Chapter 76
Historic Land Use and Social Policy Affecting Large-Scale Changes in Forest Cover in the Midwest United States

Mikaela Schmitt-Harsh, Sean P. Sweeney, and Tom P. Evans

76.1 Introduction

Changes in land use/cover have dramatic implications for a variety of critical ecosystem functions such as carbon sequestration and habitat provision, which may impact human livelihoods (Foley et al., 2005). While some changes in land cover are driven by biophysical processes, many contemporary land-use/cover change events are strongly influenced by human actions. Often a result of multiple actors and structures combining in complex synergistic ways, land-use/cover changes are dynamic across spatial, temporal, and hierarchical scales (Geoghegan et al., 1998). Given this complexity, it is important to examine the driving forces of land-use/cover change, such as economic, cultural, institutional, and technological forces. However, because land-use/cover systems do not always respond in predictable ways to these driving forces, it is equally important to examine the historical contexts from which the system has evolved or adapted. If the system is path dependent, its current state and trajectory of change depend on its history, not solely on current values of driving forces (Geoghegan et al., 1998). Path dependence plays a critical role in land-use systems with regard to both social and biophysical dynamics (Brown, Page, Riolo, Zellner, & Rand, 2005), as many of the land-use patterns we see today are products of a long lineage of historical processes.

Most land-cover change trajectories are not easily predictable, and a particular challenge is to understand how path dependence and initial conditions help determine future land-cover change trajectories. Previous research has explored the roles of initial conditions and path dependence in land-use modeling (Atkinson & Oleson, 1996; Balmann, 2001; Brown et al., 2005; Wilson, 2000). The foundation of this modeling research is the general concept that historical actions constrain future possible actions. For example, a wide literature documents the impact of road construction on land clearing (Chomitz & Gray, 1996) and urban expansion (Arthur 1988) resulting in what can be considered local-level, irreversible trajectories of

M. Schmitt-Harsh (✉)
School of Public and Environmental Affairs, Center for the Study of Institutions, Population, and Environmental Change, Indiana University, Bloomington, IN 47405, USA
e-mail: schmittm@indiana.edu

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land development and forest-cover loss. With few exceptions, once a natural landscape has transitioned to urban land uses, the probability that it will later revert back to a vegetated state is low. Similarly, the creation of dams and reservoirs result in the displacement of settled populations and the loss of what is often high fertility floodplain territory. While these events are often carried out under the auspices of economic development, a multitude of long-term ecological, cultural, and social ramifications are associated with the large-scale transitions (Patz et al., 2004).

Examining historical processes and path dependence enables greater understanding of the social and environmental dynamics associated with forest-cover change trajectories. Many anthropomorphic land-cover changes are the result of two distinct drivers: major policy prescriptions designed to result in a specific land-cover change outcome, and local-level actions of a large number of mostly autonomous actors. We consider land-use/cover change processes as a product of different types of social engineering, or large-scale attempts to serve economic, social, environmental, or political goals. While land-use/cover changes themselves may be a form of physical engineering, we focus here on the social engineering that influences land-use/cover transformations. We see policy makers as top-down actors who design a particular program (e.g. acquisition of land by federal government) to achieve a specific land-use/cover objective. Alternatively, local-level decision makers who manage individual partitions of a landscape are bottom-up actors. These local-level actors may have different objectives for the overall land-cover composition of their landholdings. Heterogeneity of land suitability can lead to complex land-cover outcomes as farmers learn which portions of their parcels are suitable for long-term production. Likewise, the decision-making processes of farmers vary from actor to actor; some maximize short-term production while others consider long-term impacts of their actions, such as soil conservation for future generations. As such, to understand the processes driving these types of large-scale land-cover changes it is helpful to examine the large-scale policy prescriptions *and* the local-level actions that in aggregate produce large-scale outcomes.

Large-scale changes in land cover are not exclusively the result of top-down management but often the product of an aggregation of local-level actions. For example, the massive deforestation seen in the Brazilian Amazon is the result of land being cleared by a multitude of individual households migrating from other areas. In this case, a government program facilitates this type of event, but the activities of many individual actors are ultimately responsible for the widespread loss of forest cover. Although both top-down and bottom-up actors are important decision makers in designing land management solutions with diverse implications for land cover, the scale of our analysis in this chapter prohibits us from closely examining local-level actions that have directly influenced land-use/cover change trajectories.

This chapter looks at engineering by examining top-down policy prescriptions that have influenced land-use/cover change in the United States. We examine how conservation initiatives incorporated as components of major social policy prescriptions, such as the Civilian Conservation Corps (CCC), the Soil Bank Program, and the Conservation Reserve Program (CRP), have influenced forest-cover change. Our objective is to examine how socially engineered policy prescriptions have influenced physical engineering, that is, reforestation. We draw on examples from work in the Midwest United States to supplement our discussion of these programs. With explicit focus on identifying path-dependent relationships between policy makers, local actors, and the environment, we identify historic land-use processes and national policies that have significantly influenced forest trajectories in the United States.

76.2 Settlement and Conversion of Forestland to Agriculture

76.2.1 Timber Extraction and Deforestation (1790–1850)

Forest-cover changes in the first half of the 19th century were largely the result of European-American colonization and the subsequent social and economic changes that accompanied settlement. Settlers advanced from the Northeast westward, felling or girdling trees with simple iron hand tools, setting fire to kill understory species, and clearing forests for agriculture (Parker, 1997). Both Thomas Jefferson and Benjamin Franklin fervently supported the value of agriculture, believing that economic growth would be greatest served through clearing farmland rather than forest preservation. Although it was thought that farming could turn to profit with hard work and a rudimentary knowledge of husbandry, many fields lost productivity after a few years, resulting in further agricultural expansion into adjacent forested areas. Many poor settlers perceived the protection of forests as an impediment and threat to their economic survival, resulting in rapid clearing of forests.

While forest harvests and remaining cleared lands offered economic opportunities to many Americans, there was also growing recognition of the commercial value of timber in the early 19th century. Logging began as a seasonal activity that was pursued when farming and clearing fields were made difficult by the weather. Wood was a principal fuel for heating and approximately half of all trees cut for purposes other than land clearing were used for fuel (Cox, Maxwell, Thomas, & Malone, 1985). Commercial logging spread rapidly from the northeast United States to midwestern and southern states. In 1839, the Northeast accounted for over two-thirds of the total production of lumber with New York accounting for 30%, Maine 14%, Pennsylvania 9%, and the rest of New England 10% (Cox et al., 1985). By 1849, production expansion to other parts of the country led to a decline in total production of lumber in the Northeast to half the total. By 1859, the continuation of geographic shifts reduced the Northeast's share to one-third.

Technological advances paved the way for even greater diversity in how forest resources were utilized. Sophistication of saws and sawmills enabled the transformation of logs into lumber with greater efficiency, the application of steam engines to milling operations enhanced the crop of activities possible within the lumber industry, and the advancement of woodworking skills enabled the creation of wooden bridges, ships, and houses unparalleled in structure and architecture. Technology affected both the supply side (the ways trees were felled, milled, and transformed into wood products) and the demand side as per capita purchases of lumber increased by more than 400% from 1799 to 1859 (Cox et al., 1985).

During this time of rapid westward expansion and technological advances, few Americans believed that the nation's forests could be exhausted, despite the work and admonitions of André Michaux, François André Michaux, Amos Eaton, and others (Cox et al., 1985; Michaux, 1817). Finding that forests between 1802 and 1807 were declining, François André Michaux tried to alert Americans to the consequences of rapid tree destruction maintaining that the destruction would surely increase with population and without protection from the federal or state governments (Michaux, 1817). Unfortunately, bodies of legislation to protect forests grew slowly after much of the colonial legislation was discarded. What regulations were present were largely ignored because many Americans continued to believe that a resource as abundant as timber would not become scarce.

76.2.2 Transition from Deforestation to Reforestation (1850–1930)

By 1850, lumber production ranked first among all manufacturing branches in the United States when measured in value added by manufacture, the most useful test of an industry's contribution to the economy (Cox et al., 1985). In many mid-western states, land clearing continued unabated until the early 1900s, at which time areas marginal for agricultural production were gradually abandoned. In Indiana, agricultural clearing and timber extraction reduced forested land from 85% pre-settlement to approximately 6% (Evans, Donnelly, & Sweeney, 2009; Nelson, 1998). Ohio experienced a similar dramatic forest loss, from 90% to 18% (Kellog, 1909). There is some discrepancy in historical estimates, with an older report citing Indiana forest cover in the early 1900s of 18% (Kellog, 1909), but because contemporary data are more reliable, considerable reforestation in the 20th century has been documented, and current forest cover estimates equal approximately 17–20%, we find Nelson's estimates to be most plausible. While other states in the eastern United States experienced precipitous declines in forest cover, none were more dramatic than in Indiana and Ohio (Fig. 76.1) (Evans et al., 2009). Between 1870 and 1910, forest utilization and perceptions/attitudes about forests changed, and the lumber industry went through its period of greatest growth, greatest production, and greatest destructiveness. Although wood was still in high demand for use in railroad building, construction of homes, log rafting, and urban and rural development, wood became less ubiquitous in American life as many commodities were made of glass, metal, or other substitutes. Gradually the commercialization of forests changed, largely due to technological advances, demand, and the realization that forests were finite. The accomplishments of those in the lumber industry – bigger mills, more jobs, new communities, larger shipments to domestic and foreign markets – were offset by the growing specter of a coming timber famine, of valueless cutover land reverting to government ownership, and of idle mills and idle workers. Not surprisingly, the expansion of lumbering preceded calls for the careful husbanding of forest

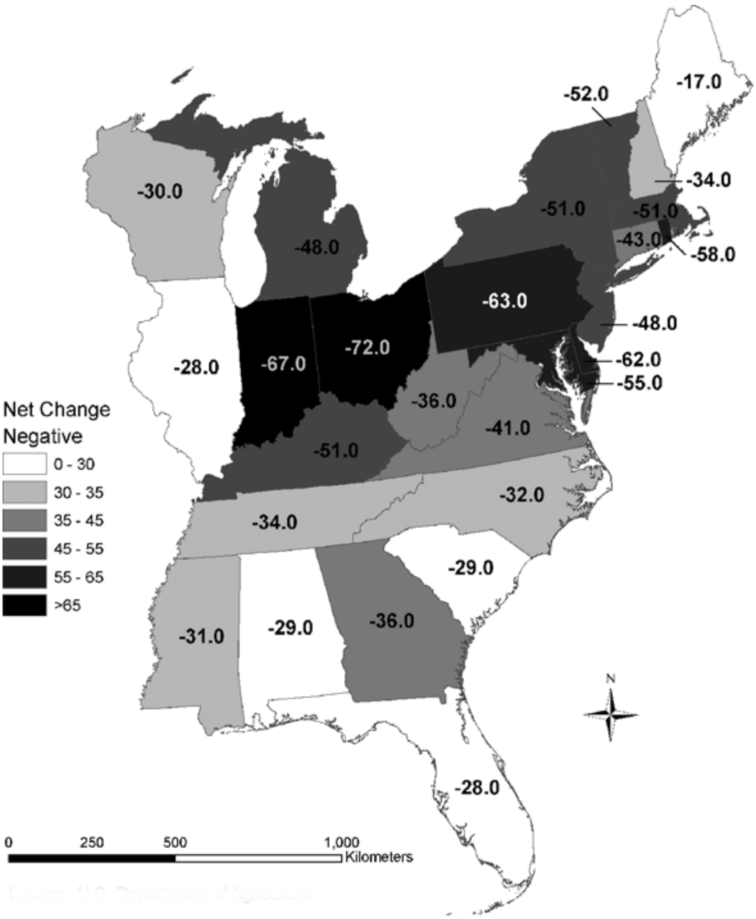

Fig. 76.1 Percent forest-cover loss in the Eastern United States, pre-1800s to 1909. (Source: Evans et al., 2009; Data Source: U.S. Department of Agriculture)

resources, though when those calls did come, they were first sounded in the Lake states where the impact of major logging activities had first been experienced.

The period following 1909 contrasted sharply with the one preceding it. Focus given to economic growth and production was replaced with reconciling public and private contending interests and their claims on the forest. Similarly, focus was shifted from the government regulatory approach of the Progressive Era to the development of cooperative approaches in which public and private sectors worked together. In essence, the public was awakened to the problems of logging and the need for comprehensive conservation. In 1911, the Weeks Law was passed by Congress. This law grew from a group of conservation-minded citizens and foresters who wanted regulations placed on logging practices and the application of sound forest management on public and private lands (Cox et al., 1985). The Weeks Law marked the beginning of extensive cooperation among the federal government, the states, and private industry in protecting forests from fire and other hazards.

World War I and the years that followed were times of continuous adjustments for the lumber industry. During the war, high demand was placed on forests for the construction of wooden merchant vessels and wooden sailing ships. Immediately following the war, demand for lumber plummeted, mills closed, and the national price index for lumber fell by 50% from 1920 to 1921 (Cox et al., 1985). Production activities resumed in 1923; however, prices for lumber remained low, putting a damper on expansion as well as on efforts to modernize. To meet the challenge of diminishing timber stands and overproduction, a comprehensive fire-prevention program supported by the chief of the U.S. Forest Service (USFS), William B. Greeley, was established. The Clarke-McNary Act in 1924 expanded the federal-state-industry program of cooperative fire protection and authorized $2.5 million annually to finance it. The bill also authorized a federal-state system of nurseries to provide seedlings for reforestation, a study of forest taxation, a federal land-acquisition program for navigable streams, and a forestry extension program (Cox et al., 1985). This bill represents a form of social engineering that influenced the physical engineering of the earth and, in combination with the expansion of forest research and other cooperative forestry programs, paved the way for a new era of consolidation, maturation, and development.

76.3 Forest Conservation Initiatives

76.3.1 Civilian Conservation Corps (1933–1942)

76.3.1.1 Origins, Legislation, Organizational Structure

The decade from 1930 to 1940 was characterized by the stagnation of price levels, profit decline, diminished incomes (particularly farm), and high unemployment that exceeded 25% by 1933. Approximately 30% of those employed worked on a part-time basis (Aaron, Hofstadter, & Miller, 1967). Employment in forestry projects was considered one viable solution to address the unemployment problem and it evolved into one of the centerpiece programs of the Roosevelt administration's New Deal. The concept of an organization that would put to work the unemployed through nature conservation projects was not uniquely Franklin Roosevelt's, although he had actively advocated and implemented such as a New York state legislator as early as 1929 (Gibbs, 1933; Paige, 1985; Salmond, 1967). Concurrent with Roosevelt's early efforts, states like California had established camps to employ individuals drawing relief on public works projects that included forestry. Likewise, the Society of American Foresters and the American Forestry Association promoted socially engineered programs to employ workers in a variety of conservation- and recreational-enhancement projects in national parks and state and national forests (Paige, 1985; Recknagel, 1932; Salmond, 1967). The Emergency Conservation Work (ECW), later renamed the CCC, was established as part of the New Deal and adopted aspects of existing and proposed programs to formulate a national program of unemployment relief through conservation projects.

On 5 April 1933, one month after assuming office, President Roosevelt signed Executive Order 6101, entitled "Relief of Unemployment through the Performance of Useful Public Works," appropriated $10 million to establish ECW, and appointed Robert Fechner as director. The executive order mandated the appointment of two representatives by each of the secretaries of Agriculture, Interior, Labor, and War to an ECW advisory council (the Veterans Administration, Office of Indian Affairs, and Department of Education were later participants). The advisory council discussed matters of policy and presented recommendations to the director, who was free to accept or reject them. However, on all matters pertaining to CCC policy, the ultimate authority resided with the president.

Responsibilities for implementing aspects of the program related to recruitment, training, and project supervision were allocated among a number of government departments, or administrative agencies: Agriculture, Interior, Labor, and War. The Department of Labor was to initiate a nationwide recruiting program, the Department of Labor was to condition and transport enrollees to work camps, and the National Park Service (NPS) and USFS were to operate the camps and supervise the work assignments (Paige, 1985). Work projects in national forests were assigned to the USFS (state, forest, and private land work was later added to their responsibilities) and state and recreation park work to the NPS. Due to insufficient resources to both operate the camps and direct projects,[1] the NPS and USFS were relieved of camp operations and the U.S. Army assumed the additional responsibility.

At the request of the president, Congress granted an authorization for extension of the ECW and a doubling of its workforce enrollment via the Emergency Relief Appropriation Act of 1935. However, as early as 1936, the president was actively working on a plan to reduce the size of the ECW to make it a smaller, manageable, and permanent organization. In June 1937, legislation was passed and signed by the president that created the CCC (formal change of title from ECW). The agency was not made permanent but was extended for three years. An additional attempt was made in 1939 to establish the permanency of the CCC but it failed. The Reorganization Act of 1939 brought the CCC under the jurisdiction of the Federal Security Agency in July of that year. The focus on conservation projects and education that had been embraced at the outset of the ECW shifted to national defense with the start of conflict in Europe in 1939. Projects became primarily defense related, and military training replaced the earlier education programs, with many recruits diverted to defense work exclusively. Recruitment began to fall short by 1941 as potential enrollees migrated to higher-wage national defense employment. All CCC camps engaged in activities unrelated to wartime production or the protection of natural resources needed for war activities were terminated with the entry of the United States into World War II (Paige 1985). In May 1942, the president requested and was subsequently denied an appropriation from the House of Representatives Committee on Appropriations to continue 150 camps. On June 30, 1942, all CCC work programs were terminated. The Labor-Federal Security Administration Act appropriated $8 million to pay for the cost of terminating the program and stipulated the completion date at July 1, 1943.

76.3.1.2 Cooperative Role with the National Park Service

Given the number of individuals expected to work in the nation's parks and forests within the first year (Roosevelt's goal was 250,000 youths by July 1, 1933), the NPS and USFS played an integral role in the administration and development of the CCC program. Although the expansion of responsibilities was demanding and brought greater involvement (and contention) with the Army, the spirit of the NPS and those taking part in the CCC program was pronounced. A letter from NPS Director Horace M. Albright to the NPS field people reflects this climate:

> While this program involves hard work placed on the shoulders of every one of us, a large responsibility and a great deal of hard work, it also permits us to play a very important part in one of the greatest schemes ever devised for the relief of our fellow citizens in this present crisis and the rehabilitation of many young men of the nation who have as yet had no opportunity for decent occupation and have been the subjects of unfortunate attitude toward their native land and conditions in general. We therefore have a wonderful opportunity to play a leading part in the development of a wholesome and patriotic mental attitude in this younger generation. (Wirth, 1980, p. 83)

During its first year, CCC work focused on forest improvement projects, construction and maintenance of fire breaks, forest fire suppression, campground and trail construction, road and trail building, survey work, tree disease control, insect control, and landscaping (Paige, 1985). These projects influenced the physical engineering of the earth and were undertaken in both national and state parks, with more rigid planning, inspections, and supervision given to projects within national parks and monuments. Prior to the CCC, the NPS had no formal ties with the state parks program, which was still in its infancy (only 19 states had a formal park system, although 45 states had initiated development plans). The NPS was granted rights to oversee the state park systems, and during the first enrollment period (June 1–September 30, 1933), 105 CCC camps were assigned to state park projects in 26 states (Wirth, 1980). Through assistance from NPS-employed technicians and CCC funds, recreational parks, wildlife conservation projects, and historical restoration programs were developed within state park systems.

76.3.1.3 Contribution to Forest Conservation and Reforestation

During the existence of the CCC program (from April 1933 to June 1942) work was undertaken by the NPS on a total of 655 parks and related types of recreation areas: 71 national parks, 23 recreational demonstration areas, 8 TVA areas, 29 federal defense areas, 405 state parks, 42 county parks, 75 metropolitan parks, and 2 unclassified areas (Wirth, 1980). At the peak of its program in 1935, there were 590 camps in national and state parks. By 1942, there were only 89 camps, 70 of which were operated by the NPS on military reservations doing defense work (Paige, 1985; Wirth, 1980).

While the activities and duties of the CCC were diverse, many were dedicated to the protection, improvement, or expansion of forests, which created immeasurable benefits to the national and state park systems. When the CCC was established in 1933, the greatest threat to the national parks was forest fires, due to insufficient fire-fighting personnel and insufficient funds to fully implement fire-protection programs within parks (Paige, 1985). The CCC program facilitated the development of fire trails and other forest fire-prevention facilities, and developed insect, disease, and erosion controls. The CCC provided a federal aid program, technical assistance, and administrative guidance for development and long-range planning of state park systems (Wirth, 1980). By the time the CCC was terminated in 1942, 711 state parks had been established (Paige, 1985). The CCC also provided the manpower and resources necessary to improve losses caused by forest fires, tree diseases, insects, rodent infestations, and soil erosion. Many other accomplishments resulted from the engineering of the CCC, such as construction of public-use facilities (sanitation and water systems), service roads, campgrounds, trails, housing for employees, and restoration of historic sites and buildings. These accomplishments still yield benefits today. An estimated 3 billion trees were planted during the CCC program, which together with the development and improvement in national and state park systems has had a lasting effect on the presence of forests nationally.

76.3.2 Soil Bank Program and Conservation Reserve Program

Although the CCC succeeded in planting trees on both public and private lands over an area that exceeded 2.3 million acres (almost 931,000 ha), CCC activities cannot be given exclusive credit as the sole government-sponsored initiative that resulted in large scale reforestation. Subsequent government programs implemented projects that successfully reforested acreage that equaled, or exceeded, that accomplished by the CCC. The Soil Bank Program (1956–1961) was essentially an acreage reduction mechanism established during the Eisenhower Administration to (1) curtail farming of cropland, particularly land that was prone to erosion, to avoid a potential repeat of conditions that led to the Dust Bowl and (2) decrease crop surpluses and stabilize eroding per capita disposable income for farm families. The Soil Bank legislation provided farmers a fixed payment per acre for removing staple crops (corn, wheat, rice, cotton, peanut, and tobacco) from production and diverting the land to conservation uses for a term of no less than 3 years to a maximum of 10. Approximately 28.6 million acres (11.6 million ha) were enrolled in the program nationwide by 1960 (Daniels, 1988).

Of that amount, 2.2 million acres (890,000 ha) were planted in trees primarily by an ownership group comprised of farmers and other private citizens, although the forest industry, the USFS, and other public entities contributed (Moulton & Hernandez, 2000). The majority of planting (87%) occurred in the southern states. A national study was conducted in 1992 of acreage that was planted in trees under the Soil Bank Program and found that only 7.5% had been converted back for agriculture or pasture purposes (Dangerfield, Newman, Moorhead, & Thompson, 1995).

The Soil Bank Program terminated in 1961, but was followed by similar programs such as the Cropland Conservation Program in 1962 and the Cropland Adjustment Program in 1965. From a conservation perspective, the Soil Bank Program yielded significant benefits, but its success at addressing the pressing societal issues of the day were less so. No restrictions were stipulated on the amount of acreage enrolled in the program and, consequently, some counties suffered substantial economic loss as a consequence (Daniels 1988). Furthermore, susceptibility of erosion was less a consideration for farmers considering enrollment as was the land's productive capacity. Consequently, marginally productive land was primarily enrolled and farmers invested enrollment imbursements in production acreage to increase yields, which exacerbated the surplus problem.

The environmental conditions and plight of the farmers that compelled the Eisenhower Administration to introduce the Soil Bank Act reappeared in the 1970s and 1980s. High export demand for staple crops and low supply forced commodity prices higher in the 1970s. Farmers responded by planting marginal cropland and expanding production into pasture and rangelands. As the value of U.S. currency increased in the 1980s, farm incomes significantly decreased again. Faced with issues related to cropland erosion and diminished farm incomes, Congress responded with the passage of the Food Security Act (1985) and a Soil Bank successor program, the Conservation Reserve Program (CRP). The CRP differed from its predecessor in that it limited the annual payments to farmers as well as the amount of acreage eligible for enrollment per county and focused on cropland that was most susceptible to erosion (Daniels 1988). As of fiscal year 1998, the extent of tree planting and seeding under the CRP had exceeded those of predecessor programs. Over 2.6 million acres (1.1 million ha) had been planted or seeded, the majority of which (almost 90%) occurred on land under private ownership (forest industry comprised 41.7% and nonindustrial private property comprised 47.9%) (Moulton & Hernandez, 2000). Similar to what was observed with the Soil Bank Program, planting and seeding in the southern states accounted for approximately 79% of the total.

The CRP is particularly important in mid-western states because of the relatively large proportion of marginal land for agriculture. The state of Indiana contributes approximately 280,000 acres to the approximate 33 million acres actively enrolled in CRP (as of 24 April 2009). An examination of cumulative enrollment in Indiana, from inception through 2007, revealed that peak enrollment occurred in the mid-1990s. A significant decline was observed from the peak period to the end of the decade but enrollment has stabilized since then in the range of 275–325 thousand acres (data compiled by the Department of Agriculture Farm Service Agency) (Fig. 76.2). Net change in acreage enrollment in the interval from 1997 to 2007 remained modest for the majority of counties. The direction of change was split evenly among the counties; an increase in enrolled acreage was observed in half and a decrease in the remainder (Fig. 76.3). However, the largest net changes were found in counties that had experienced a decrease in CRP acreage, approximately 16% lost acreage in excess of 2% (net). Although the percentage of county area in CRP, for the range of land-use practices, has remained relatively low from the peak period

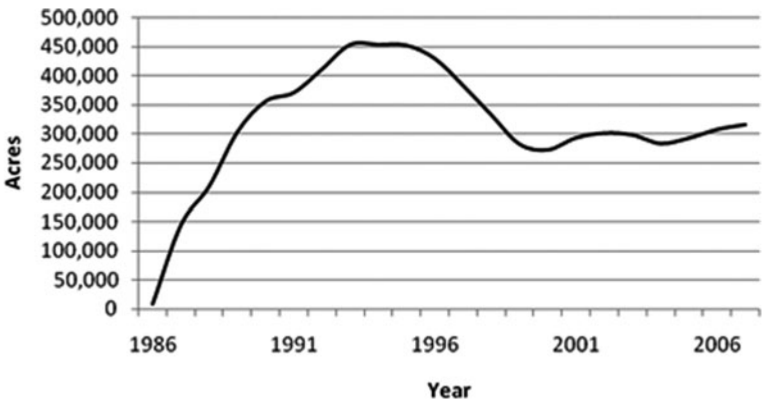

Fig. 76.2 Cumulative enrollment in the conservation reserve program in Indiana, 1986–2007

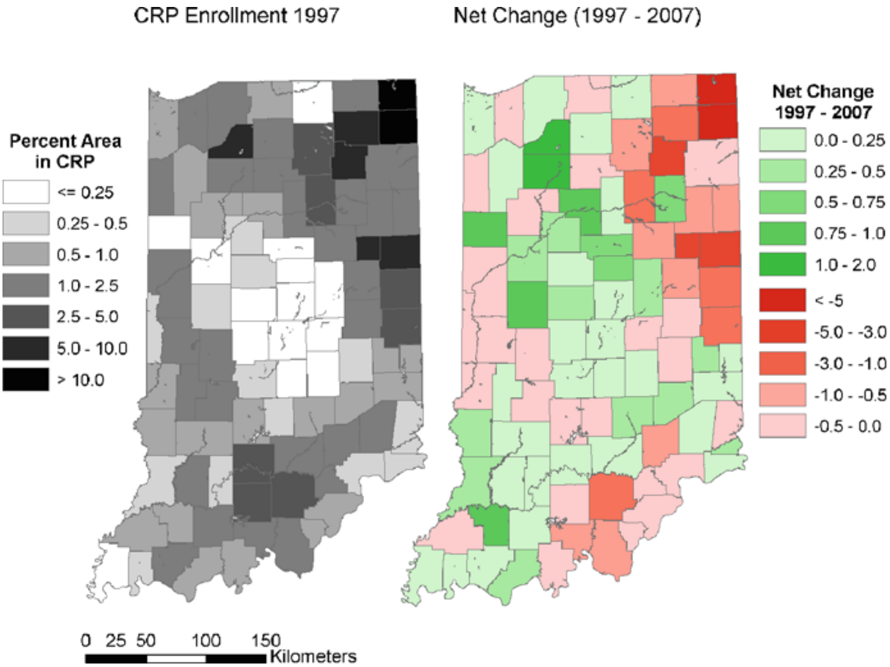

Fig. 76.3 Enrollment in the conservation reserve program in 1997 and net change in enrollment over the next decade. (Data Source: U.S. Department of Agriculture, Farm Service Agency)

through 2007, it has been estimated that 18,700 acres (7,570 ha) of tree plantings in Indiana alone have been initiated through this program (Evans et al., 2009). The 2002 Farm Bill enacted or amended a number of mandatory conservation programs; however, the largest of these programs, the CRP, has not been subject to modified limitations since the passing of the bill.

76.4 Land-Use Legacies and Future Implications

The process of westward expansion and the absence of legislation to protect forest resources in the 18th and early 19th centuries had long-lasting effects. Fire and inefficient methods of harvesting had dramatic effects on forest health and rapid increases in the number of lumber industries quickly led to overexploitation of forests and a shift in human-environmental interactions. This migration of production from the Northeast to the Lake States, the South, and the West Coast resulted in a widespread loss of forest cover. Given the trend of economic growth and production, the years from 1910 to 1930 helped determine the future of America's forests. Citizens and foresters actively engaged in promoting conservation efforts, and state conservation agencies, aided by the Weeks Law and the Clarke-McNary Act, developed increasingly effective fire-prevention systems, seedling nurseries, and educational programs. This 20-year period was critical to the consolidation, maturation, and development of cooperative federal-state-private forestry practices and provided a portion of the operational framework for national conservation, or social engineering, efforts that followed.

Federal programs such as the CCC, Soil Bank, and CRP, implemented in response to deteriorating socioeconomic and/or environmental conditions, yielded significant conservation benefits in terms of forest protection, quality, and expansion. Some of these policy responses have had long-lasting effects, such as the creation of state and federal forests through implementation of the CCC. Others have had more temporary effects, given the focus on management practices and land use rather than land cover. Land-use management decisions affecting forests on private lands in particular, as well as the potential for reforestation on private lands, remain susceptible to fluid socioeconomic conditions and conservation enrollment opportunities.

In the United States, both national and state governments have been important actors in encouraging conservation and reforestation, particularly in the 20th century. Through the development and implementation of conservation programs, and the purchasing of extensive lands that were abandoned from the 1930s to 1950s, the amount of forested area in the United States has increased in the last century. Public landholdings represent the largest contiguous patches of forests in many areas; however, a particular challenge to managers of state and federal forests is to promote increased contiguity to reduce the fragmentation that exists among many public landholdings.

While this chapter has examined how social engineering in the form of large-scale policy prescriptions influence land-use/cover changes and the activities of individual actors, greater focus on bottom-up actors as agents of change may improve our understanding of the dynamic and synergistic processes involved in forest-cover change. There is considerable complexity in local-level actions as many private landholdings are managed by a heterogeneous group of actors with diverse preferences and household contexts that result in varying approaches to land management (Evans & Kelley, 2004). For example, conversion of non-forested land to forest has been observed in recent decades on marginally productive farmland, pasture, and rangeland and the remainder holds the greatest potential for continued reforestation, particularly those unthreatened by urban encroachment (Evans, Green, & Carlson, 2001). However, global economic factors and the emergence of new opportunities such as biofuel-based agricultural production will continue to compete with the value of forest ecosystems. The shifting of fuel production to domestic agricultural sources may result in a tighter coupling between fuel supply and land use, which may have unforeseen environmental consequences. While some landowners will not modify their land-management practices in reaction to these changes, others will, and it is important to understand the institutional forces, and socioeconomic variables associated with land-use decision-making processes of private landholders. Net trajectories of land-cover change are the products of major policy prescriptions and local-level actions, thus requiring examination of the complex decision-making processes driving private and public actors at different management levels.

Note

1. Report by National Park Service Director Horace Albright to Field Officers, 13 April 1933.

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