

V. Conservation and the Environment

With images of the Dust Bowl seared in the collective mindset, reducing wind- and waterborne soil erosion became an overriding concern, and a primary accomplishment. Soil losses have declined dramatically in response to conservation policies, and productivity gains have been equally dramatic, thanks to technological advances.

Farmers, ranchers, and private forest landowners own and manage two-thirds of the Nation's land and are the primary stewards of our soil, air, and water. While the cost of stewardship on that land is borne by land managers, the benefits serve society at large. Meeting society's demands for improved environmental quality requires that we broaden our definition of "output" to include environmental amenities—such as rural landscape amenities, wildlife habitat, wetlands, and improved water and air quality—along with food, fiber, and timber production.

Conservation programs have been part of farm policy since the 1930s. Historically, those programs focused largely on maintaining the produc-

tivity of food-producing natural resources. Today, environmental concerns extend well beyond the farmgate and have become key considerations in policy formulation.

Right Track, New Directions

Conservation programs can help reduce the gap between the level of environmental quality the public demands and the level of environmental quality that farmers and forest landowners would otherwise provide. Because environmental amenities typically are not sold on a market, managers of farm and forest land have limited marketplace incentives for providing them. Conservation programs can provide that incentive and compensate land managers for the amenities they produce.

Conservation policy evolved from a primary focus on keeping productive topsoil in place. With images of the Dust Bowl seared in the collective mindset, reducing wind- and waterborne soil erosion became an overriding concern, and a primary accomplishment. Soil losses have declined dramatically in response to conservation policies, and productiv-





ity gains have been equally dramatic, thanks to technological advances. We now realize that the off-farm costs of soil erosion far exceed on-farm costs, and that off-farm costs of agricultural production extend beyond those associated primarily with soil erosion.

As the scope of environmental concerns has expanded, a wider range of conservation policy instruments are now needed to address them. Traditional land retirement (the Conservation Reserve Program) has dominated Federal spending on conservation since 1985; 92 cents of every dollar now spent on direct conservation payments to farmers pays for rental and easement payments for idling environmentally sensitive cropland and cost sharing for management practices that enhance the environmental benefits from retired lands. But direct outlays for conservation are only part of the picture. While land retirement programs involve less than 10 percent of total cropland, considerable conservation activities are carried out on vast stretches of working lands, both voluntarily and to comply with regulatory requirements.

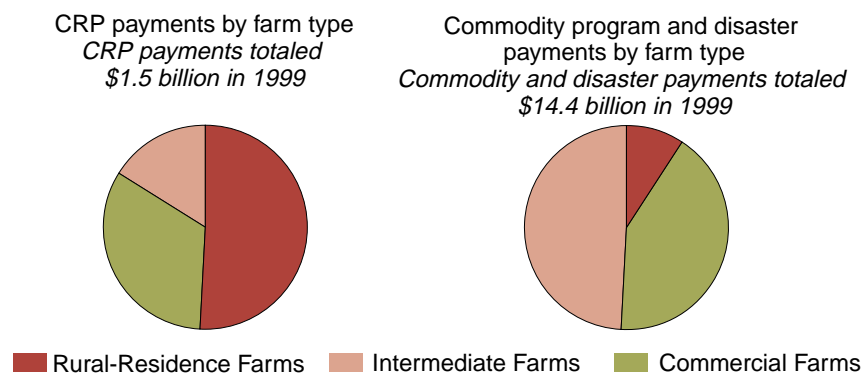
Nevertheless, the current imbalance favoring land retirement suggests an untapped potential for achieving cost-effective environmental benefits from conservation spending on working lands. Further, many

emerging agri-environmental problems can be addressed only by changing management practices on working land. In particular, reducing nutrient runoff from fertilizer and animal waste may require widespread changes in the management of nutrients, as well as strategically placed conservation buffers. Similarly, improved private forest management practices can better protect watersheds, provide improved habitat for threatened and endangered species, and guard against non-native invasive species.

The changes in agriculture also provide new perspectives. Increasingly diverse farms—rural-residence farms, intermediate farms, and commercial farms, including those farms that have not been served by traditional agricultural programs—all play a role in conservation efforts. Most farms are small (intermediate or rural residence), and small farms continue to control the majority of farmland (figure 5, page 23). These farms account for nearly 85 percent of all land retired for conservation purposes, and conservation programs are an important income source for them (figure 18). The success of new conservation

Figure 18

Rural-Residence Farms Get Most of the Payments From the Conservation Reserve Program, But a Small Portion of Other Farm Program Payments



tools will depend on ensuring that intermediate and rural-residence farms and nonindustrial private forest landowners will have continued access to them.

Some environmental problems are associated primarily with large, commercial farms. For example, confined animal operations are getting larger and more concentrated and contribute disproportionately to nutrient-based water quality problems; just 5 percent of farms with confined livestock account for more than 60 percent of the excess nitrogen and phosphorus from manure produced nationwide. These structural changes suggest a changing and varied relationship between

farming and the environment, with implications for policy design.

Programs Score Environmental Gains

Since 1985, significant gains have been made in addressing major environmental concerns (see box, page 75). In response to conservation programs and requirements, soil erosion has declined (figure 19), wetlands losses have declined (figure 20), and other wetlands have been restored. As a result, water quality has improved, and fish and wildlife populations are improved.

Figure 19

The Decline in Soil Erosion Is Widespread

Change in average annual soil erosion by wind and water on cropland and CRP land 1982-1997

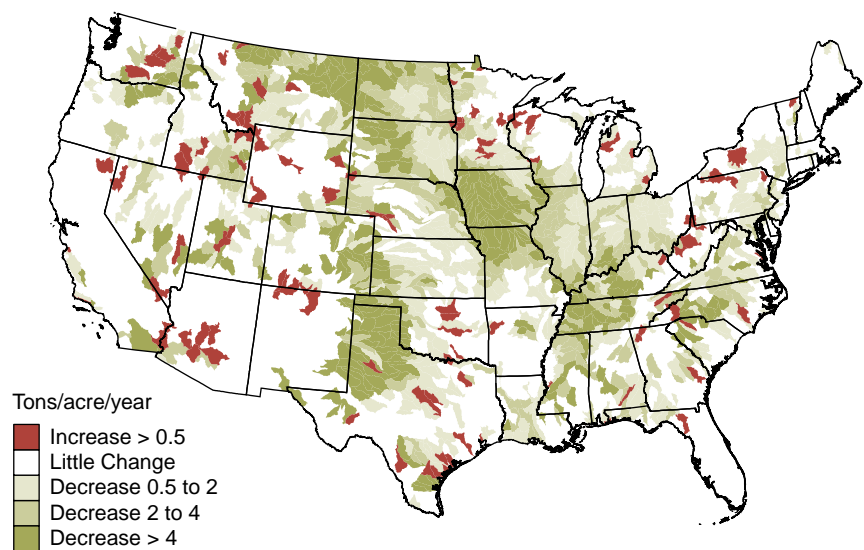
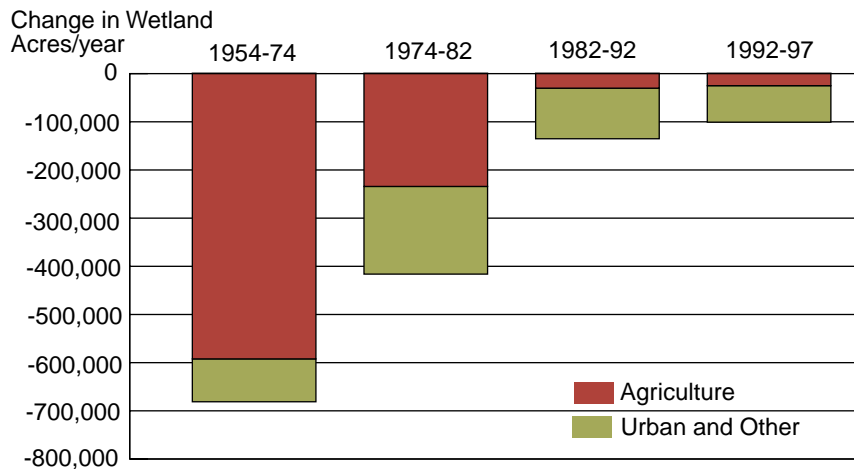


Figure 20

Annual Wetland Losses From Agriculture Slowed Dramatically Through 1982, and Continue To Decline



Environmental Gains From Major Conservation Programs

- Soil erosion on cropland and pasture declined by 1.2 billion tons (40 percent) from 1982 to 1997, and those gains are spread widely across all major farming regions (figure 19). The benefits of erosion reduction due to conservation compliance and the Conservation Reserve Program (CRP) are estimated to exceed \$2 billion per year.
- Wetland losses from agriculture were down to 27,000 acres per year in 1992-97, from 593,000 acres per year during 1954-74 (figure 20). The swampbuster requirements are effective in discouraging conversion of as much as 3.3 million acres of agricultural wetlands.
- Agriculture has become a major engine of wetland restoration. More than 990,000 acres of wetlands have been restored through the Wetlands Reserve Program (WRP) since 1991.
- Wildlife habitat has been restored and improved. The hunting and recreation benefits associated with the CRP are estimated at over \$700 million per year.
- Land retirement and other conservation programs are increasing the amount of carbon sequestered in the soil and mitigating greenhouse gas buildup.

Emerging Environmental Challenges

Building on past environmental gains will require renewed effort. Although soil erosion has declined by 40 percent over the past 15 years, farms are still losing 1.9 billion tons of soil every year, which impairs water quality and fish habitat, reduces water storage capacity in reservoirs, imposes costs on municipal and industrial water users, and reduces future soil productivity. The

Wetlands Reserve Program (WRP) is an important tool for reducing the Nation's net loss of wetlands. Without conservation compliance, soil erosion and wetland losses would both increase because, depending on crop prices, farmers could find it profitable to farm up to nearly 15 million acres of the highly erodible lands and wetlands that are currently protected by sodbuster and swampbuster provisions.

The array of conservation issues has grown with changes in the structure of agriculture and in farm and forest management practices, and with greater public concern about a

Emerging Challenge Water and Agriculture: Inextricably Linked

Nationwide, agriculture accounts for nearly 80 percent of all water consumption. That figure is even higher west of the Mississippi. Three-quarters of all cropland in the Western United States is irrigated. The 16 percent of harvested cropland that is irrigated accounts for nearly half of the value of all crops sold. Nationwide, nearly 100 percent of all orchard sales and more than 80 percent of the sales of vegetables and potatoes are produced on irrigated cropland.

Increasingly, in all regions of the country, demand for water is growing faster than supply. Increasing demands—for urban, environmental, and Native American uses and for the production of hydroelectric power—and declining supplies—arising in part from land use changes including urbanization,

deforestation, and fewer wetlands—create conflicts over water allocations. Conflicts arising over scarce water supplies in river basins throughout the West may foreshadow emerging conflicts in Eastern States. Because it accounts for such a large percentage of total water use, agriculture is uniquely positioned to be a part of the solution.

Incentives and technical support for improved on-farm water management encourage farmers to do more with less and provide some regulatory and drought relief for farmers who have to cut back. Conservation programs can also play an important role in helping to solve water management issues on the watershed scale. Voluntary conservation programs and risk management programs could be

parlayed, in conjunction with other Tribal, State, and Federal agencies, to develop market-based water banks to help mitigate the high cost to all water users of drought-induced water supply reductions. Water banks could consist of producers who would voluntarily idle production on irrigated lands in drought years in return for payment. Such a program would minimize the cost of disruptions associated with droughts while keeping resources (water, land, and labor) in production in non-drought years. Encouraging development of more on-farm water storage facilities (such as reservoirs and storm water ponds) can help alleviate local shortages.

wider range of issues. These issues include: diminishing open space; nutrient management; pesticide use and runoff; greenhouse gas emissions and carbon sequestration; water conservation and flood mitigation; air quality; energy production and conservation; non-nutrient animal waste concerns, such as water-borne pathogens and antibiotic-resistant bacteria; and lack of access to natural forestland (see boxes). Progress has already been made in each of these areas, but more can be done.

Two particularly timely issues—energy efficiency in agriculture and

conflicts over irrigation water supplies—can be addressed to some extent by conservation efforts. Given appropriate economic incentives, much of the vast landscape managed by farmers and forest landowners could be managed to store additional carbon or to produce biomass and biofuels to replace fossil fuels, and onfarm energy use can be reduced. Similarly, improved management of irrigation water and innovative approaches to addressing shortages can help mitigate, and possibly avoid, conflicts over increasingly scarce water resources.

Emerging Challenge **Energy: Agriculture as User and Supplier**

The recent increases in energy prices faced by producers throughout the country emphasize the need to find new ways to improve the energy efficiency of U.S. agriculture. While agricultural production accounts for about 1 percent of the Nation's annual Gross Domestic Product, it accounts for some 2 percent of total energy consumed in the United States, in both direct form, such as diesel fuel, and indirect forms, such as fertilizers.

Adoption of energy-saving equipment, the shift to diesel power, and conservation practices such as conservation tillage have resulted in significant improvements in the energy efficiency of agriculture during the past several decades.

In the future, the challenge will be to improve energy efficiency in

ways that maintain the productive capacity of farms while benefiting the environment. One avenue is the adoption of advanced farming practices, such as precision farming, which can optimize the use of equipment, chemicals, and fertilizers, lowering production costs and reducing chemical and fertilizer runoff. Development of more efficient machinery and new seed varieties can improve energy efficiency.

Air quality concerns, increased oil imports, imbalances in U.S. energy supply and demand, and new opportunities for farmers have combined to intensify interest in the production of renewable energy. Crops, crop residues, and forest residues could be converted to various forms of energy. Farms could be sites for wind and geo-

thermal power production where conditions are favorable. Products from livestock and poultry operations, including animal fats, manure, and methane, could be harnessed to produce various forms of energy.

While bioenergy and bioproducts can improve air quality and reduce greenhouse gas emissions compared with the use of fossil fuels, the challenge is to overcome the barriers to economic feasibility and ensure that the production of energy raw materials is environmentally beneficial at the farm level.

Emerging Challenge **Climate Change and Agriculture: Risks and Opportunities**

While significant uncertainties remain over the timing and extent of future changes in climate, there is good evidence that warming is occurring and that it is due in large part to human activity. Over the next 100 years, the implications of these changes for U.S. agriculture are potentially significant. Agricultural systems are vulnerable to changes in growing season, precipitation, and water availability. Some of these effects are likely to benefit agricultural productivity. Higher concentrations of carbon dioxide in the atmosphere will likely result in higher photosynthesis rates and potentially increase yields. While overall changes in climate are not expected to imperil the ability of the United States to feed its population and to export foodstuffs, impacts within U.S. regions are expected to vary widely.

Agricultural activities contribute about 9 percent of overall U.S. greenhouse gas emissions. Emissions are caused by activities

such as the use of nitrogen fertilizers, animal waste management, and onfarm fuel use. Tillage practices can turn agricultural soils into a source or a sink of carbon. During the first half of the last century, carbon in Corn Belt soils declined by almost 50 percent, but subsequent adoption of reduced tillage and reversion of marginal lands from agriculture to native vegetation began to improve soil carbon levels. Today, agricultural soils are offsetting almost 2 percent of U.S. greenhouse gas emissions.

The challenge is to identify and implement low-cost opportunities to reduce emissions from agricultural sources and increase carbon storage in soils. Many of these actions provide broader conservation and environmental benefits. Increasing the organic content of soils can improve the soils' water-holding capacity, reduce erosion, and improve fertility. Improving animal waste handling techniques can reduce water and air pollution as well as lowering emissions of

methane, a potent greenhouse gas. Opportunities exist to improve the management of the Nation's forests for carbon sequestration and bioenergy. U.S. forests are sequestering a significant quantity of carbon each year, equivalent to roughly 15 percent of overall U.S. emissions.

Realizing these opportunities will take a number of efforts, including an adequate system for measuring the carbon storage and greenhouse gas emissions from agriculture and forests. In addition to building carbon storage and reductions in greenhouse gas emissions into conservation programs, other potentially useful efforts include improving technical assistance given to farmers, disseminating information on the nature of potential changes in climate, identifying potential vulnerabilities and adaptation strategies for agriculture, and devising techniques and practices that can offset greenhouse gas emissions.



Emerging Challenge **Soil: Managing a National Strategic Asset**

High-quality soils can help ensure efficient and sustained agricultural productivity, mitigate adverse effects of drought and flooding, and promote clean water by buffering against pollutants such as excess nutrients and pesticides. High-quality soils resist degradation when beset by natural disasters such as flooding and drought, quickly recovering their beneficial functions. They respond efficiently and quickly to agronomic and energy inputs, achieve maximum yields with improved crop varieties, and

require less energy to work and manage. More than 129 million acres of U.S. cropland, about 34 percent of total U.S. cropland as of 1997, are in need of improved soil quality.

While excess erosion has been reduced, in part through conservation assistance, persistent and new soil resource concerns require new conservation efforts. The biological, chemical, and physical processes that occur in soils are important drivers of agriculture's productivity. These processes cannot be simply bypassed with other inputs.

Soil degradation is not just the loss of soil through soil erosion. Processes can be interrupted even while the soil stays in place, as through compaction, crusting, salinization, or loss of organic matter.

The challenge is to develop strategies to maintain the Nation's soils as a means to achieve multiple benefits, including reduced runoff and erosion, increased carbon sequestration, and improved productivity and sustainability.

Emerging Challenge **Wildlife: Broadening the Support System**

A healthy rural landscape provides critical habitat, food, and safety to a diversity of wildlife. About 80 percent of the wildlife species in the West use agricultural land. Improvements to the landscape—including wetlands, grasslands, flood plains, and certain types of forests—can provide ecosystems to help support wildlife and aquatic species and provide benefits in the form of recreation, hunting, and other forms of agrotourism. Habitat

restoration can also help threatened and endangered species recover. Pursuing environmental quality across a diverse landscape mosaic will better safeguard wildlife populations and healthy ecosystems than limiting conservation to small, specialized, and isolated tracts.

Wildlife habitat restoration has helped significantly in the past several years, and has yielded substantial benefits. Because wildlife species move freely across both

public and private lands, new approaches should cover both public and private lands, farm and nonfarm lands, and will require cooperation among agencies, multiple levels of government, and the public.

Emerging Challenge Managing the Urban/Rural Interface

Large and growing areas of U.S. agriculture and forestry are influenced by proximity to urban areas and spreading concentrations of population brought about by urban development and large-lot housing. Development at the urban fringe, in small towns and scattered across the rural countryside, removes land from agriculture and forest production and changes the nature of open space. This development can increase costs for infrastructure like roads and sewers; increase traffic congestion and energy used for transportation; impose higher costs

on local communities for services; heighten controversy about farming and forestry activities; increase risk of wildfire in the wildland-urban interface; cause forest fragmentation; and erode the sense of community in formerly rural areas.

Farms in metro areas are an increasingly important segment of agriculture, comprising one-third of all farms, nearly one-fifth of farmland, and one-third of the value of U.S. agricultural output. However, as farmers adapt to rising land values and increasing contact with new residents, new challenges

arise. Strategies to help metro-area farmers adapt may include emphasizing new and higher value products, conserving resources, and using marketing techniques for a more urban environment. Wildfire protection and preventative action are most needed in the urban wildland interface—often located in municipal watersheds—to protect homes, lives, and property. A challenge is to coordinate effectively with State and local governments and communities.

A Portfolio of Policy Tools

The greatest challenge in designing the next generation of conservation programs is to simultaneously address multiple environmental problems, support rural communities, make efficient use of Federal funds, and comply with international trade agreements. The challenge is made more difficult by the diversity in agricultural resources, crops, and farm and forest types.

Conservation policy needs to balance competing concerns. Voluntary measures must be weighed against compulsory actions for improving the environmental performance of agriculture. The benefits and costs of removing land from crop production must be balanced with improved conservation and environmental performance on land that remains in production. A carefully designed “portfolio” approach—employing coordinated land retirement, stewardship incentives, conservation compliance, and regulatory assistance, each where most

appropriate—can enhance agri-environmental protection most efficiently. A third dimension will be striking the appropriate balance among the roles of Federal, State, and local governments in implementing conservation programs.

Incentives for Stewardship on Working Farmlands

The sheer vastness of land remaining in production suggests that substantial improvements in water and air quality and wildlife habitat may be possible only with conserving activities on working lands. Conservation incentive programs for working lands, in combination with technical assistance, are also a means of reducing the regulatory burden on farmers faced with air and water quality restrictions.

Two approaches, one existing and one suggested, form the centerpiece of public dialogue on conservation incentive options for working farmland. Both approaches provide incentives to encourage private land and wildlife conservation. The existing program is the Environmental Quality Incentives Program (EQIP),

created in 1996 to combine and refocus a number of longstanding conservation cost-share/incentive payment programs.

By most measures, EQIP is a successful program. It is targeted; statutory language requires that the program be implemented in a manner that maximizes the environmental benefits per dollar expended. To achieve that goal, the environmental concerns addressed by the program vary across the country, reflecting the high degree of regional diversity in priorities, resource conditions, and opportunities for conservation. Practices associated with management of livestock waste obtain the lion's share of funds in the Northern, Eastern, and Southern States, where these issues are an overriding concern. In the western half of the United States, where water is scarce, the majority of funds are allocated to improving water management practices. In the Midwest, a large share of the funds are used to prevent soil erosion.

EQIP is also in high demand by farmers. Currently, EQIP has the largest unmet demand of all conservation programs, with a backlog of about 197,000 applications to improve the environmental performance on 67 million acres of agricultural land. In comparison, current enrollment levels include 80,000 contracts covering 34 million acres. Expanded funding could help alleviate this backlog.

The new approach is a broader, market-based incentive program for providing payments to farmers who use or adopt practices that enhance the environment. It may be the best option for compensating farmers for the environmental amenities they provide, as well as recognizing the past efforts of "good actors" who already practice enhanced stewardship. Each approach has unique features and several in common, and use of both would require careful coordination.

In addition, a number of smaller initiatives or programs can be used to promote specific activities or to capitalize on unique opportunities to address more specialized problems. However, coordination among program efforts and levels of government is essential to ensure that they are accessible to farmers and not duplicative with other agencies. Protection of farmland and preservation of open space, for example, are currently being coordinated among USDA and State and local governments through the Farmland Protection Program.



Incentives for Land Retirement

Land retirement is generally a long-term (10 years or more) dedication of land to a specific environmental or resource-conserving use. As such, it is well suited for providing environmental benefits that increase with the length of time land is removed from crop production. For example, many wetland services (wildlife habitat, filtering runoff, and floodwater retention) and other wildlife habitat arise only when the ecosystem is fully established, a process that may take years. By removing land from crop production, these programs also affect com-

modity supply, whether intentionally or not. Land retirement can be achieved using long-term contracts or permanent or term-specific easements.

The Conservation Reserve Program (CRP) is the primary example of a land retirement program. In effect since 1985, it provides annual rental payments and cost-sharing for establishing a permanent cover on environmentally sensitive land. Acres are selected through a competitive process. Use of an Environmental Benefits Index to select land parcels, beginning in 1991, substantially increased environmental benefits relative to costs. Currently, 34 million acres are enrolled, just under the statutory limit of 36 million acres.

Alternative enrollment programs, which emphasize local environmental problems and partial-field enrollment, have the greatest untapped potential for yielding benefits from land retirement. For example, buffer practices (riparian buffer and filter strips) and other partial-field enrollments can be targeted. Buffers are extremely effective in addressing water quality problems from sediment, nutrients, and pesticides, with 50- to 90-percent removal efficiencies. By focusing funds on only that portion of fields that can best provide environmental benefits, results per program dollar increase, with minimal land retirement.

Programs such as the Conservation Reserve Enhancement Program, that partner Federal, State, tribal, and private organizations to combat priority problems in water quality, soil erosion, and wildlife habitat, help leverage Federal funds and further target local environmental priorities. These partnerships provide additional resources, greater community buy-in, and improved program implementation.

An alternative to long-term contracts for land retirement is purchasing permanent (or very long term) easements, as is done in the

Wetlands Reserve Program. Similar to the CRP, WRP focuses exclusively on restoring wetlands that had been converted to cropland. With slightly more than 1 million acres enrolled in WRP, the program is a strong tool for mitigating the loss of wetlands.

Resources not previously eligible for land retirement programs, such as grasslands, could also be targeted. The Nation's grassland and pastureland declined by 23 million acres from 1982 to 1997. Some of these areas offer significant environmental benefits to the public. If land retirement is carefully used, areas of native prairie and improved biodiversity could be established. A new grazing land reserve program could provide a needed economic incentive for many producers to conserve the agricultural productive capacities of grasslands while providing environmental benefits for the public. Local nonprofit organizations and grassbanks are also improving land stewardship on public grazing lands.

Education and Technical Assistance

Farmers and forest landowners need information to facilitate the adoption or use of more environmentally sound practices. Educational and technical assistance entail providing data on soil quality, water quality, and wildlife habitat, as well as disseminating information on ways to use that data and how to





apply sustainable production techniques and new technologies.

Demand for education and technical assistance could increase substantially as land managers grapple with regulatory or program participation requirements, such as the development of conservation or nutrient management plans. Targeted Federal programs may play a critical role in helping to mitigate the costs of such requirements. Both for-profit and not-for-profit groups, including agricultural extension programs, may satisfy a portion of that demand. Training and certification programs for extension agents and technical consultants could help build that capability and provide quality assurance. The role of State and local government partners must also be encouraged.

Incentives for Stewardship on Non-Federal Forests

The Nation's capacity to produce healthy, sustainable forest resources, while maintaining favorable watershed and habitat conditions, increasingly depends on nonindustrial private forests. Owners of these lands control nearly 60 percent of the Nation's forests and supply nearly half of its forest products, but fall far

short of their potential for producing wood, other forest products, or environmental benefits.

A forest stewardship incentives program could provide non-Federal forest land managers with technical assistance and financial help to improve forest conditions and help ensure that environmentally important forest tracts are conserved. Education and technical assistance will be an important component of such a program. On small owner-ships, a timber sale is an unusual event in the owner's life, and often is a response to a personal situation, such as retirement. The vast majority of timber sales occur without the benefit of professional advice and with no plan for maintaining or regenerating a sustainable forest on the site following the harvest. Landowners who receive technical assistance are more likely to manage their forests for timber, wildlife, and water quality.

Also key to forest stewardship are State/Federal partnerships providing economic incentives for increased provision of environmental amenities, reduced fire hazards and protection of rural communities from wildfires, and improved defense against invasive species.

As with farmlands and grasslands, in some cases, purchasing conservation easements may be the most efficient and effective means for helping to address social goals for maintaining forest landscapes, reducing fragmentation, and slowing urban sprawl.

Farmer and Forester Responsibility and Regulatory Requirements

While incentive-based policies can play an important role in encouraging improved environmental performance on farms and forests, land managers also have a responsibility to limit environmental damages from their activities.

Conservation compliance.

Compliance provisions, first introduced in the 1985 Food Security Act, require certain resource conservation activities for farmers to remain eligible for benefits from selected Federal agricultural programs. Specifically, farmers can lose program benefits if they produce crops on highly erodible land without applying an approved conservation system or if they convert wetlands for agricultural production.

Compliance provisions redressed a longstanding inconsistency between price and income support programs, which encouraged farmers to expand production (sometimes on environmentally sensitive land), and conservation programs that sought to mitigate the adverse effects of agricultural production. The need for compliance requirements has not been lessened by the changing nature of farm price and income supports. Some environmentally sensitive land is still vulnerable to conversion for crop production because commodity and crop insurance programs can reduce the risk of converting this land for crops. Applying conservation compliance requirements to crop insurance programs would help ensure that those programs do not encourage farmers to bring marginal land into production.

Animal feeding operations. The concentration of livestock production into fewer, larger confined animal feeding operations (CAFOs) has raised public concern over the impact of this trend on air and water quality. Manure nutrients can run off to surface water and/or leach into ground water due to accumulation in open and unpaved feedlots, storage in holding ponds and lagoons, uncovered stockpiles, or when excess manure and wastewater are applied to land.

Forthcoming Federal and State regulations on animal waste will increase the demand for educational, technical, and financial assistance for waste management practices, and for development of alternative uses of waste, new storage and management technologies, and improved feed management strategies. Demand for technical assistance to produce farm-level nutrient management plans will also increase. Longer term research needs include technological advances in the treatment and storage of, and alternative uses for, manure.



Total maximum daily loads. A TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and allocates pollutant loading among point and non-point sources. Across the country, States have committed to developing TMDLs for nearly 22,000 impaired water bodies by 2015, under authority provided by the Clean Water Act. Three leading pollutants identified by States in their 1998 water quality assessments were sediments, nutrients, and harmful micro-organisms. Depending on the levels of pollutants found in impaired waters and the designated uses of the waters, some TMDLs will indicate that certain pollutants should be significantly reduced. Such reductions could dramatically affect U.S. agriculture and the forest products industry.

Endangered species. Farmers and forest landowners whose lands include habitat for species listed as threatened or endangered under the Federal Endangered Species Act may find their activities restricted. Attempts to protect the northern spotted owl on public and private forests throughout the Pacific Northwest led to reduced timber harvests, perhaps the most well-known example of the impact of such restrictions. Similarly, efforts to protect threatened and endangered fish species have led to reduced access to irrigation water for farmers in many Western States. Forest and farmland stewardship programs and safe harbor provisions can help land managers implement the types of conservation practices necessary to avoid the need for such drastic tradeoffs in the future.

Next Generation in Conservation Incentives

As we look to the next generation of conservation programs, the current portfolio of land retirement and stewardship incentives could be retained. Or the array of current cost-share and rental payment programs could be augmented by, or even replaced with, a single, comprehensive system of financial incentives, supported by appropriate research and technical and educational assistance. This new approach could be developed using the market-based tools that already have been proven to work (see box, page 86). It could be structured to encourage the production of environmental goods and services in a more cost-effective way. Actions that improve environmental performance on working land could even be considered side-by-side with land retirement, eliminating the bias in current conservation programs toward idling productive farmland.



...Encourage the production of environmental goods and services in the most cost-effective way.

Designing a Market-Based Stewardship Program

Environmental performance—the level of environmental gain per dollar of cost—is determined largely by program design. Two mechanisms have already been proven to work—environmental targeting and competitive bids. Targeting environmental objectives through the use of a comprehensive benefits index, and minimizing costs through the use of competitive bids, can increase overall efficiency and provide greater environmental benefits.

Benefits index: A comprehensive conservation benefits index could be used to assess the relative value of all proposed conservation and environmental projects. The index would provide ratings for improvements in a set of environmental, conservation, and rural community elements, with scores based on the expected benefits during the time of enrollment. The scores would then be compared with the proposed bids to determine acceptability. By allowing all activities, including those proposed for producing lands, to compete for conservation resources, the current bias toward setting lands aside from production could be eliminated. The index could capture such benefits as wildlife, water quality, soil erosion, soil quality, control of invasive species, local and regional air quality, greenhouse gas reductions and carbon sequestration, innovative biomass energy and biobased feedstocks, rural/community enhancements, and State and regional priorities.

Bid system: As part of each proposal, an owner/operator would propose a payment per acre for implementing a set of practices or management systems. Competitive bids would improve the effectiveness of efforts, given limited Federal resources. The bid would reflect the owner/operator's costs and forgone opportunities. For example, converting land from conventional tillage to

conservation tillage would have lower opportunity costs than retiring the land, so it should generate a lower bid. At the same time, conservation tillage would likely receive a lower benefits score than land retirement.

Contracts would be awarded to owner/operators with the greatest benefit index score relative to the bid. All land in farm production or enrolled in a land retirement program could be eligible, including land devoted to animal agriculture and to forests. Myriad conservation and environmental practices and activities could also be eligible, provided they can be objectively scored. This bid system adopts and enhances the bid process already proven to increase benefits to the CRP. However, it differs from CRP in that it would accept practices on lands that remain in production. A separate program could be developed for range, pasture lands, and forest lands.

In selecting contracts for enrollment, the duration of the contract would be taken into account. Producers could propose single-year or multiyear activities, with priority given to offers with multiyear benefits. This flexibility would allow land owners to specify the contract length that works best for them. Once enrolled, compliance could be enforced as under existing conservation programs.

Two key features suggest this program would be categorized as a “green box” conservation program for purposes of meeting WTO obligations. First, the payments to producers would be determined on a bid basis. Competition in bids is likely to result in payment rates reflecting costs of implementing the practices, a WTO requirement for “green box” programs. Second, the index would favor neither commodity production nor land retirement,

so the program should not be viewed as production distorting.

This program could supplement existing programs. Moving to a single, new comprehensive program would require a multiyear phase-in schedule to accommodate existing contracts and the time required to develop the new benefits index. But careful coordination would be necessary to minimize landowner confusion and administrative burdens, and to ensure that the programs complement each other. Because of the complexity in designing a new conservation benefits index and consolidating farm programs, it would be appropriate to initiate such an approach with a pilot program.

In some instances, private markets for environmental goods and services do not develop due to a lack of uniform standards or other mechanisms that bring buyers and sellers together and/or assure buyers of product quality. The comprehensive system of incentives could facilitate and accommodate emerging private markets for farm- and forest-based environmental goods and services. Since the benefits index could be disaggregated, the proportion of the overall incentive attributable to a particular element could be separated. Separating out these benefits and providing uniform standards and assurances in quality could remove barriers to private financing for certain environmental goods.

One option would allow private companies to enter into separate contracts with landowners to support the production of certain environmental benefits—based on the benefits index. Or, a fund could be established to support one component of the overall program. The fund could accept private sector resources in return for attribution of certain environmental services, such as water quality improvements and carbon sequestration.

Principles for Conservation

- **Sustain past environmental gains.** Improvements in losses from soil erosion and wetlands benefit farmers and all Americans. These and other gains resulting from existing conservation programs should be maintained.
- **Accommodate new and emerging environmental concerns.** The need for sources of renewable energy and the potential for reducing greenhouse gas emission are emerging environmental issues. In addition, reducing nutrient runoff from livestock production, addressing conflicts over scarce water supplies, and protecting open space have gained momentum as issues to be addressed. Conservation policy should adapt to emerging environmental and community needs and incorporate the latest science.
- **Design and adopt a portfolio approach to conservation policies.** Targeted technical assistance, incentives for improved practices on working farm and forest lands, compensation for environmental achievements, and limited dedication of farmland and private forest lands to environmental use will provide a coordinated and flexible portfolio approach to agri-environmental goals.
- **Reaffirm market-oriented policies.** Competition in the supply of environmental goods and services and targeted incentives ensure the maximum environmental benefits for each public dollar spent. In addition, permitting the private sector to invest in the provision of environmental goods and services leverages Federal resources and facilitates a transition to a fully functioning private market.
- **Ensure compatibility of conservation and trade policies.** Producer compensation for conservation practices and environmental achievements should be consistent with “green box” criteria under WTO obligations.
- **Coordinate conservation and farm policies.** Conflicts may exist between farm program incentives to increase production and conservation programs seeking to reduce environmental problems from expanded production. Extending conservation compliance will help coordinate environmental objectives and Federal programs.
- **Recognize the importance of collaboration.** Non-Federal governmental agencies, including State, local, and Tribal governments, as well as private for-profit and not-for-profit organizations, are playing an ever-increasing role in the delivery of technical assistance and in incentive programs for conservation. Encouraging these efforts and developing public-private partnerships and joint programs leverage Federal resources and improves program access and implementation.