985): 111-114.

[58] The Senate Select Committee on National Water Resources classified sediments, "organic chemical exotics," and "plant nutrients" (and several other substances) as pollutants in its Committee Print No. 9, "Pollution Abatement." For a summary of this document, see US Senate Select Committee on National Water Resources, *Report of the Select Committee on National Water Resources*, 87th Cong., 1st sess., 30 January 1961, S. Rept. 29, 86-87. For SCS attention toward

agency's resolve was at best tepid when it concerned abatement of pollution from agricultural chemicals. Since Hugh Hammond Bennett in the 1920s, conservation administrators had defined their mission as protecting the physical body of soil, not soil fertility. Consequently, in keeping with this mindset, the SCS need not concern itself with increasing application of chemical fertilizers, as long as farmers had enough topsoil to apply it to.

This mentality survived into the 1960s and 1970s, even as nutrient-fueled algae blooms grew more prevalent throughout the country. SCS officials and conservation researchers readily acknowledged that farming contributed to nonpoint source water pollution through eroded sediments. But they equivocated when it concerned increased nutrient loads in streams, lakes, and rivers. "Some people may think that excessive phosphorous in surface waters is due to runoff from…fertilized fields," tutored Cecil Wadleigh, a head researcher at the Agricultural Research Service (ARS), but a "hard look at the sources of phosphorous" suggested otherwise. Wadleigh explained that most agricultural phosphorous entered water not through field runoff, but through feedlot or barnyard runoff, or via attachment to soil particles that then washed into waterways. According to this calculus, the problem was not that farmers were applying fertilizer indiscriminately, but that they were *not* adopting "the best way to control the phosphorous burden in streams": traditional "soil conservation practices and structures."[59] In other words, solving the nonpoint pollution problem did not necessarily require wholesale changes to the ascendant regime of industrialized agriculture. Rather, it merely entailed participating in the conservation-industrial complex, which offered methods that could protect the environment while producing abundantly.

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suburban sedimentation problems in the 1960s, see Douglas Helms, et al., "Water Quality in the Natural Resources Conservation Service: An Historical Overview," *Agricultural History* 76 (Spring 2002): 293-300; Adam Rome, *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (Cambridge: Cambridge University Press, 2001), 207-210.

[59] C. H. Wadleigh, "Agricultural Pollution of Water Resources," *Soil Conservation* 33 (September 1967): 28-29. See also Wadleigh, *Wastes in Relation to Agriculture and Forestry*, USDA Miscellaneous Publication 1065 (Washington, D.C.: 1968); Hollis R. Williams, "Agriculture and Water Quality," *Soil Conservation* 34 (May 1969): 219-220.

Other conservation researchers went so far as to argue that fertilizers helped improve water quality. In a 1971 *Journal of Soil and Water Conservation* roundtable on agricultural pollution, for instance, an ARS researcher reasoned that, because sediment carries nutrients into waterways, the best solution to nonpoint source pollution was to remove from production erodible lands and replace them with intensive cultivation of flatter fields. "We should use even *higher* rates of fertilization where crop yields can be increased without creating a pollution hazard," the scientist deduced. "More land could then be returned to continuous vegetation."[60] This facile reasoning neglected the mounting evidence that the rise in fertilizer usage and the rise in algal blooms were more than coincidental. In the late 1960s and early 1970s, for example, issues of the *Journal of Soil and Water Conservation*—including the roundtable issue—regularly included advertisements for aquatic weed-killing technologies (Figure 12).

A final way that the conservation-industrial complex resisted concerted action to address nonpoint pollution in the 1960s was to blame urban and suburban America. This strategy typically involved acknowledgement of agricultural sources while simultaneously suggesting that non-farm water pollution was far more serious—an appeal for "perspective" that lent far greater credibility than if conservationists were to deny responsibility entirely. In a paper presented at the Fourth Annual International Water Quality Symposium in 1968, Cecil Wadleigh and an SCS official deployed this strategy. After conceding that eroded soil particles carried phosphorous into waterways, they explained that these phosphates were relatively insoluble and thus unavailable to aquatic organisms. Contrarily, phosphates from non-farm sources, such as detergents "delivered in the effluent from [sewage] treatment plants," were highly soluble and readily available in aquatic ecosystems. "We can confidently say," the two concluded, "that even if the total contribution of

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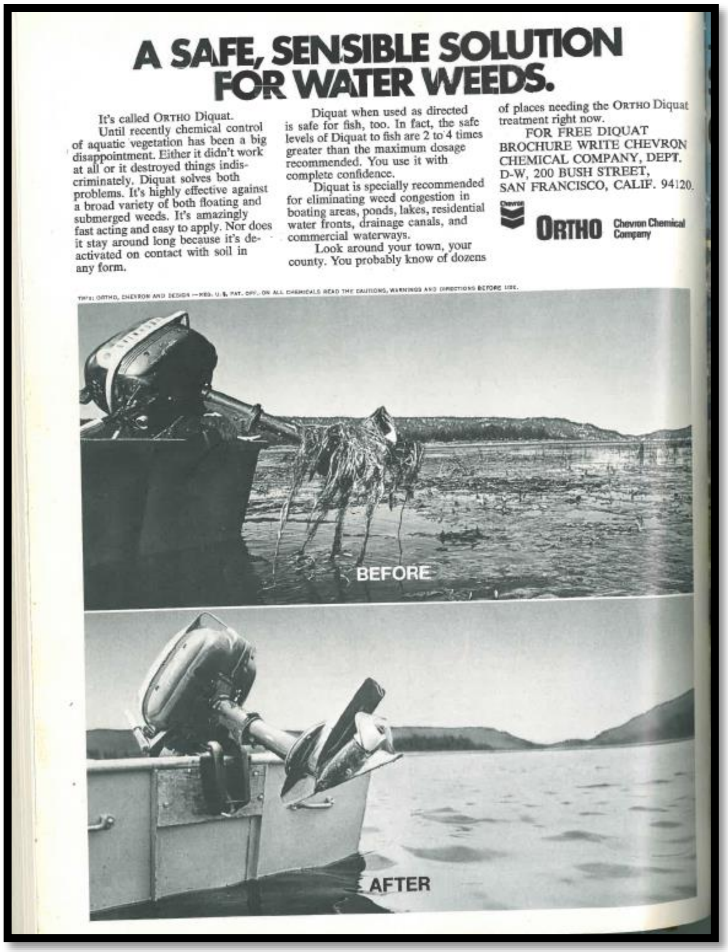
[60] Frank G. Viets, Jr., "Fertilizers," *JSWC* 26 (March-April 1971): 51, emphasis added. See also B. A. Stewart, "Comment on Nitrates," *Soil Conservation* 35 (March 1970): 190.



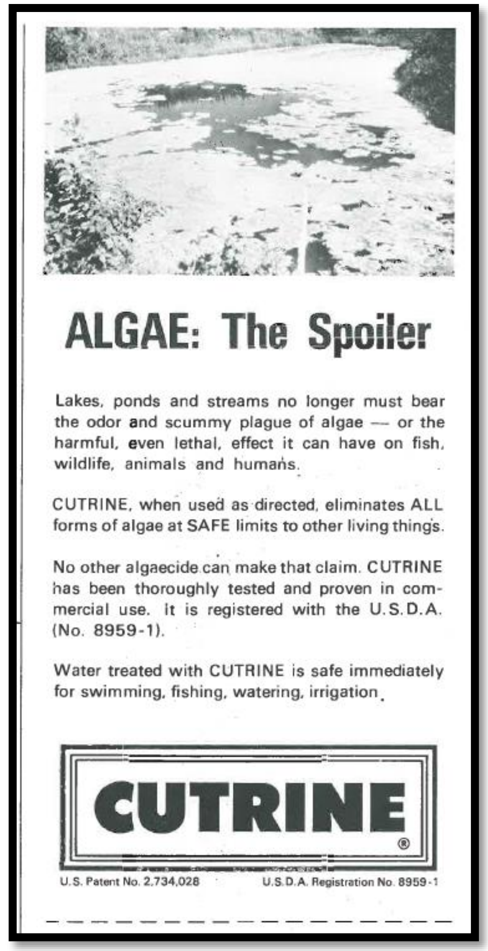


Figure 12: Two advertisements appearing in the *Journal of Soil and Water Conservation* in 1971, illustrating the growing awareness of nutrient loads in the nation's waterways. Source: *Journal of Soil and Water Conservation* 26 (March-April 1971): 39-40.

agricultural fertilizers were eliminated, there would be little effect on the available phosphorous supply in the rivers and estuaries."[61] By casting doubt on agriculture's relative culpability for the growing water pollution problem, this logic only served to justify inaction.

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[61] Hollis R. Williams and Cecil H. Wadleigh, "Agricultural Wastes in Perspective," 14 August 1968, 3; b1; Item 203; RG 114; NACP. Williams, a director of the Small Watershed Program, was among the most vocal skeptics of agricultural culpability for water pollution. See also Williams, "Agriculture and Water Quality," 219; Williams, "Land Treatment and Sediment Control in the Drive for Water Quality," Address at the Fifteenth National Watershed Congress in New Orleans, Louisiana, 28 May 1968, 1; b1; Item 203; RG 114; NACP; and Williams, "Agriculture and Water Pollution," Address at the State Conservationists' Annual Meeting in Lincoln, Nebraska, 16-20 September 1968, 2; b1; Item 203; RG 114; NACP. For an example of this strategy in the Palouse region of Washington, Oregon, and Idaho, see Andrew Duffin, *Plowed Under: Agriculture and Environment in the Palouse* (Seattle: University of Washington Press, 2007), 130-132.

The passage in 1972 of the Federal Water Pollution Control Act Amendments (the "Clean Water Act," or CWA) in 1972 forced the conservation-industrial complex to pay closer attention to water quality, but not by regulating nonpoint source pollution. The Clean Water Act called for "fishable, swimmable" waters by 1983, which required reduction of agricultural pollutants. As historian Paul Milazzo has demonstrated, however, the drafters of the bill balked at regulating nonpoint pollution directly. They deemed political and financial costs needed to impose a vast regulatory network throughout the country, especially in rural America, prohibitively expensive—especially because the lack of effective monitoring technology meant that such a network might still prove ineffective. Moreover, powerfully situated representatives from agricultural states opposed provisions that would introduce federal controls to farm operations. Instead of a regulatory approach to nonpoint pollution, Section 208 of the CWA directed the Environmental Protection Agency to develop and implement "areawide waste treatment management plans." Befitting the decentralized nature of nonpoint pollution, the EPA sought to execute its mandate by tapping into an existing network of local organizations, soil and water conservation districts.[62]

The EPA had already established a partnership with the National Association of Conservation Districts the year before the passage of the CWA in an effort to create and implement water-quality management plans. This agreement signaled a backdoor entry for the conservation-industrial complex into nonpoint pollution control. The Soil Conservation Service, which had previously enjoyed an institutional monopoly over pollution abatement programs, had lagged in effective remediation of nonpoint pollutants. But that did not mean that the EPA would not take

[62] Public Law 500, 92d Cong., 2d sess., (18 October 1972), 839; Paul Charles Milazzo, *Unlikely Environmentalists: Congress and Clean Water, 1945-1972* (Lawrence: University Press of Kansas, 2006), 208-211, 217. It remains unclear whether the USDA lobbied against nonpoint regulation. The NACD, meanwhile, reportedly supported nonpoint pollution control in the CWA, but advocated a voluntary approach. See Sampson, *For Love of the Land*, 209-212. For important legal precedents to the Clean Water Act, see Karl Boyd Brooks, *Before Earth Day: The Origins of American Environmental Law, 1945-1970* (Lawrence: University Press of Kansas, 2009), especially 123-133, 139-143.

advantage of the network the SCS had helped construct. The EPA considered conservation districts "uniquely equipped to help plan, manage, and implement" its management plans, for "they have not only perfected working arrangements with a host of federal and state agencies, institutions, and groups, but have developed a widespread and effective delivery system as well." Moreover, conservation districts continued to work with the SCS even while they collaborated with the EPA. Because the SCS offered technical assistance to help districts achieve their objectives, the NACD-EPA partnership forced the SCS to pay greater attention to nonpoint pollution control as an objective in its own right, rather than as a product of traditional erosion-control activities. As the conservation-industrial complex began prioritizing water quality, the meaning of conservation moved closer to popular understandings environmental quality.[63]

Actually implementing nonpoint pollution control measures on the land, however, proved more difficult than merely creating water-quality plans. The biggest obstacle in the mid-1970s was the lack of subsidized financial assistance to execute these plans. As Congress deliberated over amendments to the Clean Water Act in 1977, Senator John Culver of Iowa inserted authorizations for a program to address these concerns. The Culver amendment authorized the Rural Clean Water Program (RCWP), a $600 million initiative for the USDA to pay farmers up to fifty percent the cost of pollution prevention in exchange for five-to-ten-year cooperation contracts. Although the amendment passed Congress and became law, Culver's vision for the RCWP never materialized.

[63] The significance here is not that the SCS had yet started advocating new techniques and technologies—the "best management practices" in 1977 remained indistinguishable from traditional conservation techniques—but that the agency began prioritizing pollution control as a goal unto itself. William B. Davey, *Conservation Districts and 208 Water Quality Management* ([Washington, D.C.]: Environmental Protection Agency, 1977), v, 33-47, 96-100. See also George R. Bagley, "Evolution of Institutional Arrangements: A Nongovernmental View," in *Soil Conservation Policies: An Assessment* ed. Soil Conservation Society of America (Ankeny, Ia: SCSA, 1979), 42; and Sampson, *For Love of the Land*, 209-214.

The program would have funneled financial support to landowners through the SCS and conservation districts, but this would have upset a decades-old arrangement within the USDA.[64]

In the 1940s and 1950s, Representative Jamie Whitten of Mississippi used his position on the House Agriculture Appropriations Committee to orchestrate a system that assigned responsibility for technical assistance to the SCS and financial assistance to the Agricultural Stabilization and Conservation Service (ASCS). The name of the ASCS program changed often, but it most often went by the Agricultural Conservation Program (ACP). The ASCS channeled ACP support to farmers through county-level committees that existed independent of conservation districts. By allocating financial assistance through conservation districts (the SCS's local allies) rather than through county ASCS committees, Culver's program would have upended the tenuous balance between the SCS and the ASCS. The ASCS proved protective of its bureaucratic territory, and it was glad to have a powerful congressional ally in Jamie Whitten.[65]

In the 1950s, Whitten had climbed the ranks of Congress to head the influential House Subcommittee on Agriculture Appropriations, and he became chair of the entire Appropriations Committee in 1979 (see Chapter 6). The conservative Democrat, who was known as the "permanent Secretary of Agriculture" for his influence and long tenure, had a well-earned reputation as a patron of production-oriented policies in agriculture and conservation, and his grip on

[64] Public Law 217, 95th Cong., 1st sess., (27 December 1977), Sec. 35. The following discussion of the battles surrounding RCWP draw on Sampson, *Farmland or Wasteland*, 274-275; Sampson, *For Love of the Land*, 221-223; and Charles E. Little, *The Rural Clean Water Program: A Report* (Kensington, Md: USDA and EPA, May 1989), 3-4. For more, see Helms, et al., "Water Quality," 32; Risser, "Environmental Crisis Down on Farm," 7A; and Risser, "Soil Erosion," 6, 11-13. The RCWP was modeled on the Great Plains Conservation Program, which began in the 1950s. For more on the latter program, see Douglas Helms, "Conserving the Plains: The Soil Conservation Service in the Great Plains," *Agricultural History* 64 (Spring 1990), 66-70; and Helms, "The Great Plains Conservation Program, 1956-1981: A Short Administrative and Legislative History," in *Readings in the History of the Soil Conservation Service*, ed. Douglas Helms (Washington, D.C.: GPO, 1992), 140-157.

[65] The ASCS also worried that such an expansive program would fuel the enervation of other ACP funding. See Sampson, *For Love of the Land*, 222. For more on the ASCS and Whitten's support of it, see Sampson, *Farmland or Wasteland*, 263-266. For an in-depth treatment of how decentralized structure of the ASCS fostered institutional racism within the USDA, see Pete Daniel, *Dispossession: Discrimination Against African American Farmers in the Age of Civil Rights* (Chapel Hill: University of North Carolina Press, 2013).

congressional purse strings provided plenty of opportunities to bend federal policy to his liking.[66] In conservation matters one of the primary ways he achieved this was by inserting language in spending bills that prohibited presidencies from cutting ACP budgets—a feat that, by the 1980s, he boasted he had achieved over thirty times.[67] Critics charged that ACP funds often paid for measures only tangentially related to conservation. A former SCS field agent from Idaho, for instance, recalled that in the early 1960s, ACP payments often helped farmers pay for herbicides and summer fallowing, a practice long recognized as a primary cause of erosion. Yet, the payments continued to flow, for they "represented a way for the program to reach many farmers that would not otherwise participate."[68] Whether ACP payments went toward practices that reduced erosion or worsened it, in the late 1970s Jamie Whitten remained a steady advocate of the status-quo power balance in the conservation-industrial complex, which he had had helped establish in the previous decades.

It thus came as no surprise to many observers when Whitten scuttled the SCS-administered RCWP program and replaced it with one managed by the ASCS. When Culver's RCWP program initially came before Whitten's subcommittee in 1978 for funding, the Mississippi Democrat had no problem denying appropriations, particularly when the Carter Administration omitted the RCWP from its budget.[69] In 1979, however, Whitten inserted into an appropriations bill language that established an "experimental" clean-water program similar to Culver's proposal, but administered by the ASCS.

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[66] See, for instance, Norman C. Miller, "The Farm Baron: Rep. Jamie Whitten Works Behind the Scenes to Shape Big Spending," *Wall Street Journal*, 7 June 1971, pp. 1, 19.

[67] Leonard M. Apcar, "Big Spender: Rep. Whitten Pushes Money Bills through by Baffling Opponents," *Wall Street Journal*, 4 October 1983, 1.

[68] Sampson, *Farmland or Wasteland*, 265. For more on summer fallowing as a cause of erosion in the Palouse region, see Duffin, *Plowed Under*, especially 64-72 and 80-85.

[69] Whitten's subcommittee originally intended to provide $25 million for the RCWP in fiscal year 1979, but it deleted it from the appropriations bill when Carter left it out of his budget request. The administration omitted the program from its budget because it preferred a single, consolidated program for cost-sharing within the USDA. See House Committee on Appropriations, *Agriculture, Rural Development, and Related Agencies Appropriation Bill, 1979*, 95th Cong., 2d sess., 13 June 1978, H. Rept. 95-1290, 85; Committee on Conference, *Making Appropriations for the Agriculture, Rural Development, and Related Agencies Programs*, 95th Cong., 2d sess., 18 September 1978, H. Rept. 95-1579, 24.

The new program was far more constrained than the original RCWP. First, whereas Culver's RCWP enjoyed the congressional mandate that comes from floor debate, Whitten created his program somewhat autocratically, bypassing floor debate by adding an earmark to a spending bill. Second, Whitten allocated only $50 million for his program, a fraction of Congress' original $600 million authorization. Finally, while the original RCWP had been a national program, Whitten's creation was limited to "only [the] highest priority projects in geographical areas to be selected primarily from applications previously submitted to the Secretary [of Agriculture]." In operation, the new Experimental Rural Clean Water Program revealed some important insights into agricultural nonpoint source pollution, but it fell far short of the promise embodied in the original program.[70]

By the early 1980s, the conservation-industrial complex was gradually recognizing the need to pursue environmental quality when it came to water conservation. Over the previous two decades, parties in the complex had gradually gone from actively obfuscating agricultural responsibility for nonpoint pollution to begrudging acceptance of the need to integrate pollution-control as a central purpose of conservation programs. The RCWP offered tremendous promise as a mechanism for reducing agricultural water pollution. But, as a reporter put it, the program was "undercut by bureaucratic jealousies, Carter administration budget-cutting, and congressional jockeying"—much of it because the RCWP would have meant a reorientation of authority within the conservation-industrial complex.[71] Consequently, the meaning of conservation inched toward environmental quality, but only slowly.

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[70] Committee of Conference, *Making Appropriations for the Agriculture, Rural Development, and Related Agencies Programs for Fiscal Year 1980*, 96th Cong., 1st sess., 24 October 1979, H. Rept. 96-553, 24-25. The difference in subsequent appropriations was also evident. Congress authorized another $200 million to Culver's RCWP in 1980, while the same year, Whitten added a mere $20 million. Little, *Rural Clean Water Program*, 3-4.

[71] Risser, "Soil Erosion," 11.

The 1985 Farm Bill: A Boon for Conservation?

In a 1979 Pulitzer Prize-winning series on agriculture and the environment—the first in-depth reporting on the erosion crisis—*Des Moines Register* reporter James Risser linked the on-farm costs of soil erosion with the off-farm externalities of nonpoint source pollution. "The farm soil that washes into the nation's waterways," he explained, "carries with it pesticides that threaten human and animal health, and fertilizers that turn sparking rivers and lakes into dying bodies of water."[72] Erosion and water pollution were not distinct phenomena, but rather two sides of the same coin. Despite the difficulty in pinpointing the sources for many water pollutants, the USDA was beginning to realize that "if we clean up our municipal and industrial pollution and still find our waters polluted, the finger is going to be pointed more and more toward agriculture."[73] In fact, some agricultural researchers suggested in the late 1970s that, because pollution-control efforts had greater regulatory momentum than efforts at erosion control, "the water pollution approach is going to make agriculture face the [erosion] problem in a way it hasn't before."[74] Indeed, the debate over nonpoint pollution sparked vigorous debates within the conservation-industrial complex whether a more regulatory approach to conservation was in order.

The rise of nonpoint water pollution as an issue of national concern forced the question of regulation in a way that soil erosion could not. The threat of erosion was difficult for the much of the public to comprehend, for its primary damages seemed far off in a distant future. "We haven't missed [eroded] soil so far," explained an Iowa SCS official, "because we've put more and more fertilizer on the soil to keep yields up."[75] Other than those who might suffer from sedimentation in streams and reservoirs, most of the broader public could not see the damages from erosion, making

[72] Risser, "Environmental Crisis Down on Farm," 7A.
[73] M. Rupert Cutler, as quoted in Risser, "Environmental Crisis Down on Farm," 7A.
[74] Lee Kolmer, Dean of Agriculture at Iowa State University, as quoted in Risser, "Soil Erosion," 17.
[75] Brune, as quoted in Risser, "Soil Erosion," 5. See also Crittenden, "Soil Erosion," 1, 55; and Risser, "Environmental Crisis Down on the Farm," 7A.

it easy to consider it a problem for individuals, not society as a whole. Nonpoint pollution was different. Even if people did not pay attention to debates surrounding the Clean Water Acts, it was harder to ignore fish kills or the putrid smells wafting from eutrophic lakes. Water pollution made the public costs of agricultural land use far more personal and apparent. Perhaps unsurprisingly, then, some of the earliest calls for regulatory conservation programs during the 1970s were prompted by efforts to comply with water-quality standards in the Clean Water Acts.[76]

The debate over voluntary versus compulsory conservation was so contentious because it threatened to dismantle one of the core strengths of the conservation-industrial complex, the relative invisibility of the federal government. Since the 1930s, soil and water conservation had thrived to a significant degree because independent-minded farmers could retain their self-identities while still accepting federal assistance (see Chapter 5). Many in the late 1970s and early 1980s worried that contemporary proposals to compel conservation compliance would make the presence of the state much more overt, thereby removing a central pillar of the conservation-industrial complex and causing the entire structure to collapse. As an Iowa State University researcher noted, "Some farmers don't give a damn about conservation, and there could be a backlash if they're pushed" into mandatory programs.[77]

These fears were expressed most often by those in the conservation-industrial complex with the keenest understanding of the social dynamics in soil and water conservation, particularly agricultural producers and conservation district officials. "I'm all for soil conservation," a Wisconsin farmer told a researcher. "But I don't believe we have or anybody has the right to tell others how to

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[76] See, for example, Mary M. Garner, "Regulatory Programs for Nonpoint Pollution Control: The Role of Conservation Districts," *JSWC* 32 (September-October 1977): 199-204; Jim Morrison, "Managing Farmland to Improve Water Quality," *JSWC* 32 (September-October 1977): 205-208. Early calls for increased regulation were not exclusive to the context of water pollution, however, for the erosion crisis also elicited such proposals. See GAO, *To Protect Tomorrow's Food Supply*.

[77] Howard P. Johnson, an agricultural engineer, quoted in Risser, "Soil Erosion," 6.

use their land." The NACD tended to realize that some compulsory action could be beneficial "as backup efforts," but the organization's leadership maintained, "Voluntary programs work if they are given a chance." The NACD's rationale was part pragmatic, part philosophical. First, they realized from years of experience the importance of using farmers' independent mentalities to their advantage. Second, they worried that compulsory measures might lead to the centralization of USDA power, an abandonment of the "local-state-federal partnership" that was at the heart of the conservation-industrial complex.[78]

Calls for increased regulation typically came from those who worked less closely with farmers and from outside the bureaucratic framework of the USDA. University researchers were often among the most vocal. They countered the NACD's rationale for voluntary measures, suggesting that the status quo was what led to the erosion and pollution crises in the first place. "Doing more of what has been done in the past," reasoned two Penn State economists, "is not going to…reduce agricultural pollution to socially acceptable levels."[79] Others pointed to the state of industrialized agriculture as reasons to regulate farmers. "The days of completely voluntary conservation programs are numbered, if not over," a Michigan State University economist argued. "The American people expect the farmer to exhibit greater social responsibility in erosion reduction, just as they expect industries to reduce pollution." Put another way, "Congress has tended to treat the farmer as a ward rather than what he is: a businessman." When considered from this perspective, proponents of regulation could find no good reason why agricultural producers should be treated differently than other producers who adhered to the industrial ideal.[80]

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[78] Anonymous farmer quoted in Junko Goto, "Soil and Water Conservation Programs in Action: The Vernon County Wisconsin Experience," (Master's thesis, University of Wisconsin-Madison, 1981), 141; Bauer, "Foreword," xii, xiii.

[79] Epp and Shortie, "Agricultural Nonpoint Pollution Control," 111.

[80] Lawrence W. Libby, "Who Should Pay for Soil Conservation?" *JSWC* 35 (July-August 1980): 156; Lindsey Grant, "Speculators in the Cornfield," *JSWC* 34 (March-April 1979): 53. I borrow the phrase "industrial ideal" from Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003).

The debate over compulsory conservation raged until 1985, when a compromise was reached in the Farm Bill. Congress understood that neither the carrot nor the stick had broad support independently, so it combined the two into a system called "cross-compliance." Soil and water conservation would remain voluntary, but failure to comply would disqualify farmers from receiving *any* USDA payments. For years, policymakers had been proposing cross-compliance as one of a handful of solutions to the impasse in the voluntary/regulatory debate. The 1985 Farm Bill provided the opportunity to codify the idea into policy.[81]

The passage of the 1985 Farm Bill depended on a "conservation coalition" between utilitarian conservationists and environmentalists. This alliance taught each side that their goals were not mutually exclusive, but rather could be complementary. The Farm Bill, the legislation that established a five-year framework for American agricultural policy, contained a number of provisions designed to protect the natural world. In addition to cross-compliance, the bill included a "sodbuster" provision to protect highly erodible lands from cultivation, a "swampbuster" provision to guard against drainage of wetlands, and the Conservation Reserve Program (CRP), which paid farmers to take land out of production. The conservation coalition had worked hard to implement these provisions, yet it remained unsure whether they all would pass. As an important Senate committee approved each of them, one observer noted, it left the ecstatic "environmental gallery…in a full, gape-mouthed swoon." One professional soil conservationist praised the Farm Bill as "the most conservation-oriented farm legislation in the history of the United States."[82] After

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[81] For earlier deliberations of cross-compliance, see Grant, "Speculators in the Cornfield," 53; Libby, "Who Should Pay," 157; Sampson, *Farmland or Wasteland*, 316-317; and Kenneth A. Cook, "Conservation Policy Under a Tightening Belt," *JSWC* 36(3): 150. On the passage of the 1985 Farm Bill, see Helms, "New Authorities and New Roles," 158-168.

[82] Ken Cook, "Pinch Me, I Must Be Dreaming!" *JSWC* 41 (March-April 1986), 93; Thomas A. Hurford, "Coherent Farm Conservation Policy, At Last," *JSWC* 41 (July-August 1986): 238. On the conservation coalition, see Helms, "New Authorities and New Roles," 162-164.

years of contentiousness, it at last appeared that environmental and utilitarian policies had merged as one.

The administration of the 1985 Farm Bill, however, yielded far less promising results. Most of the shortcomings in the Soil Conservation Service's administration of the law stemmed from the logistical challenges in implementing the cross-compliance provisions. In order to be eligible for continued USDA benefits, farmers needed to create an agency-approved conservation plan by January 1990 and fully implement it by January 1995, and Congress mandated that SCS technicians help farmers meet these deadlines. The problem was that SCS field offices were understaffed and overworked. The agency estimated that, in addition to its typical duties, executing the compliance provisions would consume approximately seventy percent of its roughly seven thousand employees' time until the 1995. While Jamie Whitten successfully fended off the Reagan Administration's proposed budget cuts to soil conservation programs—for example, appropriating over $600 million in 1987 when Reagan's budget called for only $475 million—the bulk of these dollars went toward beefing up Whitten's beloved ACP payments rather than augmenting SCS technical staff.[83]

Congress's underfunded mandates had a number of effects of the administration of the Farm Bill. First, the SCS prioritized farm-plan creation over other features of the law, particularly the swampbuster provision. By the early 1990s, a number of observers noted the lack of attention to stemming wetlands drainage. The General Accounting Office, for instance, reported that by 1990 the Soil Conservation Service had identified less than ten percent of the nation's wetlands subject to swampbuster protection and that the agency applied inconsistent standards in classifying wetlands.

[83] On the challenges of implementing the Farm Bill provisions, see Helms, "New Authorities and New Roles," 164-165; Helms, "Conserving the Plains," 73. On Jamie Whitten, see Joe Atkins, "Lesson 1: Don't Mess with Whitten," *Jackson (Miss.) Clarion-Ledger*, 10 January 1988, sec. H, p. 3. The Mississippi congressman proved so protective of the Agricultural Conservation Program that in 1986 he threatened to slash the CRP program out of fear that the new program would, as a USDA official put it, "eliminate some of the programs that Whitten rightly considers himself the father of." Anonymous official, as quoted in Ward Sinclair, "Soil Conservation Plan Stirs a Dust-Up on Hill," *Washington Post*, 20 March 1986, sec. A, p. 4.

Other observers pointed to "a number of…glaring loopholes" that hindered the effectiveness of the wetlands-protection provisions.[84]

What's more, even the SCS's prioritization of farm plans over swampbuster implementation did not often translate into high-quality work. Many field agents had to rush farm planning in an effort to meet the January 1990 deadline. Researchers in Wisconsin, for example, concluded that conservation offices lacked sufficient resources—"time, money, staff, equipment, expertise"—to fulfill their expectations. SCS field staff understood how the Farm Bill had transformed their work. "I would describe my conservation plans as 'quick and dirty,'" confessed a technician. "There just isn't time to do the job the way it should be done…. I really don't know sometimes if what I've determined for a given farm is sound. You just have to hope you do OK on average." The Soil Conservation Service even began lowering its standards of tolerable soil loss in an effort to obtain compliance from farmers, many of whom had never cooperated with the SCS and were now forced to comply in order to remain eligible for federal subsidies.[85] A number of farmers also adopted what the president of the NACD called "a wait-and-see attitude," remaining skeptical that the USDA would actually enforce the law's most stringent provisions.[86]

Old-guard conservationists eyed these developments with ambivalence. A retired SCS field technician who started his career in the 1930s, for instance, witnessed the changes sparked by the 1985 Farm Bill, which he believed had created "a 'pretend' SCS, an 'almost' conservation." The

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[84] United States General Accounting Office, *Farm Programs: Conservation Compliance Provisions Could Be Made More Effective*, GAO/RCED-90-206 (Washington, D.C.: US General Accounting Office, 1990), 4-5; Ann Y. Robinson, "Wetlands Protection: What Success?" *JSWC* 48 no. 4 (1993): 270.

[85] Stephen J. Ventura and David A. Giampetroni, "Wisconsin Conservationists Respond to Field Office Overload," *JSWC* 48 no. 2 (1993): 83-89, quoted on 86, 88. On the lowered standards of tolerable erosion, see Frederick R. Steiner, *Soil Conservation in the United States: Policy and Planning* (Baltimore: Johns Hopkins University Press, 1990), 178-180.

[86] Clarence Durban, as quoted in Steiner, Soil Conservation in the United States, 177-178. See also J. Dixon Esseks and Steven E. Kraft, "Midwestern Farmers' Perceptions of Monitoring for Conservation Compliance," *JSWC* 48 (September-October 1993): 458-465.

basic problem, Roy Dingle argued in 1991, was that "the field staff [had become] an office staff." In order to fulfill its congressional mandates under the 1985 Farm Bill, he explained, the SCS offered farmers

> A conservation plan where you filled in a few blanks and signed here, or even worse, a plan that you received in the mail from a person…who had never set foot on your land. Thousands, maybe millions of paper plans filled the files to overflowing. Staff people had no idea where the people who were given the plans lived or of their aims and aspirations. But everybody got their conservation plan by the deadline.[87]

From the perspective of those who spent their careers designing conservation plans fitted to each farm, the Farm Bill did not strengthen and extend soil and water conservation as many had hoped. It watered it down.

While Congress passed the 1985 Farm Bill amid acclamations over the opportunities to merge environmental concerns with utilitarian objectives, its actual administration proved far more challenging. To be sure, some aspects of the law proved highly successful, particularly the Conservation Reserve Program. Already by 1990, landowners had agreed to remove thirty-four million acres of highly erodible land from production for a period of ten-to-fifteen years.[88] Yet, other aspects of the law were much more difficult to administer. Conservation-compliance had emerged as a compromise between proposals for voluntary and regulatory conservation. Many observers had hoped conservation-compliance would bring the conservation-industrial complex in line with the sort of environmental quality advocated by environmentalists. While Congress had proved itself ready over the past several decades to commit vast sums of money to conservation agencies and programs when the economic returns on investment were high, it was unwilling to do the same for programs with the potential to curtail production.

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[87] Dingle, *Nothing But Conservation*, 342-343.

[88] Bruce L. Gardner, *American Agriculture in the Twentieth Century: How It Flourished and What It Cost* (Cambridge: Harvard University Press), 211.

Conclusion

The conservation-industrial complex, especially the Soil Conservation Service, experienced a series of crises between 1970 and 1990. Starting around 1970, the SCS came under fire from wildlife enthusiasts and biologists for its stream channelization activities, a cornerstone of the Small Watershed Program. Later in the decade, the USDA encouraged maximized production, hoping that the Produce More, Protect More campaign would enable the conservation-industrial complex to keep erosion in check. By the end of the 1970s, a growing awareness of severe rates of erosion made it clear to myriad observers that the complex was ill equipped for the capital-intensive, technology-intensive, export-oriented regime of industrialized farming that dominated American agriculture. Finally, members of the conservation-industrial complex were aware of agricultural water pollution starting in the early 1960s, but they considered it a secondary problem. During the 1970s and early 1980s, however, mounting national concern over water pollution brought the failures of soil and water conservation into sharp relief. These crises forced the conservation-industrial complex to pursue not only efficient economic production, but increasingly environmental quality, as well. If the story ended with the passage of the 1985 Farm Bill, it might even seem that the Soil Conservation Service and its allies had abandoned their utilitarian bent altogether. After all, removing vulnerable lands from production and preserving wetlands for wildlife habitat certainly appealed to those who valued environmental protection for non-economic purposes.

Yet, while the goals and discourse of conservation had gravitated toward environmental quality, the conservation-industrial complex remained fully committed to utilitarian ideas and practices. As the SCS's lack of adequate funding and staffing in the 1980s suggested, support for conservation efforts without clear and immediate economic benefits often proved tepid. Moreover, when farmers remained in compliance with the Farm Bill, it was often because they adopted conservation tillage, the crowning technological achievement of the conservation-industrial complex's utilitarian ethos.[89] By obviating or reducing the need for plowing, tillage helped fight erosion, and with capital-intensive machinery and chemicals, it helped maintain high yields. Moreover, the farm-equipment and agrochemical industries also stood to profit handsomely from conservation tillage. In short, while the discourse of conservation embraced ideals of environmental quality during the 1970s and 1980s, the conservation-industrial complex was not willing to abandon the utilitarian vision on which its strength was based.

Despite the continuity in the complex's dual objective of economic production and environmental protection, its structure of authority underwent considerable change between 1970 and 1990. Specifically, the trifold crises of stream channelization, soil erosion, and water pollution challenged the legitimacy of the Soil Conservation Service as a protector of the environment. The agency had long enjoyed considerable institutional authority within the conservation-industrial complex. Starting in the 1970s, however, policymaking was steered less by institutions and more by interest groups. The conservation-industrial complex still embodied an associative order, but during the 1970s and 1980s, that associational structure became much less orderly.

From the beginning of Hugh Bennett's crusade in the 1920s until the administration of the 1985 Farm Bill, the discourse—and thereby, the meaning—of conservation had evolved in response to shifting national priorities. The conservation-industrial complex was thus able to carve out its place in an ever-changing American society. Nevertheless, its basic features remained constant. Conservation advocates remained committed to a utilitarian vision that merged economic production and environmental protection. They united in an associative state that blended public and private interests and authorities. And they pursued programs that would be compatible with the goals and practices of industrialized agriculture.

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[89] As former SCS historian Douglas Helms noted in 2010, "Conservation tillage made it possible for many farmers to comply with the law." Quoted in Lynn Betts, "Happy 75th to the NRCS," *Wisconsin Agriculturist* 241 (April 2010): 30.

These ideas and policies did not alone put conservation on the land, however. As Part II demonstrates, the conservation-industrial complex also depended on three crucial elements: technologies, farmers, and politicians. These technological, social, and political relationships were shaped in important ways by various geological, climatic, biological, and hydrologic features of the natural world.

PART II
NATURE & THE CONSERVATION-INDUSTRIAL COMPLEX

4

Practicality and Power: Terracing, Tillage, and the Technology of the Conservation-Industrial Complex

In June 1929, Hugh Hammond Bennett and two other officials in the US Department of Agriculture (USDA) drafted a project plan for "Soil Erosion and Moisture Conservation Investigations." Congress had just allocated $160,000 to study the mechanics of soil erosion, and now it was time to develop an outline to guide the studies at several erosion experiment stations scattered throughout the country. The authors acknowledged that "some work was done on erosion" prior to the inaugural experiment station at Guthrie, Oklahoma, which had opened just a few months earlier, "but not in a systematic way and not in relation to soil types, soil regions, and field conditions." Consequently, they explained, "nothing practical, seemingly, came of these efforts…. No enthusiasm was aroused about the [erosion] problem and no noticeably increased efforts of control followed in the fields." Alternatively, they predicted that systematic research conducted at the new experiment stations—in regions representative of the specific environmental conditions in which American farmers labored on a daily basis—would produce workable, effective results. "Without tying up investigations to soil types and regions," the officials argued, practical solutions would remain elusive and farmer support "impossible." The fate of the nascent soil conservation movement hinged upon its practicality.[1]

Even at its most formative stage, the success of the conservation-industrial complex depended directly on practical, effective technologies. While government assistance (financial and

[1] H. H. Bennett, A. G. McCall, and Henry G. Knight, "Bureau of Chemistry and Soils: Soil Erosion and Moisture Conservation Investigations, Project No. 33-2," (June 1929), 4; Box 6; Item 97; RG 114; NACP.

technical) and outreach helped persuade farmers to practice soil and water conservation, these overtures would have been meaningless without technology that was practical—harmonious with existing systems of agricultural production, effective in conserving the natural resources necessary for sustained production, and easily adapted to specific environmental and agricultural conditions. The centrality of technology to the conservation mission raises several questions. How did researchers in the burgeoning conservation-industrial complex devise practical technologies that farmers considered worthy of use on their own farms? Why did new technologies emerge when they did? How did these developments lay the literal and figurative groundwork for the conservation-industrial complex to generate the political and social influence it enjoyed after 1920?

Throughout the twentieth century, conservation researchers in government and industry designed technologies, especially terracing and conservation tillage, with an eye toward power. First, they sought to control the erosive physical power of water on soil, either by slowing down and redirecting the force of runoff water through terracing, or by protecting the soil surface from the force of pounding raindrops with conservation tillage. Second, as Hugh Bennett and his USDA colleagues realized in 1929, gaining more control over the physical power of water would lend conservation technicians greater influence with farmers and would generate increased investment of public resources in soil and water conservation. Physical power therefore laid the groundwork for social and political power. Finally, these technologies created new markets for machine power in American agriculture, fostering stronger links between the farm-equipment and petrochemical industries and the central conservation agencies of the federal government, particularly the Soil Conservation Service (SCS). Throughout the twentieth century, parties in the conservation-industrial complex therefore strove to develop, and then depended on, practical technologies to bolster and secure their power in American society.

Technology represented one of the major contributors to the success of the conservation-industrial complex.[2] Terraces and conservation tillage enabled an expansion of social and political influence wholly compatible with the associative order that structured soil and water conservation. Because these technologies reduced erosion and runoff without inordinately obstructing agricultural production, the conservation-industrial complex could rely on persuasion rather than regulation to spread conservation. State authority and influence could filter through the federal-state-local network in an inconspicuous manner, for these technologies complemented farmers' existing requirements for practical and effective modes of production. Put another way, technology appealed to producers' self-interest, thereby obviating the need for coercive approaches to erosion control. Moreover, because terracing and conservation tillage involved not only techniques but also equipment, they opened up new markets for the agricultural industry. Consequently, farm-machinery manufacturers and agrochemical producers became important allies of the USDA's conservation agencies. In short, conservation technology fostered both the public and private dimensions of the conservation-industrial complex.

Historians of the SCS have acknowledged the importance of conservation technologies to the success of the soil and water conservation movement, but they have dedicated far greater attention to conservation politics and outreach efforts than to the actual creation of these technologies. According such a narrative, the biggest obstacle to the triumph of conservation was cultural resistance, both on the part of politicians who controlled the purse strings and farmers who controlled their land use. Technology typically enjoys a brief window of scholarly attention from the inauguration of conservation experiment stations in 1929 until the establishment of the Soil Erosion Service in 1933, at which point authors move on to talk about politics, policy, and evangelism. Such

[2] The two other critical elements of the conservation-industrial complex—the social and political dynamics of conservation—are the topics of the next two chapters.

an approach relegates the development of conservation methods to an abridged historical period and appraises technology as an outcome rather than a process. It also treats technologies with an air of inevitability, as if they were predestined to fulfill their purpose as long as researchers had enough time and money. The drama in these interpretations centers on humans and their relationships with one another; culture is privileged over nature.[3]

What is lost, or at least subordinated, in existing examinations of conservation technology are people's physical relationships with the natural world. The objective here is not to trade one historical reductionism for another, for as this chapter and the next demonstrate, cultural resistance to new methods was often considerable and had to be overcome before the conservation-industrial complex could thrive. Rather, the goal is to elevate nature to its rightful place in the history of soil and water conservation by focusing on the evolution of the technology with which conservationists and farmers negotiated the natural world. Agricultural producers' livelihoods depended on daily interactions with the elements and forces of nature. Conservation researchers designed technologies such as terraces and conservation tillage to help farmers gain greater control over the physical power of the environment and to thereby foster their social influence in American society.

The connection between physical and social power is not new to historians. Indeed, in 2011 Edmund Russell and others proposed the concept of *power* as a means to unite the history of

[3] Take, for instance, Douglas Helms, who in one of his many articles discusses briefly the basic features of conservation technology before moving on to other matters, writing that "while technology has changed through the years, these essential elements still guide the soil conservation program." Helms, "Conserving the Plains: The Soil Conservation Service in the Great Plains," *Agricultural History* 64 (Spring 1990): 60-61. Sam Stalcup has recently added more depth to our understanding of conservation technologies, but with a few important exceptions, he focuses more on outcomes of research and their policy implications than on the processes of creating technology. See Stalcup, "Public Interest, Private Lands: Soil Conservation in the United States, 1890-1940," (PhD diss., University of Oklahoma, 2014), chapter 4, especially pp. 167-180 and 183-190. See also Lynne Heasley, *A Thousand Pieces of Paradise: Landscape and Property in the Kickapoo Valley* (Madison: University of Wisconsin Press, 2005), chapter 1; Kevin C. Armitage, "The Soil Doctor: Hugh Hammond Bennett, Soil Conservation, and the Search for a Democratic Science," in *New Natures: Joining Environmental History with Science and Technology Studies* eds. Dolly Jørgensen, Finn Arne Jørgensen, and Sara B. Pritchard (Pittsburgh: University of Pittsburgh Press, 2013), 87-102; and L. Donald Meyer and William C. Moldenhauer, "Soil Erosion by Water: The Research Experience," *Agricultural History* 59 (April 1985): 192-204.

technology with environmental history. Borrowing definitions from physicists, Russell and his colleagues consider the study of energy ("the capacity to do work") and its flows the key to understanding power ("energy put to work"). "All power, social as well as physical, derives from energy," they argue. "This power must originate in nature, especially the sun's solar energy." By following the flow of energy through natural and sociotechnical systems, the authors suggest, scholars can gain a greater understanding of power in its fullest sense.[4] In previous decades, other historians demonstrated how people have used another source of energy, gravity, and from it derived physical and social power, particularly by capturing the energy of falling water via dams.[5] Nevertheless, most scholars tend to overlook or take for granted the capacity of solar and gravitational energy to generate not only physical power, but also social and political power.

These two sources of energy—the sun and gravity—were fundamental to the processes of power in the history of conservation technology. Solar energy drives evaporation and evapotranspiration (evaporation from plants), transforming a molecule of liquid water into vapor by loading it with energy in the form of latent heat. As the molecule rises into the atmosphere, the air becomes cooler and the latent heat releases. When the molecule loses this energy, two things happen: the molecule converts back into a liquid, and the pull of gravity becomes greater than the energy within the molecule. The molecule falls back to the earth in the form of precipitation.

At this point, gravity and solar energy converge to create the potential for soil erosion. This can take place either by water falling vertically onto the earth or moving horizontally across it. First, as this molecule falls along with sextillions of others in the form of a raindrop, it picks up speed. If

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[4] Russell, et al., "The Nature of Power: Synthesizing the History of Technology and Environmental History," *Technology and Culture* 52 (April 2011), 248, 249, 259. For a useful primer on the intersections between environmental history and the history of technology, see Martin Reuss and Stephen H. Cutliffe, eds. *The Illusory Boundary: Environment and Technology in History* (Charlottesville: University of Virginia Press, 2010).

[5] See Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York: Hill and Wang, 1995); Theodore Steinberg, *Nature Incorporated: Industrialization and the Waters of New England* (Cambridge: Cambridge University Press, 1991); and Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (New York: Oxford University Press, 1985).

it hits bare soil, the raindrop can dislodge soil particles and cast them downslope. Over time, this process results in the slow, imperceptible process of sheet erosion. Second, after rainwater hits the soil surface (or after snow melts), it will either be absorbed into the soil or make its way downhill along the path of least resistance. In the latter scenario, the runoff water concentrates into channels that can have a cutting effect on exposed soils, washing away soil particles and creating rill or gully erosion.[6] Consequently, all technologies designed to prevent water erosion seek control over the energy of gravity and of the sun. They achieve this either by protecting soil from the pounding of raindrops, usually with vegetation, or by reducing the rate of runoff in order to increase absorption into the soil.

The ability of the conservation-industrial complex to derive power through the control of gravitational and solar energy is best illustrated through the case studies of two technologies—terracing and conservation tillage (Figure 13). Terracing was a form of geotechnology that reshaped a hillside into a series of steps, reducing the effective slope of a hill (and thereby the speed and energy of runoff water). Conservation tillage—the most technologically advanced variation of which was "no-till"—offered a way of planting and growing crops that obviated or reduced the need for plowing, thus maintaining a constant vegetative cover over the soil surface. Of the wide variety of conservation technologies, these two were among the most heavily promoted and widely adopted throughout the country.[7] They were the bookend technologies of conservation in the twentieth century; terracing offered the method of choice early in the soil and water conservation movement, and tillage became the technology *du jour* of the late twentieth century.

[6] See, for instance, Ben Osborn, "How Rainfall and Runoff Erode Soil," *USDA Yearbook of Agriculture 1955: Water* (Washington, D.C.: Government Printing Office, 1955), 126-135; and Hugh Hammond Bennett and Forrest G. Bell, *Raindrops and Erosion*, USDA Circular 895 (Washington, D.C.: Government Printing Office, 1951), 8-12.

[7] Other methods include strip-cropping and contour strip-cropping (see Chapter 5), contour plowing, grassed waterways, check dams and drop-inlet dams, pasture renovation, and vegetational buffers along streams and, in the case of wind erosion, fields.

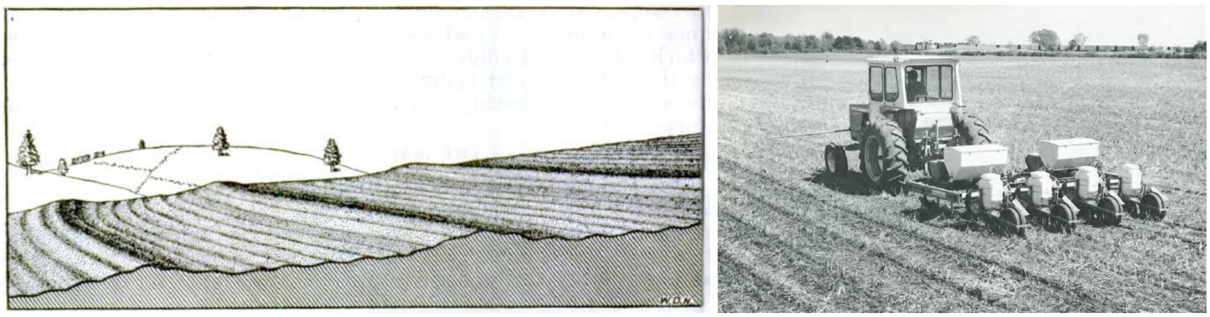

Figure 13: (Left) Artist's depiction of a terrace system, ca. 1931. (Right) A farmer planting corn with no-till methods, ca. 1973. Sources: Ramser, *Farm Terracing*, USDA Farmers' Bulletin 1669 (Washington, D.C.: Government Printing Office, 1931), 6; and S. H. Phillips and H. M. Young, Jr., *No-Tillage Farming* (Milwaukee, Wis.: Reiman Associates, 1973), 28.

Terracing and conservation tillage exemplified some of the core differences in conservation technology. The main technological distinction for much of the twentieth century was between mechanical solutions favored by engineers and vegetative solutions championed by soil scientists, biologists, and agronomists.[8] Terracing represented the former, a way of molding the land to fit the agriculture; tillage was an heir to the latter, the result of efforts to adapt the agriculture and land-use to fit the land. Yet, mechanical and vegetative solutions were never mutually exclusive, for conservationists often recommended, and farmers adopted, both at once. Likewise, as we shall see, tillage was a hybrid technology, achieving a vegetative solution through highly mechanical means.

Despite these differences, terracing and conservation tillage also shared much in common. Each technology required a certain level of expertise to implement, each became increasingly capital-intensive over time, and each emerged in the United States to a significant degree out of well-funded research conducted by government and industry. Finally, the practicality of both technologies was facilitated by specific external developments—the legacy of agricultural drainage in the case of terraces, and the 1970s energy crises in the case of tillage.

[8] Stalcup, "Public Interest, Private Lands," 167-190.

Focusing on the expert knowledge required to develop workable, replicable technologies is not to suggest that farmers were unwilling or unaware pawns in the conservation-industrial complex. As Chapter 5 demonstrates, farm people adopted new technologies on their own terms—rejecting technology that did not correspond with their visions of production, and embracing or modifying those that did.[9] Researchers understood this, which is precisely why they prized practicality. If a technology controlled erosion but obstructed a farmer's ability to make a living from his land, it would amount to little. Consequently, agricultural producers exerted a constant, often unspoken influence on conservation researchers, pressuring them to design and adapt their technologies to changing agricultural and economic conditions.

By designing for practicality, researchers and technicians bolstered the appeal of the conservation-industrial complex. It increased the likelihood that farmers would embrace soil and water conservation, which tightened the political and economic bonds between farmers, industry, and government. The practicality of technology and the power of the conservation-industrial complex were inextricably connected.

The Evolution of Terracing Technology and Expertise, 1885-1935

The three main features that constituted practical terracing technology were proper design and planning, appropriate terrace type given prevailing environmental and agricultural conditions, and the ability of farmers to construct them easily. From the late nineteenth through the middle of the twentieth century, these three aspects of terracing—design, type, and construction—gradually became more refined and sophisticated, due largely to the research efforts at federal-state experiment stations. But as knowledge of terracing grew, the practice of it became increasingly

[9] For other explorations of this theme, see Kendra Smith-Howard, *Pure and Modern Milk: An Environmental History since 1900* (New York: OUP, 2014); and J. L. Anderson, *Industrializing the Corn Belt: Agriculture, Technology, and Environment, 1945-1972* (DeKalb, Ill.: Northern Illinois University Press, 2009).

expert-dependent and capital-intensive. By the early 1930s, terrace design principles had advanced to the point that most farmers did not possess the engineering proficiency needed to independently design and build terraces that could reliably prevent the energy of runoff water from eroding soils. Likewise, federal researchers relied on and adapted to the farm equipment industry to refine terrace-construction methods, which not only made terracing dependent upon capital but also fostered the connections that tied together government, industry, and farmers. As agricultural researchers developed technologies that were more effective at controlling the power of running water, they thereby increased the social and political power of the conservation-industrial complex.

Terracing hardly represented a novel technology when conservation researchers started experiments in the 1910s and 1920s. In fact, it was the world's oldest and most widespread conservation technology. Many of the earliest terraces—the oldest record of which dates to at least 2,000 years ago in Arabia—were carved into mountainsides in order to create flat, arable land in the otherwise undulating landscapes of South and Southeast Asia, the Mediterranean, South and Central America, and the Caribbean. Thus, the terraces of the ancient world were typically designed to create new farmland, not to conserve the soils of existing fields.[10]

Terraces originated in the United States primarily in the US South. In the nineteenth century, southern planters began appreciating the power of falling and running water on soil and, accordingly, started building terraces to prevent erosion. This was particularly true in the Piedmont. Decades ago, historian Arthur R. Hall traced the development of this technology in the region, demonstrating that the ideas, principles, and tools behind terracing evolved out of the earlier

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[10] See J. R. McNeill and Verena Winiwarter, "Breaking the Sod: Humankind, History, and Soil," *Science* 304 (11 June 2004), 1628; Tim Beach, Sheryl Luzzadder-Beach, and Nicholas Dunning, "A Soils History of Mesoamerica and the Caribbean Islands," in *Soils and Societies: Perspectives from Environmental History* ed. J. R. McNeill and Verena Winiwarter (Isle of Harris, UK: White Horse Press, 2006), 51-90; J. R. McNeill, *The Mountains of the Mediterranean World: An Environmental History* (Cambridge: CUP, 1992); David R. Montgomery, *Dirt: The Erosion of Civilizations* (Berkeley: University of California Press, 2007), chapter 4; and Walter Clay Lowdermilk, *Conquest of the Land through 7,000 Years*, USDA Soil Conservation Service Agriculture Information Bulletin No. 99 (1953; Washington: GPO, 1994).

practices of contour plowing and hillside ditching. These measures were designed to increase the absorption of water into the ground and to dispose safely of excess water so that it would not wash away soil. By the Civil War, planters were starting to apply these principles to various versions of "level" terraces—those that formed a horizontal step across a hillside—and they helped spread the technology by sharing their experiences in the agricultural press. By the late nineteenth century, terraces were becoming a common feature throughout the agricultural landscape of the Southeast.[11]

In 1885, Priestly H. Mangum, a farmer from Wake Forest, North Carolina, constructed a different type of terrace that quickly proliferated throughout the Southeast. The so-called "Mangum terrace" (also called a "broad-base terrace") offers a useful tutorial on how terraces work (Figure 14). A farmer used a plow, a road-grader, or (by at least 1920) a special terracing instrument to create a mound of soil across a slope, following or slightly offset from the contour (a).[12] On the uphill side of the terrace embankment, he created a flattened or slightly concave drainage channel (b). Unlike bench terraces, which were level and designed to let water absorb into the ground, the Mangum terrace was "graded" so that runoff water drained off the terrace. As gravity pulled water downhill, the runoff flowed into the drainage channel and then off of the field (c) to terrace outlets (d). These outlets opened into a variety of locations, including road ditches, streams, wood lots, pastures, or even neighboring fields. In the early twentieth century, researchers would dedicate their efforts to refining these three major parts of a terrace system—the embankment, the channel, and the outlet.

Priestly Mangum designed his terrace in 1885 out of a desire for an erosion-control technology that integrated more seamlessly with the heavy machinery that was proliferating in

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[11] Hall, "Terracing in the Southern Piedmont," *Agricultural History* 23 (April 1949): 96-109. See also Paul S. Sutter, *Let Us Now Praise Famous Gullies: Georgia's "Little Grand Canyon" and the Soils of the South* (Athens: University of Georgia Press, forthcoming 2015); and Steven Stoll, *Larding the Lean Earth: Soil and Society in Nineteenth-Century America* (New York: Hill and Wang, 2002), 129-130, 140-142.

[12] The Corsicana Grader & Machine Company of Corsicana, Texas, organized and began manufacturing terracers in 1920, the earliest date I have seen. See [Iron Trade Review], "Here and There in Industry: Live Information Which Records the Expansion of Various Lines of Productive Enterprise," *The Iron Trade Review* 67 (1 July 1920), 124.

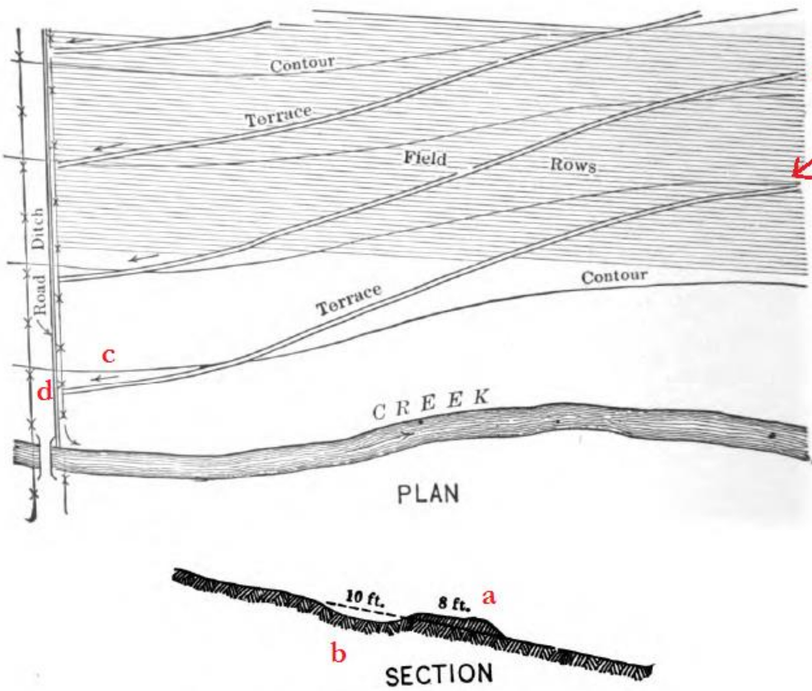

Figure 14: Plan and section views of the Mangum terrace. Farmers created a terrace (a) with a drainage channel (b) to the upslope side. As runoff water flowed downhill, it struck the channel and was directed downslope (c) toward an outlet ditch (d). Adapted from Charles Gleason Elliott, *Engineering for Land Drainage: A Manual for the Reclamation of Lands Injured by Water*, 2nd ed. (New York: John Wiley & Sons, 1912), 310.

American agriculture. He had recently purchased a wheat binder, and existing erosion control technologies apparently did not hold up under its weight. Compared to earlier bench terraces, the Mangum terrace offered two chief advantages. First, its low bank and wide, shallow drainage ditch made operation of machinery easier. Second, its gentle grade helped channel water away from the field, rather than letting it spill over the tops of the terraces as did bench terraces (Figures 14 and 15). Throughout the 1880s and 1890s, Mangum welcomed scores of visitors—farmers as well as researchers from the experiment station and agricultural college at Raleigh—to view his design, which by the turn of the century was growing in popularity. Farmers' reviews of the graded Mangum terrace were mixed, however. Sometimes the system held up well, but other times the system failed and made erosion conditions even worse. Consequently, until the 1930s, farmers and

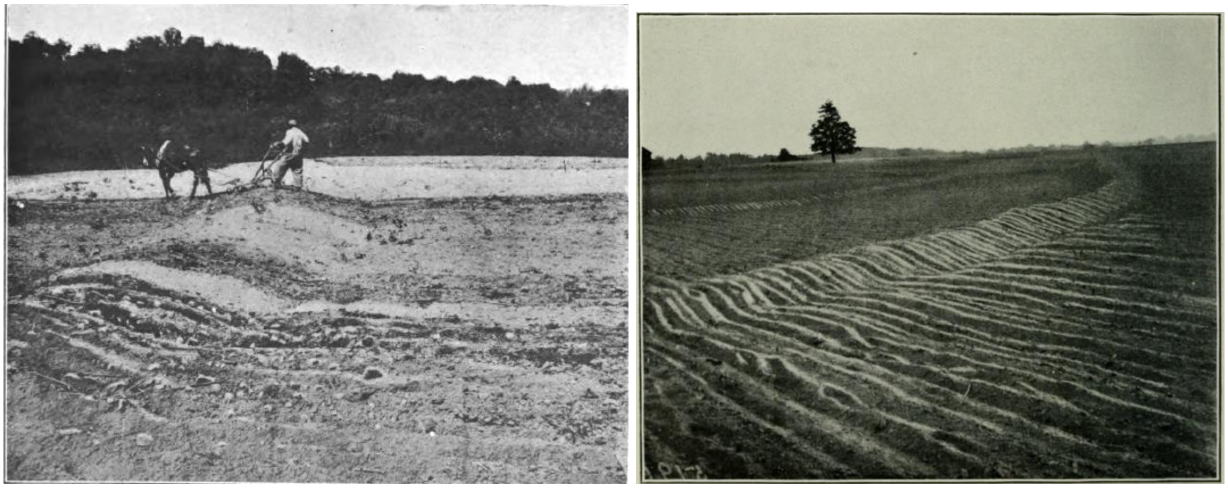

Figure 15: One of the original Mangum terraces, ca. 1912 (left); another system of Mangum terraces [location unknown], ca. 1913 (right). Note that this technology allowed farmers to plow across the terrace embankment. Despite the mule-drawn plow pictured (left), this feature also facilitated heavy machinery, which operated more efficiently with fewer obstructions in a field. Sources: J. S. Cates, *The Mangum Terrace in Its Relation to Efficient Farm Management*, USDA Bureau of Plant Industry Circular 94 (Washington, D.C.: Government Printing Office, 1912), 9; R. O. E. Davis, "Economic Waste from Soil Erosion," in *Yearbook of the United States Department of Agriculture 1913* (Washington, D.C.: GPO, 1914), Plate XXVIII.

researchers disputed whether graded or level terraces offered the best choice for Piedmont plantations.[13]

This question would only be settled after researchers diagnosed the causes of terrace failures, which they claimed were common. Most of the weaknesses with terracing technology around the turn of the twentieth century were due to improper design, incomplete construction, or poor maintenance. These problems owed to the inability (and, in some cases, unwillingness) of both farmers and agricultural experts to translate the general principles of terracing into actual practice in specific environmental and agricultural conditions. The same system installed on one plantation would function differently on a farm with varying slope, soils, crop choice, machinery, and precipitation. "We cannot lay down any rule for governing this work," cautioned the superintendent

[13] Hall, "Terracing in the Southern Piedmont," 103-104, 108; F. E. Emery, *Hillside Terraces or Ditches*, Bulletin No. 121 (Raleigh: North Carolina Agricultural Experiment Station, October 1895), 319; C. E. Ramser, *Prevention of the Erosion of Farm Lands by Terracing*, USDA Bulletin No. 512 (Washington, D.C.: GPO, April 1917), 6.

of the North Carolina experimental farm in a 1904 terracing bulletin, for with "so many farms to be terraced…[there are] so many different conditions have we to contend with."[14] Local environmental diversity—even within a region of similar soils, climate, and agriculture—thus had significant bearing on the success of terracing. Unless planters had the patience, knowledge, or serendipity to adapt successfully the principles of terracing to their unique conditions, they risked and often experienced failure.[15]

Terrace failure in the late nineteenth and early twentieth-century Piedmont took many forms, all of which related to the flow of water over land. One common design flaw was excessive spacing between terraces, which meant each terrace was tasked with retaining too much water. Another included improper grading, which resulted in water flowing off the terrace too quickly (causing drainage-channel erosion) or too slowly (causing ponding and breaching of terraces). Still other failures stemmed from inadequate drainage channel capacity, which meant water washed away soils rather than flowing smoothly to the terrace outlet, or insufficient terrace outlets, which could result in terraces channeling water safely to the edge of a field only to cause a gully that crept back into the field or into adjacent fields or roads. It thus comes as no surprise that, as conservation engineers learned more about proper terrace design, they determined that many early terracing efforts "resulted in an accelerated erosion process rather than a corrective measure."[16] Researchers believed that a poorly designed terrace system could cause more damage than none whatsoever.

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[14] F. T. Meacham, "Terracing and Other Means of Preventing Lands from Washing," in *The Bulletin of the North Carolina State Board of Agriculture, Raleigh* (Raleigh: North Carolina Department of Agriculture, October 1904), 27.

[15] On the commonality of terrace failures, see Stanley W. Trimble, *Man-Induced Soil Erosion on the Southern Piedmont, 1700-1970* ([Ankeny, Ia.]: Soil Conservation Society of America, 1974), Appendix B, 148-150; and Paul S. Sutter, "What Gullies Mean: Georgia's 'Little Grand Canyon' and Southern Environmental History," *Journal of Southern History* 76 (August 2010), 601.

[16] In the spring of 1940, the Soil Conservation Service conducted a study of 524 terraced fields constructed by farmers in the Southeast before 1933 and found that, for many design principles, over half or even three-quarters of the terraces were inadequate. This reinforced observations made as early as the 1910s. Arvy Carnes and W. A. Weld, "A Study of Old Farmer-Built Terraces in the Southeast," [1940], quoted on 1; b1; Item 102; RG 114; NACP. See also F. R. Baker, *The Prevention and Control of Erosion in North Carolina, with Special Reference to Terracing*, Bulletin 235 (Raleigh: North

In essence, terraces failed because they were unable to withstand, absorb, or redirect the energy of running water. When that energy was put to work on soils—that is, when it created *power*—the power of nature surpassed that of many Piedmont planters to prevent soil erosion reliably. Before the embryonic conservation-industrial complex could ascend to social, political, and economic power, it would need to regulate the power of falling water more effectively. Researchers achieved this not by abandoning imperfect terracing technology, but by refining it.

Some of the biggest strides in terracing technology during the 1910s emerged from the existing science of agricultural drainage. If the predominant reason a terrace breached or otherwise failed to fulfill its purpose was its inability to handle the erosive power of water, the solution was to design terraces so they would withstand that power. To accomplish this, conservation technicians first needed to calculate how much water could be expected to flow over a field, and then they needed to know what how to design a terrace to accommodate the expected runoff. Drainage engineers had a deep reservoir of experience in these areas. The federal government had incentivized and subsidized wetland and farm drainage since the middle of the nineteenth century, and by the early twentieth century drainage engineering was becoming an increasingly rationalized science.[17] Consequently, as the USDA sought to help farmers drain water more effectively from

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Carolina Agricultural Experiment Station, August 1916), 8, 27; John W. Carpenter, Jr. and E. R. Gross, *The Terrace in Mississippi*, Extension Bulletin 9 ([State College, Miss.]: Mississippi Agricultural and Mechanical College Extension Department, November 1918), 3, 18; and C. E. Ramser, "Terrace Failures Often Result from Errors in Planning and Building," *USDA Yearbook of Agriculture 1931* (Washington, D.C.: GPO, 1931), 508-512.

[17] On the history of wetlands and drainage in the US, see Ann Vileisis, *Discovering the Unknown Landscape: A History of America's Wetlands* (Washington, D.C.: Island Press, 1997); and Anthony E. Carlson, "The Other Kind of Reclamation: Wetlands Drainage and National Water Policy, 1902-1912," *Agricultural History* 84 (Fall 2010): 451-478. On the increased rationalization of drainage engineering, compare the prefaces to the first and second editions of Charles Elliott's *Engineering for Land Drainage*. In the 1903 edition, Elliott conceded, "The hydraulics of drainage cannot be computed with as much accuracy as may be done in some other branches of engineering, owing to the uncertain data available and the variable conditions which must be met." The state of the field changed considerably in the following decade, thanks especially to the USDA's entry into drainage investigations in 1904. "Since the preparation of the first edition of this book," Elliott wrote in 1912, "the development and extension of land drainage have been continuous and substantial. In the course of this progress much additional data of use to engineers have become available." Elliott, *Engineering for Land Drainage: A Manual for the Reclamation of Lands Injured by Water* (New York: John Wiley & Sons, 1903),

hillsides, it turned to the theories and formulas of engineers with experience draining water from low-lying areas.

No individual embodied this shift from agricultural drainage to terracing more completely than Charles E. Ramser. Ramser was born in 1885, grew up on a farm near Montezuma, Iowa, earned a degree in civil engineering from the University of Illinois in 1909, and was hired by the USDA as a drainage engineer in 1913.[18] As with the discipline of engineering more generally, Ramser pursued order and rationality by reducing complex systems to their constituent parts. In agricultural drainage, the engineers' goal was to move water out of the system as quickly and as efficiently as possible in order to limit damage to crops. Consequently, the most important components of a system were the maximum volume and velocity of runoff. If engineers could calculate these values with accuracy, they would have the data they needed to design and construct drainage ditches capable of ushering away water efficiently.

Charles Ramser's greatest contribution to drainage engineering, and ultimately terracing, was to improve the formulas that engineers used to determine the flow of water through channels. Engineers had long understood that the rate of runoff was determined by the hydraulic radius of a channel, the slope of the channel, and a final variable that depended on local conditions—a set of relationships captured by the "Chezy formula." For open channels such as drainage ditches, "Kutter's formula" offered the preferred means of calculating the final variable. The problem, however, was that Kutter's formula itself included a factor (called the "roughness coefficient," represented by *n*) that confounded engineers (Figure 16). "No little uncertainty attends the selection of the correct value of *n* for open channels, because of their variable character," wrote a drainage

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iii; and Elliott, *Engineering for Land Drainage: A Manual for the Reclamation of Lands Injured by Water* 2nd ed. (New York: John Wiley & Sons, 1912), iii.

18 Sam Stalcup also emphasizes Ramser's importance to advances in terracing technology. Stalcup, "Public Interest, Private Lands," 175-176.

The Chezy formula

$$v = c\sqrt{rs}$$

c = a variable coefficient,

r = hydraulic radius $= \frac{a}{p} = \frac{\text{area}}{\text{wet perimeter}}$,

s = slope $= \frac{h}{l}$ = fall of water surface per unit of length.

With Kutter's formula substituted for *c*

$$v = \left\{ \frac{\frac{1.811}{n} + 41.6 + \frac{.00281}{s}}{1 + \left\{ 41.6 + \frac{.00281}{s} \right\} \frac{n}{\sqrt{r}}} \right\} \sqrt{rs}$$

n = coefficient of roughness

Figure 16: The Chezy formula (left), and the Chezy formula with Kutter's formula substituted for *c* (right). Each of these formulas determine the velocity (*v*) of water in a stream channel. These formulas were widely accepted by engineers in 1913 when Ramser started working for the USDA, but it remained unknown how to accurately calculate *n*, the "roughness coefficient." Adapted from Elliott, *Engineering for Land Drainage* (1912), 147-148.

engineer in a 1912 manual. If engineers chose the wrong *n*-value for their drainage system, their entire design might be compromised. "The results obtained by the use of [Kutter's] formula," Ramser stated after over fifteen years of studying the roughness coefficient, "are…affected to such a degree by the coefficient of roughness, *n*, that the selection of the correct value for this factor is a matter of the highest importance." If engineers chose an inaccurate *n*-value, their drainage channels could fail to cope with the power of running water and their credibility could be tarnished.[19]

Ramser sought to refine drainage systems by demonstrating to engineers how to calculate an accurate roughness coefficient. "To do this," he wrote in 1916, "it is necessary to determine *r*, *s*, and *v* [the channel radius, slope, and velocity, respectively] by actual field measurements," because this allowed engineers to solve the Chezy equation for *n* (Figure 16). Between 1913 and 1915, Ramser conducted a series of field experiments in Mississippi to derive the roughness coefficients for drainage ditches under a variety of conditions. While these data certainly benefited the drainage systems under examination, Ramser stressed that his studies served a broader purpose. Now that he

[19] Elliott, *Engineering for Land Drainage* (1912), 147-148; Ramser, *Flow of Water in Drainage Channels: The Results of Experiments to Determine the Roughness Coefficient* n *in Kutter's Formula*, USDA Technical Bulletin No. 129 (Washington, D.C.: GPO, November 1929), 1.

had calculated the roughness coefficients for several different drainage systems, he explained, "These values can be used as a guide in the design of drainage channels where like conditions can reasonably be expected to exist."[20] For the next several years, Ramser directed studies to determine accurate *n*-values for drainage channels throughout the Southeast and Midwest, where major drainage efforts were underway.[21] By developing a more accurate means of determining roughness coefficients, which had previously eluded engineers, Ramser increased the functionality and practicality of drainage systems.

This increased understanding of runoff water directly influenced the refinement of terracing technology. In 1915, on the heels of his drainage investigations in Mississippi, the USDA's Office of Experiment Stations dispatched Ramser on a tour through North and South Carolina, Georgia, Alabama, and Mississippi. His mission was to survey the many types of terraces farmers had adopted and to "[deduct] from a close study of the field data comprehensive and definite instructions for the design and construction of adequate and efficient systems of terraces." The similarities between his approach to terracing and drainage were significant. Essentially, the terrace channel served the same function and operated under the same hydraulic principles as the drainage ditch. Each had to be of sufficient "size and grade…[to] conduct the surface water slowly to a drainage outlet" without experiencing a spillover. Ramser was therefore able to apply the Chezy and

[20] Ramser conducted these experiments in Bolivar County (in the Mississippi Delta) and Lee County (in northeastern hill section). Ramser, "Report on Run-Off Investigations and Determinations of the Roughness Coefficient for Kutter's Formula in Bolivar County, Mississippi," (April 1916), quoted on 24, 35; b1; Item 151; RG 114; NACP; Ramser, "Studies of Dredged Drainage Ditches Before and After Clearing," in *Engineering News* 77 (18 January 1917), 104-105. As the Mississippi Delta underwent further drainage in following years, the USDA (with Ramser as the lead investigator) continued to turn to Bolivar County, Mississippi, to measure runoff rates and ascertain coefficients of roughness. See C. E. Ramser and B. S. Clayton, "Progress Report on Run-Off Investigations in Bolivar and Washington Counties, Mississippi," (1924); b69; Item 151; RG 114; NACP

[21] Ramser, *Flow of Water in Drainage Channels*, 9-98.

Kutter formulas toward improving terrace designs just as he had a few years earlier in improving drainage systems.[22]

The results of Ramser's terracing survey, published as a professional paper in 1917 and as a less technical farmers' bulletin in 1918, quickly became ensconced in the canon of soil and water conservation. These publications helped make terracing more systematic, demonstrating how a variety of variables—land slope and terrace spacing, lengths, and grades—interacted to determine the proper design of a terrace (Figure 17). In addition, one of Ramser's most noteworthy observations was the superiority of the "variable-grade terrace" to the "uniform-grade terrace." Both designs were meant to channel water off the field, but rather than maintaining a uniform grade throughout the length of the terrace, the drainage channels in variable-grade terraces became gradually steeper as they approached the terrace outlet. This modification helped accommodate the increased amount of water entering the channel "without the possibility of water overtopping the terrace." This resulted in slower, less erosive runoff, thereby bolstering the viability of terrace technology. While Ramser seems not to have anticipated it in 1917, the variable-grade terrace would ultimately become the standard design in the field.[23]

Although the transfer of hydraulics knowledge from drainage to erosion control contributed greatly toward the refinement of terrace *design*, it was less useful in helping conservation researchers determine the optimal terrace *type* for a given region. Whether a farmer should install a level terrace or a graded one, Charles Ramser noted in 1917, depended on the specific soils and topography of a field.[24] In other words, engineers' reductionism could provide the basic principles of terrace design,

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[22] Ramser, *Prevention of the Erosion of Farm Lands by Terracing*, USDA Bulletin No. 512 (Washington, D.C.: GPO, April 1917), 6, 23-25.

[23] Based largely on the notion that the primary purpose of terracing was to prevent soil and water losses, Ramser "recommended that the broad-base level-ridge terrace be used whenever the conditions of soil and topography will permit." By the 1930s, however, experiments revealed that level terraces too often drowned out crops, making them impractical. Ramser, *Prevention of the Erosion of Farm Lands by Terracing*, 23, 27-28, 32. The farmers' bulletin is Ramser, *Terracing Farm Lands*, USDA Farmers' Bulletin No. 997 (Washington, D.C.: GPO, August 1918).

[24] Ramser, *Prevention of the Erosion of Farm Lands*, 32, 39-40.

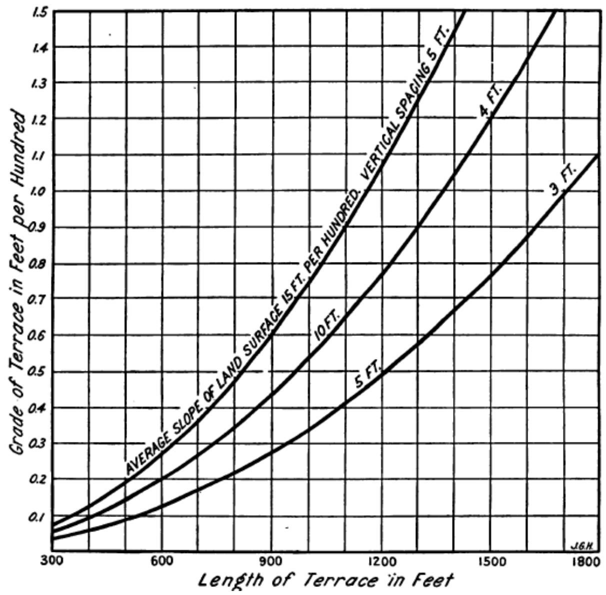

Figure 17: Curves for a uniformly graded terrace showing required grades for different spacing, land slopes, and lengths of terraces. Source: Ramser, *Prevention of the Erosion of Farm Lands by Terracing*, 26.

but the application of those designs on actual farms was highly contingent upon local and regional environmental conditions. Starting in the 1920s, conservation researchers in the USDA and at state land grant colleges conducted controlled experiments that revealed the optimal—and most practical—terrace types in given regions.

The earliest terracing experiments provided greater clarity into which types of terraces were best suited for different conditions. These tests began during 1926 in North Carolina and Texas. Researchers measured a variety of relationships in these experiments: runoff rates, soil loss, crop yields, and so on. One result of these experiments was to suggest the best terrace type for a given environment. Three years of studies at the state experiment station in Spur, Texas, for instance, revealed that level terraces were optimal. In a semiarid environment with a lower likelihood of rainwater overtopping a terrace embankment, the priority was not channeling runoff slowly away from a field, but increasing its absorption into the ground. At Spur, level terraces yielded more crops and reduced water and soil loss than did graded terraces.[25] As a result, the director of the station concluded they were more practical.

While the North Carolina and Texas experiments showed promise, those growing concerned with the state of soil erosion across the country deemed them too isolated to solve a much more widespread problem. Upon returning from a visit to the Spur, Texas, research station in December 1926, Hugh Hammond Bennett wrote to A. F. Woods, the USDA's Director of Scientific Research. Experimental work showed great potential, Bennett explained, for water erosion wreaked havoc even in semiarid environments. The Spur experiments were yielding "results that are proving astonishing to all who see them," for "no one out there had any idea of the enormous soil-removing power of running water in the subhumid region, even where…the land has the appearance of being level." If the erosive power of water caused damage even in a region where rainfall was relatively scarce, "it is a problem for national research if there ever was one," he lobbied Woods. "[W]hat must be had before the best practical work can be done is fundamental data relating to broad soil types and soil regions." The Spur station served as a model for his proposed program. "Since seeing the layout of the Texas work," Bennett urged, "I believe some large plots (perhaps of several acres each) will be needed in order to determine precisely what terraces of different build, on varying slopes, spread at varying intervals will accomplish."[26] Thus was born the idea to create a network of erosion-control experiment stations throughout the nation, a plan that resulted in the 1929 passage of the Buchanan Amendment. This network marked the beginnings of a federal-state partnership in erosion research between the USDA and land grant universities (Chapter 1).

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[25] R. E. Dickson, "The Results and Significance of the Spur (Texas) Run-Off and Erosion Experiments," *Journal of the American Society of Agronomy* 21 (October 1929), 421-422. I have only been able to locate records for the first year of terrace studies in North Carolina. In that first year, researchers apparently measured runoff rates only on terraces of different sizes, not of different types. See F. O. Bartel, *Third Progress Report on Soil Erosion and Run-Off Experiments at the North Carolina Experiment Station Farm, Raleigh, North Carolina, From June 1, 1926 to May 31, 1927* ([Raleigh, NC]: USDA Bureau of Public Roads and North Carolina Department of Agriculture, 1928), 31-32.

[26] Bennett to Dr. [A. F.] Woods, 28 December 1926, Box 1197, Erosion Folder; General Correspondence of the Office of the Secretary, 1906-70; Records of the Office of the Secretary of Agriculture, RG 16; NACP.

By the early 1930s, results from the eight original erosion experiment stations were providing greater clarity into what constituted a practical terrace. In 1931, Charles Ramser—now directing the USDA's engineering research at the experiment stations—had repeated his earlier sentiments that "the level terrace is most nearly an ideal terrace" because "it holds practically all of the soil and fertility on the field."[27] By the following year, however, conservation experiments were revealing that what was ideal was not always practical. For example, in Guthrie, Oklahoma, researchers found that, although "soil losses…increase with increase in the grade of terrace," level terraces kept water on the land so long that it "interfered with farming operations" and drowned crops. The stations at Temple, Texas, and Bethany, Missouri, reported similar "impractical" results from level terraces. Alternatively, researchers at several stations found that the variable-graded terraces Ramser had introduced in 1917, especially those with more gentle grades, performed better than uniform-graded ones.[28] Ramser's theorizing had helped advance terrace designs, but studies throughout the country were revealing that specific environmental conditions and farmers' need to produce would ultimately decide between level and graded terraces.

Experiments at the federal erosion stations finally settled the question of terrace type. In drier regions, where the primary goal was to maintain soil moisture and where the risk of extended torrential rainstorms was minimal, level terraces worked best. In humid areas, graded terraces might yield greater erosion through runoff, but by preventing waterlogged soils, they also yielded more crops. "Practical erosion control," reported the chief of the Bureau of Agricultural Engineering (BAE) in 1933, "is not merely a matter of preventing loss of soil from the fields, but of doing it in

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[27] Ramser, *Farm Terracing*, USDA Farmers' Bulletin No. 1669 (Washington, D.C.: Government Printing Office, July 1931), [front matter].

[28] S. H. McCrory, *Report of the Chief of the Bureau of Agricultural Engineering, 1932* (Washington, D.C.: GPO, 1932), 10-13.

such a way that the lands may be maintained in profitable production."[29] Conservation researchers had not only devised the proper specifications for terraces and the all-important drainage channel, but also determined which types of terraces were suitable for specific environmental conditions. The technology of terracing was becoming better equipped to counteract the erosive power of running water throughout much of the United States. In short, it was conferring to the nascent conservation-industrial complex practicality as well as power.

In the 1930s, a final adjustment to terrace design helped make the entire system more effective. Once a terrace channel collected runoff and conducted it safely to the edge of the field, the danger of erosion had not disappeared. In fact, in many instances it had increased, for the terrace had now concentrated runoff—with all of its erosive energy—from an entire slope into a relatively small area. Proper designs for terrace outlets thus became imperative to conservation researchers, especially after federal erosion-control work got underway in 1933 with the creation of the Soil Erosion Service (SES). "Unless measures are taken to control erosion in these outlet ditches," a federal engineer cautioned in 1934, "gully erosion is certain to follow." Gullies could begin in the drainage ditches themselves, or they could initiate at the outlet and grow back into the field (Figure 18). "Often entire fields or large parts of fields are completely destroyed for farming purposes by erosion which starts in the outlet ditches," the engineer warned.[30] After some subpar outlet construction on terracing projects in 1934, an SES administrator in Wisconsin admonished his engineering staff, "The matter of outlets is half the job of terracing…. We must be extremely careful with these or we will create a real problem for ourselves."[31] If some of the federal government's

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[29] S. H. McCrory, *Report of the Chief of the Bureau of Agricultural Engineering, 1933* (Washington, D.C.: GPO, 1933), 8-10; T. B. Chambers, "Terracing Practices Vary According to Conditions," *Soil Conservation* 1 (August 1935), 12-13.

[30] W. D. Ellison, "Work of the E.C.W. Soil Erosion Camps in Alabama, Mississippi, Oklahoma and Texas," (February 1934), 5; b4; Item 152; RG 114; NACP.

[31] R. H. Davis memorandum to Engineers, 28 June 1934; b7; RG 114; NARA-Chicago.

Figure 18: Farmers near Cleburne, Texas, used this former county road as a terrace outlet. Without proper protection from the increased runoff, it soon became a gully. Civilian Conservation Corps workers constructed the check dam pictured behind the man in the photo (ca. 1934) as a way to dampen the erosive power of runoff water. Source: Ellison, "Work of the E.C.W. Soil Erosion Camps in Alabama, Mississippi, Oklahoma and Texas," 4a.

forays into conservation outreach ended in disaster, Americans might begin to question the value of the burgeoning conservation-industrial complex.

Conservation researchers addressed the threat of inadequate terrace outlets in the same manner as they had refined terrace designs years earlier. They combined the hydraulic principles developed by drainage engineers with experiments at the federal erosion stations. Just as one of the first steps in a drainage project was locating a suitable outlet, engineers advised field technicians to design entire terrace systems around a well-located outlet.[32] In a similar manner, researchers at experiment stations concluded that, with sufficient planning, farmers and technicians could prevent outlet-ditch erosion by planting it to grass. At the Bethany, Missouri, experimental farm, researchers

[32] On outlets in drainage projects, see R. D. Marsden, "The Economy of Farm Drainage," in USDA Yearbook of Agriculture 1914 (Washington, D.C.: GPO, 1915), 254-255. On outlets in terracing projects, see Ramser, *Farm Terracing*, 11-12; and E. C. Johnson, "Soil Conservation Tips: Establish Outlets First—Then Terrace," USDA Soil Conservation Service Region 3 Regional Circular 36 (16 March 1937) [ts]; b1; Item 102; RG 114; NACP.

even developed a supplementary method of ditch protection in which technicians buried wooden planks on their edges across the width of a channel, slightly exposed above ground. This helped disperse any water that might concentrate to form a rill or gully, and it helped protect the sod in the channel. The same principle of decelerating runoff operated at a more pronounced level in the construction of check dams made from wood, masonry, or even temporary materials such as hay bales across outlet ditches (Figure 18).[33]

By the early 1930s, then, the principles of drainage hydraulics and the controlled experiments at USDA research stations had produced most of the foundations of terrace design. While historians have acknowledged (often superficially) the more obvious contributions of experiment stations, few have traced the origins of terracing expertise to agricultural drainage, despite the number of clues suggesting a close relationship.[34] First, the bureaucracy of the USDA reflected the relationship, as terracing and drainage were institutional bedfellows from 1915 to 1933.[35] Second, engineers' descriptions of terracing revealed their intellectual roots in the science of hydraulics. In 1933, the Bureau of Agricultural Engineering condensed the fundamentals of terracing into a short memorandum. "To control and prevent erosion," the document began,

> It is necessary to control the flow of the run-off water so that it cannot attain the velocity necessary to erode the soil over which it travels…. Controlling this run-off water is primarily a problem in hydraulics…and drainage, a branch of this science, is the key to the whole erosion control problem. In fact, erosion control is essentially properly planned hillside drainage…known as terracing.[36]

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33 Ramser, "Latest Results of Engineering Experiments," 11; Johnson, "Soil Conservation Tips," 1.

34 Sam Stalcup mentions a connection between Charles Ramser's early drainage activities and his later terracing research, but he does not explain the details of the relationship. Stalcup, "Public Interest, Private Lands," 175-176.

35 Drainage and terrace engineers operated as part of the Division of Agricultural Engineering in the Office of Public Roads and Rural Engineering from 1915 to 1918, when the parent office became the Bureau of Public Roads. This arrangement lasted until 1931. From 1931 to 1933, drainage and terrace engineers shared offices in the Division of Drainage and Soil Erosion Control under the Bureau of Agricultural Engineering. In 1933, terracing duties were transferred to the newly created Soil Erosion Service.

36 Bureau of Agricultural Engineering, "Principles of Soil Erosion Control," (1933), 1-2; b4; Item 152; RG 114; NACP.

The BAE even reduced the principles of channel-design to an equation clearly derived from the Chezy and Kutter's formulas and Ramser's work on the roughness coefficient.[37]

By 1933, the eve of massive federal outreach efforts and a new funding stream, conservation engineers understood that the past two decades of research had made possible a relationship between the USDA and farmers. The bridge between the two was terracing technology. "Terracing has been reduced by engineers to an essentially simple and easy farm practice," the BAE beamed in 1933. "Necessary variations in specifications, resulting from differences in topography, rainfall, soil, crops, and field operations, have been simplified until they are readily understood by the layman." Terracing now offered farmers "an effective and practical method of controlling soil erosion on cultivated land," but its research and development had depended on an infusion of federal resources.[38] In other words, terraces were a clear embodiment of the conservation-industrial complex.

Making the Complex Industrial: Terracing and Industry, 1930-1945

As terracing became more practical for farmers, it also grew more attractive to industry. Concomitant with the establishment of the federalist components of the nascent conservation-industrial complex—the federal-state-local network of USDA agencies, land grant universities, soil conservation districts, and individual farmers—was the formulation of public-private partnerships between the government and industry. This alliance was mutually beneficial. Through increased federal and state activity in soil and water conservation, farm-equipment manufacturers enjoyed new

[37] As the Bureau of Agricultural Engineering described it, the equation was $Q = CA\sqrt{RS}$, where "Q is the discharge in cubic feet per second [that is, the velocity of a channel], C is the coefficient representing the frictional resistance to flow, A is the cross-sectional area in square feet, R is the hydraulic radius depending upon the size and shape of [the] channel and S is the slope of the bottom of the channel." Bureau of Agricultural Engineering, "Principles of Soil Erosion Control," 3.

[38] BAE, "Principles of Soil Erosion Control," 5.

markets for their wares, free product testing at experiment stations, and the credibility of USDA research and expertise, which they leveraged repeatedly in their advertisements. Likewise, conservationists profited by their allies in industry whose specialty equipment enhanced the effectiveness of terracing, whose advertisements provided free publicity for government agencies and programs, and whose detailed, illustrated construction manuals reinforced the practicality of terracing. As government researchers developed terracing from a dubious technology to a practical and effective one, equipment manufacturers enlisted in the conservation effort. Put another way, they made the complex industrial.

The mutualism between conservation researchers and farm-equipment manufacturers assumed pronounced proportions with the establishment of erosion experiment stations starting in 1929. Throughout the 1920s, historian Deborah Fitzgerald has shown, "agricultural engineers created a professional system in which both academic and commercial interests concentrated on problems of mutual concern."[39] The machinery industry lobbied vigorously for the elevation of agricultural engineering to bureau status in the USDA, an achievement realized in 1931.[40] With the launch of federal research into erosion in 1929, equipment manufacturers and USDA researchers began to realize that conservation offered another avenue for cooperative ventures.

One of the chief benefits the farm-equipment industry enjoyed from erosion experiment stations was federally subsidized research. Experiment station staff provided what amounted to free product testing. In the process of testing on terrace designs and construction methods, researchers employed equipment that would be available to most farmers. At the experiment farm outside of La

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[39] Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003), 103.

[40] Among the companies and organizations that wrote to the Secretary of Agriculture in support of a Bureau of Agricultural Engineering in the late 1920s and early 1930s were Caterpillar Tractor, John Deere, J. I. Case, and the American Society of Agricultural Engineers. See F. A. Wirt to W. M. Jardine, 28 September 1927; [F. J.?] Fletcher [of Caterpillar Tractor] to Arthur M. Hyde, 15 April 1930; Raymond Olney [of the ASAE] to Hyde, 1 April 1930; and A. H. Head to Hyde, 30 March 1930. All letters are in boxes 1270 or 1500 of RG 16; NACP.

Crosse, Wisconsin, for instance, researchers tested out a Caterpillar terracer in 1932 and found it heavier and "more ruggedly constructed throughout" than other equipment. This offered "a decided advantage in terracing steep slopes where stones are present" because it "penetrated quickly after it had been lifted out by the stones." Overall, the researchers were impressed that the Caterpillar equipment "withstood the abuse given it," but they also discovered that a fastening beam bent too easily and "could be profitably strengthened."[41] These sorts of tests took place at each of the ten federal erosion stations. While the USDA's primary goal was to ascertain the best methods and equipment to make terracing more effective, these outdoor laboratories nevertheless provided a boon to companies trying to stake a claim in the emerging market of conservation.

When their products performed well, farm-equipment manufacturers leveraged their associations with federally sponsored research in their promotional materials. Indeed, a common theme in machine advertisements from the 1930s was the Department of Agriculture's growing involvement in erosion research and conservation outreach. Industry stood to gain by associating itself with the authority and credibility of the federal government, particularly in an era when Americans increasingly viewed Washington as a force for good. One of the companies that exploited this strategy most effectively was the Corsicana Grader & Machine Company. Many of the federal erosion stations used Corsicana equipment in their experiments, which the company noted with pride its advertisements (Figure 19). In one experiment, for instance, researchers towed a Corsicana terracer behind a powerful tractor to build a terrace. The implement "stood the strain of the increased load without giving in the slightest," the company boasted in a promotional

[41] G. E. Ryerson, "Progress Report for 1932 of Upper Mississippi Valley Soil Erosion Experiment Station located at La Crosse, Wisconsin," 31 December 1932, 25; b1; Otto R. Zeasman Papers, 1925-1966 Series 9/22/10 26G8, University of Wisconsin-Madison Steenbock Library, University Archives (hereafter referred to as "Zeasman Papers").

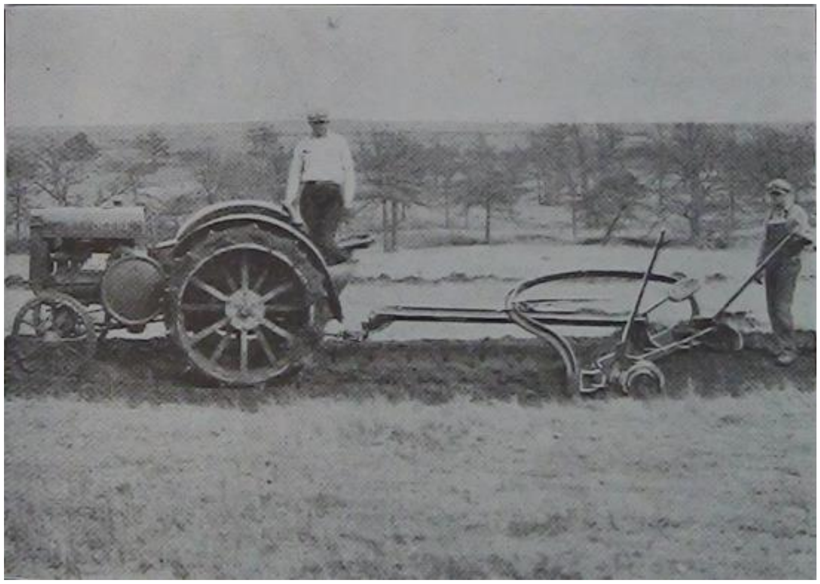

Figure 19: Many farm-equipment manufacturers sought to establish greater credibility with potential customers by associating themselves with the USDA and its erosion-control experiments. The original caption for this photo, which appeared in a Corsicana pamphlet (ca. 1930), reflected this attempt to profit by federal research: "The first regional station established under the Federal Appropriation Bill for Erosion Experiment Stations was at Guthrie, Oklahoma. Photo shows operations at work with a 'Corsicana' Model 'B' 8 ft. and a John Deere tractor." Source: Corsicana, *Soil Erosion*, 11.

pamphlet. "Proof of reserve strength, built in to stand the gaff of hard usage."[42] Federal research thus combined with private investments to refine the hardware on which the practice of terracing depended.

Farm-equipment manufacturers often supplemented their print advertisements with in-person demonstrations. In 1931, the American Society of Agricultural Engineers (ASAE), a network of professional engineers employed in both government and industry, issued a report on soil conservation in which it outlined the value of equipment demonstrations. "Manufacturers of equipment and machinery," ASAE exhorted, "can best place their products before the pubic by demonstrations *followed by* other publicity," especially when it came to "implements and power units

[42] For instance, see Corsicana, *Soil Erosion: Whittling Your Farm Away!* (Corsicana, Tex.: Stokes Printing Co., [1930?], 10; b1; Item 98; RG 114; NACP. See also Corsicana, *Is Your Profit Being Washed Away, Too?* (Corsicana, Tex.: Stokes Printing Co., [1930?], 1, 6; b8; Item 97; RG 114; NACP.

for constructing terraces and suitable implements for farming terraced land…. Field demonstrations are essential to the introduction of new equipment and implements before sales can be made." By cultivating familiarity with new technology, demonstrations primed customers to purchase machines. Thereafter, farmers would be more receptive to other forms of advertising, which the ASAE recommended should include "good informative pictures" and leverage "the economic side of soil conservation" whenever possible. In so doing, "the manufacturer…is making a contribution to an erosion control program" at the same time that it advanced its economic wellbeing.[43] Put differently, it was fostering the conservation-industrial complex.

A number of companies printed informational manuals that combined self-advertisement with tips and guidelines for proper terrace construction. Sometime in the late 1930s or early 1940s, for instance, Caterpillar Tractor released a fifty-five-page booklet that suggested farmers faced a choice: "crops…or canyons" (Figure 20). Despite the suggestive cover, the publication was not geared toward evangelizing, but toward the more practical matter of offering "suggestions for field procedures." Its pages were strewn with high-quality photographs that reflected the ability of terraces to control the power of water as much as they provided systematic instructions in the planning and construction of terrace embankments, channels, and outlets. With so many photographs, such a publication would likely have been cost-prohibitive for the federal government, but private industry faced no similar limitations. By pairing descriptive photography with the same detailed instructions that the USDA had offered in traditional bulletins, Caterpillar increased the chances that farmers would understand the process of terracing. This benefitted not only the

[43] ASAE, "Report of the Soil Erosion Committee of the Land Reclamation Division of the American Society of Agricultural Engineers" (June 1931), 11, 25, emphasis added; b4; Zeasman Papers.

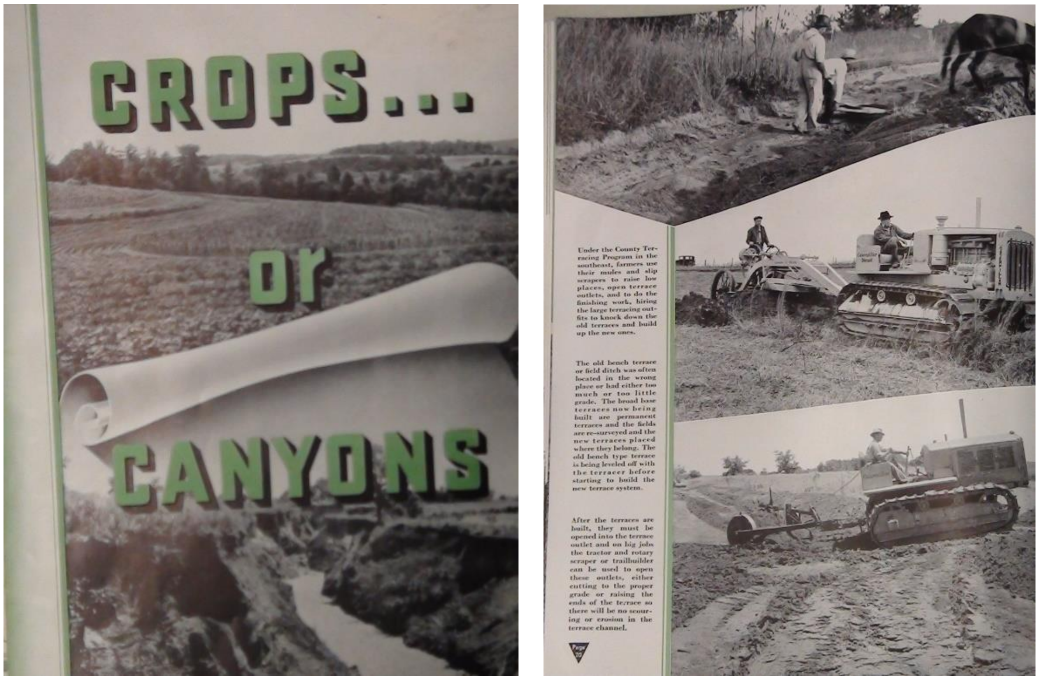

Figure 20: Despite the suggestive title and cover (left), Caterpillar Tractor sought with this booklet to provide systematic instructions for terracing, not admonitions on the evils of erosion. Caterpillar paired these instructions with high-quality photographs (right) that provided step-by-step illustrations of how to build a terrace. Source: National Archives.

company, which stood to gain financially through the sale of new equipment, but also the entire soil and water conservation movement.[44]

Other corporations facilitated conservation in a similar manner, even if their economic interests were tied less directly to agriculture or conservation. In 1942, Bethlehem published a booklet, *Your Land: Practical Methods for Preventing and Curing Soil Erosion*, as a way to teach readers how to implement conservation systems. The company made clear in the first few pages one of its primary motivations: brand redemption. After countless observers—most notably Pare Lorentz in his 1936 film *The Plow that Broke the Plains*—had diagnosed the erosion of the 1930s, particularly the Dust Bowl of the Great Plains, as a product of the steel plow exposing topsoil to wind and water, Bethlehem wanted to recover its reputation. "Overplowing has caused widespread erosion," the

[44] Caterpillar Tractor Co., *Crops…or Canyons* ([Peoria, Ill., post-1936]), quoted on 3; b1; Item 102; RG 114; NACP.

company consented early in the book, "but man, not steel, is to blame. Man took the steel implements science gave him and abused the soil with them." Now, Bethlehem's products had enlisted in the fight against erosion, representing the raw material for conservation technology such as "steel terrace-building machines." The remainder of the booklet served a similar function as Caterpillar's *Crops…or Canyons*: it paired informative photos with systematic instructions on how to install conservation on one's land. In other words, it was "a practical book, written for practical people."[45]

In pointing out the practicality of conservation, many companies highlighted how technologies such as terracing were effective because they checked the power of moving water. For instance, John Deere promoted its tractors as "completely adaptable to every phase of soil conservation farming," including "the contoured row to slow the bouncing raindrop [and] terraces to make running water walk." Caterpillar endorsed conservation in similar terms. In a booklet from the early 1930s, the company described a terrace as "a water stop effective to prevent productive topsoil from eroding away—to retard the flow of water…to slow down drainage and enable the soil to absorb more crop moisture."[46] Other companies made the importance of controlling water much more explicit. "Water is either your Servant or your Master," Corsicana Grader proclaimed in an early 1930s advertisement,

> Your Enemy or your Friend…. Water in large quantities moving rapidly is the farmers [*sic*] enemy. Water in small quantities and moving slowly is the farmer's real friend. With terraces we can regulate not only the quantity in a given area, but also the speed at which it moves. We can, therefore, combine the two necessary elements—water and soil, for maximum results and mass production.[47]

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[45] Bethlehem Steel Company, *Your Land: Practical Methods for Preventing and Curing Soil Erosion*, Booklet 144-A (Bethlehem, Penn.: Bethlehem Steel, 1942), 3.

[46] John Deere, "Signs and Symbols," [ca. 1940s?]; b9; C. R. Ashford Papers, University Archives, Mississippi State University, Mississippi State, Mississippi; Caterpillar Tractor Co., *Terracing with Caterpillar* (Baltimore, Md.: Alban Tractor Co., [1930?]), 6; b1; Item 98; RG 114; NACP.

[47] Corsicana, *Is Your Profit Being Washed Away, Too?*, [inside front cover].

Whereas uncontrolled water threatened to destroy a farmer's livelihood, regulated water through terraces would make it flourish.

These and other advertisements served important purposes for the conservation-industrial complex, beyond the obvious goal of selling goods. The farm-equipment industry's support of soil and water conservation helped normalize terraces. During the 1930s, terraces were still novel to a number of Americans outside of the South, and for many southerners they represented a dubious technology. Through the medium of modern advertising, industry framed terraces as practical, effective, and perfectly reasonable. Companies also presented themselves as close allies of government agencies, a relationship that was borne out at the USDA-land grant erosion experiment stations. Conservation agencies and private industry shared an interest in developing machines that could perform conservation tasks in an effective manner, and experiment stations presented ideal proving grounds for these machines. In the 1930s and early 1940s, these mutual interests in conservation technology weaved government and business together in a relationship that was thoroughly industrial.

Conservation Tillage from Stubble-Mulch to No-Till

Edward H. Faulkner opened his 1943 treatise, *Plowman's Folly*, with a stern rebuke of the moldboard plow. The plow was one of the most common but "the least satisfactory implement for the preparation of land," he wrote, for it overturned soils and buried organic matter beneath the soil surface. Quite simply, "plowing is wrong." Faulkner instead advocated implements "designed to operate in the trashy surface that would have resulted from mixing rough straw, leaves, stalks, stubble, weeds, and briars into the surface." The iconoclast's primary concern was to encourage agricultural methods that introduced organic materials into soil in order to promote fertility, not to prevent erosion. Nevertheless, his ideas reflected a nascent concern with the limits of conventional plowing and a growing desire to devise methods of cultivation that could maintain a year-round vegetative soil cover while still facilitating efficient production.[48] The question for researchers in the coming decades was whether these methods, which in time would be called "conservation tillage," were even practical.

While Faulkner's interest in mulching soils targeted boosted fertility, USDA researchers began studying it in an effort to reduce erosion. Conservation scientists had long understood that the energy of runoff was a principle cause of water erosion and that erosion increased with the intensity of rainfall. In the late 1930s, researchers incorporated high-speed photography to discover an important element of rainfall intensity: falling raindrops shattered upon striking the ground, scattering soil particles in all directions (Figure 21). "Where there is enough water for runoff" to remove the displaced soils, researchers later noted, "the splashing and muddying effects of raindrops account for much of the soil removed by erosion."[49] Effective conservation technologies thus required protection against the erosive energies of falling as well as running water. This often entailed leaving a layer of crop residue—the plant debris that Faulkner lovingly described as "trashy"—on the soil surface to prevent high-speed raindrops from causing imperceptible yet ultimately costly damage.

Some of the earliest experiments in leaving behind crop residues at harvest time took place in Nebraska through associative arrangements between the Soil Conservation Service and the University of Nebraska. In 1938, the two institutions began evaluating "stubble-mulch farming" at test plots on the university campus. Whereas moldboard plows turned clods of soil over completely,

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[48] Faulkner, *Plowman's Folly* (Norman: University of Oklahoma Press, 1943), 3-4. See also Randal S. Beeman and James A. Pritchard, *A Green and Permanent Land: Ecology and Agriculture in the Twentieth Century* (Lawrence: University Press of Kansas, 2001), 53-56.

[49] Bennett and Bell, *Raindrops and Erosion*, 15-17, quoted on 17. See also J. Otis Law, "Measurements of the Fall-Velocity of Water-Drops and Raindrops," *Eos, Transactions American Geophysical Union* 22 (July/August 1941): 709-721.

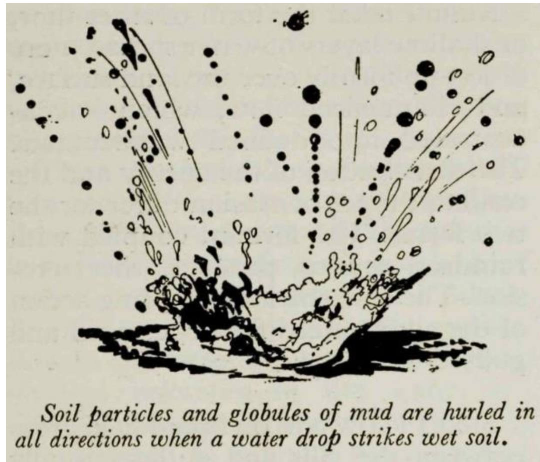

Figure 21: Illustration of raindrop impact on a soil surface. Source: Osborn, "How Rainfall and Runoff Erode Soil," 129.

leaving a field with a clean surface of soil, stubble-mulching relied on "subsurface tillers" that pierced into the soil with blades that cut plant roots from beneath. Rather than producing an entire field of mounds and furrows, each consisting of disrupted soil, stubble-mulching broke the soil only where the stem of the tiller dragged through the surface. Crop residue remained on the soil in between the furrows, providing a protective cover against raindrops (Figure 22).[50]

One of the key discoveries of the Nebraska research was that raindrop impact could cause a cementing of the soil surface. On unprotected soils, explained F. L. Duley and J. C. Russel in 1948, raindrops broke up granules of soil that, once saturated, created a "fine mud [that] forms a seal over the surface, making the soil look slick." Under such conditions, water percolated into the soil much more slowly, which led to increased volume and velocity of runoff. Full erosion control, in other words, would need to absorb the energy of falling water, which meant that "the raindrops of a heavy rain must be kept from hitting the bare soil directly." To Duley and Russel, stubble-mulch farming seemed like the ideal solution, and their soil-loss and runoff experiments backed them up.[51]

[50] Duley and Russel, *Using Crop Residues for Soil Defense*, USDA Miscellaneous Publication 494 (Washington, D.C.: Government Printing Office, 1942), 8-12. See also Duley and Russel, *Stubble-Mulch Farming to Hold Soil and Water*, USDA Farmers' Bulletin 1997 (Washington, D.C.: Government Printing Office, 1948).

[51] Duley and Russell, *Stubble-Mulch Farming*, 5.

Figure 22: (Left) A subsurface tiller used in stubble-mulch farming. (Right) This farmer uses a subsurface tiller to plow a cornfield. Notice how the soil in between the furrows is protected by a mulch made from cornstalks. Source: Duley and Russel, *Stubble-Mulch Farming*, 11, 17.

By the end of the 1940s, the Nebraska experiments were showing considerable promise, with superior yields in dry years and slightly lower in wetter seasons. Despite the researchers' praise for this new technology, they realized that stubble-mulching had a critical weakness: it did not always kill weeds effectively. Traditional cultivation controlled weeds through periodic cultivation, but Duley and Russel warned farmers that sometimes "after subsurface tillage…weeds and volunteer grain may not die as rapidly as you would wish." In these instance, the researchers recommended additional mechanical measures to kill weeds. But this eliminated one of the core benefits of this technology. The cost of stubble-mulching was typically less than conventional plowing, "*except* when it is necessary to go over the land an additional time with a tiller or weeder to kill weeds."[52] The researchers understood that if farmers were going to adopt conservation tillage, it would need to be practical and cost-effective relative to other alternatives. This meant that they needed a different way to control weeds.

Experiments in Wisconsin indicate how conservation researchers solved this dilemma. In the 1950s, the Upper Mississippi Valley Conservation Experiment Station in La Crosse—a joint

[52] Duley and Russell, *Stubble-Mulch Farming*, 20, 30, emphasis added.

venture between the USDA and the University of Wisconsin—began experiments on a form of conservation tillage called "wheel-track planting." By the early 1960s, researchers had developed a system of planting corn in the wheel tracks of tractors, with hay planted in the spaces between the tracks. When the corn was between ten and twenty inches tall, the researchers planted the wheel tracks to hay so that, once they harvested the corn in the fall, the entire field would have a protective cover of hay. Five years of experiments in La Crosse revealed that the average runoff and erosion in this system was 2.3 and 4.2 times lower than under conventional methods. While few farmers seem to have adopted wheel-track plowing, probably because it involved so many steps, the Wisconsin research points to an important innovation. Whereas in 1948 the Nebraska scientists had not integrated herbicides into their conservation tillage systems, by 1962 these chemicals were showing clear benefits in Wisconsin.[53] In the coming decades, researchers would transform conservation tillage into a practical technology only by increasing their reliance on chemical herbicides.

The dependence of conservation tillage on herbicides opened membership in the conservation-industrial complex to a new and powerful constituent: the petrochemical industry. These chemicals were especially important for the development of no-till farming, a form of conservation tillage that did not disrupt the soil with a subsurface tiller but instead drilled seeds directly into the soil. While researchers at state experiment stations used chemicals in the 1940s to develop no-till methods for pasture renovation, in 1954 Dow Chemical scientists became the first to apply chemicals to the conservation tillage of row crops. Three years later, the Ciba-Geigy Corporation invented atrazine, which revolutionized no-till corn production because it killed most weeds but left corn unharmed. Chevron Chemical Company also saw market opportunities in soil

[53] O. R. Zeasman, L. R. Massie, and A. E. Peterson, *Let's Stop Soil Erosion*, University of Wisconsin Extension Service Circular 613 (Madison: UW College of Agriculture, 1962), 12-13; Orville E. Hays, Robert E. Taylor, and Henry L. Ahlgren, *A Tour Guide of the Soil Conservation Station, La Crosse, Wisconsin* (La Crosse, Wis.: USDA Agricultural Research Service with Wisconsin Agricultural Experiment Station and State Soil Conservation Committee, 1961), 6-7.

and water conservation. Their paraquat herbicide fostered no-till farming because its short life allowed farmers to chemically kill off vegetation in a field and still be able to plant it to crops before too long.[54] To a greater degree than with terracing, the practicality of conservation tillage technology depended on private sector research.

Although tillage technologies were becoming increasingly practical and effective during the 1960s through the research of the conservation-industrial complex, they had not been widely embraced by farmers. Many simply did not consider it practical, or at least not worth the sizable investment in new machines and chemicals that conservation tillage, especially no-till, would entail. In the 1970s, however, this began to change. When the energy crisis struck in 1973, the costs of production for all sectors of the economy began to skyrocket. This gave Soil Conservation Service officials a new line of persuasion. In the face of rising energy costs, conservationists began issuing news releases suggesting, "Some farmers could give more thought to no-tillage of corn." Conservation tillage, explained the SCS agent for Marathon County, Wisconsin, "requires only one trip over a field because the planting is done in sod or other crop residues."[55] This became a powerful motivator for farmers in the 1970s, particularly as energy prices continued to run high. The SCS continued to leverage this point, pointing out in 1980 that tillage farmers had experienced as high as eighty percent savings in fuel costs, in addition to upwards of ninety percent reductions in soil erosion.[56]

Despite these overtures, a number of farmers were reluctant to try no-till or other forms of conservation tillage, especially in the 1970s and 1980s. Their aversion was largely cultural and

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[54] John P. Giere, et al., "A Closer Look at No-Till Farming," *Environment* 22 (July/August 1980): 16.

[55] Charles Livingston, Press Release, [n.d.], b1, Item 72, RG 114, NACP; Harold O. Krueger, News Release, 20 December 1973; b1; Item 72; RG 114; NACP. See also Ed Weber, "Mulch Tillage and Crop Residue Management," Dunn County Electric [Coop?] December 1973, b1, Item 72, RG 114, NACP; [Minnesota] Soil Conservation Service News, 7 January 1974, b1, Item 72, RG 114, NACP.

[56] USDA Soil Conservation Service, *Save Fuel…Use Conservation Tillage*, SCS Program Aid 1263 (Washington, D.C.: US Department of Agriculture, 1980).

aesthetic. Since the 1940s, SCS staff had echoed Edward Faulkner by referring to crop residues as "trash mulch."[57] Farmers in the late twentieth century wielded this term with derision. "It's the 'in' thing to have a clean-plowed field when you start out" as a farmer, explained SCS chief Pete Myers in 1982. Many agricultural producers thus saw crop residue remaining in fields as an indication of inferior farming. "It looks trashy, you know," an Illinois farmer explained in 1981. "It just looks terrible."[58] In the throes of the erosion crisis of the late 1970s and early 1980s, a number of reporters discovered these sentiments were widespread. As one journalist put it, even the most dedicated conservation farmer "looks out on a field of ugly brown trash and remembers what farmland is *supposed* to look like, all black and smooth and scored with stripes, and he feels fear, or revulsion—or something—and sometimes even he can't help himself, he just has to jump on his tractor and go out there and cut that vile, festering stuff to ribbons."[59] The rise of conservation tillage, in other words, was far from inevitable.

As with the case with terraces, however, the greater the exposure to conservation tillage, the more the novel technology seemed normal. Many farmers came to appreciate no-till, in particular, for making their work easier. Rather than plowing up sod and hay to reseed a field, a Wisconsin dairy farmer liked how he "went in there with Round Up. Killed the grass and hay…. That's saving the soil, too." Norbert Boeder appreciated that no-till obviated the need to cultivate for mechanical weed control and that it prevented the frost thrusting of rocks that had previously necessitated springtime rock-picking. With no-till, Boeder found, "your crop is just a little less per acre," but the

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[57] For example, see [USDA Soil Conservation Service], "Meadows without Plowing," *Soil Conservation* 14 (October 1948): 67; W. L. Vaught, "Trash Farming Pays," *Soil Conservation* 23 (April 1958): 194-196.

[58] Myers, as quoted in Tom Morganthau, et al., "The Disappearing Land," *Newsweek* (23 August 1982): 22?; Morris Wildermuth, as quoted in Michael Lenehan, "Will the Corn Belt End Up in the Rivers?" *Atlantic* 248 (December 1981): 25.

[59] Lenehan, "Will the Corn Belt," 25, emphasis added. See also Ann Crittenden, "Lack of U.S. Funds Cited in Fight Against Erosion," *New York Times* (27 October 1980), sec. D, p. 4; and Sandra S. Batie, *Soil Erosion: Crisis in America's Croplands?* (Washington, D.C.: The Conservation Foundation, 1983), 69.

decreased labor load "offsets it."[60] In an age when rural labor was growing increasingly scarce, labor-saving technology such as no-till represented a godsend (albeit an expensive one) to many farmers seeking less wearisome means of deriving their livelihood from the soil. And thanks to decades of research, that technology was practical and effective.

Conclusion

Conservation technology represented a central component of the conservation-industrial complex. Terraces and conservation tillage provided field technicians one of the most compelling arguments to use in persuading farmers to adopt conservation practices: they worked. The practicality and effectiveness of these technologies were not inevitable, however, nor did they simply materialize automatically with the establishment of erosion experiment stations. The success of conservation technologies was the product of historical forces. Agricultural drainage provided the knowledge base that helped terrace engineers devise proper specifications for terraces; researchers later realized that to become practical for farmers, those standards had to be adapted to specific environmental conditions. Likewise, the spread of conservation tillage depended on the rise of the agrochemical industry, which provided farmers an effective yet problematic means of controlling weeds. The energy crisis also fostered the proliferation of tillage by increasing costs of production and thereby rendering the heavy capital outlays required for tillage far more acceptable.

As conservation researchers improved the ability of their technologies to control the erosive power of running and falling water, they laid the groundwork for increased social and political power within the conservation-industrial complex. This was true for terraces and conservation tillage as

[60] Earl Brey oral history interview, by Gabe Fowler and Frank Juresh III, 3 August 2000, transcribed by Chip Ozburn, 6, University of Wisconsin-La Crosse Murphy Library Oral History Collection; Norbert and Adeline Boeder Interview, by Frank Juresh and Gabe Fowler, 21 June 2000, transcribed by Katie Swank, 4, University of Wisconsin-La Crosse Murphy Library Oral History Collection.

well as for the array of other technologies in conservation technicians' toolkits: contour plowing, strip-cropping, check dams, grassed waterways, and so on. Farmers might have been swayed by Hugh Bennett's sermonizing or Donald Williams' appeals to conserving abundance, but if they invested time and money in technologies that failed to perform as advertised—or made matters worse—they would have had no reason to participate in conservation programs. Similarly, Congress would have eventually cut off funding for programs and agencies whose programs proved ineffective.

While practical technologies were essential to the growing power of the conservation-industrial complex, they were not sufficient. Just as the appeal of technology was not preordained, neither was its dissemination. As the next two chapters demonstrate, farmers and politicians had their own concerns and motivations that fostered the enduring social and political influence of the conservation-industrial complex throughout the twentieth century.

5

The Conservation Triangle: Farmers, Nature, and Negotiation in the Driftless Area of the Upper Mississippi River Valley

Perhaps no region in the United States enjoys as sterling a reputation in soil and water conservation than the Driftless Area of the Upper Mississippi River Valley. Historians, scientists, conservationists, and journalists have praised the region—particularly the Coon Creek watershed in southwestern Wisconsin—as one of the "birthplaces" of "modern soil and water conservation," as a site of "the fall and recovery of paradise," as "a conservation success story." The typical narrative begins with a brief overview of late-nineteenth and early-twentieth-century farmers despoiling the landscape out of ignorance. It then proceeds to a lengthy discussion of how, in a New Deal project at Coon Valley, Wisconsin, individual and community initiative converged with positive governmental intervention to apply techniques (especially contour strip-cropping) that cut down on soil erosion and flooding. Most writers take the appeal of these techniques for granted, suggesting that "from Coon Valley [these] practice[s] spread"—as if automatically—"during the 1940s, 1950s, and 1960s into adjacent valleys of the Driftless area." Finally, the story typically fast-forwards to the late-twentieth century, when the foresight of early 1930s pioneers was ostensibly proven by the enduring strip-cropped landscape, the recovery of trout populations in the region's streams, and scientific studies showing reduced rates of erosion.[1]

[1] Quoted on John M. Cross and Millard C. Davis, "Coon Valley Proves the Claim," *Soil Conservation* 36 (April 1971), 195; Stanley W. Trimble, *Historical Agriculture and Soil Erosion in the Upper Mississippi Valley Hill Country* (Boca Raton, Fla.: CRC Press, 2013), xxxii; and Douglas Helms, "Coon Valley, Wisconsin: A Conservation Success Story," in *Readings in the History of the Soil Conservation Service*, ed. Douglas Helms (Washington, D.C.: USDA Soil Conservation Service, 1992), 53. For narratives that follow a similar arc, see Lynne Heasley, *A Thousand Pieces of Paradise: Landscape and Property in the Kickapoo Valley* (Madison: University of Wisconsin Press, 2005), chapter 1; Neil Maher, *Nature's New Deal: The Civilian*

Although much of this narrative is accurate, it remains too simplistic. It freezes the Driftless Area in the 1930s, ignoring the host of changes unfolding in conservation and agriculture after World War II. Moreover, this construct obscures the social conflicts and dynamics that both made conservation successful and threatened its undoing, and it suggests that the natural world was merely setting, not an active agent of historical change. In short, it does not explain adequately how or why soil and water conservation continued to succeed throughout the twentieth century.

The story of conservation in the Driftless Area demonstrates the importance of the second major component of the conservation-industrial complex: farmers. A close examination of agricultural producers reveals that conservation thrived in this region because of three sets of evolving relationships between farmers, conservation agents, and the natural world—relationships that formed a conservation triangle (Figure 23). Each of these actors (the points of the triangle) influenced the others, presenting them with new possibilities and shaping their behavior in countless ways. Yet, none of the relationships between the actors (the sides of the triangle) alone constituted conservation, for in order for conservation to succeed, all three sets of relationships needed to work together, to be in alignment. Southwestern Wisconsin represented a conservation success story, although never an absolute one, not because of a set of decisions made during the New Deal. Rather, the conservation-industrial complex thrived in the Driftless Area because of a series of processes, relationships, and negotiations that evolved with changing modes of production and scientific and technological knowledge.

Conservation Corps and the Roots of the American Environmental Movement (New York: Oxford University Press, 2008), chapter 4; Renae Anderson, "Coon Valley Days," *Wisconsin Academy Review* 48 (Spring 2002): 42-48; Joseph Hart, "Ground Lost and Gained in 75 Years of Conservation at Coon Creek," *Journal of Soil and Water Conservation* 63 (July/August 2008): 102A-106A; Bob Oertel, "A Reclaimed Coon Valley," *Land and Water* 39 (September/October 1995): 28-29; Douglas Sorenson, "Coon Creek Watershed: Cradle of Conservation," *Journal of Soil and Water Conservation* 38 no. 5 (1983): 393-395; Melville H. Cohee, "The Leopold Legacy for Soil Conservation," *JSWC* 42 no. 3 (1987): 142; Craig Cox, "Back to the Future?" *JSWC* 59 no. 2 (2004): 22A. A study that bucks this trend is Leonard C. Johnson, *Soil Conservation in Wisconsin: Birth to Rebirth* (Madison: University of Wisconsin Department of Soil Science, 1991).

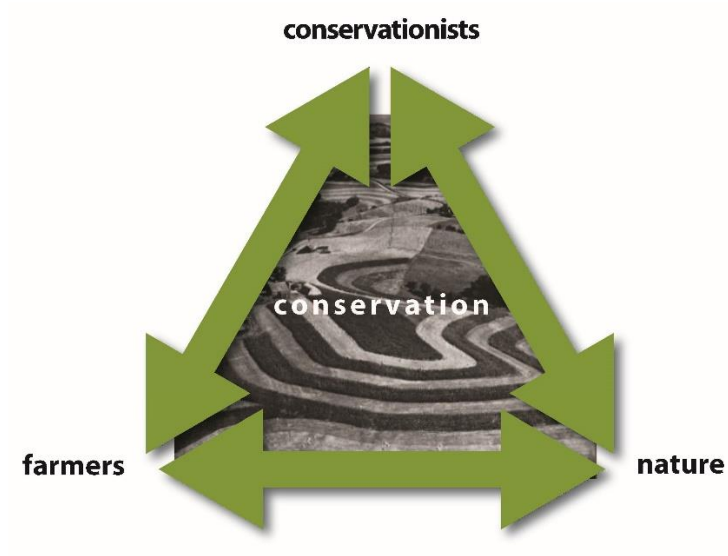

Figure 23: The conservation triangle depicts how soil and water conservation in the Driftless Area consisted of a series of two-way relationships between farmers, conservationists, and the natural world. The interactions took place not at the angles, but along the sides, each of which represented a continuum of relationships between the two points. Photo credit: Contour strips of alfalfa, corn, and oats on the William Thieke farm, Winona County, Minnesota, adapted from front cover of *Soil Conservation* 16 (January 1951). Design credit: Angie Nygren.

When scholars have lent a critical eye to conservation in the Driftless Area, they have often glossed over the roles of farmers, the natural world, or both. They often treat conservation technicians as the only meaningful actors in conservation: agriculturists' agency matters only insofar as they are willing to accept expert recommendations, and the natural world exists merely as the canvas on which conservationists and farmers painted. These scholars have revealed many important aspects of conservation and land use in the region, albeit incompletely. For instance, geographer Stanley W. Trimble—long a student of the Upper Mississippi Valley environment—published a comprehensive treatment of the physical changes in the region's soils and streams since nineteenth-century Euroamerican settlement.[2] Several historians have also pointed out that soil and

[2] While Trimble's goal is to "show the human side of these profound landscape changes," his focus (particularly after the 1930s) remains on the physical changes to the land itself. He provides a compelling overview of people living on the land from the early nineteenth century until the 1930s. However, for the rest of the twentieth

water conservation—particularly in the Coon Creek, Wisconsin demonstration project of the 1930s—represented the culmination of efforts to apply public values to private property.[3] Other scholars have noted that the practice of contour strip-cropping, the most successful and visible conservation technology in the Driftless Area, represented a rejection of the Jeffersonian land grid applied to a region ill-suited to superimposing squares on the landscape.[4] Thus, most critical treatments of conservation in the region have taken for granted that conservation continued to thrive, focusing instead on the meaning of the changing landscape.[5]

These approaches neglect the basic processes by which soil and water conservation became successful in this region. Conservation ultimately thrived in the Upper Mississippi Valley because the farmers' quest for practical methods materially shaped the creation of conservation technology. Conservation technicians and agricultural producers established working relationships, and the recommended methods corresponded to farmers' evolving relationships with the natural world. Moreover, these techniques took hold because farmers convinced each other of their efficacy. What ultimately made conservation popular was not its upheaval of the Jeffersonian grid, but its functionality in this landscape.

The human component of the conservation triangle consisted of conservationists and farmers. Conservationists were experts who, in some capacity, advocated for or implemented soil

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century (the majority of the book), the humans that appear in his narrative with any sort of depth are relegated to scientists such as himself. Trimble, *Historical Agriculture and Soil Erosion*, xxxv.

3 Heasley, *A Thousand Pieces of Paradise*, chapter 1; Maher, *Nature's New Deal*, chapter 4.

4 Hildegard Binder Johnson makes this argument most directly in Johnson, *Order Upon the Land: The U.S. Rectangular Land Survey and the Upper Mississippi Country* (New York: OUP, 1976). See also Heasley, *A Thousand Pieces of Paradise*, 26, 41; Maher, *Nature's New Deal*, 119-122; Maher, "'Crazy-Quilt Farming on Round Land': The Great Depression, the Soil Conservation Service, and the Politics of Landscape Change on the Great Plains during the New Deal Era," *Western Historical Quarterly* 31 (Autumn 2000): 319-339.

5 Lynne Heasley, it should be noted, acknowledges that "contour strip cropping was not preordained," but she considers its primary catalyst to be "powerful government programs…. Contour strips spread across the Kickapoo Valley [of the Driftless Area] because the federal government made a concerted effort to create new public prerogatives on private lands." She also discusses (but does not flesh out the full social dimensions of) the social relationships between farmers and conservationists and the creation of conservation science at the La Crosse, Wisconsin, experiment station. Heasley, *A Thousand Pieces of Paradise*, 28-29, 35-36, and 38.

and water conservation, usually as employees of universities or the Soil Conservation Service (SCS) of the US Department of Agriculture (USDA). Their ranks included researchers, field technicians, and administrators—particularly in Wisconsin, the state comprising the bulk of the Driftless Area. Farmers were typically men of northern European descent who derived their livelihood from the land by raising crops or animals. In the first half of the twentieth century, these farmers practiced diversified agriculture, growing corn, oats, hay, and tobacco. In addition, they raised a variety of livestock: pigs, chickens, and dairy and beef cattle. As the twentieth century progressed, however, a variety of forces encouraged and enabled farmers to specialize in dairying.[6] The SCS and state agricultural researchers facilitated this transition by devising agricultural systems that protected against erosion while providing nutritious hays, particularly alfalfa. Many farmers also grew tobacco as a cash crop, and beginning in the 1970s and 1980s, corn and soybean agriculture started to challenge the dominance of dairy.[7]

Both conservationists and farmers had to contend with the third component of the triangle, the natural world, which continuously shaped the realm of possible human action. In the Upper Mississippi Valley, this process had its origins in the last ice age. As glaciers scraped southward across much of the northern United States, they wrapped around an area of resistant rock

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[6] For intricate treatments of this process, see Kendra Smith-Howard, *Pure and Modern Milk: An Environmental History since 1900* (New York: OUP, 2014); Alan L. Olmstead and Paul W. Rhode, *Creating Abundance: Biological Innovation and American Agricultural Development* (New York: Cambridge University Press, 2008), chapter 11.

[7] This admittedly does not capture the full scope of farmers in the Driftless Area. Here and elsewhere, the reality of twentieth-century agriculture (an unfortunate one, depending on one's perspective) is that many farmers stopped farming amidst escalating pressures to produce, indebtedness, or because their children opted for other livelihoods. The extent to which a common theme in the stories of Upper Mississippi Valley farm families involved the purchase of additional land from the 1940s on, testifies to the actuality that any history of agriculture after World War II by definition is unrepresentative of all farmers. For example, see Gerd and Don Dudenbostel oral history interview, by Katie Swank and Chip Ozburn, 26 July 2001, transcribed by Katie Swank, 1-3, University of Wisconsin-La Crosse Murphy Library Oral History Collection; Norbert and Adeline Boeder Interview, by Frank Juresh and Gabe Fowler, 21 June 2000, transcribed by Katie Swank, 2, University of Wisconsin-La Crosse Murphy Library Oral History Collection; Earl Brey oral history interview, by Gabe Fowler and Frank Juresh III, 3 August 2000, transcribed by Chip Ozburn, 2, University of Wisconsin-La Crosse Murphy Library Oral History Collection; and Bob Breidenstein oral history interview, [interviewers unknown], 17 August 2000, transcribed by Katie Swank, 1, University of Wisconsin-La Crosse Murphy Library Oral History Collection.

formations. Before the ice could advance into this region, the climate warmed and the ice retreated, leaving untouched a swath of land roughly 210 miles long by 180 miles wide.[8] Geologists call this region, which is devoid of glacial debris or "drift," the Driftless Area (Figure 24). The hills of the region—which spreads across present-day southwest Wisconsin, southeast Minnesota, northeast Iowa, and northwest Illinois—were thus left unflattened by glaciers. Glacial outwash and subsequent precipitation carved through the bedrock, etching a series of steep valleys through the hills. The icy rivers carried along millions of tons of suspended soil. Some of this soil settled alongside the Mississippi River, forming flat terraces between the river and adjacent bluffs. High winds whipped up other soil and blew it into the unglaciated hills, depositing a cap of fine silt as deep as sixty feet, but averaging ten to fifteen feet. This soil was highly fertile, but also extremely susceptible to erosion.[9] It was also acidic, which presented problems for farmers looking to grow crops (such as alfalfa) that cannot tolerate low soil pH. These factors—a rugged, variable topography and a rich, erodible, and acidic soil—represented two of the most important features of the natural world in the Driftless Area. No less important were the biological demands of farmers' crops, particularly hay and tobacco.

In order for agricultural conservation to succeed, the three points of the conservation triangle needed to be in alignment, which required the forging and sustaining of relationships

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[8] The glaciers were stalled by highlands in the north and advanced more rapidly into lower regions in the east and the west before joining together in the south. Lawrence Martin, *The Physical Geography of Wisconsin* 3rd ed. (Madison: University of Wisconsin Press, 1965), 82-90; and Lee Clayton, et al., "Glaciation of Wisconsin," *University of Wisconsin-Extension Educational Series* 36 3rd ed. (2006), accessed 1 September 2013, http://www.geology.wisc.edu/~davem/abstracts/06-1.pdf.

[9] Martin, *Physical Geography of Wisconsin*, 133-137.

One of the basic differentiations scientists make between different soils is based on particle size, which determines its surface area and therefore its functionality. Surface area is important to plants because soil particles bind nutrients and water to their surfaces. The greater the surface area, the greater the binding power. Silt soils—unlike sands or clays—have the right amount of surface area so that water is retained tightly enough so it does not drain through before plants can use it, but not so tightly that plant roots cannot absorb it. This same property increases their erodibility. Silts hold on to enough water that runoff increases, but their surface area is not great enough to bind the soil together with sufficient strength to overcome the force of the runoff water. In an area such as the Driftless Area that is marked by steep hills and valleys, where the force of runoff would be magnified by gravity, human relationships with these micro-properties of loess soils could easily spell ruin for farmers.

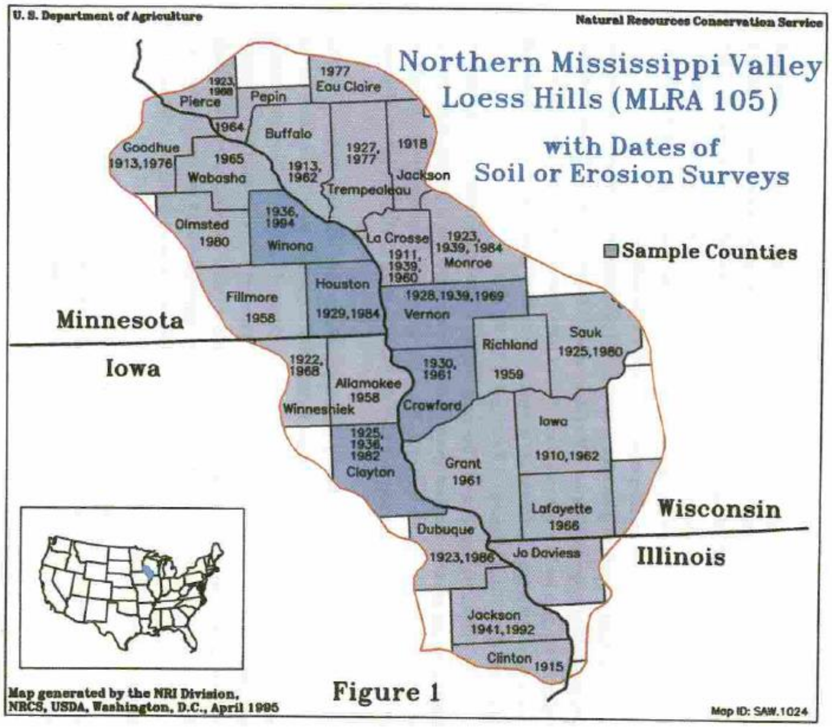

Figure 24: Map of the Driftless Area, which the Natural Resources Conservation Service (the successor of the SCS) classifies as the "Northern Mississippi Valley Loess Hills." Source: Argabright, et al. *Historical Changes in Soil Erosion,* 2.

between all three. These relationships represented the sides of the triangle, each a continuum where most of the action took place. Farmers and conservationists both engaged with the natural world on a daily basis, trying to devise and maintain a system of agriculture that was simultaneously profitable and suitable for Driftless soils and topography. When researchers studied the natural world, they worked knowing that agricultural producers would (and often did) rebuff recommendations that seemed impractical or did not facilitate local visions of agricultural production. Farmers also fostered conservation through their relationships with one another. Ultimately, the social negotiations among farmers and conservationists—always mediated by the natural world—comprised an essential cog in the conservation-industrial complex.[10]

[10] The theme of negotiations between humans and nature has been articulated most clearly by Richard White and Mark Fiege. See, for example, White, *The Organic Machine: The Remaking of the Columbia River* (New York: Hill and

The Foundations of the Triangle: Otto Zeasman in the 1920s

In 1916, University of Wisconsin soil scientists A. R. Whitson and T. J. Dunnewald published a farmers' bulletin titled "Keep Our Hillsides from Washing." Whitson and Dunnewald understood that erosion was a product of rainfall, soil type and character, slope, and vegetative cover. They explained that erosion—which they suggested threatened "at least 75 percent of the farms" in southwest Wisconsin—could be prevented by "increas[ing] the absorbing power of the soil" through such measures as strip-cropping, contour cultivation, and terracing.[11] Despite pointing out the severity of soil erosion, diagnosing its major causes, and prescribing some solutions, this bulletin seems to have had limited effect. When conservation technicians traveled throughout the Driftless Area in the 1920s and into the 1930s, they noted countless instances where the region's soils were washing into streams that fed the Mississippi River and the Gulf of Mexico. Given Whitson and Dunnewald's identification of the causes and solutions to erosion, what explains this dearth of remedial action in the 1910s and 1920s?

Soil and water conservation in the Driftless Area failed to gain traction before 1930 because the collaborations inherent in the triangle of conservation were only tenuously established. Daily experience and observation taught farmers that gullies threatened their land and livelihoods, but their awareness of the natural world was not accompanied by a framework for effective solutions. Likewise, even though scientists and conservationists were studying erosion and erosion-control methods, they lacked the concrete data needed to convince agriculturists that their recommended practices improved significantly upon the *status quo*. By working closely together over the course of

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Wang, 1995); Fiege, *Irrigated Eden: The Making of an Agricultural Landscape in the American West* (Seattle: University of Washington Press, 1999). For an overview of the literature on negotiations in agro-environmental history, see Sara M. Gregg, "Cultivating an Agro-Environmental History," in *A Companion to American Environmental History*, ed. Douglas Cazaux Sackman (Chichester, West Sussex, UK: Wiley-Blackwell, 2010), 425-441.

[11] Whitson and Dunnewald, *Keep Our Hillsides from Washing*, Agricultural Experiment Station Bulletin 272 (Madison: University of Wisconsin, 1916), 7-14.

the 1920s and 1930s, farmers and conservation technicians not only established a working relationship. They also created new knowledge of the natural world.

The earliest organized erosion-control initiatives began in 1922 when administrators of Buffalo County, Wisconsin, requested state assistance in controlling gullies that threatened the county's roads and highways (Figure 25). The state dispatched Otto Zeasman, a drainage engineer and University of Wisconsin extension agent, to the county to render support. The problem was, Zeasman later recalled, that he "had not seen gullies before [this assignment]…and knew nothing about effective control practices." The geography of erosion compounded the engineer's dismay, for he recognized that "the most severe gullying was taking place in level land" alongside the Mississippi River rather than on hilly lands further inland.[12]

The explanation for this paradox, Zeasman came to discover, was rooted in the region's geologic past. Glacial outwash from the last ice age carried tons of gravel, sand, and silt and deposited it in the gorge of the pre-glacial Mississippi River, raising the floodplain 200 feet higher than its previous level. In the late glacial period, the Mississippi and its tributaries carved through the tons of sediment in the gorge. This cutting action created a landscape of flat, fertile, yet erodible "bench terraces" bounded on one side by the Mississippi River and on the other by undulating topography that characterized the rest of the Driftless Area. By the early twentieth century, runoff from these hills flowed over the terrace lands and dropped off their escarpments at river's edge. "The energy of the falling water," Zeasman realized, "cuts enormous gullies back into the good level terrace land."[13] After studying the region's terrain, Zeasman concluded that slowing the rate of runoff was essential to solving the erosion problem of the Driftless Area.

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[12] Zeasman and I. O. Hembre, *A Brief History of Erosion Control in Wisconsin* (Madison, Wis.: State Soil and Water Conservation Committee, 1963), 9.

[13] Ibid., 6-9. See also Martin, *The Physical Geography of Wisconsin*, 179-181.

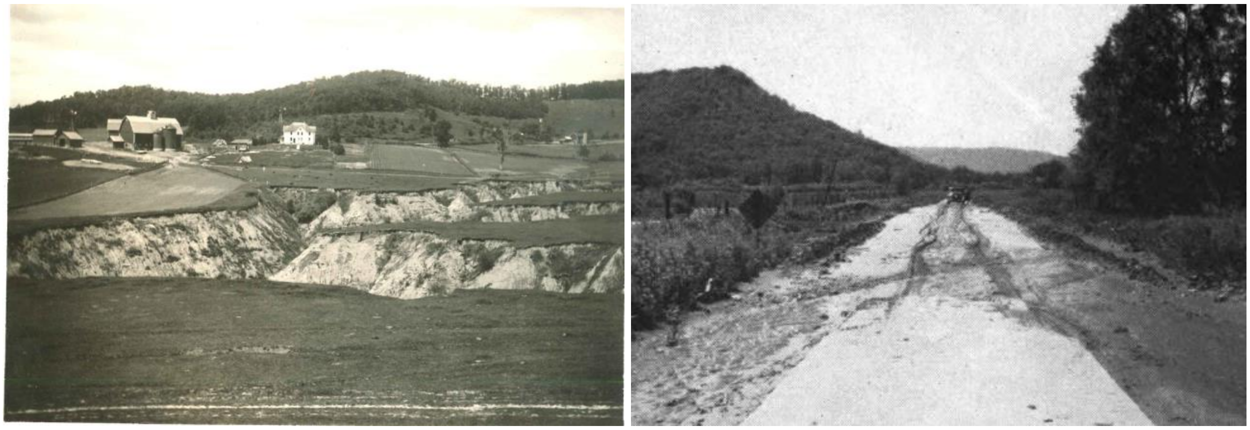

Figure 25: (Left) Gully on a farm owned by a man named McDonald in Alma, Wisconsin. Although Alma abuts the Mississippi River, it lacks any "bench terraces" and is thus more representative of the rest of the Driftless Area. (Right) Ten inches of sediment covering Minnesota State Highway No. 74 in Winona County, Minnesota, illustrating the types of highway sedimentation problems Otto Zeasman encountered in the 1920s. Sources: Otto R. Zeasman Papers, University of Wisconsin Archives (photo by Gottlieb Muehleisen); Stafford C. Happ, et al., *Some Principles of Accelerated Stream and Valley Sedimentation*, Technical Bulletin No. 695 (Washington, D.C.: USDA, May 1940), Plate 13B.

This lesson demonstrating the erosive power of water was corroborated by the experiential knowledge of the agricultural producers who worked the land. Buffalo County farmers, Zeasman observed, "were aware of and emphasized the fact that only the occasional intense storms caused gullies and floods." In other words, "rapid downpours of rain cause much more serious erosion than the same amount of rain falling over a longer time. This is so generally appreciated by farmers that they call a gentle, steady rain a 'ground-soaker' and a dashing rain a 'gully-washer.'" Years later in retirement, Zeasman recalled the importance of this lesson in precipitation: "to me as a novice, this was a key observation in the study of soil removal…from which I have not deviated."[14] Farmers' intimate knowledge of the effect of rainfall intensity on soil erosion, which agricultural

[14] Zeasman, "Stream Bank Erosion & Protective Methods," b1f5, Otto R. Zeasman Papers, 1925-1966 Series 9/22/10 26G8, University of Wisconsin-Madison Steenbock Library, University Archives (hereafter referred to as "Zeasman Papers"); Zeasman, *Control Soil Erosion by Crops, Terraces, and Dams*, Extension Service Circular 249 (Madison, Wis.: University of Wisconsin College of Agriculture, December 1931), 6. See also C. G. Bates and O.R. Zeasman, *Soil Erosion—A Local and National Problem*, University of Wisconsin Agricultural Experiment Station Research Bulletin 99 (Madison, Wis.: University of Wisconsin and USDA Forest Service, 1930), 32.

research soon corroborated, led Zeasman to an important conclusion: effective erosion control required engineering solutions, lest an intense rainstorm strike when soil was unprotected by crops and thereby creating a washout.[15]

Armed with this knowledge, Zeasman worked throughout the 1920s to develop erosion-control methods, which typically involved two steps. First, drew on Charles Ramser's terracing research (see Chapter 4) to reduce the erosive energy of runoff on hills.[16] When the engineer sought to apply this knowledge to real-world conditions, however, he ran into a problem. The literature called for several terraces constructed across a field, but farmer Orville Jost refused to terrace his entire field. In response, Zeasman designed "a single terrace far down the slope," which he knew was "contrary to recommendations in the terracing bulletins." This adaptation essentially amounted to a modification of a nineteenth-century technology, the hillside ditch, which engineers then considered incapable of controlling erosion. Nevertheless, his design worked. The negotiation between farmer and conservationist had created a new technology, the "diversion terrace."[17]

The second aspect to erosion control was to stop and reverse the spread of existing gullies. Unlike with terraces, Zeasman found little advice in the agricultural literature, which he deemed "extremely meager regarding control of gullies." The engineer found some guidance from local farmers who had attempted gully control through makeshift measures. Zeasman considered most of these efforts shoddy and "futile efforts at [erosion] control," but he did incorporate into his projects

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[15] For the research that corroborated farmers' observations, see F. L. Duley and M. F. Miller, *Erosion and Surface Runoff Under Different Soil Conditions*, Research Bulletin No. 63 (Columbia: University of Missouri Agricultural Experiment Station, Dec. 1923). For more on these early studies in Missouri, see C. M. Woodruff, "Pioneering Erosion Research that Paid," *JSWC* 42(2): 91-92.

[16] Zeasman and Hembre, *A Brief History of Erosion Control in Wisconsin*, 10. See C. E. Ramser, *Prevention of the Erosion of Farm Lands by Terracing*, USDA Bulletin No. 512 (Washington, D.C.: GPO, 5 April 1917); and C. E. Ramser, *Terracing Farm Lands*, USDA Farmers' Bulletin 997 (Washington, D.C.: GPO, August 1918).

[17] Zeasman did not specify why Jost refused to terrace the entire field, but he noted that the terrace held strong for over thirty years. Zeasman and Hembre, *A Brief History of Erosion Control in Wisconsin*, 10-11. On hillside ditches in the nineteenth century, see Arthur R. Hall, "Terracing in the Southern Piedmont," *Agricultural History* 23 (April 1949): 98-100. For the waning reputation of the hillside ditch, see Ramser, *Prevention of the Erosion of Farm Lands*, 5; John W. Carpenter, Jr. and E. R. Gross, *The Terrace in Mississippi*, Extension Bulletin 9 ([State College, Miss.]: Mississippi Agricultural and Mechanical College Extension Department, November 1918), 3.

the devices of farmer-turned-inventor Gottleib Muehleisen of Alma, Wisconsin. Muehleisen had created sheet-metal flumes to carry runoff water from the top of gullies on his farm to the bottom, thereby preventing further scouring of the land. In 1912, he launched the National Soil Conservation Company to market these and other inventions, and in the 1920s, Zeasman's erosion-control projects garnered the inventor a sizable number of clients. Although Zeasman judged these flumes "sound in principle" but often wanting in design or implementation, he nevertheless incorporated them into several reclamation projects as a means of preventing further gullying (Figure 26).[18]

Muehleisen's flumes helped prevent further gullying, but a more effective measure was a dam designed by another farmer, J. A. Adams of Johnson County, Missouri. Zeasman read about the "Adams dam" in Charles Ramser's 1918 farmers' bulletin and found its principle widely applicable.[19] The structure, which later took on the name "drop-inlet dam," consisted of an earthen dam with a pipe inserted vertically or diagonally through the mound. The dam stopped sediment from proceeding downhill, eventually filling in the gully, and the pipe prevented runoff from undermining the structure by funneling water from the top of the dam to a safe outlet at the bottom. In order to be replicable outside of Adams' farm, however, this basic idea had to be adapted to unique hydrologic, topographic, and soil conditions. This often required an expert's knowledge. If a dam design failed to account for the amount and rate of runoff, for instance, it could easily fail within a few years, or even a single storm. Zeasman's training as a drainage engineer—the core of which was calculating runoff dynamics—prepared him well for gully reclamation. During the 1920s,

[18] Zeasman and Hembre *A Brief History of Erosion Control in Wisconsin*, 5-6, 7-12; Zeasman to A. J. Wojta, 24 June 1955, b1f7, Zeasman Papers. In the 1930s, Muelheisen was forced out of business when, as he put it, "the State and Federal activities promised the [erosion-control] service and material free of charge to private land owners, which made it unprofitable to operate as a private concern." Gottlieb Muehleisen to Soil Conservation Service Project, 31 March 1936, b1, RG 114, NARA-Chicago.

[19] Zeasman and Hembre, *A Brief History of Erosion Control in Wisconsin*, 12; Ramser, *Terracing Farm Lands*, 25-27. Zeasman claimed that he read about the Adams dam in 1917, but Ramser's bulletin from that year did not discuss Adams dams.

Figure 26: (Left) Muehleisen flume on Orville Jost farm, Buffalo County, Wisconsin, ca. 1922. (Right) Remains of a flume on the lands of the former Upper Mississippi Valley Soil Erosion Control Experiment Station, La Crosse, Wisconsin, ca. 2013. Sources: Zeasman Papers, University of Wisconsin Archives (left); author's collection (right).

he applied this training to modify the Adams dam for specific gullies throughout Buffalo and Jackson counties, Wisconsin. The structure became his go-to device for erosion control, for he considered it "best adapted to the deep gullies and…most useful to store sediment."[20] These technologies reflected the sharing of ideas that was necessary to adapt expert knowledge to local conditions.

Zeasman's soil conservation work throughout the 1920s embodied the conservation triangle. As he recalled in his twilight years, he spent this time "formulating basic requirements of structures for control of gullies…and helping farmers build the structures that offered solutions."[21] His own study of the natural world convinced him that erosion-control required the control of runoff. His solutions to gullying also relied on farmers' embedded knowledge of nature, as represented by the

[20] Zeasman to Wojta, 24 June 1955, 2.

[21] Zeasman, *Land Drainage and Soil Conservation in Retrospect*, University of Wisconsin University Archives Oral History Report (Madison: Regents of the University of Wisconsin, 1972), 11.

Muehleisen flume and the Adams dam—each a farmer's creation. These technologies also incorporated Zeasman's engineering expertise, particularly as he modified existing designs for application on specific farms. Finally, the creation of a new conservation technique (the "diversion terrace") on Orville Jost's farm signifies how soil conservation in the 1920s emerged as a product of the negotiation between farmers and conservation technicians.

"Before Recommending to Farmers": A Station for Predictive Knowledge, 1929-1931

Despite Zeasman's erosion-control projects, many technicians in the late 1920s desired greater scientific grounding for their programs. Zeasman's work consisted of adapting to unique conditions on individual farms a set of standards that had been developed for much different environmental conditions. It was deficient in the sorts of predictive, replicable, data-driven knowledge that constituted science as conservationists knew it. As Raphael Zon, a USDA forester involved in early soil conservation efforts, put it in 1929, "the existing knowledge, much of which consists only of good 'hunches,' must be made more specifically applicable to given, definable conditions." The lack of scientific guidelines presented problems for technicians trying to install conservation measures on Driftless lands. It also jeopardized farmers' receptivity to conservation. Agriculture was already an inherently risky profession, so why abandon time-tested techniques for untested ones? Zon, the director of the Lake States Forest Experiment Station in St. Paul, Minnesota, realized that "before recommending to farmers" any new land management systems, "there must be some concrete measure of the value of that protection, obviously implying more definite information than we now possess."[22] Simply by demanding evidence-based practices and resisting speculative measures, farmers were shaping the course of conservation.

[22] Raphael Zon, "Preliminary Working Plan: For the Study of Soil Erosion, Stream Regulation, and Moisture Conservation in Southwestern Wisconsin and Adjacent Areas," 16 May 1929, 4, b1f1, Zeasman Papers; Zon to Assistant

In May 1929, Zon sketched out a plan for federal erosion research in the Driftless Area. Congress had recently allocated his station ten thousand dollars to cooperate with a state to study erosion.[23] The first step of the plan called for a broad canvass of the region to ascertain in a general manner the extent of soil erosion.[24] That summer, Zon dispatched forester C. G. Bates to collaborate with Otto Zeasman and conduct the survey. Bates and Zeasman traveled throughout the Driftless Area—primarily in Wisconsin, but also in Minnesota—to observe erosion. While the two men drew conclusions that would later become conservation doctrine, they conceded that their "measurements were intended to be of a qualitative rather than an exact quantitative nature" and thus lacked the scientific rigor conservationists prized.[25] Zon sought to rectify this deficiency with his second proposal, which called for controlled experiments to derive the "theoretical character" of erosion and to determine "almost any variation which might affect erodibility of a soil mass."[26] In short, these experiments would yield predictive, concrete knowledge of erosion.

The convergence of a series of events made Zon's second proposal feasible through the entry of the federal government into erosion research. In February 1929, Congress passed the so-called Buchanan Amendment, which allocated $160,000 to establish federal erosion experiment

Forester [Earl H. Clapp], 25 October 1929, 2-3, b11, Item 103, RG 114, NACP. In 1930, Zeasman acknowledged his desire for greater scientific rigor in 1930, writing, "Scientifically accurate information on erosion control is still very limited, and practically all research work to date has been done under…conditions [in the US South]." Zeasman, "Reasons for the Establishment of a Federal Erosion Station in the Non-Glaciated Section of the Upper Mississippi Valley," January 1930, b1f2, Zeasman Papers.

[23] Zeasman and Hembre, *A Brief History of Erosion Control in Wisconsin*, 14. Two months earlier, the USDA had also determined that Zon's experiment station would collaborate with the University of Wisconsin to study erosion in the Driftless Area. USDA Committee on Soil Erosion, "A Program for Soil Erosion, Moisture Conservation, and Stream Regulation Research: First Report of the Committee on Soil Erosion," 25 March 1929, 10; b2; Item 97; RG 114; NACP.

[24] Zon, "Preliminary Working Plan," 7.

[25] Among conclusions that became conservation doctrine were their recommendations that steep slopes be converted from pastures to forests, that ungrazed woods offered the best protection against erosion, and that hay prevented washing better than corn or oats. Bates and Zeasman, *Soil Erosion*, 54, 69-72.

[26] Zon, "Preliminary Working Plan," 7. Zon's third suggestion was too ambitious. He called for "an intensive and long-term study of the run-off and erosion upon two or more parallel or similar watersheds." Conservationists ultimately inaugurated a watershed project in the Driftless Area, but not of the character suggested by Zon. Zon, "Preliminary Working Plan," 6.

stations throughout the country—a move that precipitated Zon's proposal that May.[27] Moreover, the country was still recovering from the massive Mississippi River flooding of 1927. Bates and Zeasman highlighted how erosion exacerbated flooding and inhibited inland navigation (each falling under federal purview) by adding sediment to the Mississippi River, which "gives to erosion in this region a national significance."[28] Finally, in August 1929 a group of federal employees, including Hugh Hammond Bennett, toured the Driftless Area and deemed it a suitable site for an experiment station. Joining the contingent was Harry L. Russell, the dean of the University of Wisconsin's College of Agriculture for whom this trip through "the erosion belt" of Wisconsin "forcibly brought to [his] attention" the severity of the erosion problem. Russell lobbied federal officials to locate one of its new stations in Wisconsin, promising the full cooperation of the university.[29] Once the USDA agreed to operate the station jointly with the UW College of Agriculture, Russell was able to acquire ten thousand dollars from the state to purchase a farm for the Upper Mississippi Valley Soil Erosion Control Experiment Station.

College officials had a host of potential farm sites to choose from, but their ultimate selection was dictated by the needs of farmers. USDA and UW researchers began a general reconnaissance for a suitable farm in October 1929, but not until 1931 did their hunt result in a

[27] See chapters 1 and 4.

[28] Bates and Zeasman, *Soil Erosion*, 2, 98-99. On the influence of the 1927 flood to soil conservation, see Samuel R. Stalcup, "Public Interest, Private Lands: Soil Conservation in the United States, 1890-1940," (PhD diss., University of Oklahoma, 2014), 135-143.

For more on the Mississippi River flood, see Pete Daniel, *Deep'n as It Come: The 1927 Mississippi River Flood* (New York: Oxford University Press, 1977); and John Barry, *Rising Tide: The Great Mississippi Flood of 1927 and How It Changed America* (New York: Touchstone, 1997).

[29] H. L. Russell to A. G. McCall, 19 September 1929, b11, Item 103, RG 114, NACP; Russell to A. G. McCall, 4 November 1929, b11, Item 103, RG 114, NACP. Zon mentioned that the party included "Messrs. [A. G.] McCall, Bennett, and [L. A.?] Jones," and that "so far as we could ascertain…[they] were all convinced that the region is of sufficient importance from the erosion standpoint to justify the establishment of one of the proposed series of erosion experiment stations." Zon to Assistant Forester [Clapp], 25 October 1929, 3.

concerted effort.[30] In April of that year, with state funding secured, scientists set out with a list of twelve requirements for the farm. Some of the criteria were purely logistical, such as buildings in good condition and a price tag within the allotted budget. Others, however, spoke to the ultimate purpose of the experiment station, which was to develop precise techniques that farmers would be willing to adopt. The ideal farm would furnish opportunities to study three phenomena: sheet erosion "under varying conditions," the "ordinary control" of smaller gullies, and the "spectacular control" of massive gullies.[31] The committee was hard pressed, however, to meet all these criteria, because most "spectacular" gullies were located on terraces adjacent to the Mississippi River and the most problematic sheet and moderate gully erosion was in the uplands. As a UW soils professor explained, farmers suffering from massive gullying "are only too anxious to have assistance, while those on upland farms which have not been strikingly injured, but are nevertheless suffering seriously from sheet erosion, do not fully appreciate this fact nor understand what can be done to prevent it."[32] In order to reach the typical Driftless Area farmer, the experiment station had to be located on typical Driftless Area land.

The farm also needed to be within reach of the region's agricultural producers, particularly those "who appear willing and able to co-operate in extending the control to adjacent farms." This meant it needed "accessibility to a good road" and a central location, "not too far from the rough area in northwestern Illinois and northeastern Iowa" also "to be served by this farm." That the station would also be located close to Minnesota, which was home to the second highest acreage of

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[30] Zeasman, Bates, and two UW officials (E. R. Jones and A. R. Whitson) searched for a farm in October 1929, but kept a low profile because "we did not want to arouse anybody's curiousity [sic] by looking these farms over in a detailed way." E. R. Jones to L. A. Jones, 23 October 1929, b11, Item 103, RG 114, NACP.

[31] "Erosion Control Experiment Station Farm: Proposed Plan," [n.d.], Zeasman Papers, Box 1, f[Exp Farm], attached to "Farms Examined by A. R. Whitson, O. R. Zeasman, and E. R. Jones April 10 and 11, 1931, as a basis of selecting a farm for a Soil Erosion Experiment Station," 1, b1, Zeasman Papers.

[32] A. R. Whitson to A. G. McCall, 24 April 1931, b11, Item 103, RG 114, NACP.

the Driftless Area as well as the USDA forest experiment station, was a given.[33] The committee settled ultimately on an 85-acre, somewhat rundown dairy farm atop a bluff just outside of La Crosse, Wisconsin, a small city near the middle of the Driftless Area. William Stroeh, the landowner, had grown corn, oats, barley, and timothy hay, but "with no apparent system of rotation," and the land was suffering from both sheet and moderate gully erosion. In short, it was as close to the typical Driftless farm as could be expected. On 12 September 1931, the University of Wisconsin reported to the USDA that it had "now definitely secured" the farm title, and by the end of the month, the Department finalized the establishment of the Upper Mississippi Valley experiment station.[34]

From start to finish, the establishment of the experiment station was driven not only by conservation researchers' desires for more quantitative, predictive knowledge of the natural world, but also by their pervading awareness that expertise was meaningless if farmers could not apply it practically to their land. Compared with what followed, the late 1920s and early 1930s looks like a period defined primarily by expert activity and farmer passivity, but this does not mean producers failed to shape conservation. Farmers related intimately with the natural world, and they insisted upon techniques that they could trust to work on their own land. Conservationists understood this and acted accordingly. This period was thus characterized not simply by the formulation of the conservationist-nature side of the triangle, but by the co-mingling of all three sides.

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[33] "Experiment Station: Proposed Plan," 1. W. C. Coffey, dean of the University of Minnesota's Agricultural Department, acknowledged that the station "belongs in the state of Wisconsin," but requested that "it will be located near the city of Winona, Minnesota," for "it will be almost or quite as usable to the State of Minnesota as it is to the state of Wisconsin. I should like to stress this point as much as I can for…we are anxious to make use of it." Coffey to A. G. McCall, 12 November 1929, b11, Item 103, RG 114, NACP.

[34] The farm later grew to 160 acres. G. E. Ryerson, "Progress Report for 1932 of Upper Mississippi Valley Soil Erosion Experiment Station located at La Crosse, Wisconsin," 31 December 1932, 3, b1, Zeasman Papers; A. R. Whitson to Hugh Hammond Bennett, 12 September 1931, b11, Item 103, RG 114, NACP; Henry G. Knight to Noble Clark, 28 September 1931, b11, Item 103, RG 114, NACP.

Creating Conservation Technology: Contour Strip-Cropping in the 1930s

With the establishment of the Upper Mississippi Valley Soil Erosion Control Experiment Station in 1931, conservation researchers had an apparatus for investigating new agroecological systems. Scholars have noted the importance of the La Crosse experiment farm to the success of conservation in the region, but few have examined the process of constructing the knowledge and techniques that were produced the station. Consequently, most historians have treated conservation technology—particularly contour strip-cropping—as an obvious, inevitable solution to the region's erosion problems. This line of thinking overlooks the many ways in which contour strips were the product not of the progressive advancement of science and technology, but rather of conservationists' relationships with farmers as well as farmers' relationships with the natural world.

The development of contour strip-cropping began originally with farmers and their experiential relationship to nature, not with trained experts. Several Driftless Area farmers began strip-cropping (although not always on the contour) in the late-nineteenth century to prevent erosion. They discovered that they could limit washing on sloping lands if they alternated strips of plowed crops such as corn or grain with strips of closely planted crops such as hay. This technique still allowed for crop rotations. It also worked to reduce erosion, scientists later discovered, because hay (a perennial) retained ground cover even when the soil was exposed for other crops between harvests. As runoff from rainfall washed downhill, the water on the exposed soil converged into several channels. Once the water hit a hay strip, the thousands of hay blades dispersed the water, thereby preventing the formation of rills that could eventually become gullies. The strips of hay also trapped soil particles that were descending the hill, reducing soil loss from the field.[35]

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[35] See, for example, Kenneth P. Davis and Orville E. Hays, *Farms the Rains Can't Take*, USDA SCS Miscellaneous Publication 394 (1940; revised, Washington, D.C.: GPO, 1942), 8.

Although nineteenth-century farmers may not have been able to articulate the precise reasons why this method worked, they recognized that strip-cropped land lost significantly less soil than "clean-tilled" fields. For example, H. A. Von Arx, a Swiss immigrant who settled in Houston County, Minnesota, started contour strip-cropping on steep slopes in 1878. His children narrowed these strips after discovering through observation that narrow strips reduced soil loss during intense storms. Soil conservationists later determined in a 1939 study that the Von Arx farm experienced significantly less erosion on steep slopes than neighboring farms did on gentler slopes.[36] Von Arx was not alone. When Otto Zeasman and C. G. Bates surveyed the Driftless Area in the summer of 1929, they found a number of farms with strip-cropped fields. Lacking a firm understanding of the benefits of the practice, however, Bates and Zeasman could offer little more than a general suggestion that strip-cropping helped reduce erosion.[37]

In order to learn more about strip-cropping, researchers tapped into farmers' wealth of experience with the practice. Experts from the Upper Mississippi Valley experiment station traveled in the early 1930s to the August Kramer farm in Mormon Coulee, Wisconsin. Kramer, a German immigrant, started strip-cropping in the mid-1880s, and his family continued the practice well into the twentieth century.[38] According to an SCS agent in the 1960s, these observations convinced Raymond H. Davis, the director of the experimental farm, to "set up plots with strips of various

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[36] I. J. Nygard and L. E. Bullard, "Effect of Erosion on Long-Time Strip Cropping in Bush Valley, Minnesota," *Soil Conservation* 4 (April 1939), 239-240.

[37] This lack of detail regarding strip cropping stands in stark contrast to the very particular recommendations for terracing, which by that point had been studied for years. Bates and Zeasman, *Soil Erosion*, 73-80. The Driftless Area was not the only place where nineteenth-century farmers experimented with strip cropping. Conservationists reported in the 1930s that agriculturists in Ohio, Pennsylvania, New York, and West Virginia had also practiced strip cropping for many years. See, for example, Guy C. Fuller, "Long Experience with Strip Cropping Cited by Farmers," *Soil Conservation* 2 (October 1936): 68; and "Strips," *Soil Conservation* 3 (June 1938): 287.

[38] In 1948, SCS surveyors discovered the strip-cropped Kramer land had topsoil that was roughly five inches deeper than neighboring farms that had not strip-cropped. Zeasman and Hembre, *A Brief History of Erosion Control in Wisconsin*, 3-4. Herbert Flueck, an early conservationist, recalled working as a boy on his relatives' farms in Mormon Coulee. He recalls seeing rill erosion on his family's land and comparing it to Kramer's strip cropping. Douglas Helms oral history interview of Flueck, 22 September 1982, 4, NRCS Historical Files, Madison, Wisconsin.

widths, to get an actual measurement of comparative runoff and soil losses." The earliest tests at the experiment station were dedicated to terracing—by far the preeminent conservation technology in the early 1930s (see Chapter 4)—so Davis established the strip-cropping plots on the farm of Hubert Hundt of Coon Valley. After twelve years of study, "these plots showed beyond question that the width of the strips had a definite effect on soil loss," with narrower strips yielding increasingly less erosion.[39] The earliest scientific research into strip-cropping in the Driftless Area was therefore guided by farmers' expertise and executed through their collaboration with conservationists.

Unlike the Von Arx strips in Minnesota, the strip-cropping on the Kramer and Hundt farms apparently did not follow the curves of the land. This raises the question of how conservationists in the Upper Mississippi Valley further transformed the practice into *contour* strip-cropping. Extant sources do not offer a definite answer, but a couple clues at the national level are suggestive. First, conservationists in the early 1930s were well aware of the benefits of contour plowing, for a vocal minority of American farmers had advocated and practiced it since the eighteenth century.[40] Second, contour strip-cropping seems to have emerged out of farmers' and conservationists' prior experiences with terraces, most of which followed the contour. Indeed, some of the earliest USDA promotions of strip-cropping suggested the practice was a suitable, yet inferior, substitute for farmers who could not afford to build terraces, and that it was made easier by following the contour

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[39] Evidence suggesting experiment station experts visited the Kramer and Hundt farms is limited to a promotional piece from 1962. However, SCS officials in Washington noted before the launch of the demonstration project that "strip cropping according to a rotation system…is working nicely in Wisconsin on a number of progressive farms." Glenn D. Garvey, "Centennial of Stripcropping," *Soil Conservation* 27 (June 1962), 256; Hugh Hammond Bennett to E. B. Deeter, 18 August 1933, b6; Item 97; RG 114; NACP.

[40] Between 1932 and 1935, all of the early terrace experiments at La Crosse incorporated contour plowing. O. E. Hays and V. J. Palmer, *Soil and Water Conservation Investigations: Progress Report, 1932-35* (La Crosse, Wis.: USDA, 1937), 43. For the precedents of contour plowing, see Steven Stoll, *Larding the Lean Earth: Soil and Society in Nineteenth-Century America* (New York: Hill and Wang, 2002); Hall, "Terracing in the Southern Piedmont," 97-98; and Angus McDonald, *Early American Soil Conservationists*, USDA Miscellaneous Publication 449 (Washington, D.C.: Government Printing Office, 1941).

lines of terraces.[41] At the Upper Mississippi Valley experiment station between 1932 and 1935, researchers' only field-scale experiments were sited on terraces.[42] Thus, it stands to reason that, like their colleagues at the national level, conservation researchers in the Driftless Area came upon *contour* strip-cropping by merging August Kramer's practices and their decades of experiences with plowing and terracing on the contour.

While La Crosse scientists did not in their early years experiment with field-scale contour strips, they did conduct plot-level research that established new ways of managing natural processes, ways that would inform the rise of strip-cropping. One of the most important experiments conducted at the station involved research into the relative erodibility of soils and the optimal rotations of different crops. Researchers established experimental plots to determine which crops and rotations in a strip-cropping system would produce the greatest yields and the least erosion.

Depending on the variety, perennial hay crops retained peak nutrients for two or more years, but then farmers would need to replace their hay strips. Rather than be seeded directly back to hay, scientists determined that, since the strip needed to be plowed up anyway, it was most lucrative to plant it to corn (a cash crop) for one year, followed by grain for one year. At this point, the soil structure (which had been improved by the hay) had broken down under corn and started to erode under grain, so the researchers recommended reseeding the strip to hay for one to three years before repeating the cycle. The La Crosse researchers continued these and other experiments well into the 1950s on controlled test plots (Figure 27) as well as in the field, measuring the effect of many variables—crop choice, rotation length, width of strips, steepness and length of slope, and so forth—to refine and optimize the productive and protective capacity of strip-cropping. Many

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[41] H. V. Gieb, *Strip Cropping to Prevent Erosion*, USDA Leaflet 85 (Washington, D.C.: GPO, 1931), 2, 6; Walter V. Kell and Grover F. Brown, *Strip Cropping for Soil Conservation*, USDA Farmers' Bulletin 1776 (Washington, D.C.: GPO, 1937), 2, 7. For more on terraces, see chapter 4.

[42] Hays and Palmer, *Soil and Water Conservation Investigations*, 26.

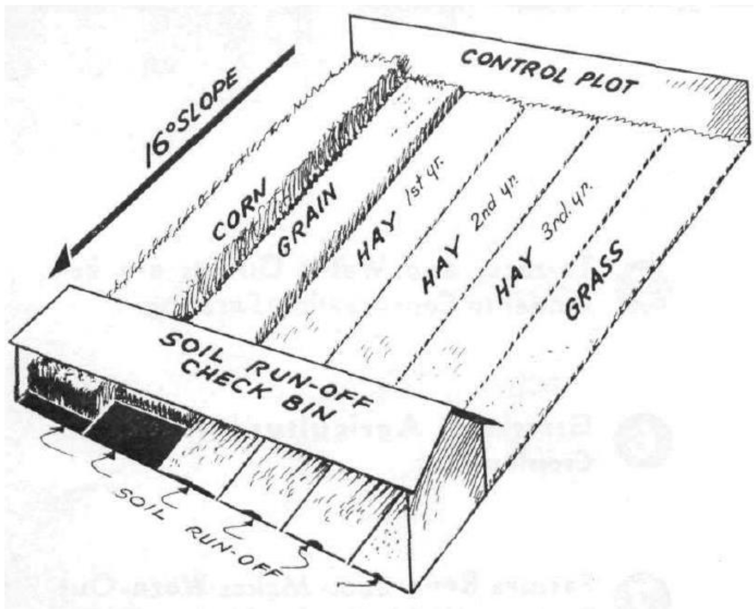

Figure 27: Schematic illustrating control plots at Upper Mississippi Valley Soil Conservation Experiment Station. Researchers monitored soil erosion and water runoff according to crop cover in a typical rotation. Source: Hays and Hembre, *Each Acre to Its Best Use*, 4.

technicians considered these test results as indisputable evidence that conservation reduced erosion. "It was all there in front of you," Roy Dingle recalled. "There was no denying it."[43] Ultimately, these studies provided conservationists the knowledge of agroecological systems they wanted in order to persuade farmers to embrace their methods.

Indeed, even while the researchers at La Crosse were building their knowledge of the natural world, the needs of producers were never far from their minds. By the mid-1930s, scientists understood from observation at the station that strip-cropping offered an effective technique that they were "certainly justified in continuing to advocate," yet they had conducted no measureable

[43] Dingle, *Nothing But Conservation* (Richland Center, Wis: Roy H. Dingle, 1993), 199. For results of experiments, see, for instance, Davis and Hays, *Farms the Rains Can't Take*, 10; Orville E. Hays and Ingvald O. Hembre, *Each Acre to Its Best Use: A Tour Guide of the Soil Conservation Station, La Crosse, Wisconsin* (La Crosse, Wisc: USDA Soil Conservation Service with Wisconsin Agricultural Experiment Station and State Soil Conservation Committee, 1951); Orville E. Hays, *The Twenty Second Annual Report of the Upper Mississippi Valley Conservation Experiment Station* (March 1954), b4, Zeasman Papers; and Orville E. Hays, Robert E. Taylor, and Henry L. Ahlgren, *A Tour Guide of the Soil Conservation Station, La Crosse, Wisconsin* (La Crosse, Wis.: USDA Agricultural Research Service with Wisconsin Agricultural Experiment Station and State Soil Conservation Committee, 1961).

experiments on the practice. Consequently, conservationists remained frustrated by their inability "to give farmers any quantitative answer when they ask us how much they can expect strip cropping to reduce water and soil losses, and how strip cropping compares with terracing in this respect."[44] Raymond Davis, the director of the La Crosse station, shared this concern. In 1936, he lobbied SCS chief Hugh Bennett to authorize additional funding for:

> experiment[s] to determine quantitatively the value of strip-cropping as a means of erosion control…. We have been pushing this form of control to the very limit and yet we do not have any experimental evidence on which to base our recommendations. We are often confronted with the question by farmers as to whether we know definitely that strip-cropping will do what we claim for it…. We certainly cannot afford to overlook the opportunity of spending a reasonable amount of money for gathering information in an experimental way which will improve the effectiveness of our field operations.[45]

Although small experimental plots indicated that strip-cropping worked as advertised, farmers demanded hard data. A transition to strip-cropping, with its rotational patterns, terraforming, and varied crops, was no small matter for farmers whose livelihoods were at stake, and they could not afford to risk trusting merely in conservationists' assurances. They needed numbers.

The La Crosse experiment station responded to farmers' demand. In 1937, apparently having secured funding from Washington, researchers installed equipment on their fields "to measure soil and water losses." Within a few years, conservationists had the quantified, predictive data they needed to substantiate their claims that strip-cropping both reduced erosion and boosted crop yields. In the four-year period between 1937 and 1940, they reported, the tests resulted in a 90 percent reduction in soil erosion, a more than twofold increase in barley and hay production, and a 20 percent increase in corn yields. The La Crosse scientists assured farmers throughout the Driftless

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[44] Researchers started strip-cropping at the La Crosse station in 1932, but they did not install measuring equipment until 1937. Hays and Palmer, *Soil and Water Conservation Investigations*; Davis and Hays, *Farms the Rains Can't Take*, 9-11. Quoted from Noble Clark, "Management and Use of Agricultural Lands, Including Farm Woods and Pastures," Address at Conference on Up-Stream Engineering in Washington, D.C., 22 September 1936, 10, b3, RG 114, NARA-Chicago.

[45] Davis requested the funding to buy more land at the La Crosse experiment station. Davis to Bennett, 17 July 1936, b3, RG 114, NARA-Chicago.

Area that these figures were both reliable and replicable. "Farmers who live on this land," wrote Kenneth Davis and Orville Hays, "can assume that the findings at the station are similar to what they would have been had the experiments been conducted on their own farms." In fact, researchers had producers in mind all along. The station's experiments had the express purpose of deriving "answers to questions about which there is still doubt. From these answers come better ways of farming" (Figure 28). In short, the creation of conservation science and technology was a social affair.[46]

Farmers and Dairy in the Coon Creek Demonstration Project of Wisconsin

The data emanating from the Upper Mississippi Valley experiment station corroborated the observations and experiences of hundreds of Driftless Area farmers in the 1930s: conservation technologies reduced erosion. In 1939, the Soil Conservation Service reported a dramatic improvement in erosion control and crop production within its demonstration project in the watershed surrounding Coon Valley, Wisconsin. Of the 418 farmers who originally enrolled the project, 374 cooperated for the full five-year period. A survey of these cooperators conducted in the late 1930s found that even though the amount of cultivated land had been reduced by 7.5 percent, the production of butterfat had increased from an average of 166 pounds per cow in 1934 to 207 pounds per cow in 1936. SCS technicians credited this boosted production to the increased crop

[46] Davis and Hays, *Farms the Rains Can't Take*, 3, 10-11. I have not been able to find hard evidence that suggests Bennett authorized the expansion of the farm in 1936, although evidence does suggest that the farm grew in size from an original 85 acres to 160 acres. This likely took place at least partially in response to Davis' request. The average soil loss from 1937 to 1940 was 27.1 tons per acre on a field not strip-cropped while only 3.1 tons per acre on a strip-cropped field. The strip-cropped fields averaged per year 43.0 bushels of corn, 41.9 bushels of barley, and 2.5 tons of hay. For the same four year period, the field that was not strip cropped was in hay for two years and in corn and barley for one year each. The yields were as follows: 35.6 bushels of corn, 20.8 bushels of barley, and an average of 1.18 tons of hay each year.

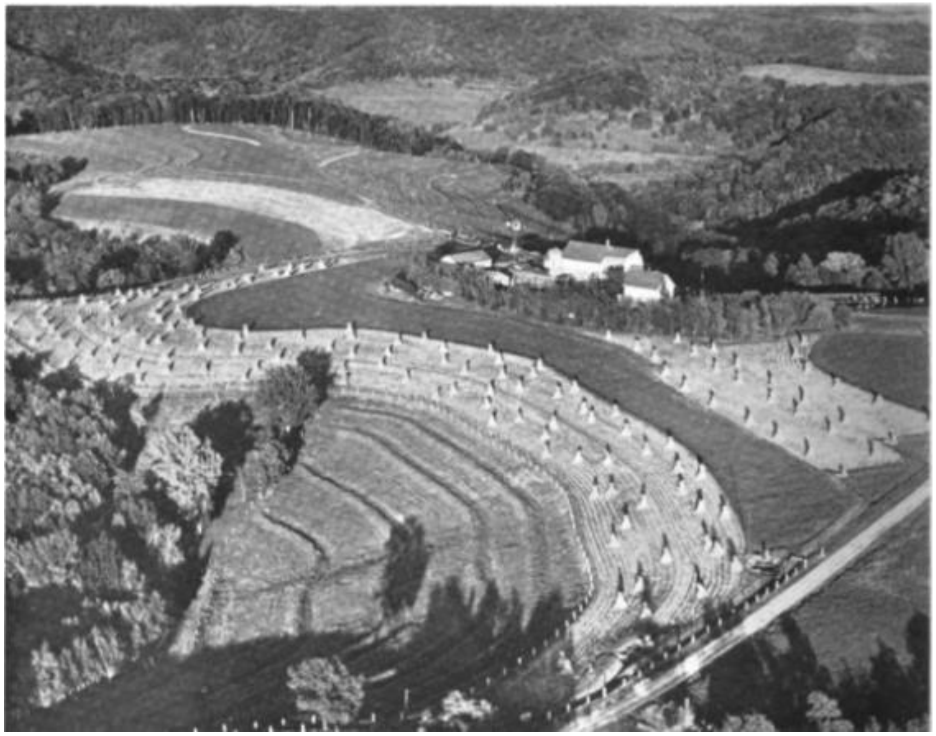

Figure 28: Field-level contour strip-cropping plots at the Upper Mississippi Valley Soil Conservation Experiment Station, ca. 1942. Credit: James N. Meyer. Source: *Soil Conservation* 8 (November 1942), 120.

nutrition made possible by conservation methods.[47] Together with the research at the La Crosse experimental farm, the Coon Valley project offered compelling evidence to farmers and the larger conservation community of the practicality and productivity of strip-cropping.

The Coon Creek watershed, centered on the village of Coon Valley roughly fifteen miles southeast of La Crosse, Wisconsin, was home to the nation's first soil conservation demonstration project. The project involved five-year cooperative agreements signed between farmers and the Soil Erosion Service (SES), later the Soil Conservation Service, to install conservation measures on the

[47] R. H. Musser, "Coon Valley—4 Years After," *Soil Conservation* 4 (May 1939), 260-261. Musser's figure of 374 participating farmers suggests that a few dozen of the original 418 cooperators cancelled their agreements. The project signed up 412 cooperators by 1935 and added 6 more in 1937. See Helms, "Coon Valley," 53; and McKelvey, "Farming Against Erosion," Coon Creek Project Monograph (1939), 49-50; NRCS historical files, Madison, Wisconsin.

In the 1960s, Otto Zeasman cited an unnamed circular which noted that, as of 1939, "351 of the 800 farms in the [watershed] were under active agreements, 67 being cancelled with a change of ownership. Of these 351 cooperators, 255 were classed as good and 96 as poor." Zeasman, letter to "Reader," [1960s?]; b1; Zeasman Papers.

land using government labor, expertise, and supplies such as seed and fencing. In exchange, farmers would have to practice conservation for the duration of their agreement. The project was designed to showcase the practicality of soil and water conservation so neighboring farmers could replicate it on their own land. Despite only operating from late-1933 until 1939, the Coon Creek project has attracted considerable attention in popular and scholarly histories of soil and water conservation.[48]

Most students of the Coon Creek demonstration project emphasize that the watershed represented a proving grounds for soil conservation. Yet this focus offers an incomplete picture of how and why the demonstration project—and strip-cropping, in particular—achieved such popularity and persuasiveness. Cooperating farmers signed agreements with the government, but they could and sometimes did break them. Why did nearly 90 percent of the cooperators adhere to their agreements?[49] The legal obligation of having to repay the government for its supplies and services suggests one possible explanation, as does the cultural imperative to stand by one's word. But other forces were also at play: namely, farmers' relationships with conservation technicians and the environmental imperatives of dairy farming.

The success of the Coon Creek project owed in large part to the relationships conservationists worked to cultivate with farmers. One aspect of this involved sitting down with farmers to develop a farm plan suited specifically for each specific farm. In 2008, Ernest Haugen recalled that in 1934 "the Soil Conservation man John Bollinger and my father sat by the kitchen

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[48] See Maher, *Nature's New Deal*, chapter 4; Arthur S. Hawkins, "Return to Coon Valley," in *The Farm as Natural Habitat: Reconnecting Food Systems with Ecosystems*, ed. Dana L. Jackson and Laura L. Jackson (Washington, D.C.: Island Press, 2002), 57-70; Anderson, "Coon Valley Days;" Oertel, "A Reclaimed Coon Valley;" Sorenson, "Coon Creek Watershed;" Cohee, "The Leopold Legacy for Soil Conservation;" Cox, "Back to the Future?"; Hart, "Ground Lost and Gained."

[49] Of the 418 initial cooperators, only 44 (10.5 percent) did not see their agreement to the end. One of them was Anton Chapiewsky, who received a stern letter of rebuke from a conservationist. George V. Bowers to Chapiewsky, 20 April 1937, b3, RG 114, NARA-Chicago.

table in the living room with a kerosine [*sic*] lamp for light" to develop the Haugen farm plan.[50] Bollinger's colleague, Herbert Flueck, noted the importance of this approach—of "listening to the farmer, always. We figured he must have a big input on [the plan] because he's been farming it." Although conservationists had "certain specifications," as Flueck put it, their willingness to coordinate with farmers to apply those standards engendered a strong sense of ownership over conservation in many Coon Valley dairy producers.[51]

This strategy, which conservationists replicated for years both within and beyond the Coon Creek watershed, was designed to transform farmers' independent mentalities from a liability to an asset. "If you know farming," Flueck maintained, "[you know that] farmers are very independent, and they are doing what their grandfathers and great grandfathers have been doing over the years."[52] By working closely with a dairyman, conservationists hoped to cajole him into replacing his forebears' methods with the latest innovations. As an SCS official recommended to field technicians in 1937,

> Although the recommendations [in a farm plan] are essentially ours, by careful approach and suggestions, the farmer can be made to feel that *he* is assisting in developing the program…. Let us make every possible effort to encourage the farmer to feel that he is the one who is suggesting strip cropping, contour cultivation, proper rotations, and other effective means that we know are fundamental.[53]

The agent suggested that conservationists avoid language in farm plans that indicated the farm plan was executed "'by the government' or 'the agronomist,' etc." Instead, the official stressed, if a plan stated that the farmer made the recommendations, "he immediately feels a certain amount of pride

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[50] Haugen, Speech Delivered at Coon Creek 75th Anniversary, 25 April 2008, 1, NRCS Historical Files, Madison, Wisconsin.

[51] Helms interview of Flueck, 12, 13.

[52] Ibid., 11. From this quote, it is clear that the independence Flueck references applied primarily to outsiders, not family members.

[53] [Leslie Wright?], "What is Cooperation?" 13 March 1937, memo attached to Leslie Wright to Lloyd G. Signell, 13 March 1937, b4, RG 114, NARA-Chicago. Emphasis original. Signell was the Acting Project Manager in Coon Valley.

and satisfaction in the thought that 'he' had an *important* part in the development of [his farm plan]."[54] Conservationists engaged in a strategic process of negotiation in order to ingratiate themselves and their practices to otherwise independently minded farmers.

If Coon Valley cooperators detected this strategy, they seemed to have not minded. The demonstration project attracted a large number of cooperators, several of whom served on an advisory board to the SCS.[55] These farmers formed committees and arranged meetings in various townships throughout the valley where their neighbors could meet with extension agents and SCS technicians "to discuss the soil conservation program." Moreover, the advisory board provided the SCS important insight into the minds of farmers. In 1936, for instance, SCS agents learned from this council that many farmers continued to plow their fields in the fall (against agency recommendations) because the summer drought had killed their hay crop, because they had more time in the fall than in the spring, and because they thought it would increase soil moisture. Alternatively, conservationists ascertained that strip-cropping constituted a much more popular technique than terracing. "Terraces are fine," commented one farmer, "but strip cropping is better." Another agreed: "It is the only way to do any farming at all."[56]

Agriculturists in the Coon Creek watershed preferred strip-cropping largely because it aligned with their specific relationship to the natural world, which centered on dairy farming. Few factors determine the quality and quantity of a cow's milk more than its feed, and the Coon Creek demonstration project inaugurated a new agricultural system in which farmers could grow high-

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[54] Ibid. Emphasis original.

[55] Edwin Freyburger memo to R. H. Musser, "Work Review of Coon Valley, Wisconsin Project, March 30 to April 2, 1937," 24 May 1937, 7, b5, RG 114, NARA-Chicago. At least fourteen farmers comprised this board, according to the minutes from a meeting held 23 November 1936. See M. F. Schweers memo to R. H. Davis, 27 November 1936, b3, RG 114, NARA-Chicago.

[56] Schweers to Davis, 27 November 1936, 2, 4. The farmers quoted were Cornelius Skolos and Orville Lunde, respectively.

quality feed while still limiting erosion.[57] Although generally overlooked by scholars, the provision of free lime and seed by the federal government also proved instrumental to the success of the Coon Valley project.[58] It enabled farmers to raise alfalfa, a hay crop central to the success of conservation and dairy production in the Driftless Area.

Alfalfa facilitated soil and water conservation in several ways. Unlike other types of hay such as timothy and clover, which lose their nutritional value usually after one or two years, a stand of alfalfa can remain productive for three to five years. Once integrated into a contour strip-cropping system, this translated into longer rotations and less frequent plowing, which meant reduced erosion. Its lengthier range of productivity also made alfalfa attractive for growing on steeper slopes because farmers could maximize the economic returns of their more erodible land.[59] Moreover, compared to other hays like timothy or clover, alfalfa is protein-rich, which contributes to greater quality and quantities of milk. In this manner, conservation fostered the specialization of dairy farming.[60] Finally, because alfalfa is a legume, it fixes nitrogen into the soil, thereby replacing some of the nutrients consumed by other crops, especially corn. As *Hoard's Dairyman*, a journal for dairy farmers, put it in 1931, alfalfa was "the king of hays."[61] While practices such as terraces and strip-cropping

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[57] One factor more important to production than cattle feed is likely genetics.

[58] If historians have mentioned alfalfa at all, it is usually just a passing reference. This likely stems from previous scholars' dominant treatment of Driftless soil and water conservation as somehow only tangentially related to dairy farming, not inextricably entwined with it. For a few brief references to alfalfa in the literature, see Trimble, *Historical Agriculture and Soil Erosion*, 45 and 98; Johnson, *Soil Conservation in Wisconsin*, 154-155; and Maher, *Nature's New Deal*, 126-127. For an exception where alfalfa is featured somewhat more prominently, see M. Scott Argabright, et al. *Historical Changes in Soil Erosion, 1930-1992: The Northern Mississippi Valley Loess Hills* (Washington, D.C.: USDA NRCS, 1996).

[59] For example, see H. O. Anderson, D. R. Mitchell, and P. E. McNall, "Ten Years of Soil Conservation Farming: Coon Creek Area, Wisconsin, 1934-1943" (October 1946), 6, NRCS Historical Files, Madison, Wisconsin. For more on the benefits of crop rotations, see R. E. Uhland, "Rotations in Conservation," For more on the benefits of crop rotations, see R. E. Uhland, "Rotations in Conservation," *Yearbook of Agriculture, 1943-1947: Science in Farming* (Washington, D.C.: Government Printing Office, 1947), 527-536.

[60] As Richland County conservationist Roy Dingle explained—and what farmers now know intuitively—the best time to cut alfalfa is right as it begins to bud. "Bright green leafy alfalfa hay," he wrote, "was next thing to a protein concentrate--seventeen to twenty percent protein and full of vitamins. Good hay was something to be prized and sought after." Dingle, *Nothing But Conservation*, 80, 85-86. One farmer claimed that conservation enabled him to increase his livestock production by sixty-five percent within only five years. Frank Kotek to Marvin Schweers, 16 January 1946; b43; Item 21; RG 114; NACP.

[61] Hoard's Dairyman, *Feed Book* (Fort Atkinson, Wis.: Hoard's Dairyman, 1931), 69.

Figure 29: Aerial photo of contour strip-cropping on Elmer Manske farm, just outside of Coon Valley, Wisconsin. Rotations include corn, oats, and alfalfa. In 1955, Hugh Bennett called this farm "the most photographed farm in the world." Quoted in "Sun Brightens Marker Rights," *Milwaukee Journal* (20 July 1955). Photo credit: James Richardson; NRCS Historical Files, Madison, Wisconsin.

were more visible on the land (Figure 29), dairy farmers still needed crops to feed their cows, and many considered "alfalfa…the biggest part of [conservation farming]."[62] In the Driftless Area of southwestern Wisconsin, alfalfa was the cornerstone of contour strip-cropping.

Farmers were keenly aware of alfalfa's inherent advantages over other types of hay before the inauguration of the Coon Creek project, but environmental and economic conditions had discouraged its use. First, while timothy and certain varieties of clover could tolerate the slightly acidic soils found in the Driftless Area, alfalfa could not. Free federal lime, which was quarried nearby with government labor, helped raise soil pH—"sweeten the soil," as one conservationist put it—conditioning the soil for alfalfa production. Second, alfalfa seed was costly. Ernest Haugen, a

[62] The quote is from Elmer Manske, one of the original Coon Creek cooperators. Quoted in Darrell Smith, "The Soil Stayed and the Controversy Died Down," *Farm Journal* 108 (December 1984), A-10.

son of one of the original Coon Creek cooperators, recalled that when presented by the government with the choice of free seed, "my father…chose alfalfa most of the time because it was long lasting and [had been] expensive but now it was free." Finally, the drought of the early 1930s made it difficult for any hay seedlings (much less expensive alfalfa seed) to germinate and take root. Given these difficulties, few farmers saw the benefit of spending more for alfalfa only to watch it fail in the field.[63]

By providing lime and alfalfa free of charge, the Coon Creek demonstration project removed these obstacles to alfalfa production. One conservationist noted the popularity of alfalfa and lime for the first 99 contracts in the Coon Creek project. For every 101 acres (the average farm size), the SES supplied thirty-eight tons of lime; moreover, of the more than 39,000 pounds of seed requested by cooperators, over 24,000 pounds were for alfalfa.[64] Some conservationists believed this project also opened a market for limestone production, for "various project managers [indicated] that the commercial production of limestone is speeding up very much as a result of our activities."[65] The increased availability of lime even after the end of the demonstration project enabled the continued rise in alfalfa production. Indeed, one scholar concluded that whereas in 1930 hardly anyone raised alfalfa in Vernon County, Wisconsin, by 1950 the county's alfalfa acreage had permanently surpassed that of farmers' chief alternatives, timothy and clover.[66] The long-lasting success of the Coon Creek

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[63] Dingle, *Nothing But Conservation*, 30; Ernest Haugen, Speech Delivered at Coon Creek 75th Anniversary, 1. As one farmer later explained, alfalfa "can't hardly grow" in soils with pH below 6.5; a pH closer to 6.8 is much more optimal. See Earl Brey Interview, 10. For more on economic pressures restricting alfalfa usage, see Argabright, et al., *Historical Changes in Soil Erosion*, 21. On drought inhibiting alfalfa stands, see Agnes Blanding to Otto Zeasman, 5 November 1934, b1, Zeasman Papers; Dingle, *Nothing But Conservation*, 80.

[64] [J. K.?] Landon, "Report on First 100 Farm Agreements," [n.d.], [1-2], b7, RG 114, NARA-Chicago.

[65] Raymond Davis noted that this idea was hard to verify, for "the State WPA lime program would make it impossible to determine the effect of our lime production activities." R. E. Uhland to R. H. Davis, 27 June 1936, b3, RG 114, NARA-Chicago.

[66] Junko Goto, "Soil and Water Conservation Programs in Action: The Vernon County, Wisconsin Experience," (master's thesis, University of Wisconsin-Madison, 1981), 62. Vernon County, which was just south of La Crosse, encompassed most of the Coon Creek watershed.

project was the result not only of technicians' initiatives, but also of the new relationships forged between conservationists, farmers, and the natural world.

Beyond Coon Creek: The Spread of Contour Strip-Cropping, 1930s-1960s

Although historians have neglected certain aspects of the Coon Creek project, its success remains clear. However, the project has also come to dominate narratives chronicling the accomplishments of conservation in the Driftless Area. Many scholars have been content to explain the proliferation of practices such as contour strip-cropping by suggesting that they spread from Coon Creek as if on their own, without clear mechanisms of dispersal.[67] Contour strips dispersed throughout the region because the sides of conservation triangle were aligned. Two new factors emerged between the 1930s and 1960s that aided the spread of strip-cropping. First, "land-capability maps" offered a new way for both conservationists and farmers to relate to the natural world—particularly the topography of the Driftless Area—at the same time that they fostered the relationships between farmers and technicians by making conservation plans comprehensible. Second, agriculturists helped convince one another of the virtues of strip-cropping, creating an important set of relationships not along the sides of the conservation triangle, but at one of its points.

With the end of demonstration projects in the late 1930s, one of the biggest challenges conservationists faced was how to spread conservation beyond places like Coon Valley without the benefit of concentrated labor and financial resources. The SCS needed a tool that would enable a small team of technicians to work with geographically dispersed farmers to put conservation into

[67] Indeed, it remains unclear the extent to which Coon Valley served as a hub for the dispersal of contour strip-cropping. Helms, "Coon Valley," 53; Stanley W. Trimble and Steven W. Lund, *Soil Conservation and the Reduction of Erosion and Sedimentation in the Coon Creek Basin*, Wisconsin, Geological Survey Professional Paper 1234 (Washington, D.C.: GPO, 1982), 29-30.

practice. Conservationists found one answer in land-capability maps—color-coded maps that "indicate…the use for which the land is best suited." These maps combined data from USDA soil surveys and aerial photographs with the specific topography, soils, and extent of erosion on a farm to categorize land into different classes, ranging from "excellent cropland" to "permanent grass or trees" (Figure 30).[68]

SCS technicians had used color-coded farm plans in the demonstration projects of the 1930s, but the land-capability maps the agency introduced in 1940 (and beyond) were notably different. The classification of lands represented a means of abstracting the earlier farm plans, still accounting for the environmental particularities of a specific farm but also arranging land into categories that were understandable and manageable from a distance. In this respect, the rise of land-capability maps in the 1940s reflected the desire of the Soil Conservation Service to make lands more *legible*—a process that agrarian scholar James C. Scott describes as "rationalizing and standardizing what was a social hieroglyph into a legible and administratively more convenient format."[69] Land-capability maps offered conservationists a new way of mentally organizing the natural world, one that encompassed topographic and soils diversity as well as fostered efficient application of conservation over widespread stretches of the Driftless Area.

These maps also changed farmers' perception of land and proper land use. Throughout the 1940s, the SCS reported that Driftless Area agriculturists considered land-capability maps useful

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[68] R. D. Hockensmith and J. G. Steele, *Classifying Land for Conservation Farming*, USDA Farmers' Bulletin 1853 (Washington, D.C.: GPO, 1943), 2, 9. In the early 1940s, the Soil Conservation Service used five classes of land, but within a few years they had expanded their classes to eight. For the long history of SCS land classification systems, see Douglas Helms, "The Development of the Land Capability Classification," in *Readings in the History of the Soil Conservation Service*, 60-73; John Opie, *The Law of the Land: Two Hundred Years of American Farmland Policy* (Lincoln: University of Nebraska Press, 1987), 154-161. See also R. Burnell Held and Marion Clawson, *Soil Conservation in Perspective* (Baltimore: The Johns Hopkins Press for Resources for the Future, Inc., 1965), chapters 6-7.

[69] James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998), 3. For other applications of the legibility concept in twentieth-century Wisconsin, see James W. Feldman, *A Storied Wilderness: Rewilding the Apostle Islands* (Seattle: University of Washington Press, 2011); and Joshua Nygren, "A Producers' Republic: Rural Zoning, Land Use, and Citizenship in the Great Lakes Cutover, 1920-1940," *Michigan Historical Review* 40 (Spring 2014): 1-26.

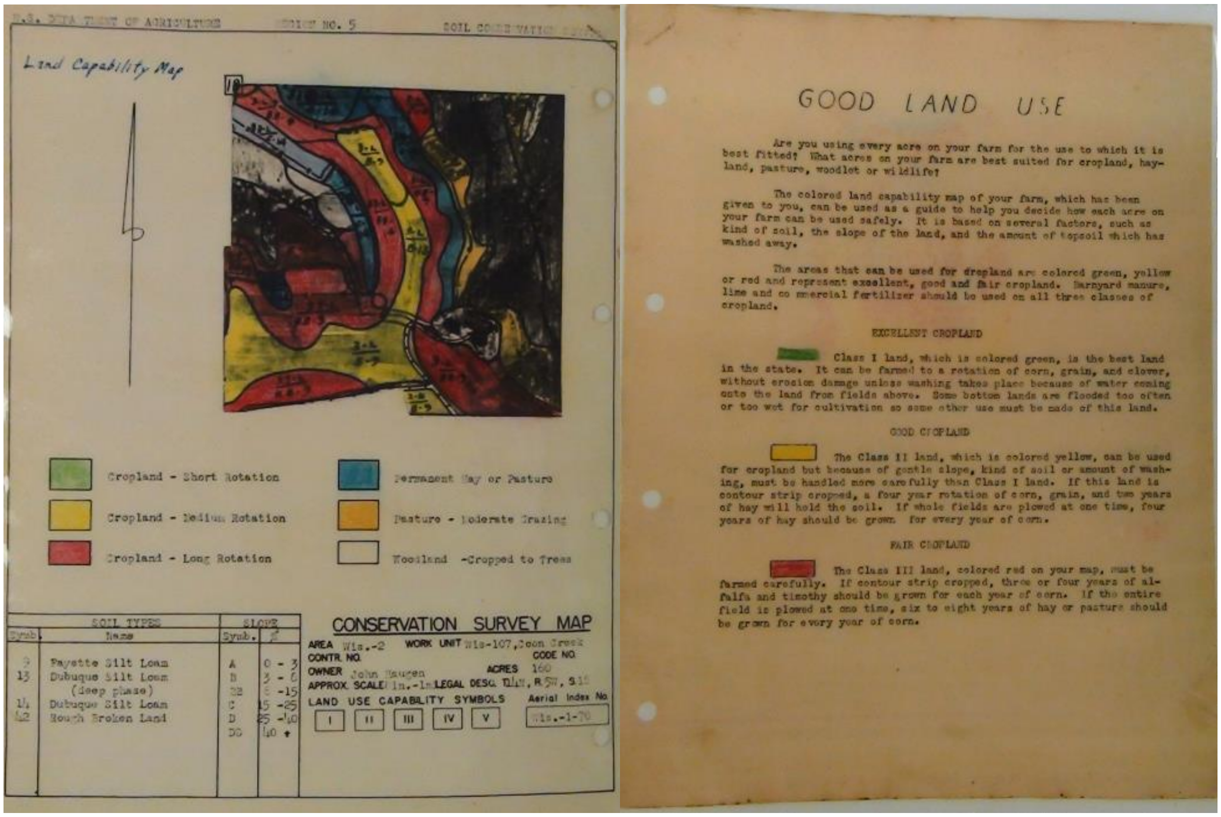

Figure 30: (Left) Farm plan of John Haugen, Coon Valley, Wisconsin, ca. 1940; (right) a partial description of land capabilities designed to show farmers how to "[use] every acre on your farm for the use to which it is best fitted." These documents illustrate the rise of land-capability maps in the 1940s as a new way of knowing nature for conservationists and farmers alike. The smudging of the map seems to be an aberration, as most farm-plan maps were of much higher quality. Source: NRCS Historical Files, Viroqua, Wisconsin.

tools for understanding and applying conservation. Gilbert Brown, a farmer in northwest Illinois, informed SCS technicians in 1941 that he found these maps more comprehensible and practical than detailed soil surveys, because land-capability maps prescribed specific uses for land. Arnold Ellinghuysen of Winona County, Minnesota, agreed. "The colors on those maps told me how to handle my land better than anything else I've seen," he explained the same year. "It is easy to see what each color means; the plow shows me where yellow land leaves off and red land begins, just as it is on the map." In other words, a Sauk County, Wisconsin, farmer said in 1947, "we have a much better knowledge of our land capability through the farm maps." Land-capability maps resonated with thousands of Driftless Area farmers who sought to align the way they thought about their land with the new conservation methods they were embracing.[70]

SCS personnel often found that getting farmers to embrace these new conservation practices was no small matter. One of the most common recollections amongst agriculturists of their early experiences with conservation was the social stigma attached to contour strip-cropping. The first farmer in a neighborhood to install contour strips often became the target of ridicule. Cyril Crawford, who managed a farm in Winona County, Minnesota, recalled installing "the first strips" in the county in 1936. "The neighbors got many a laugh from those crooked rows."[71] "Out of courtesy," another farmer, "Butch" Wirkler of Elkader, Iowa, allowed workers from the local CCC camp to install contour strips on one of his fields in 1935. But he only let them work on "the back forty. It was back out of sight and I didn't think there would be so much talk about it among the neighbors if I could hide it. I felt foolish." As he drove with two neighbors to an auction the following day, he needed to "release the pressure," so he divulged his secret. "As soon as we arrived," Wirkler recounted, "I lost myself in the crowd to get away from their ribbing."[72] Many of

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[70] Quoted in Kenneth S. Davis, "The Munson Conservation District—An Example of Democracy at Grass Roots," *Soil Conservation* 6 (February-March 1941): 220; Walter W. John, "Colored Land-Use Maps Guide Farmers," *Soil Conservation* 6 (February-March 1941): 236; and "Farm Maps Tell Story," *Soil Conservation* 13 (October 1947): 69. See also Walter W. John, "The Land Comes First," *Soil Conservation* 6 (February-March 1941): 225.

Not all farmers found these colorful maps revelatory, however. Roy Dingle, a conservationist from Richland County, Wisconsin, recalled a farmer who rebuffed his exhortation to use a land-capability map. "Young feller," the farmer replied, "that's a mighty pretty picture you've got there, but it ain't no use. Why we've knowed about that dirt stuff since I was a little kid." The farmer explained that the best land in the county was always found to the right side of a stream if one faced downstream. Upon reflection, Dingle was dumbfounded: most of the streams in Richland County were oriented in such a manner that the silt cap that blew in after the ice age settled deepest precisely according to the farmer's description. While Dingle determined that this formula held only for valleys, and not for ridges, he concluded, "There was no way to beat sound native wisdom." Instances such as these are rare in the historical record, primarily because few conservationists were as candid and introspective as Dingle, and because farmers typically did not record this sort of experiential knowledge in written form. This exchange reminds us that just as the conservationist-nature side of the triangle could influence the farmer-nature side, the reverse was also true. Dingle, *Nothing But Conservation*, 179-180.

[71] Harold Severson, "District Profile: Cyril Crawford of Minnesota," *Soil Conservation* 22 (May 1957), 237.

[72] Glennon Loyd, "Iowa's Wirkler and His Victory Farm," *Soil Conservation* 8 (July 1942), 10.

the early innovators found that switching to contour strip-cropping required a hefty investment of social capital.

Wirkler, Crawford, and countless other Driftless Area farmers endured razzing from their neighbors because contour strip-cropping departed so obviously from tradition. Roy Dingle, the SCS agent for Richland County, Wisconsin, reflected that in the 1930s and 1940s, "contour strip cropping…immediately branded a farmer. Here was a crazy man going to that 'rainbow farming,' that crooked farming where it was impossible to checkrow the corn." Agriculturists prided themselves on planting straight rows in square fields, but that "old pride…had to be erased for this contour farming" to thrive.[73] Expunging the old mentality from the Driftless Area involved not only conservationists working with farmers, and farmers seeing the results for themselves, but also farmers convincing one another.

Farmers had a range of opportunities to evangelize to their neighbors on the virtues of contour strip-cropping, but some of the most evocative moments for convincing one another came while working together in the fields. Norbert Boeder of Monroe County, Wisconsin, started strip-cropping in the late-1940s because he "had a neighbor…[who] had his all laid out. I had worked with him a little, some field work. I saw that there was quite an advantage." Farmers elsewhere shared similar experiences. Conservationist Jack Densmore relayed a story of a farmer named Oscar who, during threshing time, endured "a lot of 'chatter' about his 'crazy farming.' Oscar took it all good naturedly," but at the next farm in the threshing ring "Oscar deliberately drove his tractor into a gully." As the crew labored to dig out the tractor, "Oscar pointed out that he might be doing

[73] Dingle, *Nothing But Conservation*, 33. Checkrowing refers to the traditional practice of applying the grid to the field; the spaces between rows are equal to the spaces between adjacent plants within a row.

'crazy farming' but he didn't have any gullies!" Densmore concluded, "The neighbors quickly got the point."[74]

Field labor was not the only opportunity for farmers to persuade their peers to adopt contour strips. They also exerted pressure through neighborhood work groups—the informal, closely knit associations rural people relied upon for collective labor. "These were the groups who did things together," recalled Roy Dingle, "such as filling silo, threshing, wood buzzing, and any job that required a crew…. Their leader…was always there somewhere." Dingle knew that if he could "sell conservation to this natural leader…the rest of the members of the group would follow."[75]

Experiences elsewhere in the Driftless Area corroborated Dingle's philosophy. Conservationist Herbert Flueck recalled a strong "community pride" for conservation in Minnesota, where if a newcomer bought a farm and refused to practice conservation, neighbors would respond, "We won't help you [thresh] if you don't go back to the proper land use and proper erosion control practice." According to Flueck, "it worked." In Green County, Wisconsin, Ken Digman brought together his neighbors in 1951 to discuss soil and water conservation. "A neighbor can show results," Digman reasoned, "where a government technician may not be able to convince a farmer that conservation farming is best. 'How will it work on my farm?' is the first thing most farmers want to know, and a neighbor is the one who can tell him." Digman's approach paid off, and this local leader converted his neighbors, including Tommy Schuetz, into conservation practitioners. "Those group meetings helped straighten me out," Schuetz recalled. Moreover, some of these neighborhood groups formalized into watershed associations in the 1950s. For farmers, watershed associations offered a means of preserving a sense of unity even as rural communities grew more

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[74] Norbert and Adeline Boeder Interview, 3; Densmore, "Wisconsin First in Strips," 5. Such reactions toward contour strip cropping were not unique to Wisconsin. For example, see Maher, "'Crazy Quilt Farming on Round Land,'" 319-320.

[75] Dingle, *Nothing But Conservation*, 183. See also Densmore, "Wisconsin First in Strips," 5.

atomized after World War II. Tommy Schuetz, for instance, realized "that the old threshing ring is gone, people no longer butcher together, so neighbors have tended to become strangers to each other." By contrast, Schuetz and Digman found that the monthly watershed meetings fostered opportunities for entire families to meet together and perpetuate the social fabric of the community.[76]

From the vantage point of SCS technicians, however, watershed associations functioned as more formal versions of neighborhood groups. In 1957, a soil conservationist from Sauk County, Wisconsin, reminded a gathering of his peers, "Farmers and ranchers resent 'being told' how to manage their land. They are more likely to adopt new practices if they hear neighbors in their watershed talking about and approving them. This makes ideas socially acceptable." The watershed association framework fostered this arrangement, he continued, so long as conservation technicians and other government officials worked "to keep in the background."[77] By staying out of the way as much as possible, conservationists discovered, their mission to spread soil and water conservation would achieve much greater success. Watershed associations, like the neighborhood groups before them, helped make the presence of federal agents in conservation affairs much less conspicuous.

This neighborhood group format helped diffuse conservation practices such as contour strip-cropping throughout the Driftless Area by the 1960s. The diffusion was recorded not just anecdotally, but also by academic research. In 1969, a University of Wisconsin geographer plotted the spread of contour strips in southwestern Wisconsin since the 1930s (Figure 31). As the diagram illustrates, contour strips were centered primarily within or nearby the Coon Creek watershed in 1939, but by 1967 they had multiplied throughout the region. While other factors (such as

[76] Helms interview of Flueck, 30; A. B. Foster, "Cooperation on a Watershed," *Soil Conservation* 22 (August 1956): 12-14.

[77] J. W. Stevenson, "Watershed Associations," *Soil Conservation* 24 (September 1958), 30. The article was abstracted from a talk he delivered at the Interagency Conference on Watershed Activities in Madison and Chippewa Falls, Wisconsin, in August 1957.

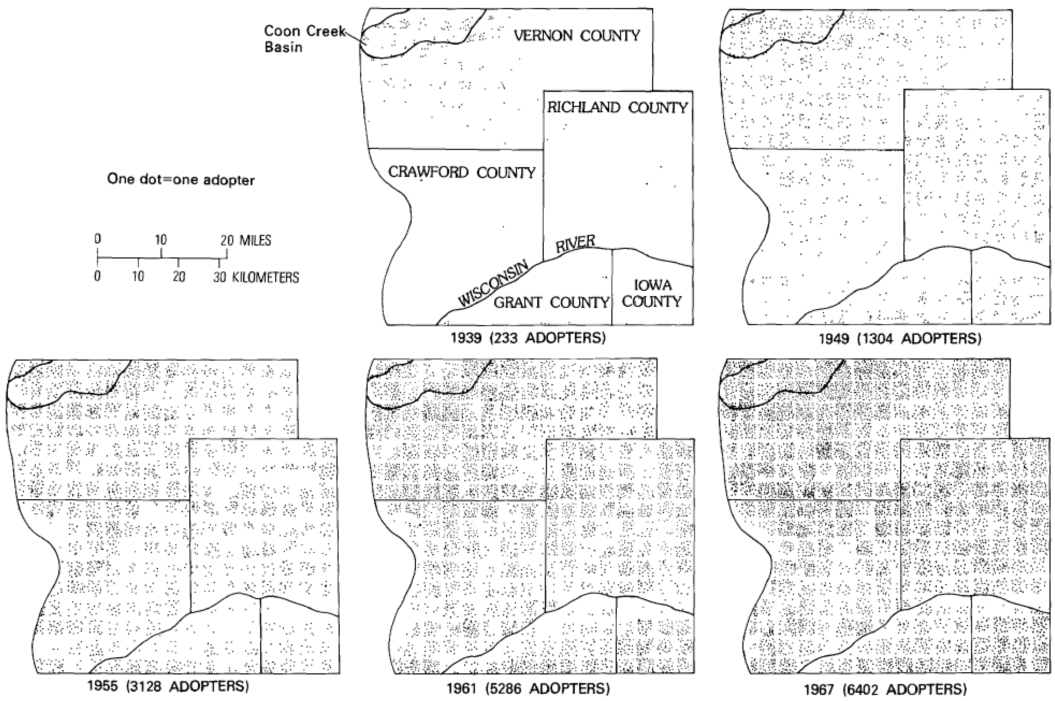

Figure 31: Diffusion of contour strip-cropping in five southwestern Wisconsin counties, 1939-1967. Source: Harley E. Johansen, "Spatial Diffusion of Contour Strip Cropping in Wisconsin" (University of Wisconsin: Master's Thesis, 1969), as pictured in Stanley W. Trimble and Steven W. Lund, *Soil Conservation and the Reduction of Erosion and Sedimentation in the Coon Creek Basin, Wisconsin*, Geological Survey Professional Paper 1234 (Washington, D.C.: GPO, 1982), 30.

government payments and continued contact with conservationists) certainly influenced the proliferation of this technique, the regular interactions between farmers often played a decisive role in breaking down the social stigma attached to strip crops. Roy Dingle considered the initial abandonment of straight rows for contour strips "almost a complete revolution for farmers."[78] The diffusion of the practice throughout the region represented yet another.

An Incomplete Revolution: The Limits of Conservation, 1930s-1970s

Like any revolution, however, soil and water conservation did not benefit everyone equally. The narrative of a "conservation success story" typically leaves out the thousands of farmers to

[78] Dingle, *Nothing But Conservation*, 86.

whom the conservation triangle could not or did not apply. Indeed, conservationists confided that SCS rhetoric of the success of conservation was overblown, for they typically found it difficult to get more than fifty percent of farmers to embrace their activities. Roy Dingle explained this "'half done' phenomenon": "when a practice is effective, it is fairly easy to gain acceptance by half of the landowners. The second half is much more difficult to win. It becomes difficult even to maintain the halfway level as some slippage takes place every year."[79] Given the difficulties getting farmers to cooperate, Otto Zeasman thought the SCS "would do *well* if they obtained 50% of the farmers."[80] Many factors contributed to the lack of cooperation by nearly half of Driftless Area farmers, but ultimately when these people rebuffed conservation, a failure in one of the legs of the conservation triangle was to blame.

Just as the relationships between conservationists and farmers often bred successful soil and water conservation, in other cases an inability to establish a functional relationship thwarted conservation farming. In the 1930s, SCS agents privately lamented their failed efforts to reach many farmers. Even in the Coon Creek demonstration project, the crown jewel of conservation, a number of agriculturists resisted technicians' overtures out of reluctance to switch to unfamiliar methods, unwillingness to stop grazing their woodlots, or simply "because they objected to the signing of any kind of legal document, regardless of its nature."[81] Other farmers were more targeted in their disdain for technicians' recommendations. In his memoir of growing up in the 1920s and 1930s on a farm in Crawford County, Wisconsin, Ben Logan recalled his father stopping to talk with "an old man named Abe." After recounting his years of labor to create a productive farm, Abe turned to Logan's father and grumbled, "Goddammit, Sam, last year a man from the government

[79] Ibid., 175.
[80] Zeasman to "Reader," [n.d.]. Emphasis added.
[81] Freyburger to Musser, "Work Review of Coon Valley Project," 3.

was out here telling me I shouldn't be farming this hillside…. I told him it was the closest thing to a level field I got. Hell, he might as well tell me I should [have] never made a living all these years."[82] For many farmers not driven to desperation by massive gullies, the suggestion that they change their ways amounted to a biting reprimand of their life's work.

Abe's experience reveals the extent to which the success of soil and water conservation hinged upon generational forces. As a county conservationist from the 1930s into the 1960s, Roy Dingle found that "young people with a life ahead of them are more conservation minded than the older ones who are finishing out their years."[83] Some of the earliest conservation farmers in the Driftless Area credited their youth as a contributing factor in their embrace of conservation. Lester Mundstock, one of the initial cooperators in the Coon Creek project, recalled, "Some of the older farmers didn't trust the program" out of suspicion the government would "take over their farms. We were young farmers, and it looked like a good deal to us."[84] Similarly, Clint Dabelstein of Winona County, Minnesota, adopted conservation practices in the 1930s because "[I was] young enough to feel that something should be done about the [erosion] problem."[85] Youth enabled farmers to anticipate several decades of benefits from conservation techniques. For many older farmers like Ben Logan's neighbor Abe, however, traditional farming practices were too deeply engrained, making them poor converts to the conservation mission.

Even when conservationists were able to strike up a functional relationship with farmers, they sometimes determined that farmers' commitment to conservation was superficial. In 1936, the USDA began a decades-long policy of paying farmers to practice soil and water conservation as a

[82] Ben Logan, *The Land Remembers: The Story of a Farm and Its People*, 8th ed. (Blue Mounds, Wis.: Itchy Cat Press, 2006), 85-86.

[83] Dingle, *Nothing But Conservation*, 321.

[84] Quoted in Sorenson, "Coon Creek Watershed," 395.

[85] Thomas C. Gahm, "Minnesota's First Conservation District—And Its Founding Father," *Soil Conservation* 40 (January 1975), 18.

means of reducing crop surpluses and to help overcome the financial outlays necessary for some conservation measures.[86] "What often bothered us," recalled Roy Dingle, "was that there were actually farmers who signed up for [contour] strips just to get the payment…. After they got their payment, [they] would goof up their strips at the slightest excuse. They didn't care in the least for conservation."[87] As cooperative agreements in the Coon Creek watershed expired in the early 1940s, conservation district supervisors decried how neighborhood groups were actually working at cross-purposes with the mission of the SCS. "A great deal of the excellent work done in the original Demonstration Area," the supervisors alleged, "has been undone by some unthinking men who lack judgment but are still influential in their neighborhood. Some have gone so far as to tear down extensive terrace systems."[88] Social relationships—both among farmers and between farmers and conservationists—could hamper conservation as much as they helped it.

Local social dynamics hindered soil and water conservation in other ways as well. Just as social cohesion brought together Ken Digman and Tommy Schuetz to form a watershed association in Green County, Wisconsin, preexisting community tensions could scuttle efforts to create watershed groups elsewhere. A researcher from the University of Wisconsin concluded in 1965 that successful watershed conservation projects in Richland County, Wisconsin, shared the common trait of locals who were "closely knit in their interrelationships…[and] inclined to share and understand their common physical problems." Unsuccessful projects lacked these community characteristics. Two group project initiatives in the county—the Elk Creek Watershed and the Middle Kickapoo Watershed—both sunk under "internal friction[s]…between ridge farmers and valley farmers over

[86] The agency responsible for making these payments was not the Soil Conservation Service, but the Agricultural Adjustment Administration and its successors: the Production and Marketing Administration, the Commodity Stabilization Service, and the Agricultural Stabilization and Conservation Service. See D. Harper Simms, *The Soil Conservation Service* (New York: Praeger Publishers, 1970), 96-101.

[87] Dingle, *Nothing But Conservation*, 169.

[88] Coon Creek Soil Conservation District Supervisors, "Final Report of Coon Creek Soil Conservation District Supervisors," 18 November 1941, 2, b200, Item 184, RG 114, NACP.

school district problems." Roy Dingle, the county conservationist, offered a different explanation of the problems in Elk Creek. Those trying to organize the watershed organization consisted primarily of subsistence farmers from the valley, Dingle noted, but some of their counterparts on the ridge with "large and prosperous farms…looked down on the little tobacco farms in [the valley] and were opposed to doing anything to help them."[89] If the conservation-industrial complex lived by social relationships between farmers, it could also die by them.

The same was true for farmers' relationships with the natural world. Soil and water conservation—particularly the growing of protein-rich alfalfa in contour strips—thrived on farms specializing in dairy cows, but it often faltered when other crops commanded most of the attention. This applied particularly to tobacco farmers such as those in Elk Creek. The dominant variety of the crop was "Northern Wisconsin" or Type 55 tobacco—a thin, smooth-leafed, elastic variety that commanded a high market price due to its suitability as a cigar binder (the layer in between the wrapper and the core). Tobacco was common on Driftless Area farms, particularly in Vernon County, Wisconsin, where in 1949, for instance, farmers harvested nearly twelve million pounds of tobacco from almost 7,700 acres (Figure 32).[90] One woman who grew up in the area remembered that among her neighbors, "Everybody raised tobacco. Everybody."[91] Despite its near ubiquity,

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[89] Glenn Laughlin, "The Activities and Interrelations of Local Watershed Associations and Governmental Agencies Involved in Soil and Water Conservation in Wisconsin Under Public Law 566 Projects," vol. 2 (PhD diss., University of Wisconsin-Madison, 1965), 599, 605; Dingle, *Nothing But Conservation*, 192. Robert Antonio Ibarra, a doctoral student at the University of Madison who studied Vernon County, Wisconsin, found several similar instances wherein ridge farmers "blame[d] the less productive valley farmers for making their county a[n economically] depressed area." Ibarra, "Ethnicity Genuine and Spurious: A Study of a Norwegian Community in Rural Wisconsin" (PhD diss., University of Wisconsin-Madison, 1976), 94.

[90] The specific figures were 7,680 acres and 11,980,800 pounds. V. E. Bufton, et al., *Wisconsin Tobacco Production and Marketing*, Wisconsin State Department of Agriculture Bulletin 305 (Madison: Wisconsin State Department of Agriculture, 1951), 11, 26.

[91] Janet Churchill oral history interview, by Gabe Fowler and Frank Juresh III, 15 June 2000, transcribed by Clement Ozburn, 2, University of Wisconsin-La Crosse Murphy Library Oral History Collection. For other farm families that raised tobacco, see Jeannette Berg and Don Calhoun oral history interview, by Gabe Fowler and Frank Juresh, 6 June 2000, transcribed by Clement (Chip) Ozburn, 1-2, University of Wisconsin-La Crosse Murphy Library Oral History Collection; Marcia Halligan oral history interview, by Gabe Fowler and Frank Juresh, 15 August 2000, transcribed by Katie Swank, 7-8, University of Wisconsin-La Crosse Murphy Library Oral History Collection; Norbert and Adeline Boeder interview, 1; and Bob Breidenstein Interview, 2.

Figure 32: The Northern Wisconsin Co-Op Tobacco Pool building (constructed in 1906) in Viroqua, Wisconsin, stands as a legacy to the importance of tobacco farming in the Driftless Area—particularly in Vernon County, Wisconsin—during the twentieth century. Two buildings nearby (one of which is visible behind the featured building) were also used to cure, store, and market Driftless Area tobacco. Source: Wisconsin Historical Society.

tobacco rarely appeared in conservationists' descriptions of their work.[92] One reason is that farmers typically grew tobacco on only one or two acres of their flattest lands.[93] Thus, conservation methods such as contour strip-cropping and terracing, which were designed for sloping land and larger fields, were not well suited for tobacco.

Another reason for tobacco's incompatibility with soil and water conservation was that tobacco growers were driven to prioritize the biological demands of this crop above those of all others. Most southwestern Wisconsin farmers who grew tobacco also raised dairy cattle, but conservationists found that the former was often "the favored crop…. For nearly the entire year,"

[92] Two exceptions include references to building terraces above tobacco fields to protect them from flooding or sedimentation. See Dingle, *Nothing But Conservation*, 32; Zeasman, *Control Soil Erosion by Crops, Terraces, and Dams*, 18.

[93] The small acreage was in part due to Driftless Area topography, which offered little of the flat land on which tobacco thrived. But it was also a consequence of acreage restrictions imposed by the Agricultural Adjustment Administration in the 1930s and by subsequent USDA allotment programs.

Roy Dingle explained, "tobacco had first claim on all farm resources," including time, labor, and manure. Tobacco, a labor-intensive and fragile crop that for much of the twentieth century resisted mechanization, required careful handling and close attention from germination through harvesting.[94]

The problem that tobacco cultivation raised for conservation methods was that the life cycle of tobacco competed with that of hay, which was central to conservation farming in the Driftless Area. For instance, farmers transplanted tobacco from seedbeds to fields in mid-to-late June, typically the same time that the first hay crop was ready for mowing and loading into barns to prevent molding. "No matter that hay was dry in the windrow ready to bring in," Dingle observed, "if the tobacco land needed attention, it came first. If rain came and ruined the hay, the tobacco grower cursed his luck and continued to genuflect to his tobacco crop."[95]

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[94] Dingle, *Nothing But Conservation*, 142. A typical tobacco-growing season in the Driftless Area looked like this. In early spring, farmers sprouted their seeds between layers of moist cloth. In late April, they prepared their seedbeds, often by steaming the soil to kill weeds and diseases. Farmers then kept their seedbeds well watered, hand-weeded, and covered with protective canvas until mid-to-late June, at which point they transplanted the tobacco plants to a thoroughly prepared tobacco field. Not all plants survived the transplantation process, so growers typically replanted at least once within a few days of initial transplantation.

From early July into August, farm families cultivated their fields with hoes from two to five times to kill weeds, and they typically used this time to handpick tobacco worms from their crop's fragile leaves. After World War II, farmers began relying more heavily on chemicals to kill worms, but their use of human labor (often by children) persisted. By August, tobacco leaves had usually grown large enough to shade out competing weeds, but at this point the plant began growing flower stalks and blossoms for reproduction. Farm people—typically adults who could move carefully to avoid damaging the large, delicate leaves—cut off these stalks and flowers (called "topping") to keep the plant's nutrients flowing to the leaves. Within a few days, the plant regrew these shoots (called "suckers") and required trimming again by hand.

By late August or early September, the tobacco leaves had ripened and needed to be harvested before the first frost arrived (often by the middle of September). Farmers harvested the crop by hand, chopping each tobacco plant with a sharp knife. According to Roy Dingle, this required "a strong, yet gentle man" who could "catch the [four-foot high, 35 to 50-pound] stalk in his arms when it was cut and gently lay it on the ground without breaking any leaves." Farm families placed the stalks in piles to promote wilting—which made the leaves less susceptible to breaking—before bringing them to their tobacco shed to cure. Tobacco sheds were designed with weather boards for ventilation to facilitate drying. In dry weather, they opened their weather boards; in wet or stormy weather, they closed the vents. Leaves typically dried by Thanksgiving, at which point growers hoped for foggy or wet weather for "casing," a curing process that gave the tobacco flexibility and a leathery texture. This weather usually arrived in southwest Wisconsin in December or early January. Too much of this weather, however, promoted molding, which ruined the crop. Once the tobacco had cased sufficiently, farmers stripped the leaves from the plants and packed them into bales that they sold to manufacturers or pooled together in farm cooperatives. See Dingle, *Nothing But Conservation*, 142-149; and Bufton, et al., *Wisconsin Tobacco Production and Marketing*, 23-25.

[95] Dingle, *Nothing But Conservation*, 143.

Despite Dingle's apparent scorn for tobacco growers, a more sympathetic observer came to similar conclusions. In the 1970s, Robert Ibarra, a University of Wisconsin doctoral student in anthropology, studied a community in Vernon County, Wisconsin, and found that for a number of tobacco growers, "tobacco goes into the barn before hay does." Ibarra also pointed out that the biological demands of tobacco often trumped those of hay and cows. "Many informants disclosed [to me]," he wrote, "that they put three times more manure on their tobacco ground than for any other field…. Manure was seldom given priority for fields which could produce feed for their cows." Moreover, Ibarra concluded that tobacco-dairy farmers privileged the life cycle of tobacco over milk production, sacrificing the lactation cycles of cows for the labor needed to tend tobacco.[96] Conservation methods in southwestern Wisconsin complemented the central components of dairy farming—hay and cows—but in farming arrangements where those two components were subordinated to a different organism, the practicality of conservation diminished considerably.

The incompatibility of tobacco farming and proactive conservation techniques applied most frequently to small-scale agriculturists and those who struggled to pay their debts. Indeed, the near ubiquity of tobacco and the success of conservation in the Driftless Area suggest that they were not mutually exclusive. Rather, the demands of tobacco seem to have supplanted those of hay and cows most often when farm people faced slim economic margins. The most common justification for raising tobacco was that it paid either the property taxes or the mortgage.[97] Scholars in the 1970s and 1980s concluded that this strategy was particularly appealing to farmers trying to stay in operation on farms of 40 to 100 acres amidst a regime of dairy farming that was increasingly

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[96] Ibarra, "Ethnicity Genuine and Spurious," 108-136, quoted on 108-109, 123, 136. The "tobacco-dairy strategy" represented a successful cultural adaptation to Ibarra because tobacco growing became synonymous with Norwegian identity in the community, and Ibarra argued it was a successful economic strategy because it allowed farmers—particularly those on smaller farms of 40 to 100 acres—to withstand price fluctuations in the tobacco or dairy markets.

[97] Ibid., 104, 123; Dingle, *Nothing But Conservation*, 142; Janet Churchill Interview, 2.

growing large scale. Whereas profitable dairy farming increasingly required investments in land and capital, tobacco farming could thrive on the labor of a large family. Meanwhile, farmers operating over 100 acres typically grew tobacco merely as a supplemental crop, not as a principal source of income.[98] Agricultural producers' relationships with the natural world involved not just the life cycles of different crops, but also the amount of land they farmed.

Just as larger-scale farmers were less likely to depend on tobacco to stay in business, they were also more likely than small-scale producers to practice soil and water conservation. By 1936, conservationists already could see that "the operator of the large farm is usually much better able to practice soil and water conservation than the man on a small holding," because "the limited acreage of the little farm does not give the operator much flexibility." In order to make ends meet, small-scale farmers often had to dedicate all of their land to immediate production, and thus could not afford to retire steeper slopes to forests or pasture.[99] This trend continued into the late 1950s, when in a study of 195 farmers just to the north of the Driftless Area, USDA researchers concluded that wealthier farmers were still more likely to adopt conservation methods. "Farmers with a relatively low income," they reasoned, "tend to discount [the] long-run income benefits" of conservation.[100]

Not much had changed by the early 1980s. In 1981, a University of Wisconsin researcher conducted a statistical analysis of a representative township in Vernon County, Wisconsin. "The bigger a farm is," Junko Goto concluded, "the more likely the farmer participates in soil and water conservation district programs; in other words, soil and water conservation district participant farms tend to be bigger, and to be engaged in dairy operation."[101] The scale and type of farming—in other

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[98] Ibarra, "Ethnicity Genuine and Spurious," 122-126. Junko Goto drew from Ibarra's study and agreed with these conclusions. Goto, "Soil and Water Conservation Programs in Action," 75-76, 89.

[99] Clark, "Management and Use of Agricultural Lands," 6.

[100] Rudolph A. Christiansen and John R. Schmidt, "Planning Maximum Income in Soil Conservation," *Soil Conservation* 25 (September 1959), 30.

[101] Goto, "Soil and Water Conservation Programs in Action," 91.

words, farmers' relationships to the natural world—often influenced their receptivity to soil and water conservation. Even as Upper Mississippi Valley agriculture underwent dramatic changes in the late-twentieth century, all three sides of the triangle were necessary for conservation to succeed.

The Conservation Triangle and the Return of Grain Farming, 1970s-2000s

Starting in the 1970s, the face of agriculture and conservation in the Driftless Area began to change. Skyrocketing grain prices, plummeting milk prices, and the rise of conservation tillage encouraged a competing brand of conservation that undermined the system that had thrived since the 1930s (see Chapters 3 and 4). Farmers tore up their contour strips, the gold standard of conservation in the region, and planted acreages of erosive grains that had not been seen in years. Many old-guard farmers—the same generation at the vanguard of strip-cropping a few decades earlier—eyed this trend ambivalently, and even with alarm. Contour strip-cropping, hay, and dairy farming had grown so intertwined in the Driftless Area over the past decades that this shift away from all three amounted to an upheaval in farmers' ways of life and their senses of place.

Just as the rise of strip-cropping had involved the renegotiation of social dynamics among farmers, the tearing up of contour strips prompted similar responses. In one instance, farmers banded together to compel their neighbors into applying conservation practices by exercising a rarely used clause in Wisconsin's conservation-district enabling law that authorized land-use regulation. An absentee owner had purchased several farms in Vernon County and dismantled conservation practices while converting to what two observers called "wall-to-wall" corn. Conservation district supervisors and local farmers led the charge to enact in the town of Sterling a land-use ordinance that restricted row-crop farming on steep slopes. After a difficult campaign over several years, the town passed the ordinance by a three-vote margin in 1976. Despite widespread concern that the ordinance would "open the door to increased regulation by state agencies and nonlocal units of government," the voters decided that where social pressures failed to induce conservation practices, legal pressures were necessary.[102]

Elsewhere in southwestern Wisconsin, the transition from dairying to grain farming reversed the generational tensions that had divided farmers in the 1930s and 1940s. In the late 1970s and early 1980s, commentators began noting that conservation zeal was found most often not in young farmers, but in older ones. A scholar from the University of Wisconsin found that in Vernon County, "the oldtimers, almost all dairy farmers, are usually more conservation-minded than are the newcomers who have recently moved into the area…[and who] engage mainly in cash grain farming." Older farmers tended to agree. In response to the wave of grain making its way into the Driftless Area, a Vernon County, Wisconsin, agriculturist insisted, "these hillsides aren't geared for big-time farming." In 2001, six-decade dairy farmer Orlie Baker eyed the new trend—including the farming of grains in strip crops—with suspicion. "Why are they going to grain farming here in the hills?" he exclaimed. "That's dumb…. I can't see anything but it stepping up erosion again." At the core of the problem, from Baker's perspective, were generational differences. "Us old folks say it's bad, the young folks say it's good," he explained. "I think we're right."[103] While Baker's primary concern was the rise of operations that would amplify erosion, others eyed these developments with more personal concerns.

Contour strip-cropping had so thoroughly become the signature of conservation in the Driftless Area—particularly in the Coon Creek basin—that it became inseparable from residents' sense of place. When farmers began tearing up strips in the late-twentieth and early-twenty-first

[102] The specific legal penalties remain unclear, partially because few (if any) farmers were prosecuted for violations. Richard Barrows and Carol Olson, "Soil Conservation Policy: Local Action and Federal Alternatives," *JSWC* 36 (November-December 1981), 312-316.

[103] Goto, "Soil and Water Conservation Programs in Action," 94; Bob Breidenstein interview, 4; Orlie Baker Interview, by Chip Ozburn and Katie Swank, 30 July 2001, transcribed by Katie Swank, 2, 6, 13, University of Wisconsin-La Crosse Murphy Library Oral History Collection.

centuries, people with deep connections to the region experienced an acute sense of loss. Dairy farmer Bob Breidenstein of Ontario, Wisconsin, recalled how his father first installed strip crops in the late 1930s. "It would break his heart," Breidenstein regretted, "to see what some of these people do now…tear[ing] out these contour strips." Ernest and Joseph Haugen, brothers whose father was an original Coon Creek cooperator and who followed their 1934 farm plan for decades, regarded these changes with a similar attitude. As farmers cleared steep hillsides and dismantled contour strips, they charged, "it seems like they ridicule everything that Soil Conservation men taught us in the 1930s…. People are so greedy!" In 2012, Sam Skemp, the Natural Resources Conservation Service (NRCS) conservationist for Vernon County, Wisconsin, explained that even farmers whose families had contour stripped since the 1930s were converting their strips to conservation tillage. While Skemp maintained that the agency condoned such changes so long as the new practices achieve similar results, I nonetheless detected a note of regret in his voice.[104] Since the 1930s, contour strip-cropping had come to embody people's identities as residents of the Driftless Area's hills and valleys. For many observers, the increasing abandonment of contour strips thus represented an upheaval in culture as well as in agriculture.

Conclusion

By the turn of the twenty-first century, a number of clues suggested that conservation in the Driftless Area of southwest Wisconsin remained a success story. The region's populations of trout—a barometer for ecosystem health due to their need for cold, clear streams unmuddied by

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[104] Breidenstein Interview, 9; Joseph and Ernest Haugen to Patricia Leavenworth, 24 May 2009, NRCS Historical Files, Madison, Wisconsin; Author interview with Sam Skemp, NRCS offices, Viroqua, Wisconsin, 20 June 2012. The NRCS is the successor agency to the Soil Conservation Service.

eroded sediment—had recovered, fostering a vibrant recreational fishing industry.[105] Hosts of scientific studies revealed that erosion had declined dramatically since the 1930s. In the 1990s, for instance, researchers from the US Department of Agriculture applied the USLE equation to compare the rates of Driftless Area soil erosion in 1982 and 1992 with a retroactive analysis of erosion in 1930. They concluded that conservation methods such as contour strip-cropping and conservation tillage had reduced annual erosion per acre from roughly 14.9 tons in 1930, to 7.8 tons in 1982, to 6.3 tons in 1992, despite the persistence of intensive agriculture in the region.[106] Other scientists, most notably geomorphologist Stanley Trimble, measured historical erosion in the field and drew similar conclusions: by all measurements, soil erosion had declined dramatically thanks to soil and water conservation.[107]

The considerable reductions in soil erosion in the Driftless Area are noteworthy, yet the facile portrayal of a conservation success story remains problematic for three primary reasons. First, even the decreased rates of erosion proceed faster than soil formation, which ultimately means that the practice remains unsustainable.[108] Even the USDA's estimation of "tolerable" annual soil loss

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[105] For the influence of conservation measures on trout populations in Coon Creek, see Anderson, "Coon Valley Days," 42; J. Lyons, et al., "Influence of Intensive Rotational Grazing on Bank Erosion, Fish Habitat Quality, and Fish Communities in Southwestern Wisconsin Trout Streams," *JSWC* 55(3): 271-276. For a recent account of Driftless Area fishing, see Paul A. Smith, "Driftless Area Trip Finds the Trout Biting," *Milwaukee Journal Sentinel*, 23 March 2014.

[106] A ton of soil spread over an acre is equivalent to approximately 1/50 of an inch, or about the thickness of a sheet of paper. The USLE equation—and its successors, RUSLE and RUSLE2—are explored in Chapters 3 and 4. Argabright, et al., *Historical Changes in Soil Erosion*, vii-xi.

[107] Trimble studied soil erosion and sedimentation extensively in the Driftless Area—particularly in the Coon Creek basin—from the 1970s to the 2010s. For a sampling of Trimble's publications, see Trimble, *Historical Agriculture and Soil Erosion*; Trimble, "Fluvial Processes, Morphology and Sediment Budgets in the Coon Creek Basin, WI, USA, 1975-1993," *Geomorphology* 108 (2009): 8-23; Trimble, "Decreased Rates of Alluvial Sediment Storage in the Coon Creek Basin, Wisconsin, 1975-93," *Science* 285 (August 20, 1999): 1244-1246; and Trimble and Lund, *Soil Conservation and the Reduction of Erosion and Sedimentation*. For examples of other studies, see Timothy Beach, "The Fate of Eroded Soil: Sediment Sinks and Sediment Budgets of Agrarian Landscapes in Southern Minnesota, 1851-1988," *Annals of the Association of American Geographers* 84 (March 1994): 5-28; and James C. Knox, "Historical Valley Floor Sedimentation in the Upper Mississippi Valley," *Annals of the Association of American Geographers* 77 (June 1987): 224-244.

[108] Critics of the scientific research that supports this narrative—particularly Trimble's—have also made this point. See, for example, David Pimentel and Edward L. Skidmore, "Rates of Soil Erosion," *Science* 286 (November 19, 1999): 1477-1478; Dale Hanson, *Soil Conservation in Wisconsin: Rebirth to Revival* (Chippewa Falls, Wis.: Rooney Print, 2011), 28-31.

(typically between 3 and 5 tons per acre) exceeds the rate of soil formation (usually 1.5 tons per acre), and erosion surveys in the 1980s estimated soil losses far in excess of tolerability.[109] Second, the narrative of a success story suggests stasis—that the job was finished in the 1930s and 1940s. The conservation triangle, however, offers a more nuanced examination of the dynamic, ongoing interactions between conservationists, farmers, and the soil, topography, and organisms at the heart of Driftless Area agriculture. It thereby presents a more useful framework for those looking to replicate its results, one that focuses not simply on a set of decisions that bred desirable outcomes, but on the evolving processes that facilitated those outcomes. Finally, the Driftless Area's celebratory reputation elides a much messier reality. Soil and water conservation certainly thrived in the region, perhaps more than anywhere else in the country, due to the complete construction of the conservation triangle by the likes of Otto Zeasman, Raymond Davis, Roy Dingle, and thousands of farmers. But the sides of the triangle sometimes failed to come together.

Exploring the failures of conservation in the Driftless Area of southwest Wisconsin—the instances when it was scuttled by mistrust of conservation technicians, by farmers' social conflicts, or by modes of agriculture incompatible with conservation methods—serves to reinforce the importance of the conservation triangle. Soil and water conservation thrived when the relationships between farmers and nature, conservationists and nature, and farmers and conservationists were aligned, and it failed when they were not.

Despite the peculiarities of the Upper Mississippi River Valley—its topography, its representation of dairy farmers, its legendary conservation record—the conservation triangle was

[109] "Soil losses" refer not to erosion that carries soil away from the field, but merely soil that is transported elsewhere, whether within or away from the field. In response to a state law mandating erosion surveys, studies in Vernon and Crawford counties revealed annual cropland soil losses of 8.5 tons per acre. Vernon County LLC, *Vernon County Erosion Control Plan* ([Viroqua, Wis.?]: Vernon County Land Conservation Committee, 1986); Midwest Reclamation Planners, Inc., *Crawford County Soil Erosion Control Plan* (Dubuque, Ia.: Midwest Reclamation Planners, 1987). See also Wisconsin § 92.10 (5) (7 May 1982).

not unique to the region. It applied whenever and wherever soil and water conservation was successful. When these methods flourished, success was not due simply to the efforts of conservationists. It was because of the entire conservation-industrial complex, which the Driftless Area case study illustrates depended materially on farmers, their modes of production, and their negotiations with nature and experts.

Yet, the conservation-industrial complex also included ingredients not addressed sufficiently by the conservation triangle. An exploration of soil and water conservation some nine hundred miles to the south in the Yazoo River basin of Mississippi illustrates the centrality of politics to the success of the conservation-industrial complex.

6

Chain Reactions: Sedimentation and the Congressional Politics of Conservation in the Yazoo River Basin

In his 1928 landmark publication, *Soil Erosion a National Menace*, Hugh Hammond Bennett singled out the loess hills skirting the Lower Mississippi Valley as home to some of the most destructive soil erosion in the nation, even worse than the highly eroded Piedmont. The Yazoo River basin in northwestern Mississippi suffered perhaps the gravest conditions. Erosion here had "driven out" agriculture from "a very large part of the upland," leaving hundreds of farms "abandoned to [unmarketable] timber and brush." Bennett stressed that the flat bottomlands along hill tributaries also deteriorated from erosion, for the eroded sediments poured out of upland gullies and buried "former good alluvial land…. Stream channels have been choked with erosional debris, and overflows have become so common that large tracts of highly productive soil formerly tilled are now nothing more than swamp land." The sedimentation of streams even rendered formerly navigable streams "so choked with sand and mud…that they have not been plied by boats for a generation or more." In Bennett's eyes, while erosion represented a "national menace," no part of the country demonstrated more persuasively the need for federal programs and dollars to combat erosion, sedimentation, and flooding than did the Yazoo River basin of northern Mississippi.[1]

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[1] Bennett and W. R. Chapline, *Soil Erosion a National Menace*, USDA Circular 33 (Washington, D.C.: Government Printing Office, April 1928), 3-4, 8-9. Although Bennett was the first to lead a concerted campaign for a national soil conservation program, he was not the first to notice the interrelated problems in the Yazoo basin. Two state geologists also noted the erosion and sedimentation problems. See E. N. Lowe, "Reforestation, Soil Erosion, and Flood Control in the Yazoo Drainage Basin," *Lumber World Review* 42 no. 4 (25 February 1922): 47-48; E. N. Lowe, *Our Waste Lands: A Preliminary Study of Erosion in Mississippi* (Nashville: Mississippi State Geological Survey, 1910); and Eugene W. Hilgard, *Report on the Geology and Agriculture of the State of Mississippi* (Jackson, Miss.: E. Barksdale, 1860), 290-295. See also USDA, *Relation of Forestry to the Control of Floods in the Mississippi Valley: Message from the President of the United States Transmitting Communications from the Secretary of Agriculture Submitting Reports with Reference to the Relation of Forestry to the Control*

If Bennett had lived through the twentieth century and witnessed the level of funding dedicated to conservation in the Yazoo basin, he surely would have been impressed. By the turn of the twenty-first century, Congress had funneled billions of dollars in financial and technical assistance to soil and water conservation projects in northern Mississippi. The final major endeavor—the Demonstration Erosion Control Program, inaugurated in 1984—received nearly $900 million in its first twenty years.[2] These investments in conservation suggest a deep-rooted commitment on the part of federal lawmakers to supporting conservation in the Yazoo watershed. Why did politicians consider this region so worthy of federal assistance? How did changing environmental conditions shape conservation politics, and how did politics shape environmental conditions?

Soil and water conservation in the Yazoo River basin during the twentieth century was driven by a series of unintended consequences. Politicians, especially those in the House of Representatives, strove to serve their districts by authorizing programs and allocating money that would meet their constituents' specific concerns. In the Yazoo watershed, these concerns were frequently tied to sedimentation, an environmental process that linked soil erosion with flooding. These changes prompted politicians to fund, authorize, or otherwise support conservation initiatives. The results of these political maneuvers, in turn, triggered unforeseen changes in the Yazoo environment, which then demanded further attention from politicians.[3] In short, a series of

of Floods in the Mississippi Valley, 79th Cong., 2d sess., 11 February 1929, H. Doc. 573, 33, 146, 157-163, 455-461. For erosion in the Piedmont, see Paul S. Sutter, "What Gullies Mean: Georgia's Little Grand Canyon' and Southern Environmental History," *Journal of Southern History* 76 (August 2010): 614-615; Sutter, *Let Us Now Praise Famous Gullies: Georgia's "Little Grand Canyon" and the Soils of the South* (Athens: University of Georgia Press, forthcoming 2015); and Stanley W. Trimble, *Man-Induced Soil Erosion on the Southern Piedmont, 1700-1970* ([Ankeny, Ia.]: Soil Conservation Society of America, 1974).

[2] By 2003, DEC expenditures totaled roughly $862 million. F. D. Shields, Jr., "Effects of a Regional Channel Stabilization Project on Suspended Sediment Yield," *JSWC* 63 (March/April 2008): 60.

[3] This sort of dialectical relationship between nature and politics is at the center of political ecology, yet the discipline is of limited assistance here for three primary reasons. First, political ecology remains a highly ahistorical field of study. Some scholars have called for more historical analysis, yet I have found very few instances where trained

chain reactions between nature and politics propelled conservation in the Yazoo basin, ensuring that the conservation-industrial complex would become rooted in northern Mississippi.

Politics represents the final major contributor to the success of the conservation-industrial complex. Just as the complex thrived on practical technologies and social relationships between farmers and conservation technicians, such as those in southwestern Wisconsin, so did it depend on a steady supply of congressional patronage for its authorizations and funding. Historians have noted the role of politics in conservation, but they have tended to focus on the interwar period rather than carrying their analysis through the entire twentieth century. Moreover, few scholars have emphasized the influence of specific environmental conditions on the character and trajectory of politics. As with technology and social relationships, conservation politics were mediated by people's relationships with the natural world, and this remained true throughout the twentieth century.[4]

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historians have taken up the standard. Second, political ecology has thrived in studies on the Global South, but only a few scholars have begun to apply its perspectives to the Western world. Finally, political ecologists have generally paid attention to the less formal politics of power than to the formal types of politics I discuss here. For a useful introduction to political ecology, see Paul Robbins, *Political Ecology: A Critical Introduction* 2nd ed. (Chichester, U.K.: J. Wiley & Sons, 2012). On the lack of historical analysis in political ecology, see Karl H. Offen, "Historical Political Ecology: An Introduction," *Historical Geography* 32 (2004): 19-42. Historian John Soluri has come close to offering a historical treatment of political ecology, although in an effort to focus on the agency of "plants, pathogens, and working people," he "move[s] politics off center stage." See Soluri, *Banana Cultures: Agriculture, Consumption, and Environmental Change in Honduras and the United States* (Austin: University of Texas Press, 2005), 12. For a discussion of the discipline's roots in the Global South and efforts to apply it to developed countries, see Offen, "Historical Political Ecology," 23; Peter A. Walker, "Reconsidering 'Regional' Political Ecologies: Toward a Political Ecology of the Rural American West," *Progress in Human Geography* 27:1 (2003): 7-24; and James McCarthy, "First World Political Ecology: Lessons from the Wise Use Movement," *Environment and Planning A* 34:7 (2002): 1281-1302. For a call to look at more formal politics in the developed world, see Paul Robbins, "Obstacles to a First World Political Ecology: Looking Near without Looking Up," *Environment and Planning A* 34:8 (2002): 1509-1513. For examples of political ecological approaches to soil conservation, see Piers Blaikie, *The Political Economy of Soil Erosion in Developing Countries* (London: Longman, 1985); and Lawrence S. Grossman, "Soil Conservation, Political Ecology, and Technological Change on Saint Vincent," *Geographical Review* 87 (July 1997): 353-374.

[4] For histories of interwar conservation that relate conservation to congressional politics in a variety of manners, see Sara M. Gregg, *Managing the Mountains: Land Use Planning, the New Deal, and the Creation of a Federal Landscape* (New Haven: Yale University Press, 2010); Neil M. Maher, *Nature's New Deal: The Civilian Conservation Corps and the Roots of the American Environmental Movement* (New York: Oxford University Press, 2008); Sarah T. Phillips, *This Land, This Nation: Conservation, Rural America, and the New Deal* (New York: Cambridge University Press, 2007). Maher and Phillips highlight the connections between conservation and politics much more explicitly, but they tend to privilege politics and ideas about conservation over specific environmental conditions. Maher, for instance, concedes that his organizing

The Yazoo River basin offers an ideal case study on the chain reactions between politics and nature. First, it was home to a number of politicians who wielded considerable influence in natural resource politics and policy. As historian Jeffrey Stine has demonstrated, southern representatives exploited long tenures and Congress's seniority system to exert tremendous influence in natural resources affairs in the second half of the twentieth century.[5] No one from Mississippi—or anywhere in the country, for that matter—exerted greater influence over national agriculture and conservation programs than did Representative Jamie L. Whitten of Tallahatchie County, Mississippi. Whitten's power over national policy, derived through his decades-long chairmanship of the House Subcommittee on Agricultural Appropriations, conveyed myriad opportunities to shower his district in northern Mississippi with federal largesse. Whitten did not disappoint. He repeatedly intervened in bureaucratic and legislative affairs to provide the authorizations and funding needed to execute soil and water conservation in the Yazoo basin.[6]

The Yazoo River watershed also makes an ideal case study in chain reactions because of its specific hydrology. Surface water originating in the upper reaches of the basin (the "uplands") flowed downstream until it reached the valleys (the "bottomlands") of the major creeks and rivers. From there, the water ran west and south until it hit the "Bluff Line," a stark divide between the hills and the vast alluvial floodplain called the Yazoo-Mississippi Delta. The water finally reached the Yazoo River after passing through a narrow strip of delta lands (Figure 33).

Although scholars have generally treated the two major regions of this watershed—the hills and the Delta—as distinct and separate, twentieth-century Mississippians understood that they were

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framework of *landscape* "lets environmental historians off the hook…[when it comes to] pinpointing the exact causes of ecological change." Maher, *Nature's New Deal*, 6.

[5] Jeffrey K. Stine, *Mixing the Waters: Environment, Politics, and the Building of the Tennessee-Tombigbee Waterway* (Akron, Ohio: University of Akron Press, 1993).

[6] Considering his vast political clout, historians have paid far too little attention to Whitten. This is perhaps because the archivists at the University of Mississippi are still processing his papers, a herculean effort considering his long tenure in the House. For one exception, see Stine, *Mixing the Waters*.

Figure 33: Map of the Yazoo-Little Tallahatchie Flood Prevention Project, which encapsulated the entire upland reaches (to the east of the Bluff Line) and parts of the delta regions of the Yazoo River Basin. Map adapted from Andrew Simon and Stephen E. Darby, "Effectiveness of Grade-Control Structures in Reducing Erosion along Incised River Channels: The Case of Hotophia Creek, Mississippi," *Geomorphology* 42 (2002): 233; and US Forest Service, The New Forest on the Yazoo ([Atlanta?]: USDA, 1968), 1.

tied together by soil and water. As water hit the fertile yet fragile loess soils in the hills, soil erosion often ensued. Historians have long understood and, thanks to recent scholarship, are gaining an even deeper appreciation for the centrality of erosion to southern history. Yet, the problem of soil erosion did not stop at the massive gullies that scarred the South. Eroded soil did not disappear, but was transported by water throughout a watershed, destabilizing the established hydrological order and wreaking havoc on people's efforts to derive their livelihoods (and, in some cases, profits) from the land. Sediment settled in stream channels, drainage ditches, flood-prevention reservoirs, and atop farm fields. Sedimentation therefore demonstrates that the uplands, bottomlands, and delta lands of the Yazoo basin were not worlds apart, but were tied inextricably together in a distinct hydrological system.[7]

Because sedimentation linked different parts of the Yazoo watershed, its remediation forced the cooperation of federal agencies whose traditional responsibilities were more frequently tied to specific locations and issues. While this chapter explores some of the interactions between the US

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[7] Sedimentation, as defined by the USDA, refers to the "detachment, entrainment, transportation, and deposition of soil materials." Agricultural Research Service, *USDA Sedimentation Laboratory* USDA Miscellaneous Publication No. 918 (Washington, DC: GPO, 1963), 3.

Historian James Cobb has emphasized that the Delta was "the most southern place on earth," not because it was an isolated relic of the Old South, but because it was very much a part of the New South in its "interaction with…the larger national and global setting." Yet, Cobb and other historians have nevertheless treated the Delta as a world apart, both culturally and ecologically, when compared to the adjoining hills. See James C. Cobb, *The Most Southern Place on Earth: The Mississippi Delta and the Roots of Regional Identity* (New York: Oxford University Press, 1992), xi; Nan Elizabeth Woodruff, *American Congo: The African American Freedom Struggle in the Delta* (Cambridge: Harvard University Press, 2003); John C. Willis, *Forgotten Time: The Yazoo-Mississippi Delta after the Civil War* (Charlottesville: University Press of Virginia, 2000); Robert L. Brandfon, *Cotton Kingdom of the New South: A History of the Yazoo Mississippi Delta from Reconstruction to the Twentieth Century* (Cambridge: Harvard University Press, 1967); James C. Giesen, *Boll Weevil Blues: Cotton, Myth, and Power in the American South* (Chicago: University of Chicago Press, 2011), chapters 3 and 4; and John M. Barry, *Rising Tide: The Great Mississippi Flood of 1927 and How It Changed America* (New York: Simon & Schuster, 1997). Those who mention the connections between the hills and the Delta tend to do so sparingly. See, for example, Christopher Morris, *The Big Muddy: An Environmental History of the Mississippi and Its Peoples from Hernando de Soto to Hurricane Katrina* (New York: OUP, 2012), 4, 102; and Mikko Saikku, *This Land, This Delta: An Environmental History of the Yazoo Mississippi Floodplain* (Athens: University of Georgia Press, 2005), 28, 35, 162-163, 245-246.

For treatments of soil erosion in the South, start with Sutter, "What Gullies Mean"; Sutter, *Let Us Now Praise Famous Gullies*; and Steven Stoll, *Larding the Lean Earth: Soil and Society in Nineteenth-Century America* (New York: Hill and Wang, 2002), especially pp. 122-166. For older studies, see Carville Earle, "The Myth of the Southern Soil Miner: Macrohistory, Agricultural Innovation, and Environmental Change," in *The Ends of the Earth: Perspectives on Modern Environmental History*, ed. Donald Worster (New York: Cambridge University Press, 1988), 175-210; and Trimble, *Man-Induced Soil Erosion*.

Department of Agriculture (USDA) Soil Conservation Service and Forest Service, its primary focus is the collaboration between the SCS and the Army Corps of Engineers. SCS jurisdiction was erosion control in the uplands, while the Corps' responsibilities included flood control in the Delta and in the large reservoirs constructed on the four main tributaries of the Yazoo. Historian Christopher Manganiello argues that southerners embraced the Corps of Engineers after World War II because it offered a more decentralized approach to water management than did the leviathan of the Tennessee Valley Authority (TVA). The story of soil and water conservation in the Yazoo basin, however, illustrates how southerners had an even more decentralized option in the Soil Conservation Service—an agency that for many years enjoyed preferential treatment from Jamie Whitten. Yet, Whitten and others understood that solutions to the interlinked problems of erosion, sedimentation, and flooding demanded coordination between the SCS and the Corps. Consequently, fostering interagency coordination through authorizations and funding became a primary point of convergence between nature and politics.[8]

Chain reactions between nature and politics in the Yazoo River basin unfolded most clearly in three main activities: the Yazoo-Little Tallahatchie Flood Prevention Project in the 1940s and 1950s; sediment and flood control along the Bluff Line during the 1950s and 1960s; and the response to stream channelization from the 1970s through the 1990s. In each of these operations, Jamie Whitten and other Mississippi politicians maneuvered behind the scenes to provide the federal dollars and the congressional authority on which the conservation-industrial complex in northern Mississippi depended. The history of soil and water conservation in the Yazoo basin therefore

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[8] See Christopher J. Manganiello, *Southern Water, Southern Power: Energy, Environment, and Insecurity* (Chapel Hill: University of North Carolina Press, forthcoming 2015); based on his dissertation, "Dam Crazy with Wild Consequences: Artificial Lakes and Natural Rivers in the American South, 1845-1990" (PhD diss., University of Georgia, 2010). On efforts to control flooding in the lower Mississippi Valley, see Morris, *The Big Muddy*, chapter 8; Ellen E. Wohl, *Disconnected Rivers: Linking Rivers to Landscapes* (New Haven: Yale University Press,2004); and Martin Reuss, *Designing the Bayous: The Control of Water in the Atchafalaya Basin, 1800-1995* (1998; College Station: Texas A&M University Press, 2004).

illustrates a range of possibilities open to politicians nationwide who, eager to serve their constituents by responding to their particular natural resource concerns, worked to promote and sustain conservation in their home districts. The cumulative effect of this support was a steady expansion of the conservation-industrial complex.

Politicians and Pork: The Methods and Motivations of Conservation Politics

To represent northern Mississippi in the House of Representatives was to become a booster for natural resources conservation. Here, to a greater degree than in southwestern Wisconsin, conservation was synonymous with development. Mississippi was perennially among the poorest states in the nation. Its politicians saw in soil and water conservation a set of programs and projects that could expand the tax base and foster economic development, and they understood the importance of pork-barrel methods in achieving these goals.

Perhaps the most self-reflective politician to articulate the methods and motivations of conservation politics was Frank E. Smith. Smith served the Delta in the House of Representatives from 1951 until 1962. He quickly learned the importance to his district of the conservation and development of natural resources, especially in flood control matters. Smith's immediate predecessor, Will M. Whittington, had been a heavyweight in national flood policy and a powerful benefactor of delta interests. Whittington was largely responsible for the provisions in the 1936 Flood Control Act that authorized and financed the construction of four large reservoirs in the Yazoo uplands, which protected the Delta from flooding. He also was instrumental in securing funding in the 1944 Flood Control Act for the Yazoo-Little Tallahatchie Flood Prevention Project, which was designed to protect the reservoirs from filling with sediment and to otherwise provide flood control where the Army Corps of Engineers did not operate. Consequently, Smith already understood when he took office in 1951 that "I had to render [my constituents] special service in areas of major concern to the district," which meant "specialization in flood control and water resource development." From his position on the House Public Works Committee, Smith gained keen insight into the operations of conservation politics.[9]

Smith's primary motivation during his twelve years in Washington was "the driving need to improve the economy of the South." The key, he argued, was for the federal government to help Mississippians conserve and develop their natural resources. "Both in practical terms and in speech-making generalities," he reflected in 1964, his economic philosophy called for "improving the standard of living by developing natural resources and enlarging economic opportunities for the South as a whole and the Delta in particular." Natural resources formed the base of the economy, Smith believed. Conservation, with its emphasis on development, would expand that base and bring greater prosperity to all Americans, especially in the impoverished South.[10]

Smith also shrewdly recognized that political patronage was often requisite to achieving goals in conservation. "Pork barrel methods have been the only way to achieve results," he stated plainly in 1966. Nothing was necessarily nefarious about this system, insofar as it was not exclusive to soil and water conservation. Although Smith recognized that it resulted in some waste and inefficiencies—particularly in the lack of coordination between agencies—he considered it too entrenched to change, either in Congress or the executive branch. Plus, he argued, "it has often succeeded in spite of itself," thanks largely to "our ideal of…the public benefit harnessed to the

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[9] Smith, *Congressman from Mississippi* (New York: Pantheon Books, 1964), 129. For more on Smith, see Dennis J. Mitchell, *Mississippi Liberal: A Biography of Frank E. Smith* (Jackson, Miss.: University Press of Mississippi for the Mississippi Historical Society, 2001). For Whittington's role in the Flood Control Acts, see Martin Reuss, "The Army Corps of Engineers and Flood-Control Politics on the Lower Mississippi," *Louisiana History* 23 (Spring 1982): 142-148; and Reuss, *Designing the Bayous*, especially chapter 6.

[10] Smith added that southerners needed access to capital, and "Mississippi's tax base simply wasn't big enough to produce the revenue required for development programs—it had to come from the federal government." Smith, *The Politics of Conservation* (New York: Pantheon Books, 1966), ix; Smith, *Congressman from Mississippi* (New York: Pantheon Books, 1964), 89-90. See also Smith, "A Concerned, but Reasonable, Discussion of Pollution Problems," *Osceola* [Arkansas] *Times*, 30 April 1970, p. 3. For more on Smith, see Dennis J. Mitchell, *Mississippi Liberal: A Biography of Frank E. Smith* (Jackson, Miss.: University Press of Mississippi for the Mississippi Historical Society, 2001).

pulling power of self-interest, sometimes enlightened and sometimes wholly selfish." By this rubric, politicians seeking to help their constituents or themselves had bolstered programs that generated positive impacts in thousands of communities scattered throughout the nation. Ultimately, while some judged it "a term of scathing disparagement," Smith viewed pork-barrel conservation politics as "the lesser evil from which has come the greater good."[11]

Smith's economic philosophy and embrace of congressional pork paralleled those of Jamie Whitten, the more conservative and powerful congressman who defeated Smith in a 1962 election after redistricting merged their districts into one. In fact, conservation patronage was so central to northern Mississippi politics that it became a defining issue of their campaigns against one another. On the stump, Smith stressed the importance for his district of his position on the House Public Works Committee, which authorized flood-control and conservation projects. Whitten supporters countered, "Authorizations come easy; but appropriations, with all the competition for the tax dollar, are hard to obtain." As a member of the Appropriations Committee and the chair of the Agriculture Subcommittee, Whitten held the purse strings. While conservation patronage did not decide the election—civil rights and the dissolution of the "Solid South" ultimately determined most votes—it nevertheless represented a major campaign issue.[12] If northern Mississippians wanted a powerful benefactor of conservation and development, they made the right choice in electing Jamie Whitten.

Whitten was born in 1910 to a farm family in Cascilla, Mississippi, a hill town a few miles from the Bluff Line in Tallahatchie County. In 1941, he was elected to Congress in his first of twenty-seven terms, and by 1950 he had climbed the ranks to become chair of the House

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[11] Smith, *Politics of Conservation*, x, 308-310.

[12] Clarence Cannon to Walter Sillers, Jr., 19 September 1961; f12; b58; Walter Sillers, Jr. Papers, M004, Delta State University Archives and Museum, Cleveland, Mississippi (hereafter "Sillers Papers"). See also Walter Sillers, Jr., Form Letter, 3 June 1962; b58f11; Sillers Papers; Smith, *Congressman from Mississippi*, 278-299; Mitchell, *Mississippi Liberal*, 143-167.

Agriculture Appropriations Subcommittee. Whitten held this position for so long and exerted such a tremendous influence over agricultural policy that by 1970 he was known as the "permanent Secretary of Agriculture." In 1979, he gained even greater power when he became the chair of the House Appropriations Committee. Whitten's grip on those levers of power did not end until his ouster by party leadership in December 1992, on the eve of his final term in Congress. Between 1941 and 1995, the conservative Democrat became one of the nation's most powerful individuals in agricultural and conservation politics, all the while doling out millions of dollars to help his constituents fight erosion, sedimentation, and flooding.[13]

Part of Whitten's influence at home stemmed from his recognition that in order to serve his district consistently, he had to serve every district. "It's all right for a young fellow to go local for one year," he explained in 1959, "but you've got to be national about this." Whitten understood that if he only supported his own pet projects, he would soon exhaust his political capital. By patronizing programs that reached a broad constituency, however, he accumulated allegiance from a number of colleagues in Congress. In 1978, one journalist noted the effect of his widespread patronage. "A national network of potent political backing," wrote Ward Sinclair, was the product of "state-by-state distribution of money and the security it provides to a hefty federal bureaucracy." One of the most effective ways Whitten executed this principle was through his unwavering support of the extremely popular Small Watershed Program, inaugurated by Public Law (P. L.) 566 in 1954 (see Chapter 2).[14]

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[13] Norman C. Miller, "The Farm Baron: Rep. Jamie Whitten Works Behind the Scenes to Shape Big Spending," *Wall Street Journal*, 7 June 1971, pp. 1, 19. The only years between 1950 and 1992 in which Whitten did not chair the agriculture subcommittee was 1953 to 1955, when Republicans controlled the House.

[14] Richard F. Fenno, Jr. "Interview with Rep. Jamie L. Whitten (D-MS)," (1 June 1959); Research Interview Notes of Richard F. Fenno, Jr. with Members of the U.S. House of Representatives, 1959-1965; Center for Legislative Archives; National Archives, Washington, D.C.; http://www.archives.gov/legislative/research/special-collections/oral-history/fenno/whitten-1959.html; Ward Sinclair, "House Power Broker's Rise: Whitten May Head Appropriations Panel," *Washington Post*, 26 December 1978, sec. A, p. 10. The congressman emphasized during his interview with Fenno that his strategic position as an appropriations subcommittee chairman meant "other members [of Congress] come to

Whitten's power and his mastery of pork-barrel politics grew more controversial with time. Until the mid-1960s, even though he repeatedly made sure his district had ample financial support for conservation and related programs, his influence garnered little attention outside of his constituents, Washington insiders, and proponents of agriculture and conservation. As he crept closer to the top seat on the Appropriations Committee in the 1960s and 1970s, however, he attracted increasing national scrutiny for bankrolling production-oriented farm programs and for his level of patronage toward northern Mississippi. He drew attention toward himself with his 1966 book *That We May Live*, an industry-funded defense of agrochemicals and the place of pesticides in American life, designed to repudiate Rachel Carson's 1962 bestseller, *Silent Spring*. In 1971, the *Wall Street Journal* published a caustic exposé of Whitten as "the Farm Baron"—a hard-working legislator with a deep understanding of farm programs who worked secretively behind closed committee-room doors to control agricultural spending and thereby shape federal policy. "There is no way you can beat him when he's dead set against you," the article quoted a former USDA official. "What he brings out of committee is what you get." Several years later, a *Washington Post* editorial censured a House appropriations bill that contained several earmarked projects in Whitten's and other Appropriations Committee members' districts.[15]

Throughout his career, Whitten also justified his generous support of agriculture and conservation with his philosophy that natural resources formed the foundation of prosperity. "Save

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him when they want things and this gives him access to other places where he wants things"—although "he protested that this was not log rolling." Whitten's previous comment concerned Representative Robert H. Michel (R-Illinois), who interviewer Fenno explained "opposed soil conservation because it didn't help his district." Years later in an interview, Whitten responded to his reputation as a pork-barreller. "I plead guilty," he said. "I helped everybody's district." Joe Atkins, "Whitten: Dean of the Congress," *Jackson Clarion-Ledger*, 7 December 1986, sec. G, p. 1.

[15] Jamie L. Whitten, *That We May Live* (Princeton: D. Van Nostrand Company, Inc., 1966); Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin, 1962); Miller, "The Farm Baron"; "Oink," *Washington Post*, 27 May 1980, sec. A, p. 14. On the subsidization of Whitten's book by the chemical industry, see Pete Daniel, *Toxic Drift: Pesticides and Health in the Post-World War II South*, (Baton Rouge: Louisiana State University Press in association with Smithsonian Institution, 2005), 82-83.

our financial system, yes," proclaimed Whitten in a 1952 speech, "but above all save our *real wealth*: the land, the trees and minerals, our material wealth." While professing fiscal conservatism on most issues, Whitten repeatedly argued that resource development was different. "Our children [and] children's children could set up another financial system, but if we leave them a worn out land, devoid of natural resources, they will have nothing on which to build." He even suggested conservation would deliver the same economic benefits as mobilization for war.[16] In short, Whitten understood that American prosperity was built on natural resources, and he would do everything in his power to augment the productive capacity of those resources.

Northern Mississippi's congressional delegation, and particularly Jamie Whitten, was motivated by an underlying faith that the development soil and water resources through conservation would yield economic growth. What's more, they appreciated the centrality of pork-barrel methods to get the work done. Starting in the 1940s with the Yazoo-Little Tallahatchie Flood Prevention Project and continuing throughout the twentieth century, these politicians intervened at critical moments to ensure that the promise of conservation would not be jeopardized by lack of congressional authorization or funding.

The Yazoo-Little Tallahatchie Flood Prevention Project, 1940s-1950s

In the Flood Control Act of 1944, Congress authorized eleven USDA pilot projects for flood control on a watershed basis, two of which the Soil Conservation Service would administer jointly as the Yazoo-Little Tallahatchie Flood Prevention Project (YLT). The purpose of the

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[16] "Whitten Addresses Memphis Farm Club," *Jackson Clarion-Ledger*, 10 December 1952, emphasis added; "Whitten Urges Proper Aid for Nation's Farmers in Address at Louisiana Fair," *Jackson* [Miss.] *Daily News*, 8 October 1953; Whitten, "Development of Our Natural Resources: Key to the Future," Address to Mississippi Rivers and Harbors Association, 15 October 1965, 3; f3; b61; Sillers Papers; Atkins, "Whitten," p. 1; [Whitten], "Congressman Whitten Calls on President to Restore Soil Conservation, Rural Water, Housing, and Other Programs," *NLI Limestone* 10 (Spring 1973): 60.

projects, as expressed in a 1943 planning document, was "to prevent or alleviate flood damages on valley lands not protected by existing or proposed works of the U. S. Engineer Department." In other words, the YLT would help reduce flooding from lands above main river valleys, which constituted Army Corps of Engineers territory. The intellectual inspiration for the program was the idea that traditional soil conservation measures—especially reforestation, in the case of the Yazoo basin—helped the ground absorb runoff and thereby reduce floods. Consequently, the USDA realized that the project would "function just as effectively in conserving water and soil in place and utilizing those basic resources for productive purposes."[17] Starting in 1946 when funding was freed from the war effort, the USDA pursued this goal of flood prevention through conservation measures, and intervention by Jamie Whitten helped capture the full promise of the program.

By the dawn of the YLT in the mid-1940s, it had long been evident that traditional agriculture was untenable throughout much of the Yazoo uplands. For nearly two decades, observers noted that erosion had created a veritable wasteland from what had been agricultural fields. In 1934, an engineer dispatched to erosion-control camps in northern Mississippi reported, "This old farming region is so badly gullied that a large part of it can no longer be farmed."[18] Consequently, soil conservation would not take the same form as it did in places such as southwestern Wisconsin. Instead of systems of terraces and strip-cropping, which were designed

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[17] USDA, "Flood Control Survey Report, Yazoo River Watershed – Mississippi" (July 1943), 8-9; b32; Item 213; RG 114; NACP. See also USDA, *Survey of the Little Tallahatchie Watershed in Mississippi*, 77th Cong., 2d sess., 1942, H. Doc. 892; USDA, *Survey of the Yazoo River Watershed*, 78th Cong., 2d sess., 1944, H. Doc. 564; and Douglas Helms, "Small Watersheds and the USDA: Legacy of the Flood Control Act of 1936," in *Readings in the History of the Soil Conservation Service*, ed. Douglas Helms (Washington, D.C.: USDA Soil Conservation Service, 1992), 98-102.

[18] W. D. Ellison, "Work of the E.C.W. Soil Erosion Camps in Alabama, Mississippi, Oklahoma and Texas," (February 1934), 3; b4; Item 152; RG 114; NACP. These erosion camps combined Civilian Conservation Corps labor with Soil Erosion Service technical expertise to help implement soil conservation structures. For more on this sort of arrangement, see Neil Maher, *Nature's New Deal: The Civilian Conservation Corps and the Roots of the American Environmental Movement* (New York: Oxford University Press, 2008), especially chapters 3 and 4. For other statements of erosion rendering agriculture untenable in Mississippi and elsewhere in the South, see USDA, *Relation of Forestry*, 160-161; USDA, *Survey of the Little Tallahatchie River*, 1; and Soil Conservation Service, *New Landmarks in Soil Conservation* USDA Miscellaneous Publication No. 473 (Washington, D.C.: GPO, 1942), 16.

primarily to grow row crops on sloping lands, the Soil Conservation Service decided that the Yazoo basin was better suited for permanent vegetation (Figure 34). The result was an upland economy dominated by forestry and supplemented by row-crop farming in the bottomlands.[19]

Forestry, however, was the domain not of the SCS, but of its cousin in the USDA, the Forest Service. The Yazoo-Little Tallahatchie project, by ecological and bureaucratic necessity, involved the coordination of the two agencies to help stem erosion in the uplands with a massive tree-planting campaign. An SCS agent met with landowners to create a farm plan, which typically included a significant forestry element. After the completion of the plan, a project forester, who held a desk in the SCS office, met with the landowner to square away the final details. By all accounts, the two agencies enjoyed amicable relations in these day-to-day operations, most likely because they had been working together on erosion control since the 1920s.[20]

The two agencies collaborated to launch a reforestation project of massive proportions. In 1948, the first year of field operations, the Forest Service planted 339,000 trees on private property. Over the next decade, the tree count increased almost every year, reaching a record in 1959 of nearly forty-six million seedlings planted on private land and another four million on public land. By 1982, the Forest Service's final year in YLT (the SCS continued its operations), the project had led to over 918 million seedlings planted on nearly 836,000 acres, eighty percent of which was private land. More than one quarter of the acreage benefitted from public cost sharing through the Agricultural

[19] The other major leg of the upland economy was livestock agriculture, which the SCS also promoted extensively in the Yazoo basin and throughout the Southeast. See, for instance, "Progress in Grassland Farming," *Soil Conservation* 17 (August 1951): 24; Hugh Bennett, "Green Revolution," *Soil Conservation* 17 (October 1951): 52-57; Leon J. Sisk, "Grass Changes the Southeast," *Soil Conservation* 29 (August 1963): 8-9; and "The Touch of Beauty," *Soil Conservation* 32 (August 1966): 12-13. For more on the proliferation of grasses in the Southeast and throughout the world, see Albert G. Way, "'A Cosmopolitan Weed of the World': Following Bermudagrass," *Agricultural History* 88 (Summer 2014): 354-367.

[20] Hamlin L. Williston, *The Yazoo-Little Tallahatchie Flood Prevention Project: A History of the Forest Service's Role* Forestry Report R8-FR 8 (Atlanta: US Forest Service, 1988), 8; William L. Heard and Victor B. MacNaughton, "The Yazoo-Little Tallahatchie Flood Prevention Project," *USDA Yearbook of Agriculture 1955: Water* (Washington, D.C.: GPO, 1955), 203.

Figure 34: USDA map of Yazoo River Basin indicating land unfit for row-crop agriculture. The shaded areas indicate "steep or severely eroded land not suitable for agriculture." The unshaded areas are bottomlands. Source: USDA, "Flood Control Survey Report, Yazoo River Watershed – Mississippi" (July 1943), 8-9; b32; Item 213; RG 114; NACP.

Conservation Program (ACP), a program that Representative Jamie Whitten defended strenuously and successfully from proposed budget cuts on as many as thirty occasions. Between 1947 and 1959, for instance, landowners in the YLT project received over one million dollars in ACP assistance for forestry purposes; in 1958, forty-nine percent of Lafayette County's total ACP payments went toward forestry.[21]

[21] US Forest Service, *The New Forest on the Yazoo* ([Atlanta?]: USDA, 1968), 13; Williston, *The Yazoo-Little Tallahatchie Flood Prevention Project*, 8, 14-15; Paul D. Duffy and Stanley J. Ursic, "Land Rehabilitation Success in the Yazoo Basin, USA," *Land Use Policy* 8 (July 1991): 200; Victor B. MacNaughton, "The Forest Returns to the Yazoo," *Forest Farmer* (February 1959). Whitten's support of ACP was legendary. See James Risser, "Soil Erosion Creates a Crisis Down on the Farm," in *Conservation Foundation Letter* (December 1978): 12-13; R. Neil Sampson, *Farmland or Wasteland: A Time to Choose; Overcoming the Threat to America's Farm and Food Future* (Emmaus, Penn.: Rodale Press, 1981), 266; and Leonard M. Apcar, "Big Spender: Rep. Whitten Pushes Money Bills through by Baffling Opponents," *Wall Street Journal*, 4 October 1983, 1.

The Forest Service's preferred tree, the loblolly pine (*Pinus taeda*), was ideal for the goals of the program. First, it produced abundant needle litter starting at an early stage of growth, which meant that the bare, eroded soils in which it was typically planted were almost immediately protected from pounding rains and surface runoff. The increased infiltration of water into soils decreased erosion and sedimentation. Second, loblolly dovetailed with the project's goals because it grew aggressively and was merchantable. Fast-growing stands of trees equated to economic growth for a region that only recently had faced the prospect of wide swaths of land unable to carry their taxes. Pecuniary benefits also extended into the region's towns, where a number of paper companies, saw mills, and lumberyards located their operations with the promise of a ready supply of raw materials growing just nearby. YLT officials beamed that these businesses translated to more jobs and a stronger economy for the otherwise depressed region. In short, while erosion ushered out the plantation agriculture of the Old South, reforestation helped usher in the diversified and industrialized economy of the New South—although at the cost of native species that were replaced by loblolly monocultures.[22]

For all the benefits that accrued to northern Mississippians through the coordination of the Soil Conservation Service and the Forest Service, the YLT was nearly scuttled at an early stage by questions over its legality. The Flood Control Act of 1936 authorized the project based on the

[22] On the traits of loblolly, see Heard and MacNaughton, "The Yazoo-Little Tallahatchie Flood Prevention Project," 201; Williston, *The Yazoo-Little Tallahatchie Flood Prevention Project*, 16, 29-30; and Duffy and Ursic, "Land Rehabilitation Success," 202. For another area of the South where loblolly outcompeted slower-growing native species, see Albert G. Way, *Conserving Southern Longleaf: Herbert Stoddard and the Rise of Ecological Land Management* (Athens: University of Georgia Press, 2011), 176-178. On the rise of a forest-products industry in northern Mississippi, see US Forest Service, *Environment Restored: Yazoo-Little Tallahatchie Flood Prevention Project, Mississippi* (Oxford, Miss.: USFS, 1971); Victor B. MacNaughton, "Something of Value," *Southern Lumberman* (15 Dec 1956); and Williston, *The Yazoo-Little Tallahatchie Flood Prevention Project*, 24-29, 46-49. Much has been written on the pursuit of an industrialized New South. For starters, see Gavin Wright, *Old South, New South: Revolutions in the Southern Economy Since the Civil War* (New York: Basic Books, 1986); Bruce J. Schulman, *From Cotton Belt to Sunbelt: Federal Policy, Economic Development, and the Transformation of the South, 1938-1980* (New York: OUP, 1991); James C. Cobb, *The Selling of the South: The Southern Crusade for Industrial Development* 2nd ed. (Urbana: University of Illinois Press, 1993), especially chapter 1; Connie L. Lester, "Balancing Agriculture with Industry: Capital, Labor, and the Public Good in Mississippi's Home-Grown New Deal," *Journal of Mississippi History* 70 (Fall 2008): 235-263; and William Bryan, "Nature and the New South: Economic Development in an Age of Conservation, 1877-1929," (PhD diss., Pennsylvania State University, 2013).

notion that because forests reduced runoff and increased infiltration, they would provide adequate and measurable downstream flood control. As historian Douglas Helms has shown, this reasoning came under scrutiny during the late 1940s as USDA hydrologists realized that measurements conducted in fields and test-plots could not be scaled up to the watershed level, where too many variables affected flooding to predict conclusively vegetation's effect on flood reduction. The Yazoo-Little Tallahatchie project, along with the nine other pilot projects scattered across the country, had been predicated on its ability to provide flood control in all areas upstream of major rivers and reservoirs, the jurisdiction of the Army Corps of Engineers. If reforestation and other conservation practices did not provide this service, then the SCS's activities in the Yazoo basin were indistinguishable from its traditional duties authorized and funded by separate legislation. In other words, by 1950 it appeared that the agency was receiving money from two laws for one practice—the epitome of bureaucratic inefficiency.[23]

To avoid losing a program that showed such potential, the Soil Conservation Service needed a conclusive, legally defensible method to reduce floods. In a few of its pilot projects, the SCS had constructed small floodwater-retention dams that offered greater certainty in flood control, but the USDA legal counsel opined that the agency lacked legal authorization to build these structures. As it sought to retain authority over the flood-control program, the SCS found willing allies in the House Appropriations Subcommittee on Agriculture, of which Jamie Whitten was the brand new chair. This relationship did not escape the perceptive eyes of Charles M. Hardin, a political scientist studying conservation politics. "SCS has cultivated powerful Congressman more effectively than any other agricultural agency," Hardin observed in 1952, "especially…members of the agricultural

[23] Helms, "Small Watersheds," 100-101. In 1943, the USDA understood that the flood-control measures were similar to SCS work, but argued that the YLT and other programs were sufficiently different because SCS work was neither conducted on a watershed basis nor extensive enough to control floods. See USDA, "Flood Control Survey Report," 18.

appropriations subcommittee in the House." On 31 January 1950, several Department officials appeared before Whitten's committee and issued a statement expressing need for authorization to construct flood-control structures in the pilot projects. The committee agreed and inserted into the next appropriations bill the language granting such authority. "In this manner," Helms concludes, "without debate in Congress, and without comment by the U.S. Army Corps of Engineers or the Bureau of the Budget, SCS secured authority for building floodwater-retarding structures." It would not be the last time Whitten and his committee bypassed the more formal channels of legislation to further the cause of soil and water conservation.[24]

With the upland forests slowing down soil erosion, and with the legal grounding of the YLT project secured, the Soil Conservation Service could turn its attention to the bottomlands of the Yazoo River tributaries. In fact, the Service's initial flood control surveys revealed that the primary economic benefits from the pilot program would derive from reducing the duration of flooding on tributary bottomlands, not from reducing floods on major rivers farther downstream. Surveyors estimated that in the Little Tallahatchie basin, which encompassed nearly 900,000 acres and fed into the Yazoo, annual flood damages averaged almost $1.2 million. "An upland remedial program…carried out on a comprehensive scale," the USDA argued, "will reduce floods to such an extent that farmers can safely till the bottom land [the floodplains of streams and rivers] with reasonable assurance of growing and harvesting good crops." A major cause of bottomland flooding was the sediment that poured out from gullied hills, clogging stream channels and drainage ditches. Although sediment damage "is not usually spectacular, as is that from floodwater," the researchers estimated that "it has caused more harm in the Little Tallahatchie watershed in the past

[24] Charles M. Hardin, *The Politics of Agriculture: Soil Conservation and the Struggle for Power in Rural America* (Glencoe, Ill.: The Free Press, 1952), 88-89; Helms, "Small Watersheds," 101; House Subcommittee on Agriculture, *Department of Agriculture Appropriations for 1951: Hearings before the Subcommittee of the Committee on Appropriations, House of Representatives*, 81st Cong., 2d sess., 1950, pt. 4:1152-53. House Subcommittee on Department of Agriculture and Related Agencies Appropriations, *Department of Agr*

hundred years than has been caused by floodwaters." In the Yazoo watershed survey, floods accounted for a larger share of the wreckage, but the USDA drew a similar conclusion. "Most of the damage is suffered by farmers and most of the farm loss is due to reduction in crop yields," it reported. From the beginning, then, a primary justification of the YLT was to protect bottomlands from damages, and this required controlling the sediment that originated in the hills.[25]

Studies in the late 1930s revealed the extent of the intertwined problems stemming from bottomland sedimentation. In an investigation of Toby Tubby Creek and Hurricane Creek, both of which now drain into Sardis Reservoir in Lafayette County, a team of researchers found that sediment clogged stream channels and "caused more prolonged, and therefore more harmful, flooding of the valley lands." So much sand had settled in streambeds that it was common to see channels elevated several feet above adjacent fields. In other areas, splays of sterile sand covered fertile alluvium.[26]

Sedimentation also posed an economic problem. The Wells Drainage District, for instance, spent fifty-five thousand dollars in 1920 to dig eleven miles of ditches. Seventeen years later, over half of the ditches were "completely filled with sand" by 1937 (Figure 35). Sediments filled another twenty percent of the ditches to the extent that they stopped functioning properly. As a result, the researchers concluded, "An investment of $55,000 became practically worthless before the costs were entirely paid."[27] This experience, it turns out, was all too common. A contemporaneous SCS study of Mississippi's drainage districts revealed many other instances of financial investments in drainage nullified by sedimentation. Part of the problem, the Service reported, was that in previous decades, drainage districts organized according to "community needs and interest" rather than

[25] Helms, "Small Watersheds," 101. In the Yazoo River basin, which drained roughly 5.7 million acres, the Department estimated that flood damages accounted for 56 percent of annual damages, while 24 percent owed to sedimentation. USDA, *Survey of the Little Tallahatchie Watershed*, 1, 16-18; USDA, *Survey of the Yazoo River Watershed*, 21.

[26] Happ, et al., *Some Principles of Accelerated Stream and Valley Sedimentation*, 47.

[27] Ibid., 48.

Figure 35: (Top) A drainage ditch in the Wells drainage district completely filled with sand, Lafayette County (ca. 1937). (Bottom) A sand splay in an abandoned field adjacent to the filled ditch pictured above. Source: Happ, et al., *Some Principles of Accelerated Stream and Valley Sedimentation*, Plates 5-A, 7-A.

"watershed requirements." Effective solutions required greater expertise to plan and execute the technical details of drainage, and the Yazoo-Little Tallahatchie project presented an ideal mechanism through which to apply this expertise.[28]

Although drainage and channelization would later create only further sedimentation troubles, SCS priorities at the start of the YLT project presented these practices as ideal solutions to the economic and environmental problems in the Yazoo basin. By the early 1940s, for instance, upland erosion had increased the relative importance of bottomland farming, as approximately sixty-six percent of residents in the Little Tallahatchie watershed derived most of their income from working land in the tributary floodplains. SCS agents believed that if they reduced the risks posed to bottomlands by sedimentation, farmers could make enough money from the floodplains to relieve economic pressures inducing them to cultivate the erodible hills. In fact, YLT planners operated under the idea that the land-use reforms of the YLT were "dependent on the availability of other safe lands to replace those retired," which meant opening up bottomlands to fulltime production.[29] SCS assistance for drainage and channelization, funneled through the YLT project, promised to solve some of the Yazoo basin's most pressing problems.

Jamie Whitten shared the SCS's enthusiasm for the potential of drainage and channelization and, in the late 1940s, used his influence to bolster these and other conservation efforts. The YLT

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[28] John T. Olsen and Lee D. Dumm, *Organized Drainage Districts in Mississippi* (Jackson, Miss.: Mississippi Board of Development and USDA Soil Conservation Service, 1941), quoted on 5.

[29] Stafford C. Happ, et al., *Some Principles of Accelerated Stream and Valley Sedimentation* Technical Bulletin No. 695 (Washington, D.C.: USDA, May 1940), 14; USDA, *Survey of the Little Tallahatchie River*, 3, 9; H. G. Edwards, "Drainage Puts Fertile Delta Lands to Work," *Soil Conservation* 9 (July 1943): 8-10; Olsen and Dumm, *Organized Drainage Districts*, 4; [SCS], "Skeleton Work Plan: Yazoo River Flood Control Operations Above Yazoo City, Mississippi, State of Mississippi" (1947), 10, 12; b31; Item 213; RG 114; NACP.

This would have the added benefit of helping farmers avoid tax delinquency, a pervasive problem threatening county governments with insolvency in the 1930s and 1940s. In 1931, for instance, a conservation researcher estimated that as many as one million acres in northern Mississippi were so eroded that they would not yield enough income to pay that year's property taxes. J. D. Sinclair, "Studies of Soil Erosion in Mississippi," *Journal of Forestry* 29 (April 1931): 536. County revenue shortfalls and insolvency were pervasive in interwar rural America. See, for instance, Sara M. Gregg, *Managing the Mountains: Land Use Planning, the New Deal, and the Creation of a Federal Landscape* (New Haven: Yale University Press, 2010), 51-52; and Joshua Nygren, "A Producers' Republic: Rural Zoning, Land Use, and Citizenship in the Great Lakes Cutover, 1920-1940," *Michigan Historical Review* 40 (Spring 2014): 1-26.

project offered a mechanism for installing conservation measures on the land, but landowners still needed to bear some of the costs. In 1948, however, Whitten inserted language into an appropriations bill authorizing the Soil Conservation Service to pay as much as fifty percent of the cost for drainage and other conservation work in the Yazoo-Little Tallahatchie project. "By doing this," a Memphis reporter noted approvingly, Whitten "bypassed the legislative Committee on Flood Control," which had traditional authority for flood control projects but "had failed to act on the proposal." This increase in SCS cost sharing comprised part of a broader inflation in the agency's annual funding, which ballooned from $150 million to over $262 million with the passage of the bill. With increased assistance for drainage, channelization, and the flood-control reservoirs Whitten's committee would authorize two years later, the YLT work accelerated in the 1950s.[30]

Each of these measures formed part of a systematic plan to protect Yazoo bottomlands from floodwater and sedimentation damage. "The principle is simple," explained the Soil Conservation Service in a 1969 publication, *Taming the Creeks*. In each of the YLT's subwatersheds, "small watershed reservoirs control the floodwaters that once drowned the valley crops and stripped the soil from the bottom lands. The stream channels—straightened and cleared—carry the water safely to the main tributaries. Smaller debris basins and sediment control structures catch the sand from yet-unhealed roadbanks and gullies." But, first, the hills needed to be planted to perennial vegetation in order to protect these structures from sedimentation damage. The project plan for the Cypress Creek watershed, a tributary of the Little Tallahatchie River in Lafayette County, illustrated a specific application of this thinking (Figure 36). The appeal of this plan, like SCS's elucidation of

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[30] William D. Sisson, "Republican Representatives Find Successful Adversary in Democrat Jamie Whitten," *Memphis Commercial Appeal*, 20 June 1948. In typical fashion, Whitten leveraged his accomplishment to wheedle the SCS into helping his constituents. When the Tate County Soil Conservation District lobbied the agency for additional staff, Whitten intervened, gently reminding an SCS official, "We were able to get a considerable increase for the Soil Conservation Service when the bill passed my committee recently." Whitten to T. S. Buie, 29 March 1948; b78; Item 11; RG 114; NACP; and Cannon to Sillers, 19 September 1961, Sillers Papers.

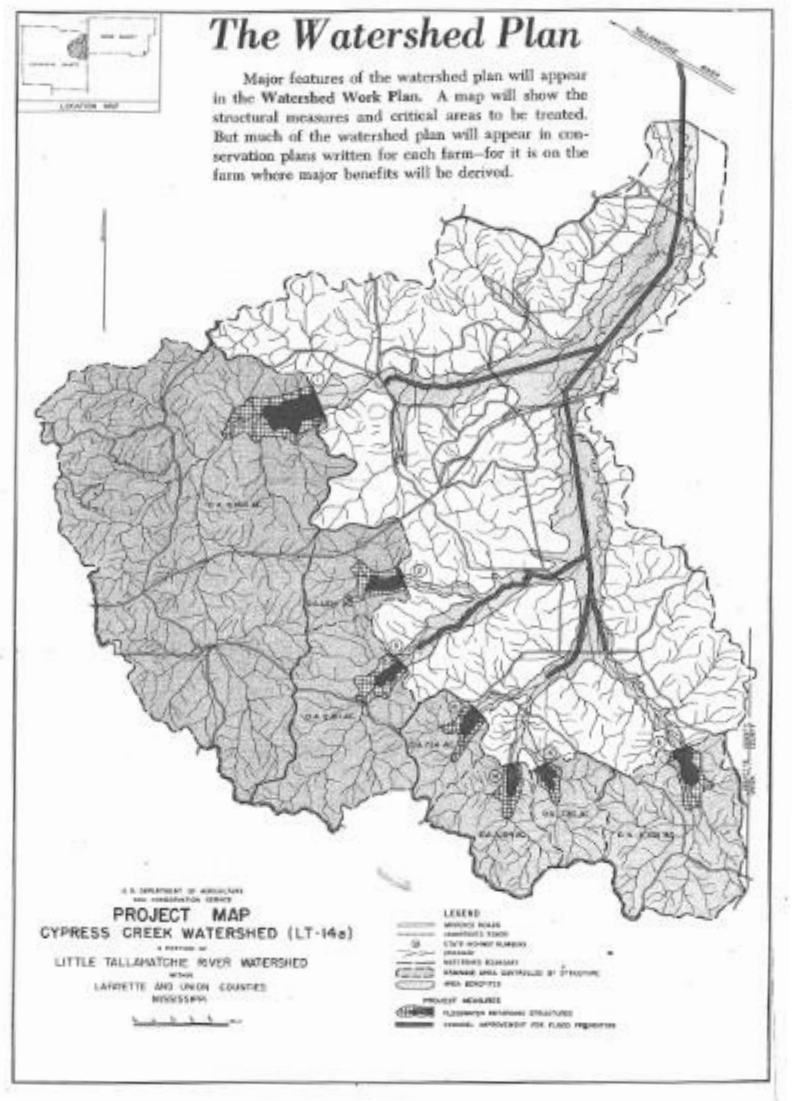

Figure 36: Project map for the Cypress Creek Watershed, Lafayette County (ca. 1950s). Note how the chaos of the small streams appears mitigated by the rational delineation of the flood-control reservoirs (dark blotches) and the channelized streams (straight, dark lines). Source: SCS, *The Road to Recovery*.

watershed protection, was its simple packaging of a complex hydrological system. According to the Cypress Creek map, reservoirs controlled water in one part of the watershed and channel work controlled it in the other. The hundreds of streams writhing chaotically throughout the landscape were thus reduced to seven reservoirs and twenty-or-so miles of channelized thoroughfares.[31]

The actual functioning of this system, however, was not quite so tidy. As water exited the Cypress Creek watershed, it first entered the Little Tallahatchie River—which itself had been channelized—and thenceforth into the Sardis Reservoir, one of the four Corps of Engineers flood-control reservoirs constructed between 1940 and 1954. This posed a potential problem, for one of the core hydraulic principles of drainage was the need for adequate outlets (Chapter 4). The Soil Conservation Service anticipated this problem privately in its YLT work plan, noting in 1947 that without "renovation of many…outlet channels, a large proportion of the benefits claimed [for the project] will not be attained." Drainage and channelization increased the speed and volume of water moving through a hydrologic system. If that system's outlet was unequipped for the additional flow, it could reduce the rate of water so abruptly that sediments settled immediately and filled the outlet. While the Sardis Reservoir apparently experienced no such troubles, the SCS noted that the four-year-old Arkabutla Reservoir was already facing such conditions, and it predicted that "this problem will be still more aggravated" with the completion of Enid and Grenada reservoirs.[32]

In the 1948 agricultural appropriations bill, Jamie Whitten added a provision designed to remediate the difficulties the SCS noted the previous year. If the SCS proceeded with drainage and channelization in the bottomlands, it needed adequate outlets at the flood-control reservoirs. Thus, the SCS needed to coordinate more closely with the Corps of Engineers. Because of Whitten's

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[31] SCS, *Taming the Creeks* (Jackson, Miss.: USDA, 1969), under "Conservation has changed the land"; SCS, *The Road to Recovery in the Yazoo-Little Tallahatchie Watersheds* (Jackson, Miss.: USDA, June 1965), under "The Watershed Plan."

[32] [SCS], "Skeleton Work Plan: Yazoo River Flood Control Operations above Yazoo City, Mississippi, State of Mississippi" (1947), 12; b31; Item 213; RG 114; NACP. A similar situation prevailed in the Delta to the west of the Yazoo River. S. H. Coker, a member of the Delta Council's Subcommittee on Drainage, explained, "In the last few years of the Soil Conservation program, they have dug many new drag line ditches and the [flood] problem is being aggravated" by the increased flow of water. Minutes of Delta Council Subcommittee on Drainage meeting, 6 July 1949, 9; b26f5; Sillers Papers. On the channelization of the Little Tallahatchie, see House Subcommittee on Agriculture Appropriations, *Department of Agriculture Appropriations for 1954: Hearings before the Subcommittee of the Committee on Appropriations, House of Representatives*, 83rd Cong., 1st sess., 1953, pt. 4:1858.

intervention—which in the coming decades he referenced frequently—the appropriations bill provided funding for conservation projects "in all areas up to that over which the Department of the Army has jurisdiction and responsibility." A conference report clarified that this provision was necessary because of "a sort of twilight zone between the jurisdiction of the War Department in carrying out the Flood Control and that of the Department of Agriculture. This has been especially evident in the work on the Yazoo and Little Tallahatchie watersheds." In other words, the appropriations act mandated that the SCS and the Corps of Engineers coordinate their respective duties in the YLT project.[33]

By January 1949 the agencies had worked out a cooperative agreement. The Corps assumed responsibility for all streams in the lands it purchased surrounding its reservoirs, as well as the reservoirs themselves. The SCS's territory extended throughout the uplands outside of the Corps' purchase area. The agreement was more ambiguous regarding the places where the two jurisdictions met. The Corps of Engineers would bear responsibility "in those cases where it is evident that deterioration of the channel…is caused by reservoir operation," while the Soil Conservation Service was liable where "the deterioration of the stream is from headwater causes."[34] In time, conflict would escalate over the source of problems at the outlets to reservoirs, but only after the SCS and Corps turned their attention downstream to the Bluff Line. There, in the 1950s and 1960s, some of the most entrenched sedimentation problems beckoned the attention of politicians to a degree much greater than before.

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[33] Public Law 712, 80th Cong., 2d sess., (19 June 1948), under "Flood Control"; House Committee on Appropriations, *Department of Agriculture Appropriation Bill, Fiscal Year 1949*, 80th Cong., 2d sess., 16 March 1948, H. Rept. 1571, 21.

[34] R. G. Lovett to W. L. Heard, 5 January 1949; C. B. Anders to Lovett, 18 January 1949; Lovett to Heard, 25 March 1949; b31; Item 213; RG 114; NACP. The Soil Conservation Service praised the YLT project as one of its best instances of cooperation with the Corps of Engineers. See House Subcommittee on Agriculture Appropriations, *Agriculture Appropriations for 1954*, pt. 4:1872.

"Mr. Whitten has Become Quite Concerned": Along the Bluff Line, 1950s-1960s

In order to understand politicians' concern with sedimentation along the Bluff Line, it is important to first comprehend their constituents' constant desire to wrest maximum control over floods. Indeed, the chief beneficiaries of the four upland reservoirs were Deltans living in the floodplain of the Yazoo, not hill folk who lived nearby. The reservoirs, combined with the YLT project designed to protect their lifespans from sedimentation, comprised a central component in the Corps of Engineers' larger flood-control system, which an SCS official framed as necessary for "the maximum economic development of the Delta."[35] As the president of the Delta Council, a powerful alliance of business and agricultural elites, put it plainly in 1952, "the Delta is totally and absolutely dependent upon flood control." In 1956, with its four reservoirs now complete, the Army Corps of Engineers shifted its attention to the edge of the bluffs, where some of the most chronic Delta flood troubles were inseparable from sedimentation.[36] To address these problems, the Corps had to coordinate with the Soil Conservation Service.

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[35] William L. Heard, quoted in "Meetings from Meeting of Delta Council Soil Conservation Committee," 16 November 1956, 9; box 11; A96-21, C. R. Ashford Papers, University Archives, Mississippi State University, Mississippi State, Mississippi (hereafter "Ashford Papers"). By the late 1940s, the Corps considered the reservoirs as one of four elements of complete flood control. The other three were the levee system along the Mississippi River, control of Yazoo River backwater (which occurred when high water levels on the Mississippi backed up water in the lower Yazoo basin), and drainage along the Sunflower River and Steele Bayou in the middle of the Delta. See Delta Council, *Annual Report of Delta Council, 1949-1950*, 9; b1f3; M050, Delta Council Collection, Delta State University Archives, Cleveland, Mississippi (hereafter "Delta Council Collection"). Backwater flood control continued to be controversial throughout the twentieth century. See Morris, *Big Muddy*, 200-203; Todd Shallat, "Hope for the Dammed: The U.S. Army Corps of Engineers and the *Greening* of the Mississippi," *Faculty Authored Books* 391 (2014): http://scholarworks.boisestate.edu/fac_books/391. Much has been written on flood control on the Mississippi River, particularly through levees. See Pete Daniel, *Deep'n as It Come: The 1927 Mississippi River Flood* (New York: Oxford University Press, 1977); Karen M. O'Neill, *Rivers by Design: State Power and the Origins of U.S. Flood Control* (Durham: Duke University Press, 2006), especially chapters 3-5; Barry, *Rising Tide*; Robert W. Harrison, *Alluvial Empire: A Study of State and Local Efforts Toward Land Development in the Alluvial Valley of the Lower Mississippi River, Including Flood Control, Land Drainage, Land Clearing, Land Forming* ([n.p.]: Delta Fund in cooperation with USDA Economic Research Service, 1961); and Harrison, *Levee Districts and Levee Building in Mississippi: A Study of State and Local Efforts to Control Mississippi River Floods* (Stoneville, Miss.: Delta Council, 1951). For a more critical and less scholarly take, see John McPhee, *The Control of Nature* (New York: Farrar Straus Giroux, 1989).

[36] Maury S. Knowlton, "President's Annual Address," in *Annual Report of the Delta Council, 1951-1952*, 8; b1f4; Delta Council Collection. On the timing of this transition, see Felix R. Garrett to Thomas C. Abernethy, 19 January 1967; b159; Subject File Series; Thomas G. Abernethy Collection, Archives and Special Collections, J.D. Williams Library, The University of Mississippi (hereafter "Abernethy Papers").

The SCS realized as early as the 1930s that the Bluff Line was home to some of the most confounding relationships between flood control, drainage, and sedimentation. "The most difficult drainage problems [in the state] are in the areas along the eastern edge of the Delta adjacent to the foot hills," wrote two USDA engineers.

> Enormous quantities of silt carried by the hill streams are deposited at the places where the streams emerge from the hills and enter the Delta. Under natural conditions, alluvial fans rising as much as 20 feet or more above the levels of the surrounding Delta lands were formed at these places. These alluvial formations retarded the velocity of the hill streams and acted to spread floodwaters in several directions over Delta farms. In attempting to prevent flooding, many districts excavated drainage channels through the alluvial accumulations and constructed guide levees to divert floodwaters into main streams and rivers. Many of these improvements operated only for short periods soon becoming destroyed by heavy silt deposits, rendering the drainage works partially or wholly ineffective.[37]

In short, Mississippians had invested mightily to drain the eastern Delta as a way to control flooding and reclaim what they perceived as good cropland, but sediments pouring down from the hills hampered their efforts. The rehabilitation of impaired drainage systems, the Delta Council explained in 1939, represented "a national problem which should be solved by the Federal government in connection with flood control." Having failed to solve the problem at the local and state levels, they appealed to the federal government for relief.[38]

The complexity of the problem made federal remediation difficult. Just as in the uplands, the convergence zones of the Corps of Engineers and the Soil Conservation Service presented difficulties. The Corps was responsible for flood control in the alluvial valleys of major waterways, while the SCS had jurisdiction over flood prevention on smaller streams in the uplands. Although

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37 Olsen and Dumm, *Organized Drainage Districts*, 12.

38 Delta Council, "Report of Flood Control and Drainage Committee," 16 March 1939, 1; b45f425; Oscar Johnston Series, Delta Pine and Land Company records, Special Collections Department, Mississippi State University Libraries. See also Olsen and Dumm, *Organized Drainage Districts*, 7.

their 1949 agreement determined that the Corps would provide outlets for upland streams entering the Delta, in the 1950s and 1960s the work proceeded slowly because of continued sedimentation.[39]

Projects on Abiaca Creek reveal some of the challenges posed by persistent erosion in the hills. In 1966, the Leflore County Board of Supervisors appealed to Congressman Thomas G. Abernethy to pressure the Corps of Engineers to expedite a channelization project in the delta reaches of Abiaca Creek. The Corps responded that it had "learned by experience that cleaning out [the channel]…is useless" until sedimentation was controlled. Army engineers had done so twice in the late 1930s and early 1940s but discovered that "the channel refills almost immediately." The Corps thus had to wait until the Soil Conservation Service reduced sedimentation from the hills, and this would take time. The SCS planned for several structures in the hills, a Corps official explained to Abernethy, but even once completed "it will take several years for the erosion problem to stabilize sufficiently to design and initiate construction of efficient and safe works in the delta."[40] The Yazoo basin was home to a dynamic hydrology, and sometimes not even boosted funding could expedite its stability.

With such concerted effort through the Yazoo-Little Tallahatchie project to halt erosion and limit sedimentation, it might seem curious why hill streams continued to carry so much sediment into the Delta even into the 1960s. An obvious answer is the sheer scale of the damage throughout the Yazoo Basin (Figure 37). Even widespread reforestation, which did not peak in the YLT until 1959, needed years to take full effect.

A more powerful explanation for the continued sedimentation, however, relates to a peculiar trait of stream hydrology. By at least the mid-1950s, hydrologists understood that the *bed load*—the portion of sediment in a stream that "slides, rolls, and bounces along the bed" (as opposed to

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[39] Lovett to Heard, 5 January 1949.

[40] Leflore County Board of Supervisors to Abernethy, 20 May 1966; W. Roper to Abernethy, 1 July 1966; and James A. Betts to Abernethy, 17 August 1966; b159; Subject File Series; Abernethy Papers.

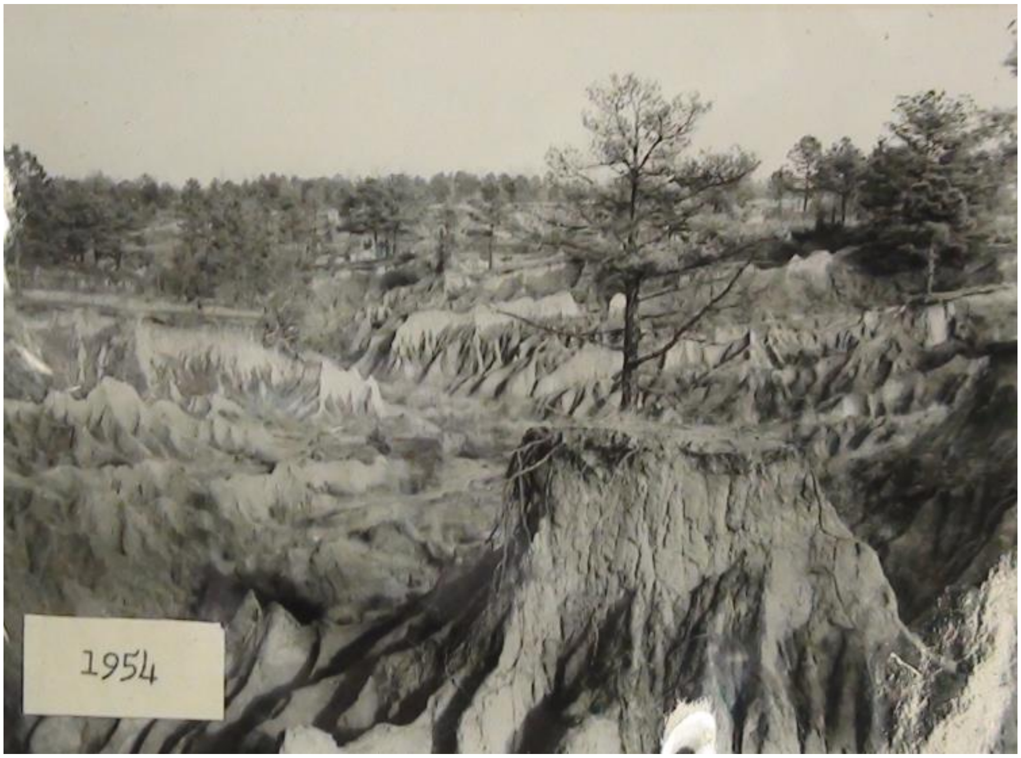

Figure 37: The Ascalmore Creek watershed represented some of the challenges along the Bluff Line in the 1950s and 1960s. All of the soil eroded from the Ascalmore uplands, pictured here, eventually made its way to stream bottoms and the Yazoo-Mississippi Delta. In 1955, the SCS estimated that 239,411 tons of sediment eroded from the watershed each year. Source: W. L. Heard, "Askalmore Creek Flood Prevention Project," (May 1963); b33; Item 213; RG 114; NACP.

remaining in suspension)—has an important effect on the stability of stream banks. Every stream has a certain *flow capacity*, the amount of sediments it will carry given a rate of flow. Stream dynamics work toward equilibrium between bed load and flow capacity. If bed load exceeds flow capacity, sediments settle to the bottom of the stream until balance is reached. Likewise, if flow capacity exceeds bed load, the water erodes the walls of the channel until it has added enough sediment to reestablish equilibrium. "Any conditions that change the sediment load or flow characteristics," wrote two scientists in the 1955 USDA *Yearbook*, "will have a corresponding effect on channel stability." In other words, an alteration in one part of a hydrologic system would likely trigger a chain reaction elsewhere.[41]

This is precisely what happened in the Yazoo basin. The primary source of sediments shifted from the uplands to the bottomlands. Although erosion in the hills was never eliminated, measures in the YLT project decreased sedimentation into upland streams—the Forest Service by planting trees, the SCS and Corps by building flood-control reservoirs that also impounded sediments. This reduced the amount of bed load downstream, which prompted water to scour the sides and bottoms of streams to bring bed load and flow capacity back into balance. The result, particularly along the Bluff Line, was caving stream banks that sent torrents of sediment down into the Delta, where it confounded flood-control and drainage efforts. Along the Bluff Line, in short, northern Mississippians were trapped as much by their present successes as by their past failures.[42]

Big Sand Creek, a tributary of the Yazoo that flows from the hills near Greenwood in Leflore County, posed perhaps the most intractable challenges. In 1943, the Delta Council's subcommittee on soil erosion noted the flood-control and drainage problems associated with sedimentation in the Big Sand. Once the stream reaches the Delta, the subcommittee reported, "it overflows its channels and menaces 5000 acres of land before it gets to the Yazoo River." Deltans had dug a drainage ditch to relieve the problem, but "it was ineffective because the hill water filled the ditches with silt." Aerial photos from 1941 and 1949 revealed that much of the sediment originated from stream-bank erosion along the upland reaches of the Big Sand, which proceeded at

[41] L. C. Gottschalk and Victor H. Jones, "Valleys and Hills, Erosion and Sedimentation," *USDA Yearbook of Agriculture 1955: Water* (Washington, DC: GPO, 1955), 137-138. Stream channelization exacerbated this instability. See Wohl, *Disconnected Rivers*, 185-192; Stephen E. Darby and Andrew Simon, eds., *Incised River Channels: Processes, Forms, Engineering, and Management* (Chichester, UK: John Wiley & Sons, 1999).

[42] Wohl, *Disconnected Rivers*, 206; Duffy and Ursic, "Land Rehabilitation Success," 204.

an annual rate of nearly one acre per mile. This equated to roughly 410,000 cubic yards of sediment flowing into the Delta each year.[43]

By the 1950s, conditions on Big Sand Creek remained unruly, which elicited calls for closer coordination between the Army Corps of Engineers and the SCS. The Army Corps of Engineers had in place a flood-control plan to divert the stream into the Yazoo River at a different location, but the engineers were careful to note was "predicated on construction of flood prevention and silt retarding measures by the Soil Conservation Service in the hill areas." At a public hearing in 1955, Will Whittington, Frank Smith, Jamie Whitten, and several farm and business representatives from Leflore County urged the completion of this project. In the coming years, Smith took particular interest in expediting the project. (Greenwood, which stood to benefit most from the Big Sand diversion, was in his district.) In 1957, for instance, Smith set up a meeting between the SCS and the Corps, understanding that "the complexity of a program for control of flood waters and sediment from hill tributaries" demanded closer coordination between the two agencies. This meeting facilitated the communication of data essential to planning the flood control work. By 1963, the Soil Conservation Service developed as part of the YLT project a work plan for the hills, a critical step in the completion of the Corps diversion.[44]

While Smith and Whitten each called for greater interagency coordination on the Big Sand project, they differed in their estimations of what that coordination would produce. Each was motivated by both genuine convictions and self-interest. Smith tended to support coordination that

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43 W. C. Neill, quoted in "Meeting of Soil Erosion Sub-Committee of Agricultural Committee, Delta Council," 30 September 1943, 2; b2; Ashford Papers; Russell Woodburn and John Kozachyn, "Sediment Problem Studied in Yazoo River Watershed," *Mississippi Farm Research* 19 (May 1956): 8.

44 U.S. Army Engineer District-Vicksburg, "Mississippi River and Tributaries Comprehensive Review Report: Yazoo Headwater Project, Mississippi, Annex Q," November 1959, Q-14; b130; Item 221; RG 114; NACP; "Digest of Public Hearing Held in Greenwood, Mississippi," 3 May 1955; b14; Item 229; RG 114; NACP; "Minutes: Delta Council Flood Control Committee Meeting," 12 December 1957, 1; b32f19b; Sillers Papers; Big Sand Drainage District, et al., "Watershed Work Plan: Big Sand Creek Watershed, Carroll and Montgomery Counties, Mississipp," June 1963; b34; Item 213; RG 114; NACP.

privileged the approaches of agencies under the oversight of his Public Works committee, such as the Corps and the Tennessee Valley Authority (TVA). Smith considered "the lack of a coordinated, coherent national policy for resource conservation and development" to be "one of the great failures of our federal government." He realized that postwar politics precluded the centralized approach of the TVA, "the closest approach to full, nonwasteful development that the federal government has ever devised." Consequently, his vision of interagency coordination was guided by the TVA ideal of comprehensive conservation and development.[45] Whitten also encouraged cooperation for the successful completion of projects. Yet, he guarded the bureaucratic autonomy of the Department of Agriculture, not wanting to sacrifice control over flood-control programs that furnished the department (and Whitten) such influence.

These divergent views manifested clearly on the eve of the Whitten-Smith runoff election. In September 1961, Smith introduced a bill authorizing joint flood-control and water-development surveys between the USDA and the Corps. When the bill hit the floor of the House in September 1961, however, Whitten objected to the bill's language out of concern that it could thwart the Soil Conservation Service's authority under the Small Watershed Program. Whitten argued that his 1948 spending bill had already "provided by law that where the responsibility of one [agency] ceases the other begins," and that the agencies subsequently worked well together in most instances. Whitten's biggest concern, however, was that by legislating *joint* surveys, as opposed to the clear delineation of authority he had outlined several years earlier, USDA planning "could be held up by the Corps or by the Committee on Public Works." In other words, Whitten supported interagency coordination, but

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[45] Smith, *Congressman from Mississippi*, 183, 194-195. Although Smith's praise for the TVA must be treated with a certain skepticism, written as it was while serving as a director of the agency, his biographer contends that "Smith had idolized the Tennessee Valley Authority since the depression." Mitchell, *Mississippi Liberal*, 205.

not if it jeopardized the programs that were wellsprings of his political power. He dropped his objection to the bill upon assurance that USDA autonomy would not be compromised.[46]

Upon Whitten's victory over Smith in their June 1962 election, he found himself with an entirely new constituency to serve. Redistricting resulted in Whitten's hill counties and Smith's delta counties being combined into a single district. To the victor went not only the spoils, but also a new set of concerns—particularly flood control in the Delta. Throughout the 1960s, Whitten worked diligently to provide the logistical and legal groundwork for solving the sedimentation problems along the Bluff Line. Specifically, he called meetings between the SCS and the Corps of Engineers, he maneuvered the appropriation of funds to Yazoo conservation projects, and he established the legal authority for the Corps and the Service to cooperate on projects in the Yazoo basin. Ultimately, these efforts fueled conservation measures, especially stream channelization, that created new problems for federal agencies and politicians to address.

One of Whitten's chief methods of forcing interagency coordination was by simply urging meetings between Corps and SCS officials. Bureaucrats likely honored such petitions from any elected representative, but when issued from someone of Whitten's stature they translated more as directives than as requests. In December 1966, for instance, Whitten arranged a meeting between him, state conservationist William Heard, and officials from the Corps' headquarters in Vicksburg. "Mr. Whitten has become quite concerned because of several situations involving SCS and the Corps of Engineers, individually or collectively," Heard reported to a supervisor in Washington. The congressman was "concerned, if not frustrated, over several projects [along the Bluff Line]

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[46] Smith told his constituents during the campaign that visit of the Watershed Development subcommittee, which he chaired, to the Yazoo basin in the spring of 1961 resulted in the passage of his bill. [Frank Smith], "1961 Report: Flood Control and Water Resource Developments," 2; b18f6; Sillers Papers; *Congressional Record*, 87th Cong., 1st sess., 1961, 107, pt. 15:20028. The final bill included language that Whitten recommended: joint surveys were authorized, "*Provided*, That the project authorization procedure established by Public Law 566, Eight-third Congress, as amended, shall not be affected." Public Law 639, 87th Cong., 2d sess., (5 September 1962).

which he is obviously determined to move at any cost." Whitten remained insistent, even as the Corps explained to him that a primary reason for their delayed projects was that "too much sediment was still moving into these channel areas" in the Delta. If the agencies were incapable of solving the interrelated problems on their own, he would shepherd them through the process. At the close of the meeting, Heard recounted, Whitten "stated, very frankly, that he expected to work completely with me, and was depending heavily on me to furnish advice and counsel to him on this area of the state."[47] The close communication between the two in subsequent years suggested that Heard obliged.

A few years later, Whitten again demanded that Heard meet with Corps officials. "Congressman Whitten is pressing Colonel John W. Brennan…and me to get together to discuss some joint project activities in the foothill area of the Yazoo River flood prevention project," Heard informed his boss. Only this time, Whitten did not veil his order as a request. "Colonel Brennan will be seeing you," he told Heard. In such situations, declining would be folly.[48]

More significant than mandating meetings, however, was Whitten's use of congressional appropriations bills to allocate more money for his preferred programs than was requested by the Department of Agriculture. Indeed, the Small Watershed Program had origins in such a move. In 1953, the Agricultural Appropriations Subcommittee allocated an unsolicited $5 million to inaugurate pilot watershed projects that served as springboards for the passage of P. L. 566 the following year.[49]

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[47] Heard to Hollis R. Williams, 4 January 1967; Heard, "Memorandum to the files," 15 December 1966; b31; Item 213; RG 114; NACP.

[48] Heard to Hollis R. Williams, 3 November 1970; Whitten to Heard, 28 October 1970; b31; Item 213; RG 114; NACP.

[49] In 1965, Whitten boasted, "when President Eisenhower was elected, from my position on the Appropriations Subcommittee for Agriculture, we provided $5 million above the budget and put through the first pilot plan program for Watershed Protection and Flood Prevention." Whitten, "Development of Our Natural Resources," 3. Once Whitten became chair of the entire House Appropriations Committee, critics charged him with "budget gimmickry" because he combined an inflation of his preferred programs with a deflation of other programs so he could

If USDA officials failed to take advantage of the committee's benevolence, Whitten sometimes coerced them into action. In the 1961 budget, for instance, the Soil Conservation Service requested $15 million for stream-stabilization work. The SCS had such a project on Ascalmore Creek, a stream on the Bluff Line in Whitten's home county of Tallahatchie. The appropriations committee granted another twenty percent for conservation loans, boosting the allocation to $18 million. The SCS claimed it could not use the additional funding because "we should not retard the rate of construction" in projects such as the YLT "by diverting the appropriated funds from construction to loans." In the agency's budget request, Whitten retorted, "you justified only $15 million [for conservation construction work], and…the Committee added the extra $3 million" for loans. "We must insist that, as a matter of fact, the total fund is available to meet the respective needs of both." Whitten's insistence paid off. By June 1961, the Ascalmore Drainage District had received a $70,000 loan to install conservation measures in the watershed. The following year, the structural measures were in place, and Whitten toured the project to observe the results of his patronage (Figure 38).[50]

A final manner in which Jamie Whitten responded to the chronic sedimentation problems along the Bluff Line was by working closely with the Soil Conservation Service and the Corps of Engineers to clear legal hurdles requisite for coordination on projects. Whitten deployed this strategy on a number of occasions. In 1965, for instance, he inserted language into a conference report that helped expand the geographic boundaries of the Yazoo-Little Tallahatchie Flood Prevention Project. This project had already proven itself an incredibly useful mechanism for

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claim he remained under budget. To make up for the shortfall, the administration would need to seek additional funding, which resulted in a gradual inflation of the federal budget. It remains unclear the extent to which Whitten employed this particular tactic as chair of the subcommittee on agricultural appropriations. See Apcar, "Big Spender," 1, 18.

[50] Gladwin Young to Whitten, 29 August 1960; Whitten to Young and K. H. Hansen, 31 August 1960; b31; Item 213; RG 114; NACP; USDA, "$70,000 Watershed Loan Approved in Tallahatchie County, Miss.," 22 June 1961; b33; Item 213; RG 114; NACP. Although the loans were for soil and water conservation, they were administered by the the Farmers Home Administration, not the SCS.

Figure 38: Whitten, second from right, touring the Ascalmore Creek watershed project in 1962. Joining Whitten in the foreground, from left to right, are US Senator John C. Stennis, A. R. Burford of the Soil Conservation Service, and M. Woods McLellan, chairman of the Ascalmore Drainage District. Source: George W. Yeats, Senator John C. Stennis in Tallahatchie County, MS (1962), Mississippi State University Libraries, http://digital.library.msstate.edu/cdm/singleitem/collection/jcs1/id/496/rec/1.

channeling federal financial and technical assistance into the Yazoo basin, but with the increased emphasis in the 1960s on sedimentation and flood problems in and along the Delta, some SCS officials began arguing that the YLT did not extend far enough because its boundaries stopped at the Bluff Line. In February 1965, Heard lobbied SCS director Donald Williams to authorize extension of the YLT into the Delta, citing "a considerable area in…which planning is incomplete, and benefits are partial." Although the Corps of Engineers installed flood-control measures on the main streams, neither the Corps nor the SCS conducted work on smaller delta tributaries. In other words, interagency coordination had not yet solved the sedimentation and flooding puzzle in the Delta. Heard requested administrative permission to use YLT funds in the Delta, claiming that

Whitten's provision in the 1948 appropriations act granted legal grounding. The USDA's lawyers disagreed, however, countering that the legislative history of Whitten's bill did not support YLT activities outside of the uplands. "It would appear that the only means by which your objective could be accomplished," Williams advised Heard while rejecting his request in March 1965, "would be through the enactment of appropriate legislation by the Congress."[51]

Whitten, however, understood that he could not execute an expansion of YLT without initiating cumbersome and high profile legislation in Congress. When Donald Williams appeared before the House Agricultural Appropriations Subcommittee hearings in April 1965, Whitten lectured him on his faulty interpretation of legislative intent. The Mississippian explained how, in his 1948 provision, "I took it upon myself" to specify that YLT funds "would be available for necessary work projects in *all* areas over which the Corps of Engineers did not have jurisdiction and responsibility…. Certainly my intent as the prime architect…of this matter was to enable the two services…to determine where their lines of responsibility would be." In short, if the Corps and the Service could agree on a plan to coordinate their operations, the 1948 law should not stand in the way.[52]

Nothing in the legislative record from 1948 suggests that Whitten made a concerted effort to let the SCS and the Corps determine their own jurisdictions. A House Appropriations Committee report from that year, for instance, merely indicated that the law was designed to eliminate "a sort of twilight zone between the jurisdiction of the War Department…and that of the Department of Agriculture"—not that those departments had authority to decide where their boundaries would

[51] Heard to Williams, 8 February 1965; Williams to Heard, 17 March 1965; b31; Item 213; RG 114; NACP.

[52] House Subcommittee on Department of Agriculture and Related Agencies Appropriations, *Department of Agriculture Appropriations for 1966: Hearings before a Subcommittee of the Committee on Appropriations, House of Representatives*, 89th Cong., 1st sess., 5 April 1965, 395, emphasis added.

lie.[53] Thus, the significance of the 1965 hearing was not that Whitten helped the USDA see old evidence in a new light, but that he provided the Department an entirely new legal basis on which to base an expansion of the YLT. Plus, Whitten codified this principle twice more in conference reports, which Agriculture Department lawyers then relied on to determine that the congressional intent in 1948 provision could be "reasonably interpreted" to authorize SCS work in Delta lands.[54] In this manner, Whitten orchestrated a reversal in USDA policy that resulted in addition of nearly 720,000 acres of delta lands to the 4.2 million acres of uplands in the Yazoo-Little Tallahatchie Flood Prevention Project. Thereafter, William Heard was free to dispatch his staff on either side of the Bluff Line to help achieve greater control of floods and sediment.[55]

In other instances, Whitten coordinated his maneuvers more closely with SCS officials. One example came in the summer of 1972 when he worked to authorize the stabilization of stream banks that, given the imbalance between bed loads and flow capacity, were now the primary source of sediments dumping into the Delta. Whitten was particularly interested in a stabilization project on Tillatoba Creek, which descended from the hills through Whitten's adopted hometown of Charleston and which had drawn his attention for a number of years.[56] The first step required directing the Corps and the SCS to coordinate on "the soil erosion and bank caving problems of the streams in the Yazoo Basin," which Whitten inserted into a June 1972 conference report on the

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[53] House Committee on Appropriations, *Department of Agriculture Appropriation Bill, Fiscal Year 1949*, 80th Cong., 2d sess., 16 March 1948, H. Rept. 1571, 21.

[54] L. M. Adams to D. A. Williams, 30 November 1965; b31; Item 213; RG 114; NACP. For the committee reports, see House Committee on Appropriations, *Department of Agriculture and Related Agencies Appropriation Bill, 1966*, 89th Cong., 1st sess., 20 May 1965, H. Rept. 364, 22; House Committee on Appropriations, *Department of Agriculture and Related Agencies Appropriation Bill, 1966*, 89th Cong., 1st sess., 20 October 1965, H. Rept. 1186, 8.

[55] The acreage figures come from Williston, *The Yazoo-Little Tallahatchie Flood Prevention Project*, 1. In 1971, Whitten's committee provided another provision that the SCS used three years later to expand the effective reach of the YLT throughout the entire Delta. See Kenneth E. Grant to William L. Heard, 11 October 1974; b31; Item 213; RG 114; NACP.

[56] As early as 1965, William Heard noted that Whitten was "influenced considerably by problems and delays on the Tillatoba projects, on [the part of] both the Corps and the SCS." Heard, "Memorandum to the Files," 15 December 1965.

Public Works Appropriations bill for 1973.[57] Whitten apparently achieved this feat through legislative bartering, for, as he told Heard, "the Public Works Committee…is having difficulty passing their omnibus bill and now is more on our side." Whitten and Heard each understood that this directive was necessary to begin work on the Tillatoba project.[58]

In August 1972, Heard and Whitten collaborated to clear another legislative obstacle to stream stabilization work: the cost-benefit ratio. In order to use flood prevention funds for such work, the SCS needed a cost-benefit ratio of at least one-to-one, but it could not meet this requirement. On 3 August, Heard suggested to Whitten two alternatives for skirting the issue. First, Whitten could "add a statement in the committee report or some similar document which would make it clear that 'the Soil Conservation Service may use its appropriated funds to install measures determined necessary in the pilot program contemplated.'" Second, Heard recommended the SCS could rely on the Corps' "previous determination that a favorable cost-benefit ratio exists *basinwide*," thereby obfuscating the agency's inability to meet the necessary criteria for specific stretches of the Yazoo basin.[59]

In the coming weeks, Whitten furnished Heard with all he needed. On the floor of the House of Representatives, he twice clarified the Appropriations Committee's intent for SCS funding using Heard's suggested language nearly *verbatim*. As an extra measure of precaution, Whitten wrote Secretary of Agriculture Earl Butz to point out that he codified language that would protect the YLT

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[57] See *Congressional Record*, 92d Cong., 2d sess., 20 June 1972, 118, pt. 17:21485; House Committee on Appropriations, *Public Works for Water and Power Development and Atomic Energy Commission Appropriation Bill, 1973*, 92d Cong., 2d sess., 19 June 1972, H. Rept. 92-1151, 47.

[58] Whitten to Heard, 20 June 1972; b31; Item 213; RG 114; NACP. Several days earlier, Whitten told Heard, "I got the Public Works Committee to agree for me to do anything I could within the law so when we get this through, we should be ready to start." Heard forwarded the letter to SCS Administrator Kenneth E. Grant and reported, "I believe that when this passes, we should be able to get clearance to go ahead on the Tillatoba Creek Project." Whitten to Heard, 9 June 1972; Heard to Grant, 14 June 1972; b31; Item 213; RG 114; NACP.

[59] Heard to Whitten, 3 August 1972; b31; Item 213; RG 114; NACP; emphasis added. Heard blamed the agency's inability to meet the cost-benefit ratio on "the system we follow in determining benefits," and SCS Administrator Kenneth Grant "recognize[d] that it is extremely difficult to make evaluations on the effects of streambank stabilization in a river system for small increments such as would be included in a watershed project." Heard to Grant, 21 August 1972; Grant to Heard, 29 August 1972; b31; Item 213; RG 114; NACP.

project from USDA budget cuts. Butz responded on 26 August reassuring him that "the pilot program in cooperation with the Corps of Engineers on the Yazoo Basin will not be affected by any [budget] limitations" imposed by the Nixon Administration. Finally, on 29 August, SCS director Kenneth Grant advised Heard that the agency had "no problem" with using Corps of Engineers' cost-benefit ratios as a proxy. "This is especially true," Grant explained, "since we have been directed by the House Agriculture Appropriations Committee to participate with the Corps in these projects." Thanks largely to Whitten's interventions, the cost-benefit issue was resolved by the end of the month, and stream bank stabilization on the small waterways of the Bluff Line could proceed.[60]

Whitten's various machinations to facilitate soil and water conservation along the Bluff Line raises an important question. Why did a congressman already secure in his position, with tremendous control over national programs, dedicate so much political capital to such a relatively small area within his district? William Heard had an idea. In a 1966 meeting, the SCS official concluded that Whitten had personal motives. The congressman "went so far," Heard recorded in his post-meeting notes, "as to compare the opportunity for his influence along the Bluff lines with that of Mr. Will Whittington in providing protection for the City of Greenwood." Just Whittington seized the opportunity of Yazoo River flooding in the 1930s to change the fortunes of his

[60] Whitten emphasized, "The Soil Conservation Service is *expected* to use its appropriated funds to install measures determined necessary in the pilot program contemplated." Whitten likely did not insert this language into a committee report because the committee issued its report for the 1973 bill the day before Heard sent his letter. See *Congressional Record*, 92d Cong., 2d sess., 9 August 1972, 118, pt. 21:27523; and *Congressional Record*, 92d Cong., 2d sess., 10 August 1972, 118, pt. 21:27614, emphasis added. For the agriculture appropriations subcommittees final report of the year, see House Committee on Appropriations, *Making Appropriations for the Agriculture-Environmental and Consumer Protection Programs for the Fiscal Year Ending June 30, 1972, and For Other Purposes*, 92d Cong., 2d sess., 2 August 1972, H. Rept. 92-1283. For Whitten's correspondence with Butz, see Whitten to Butz, 16 August 1972; Butz to Whitten, 26 August 1972; b5528; RG 16; NACP. For Grant's authorization, see Grant to Heard, 29 August 1972; b31; RG 114; NACP. In 1975, the USDA printed a document in which it established a favorable cost-benefit ratio basin wide, thereby eschewing the need to conduct benefits studies on an individual basis. Ellen Wohl notes that, nationwide, many of these cost-benefit ratios were favorable because they did not offer a full accounting of the costs. See SCS, "Economic Justification – Streambank Stabilization Measures – Yazoo River Basin," June 1975; b31; Item 213; RG 114; NACP; Wohl, *Disconnected Rivers*, 197-198.

hometown, Whitten considered sedimentation and flooding challenges along the Bluff Line in the 1950s and 1960s as a chance to establish his own lasting legacy.[61] Once again, nature mediated politics.

"A Hydrological Nightmare": Sedimentation Problems after 1973

By the early 1970s, the problem of coordinating the work of the Soil Conservation Service and the Army Corps of Engineers seemed to be resolved. Repeatedly, Jamie Whitten had propelled conservation programs by coordinating meetings, providing funds, and inserting necessary language into the legislative record to establish legal authority. What's more, the streambank stabilization work of the SCS seemed to have "reached the stage where work in the Delta…by the Corps of Engineers can proceed effectively."[62] Yet, just as reforestation in the hills induced bank erosion downstream, efforts to curb bank erosion had similar unintended consequences. In the 1970s and 1980s, technicians in the SCS and the Corps continued to confront the chain reactions sparked by past actions, and politicians intervened in attempts to resolve the situation. Conservation politics again proved inseparable from action on the ground.

The measure that subsequently caused the greatest troubles for conservation technicians after 1973, a year of major flooding in the Mississippi Valley, was stream channelization. Particularly in previous two decades, the SCS deepened, widened, cleared, and straightened streams throughout not only the Yazoo basin, but also the entire country. The goal was to shorten the duration of flooding by expediting the flow of water through the system. In the bottomlands of streams like Cypress Creek (Figure 36), this fostered agricultural production because shortened flood duration

[61] Heard, "Memorandum to the Files," 15 December 1966, 3.
[62] B. F. Smith statement before Mississippi River Commission, 14 October 1971, 3; b242; Agriculture Series; Abernethy Papers.

reassured farmers that their crops would not drown every spring and summer.[63] Channelization thus seemed like a perfect corollary to Yazoo residents increasingly dependent on bottomlands for economic production.

The problem with channelization is that it triggers chain reactions throughout a watershed. Straightening and deepening channels increases the slope of a streambed, which causes faster flow of water through not only the channelized stretches, but also farther upstream. The increased speed often results in bed and bank erosion, even when the SCS constructed bank-stabilization structures to prevent it (Figure 39). The eroded sediment then flows downstream below the channelized stretches, where it settles and accumulates in the streambed. The agency understood these dynamics for years, but its efforts to solve the chain reactions sparked by channelization repeatedly fell short. In other words, channelization was meant to reduce the threats of erosion, sedimentation, and flooding, but it often only made them worse.[64]

One of Congress's chief proponents of stream channelization in the 1950s and 1960s was Jamie Whitten. Amid the stream channelization controversy of the early 1970s (see Chapter 3), a Nixon assistant advising USDA Secretary Clifford Hardin on conflict management strategies seemed to sympathize with Hardin because of "the strong influence Jamie Whitten and [Mississippi Senator] James Eastland exercise over many of your Department's programs," particularly channelization. In fact, Whitten was a major reason that Mississippi led the nation in SCS channelization, with 2400 miles of approved projects in 1972. Whitten also rose to the aid of the Soil Conservation Service. The day that the agency's watershed director defended channelization in a 1971 *Wall Street Journal* article, for instance, Whitten left him a message that "he was 'proud of the way you handled

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[63] Ellen Wohl provides a concise yet comprehensive overview of stream channelization in Wohl, *Disconnected Rivers*, 185-204. For SCS awareness and engineering solutions, see Robert P. Apmann, "Research Seeks Best Techniques for Stabilizing Stream Channels," *Soil Conservation* 29 (April 1964): 199-201.

[64] Wohl, *Disconnected Rivers*, 189-192.

Figure 39: Streambank erosion along a stretch of Arkabutla Creek, ca. 1968. This bank eroded despite SCS bank-stabilization measures. Source: J. B. Furr and A. C. Allnutt, "Report of Investigation of Structure Failure, Arkabutla Creek Channel Bank Stabilization," 19 August 1968; b31; Item 213; RG 114; NACP.

yourself.'"[65] Several years later, in response to a suggestion that Americans "start naming floods after members of Congress" who promoted channelization and thereby exacerbated flooding, Whitten retorted that without channel work, "the floods would have been much worse…. It could be true that it sends water downstream faster, but then [agencies] put retarding walls in to block off the water." Despite—or perhaps because of—decades of experience with conservation programs, Whitten could not accept the growing scientific consensus that channelization did not solve problems, but just shifted them elsewhere.[66]

This lesson grew increasingly clear during the 1970s as the Soil Conservation Service and the Corps of Engineers faced a crisis at the mouths of Grenada Lake, one of the Corps' four flood-control reservoirs. The Yalobusha and Skuna Rivers and a number of smaller streams empty into the lake. By the late 1960s, the SCS had channelized much of the Yalobusha and had plans for

[65] John D. Ehrlichman, "Memorandum for Secretary Hardin," 28 December 1970; b5477; RG 16; NACP; Robert Gillette, "Stream Channelization: Conflict between Ditchers, Conservationists," *Science* 176 (26 May 1972), 892; "Memorandum of Call," 19 July 1971; b3; Item 203; RG 114; NACP; Tom Herman, "Waterway Wrangle: Federal Soil Service Stirs Ecologists' Ire by Altering Streams," *Wall Street Journal* (19 July 1971), 1, 17;

[66] Brent Blackwelder and Jamie Whitten, quoted in Johanna Neuman, "Flood Control Charges Denied by Politicians," *Jackson Clarion-Ledger* (25 April 1979), sec. A, p. 1, 7.

similar work on the Skuna. The purpose, explained SCS director Donald Williams, was to protect bottomlands—"the most valuable agricultural land of Calhoun and Chickasaw Counties"—from recurring flood and drainage problems. Fish and wildlife enthusiasts protested SCS plans because they would impair habitat critical to the tourism industry and to ecological integrity. Billy Joe Cross, the director of Mississippi Game and Fish Commission, noted in 1968 that the channelized Yalobusha deposited sediment "as much as three feet deep" at the mouth of Grenada Lake. He predicted that the Skuna project would yield similar results: a stream velocity so high that "there is going to be a great deal of silt carried in this runoff [that will] be deposited where the water slows down as it reaches the reservoir."[67] The needs of fish and wildlife habitat, however, were not yet enough to overcome the perceived needs of farmers for flood protection. SCS channelization would not only prove Cross correct, but would also convert farmers into vocal skeptics of channelization.

The controversy came to a head as the previously amicable relationship between the Soil Conservation Service and Corps of Engineers began to splinter, especially in the wake of massive flooding in 1973. As Cross expected, sedimentation clogged outlets into Grenada Lake, which caused floodwaters to back up onto farmers' bottomlands rather than flowing unabated into the reservoir. Channelization exacerbated the problem by accelerating streambank erosion and by ushering floodwaters more quickly toward choked outlets. Although the agencies had agreed in 1949 and again in 1975 that the Corps was responsible for providing and maintaining outlets, it

[67] Williams to John C. Stennis, 16 October 1968; Cross to Festus Bailey, 8 September 1968; Bailey to Stennis, 13 September 1968; b31; Item 213; RG 114; NACP. See also John A. Dunbar, et al. *Sedimentation Patterns within a Flood Control Reservoir: Grenada Lake, MS*, ARS Research Report No. 38 (Oxford, Miss.: National Sedimentation Laboratory, April 2003).

refused to dredge the outlets until the SCS could control the sources of sediments that, unaddressed, would require additional dredging within a matter of years.[68]

Instead, the Corps of Engineers decided to use the threat of eminent domain to purchase the rights to flood farmers' lands. If it was cost-prohibitive to dredge outlets that would refill quickly, the agency reasoned, floods would certainly recur along the tributaries upstream of Grenada Lake. Thus, it would be cheaper to buy flowage rights than to perennially pour money into an intractable problem. Their proposal elicited a bevy of protests from farmers who considered the Corps' offers far too low and its plans ultimately ineffective. One of farmers' central arguments was that the agency had bent too far to wildlife concerns by maintaining high lake levels during the rainy summer months, thereby diminishing the reservoir's capacity to retain floodwaters. "If the Corps had been more interested in flood control and less interested in providing duck refuges and feeding ground," argued forty landowners in a petition, the 1973 floods would have been much lower and "there would not be a need to spend additional hard earned tax payers [*sic*] money to acquire additional flowage right easements."[69]

These farmers appealed to their legislators, and Jamie Whitten came to their aid. In July 1979, six months into his tenure as chair of the House Appropriations Committee, Whitten inserted provisions into a large spending bill that prohibited the Corps from buying land or flowage rights, "except on a voluntary basis." He first introduced this language with Grenada Lake in mind, but by the time Congress finished negotiating the bill, it applied to all four of the Corps' reservoirs. The

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[68] R. G. Lovett to W. L. Heard, 5 January 1949; "Agreement between Corps of Engineers, Department of the Army and Soil Conservation Service, Department of Agriculture, on Flood Prevention and Related Programs in the Yazoo River Basin, Mississippi," March 1975; b31; Item 213; RG 114; NACP. The Army Corps of Engineers cited the 1973 floods as justification for acquiring flowage rights. See Gerald E. Calloway to J. C. Sides, Sr., 10 May 1976; b15; State-Local Files; Series 3, Subseries 4; James O. Eastland Collection, Archives and Special Collections, J.D. Williams Library, The University of Mississippi (hereafter "Eastland Papers").

[69] Untitled petition enclosed with J. C. Sides to James O. Eastland, John C. Stennis, and Jamie L. Whitten, 10 July 1976, 5; b15; State-Local Files; Series 3, Subseries 4; Eastland Papers.

Corps would be relieved of this burden only once it submitted to Congress a plan for regulating reservoir levels in order to allow greater containment of floodwaters during the rainy season—a clear reaction to Yazoo farmers' cries about wildlife habitat in the lakes. Whitten's measure provided temporary relief to farmers, but the rift between the SCS and the Corps continued to grow in the 1980s.[70]

The controversy continued to center on the outlet from the Yalobusha River into Grenada Lake. When the SCS channelized the Yalobusha in 1968, it widened the river by nearly twofold with the understanding that the Corps would expand its outlet to match the width of the river. In the face of persistent sedimentation, however, the Corps still refused. The result, as a reporter observed in the early 1980s, was that "the 124-foot-wide canal empties directly into the 60-foot-wide old river at the confluence of several large tributaries, creating a bottleneck that further aggravates the flooding problem." Water, still laden with silt from ever-caving banks, funneled down the channelized streams, slowed upon entry into the lake, and dumped sediment at the outlet. "The filling progresses upstream," an SCS official explained, "and it doesn't take much rain at all to cause a flood." The entire scene amounted to what one engineer dubbed "a hydrological nightmare."[71]

Each agency blamed the other for its inaction, leading to a stalemate that frustrated landowners. The Corps repeated its refrain from the 1970s, arguing, "There is not a lot we can do. Siltation often fills these rivers in as fast as you can dig it out." The SCS responded that it tried to coordinate with Corps officials, but they "put us off and put us off, and finally they said it was just more feasible to buy the water [flowage] rights to the affected land." Meanwhile, landowners'

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[70] House Committee on Appropriations, *Energy and Water Development Appropriation Bill, 1980*, 96th Cong., 1st sess., 25 July 1979, H. Rept. 96-388, 60; Public Law 86, 96th Cong., 1st sess. (12 October 1979), Sec. 108. See also Will Sullivan, "Measure Stops Corps's [sic] Taking of Delta Land," *Jackson Clarion-Ledger* (24 October 1979).

[71] Alan Huffman, "Standoff: Silt-Choked Channels Create Tense Situation," *Jackson Clarion-Ledger* (19 September 1983), sec. B, p. 1-2; Alan Huffman, "Corps Says It Hasn't Given Up on Channels," *Jackson Clarion-Ledger* (7 May 1984), sec. B, p. 1, 7.

patience ran thin as they watched the problem grow worse. Sedimentation and flooding were migrating upriver, explained one farmer, "and it's moving up pretty fast now. The canal used to be 16 feet deep, but it ain't but about 3 feet deep now, and it's dead still. It don't take nothing to throw it out on us." While farmers certainly preferred a regulated hydrosphere that obeyed its human-prescribed bounds, some considered the current situation worse than no management whatsoever. "We'd be better off with the old river than with canals that aren't maintained properly," charged a landowner in 1983. To farmers as well as the agencies, the solution seemed clear: the old methods of interagency coordination had broken down, and a new cooperative relationship was in order.[72]

As in preceding decades, interagency cooperation required congressional authorization and funding. In the early 1980s, Jamie Whitten initiated a series of legal provisions that ultimately resulted in a far-reaching cooperative endeavor by the Corps and SCS, the Demonstration Erosion Control (DEC) project. Each of these provisions was embedded in legislation with broad national appeal.

First, Whitten introduced and ushered through Congress a jobs bill in March 1983 that allocated $140 million "to remain available until expended" for cooperative flood control, prevention, and disaster response by the Corps of Engineers and the Soil Conservation Service. This was a crowning achievement for the Mississippian. Despite all "the language that I have written…through the years which enabled the Corps and Soil Conservation Service to combine their various authorities and abilities under the law," Whitten explained the following year, each authorization was project-specific and thus had only limited scope. The jobs bill, however, "gave us

[72] Quoted in Huffman, "Standoff," 1, 2. On agencies working toward better coordination, see Huffman, "Corps Says," 7.

a chance for the first time to put it all together." Ever cautious to codify authorizations in multiple places, Whitten made certain that another 1983 spending bill included similar language.[73]

In the spring of 1984, Whitten leveraged these authorizations, as well as a natural disaster, to inaugurate a "demonstration erosion control program." On 21 April 1984, a tornado tore through the heart of his district, leaving fifteen people dead and dumping up to five inches of rain in three hours. The previous year's jobs bill had authorized spending "to meet emergency requirements and remedy damages resulting from disastrous rains and floods," criteria which this storm certainly met. With the authorizations in hand, the Appropriations Committee committed an initial $6.2 million toward six watersheds in the Yazoo uplands. By the following year, Whitten understood the full potential of what heretofore was a makeshift program, and he began formalizing it as the Demonstration Erosion Control Program.[74]

The appeal of the DEC program was twofold. First, it represented an opportunity to finally achieve full coordination between the Corps of Engineers and the Soil Conservation Service in the Yazoo basin. Unlike in the Yazoo-Little Tallahatchie project, which the SCS managed with occasional coordination with the Corps, the DEC from its inception was the joint responsibility of

[73] For the jobs bill, see Public Law 8, 98th Cong., 1st sess., (24 March 1983), under "Enhancement of Water Resource Benefits and for Emergency Disaster Work"; and House Committee on Appropriations, *Making Appropriations to Provide Emergency Expenditures to Meet Neglected Urgent Needs, to Protect and Add to the National Wealth, Resulting in Not Makework but Productive Jobs for Women and Men and to Help Provide for the Indigent and Homeless for the Fiscal Year 1983, and for Other Purposes*, 98th Cong., 1st sess., 21 March 1983, H. Rept. 98-44, 18-19. For the subsequent spending bill, see Public Law 50, 98th Cong., 1st sess., (14 July 1983), under "Flood Control, Mississippi River and Tributaries, Arkansas, Illinois, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee"; House Committee on Appropriations, *Making Appropriations for Energy and Water Development*, 98th Cong., 1st sess., 28 June 1983, H. Rept. 98-272, 19; and House Committee on Appropriations, *Energy and Water Development Appropriation Bill, 1984*, 98th Cong., 1st sess., 24 May 1983, H. Rept. 98-217, 41. Whitten quoted in House Subcommittee on Energy and Water Development, *Energy and Water Development Appropriations for 1985: Hearings before a Subcommittee of the Committee on Appropriations, House of Representatives*, 98th Cong., 2d sess., 21 February 1984, pt. 2:1437.

[74] *Congressional Record*, 98th Cong., 2d sess., 26 June 1984, 130, pt. 14:18919-20; House Committee on Appropriations, *Energy and Water Development Appropriation Bill, 1985*, 98th Cong., 2d sess., 15 May 1984, H. Rept. 98-755, 36-37. For the transition to a more formal program, see House Committee on Appropriations, *Energy and Water Development Appropriation Bill, 1986*, 99th Cong., 1st sess., 10 July 1985, H. Rept. 99-195, 42-43; and House Committee on Appropriations, *Agriculture, Rural Development, and Related Agencies Appropriation Bill, 1986*, 99th Cong., 1st sess., 18 July 1985, H. Rept. 99-211, 85-86.

both agencies. "The idea," explained a Corps spokesperson, "is to get the agencies working together."[75] It effectively applied the same principle that Frank Smith had proposed over twenty years earlier, only now, rather than fighting it, Whitten endorsed it, perhaps because he was more secure in his position. As a mechanism for controlling streambank erosion and sedimentation, the DEC thus functioned far more efficiently than the YLT. For this and other reasons, by the mid-1990s the project had expanded from six experimental watersheds to sixteen.

The second major benefit of DEC was its equal emphasis on remediation and research. Contrary to most previous efforts to fix the sedimentation problems in the Yazoo basin, DEC involved constant monitoring of the results with an eye to refining erosion and sedimentation control techniques. In fact, the entire watershed became a veritable outdoor laboratory. The Corps and the SCS planned and installed conservation structures, while scientists from the USDA's National Sedimentation Laboratory in Oxford (another product of Whitten's patronage) monitored and evaluated their effectiveness. This research helped produce deeper knowledge of the complex interrelationships between erosion, sedimentation, and flooding. Studies in the Yazoo basin helped produce many of the foundational principles in the field of stream hydrology, including models that describe how channelization leads to worse conditions than before (Figure 40). Although it was likely not Whitten's intent, DEC represented to a certain degree a concession that the Soil Conservation Service and the Corps of Engineers had erred in their earlier efforts to simplify complex hydrologic systems through practices such as channelization.[76]

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[75] Michael Logue, quoted in Alan Huffman, "Erosion along Yazoo River Target of $8.2 Million Study," *Jackson Clarion-Ledger* (4 October 1984), sec. A, p. 1.

[76] On the creation of and research conducted at the National Sedimentation Laboratory, see "New Sedimentation Laboratory," *Soil Conservation* 24 (March 1960): 192; ARS, *USDA Sedimentation Laboratory*; Claude D. Crowley, "Research for Resources," *Soil Conservation* 43 (January 1978): 4-6; and Eddy J. Langendoen, et al., "The National Sedimentation Laboratory: 50 years of soil and water research in a changing agricultural environment," *Ecohydrology* 2 (2009): 227-234. On Whitten's patronage of the laboratory, see, for example, Langendoen, "National Sedimentation Laboratory," 227; and House Subcommittee, *Department of Agriculture Appropriations for 1966: Hearings*, 273-279. One exception to the lack of monitoring was a Corps of Engineers program lasting from 1974 to 1981. See US

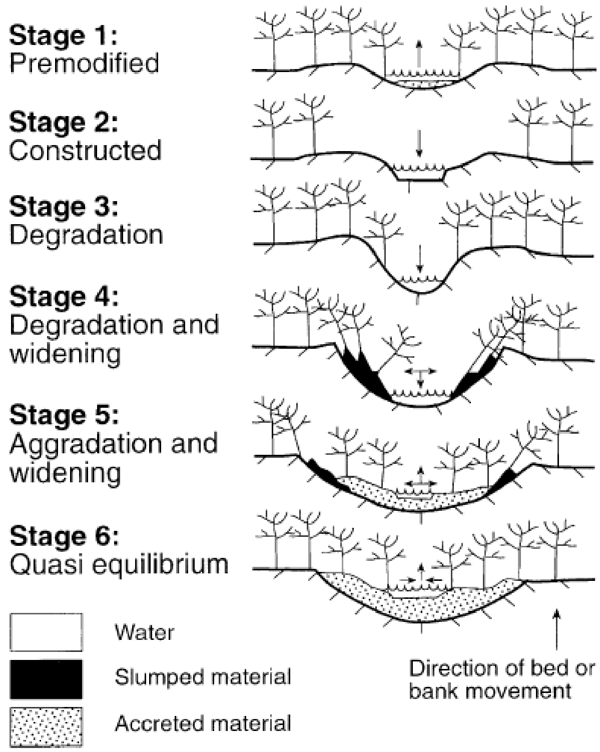

Figure 40: Stages of channel evolution before and after channelization. The model predicts that it will take fifty to seventy years after channelization (Stage 2) for equilibrium to be re-established (Stage 6). Source: Simon and Darby, "Effectiveness of Grade-Control Structues," 230; Wohl, *Disconnected Rivers*, 189-192.

Army Corps of Engineers, *Final Report to Congress: The Streambank Erosion Control Evaluation and Demonstration Act of 1974, Section 32, Public Law 93-251: Main Report* ([Washington, D.C.]: US Army Corps of Engineers, 1981). For more on monitoring and the simplification of complex systems, see Wohl, *Disconnected Rivers*, 187-189, 206-209. For an example of the realization that channelization exacerbated channel erosion, see US Army Corps of Engineers, *US Army Engineer Waterways Experiment Station*, (US Army Corps of Engineers, 8 August 1991), VHS video, 9:32, from Jamie L. Whitten Collection, Archives and Special Collections, University of Mississippi Libraries Digital Collections, http://clio.lib.olemiss.edu/cdm/singleitem/collection/whitten/id/127/rec/1. For more on research in the DEC, see Wohl, *Disconnected Rivers*, 206-214; Richard A. Rebich, *Preliminary Summaries and Trend Analyses of Stream Discharge and Sediment Data for the Yazoo River Basin Demonstration Erosion Control Project, North-Central Mississippi, July 1985 through September 1991*, Water-Resources Investigations Report 93-4068 (Jackson, Miss.: US Geological Survey, 1993); Rebich, *Estimation of Sediment-Discharge Reduction for Two Sites of the Yazoo River Basin Demonstration Erosion Control Project, North-Central Mississippi, 1985-94*, Water-Resources Investigation Report 95-4198 (Jackson, Miss.: US Geological Survey, 1995); F. E. Hudson, "Project Formulation of the Demonstration Erosion Control Project," in *Management of Landscapes Disturbed by Channel Incision: Stabilization, Rehabilitation, Restoration: Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision, 1997*, ed. S. S. Y. Wang, et al. (Oxford, Miss.: University of Mississippi, 1997), 120-124; Simon and Darby, "Effectiveness of Grade-Control Structures"; and C. R. Thorne, "Bank Processes and Channel Evolution in the Incised Rivers of North-Central Mississippi," in *Incised River Channels: Processes, Forms, Engineering, and Management*, eds. Stephen E. Darby and Andrew Simon (Chichester, UK: John Wiley & Sons, 1999), 97-121.

These lessons did not come cheap. By the early twenty-first century, total DEC expenditures were approaching one billion dollars. Part of the explanation for the hefty price tag was that, with a powerful benefactor in Whitten during the program's formative years, researchers could afford to install costly measures. In the early 1950s, for instance, SCS researchers scoffed at "grade control structures" as prohibitively expensive, but by the 1980s and 1990s the measures were fairly standard in DEC streams. Some of these structures carried a per-unit cost as high as $200,000 to $400,000. Moreover, as an outdoor laboratory, the DEC program necessarily involved trial-and-error experimentation. USDA scientists realized that many of the control measures installed in the Yazoo basin failed to control the erosion and sedimentation of streambeds and banks, and sometimes they even made matters worse.[77]

In the 1980s and 1990s, for example, the SCS and the Corps of Engineers installed over a dozen grade control structures on roughly ten miles of Hotophia Creek, a tributary of the Tallahatchie River. The goal was to reduce channel erosion and sedimentation farther downstream. Scientists later determined, however, that these structures failed to fulfill their purpose and, in some cases, exacerbated erosion downstream. The problem stemmed from the legacy of channelization. The SCS channelized Hotophia Creek between 1961 and 1963, creating a volatile hydrology that had still not stabilized several decades later. In essence, the DEC work was too late. The researchers estimated that, by 2050, the grade control structures will have caused nine percent more eroded sediment than the "more cost-effective approach…[of] allow[ing] the channel to undergo a more

[77] Russell Woodburn, "Summary of Sedimentation Conference, Yazoo-River Watershed, Bluff Line Tributaries, Mississippi, August 28-31, 1950," 18; Special Collections Department, Mississippi State University Libraries. In its first ten years—during most of which Whitten chaired the House Appropriations Committee—the DEC program's budget totaled roughly $526 million. For this and the cost of structures, see Wohl, *Disconnected Rivers*, 211.

natural recovery." This did not mark a repudiation of the DEC per se, but rather indicated an increasing sophistication of knowledge that the project enabled.[78]

As researchers learned more of the intricacies of sedimentation late in the twentieth century, the "hydrological nightmare" in the Yazoo basin grew less scary. The case of Hotophia Creek demonstrates that chain reactions continued to complicate conservationists' best efforts late into the twentieth century. Yet, it also suggests that scientists and action agencies were starting to embrace the ethic of "adaptive management"—a pragmatic approach that historian Nancy Langston describes as "the messy process of developing a management scheme that incorporates multiple human perspectives while responding to changing scientific understanding of dynamic ecosystems."[79] Jamie Whitten used his political influence and powerful committee appointments to bring the DEC program to the Yazoo basin with the goal of complete control through more thoroughly coordinated engineering. While pursuing these goals, however, DEC researchers started to realize that such methods were often counterproductive. In other words, chain reactions in the Yazoo basin triggered chain reactions in conservation policy.

Conclusion

Throughout the twentieth century, the natural world operated in a dialectical relationship with conservation politics. Changes in environmental systems induced politicians to intervene in conservation policy, which then spawned further changes in the Yazoo environment. The cycle was ongoing. Widespread gullying led to erosion-control efforts by the Soil Conservation Service and the Forest Service. Conservation in the uplands, however, reduced the sediment load entering

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[78] Andrew Simon and Stephen E. Darby, "Effectiveness of Grade-Control Structures in Reducing Erosion along Incised River Channels: The Case of Hotophia Creek, Mississippi," *Geomorphology* 42 (2002): 252. See also Wohl, *Disconnected Rivers*, 209.

[79] Langston, *Where Land and Water Meet: A Western Landscape Transformed* (Seattle: University of Washington Press, 2003), 155.

streams, which triggered increased scouring of stream channels. One of the preferred methods for regulating bottomland creeks was channelization, but this practice only exacerbated sedimentation problems. These problems struck every part of the Yazoo watershed—the uplands, the bottomlands, the Bluff Line, and the Delta.

Throughout it all, Jamie Whitten wielded the power of his leadership of the House Subcommittee on Agriculture Appropriations at critical moments to ensure the SCS and the Army Corps of Engineers had the necessary authority and funding to conduct their work in the Yazoo basin. His mastery of low-profile, behind-the-scenes maneuvers maximized his impact on soil and water conservation policy. While outside observers recognized his influence, it remained difficult to identify the full scope of his power without a clear picture of how daily congressional affairs, as opposed to landmark legislation, affected the actions of federal agencies. Whitten's position afforded him ample opportunities to use congressional hearings, committee reports, appropriations bills, personal pressure, and informal meetings to shape the creation and execution of conservation policy.

Despite Whitten's relative invisibility beyond his district and Capitol Hill, his story illustrates the centrality of political figures and congressional politics to the conservation-industrial complex. In order for the associative network of public and private parties to thrive, it needed allies in Congress who were willing and able to unloose the federal dollars on which conservation programs depended. Yet, like any other legislator, Whitten's political decision-making did not operate in a vacuum. His support for conservation was shaped by the ecological and financial realities facing his constituents, whom he strove incessantly to serve. Thus, in order to explain conservation politics, it is necessary also to understand conditions on the ground as well as on the Hill. In the Yazoo River basin, this means understanding the causes and consequences of sedimentation.

Yet, for all of the distinctiveness of Yazoo sedimentation and Whitten's extraordinary power during the second half of the twentieth century, the interworking of nature and politics in northern Mississippi is also representative of similar stories nationwide. Politicians throughout the nation represented districts with their own unique environmental challenges to which soil and water conservation was the answer. If Jamie Whitten represented the apogee of legislative influence, he also provided a window into the various avenues open to politicians who wanted to use soil and water conservation to protect and develop natural resources for their constituents. Throughout the nation, in other words, the interaction between nature and congressional politics comprised an essential cog in the conservation-industrial complex.

CONCLUSION

"Preserving the Land"?
The Conservation-Industrial Complex, the Associative State, & the Quest for Sustainability

Head west on Interstate 70 out of Lawrence, Kansas, and in a few hours you will reach Hays, a city situated among the sprawling wheat farms, cattle ranches, and confined feeding operations that dominate western Kansas. Some friends and I found ourselves passing through the city in March 2014. While stretching our legs downtown, we wandered into a thrift store where we found a bin of ball caps that reflected the sorts of working landscapes through which we had traveled. Amid caps bearing the logos of Case tractors, trucking companies, and natural gas producers, I came across a hat drawing a curious connection between a powerful corporation and conservation technology. Emblazoned across the front of the cap are a bucolic scene and the tag line, "MONSANTO: PRESERVING THE LAND WITH NO-TILL" (Figure 41). I left the shop fifty cents poorer, but enriched with an unexpected insight into the history of the conservation-industrial complex.

My new purchase symbolized the culmination of seven decades of soil and water conservation history. To be sure, the hat also represented corporate "greenwashing" by a company that many agrarians and environmentalists by the turn of the twenty-first century considered synonymous with the social and environmental evils of industrialized agriculture.[1] Yet, beneath the surface of this apparent irony lies a deeper lesson: In branding itself as caretaker of the environment, Monsanto was acting in lockstep with the history of the conservation-industrial

[1] This hat was created by J.G. Rebbe & Associates of Ballwin, Missouri, in 1999 or earlier (before the company's telephone area code, which is on the label of the hat, was converted from 314 to 636). Author telephone conversation with Cindy Rebbe, 9 June 2014. See also "636 Area Code—On What Side of the Line Do You Fall?" *St. Louis Post-Dispatch* (12 February 1999), A13. For examples of Monsanto's reputation among critics of industrialized agriculture, see the essays in Andrew Kimbrell, ed., *The Fatal Harvest Reader: The Tragedy of Industrial Agriculture* (Washington, D.C.: Island Press, 2002); Michael Pollan, *The Botany of Desire: A Plant's-Eye View of the World* (New York: Random House, 2001), chapter 4.

Figure 41: A late-twentieth-century artifact of the conservation-industrial complex, which had long considered the goals of economic production and environmental production as mutually constructive. Author's collection.

complex. Supporters of conservation had long considered the goals of economic production and environmental protection as mutually compatible. Moreover, they had increasingly turned to capital- and input-intensive technology such as no-till to help achieve these goals.

Finally, Monsanto's support of conservation reflected the associative public and private partnerships that had long characterized conservation. In 1997, the company established thirteen "Monsanto Centers of Excellence" across the country to study conservation tillage of corn, soybeans, and cotton. A profit motive certainly loomed large in this decision, but that was precisely the point. Profit and protection were bridled together. Researching conservation tillage and disseminating their results to a "primary audience" consisting of both public and private decision makers—including "local farmers, crop consultants, Natural Resources Conservation Service (NRCS) and other professionals"—served Monsanto's financial interests. After all, upwards of seventy-five percent of Americans in the late twentieth and early twenty-first century believed that "going green is…good business."[2] In short, while the rise of no-till in the late twentieth century furnished new market opportunities for the chemical companies in the conservation-industrial complex, the basic character of the complex remained remarkably constant.

"Soil, Water, and the State" traces how soil and water conservation went from a fledgling movement in the 1920s to the widespread, unified network of institutions, individuals, and industry that characterized agricultural conservation from the 1930s on. Put another way, it explains why Monsanto's support of conservation in the 1990s made perfect sense. The parties in this network shared economic, political, and (in some cases) moral interests in promoting and practicing soil and water conservation. The result was the creation of the conservation-industrial complex, an embodiment of an associative order that not only explains the history of soil and water conservation in the twentieth-century United States, but also mimics the structure of state-society relations in other areas of American life.

In creating the conservation-industrial complex, public and private parties tapped into a rich American tradition of filtering federal authority through decentralized intermediaries—state and local governments, civic organizations, and private industry—in what historians and political scientists call an "associative order" of governance. Agricultural historians have paid increasing attention in recent years to the role of the state in rural affairs. The present work, however, emphasizes that we need to go beyond mere explanation *that* the state played a larger role in agriculture during the twentieth century, and instead that we should explore *how* it achieved this. Farmers' growing economic "dependency on the federal government" certainly explains some of the

[2] R. A. Buman, et al., "Profit, Yield, and Soil Quality Effects of Tillage Systems in Corn-Soybean Rotations," *Journal of Soil and Water Conservation* 59 no. 6 (2004): 260; GfK and SC Johnson, *The Environment: Public Attitudes and Individual Behavior—A Twenty-Year Evolution* (n.p.: GfK, 2011), 7. See also Buman, et al., "Profit and Yield of Tillage in Cotton Production Systems," *Journal of Soil and Water Conservation* 60 no. 5 (2005): 235-242.

change, but the relationship between producers and the state was political as well as economic.[3] When agricultural historians have explored the associative order in American agriculture, they have tended to focus on the New Deal period or earlier, assuming that World War II brought a pronounced change.[4] This is an important omission, because associative arrangements such as the conservation-industrial complex provide powerful explanatory frameworks for understanding how many American farmers reconciled their persistently independent mentalities with their increasing dependence on federal subsidies and other forms of assistance. Throughout the twentieth century, soil and water conservation was largely dependent on the national government for research, funding, and outreach. But the associative character of the conservation-industrial complex permitted this expansion of federal authority to proceed in a low-profile manner, thereby guarding against antistatist backlash.

The decreased visibility of the complex helps explain why environmentalism has overshadowed utilitarian conservation in many US historians' treatments of post-World War II environmental history. After all, the everyday interactions between farmers, conservation technicians, and other agents of the complex have attracted far less attention than burning rivers, oil spills, and massive public demonstrations such as the first Earth Day. The environmental movement also resulted in a much greater expansion of federal regulations under which many in the conservation-industrial complex chafed. Regulation was anathema to the associative order, which

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[3] R. Douglas Hurt, *Problems of Plenty: The American Farmer in the Twentieth Century* (Chicago: Ivan R. Dee, 2002), ix. Perhaps the strongest evidence that agricultural historians are paying greater attention to the role of the state can be found in the organizing themes of recent agricultural history conferences. See Agricultural History Society, *Agriculture and the State: The Politics of Farming and Rural Life Across Space and Time*, 2012 Annual Meeting of the Agricultural History Society, Manhattan, Kansas, June 6-9, 2012, http://www.aghistorysociety.org/pdf/AHS2012.pdf; and "Thinking Land Grants: A 'Celebration' of the 150th Anniversary of the Morrill Land-Grant Act," Mississippi State University, October 3-6, 2012, http://history.msstate.edu/MorrillActWebSite/MorrillIndex.html.

[4] I join a number of scholars in emphasizing the need to look more closely at the structure of state intervention. See, for instance, Jess Gilbert, "Low Modernism and the Agrarian New Deal: A Different Kind of State," in *Fighting for the Farm: Rural America Transformed* ed. Jane Adams (Philadelphia: University of Pennsylvania Press, 2003), 129-146; Jess Gilbert and Carolyn Howe, "Beyond 'State vs. Society,': Theories of the State and New Deal Agricultural Policies," *American Sociological Review* 56 (April 1991): 204-220; and David E. Hamilton, "Building the Associative State: The Department of Agriculture and American State-Building," *Agricultural History* 64 (Spring 1990): 207-218.

was based on the premise that democracy was best served through voluntary arrangements between public and private spheres. As "Soil, Water, and the State" has demonstrated, utilitarian conservation was influenced by and forced to respond to environmental concerns, but it continued to shape the political and physical landscapes of the United States throughout the twentieth century.

The continuity of utilitarian conservation, however, does not mean that its meaning went unchanged. Conservation officials and evangelists maintained their dual pursuit of economic development and environmental protection—typically defined as using the land "according to its capabilities"—but their discourse evolved over time in response to changing national concerns and priorities.[5] During the interwar period, Hugh Hammond Bennett helped define the meaning of conservation by tying it to national security. Along with others involved with conservation during the interwar period, Bennett saw utilitarian conservation as protecting not only natural resources, but also human resources. Specifically, he promoted soil conservation as a way to fight erosion, stabilize the landscape, and thereby keep farmers from losing their land. He frequently warned that American society faced real prospects of national decadence, drawing on lessons from history that suggested a number of ancient civilizations had crumbled due to soil erosion. With the onset of World War II, Bennett's discourse on conservation shifted to prioritize national security through maximized production for the war effort. This shift had lasting consequences, for it ensconced in the conservation-industrial complex a definition of conservation that measured the value of conservation practices not only according to how well they controlled erosion, but also to how well they boosted yields.

For the next quarter century, the discourse of soil and water conservation remained tied to increased production. In the midst of the unprecedented abundance of the postwar United States,

[5] See, for instance, Hugh Hammond Bennett, *Report of the Chief of the Soil Conservation Service, 1945* (Washington, D.C.: Government Printing Office, 1945), 10.

conservation officials considered it their duty to spread conservation practices in order to guarantee the nation's material prosperity. The Soil Conservation Service's Small Watershed Program was perhaps most reflective of this shift, for it increased attention toward regulating the hydrosphere to protect from destructive floods and crippling water shortages. The United States was putting increasing pressures on natural resources not only because of increasing consumer appetites, but also due to a rapidly swelling population. By more thoroughly conserving and developing the nation's soil and water resources, conservation officials promised to guarantee material prosperity for all Americans, present and future. What's more, interwar and postwar soil and water conservationists' desires to expand government authority in order to stabilize and foster economic growth were repeated in an array of activities during the twentieth century: forest and rangeland conservation, food and drug inspection, and the creation and operation of the federal banking system, to name a few.[6]

During the interwar and postwar periods, the associative order of the conservation-industrial complex gradually took full form. In the late 1920s, Congress authorized several erosion-control research stations throughout the country to be operated by the Department of Agriculture in cooperation with state land-grant universities. Early in the New Deal, the Roosevelt Administration launched several hundred demonstration projects scattered throughout the country wherein farmers would contract with the Soil Erosion Service and its successor, the SCS, to implement and follow conservation practices for five years in exchange for federal assistance. USDA officials soon realized, however, that applying such a system nationwide was politically and logistically infeasible.

[6] See Brian Balogh, *A Government Out of Sight: The Mystery of National Authority in Nineteenth-Century America* (Cambridge: Cambridge University Press, 2009), 385-389. See also Brian Balogh, "Scientific Forestry and the Roots of the Modern Administrative State: Gifford Pinchot's Path to Progressive Reform," *Environmental History* 7 (April 2002): 198-225; Karen R. Merrill, *Public Lands and Political Meaning: Ranchers, the Government, and the Property Between Them* (Berkeley: University of California Press, 2002); and Paul W. Hirt, *A Conspiracy of Optimism: Management of the National Forests since World War Two* (Lincoln: University of Nebraska Press, 1994).

In response, they encouraged the creation of a new unit of local government—the conservation district—throughout the country, through which the USDA could funnel federal assistance. After World War II, conservation districts and their watershed equivalent, the watershed association, represented some of the most frequent sponsors of the SCS's small watershed projects. In short, the conservation-industrial complex from its genesis found tremendous political utility in a system wherein federal, state, and local authority were intertwined. Soil and water conservation thus fostered an expansion of the national government through decentralized channels, a process that was replicated to varying degrees in flood control, rural electrification, and welfare administration efforts.[7]

The conservation-industrial complex also became *industrial* during the interwar period. As early as the 1920s and 1930s, both farm-equipment manufacturers and the Soil Conservation Service appreciated that conservation measures often called for specialized equipment, which opened new markets for industrial products. Equipment manufacturers from Corsicana Grader to John Deere understood that the expansion of federal authority through conservation augured well for their balance sheets. Private industry did not fight Washington's growing influence but, as a Caterpillar Tractor official put it in 1937, typically viewed erosion as "an enemy of national concern" and thus "a problem for government" rather than for the private sector.[8] Likewise, SCS officials understood that their industrial allies could serve a vital purpose by mass marketing not only tractors and terracers, but also the conservation concepts they had articulated. Postwar conservation magnified these shared interests, especially through the Small Watershed Program, which intensified the need

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[7] On the decentralized aspects of federal flood control, see Karen M. O'Neill, *Rivers by Design: State Power and the Origins of U.S. Flood Control* (Durham: Duke University Press, 2006); and Christopher J. Manganiello, "Dam Crazy with Wild Consequences: Artificial Lakes and Natural Rivers in the American South, 1845-1990" (PhD diss., University of Georgia, 2010). For rural electrification, see Sarah T. Phillips, *This Land, This Nation: Conservation, Rural America, and the New Deal* (New York: Cambridge University Press, 2007), chapters 2 and 3. On the decentralized administration of New Deal welfare programs, see Balogh, *Government Out of Sight*, 392-393.

[8] L. J. Fletcher to Ralph V. McCue, [20 February 1937]; attached to Fletcher to M. L. Wilson, 20 February 1937; b2638; RG 16; NACP.

for private contractors and heavy earthmoving equipment to build reservoirs, farm ponds, and to channelize streams. As with the federalist character of the conservation-industrial complex, the private sector welcomed, participated in, and benefitted from the expansion of federal powers in myriad ways, including defense contracting, prison operations, and even the administration of charities.[9] Clearly, then, the conservation-industrial complex provides a model not just for analyzing soil and water conservation, but also for understanding the structure of American society.

Starting around 1970, the conservation-industrial complex's discourse of guaranteeing abundance no longer seemed legitimate to much of the country. During the following decade, the complex underwent a series of crises that challenged the authority of utilitarian conservation, particularly that of the Soil Conservation Service. These crises in legitimacy did not elicit an evolution into a network that we might classify as "environmental," which would have involved abandoning utilitarian objectives or subordinating them to "quality of life" concerns. Rather, it prompted a reshuffling of authority within the conservation-industrial complex. The reoriented complex established a discourse of conservation that moved *toward* environmental quality, but that still prioritized economic production.

This changing discourse was facilitated by the rise of conservation tillage, a new technology that opened even more promising markets for private industry. Whereas farm-equipment manufacturers represented the primary industrial members of the conservation-industrial complex before 1970, with the rise of tillage—especially no-till, which required the ample use of herbicides—garnered the complex additional support from the agrochemical industry. Conservation tillage

[9] See Balogh, *Government Out of Sight*, 394-397. For more on military contracting, see Aaron L. Friedberg, *In the Shadow of the Garrison State: America's Anti-Statism and Its Cold War Grand Strategy* (Princeton: Princeton University Press, 2000). On the "carceral state" of public-private prison operations, see Marie Gottschalk, *The Prison and the Gallows: The Politics of Mass Incarceration in America* (New York: Cambridge University Press, 2006). On private charitable organizations benefitting from the expansion of the welfare state during the mid-twentieth century, see Andrew J. F. Morris, *The Limits of Voluntarism: Charity and Welfare from the New Deal through the Great Society* (New York: Cambridge University Press, 2009).

allowed chemical companies to present themselves as guardians of the environment, a significant opportunity when the human and environmental costs of petrochemicals were coming under increased scrutiny in the post-*Silent Spring* United States.[10] By the close of the twentieth century, the utilitarian promise of soil and water conservation remained strong, perhaps as strong as ever.

Although an exploration of the discourse of conservation provides a useful window into the evolution of soil and water conservation policies and programs at the national scale, the conservation-industrial complex could not have thrived on discourse alone. Ideas do not translate automatically into action. Three elements of the conservation-industrial complex were particularly important in spreading and safeguarding conservation: technology, farmers, and politicians.

Conservation technology was instrumental to the success of the conservation-industrial complex. In an associative order dependent on the voluntary participation of farmers, the surest way for conservation officials to scuttle their mission would have been to offer agricultural producers methods that did not work. Farm people's livelihoods depended on practical and cost-effective methods that could still offer decent financial returns. Consequently, conservation researchers had to develop reliable, effective technologies that fostered simultaneously economic production and environmental protection. Two technologies are particularly illustrative: terracing and conservation tillage. By controlling the physical power of running and falling water, these technologies enabled conservation researchers to bolster the social and political power of the conservation-industrial complex. While terraces and tillage helped make environmental problems more manageable and thus more practical, they also demonstrate how the conservation-industrial

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[10] Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin, 1962). On the growing awareness of human and environmental costs of chemical usage, see Pete Daniel, *Toxic Drift: Pesticides and Health in the Post-World War II South*, (Baton Rouge: Louisiana State University Press in association with Smithsonian Institution, 2005); Angus Wright, *The Death of Ramón González: The Modern Agricultural Dilemma*, rev. ed. (Austin: University of Texas Press, 2005); and Linda Nash, *Inescapable Ecologies: A History of Environment, Disease, and Knowledge* (Berkeley: University of California Press, 2006), chapters 4-5. On the rise and evolution of the chemical industry during the mid-twentieth century, see Edmund Russell, *War and Nature: Fighting Humans and Insects with Chemicals from World War I to* Silent Spring (New York: Cambridge University Press, 2001).

complex has had greater success with technological solutions than with more fundamental economic or moral reforms.

While practical technologies were necessary to the spread of conservation, they were not sufficient. A farmer could easily reject conservation technicians' overtures if he deemed them overly aggressive, coercive, or too much of a departure from established traditions. Put differently, farmers retained tremendous agency within the conservation-industrial complex. This is evident in the experience of agricultural producers in the Driftless Area of the Upper Mississippi River Valley, home to what many scholars consider a conservation "success story." The Driftless Area demonstrates how the conservation-industrial complex thrived because of farmers, their relationships with one another and with Soil Conservation Service agents, and the biological needs of the organisms they wished to raise.

Finally, the conservation-industrial complex depended on the constant support of politicians in Congress. The associative order between public and private spheres would have been severely weakened if Congress failed to authorize and fund conservation activities. The importance of congressional patronage is most clearly seen in the evolution of conservation practices and programs in the Yazoo River basin of northern Mississippi. Yazoo residents faced perennial problems stemming from erosion, sedimentation of streams, and flooding. In an effort to alleviate these troubles, members of Congress from northern Mississippi supported conservation programs nationwide, and they strove to deliver special pork-barrel projects directly to their constituents. Nobody in the nation wielded greater or longer-lasting influence in these affairs than did Jamie Whitten, a conservative Democrat who represented the Yazoo Basin in the House of Representatives from 1941 to 1994. Wielding his powerful chairmanship of the House Agriculture Appropriations Subcommittee, Whitten repeatedly maneuvered behind the scenes to shape federal laws and policies in favor of conservation projects for his home district. The Mississippi congressman's role in the conservation-industrial complex, while atypical, illustrates some of the avenues open to thousands of politicians throughout the country who bolstered soil and water conservation programs in an effort to solve their constituents' specific environmental problems.

* * *

With this understanding of the various parties whose economic, political, and moral interests converged in the conservation-industrial complex, the larger subtexts incorporated within the logo of the Monsanto hat becomes clearer. In discourse as well as in practice, proponents of soil and water conservation had long pursued the dual objectives of economic production and environmental protection. With a greater recognition of how these utilitarian motives survived and evolved after World War II, we can understand with greater clarity and less cynicism how a multinational corporation with a lackluster environmental record could promote a version of land stewardship fully confident that it was not acting hypocritically. The hat represents but a recent manifestation of a set of ideas, practices, and relationships with a much deeper, more nuanced, and continuous history. Once we come to grips with this complex past, we might learn new insights into how to achieve a more sustainable future.

"Soil, Water, and the State" offers several lessons for present-day advocates of sustainable agriculture. It demonstrates the unlikelihood of achieving sustainability through regulatory means. The size of the regulatory apparatus required to effectively police the millions of acres of land in the United States would likely be too much for most Americans—especially farmers and their powerfully situated representatives in Congress—to stomach. Moreover, those most likely to execute laws would be Natural Resources Conservation Service (NRCS) staff, but as a county conservationist in Wisconsin told me, many in the NRCS "don't want to be Big Brother too much."

They would rather let farmers make their own decisions.[11] In sum, the associative state remains well engrained in American agriculture.

Equally important, the history of the conservation-industrial complex reveals that for decades farmers have considered themselves able caretakers of the land. They have been encouraged along the way by the discourse established by the Soil Conservation Service and its industry allies, even as some practices have fallen short of their intended goals. This suggests that advocates of a more sustainable regime of agriculture would have greater success convincing farmers to adopt new methods if they started their conversations with their shared interest in stewardship rather than with the failures, many though there are, of industrialized farming.[12]

Finally, "Soil, Water, and the State" suggests that definitions of sustainability that call for sustainable *development* will continue to confound efforts to maintain the integrity and diversity of human and nonhuman environments. The conservation-industrial complex has long pursued a brand of environmental protection that prioritizes continued economic growth, and it has done remarkably well at adapting to changing economic conditions to sustain that growth. However, the complex has failed to reduce soil erosion nationwide to what scientists consider levels of long-term sustainability, for the rates of erosion on US cropland continue to exceed those of soil formation by a factor of ten.[13] Answers to this persisting problem are not clear, but they will likely involve a reconsideration of development-oriented conservation (and sustainability) on the part of producers, and a willingness to sacrifice unbridled, inexpensive consumption on the part of consumers.

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[11] Author interview with Sam Skemp, NRCS offices, Viroqua, Wisconsin, 20 June 2012.

[12] This conclusion corresponds to social constructionist interpretations of agricultural reform, which suggest that changes in agriculture will achieve success only insofar as farmers consider those changes as possible within their *status quo* social networks. Conversations with conventional farmers that begin with the failures of industrialized agriculture immediately place reformers outside of those producers' networks. On the importance of social networks to agricultural reform, see, for instance, Diana Stuart, et al., "Responding to Climate Change: Barriers to Reflexive Modernization in U.S. Agriculture," *Organization & Environment* 25 (September 2012): 308-327.

[13] David Pimentel, "Soil Erosion: A Food and Environmental Threat," *Environment, Development, and Sustainability* 8 (February 2006): 124.

In the end, we should find in the conservation-industrial complex an important lesson. Adaptation, technological innovations, and relationship building between the state and civil society have enabled the complex to respond to changing national priorities and concerns. These same characteristics will likely prove instrumental as Americans develop the discourses, programs, and networks needed to meet the needs of the twenty-first century.

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