HOW MUCH IS ENOUGH?

A Regional Wildlife Habitat Needs Assessment for the 1995 Farm Bill

A WILDLIFE MANAGEMENT INSTITUTE REPORT

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Prepared by the Wildlife Management Institute in cooperation with the Soil and Water Conservation Society.

compiled and edited by
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INTRODUCTION

A viable agricultural economy is essential to the U.S. and must be maintained. However, it need not be maintained at the expense of valuable natural resources such as soil, water and wildlife.

U.S. agriculture policy influences the use of more land than any other federal action. Agricultural practices on more than 400 million acres of cropland are affected directly by federal farm legislation. For six decades, U.S. taxpayers have invested heavily in programs that support agriculture. Many of these programs caused substantial adverse impacts on wildlife, its habitats and other natural resources. Assuming that the federal government will continue supporting agriculture in some form, it is reasonable to expect consideration for wildlife in return for the investments made by American taxpayers.

Habitat loss to agriculture is the primary factor depressing wildlife populations in North America. While a few adaptable species such as white-tailed deer, raccoons, coyotes and Canada geese generally are thriving in human-altered environments, many less-adaptable species currently are experiencing historic low populations.

Fortunately, habitat degradation and wildlife population declines are reversible. Just as agriculture—and the federal policies that have shaped it for decades—has been the major factor reducing wildlife on a continental scale, it can be a major factor restoring wildlife populations to reasonable levels.

For several decades, soil conservation essentially was USDA's only major conservation goal. In the 1990 Food, Agriculture, Conservation and Trade Act, Congress elevated water-quality improvement to a well-deserved coequal position as USDA's second conservation goal, in recognition of agriculture's impacts on this valuable public resource.

In the 1995 Farm Bill, wildlife ought to be explicitly adopted as USDA's third conservation goal, coequal with soil and water. Wildlife, like water, is a *public resource* that has been seriously degraded by agricultural activities.

The challenge of wildlife conservation in agricultural landscapes is that many practices sufficient to conserve soil or improve water quality are inadequate for creating, restoring or maintaining habitat. Wildlife requires a higher level of conservation achievement on the ground.

How *much* higher? How much is enough?

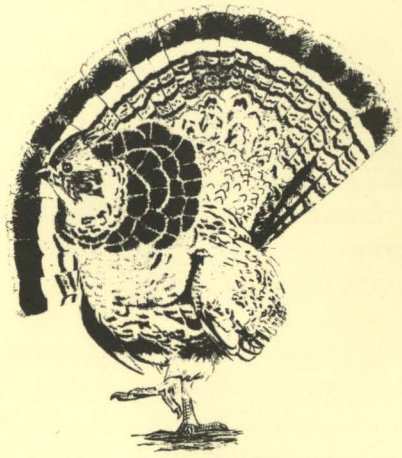
This report is a first effort by professional wildlife managers to describe and quantify habitats needed to sustain wildlife populations on agricultural lands. It is not intended to be the last word on agricultural habitats. Rather, it is a necessary step toward setting and recognizing socially acceptable wildlife goals, and defining the changes in the landscape conditions needed to meet those goals. There is no desire to roll back the clock to presettlement conditions or recreate the "buffalo commons." The goals are stabilizations or modest enhancements that are realistically attainable without disrupting the agricultural economy.

This information is presented for the benefit of agriculture policy decision makers in the interest of an informed debate as the 1995 Farm Bill is drafted and implemented. Its usefulness, however, should extend beyond Farm Bill debates to subsequent rulemaking and implementation of new and revised programs down to the county level.

CONTENTS

Glossary of Acronyms

ACP	Agricultural Conservation Program
ACR	Acreage Conservation Reserve
BMP	Best Management Practices
CFSA	Consolidated Farm Service Agency
CRP	Conservation Reserve Program
EEP	Environmental Easement Program
FIP	Forest Incentives Program
FmHA	Farmers Home Administration
NAWMP	North American Waterfowl Management Plan
NRCS	Natural Resources Conservation Service
PL-566	Watershed Protection and Flood Prevention Program
PNIF	Private, Non-industrial Forests
SIP	Stewardship Incentive Program
USDA	U.S. Department of Agriculture
WQIP	Water Quality Incentives Program
WRP	Wetlands Reserve Program



EXECUTIVE SUMMARY

Federal farm policies designed to help farmers and meet the U.S. need for crop production have stimulated dramatic alterations to the rural landscape. These changes have substantially affected populations of the public's wildlife resources. While farm policies have been a nationwide problem for many wildlife species, the specific impacts of agricultural programs have varied regionally. Likewise, the solutions to the problems of continually declining populations of wildlife that depend on farm landscapes vary regionally.

This regional effort by professional wildlife managers is a synthesis of available science and best professional judgement. The report identifies realistic goals for stabilizing and restoring wildlife populations and estimates the landscape changes that are necessary to meet those goals. The habitat enhancements and restorations projected to be necessary are relative to a baseline approximating current conditions. Thus, further degradation of remaining habitats will add to the restoration levels necessary to meet the goals. The exception is grasslands restored by and currently enrolled in CRP. All grassland restoration objectives include grassland acres currently enrolled in CRP.

Species in some regions can benefit from appropriate best management practices. Other species require careful retirement of surplus cropland. A wide variety of programmatic means could achieve the ends identified in this report. Many existing USDA programs could be modified to provide meaningful wildlife benefits at no additional expense and without disrupting the integrity of the programs.

NATIONWIDE AGRICULTURAL WILDLIFE HABITAT NEEDS, BEYOND BASELINE CONDITIONS

A gross overview of the magnitude of landscape change required nationwide can be obtained by compiling some of the various habitats identified in each region.

- Relatively undisturbed grassland restored from cropland: 54.9 million acres
- Restored wetlands: 5.9 million acres
- Enhanced wetlands: 1.05 million acres
- Restored riparian areas and filter strips: about 900,000 miles
- Improved vegetation on pasture and rangeland: 101 million acres

REGIONAL AGRICULTURAL WILDLIFE HABITAT NEEDS, BEYOND BASELINE CONDITIONS

Northeast

- 90,000 acres of idle grasslands
- 2 million acres of wetlands
- 8,000 miles of riparian habitat
- 10,000 miles (30,300 acres) of buffer zones along waterways
- Contiguous 6,500-acre blocks of forest in mid-Atlantic states

Southeast

- 10 million acres of pasture converted to warm-season grasses
- 9.8 million acres of idle grass/forb cover
- 1.03 million acres of wetlands
- 900,000 acres of farmed wetlands
- 750,000 miles (3 million acres) of filter strips
- 250 miles of protected riparian corridors

Midwest

- 13.5 million acres of idle grassland
- 1.6 million acres of wetlands

- 8,000 miles (at least 128,000 acres) of buffers and riparian habitat
- 500,000 additional acres of bottomland hardwoods

Northern Great Plains

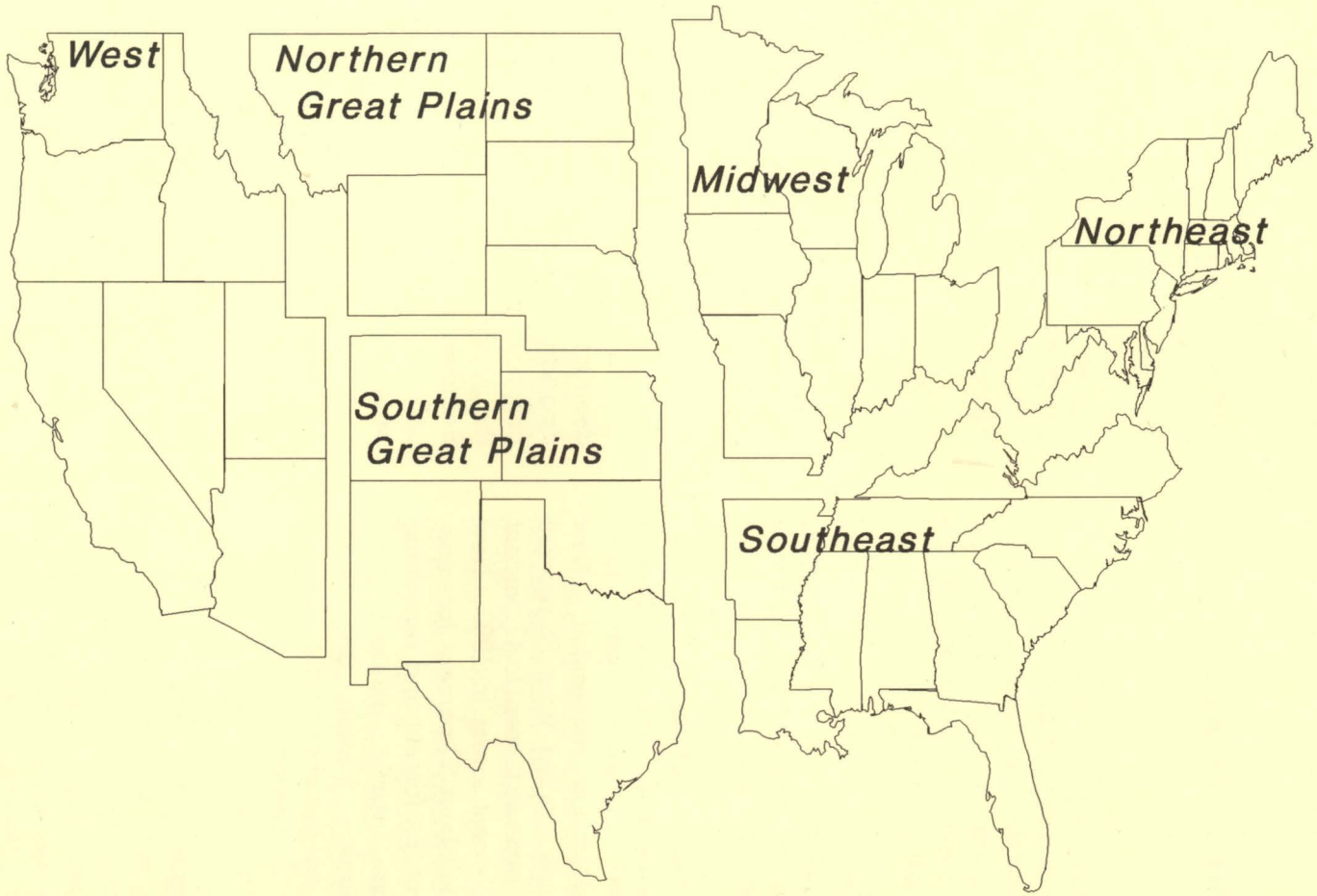
- 15 million acres of undisturbed grassland
- 600,000 acres of wetlands

Southern Great Plains

- 12 million acres of undisturbed grassland
- 90 million acres of enhanced rangeland vegetation
- 250,000 acres of wetlands

West

- 1.5 million acres of enhanced rangeland vegetation
- 3.6 million acres of undisturbed grassland in large blocks
- 900,000 acres of undisturbed grass in small strips and patches
- 462,000 acres of wetlands restored
- 150,000 acres of wetlands enhanced
- 7,500 screened irrigation intakes
- 600 fewer or modified fish passage barriers
- 1,870,000 acres of riparian habitat
- 54,600 miles of filter strips



Regions Used in Wildlife Needs Assessment

NORTHEAST REGION

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Peter Jaynes, *Maryland Department of Natural Resources*
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STATEMENT OF PROBLEM

Landscape Changes

Originally, approximately 80 percent of the northeastern U.S. was cloaked in forest: hardwood, softwood and mixed stands. Grasslands, forested savannahs, glades, bogs, marshes and other primarily herbaceous stands accounted for the remaining 20 percent of the habitat.

In the early 1600s, European settlers began clearing land for agriculture. Since then, changing land-use trends have caused different regional characteristics in these agricultural lands.

In New England, conversion of forested habitats to agriculture peaked in the late 1880s, but forested habitats since have increased with farm abandonment and vegetation succession. New Hampshire, for example, cycled from 95-percent forest at the time of European settlement to 47-percent forest in 1880, to 87-percent forest in 1990. New England once again is about 80-percent forested. However, the *quality* of the forests and remaining unforested acres are vastly different from presettlement conditions. Forests are nearly uniformly mature (but not yet old growth) and lack age-class diversity. Unforested areas now are intensively pastured or are developed.

In the middle Atlantic states (Maryland, New Jersey and Delaware), consolidation of farms and intensity of farming have continued to increase. For three centuries, the typical farm was a small, diverse operation with small fields and equipment and low management intensity. However, the economy of farming changed and small operations became less viable, especially during the past 30 years.

Consequently, there has been a massive shift from many small farms to fewer large operations. Efficient farming also involved coalescing many small fields into fewer large ones. This entailed the removal of hedgerows and treelines, causing a tremendous loss of "edge" habitat for some species. Rotational fallowing of fields has become obsolete, resulting in loss of idle acres dominated by herbaceous vegetation. Double cropping increased in popularity as soybeans were planted immediately after small grains were harvested. Combined forces of agriculture intensification and urban development have caused extensive fragmentation of remaining forests.

Pasture management also changed dramatically. Throughout the Northeast, introduced cool-season grasses of little value to wildlife now dominate pasture and forage land. Intensive management of hay, especially alfalfa, requires earlier and more frequent mowing. Most haylands are cut while ground-nesting birds are incubating their eggs, resulting in very low nesting success for most grassland species.

One of the most dramatic examples of habitat destruction in the Northeast is the elimination of riparian habitat in dairy pasture. Current dairy practices contribute to the severe degradation of thousands of miles of streams in the Northeast. Sedimentation as well as nitrogen and phosphorus pollution are major degraders of Northeast waterways.

Millions of acres of drained wetlands now constitute poor-quality agricultural land. New York, Pennsylvania and Maryland have lost more than 50 percent of their original wetland acreage.

Today, much of the northeastern landscape is dominated by habitats altered to meet agricultural needs—row and truck crops, dairy and meat production, timber and fiber. Agriculture is the number one industry in states often thought of as industrial giants, such as New York and Pennsylvania, which rank third and fourth in the nation, respectively, in dairy production.

The land-use trend common to both regions of the Northeast (New England and the middle Atlantic states) is the loss of forested and agricultural acres to commercial and residential development.

Wildlife Impacts

The impacts of land-use practices on wildlife habitat and species in the Northeast have been immense. Ongoing changes in land use continue to affect wildlife habitat and populations.

Many wildlife species in the Northeast depend on upland habitats once associated with agricultural land. In New England, early successional habitats and associated wildlife were prevalent from 1900 to 1950. Forest maturation on abandoned farmland combined with intensive pasture management have been detrimental to grassland- and early successional forest-dependent species. Some birds requiring open and/or brushy land are declining. Native grassland birds such as Henslow's sparrows and eastern meadowlarks have suffered steeper, more consistent and more widespread declines in the past 25 years than any other U.S. bird group. As a result, raptors that prey on them in open or brushy cover also are declining. Forest generalists (e.g., red-eyed vireos and white-tailed deer) are taking their place.

In the middle Atlantic states, species that benefitted the most from early agricultural expansion were those that utilize grassland and early successional stage forest habitats. In fact, several small game species, such as northern bobwhites, eastern cottontails and ring-necked pheasants, were termed "farm game" due to their close association with agriculture.

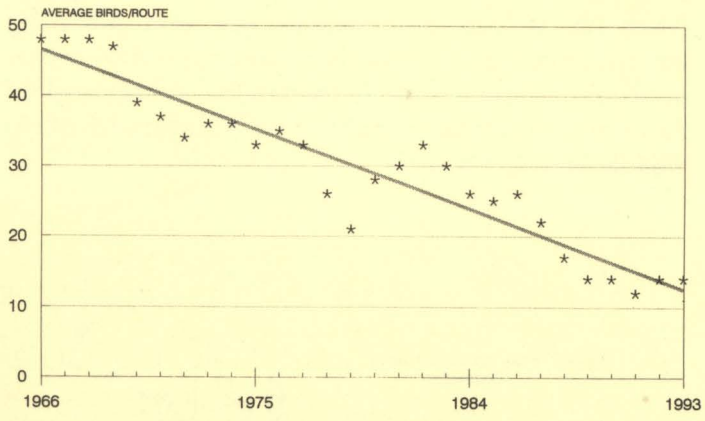


Figure 1. Population trend line for bobwhite quail in Maryland, 1966-1993 (data from the Breeding Bird Survey).

The recent intensification of farming is threatening to end this long-time association between agriculture and farm game and other upland wildlife. Two of North America's most important gamebirds—pheasants and bobwhites—have suffered dramatic declines. Despite the bobwhite's wide distribution, its populations have undergone significant declines in 75 percent of its range. In Maryland, bobwhites have declined 72 percent (Figure 1), while pheasants have crashed more than 95 percent over the past 20 years. New Jersey has witnessed similar declines in pheasant, bobwhites and cottontails. As these species decline, hunting seasons are cut back, recreational opportunities diminish and rural economies lose revenues.

In the Northeast, there is a loss of wildlife species richness in forests that are not managed for a diversity of both tree species composition and successional stages. Early successional stage (shrub/scrub) forest areas probably are the most limited habitat component in the region. Ruffed grouse and woodcock are declining throughout the region due to the lack of early successional habitat.

At the other end of the scale, old-growth stands of forest also are limiting. Within the Northern Forest region of New Hampshire, some species dependent upon late successional spruce-fir habitat are declining. In New Jersey, barred owls are declining due to lack of old-growth forest habitat.

The complexity of the interrelationships of wildlife habitat and land-use patterns is exemplified by the group of forest interior dwelling birds. Suitable habitat for these species is declining in the mid-Atlantic states as remaining woodlots are fragmented by agricultural, commercial and residential development. Small, patchy woodlots do not provide adequate forest interior habitat for these birds which are outcompeted for breeding territory by forest edge-nesting species.

Wetlands and riparian areas support a higher diversity and abundance of wildlife species than other farmland habitats. As a group, wetland birds have suffered the second greatest decline among North American bird groups in recent years (following grassland birds). Myriad wetland and aquatic wildlife species in the Chesapeake Bay have experienced dramatic, well-documented declines due to wetland drainage and nonpoint source water pollution.

WILDLIFE GOALS

Grassland-nesting Species Goal:

- ✧ Stabilize and restore declining populations of grassland species. Restore northern bob-

whites and ring-necked pheasants to population levels of the mid-1970s in their traditional range.

Wetland-dependent Species Goal:

- ✧ Arrest declines of wetland-dependent birds. Meet population and habitat objectives of the NAWMP.

Riparian and Aquatic Species Goal:

- ✧ Stabilize and ultimately restore populations of threatened and endangered aquatic species. Meet restoration goals for Chesapeake Bay.

Forest Species Goal:

- ✧ Restore and stabilize populations dependent on late successional stage and early successional stage habitats.
- ✧ Restore and stabilize populations of forest interior dwelling birds in mid-Atlantic states.

HABITATS NEEDED TO MEET GOALS

Grassland Objectives:

- ✧ Restore 90,000 acres of high-quality grassland habitat.

Objective Specifics

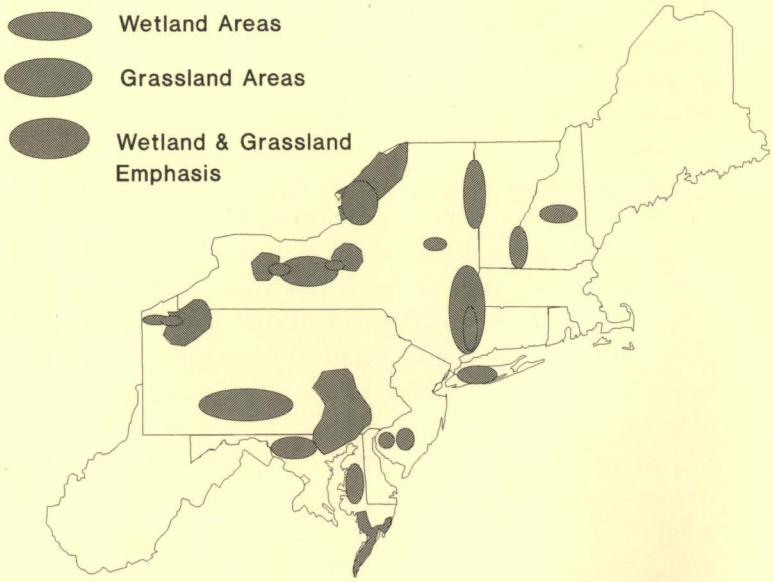
Cropland-retirement programs in New England should be limited to grassland restoration rather than forest restoration. Concentrate on the Champlain Valley in Vermont, the St. Lawrence Valley and Finger Lakes region in New York, the Susquehanna Valley in Pennsylvania and Maryland's Eastern Shore. Blocks of at least 50 acres are needed. Mixed, warm-season grasses and forbs such as goldenrod should dominate the vegetation on these sites. Grassland habitat can be restored on private land from either retired cropland or upgraded cool-season pastures.

Wetland Objectives:

- ✧ Restore 2 million acres of wetlands (10-percent increase).

Objective Specifics

In New York and Pennsylvania, wetland restoration should be emphasized in the Lower Great Lakes—St. Lawrence Basin Joint Venture of the NAWMP. In Maryland, another high priority for wetlands restoration, attention should focus on areas identified by the Atlantic Coast Joint Venture. Additional attention should focus on the non-joint venture sites shown on the map.

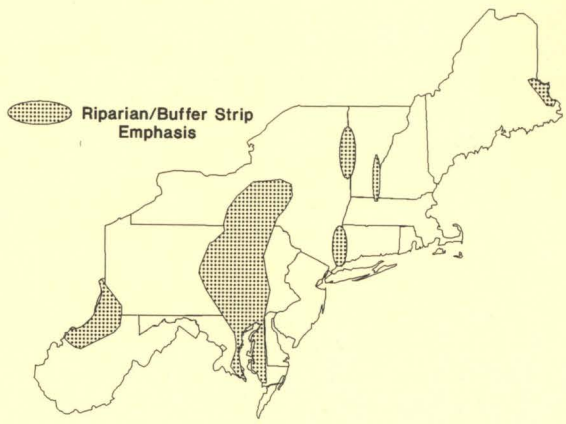


Riparian Habitat Objectives:

- ✧ Restore and protect at least 8,000 miles of riparian habitat.
- ✧ Establish at least 10,000 miles of buffer zones at least 25 feet wide adjacent to wetlands and waterways.

Objective Specifics

Establish riparian protection and buffer zones in every state, emphasizing the Connecticut River, Great Lakes and Susquehanna River watersheds. Protect and restore riparian habitats by: fencing out livestock; stabilizing streambanks; and installing stream crossings, access areas and alternative water sources. Buffer zones should be composed of vegetation suitable as habitat for grassland-nesting wildlife.



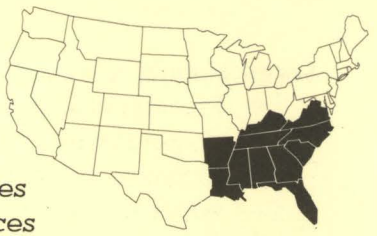
Forest Habitat Objectives:

- ✧ Protect productive forestland from conversion.
- ✧ Foster longer timber harvesting rotations.
- ✧ Improve distribution and occurrence of early successional stage habitats.
- ✧ Establish contiguous 6,500-acre blocks of forest in the mid-Atlantic states.

Objective Specifics

While there currently is enough total forest acreage in New England, more old-growth and early successional stage stands are needed in existing forested areas. Facilitate clearcuts of sufficient size (10-acre minimum) to attract and support species associated with early successional stage habitats.

SOUTHEAST REGION



Stephen Capel, *Virginia Department of Game and Inland Fisheries*
Breck Carmichael, *South Carolina Department of Natural Resources*
Mark Gudlin, *Tennessee Wildlife Resources Agency*
David Long, *Arkansas Game and Fish Commission*

STATEMENT OF PROBLEM

Landscape Changes

In the Southeast, many species of wildlife have declined to historic lows in the last 30 years. Despite conspicuous successes in management for deer, wild turkey and resident Canada geese, wildlife management agencies have been frustrated in their efforts to maintain many wildlife populations, especially species associated with early successional habitats, wetlands, grasslands and large forest tracts. Small game species, particularly bobwhite quail, are approaching unhuntable numbers in many areas.

From 1950 to 1990, average farm size doubled as the number of farms declined by more than 60 percent. This frequently resulted in bulldozing of hedgerows, old farmsteads and other odd areas as farmers employed larger equipment to till larger fields. At the same time, major fluctuations occurred annually in the total cropland acreage idled on southeastern farms. Annual set-aside acres frequently were poor habitat because there was little or no plant cover. Implementation of USDA weed control requirements destroyed what plant cover did exist.

Between 1982 and 1992, combined pasture and range acres in the Southeast declined by 2 percent. Rangeland declined more than 20 percent. During the same time, cattle numbers increased by more than 25 percent and cattle per 100 acres increased by 34 percent. Also, a substantial proportion of range and pasture has been planted to non-native forages (e.g., tall fescue, Bermudagrass) of low or no value to most wildlife species. Southeastern grasslands also have been degraded because of a declining frequency of fire used to maintain their health and integrity. Simultaneous with this intensified grazing activity, the number of woodlots grazed increased by more than 10 percent.

In the Lower Mississippi Valley, more than 80 percent of the original forested and alluvial wetlands has been converted to agriculture. The lower Atlantic Flyway has less than 60 percent of its original wetlands remaining. Although the rate of loss has moderated and agriculture is not the primary cause of loss today, wetland acreage continues to decline. The quality of remaining wetlands also continues to decline due to nutrient overloading, altered hydrology and urban encroachment.

Forested acreage in the Southeast has been stable during the last decade. However, forest acreage composition and quality has changed, thus impacting wildlife populations. Figure 1 depicts the expansion of pine plantations to occupy 15 percent of all woodlands and more than 21 percent of the vast coastal plain.

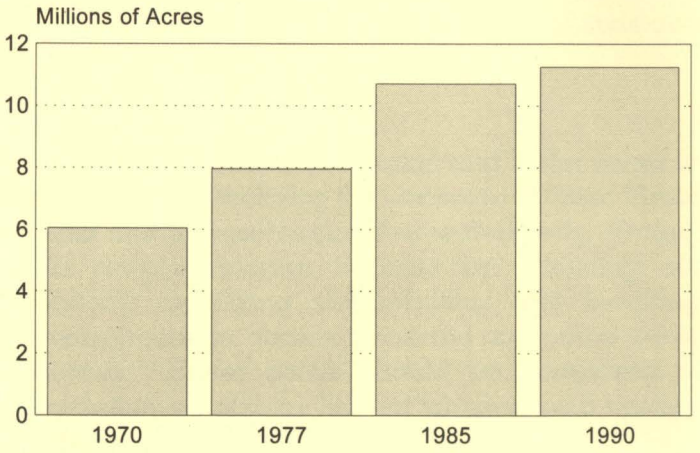


Figure 1. Increasing pine plantation acreage in the Southeast (due to cropland planted to pines and hardwoods replanted to pine after harvest) impacts a variety of wildlife.

Agriculture is the primary source of nonpoint source water pollution and often is the major cause of aquatic resource degradation. In the 11-state Southeast region, at least 71,663 miles of streams are characterized as significantly impaired. Many states have not adequately measured or characterized aquatic habitat degradation, therefore, actual degradation probably is even higher. Prior impacts were due largely to impoundments and channelization to benefit agriculture. Continuing declines primarily are due to siltation from agricultural runoff.

Wildlife Impacts

Throughout the Southeast, loss of native grasslands and widespread establishment of cool-season grasses in pastureland have resulted in steep declines in 10 of 13 grassland birds. Although Figure 2 depicts declines in grasshopper sparrows and bobwhite quail, an entire group of birds that uses or depends on healthy grassland communities in the Southeast is suffering a similar fate. Loggerhead shrikes, lark and savannah sparrows, eastern kingbirds, eastern meadowlarks and dickcissels, in addition to ten federally endangered birds and six candidates for federal listing, are experiencing long-term declines in the Southeast. Furthermore, threatened and endangered species in peninsular Florida have suffered from the decline of wildfire and insufficient use of controlled burning.

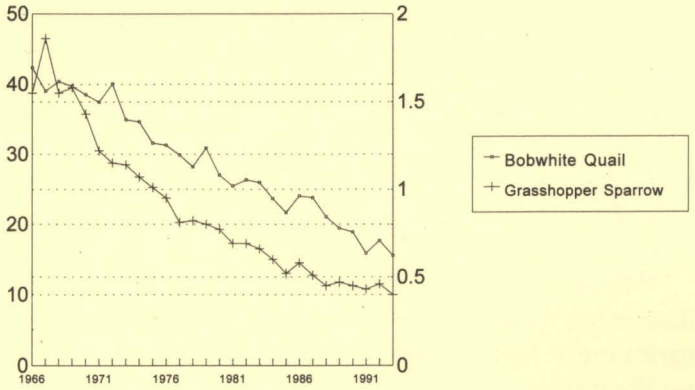


Figure 2. Bobwhite quail and grasshopper sparrow trends in the Southeast Region (data from U.S. Fish and Wildlife Service Breeding Bird Survey). The declines are representative of 10 of 13 grassland-oriented species, only one of which is increasing.

Many wildlife species in the Southeast rely on wetlands for a portion or all of their habitat needs. Duck populations utilize the Lower Mississippi Valley and Atlantic Flyway as wintering areas and have experienced long-term declines. The declines in populations of various neotropical migratory birds that utilize the expansive forested wetlands of the Southeast have been equally dramatic. Birds in this group experiencing declines include swallow-tailed kites, Swainson's, prothonotary and cerulean warblers, and scarlet and summer tanagers. Species requiring large blocks of continuous woodland have been hardest hit.

Southeastern aquatic systems support the highest numbers of endemic fishes and freshwater invertebrates in the U.S. Unfortunately, the Southeast also is infamous for having the highest numbers of extinct and federally endangered species in the U.S. The loss of southeastern aquatic systems and much of their native fauna truly is a crisis contributing to the decline of global biotic diversity. Fisheries resources are dependent on the quality of waters. Impaired streams have reduced potential for supporting recreational and commercial fisheries.

Recreational/Economic Impacts

Native, warm-season grasses are more drought hardy and provide reliable summer livestock forage. Their reestablishment throughout the Southeast would alleviate periodic drought-related economic stress to the livestock industry, while providing habitat to support viable populations of grassland-dependent wildlife.

Bobwhite quail have declined more than 60 percent since 1966. At the *current* rate of decline, quail populations will be practically unhuntable in 10 years and could even vanish in 15 years. This decline mirrors a 60 percent decline in the number of quail hunters since 1970, and translates into a loss to southeastern rural economies of $285,000,000 per year since 1980.

Currently, sport fishing alone contributes more than $6.3 billion in the Southeast, which produces multiplier benefits of $12.6 billion. This outdoor activity supports more than 200,000 jobs with earnings totaling $3.6 billion. Reducing the miles of impaired streams will permit impaired fisheries in these streams to recover, thus stimulating increased recreational opportunities and adding to the considerable economic benefits that sport fishing generates in the Southeast.

WILDLIFE GOALS

Grassland-nesting Species Goal:

- ✧ Restore declining grassland wildlife populations to 1980 levels.

Early Successional Edge Species Goal:

- ✧ Restore declining populations of early successional edge species to 1980 levels.

Wetland-dependent Species Goal:

- ✧ Restore wetland-dependent wildlife populations to viable levels. Meet duck population objectives of the NAWMP.

Forest Species Goal:

- ✧ Reverse the decline of sensitive forest wildlife populations. Stabilize and restore populations of threatened and endangered species.

Aquatic Species Goal:

- ✧ Stabilize and restore populations of threatened and endangered species. Improve the quality and sustainability of sport fisheries.

HABITATS NEEDED TO MEET GOALS

Grassland Objectives:

- ✧ Retain existing 4 million acres of rangeland.
- ✧ Convert 20 to 25 percent (10.2 million acres) of existing tame, cool-season pasture to native, warm-season grasses.

Objective Specifics

All grassland-oriented species would benefit greatly from, and some even recover with, improved grazing practices and native grassland restoration. Grasslands in peninsular Florida, the Coastal Plain and Highland Rim are traditional centers of abundance for grassland birds and should be priority targets for planting of native, warm-season grasses. Other important targets for establishment of native, warm-season grasses include the Piedmont, Ozark and Cumberland Plateaus. Controlled burning should be used to maintain health of grassland habitats.

Early Successional Habitat Objectives:

- ✧ Establish and maintain 9.8 million acres of diverse, idle grass/forb cover.

Objective Specifics

Most of the vastly fluctuating ACR should be replaced with more stable acreage of idle cover. Emphasize multiple-species plantings, especially native, warm-season grasses and forbs rather than monocultures of tame grasses. Up to one-fourth of this acreage (2.5 million acres) should be disturbed each year to maintain this cover in the earliest successional stage. The remainder should be left undisturbed for longer periods up to five years.

Linear field-edge strips (33 feet wide) that can serve simultaneously as buffers for water quality, wildlife habitat and supply control should be fostered. In North Carolina, an eight-fold increase in quail numbers was found on areas with 30-foot legume/broomsedge filter strips versus areas without strips.

All disturbances should be conducted according to guidelines of the State Technical Committees for wildlife management. Controlled burning should be encouraged as a maintenance practice. Other valuable management practices include disking and, if properly controlled, haying, mowing and grazing. No mowing should be permitted during peak nesting (April 1 to August 15). Weed control should not be mandated, except for state-declared noxious weeds.

Wetland Objectives:

- ✧ Maintain existing wetland and bottomland hardwood acres.
- ✧ Restore an additional 1,030,000 wetland acres.
- ✧ Enhance an additional 900,000 acres of rice and small grains by flooding after harvest.

Objective Specifics

The North American Waterfowl Management Plan identified key wetland regions for protection, restoration and enhancement. The Lower Mississippi Valley (LMV), Atlantic Coast (AC) and Gulf Coast (GC) are the major regions identified in the Southeast. Restoration goals are 864,000 (LMV), 166,000 acres (AC) and 104,000 acres (GC).

Winter flooding of rice fields in the Lower Mississippi Valley should be encouraged. Many active agricultural fields, especially rice, can provide high-quality habitat if flooded outside the growing season. These wintering habitats for waterfowl also provide vital habitats for neotropical migratory birds and feeding areas for wading birds and migrating shorebirds.

Protect existing large blocks of bottomland hardwoods. Restore 510,000 acres of bottomland hardwoods in the Lower Mississippi Valley. Emphasize combining the existing patches of hardwoods to attain larger blocks (minimum size of 10,000 acres).

Forest Objectives:

- ✧ Increase hardwood planting.
- ✧ Curtail the conversion of remaining hardwood stands to cropland and monoculture pine.
- ✧ Improve management of existing pine plantations.

Objective Specifics

Target all tree planting programs toward hardwood restoration, rather than pine monoculture. Tie smaller forest patches into larger blocks.

When pines must be planted, encourage more diversity:
(1) reforest with pine species native to the site;

(2) incorporate buffers of shrubs, hardwoods and grass/legume mixtures within and around plantations;

(3) fund only less-dense plantings (450 seedlings per acre or less); and

(4) do not cost-share for extensive (larger than 30 acres) pine plantations.

Foster longer-term (sawtimber) rotations. Encourage use of frequent thinning and controlled burning in pine management to achieve the valuable pine savannah growth form that is essential for such species as Bachman's sparrows, bobwhite quail and red-cockaded woodpeckers.

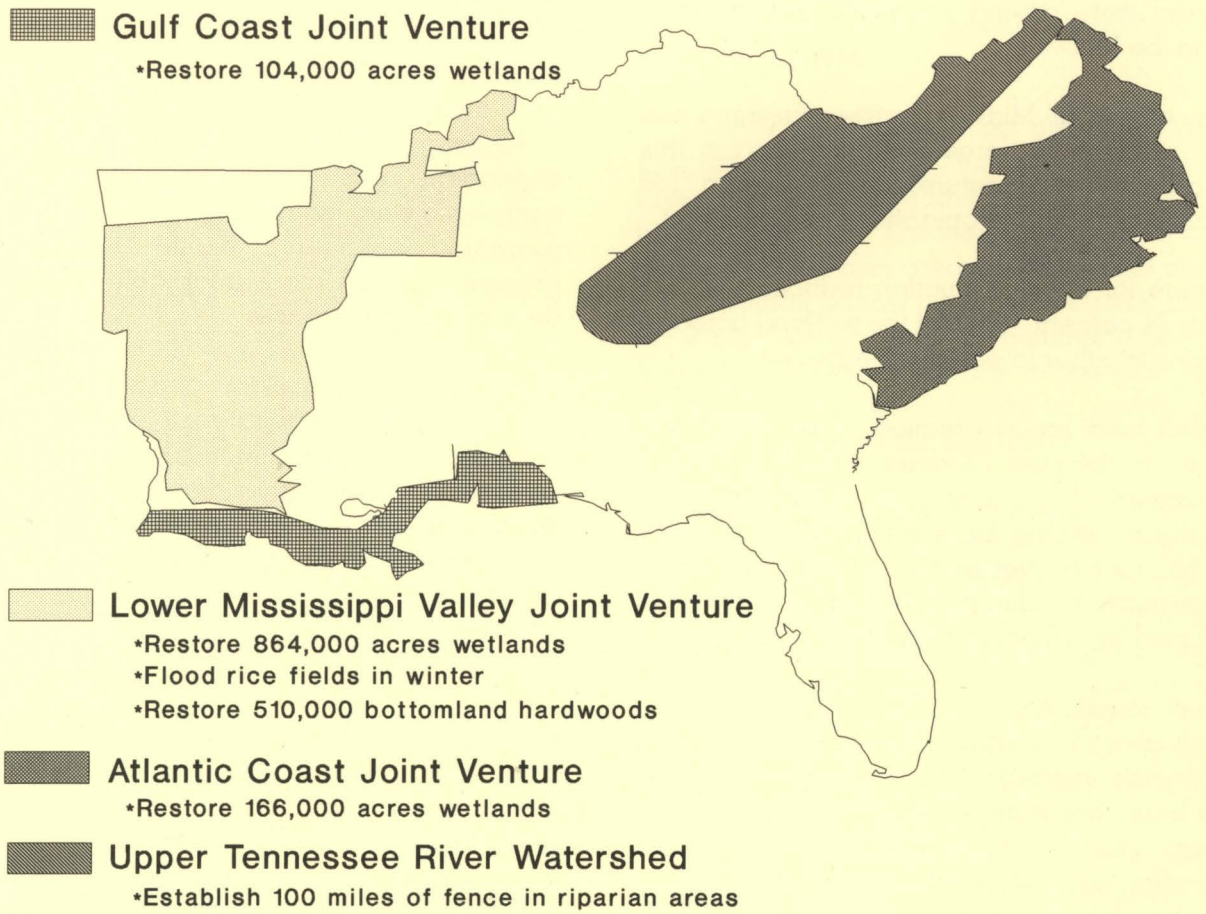
Aquatic Ecosystem Objectives:

- ✧ Establish 750,000 miles of filter strips one-half chain in width (3 million acres).
- ✧ Establish at least 250 miles of fencing, of which 100 miles should be in the upper Tennessee River system, to exclude livestock from riparian corridors.

Objective Specifics

Target filter strips to upper watersheds above agriculturally impaired streams to reduce sedimentation and nutrient enrichment. These filter strips should overlap entirely with those for early successional habitats if appropriate cover types are established. Thus, the strips would serve multiple purposes.

Monoculture fescue and Bermudagrass should be replaced by filter strips of mixed herbaceous species beneficial to wildlife.



MIDWEST REGION

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STATEMENT OF PROBLEM

Landscape Changes

Agriculture has dramatically altered rural landscapes in the Midwest. Presettlement habitat consisted of the central hardwoods of eastern Ohio blending westward into the prairies of Indiana, Illinois, Iowa and southwest Minnesota, and the northern forests of Michigan, Wisconsin and Minnesota. Wetlands—mainly open prairie wetlands—accounted for nearly one-fourth of the total surface area of the Midwest.

Farm policies designed to meet America's need for cropland were driving forces behind land-use changes in the Midwest.

Today, almost all Midwest native grassland has been lost. Nearly 60 percent of rural land in this region is cropland and pasture. About one-third (136 million acres) of all U.S. cropland is in the Midwest.

Drainage for crop production reduced wetland acreage by 74 percent. Most of the wetland acreage that remains is either forested or degraded.

Forested land has decreased 60 percent since settlement. In the past 10 years, forested acreage has increased in five states and declined in three. Much of the remaining forestland is low quality for wildlife. Because of over-harvest and poor regeneration (since many woodlands are grazed), oaks have been replaced by hardwoods with less wildlife value.

Midwest aquatic systems and riparian areas also have been altered greatly. Impairment of aquatic systems occurs in-stream from channelization and externally from poor watershed management. Many midwestern streams were channelized for flood control and/or agriculture enhancement, reducing aquatic habitat availability and productivity. Sedimentation also is a major problem. The Maumee River, entering Lake Erie at Toledo, delivers more sediment to the Great Lakes than all other U.S. rivers combined. An estimated 30 percent of every dollar spent in water treatment facilities is used for sediment removal.

Wildlife Impacts

Agriculture and other human activities effected a change in Midwest fauna from bison, elk, greater prairie-chickens and northern pintails to red-winged blackbirds and ring-necked pheasants. Prior to World War II, species dependent upon large expanses of grassland, such as greater prairie-chickens, already had been largely eliminated. However, the small, diverse farms of the early 20th century still supported a varied abundance of wildlife "edge" species that thrived in a patchwork of early successional habitats.

After World War II, larger equipment, larger fields and monotypic crop production led to dramatic reductions in even the edge species. Those dependent upon large grassland and wetland complexes were extirpated from many areas. While grassland-dependent wildlife species declined precipitously, the more adaptable species such as deer began to increase.

A variety of grassland birds use the 8.6 million acres of grassland habitat restored by the CRP in the Midwest. Some species such as the grasshopper sparrow breed at higher densities and with greater success in CRP than in crop fields. However, despite CRP's apparent successes, some species continue to decline.

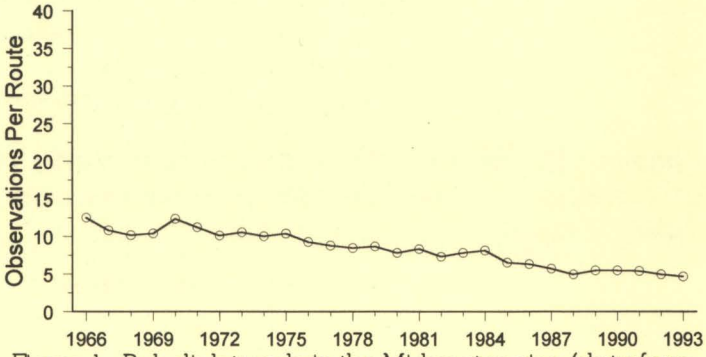


Figure 1. Bobolink trends in the Midwest region (data from U.S. Fish and Wildlife Service Breeding Bird Survey). The decline is representative of grassland-dependent birds.

The effect that agriculture has had on wildlife best can be demonstrated by declines in grassland- and wetland-dependent species. The best-available data show continuing long-term declines for myriad grassland species such as dickcissels, ring-necked pheasants, northern bobwhites, bobolinks, eastern meadowlarks and greater prairie-chickens.

Wetland drainage and alteration of associated uplands have led to declines of many wetland wildlife species. In the 1980s and early 1990s, several species of ducks such as mallards and northern pintails experienced historic low population levels. The data also indicate long-term declines in other wetland-dependent species such as spotted sandpipers and American bitterns.

Range-wide declines in ruffed grouse and some neotropical migrant birds dependent upon early successional hardwoods reflect a large-scale maturation of forest in some areas. Regional declines in species such as cerulean warblers and veerys indicate extensive forest fragmentation.

Recreational/Economic Impacts

More than 80 percent of Americans participate in wildlife-related recreation. These activities contributed $15 billion to Midwest economies in 1990. Meeting the wildlife goals will result in substantial increases in recreational opportunities, economic growth and overall quality of life in the Midwest.

WILDLIFE GOALS

Grassland-nesting Species Goal:

- ✧ Stabilize or increase grassland-nesting species to maintain minimum viable populations in targeted areas.

Wetland-dependent Species Goal:

- ✧ Stabilize or increase declining wetland-dependent species. Meet duck population objectives of the NAWMP.

Forest Species Goal:

- ✧ Stop the decline of forest-dependent species and maintain viable populations of area-sensitive forest wildlife species.

Riparian/Aquatic Species Goal:

- ✧ Restore self-sustaining populations of recreational fisheries to all streams and rivers degraded by agriculture.

HABITATS NEEDED TO MEET GOALS

Grassland Objectives:

- ✧ Convert 13.5 million acres (10 percent) of cropland existing prior to CRP (1985) to relatively undisturbed grassland.
- ✧ Protect and improve existing grasslands such as permanent hayfields, pastures and remnant prairies.

Objective Specifics

An additional 4.9 million acres of restored grassland, beyond lands currently enrolled in CRP, are necessary to address continuing wildlife declines in the Midwest. Grassland restoration should be targeted to prairie and wetland soils to approximate distribution of native habitat types. The Prairie Pothole region of the Midwest is a top priority for restoring undisturbed grassland/wetland complexes under the NAWMP.

Long-term or permanent grassland restoration programs should be focused on township-size (approximately 36 square miles) of less-intensively farmed regions. The desired result would be 20 percent of the land area in acceptable cover types such as small grains, pasture, wetlands, shelterbelts or winter cover, and a minimum of 5-percent grassland. Short-term (three- to five-year) retirement programs should be designed to provide grassland on more intensively farmed areas.

Many grassland species are sensitive to the size of habitat blocks. Therefore, long-term programs should give priority to grassland acreage in large blocks (greater than 80 acres) with a minimum width of 600 feet so that 50 percent of the block functions as interior habitat. Priority also is due to sites that enlarge or connect existing blocks. Grassland contracts should be a minimum of 20 contiguous acres unless used to connect. other habitats.

Contracts should optimize other environmental benefits such as water quality whenever possible. Grasslands are more valuable when associated with wetlands and other aquatic areas. In areas where wetland drainage has been extensive, grass buffer strips along drainage ditches would benefit wildlife and improve water quality.

Restored grasslands should be managed judiciously to maintain productivity and wildlife benefits. Specific in-state grassland habitat goals and management practices should be identified by a fully functional State Technical Committee.

Wetland Objectives:

- ✧ Protect existing wetlands.
- ✧ Restore 1.6 million acres of wetlands.

Objective Specifics

Wetland restoration programs should be targeted to optimize wildlife benefits, based especially on providing nesting and migration habitat.

Wetlands in the prairie region should be restored and managed as complexes that include at least 2 acres of associated upland nesting habitat for every wetland acre. Nesting habitat, the major limiting factor for most wetland species, is composed of wetland complexes with more extensive associated upland cover, primarily grass. Migration habitat requires less associated upland and should consist of bottomland hardwoods, open water or complexes with buffers of woodland or grass. Wetlands near existing functional wetlands should receive restoration priority to develop or enhance wetland complexes.

Riparian/Aquatic System Objectives:

- ✧ Protect all existing riparian areas.
- ✧ Restore 8,000 miles of riparian habitat (at least 128,000 acres) along streams degraded by agriculture.

Objective Specifics

Riparian area revegetation adjacent to major rivers should emphasize tree plantings with a buffer width twice the height of trees. Along smaller rivers, streams and drainage ditches, warm-season grass/forb mixtures should be emphasized with a minimum buffer width of 66 feet on each side.

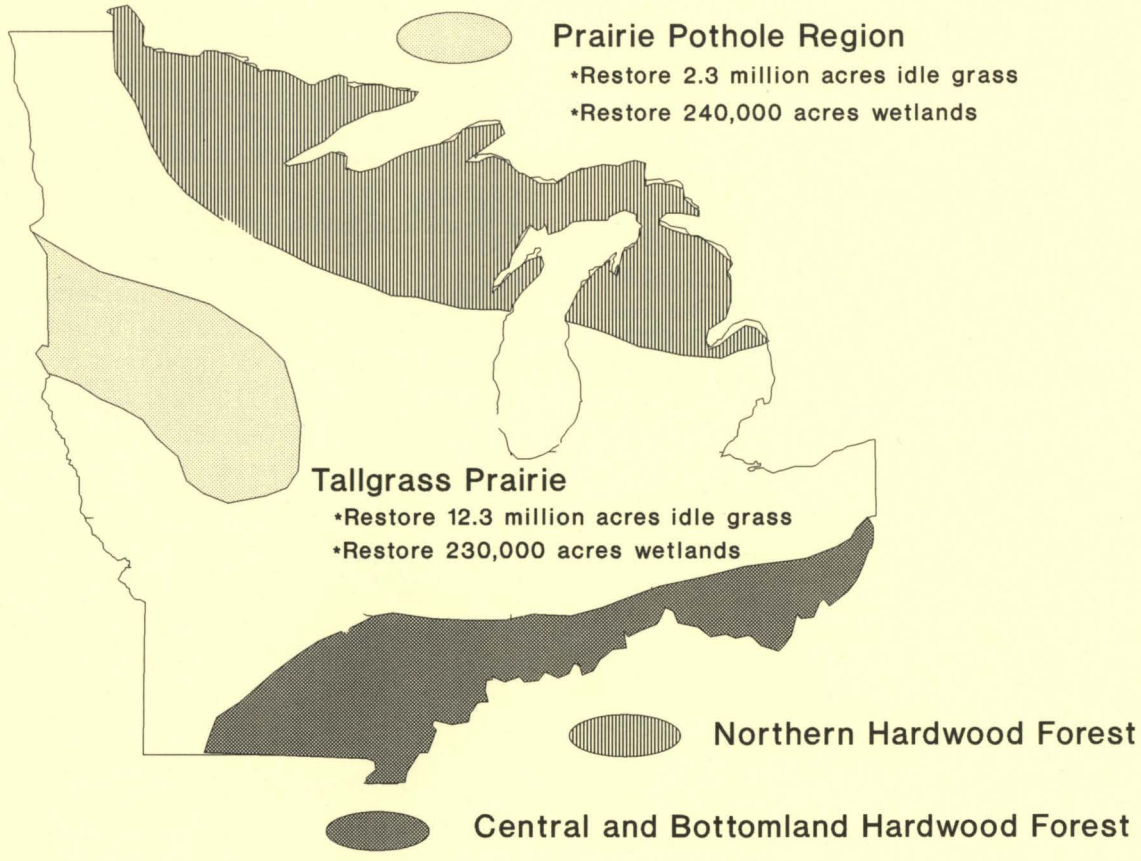
Central and Northern Hardwood Objectives:

- ✧ Increase hardwood woodland acreage by 500,000 acres in selected forest regions.

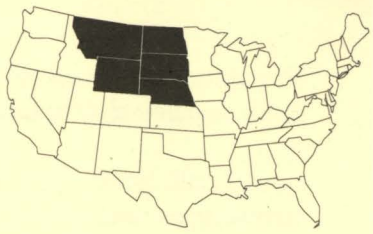
Objective Specifics

Bottomland hardwoods and floodplains throughout the region should be targeted.

Less intensively farmed areas (less than 25-percent cropland per township) should concentrate on forest restoration. Reforestation should focus on reducing fragmentation by developing forest blocks of at least 7,000 acres where possible.



NORTHERN GREAT PLAINS REGION



Arnold Kruse, *U.S. Fish and Wildlife Service*
Lloyd Jones, *Delta Waterfowl Foundation*

STATEMENT OF PROBLEM

Landscape Changes

The Northern Great Plains region is one of the most altered ecosystems in the country. Prior to settlement, this region was dominated primarily by grassland. Riparian areas and some wetland basins were characterized by patches of brush and woody vegetation. Large forested tracts were restricted mostly to specific areas such as the Black Hills in South Dakota and Wyoming.

Constant successional repression in the grasslands, due to frequent natural events such as fire, drought, grazing by wild ungulates and severe winter climate, created a landscape dominated by a diverse mix of grasses and forbs, interspersed with woody draws and riparian zones.

The most recent glacier created the Prairie Potholes, a 300,000-square mile area in the U.S. and Canada with a high density of isolated wetlands interspersed among the tallgrass and mixed grass prairies. This region is one of the most ecologically rich areas in the world. Its unique combination of habitats supported the evolution of a great diversity of ground-nesting wildlife, particularly migratory birds. The Potholes are the most important breeding ground for waterfowl in North America.

Since settlement, agriculture has had the most significant impact on the region's landscape. In eastern portions of the Dakotas and Nebraska, less than 1 percent of the tallgrass prairie remains. In this region, two-thirds of the mixed grass prairie and 20 percent of the shortgrass prairie have been converted to cropland. Intense grazing pressure has reduced the structure and quality of the remaining shortgrass prairie's vegetative cover. In North Dakota, more than 60 percent of the original grasslands has been converted to annual crop production. Of the remaining grasslands, about 95 percent is grazed or hayed intensively.

Agricultural activity also has drained and degraded nearly half of the original wetlands in the Prairie Pothole Region. Of those remaining, most are cropped when weather permits or are otherwise negatively impacted by agricultural practices that cause sedimentation, reduce wetland vegetation, and add chemicals and fertilizers. Runoff from unprotected cropland is filling many wetlands with silt.

Surface water constitutes approximately 4.6 million acres of this five-state region. Aquatic resources are threatened by drainage, development, siltation, channelization, dams, levees, increased water temperature, riparian habitat loss, degraded water quality and decreased water quantity. Nutrient enrichment and siltation ultimately shorten the lives of lakes and reservoirs. The single largest issue facing fish managers is decline in water quality caused by nonpoint source pollution.

Wildlife Impacts

The combined losses of wetland, grassland and aquatic habitats have resulted in reduced populations of many prairie wildlife species. Extensive grassland conversion in the Prairie Potholes primarily is responsible for the substantial decreases in populations of northern pintails, mallards and blue-winged teal. Although this region comprises only 10 percent of the available waterfowl nesting habitat in North America, it provides more than 50 percent of the waterfowl production during average years. Populations of several duck species declined sharply between 1970 and 1985 and currently are below population goals of the North American Waterfowl Management Plan. The percentage of upland-nesting ducks able to nest successfully is too low for many populations to sustain themselves, because their vulnerability to predators increases in small fragments of grass scattered among cropland.

Pheasant and gray partridge are the most important game birds in this region. Populations of both fluctuate dramatically with the amount, extent and distribution of cropland and cropland retirement programs. The Soil Bank, which retired cropland in the 1950s to early 1960s, resulted in dramatic increases in pheasants and partridges. When that program expired, populations quickly plummeted.

Population surges currently are being experienced by both species due to CRP.

Of all North American birds, those occupying grasslands throughout the Great Plains are experiencing the steepest, most consistent and most widespread declines. Approximately 83 percent of these species showed decreasing population trends from 1966 to 1993. Lark buntings and grasshopper sparrows, for example, declined by about 50 percent. Conversion of perennial grassland to annually tilled cropland is the dominant factor causing declines.

Prairie grouse (sage grouse, sharp-tailed grouse and greater prairie-chickens) once were commonplace and maintained peak abundance prior to 1930. Prairie grouse numbers are governed by the amount and distribution of native mixed prairie grasslands. In Nebraska, from 1965 to 1978, land in irrigated cropland increased more than 800 percent. Nearly 85 percent of those acres came from grassland that had supported prairie grouse. Consequently, the species' breeding range and populations have been greatly restricted.

At least 28 species of raptors nest in the Northern Great Plains region, 8 of which are nearly endemic to the Great Plains or depend on this region for most of their North American breeding habitat. Five of the eight "prairie raptors" are listed as endangered, threatened or candidate species. Another, the northern harrier, is designated as a "species of special management concern," due mainly to the vulnerability of its habitat.

Because of drainage and degradation of wetlands, diving ducks and other birds that nest in the wetlands also are declining in this region (Table 1). In addition, survival rates of the small portion of upland-nesting duck broods that do hatch are decreased. During the period 1966-1991, more wetland-nesting species in this region had declining populations than in any other region in the U.S.

CRP converted more than 9 million acres of cropland to relatively undisturbed grass and wetland cover in the Northern Great Plains. This cover is highly attractive to and productive of wildlife. Nesting intensity and success for a wide array of birds are higher than prior to CRP. CRP is the single most important, large-scale land-use change to positively influence bird productivity.

Table 1. Wetland bird species which showed negative average annual change greater than 5 percent in North Dakota, 1966-86.

Species	Percentage annual change
Western grebe	-31.3
Pied-billed grebe	-9.1**
Ring-billed gull	-10.6***
Franklin's gull	-6.9
Black tern	-7.1
Wilson's phalarope	-5.6***

**P=.05, ***P=.01

Generally, fish populations mirror long-term trends in habitat quality. Thus, degraded water quality and habitat have reduced or eliminated native species, produced fish populations of less desirable species, and caused fisheries managers to rely on hatchery stocks to maintain populations and sport fisheries. In addition, many more species are becoming threatened and endangered.

Recreational/Economic Impacts

Americans spend much money pursuing recreational use of wildlife resources. A large percentage of this money is spent in rural communities that especially need the revenues. In 1991, more than 1.5 million people spent $287,252,000 on nonconsumptive wildlife-related activities in the Northern Great Plains region alone.

Increased pheasant populations in South Dakota due to CRP attracted almost 48,000 non-resident and 88,000 resident hunters in 1993. While engaged in this recreation, these hunters spent more than $50 million in the state. Economic benefits from pheasant-related activities throughout the Northern Great Plains are in excess of $80 million annually, and are expected to increase to approximately $140 million annually if population objectives are reached.

Ten million user days of fishing generate more than $309 million annually (angler expenditures) in the Northern Great Plains. Currently, agricultural nonpoint source pollution is reducing fish populations, dampening fishing activity and keeping economic activity from being much higher.

WILDLIFE GOALS

Waterfowl Goal:

- ✧ A breeding population of 6.8 million ducks, and an autumn flight of 13.6 million ducks.

Other Wetland Birds Goal:

- ✧ Reverse declines sufficient to achieve a positive 10-year average annual change that equals or exceeds the previous long-term average annual decline.

Gray Partridge Goal:

- ✧ A total population sufficient to sustain an annual harvest of 410,000 birds.

Ring-necked Pheasant Goal:

- ✧ A peak annual population of 21 million.

Raptor Goal:

- ✧ Stabilize and restore raptor populations sufficient to remove from sensitive, threatened and endangered status.

Nongame Bird Goal:

- ✧ Restore and maintain populations equal to those indicated by the 1966-68 U.S. Fish and Wildlife Service's Breeding Bird Survey.

Prairie Grouse Goal:

- ✧ A total population sufficient to sustain an annual harvest of half a million birds.

Fisheries Goal:

- ✧ Enable individual states to achieve established fisheries objectives.

HABITATS NEEDED TO MEET GOALS

The following habitat estimates are relative to baseline conditions in 1985, prior to CRP.

Grassland Objectives:

- ✧ Stop conversion of remaining native prairie rangeland to cropland.
- ✧ Improve vegetative structure of native prairie rangeland to foster suitable nesting cover.
- ✧ Restore 8 million acres of undisturbed grass cover in the Prairie Potholes, in association with abundant, functional wetland complexes. One million acres of restored grassland are needed in the Prairie Pothole area of Montana, 4.25 million acres in North Dakota and 2.75 million acres in South Dakota.
- ✧ Restore 5.5 million acres of undisturbed (three to five years) grass/forb cover within the pheasant range, including 1 million acres in the eastern and southern portions of the Nebraska sandhills and 50,000 acres in eastern Wyoming.
- ✧ Restore 1.5 million acres of undisturbed grass/forb cover throughout areas not already delineated.

Objective Specifics

A total of 15 million acres of undisturbed grass cover is required in the Northern Great Plains to meet the wildlife goals. These acres can be provided by a combination of short-, mid- and long-term programs. Undisturbed grass cover is defined as "previous cropland restored to mixed grass/forb cover that receives manipulation only for identified wildlife management purposes."

Throughout this region, large, contiguous tracts of undisturbed grass cover—at least 80 acres—are imperative to attract and protect nesting birds. Small patches or strips of grass generally provide little or even negative benefit to wildlife in this region.

The quality of restored tracts of undisturbed grass cover is as important as the quantity. Current CRP acres could have provided substantially more wildlife benefits if cover quality had been improved. Forbs should comprise at least 15 percent of the vegetation. Weed control should be prohibited, except for state-declared noxious weeds, for which only spot treatment should be allowed. Native, warm-season grasses should be used more extensively; crested wheatgrass should not be allowed. Shrubs such as western snowberry, buffaloberry or rose should be promoted for food and shelter. Food plots should be encouraged within or adjacent to winter cover.

Grass/forb covers should be managed actively to maintain vegetation quality and wildlife benefits. Periodic disturbance—such as haying, grazing or burning—after the nesting season (July 15), every four to five years would maximize wildlife benefits. Such disturbance could be administered to simultaneously provide economic benefits to the landowner, such as a rotational grazing or haying regime.

Native prairie rangeland vegetation with an average visual obstruction reading of 6 inches or greater provides adequate nesting and brooding habitat. Discourage reduction of sagebrush where live sagebrush crown cover is less than 20 percent, or on steep upper slopes where big sagebrush height is 12 inches or less.

Wetland Objectives:

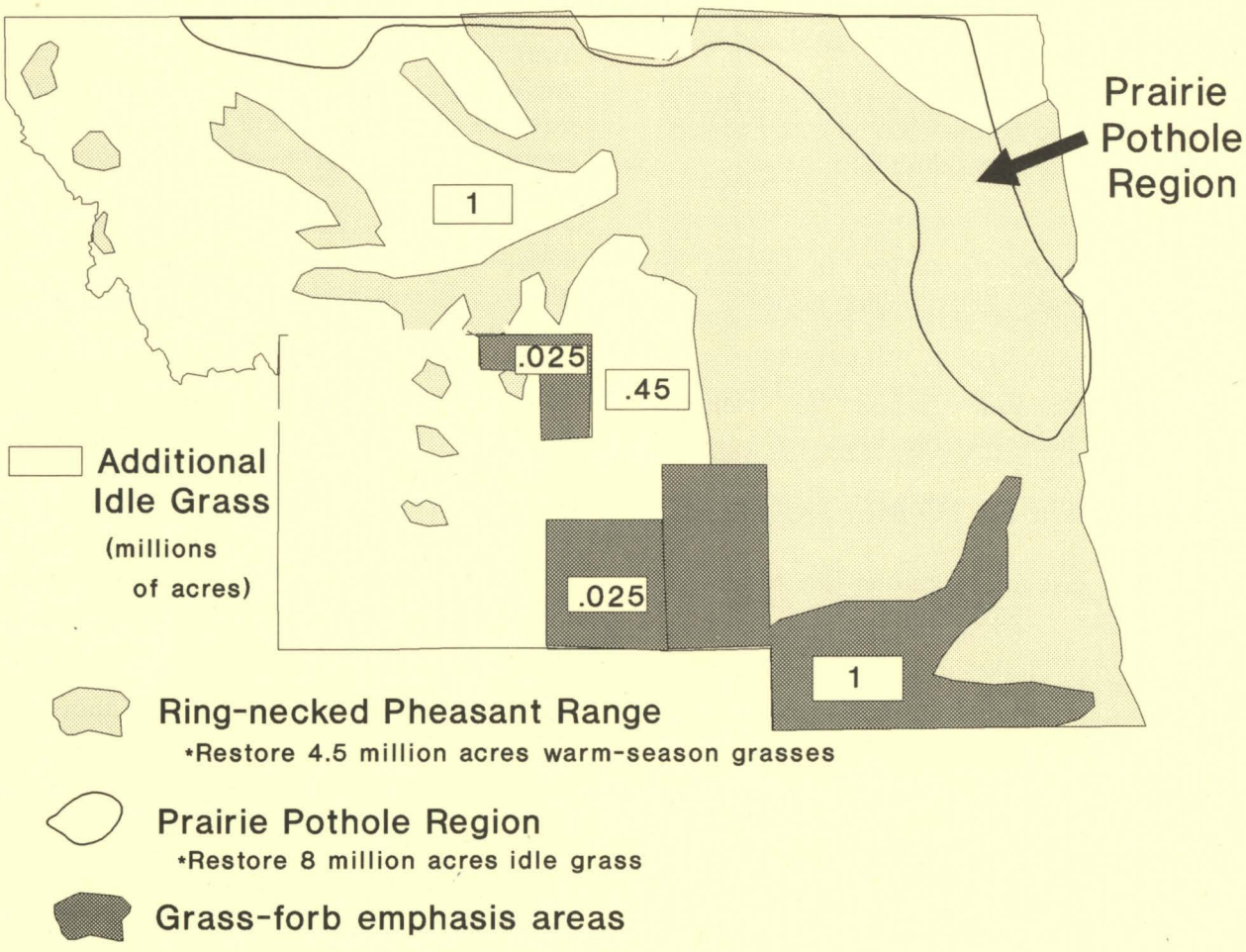
- ✧ Protect all remaining wetlands—including small, temporary wetlands—from drainage or filling by sedimentation.
- ✧ Restore or create 600,000 acres (about 10 percent of wetland acreage previously drained) of temporary, seasonal and semi-permanent wetlands in the Prairie Potholes.

Objective Specifics

In the Prairie Pothole Region, wetlands without abundant upland cover have minimal value for breeding species. In addition, high rates of sedimentation from eroding cropland is degrading more pothole wetlands today than drainage. Therefore, wetland and grassland restoration should proceed simultaneously and in close proximity. A minimum of 3 acres of undisturbed grass cover is needed for each acre of wetland, as nesting habitat and buffer area to protect the wetlands from siltation and pesticides. A wetland complex (group of various-sized wetlands) is much more valuable to wildlife than single, isolated wetlands.

Riparian/Aquatic Area Objectives:

- ✧ Continue to promote no-till and minimum till.
- ✧ Eliminate or reduce summer fallow.
- ✧ Improve riparian zone management by developing filter strips and protecting habitat and permanent cover around wetlands, waterways, and drainage and irrigation ditches.
- ✧ Minimize or control livestock on shorelines.



SOUTHERN GREAT PLAINS REGION

Charles Lee, *Kansas Department of Wildlife and Parks*

STATEMENT OF PROBLEM

Landscape Changes

About 95 percent of the land in the Southern Great Plains is privately owned. Large-scale agricultural alterations to the prairie landscape first became apparent in the mid-1900s and intensified in the 1960s. Expansion of exotic plant species and advancements in agricultural technology (i.e., sprinkler irrigation, new pesticides) accelerated the landscape changes.

The Southern Great Plains has lost almost 5 million acres of rangeland since 1982. Suppression of fire and chronic overgrazing by domestic livestock have decreased the quality and value of remaining rangelands. Invasion of woody species such as juniper into native rangeland, particularly in the southern portion of this region, has increased pesticide use, decreased habitat for grassland wildlife and further altered native ecosystems.

More than 11 million acres of wetlands have been lost in the five Southern Great Plains states during the last 200 years. This loss and the decreased quality of existing wetlands and associated upland buffers in areas such as, but not limited to, playas or seasonal depression wetlands, saline lakes and riparian corridors, result in declining wildlife populations, decreased water quality and increased flooding. Despite current wetland protection policies, degradation, alteration, sedimentation, dewatering and destruction of wetlands still occur.

Although total acreage of woodlands in the Southern Great Plains has remained static over the last 10 years, conversion and degradation have decreased their quality and value to wildlife.

Aquatic communities have been highly altered. Pollutants, including pesticides, nutrients and soil particles, have caused major declines in habitat quality in streams and impoundments. Dam construction continues to compromise the integrity of many streams by altering stream flows and blocking fish movements. Improper disposal of agricultural wastes also is impairing streams and reservoirs and causing numerous fish kills.

Wind erosion is another significant factor reducing soil, air and water quality in the Southern Great Plains. This region still is losing more than 7.2 tons of soil per acre annually to wind erosion.

Wildlife Impacts

As a result of landscape changes, many wildlife populations have declined or suffered range reductions to the point of becoming threatened, endangered or even extirpated in the Southern Great Plains.

Grassland-dependent wildlife species, those less adaptable to edge or fragmented habitats, are declining in the Southern Great Plains. The greatest of these declines occurs in the shortgrass prairie obligate species such as lesser prairie-chickens, grasshopper sparrows, loggerhead shrikes and mountain plovers.

The North American Waterfowl Management Plan lists loss and degradation of habitat as the major waterfowl management problem in North America. The Playa Lake Joint Venture reports protection and improvement of playas in the Southern Great Plains is vital to ensuring continued accommodation of waterfowl overwintering in, migrating through and breeding in this region.

CRP has restored 10.7 million acres of grassland in the Southern Great Plains. It has proven extremely valuable in reversing some of these trends. Meadowlark habitat improved over much of the species' range; white-tailed deer populations have expanded and extended their range. Ring-necked pheasant populations, previously very volatile, have stabilized due to improved winter cover and nesting habitat. Wetlands in CRP provide benefits to waterfowl, shorebirds, small mammals, reptiles and amphibians. Loss or weakening of this program would prove devastating to Southern Great Plains' wildlife and those who enjoy it.

Recreational/Economic Impacts

Improved water and air quality lessens health and safety concerns by controlling flooding and erosion. Increased quality and quantity of wildlife and its habitat will enhance hunting, fishing, photography and other wildlife-related activities, and will provide economic, aesthetic and educational opportunities for the Southern Great Plains.

WILDLIFE GOALS

Grassland Species Goal:

- ✧ Reverse declining population trends. Stabilize and increase populations of species of special concern.

Forestland Species Goal:

- ✧ Maintain "woodland" wildlife species at current population levels.

Wetland Species Goal:

- ✧ Increase populations of wetland wildlife species. Meet duck population objectives of NAWMP.

Riparian/Aquatic Species Goal:

- ✧ Stabilize populations of sensitive and threatened species.

HABITATS NEEDED TO MEET GOALS

Grassland Objectives:

- ✧ Convert 9 million cropland acres to long-term undisturbed grasses and forbs.
- ✧ Restore 3 million cropland acres to short-term undisturbed grasses and forbs.
- ✧ Improve the vegetative structure on 90 million rangeland acres.

Objective Specifics

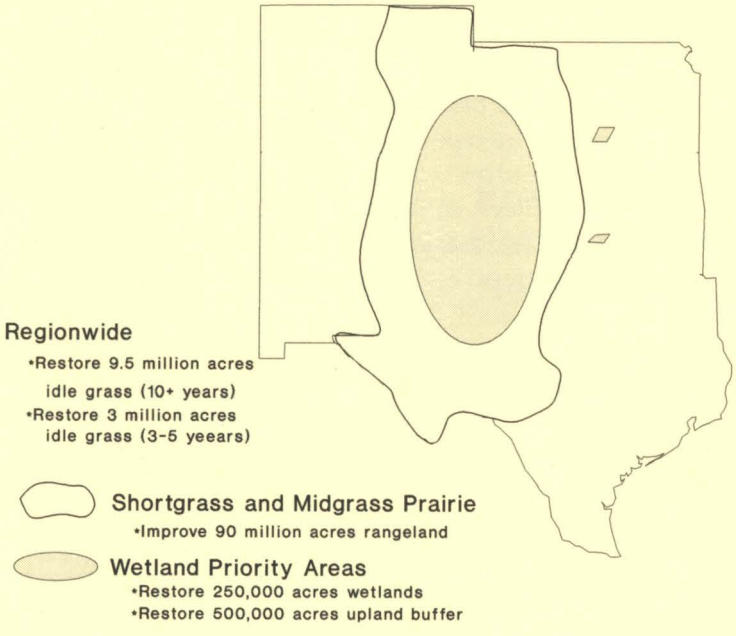
At least 500,000 acres of long-term restored grassland should be in conjunction with restored Playa Lakes, as buffers and nesting habitat. The remainder can be distributed anywhere east of the Rocky Mountains with consideration for soil erosion and water-quality problem areas. However, the size of habitat blocks should be maximized (80-acre minimum) to benefit area-sensitive species.

Restored grasslands should be diverse in plant species and growth characteristics. Removal of exotic grass and establishment of native, warm-season species mimicking historical conditions should be encouraged. Natural vegetation should be allowed as acceptable cover.

Up to one-fourth of the total 12 million acres of restored grassland should be disturbed each year to set back vegetation succession.

Habitat management practices such as grazing, burning, mowing, food plots, planting woody vegetation and strip disking should be promoted on restored grasslands only as approved by a State Technical Committee. Mandatory weed control should be limited to state-listed noxious weeds.

Improved rangeland management should reduce fragmentation of native habitats and help reverse the decline of grassland wildlife species.



Forestland Objectives:

- ✧ Prevent conversion and degradation of quality forestland.
- ✧ Improve location and management of 1.5 million acres of hardwood and 130,000 acres of shelterbelt.

Objective Specifics

Target shelterbelts to the western half of the region. Target hardwood establishment and management along waterways in the eastern half of the region.

Wetland Objectives:

- ✧ Protect existing functional wetlands.
- ✧ Restore 250,000 acres of wetlands with 500,000 acres of upland buffer.

Objective Specifics

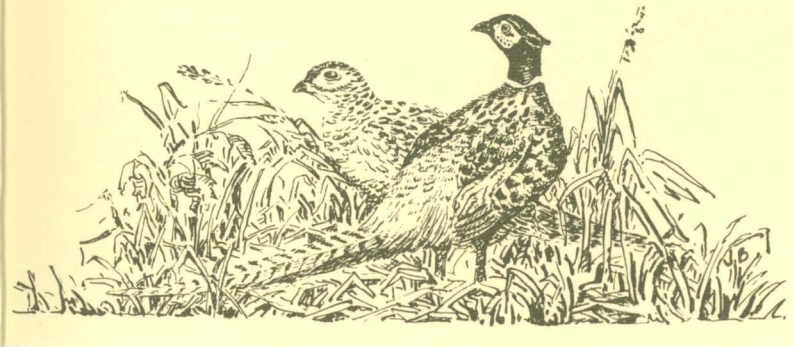
The Playa Lakes are highest priority for restoration. Attention also should be focused on Cheyenne Bottoms and on state-defined priority areas such as Lake Rita Blanca, Cactus Lake and Hackberry Flats.

Riparian/Aquatic Area Objectives:

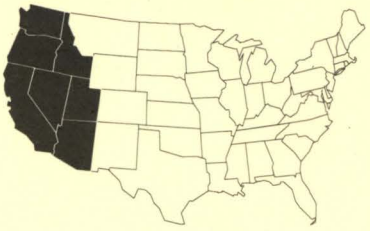
- ✧ Manage 14,000 miles of streams with 50-foot wide filter strips on each side (170,000 acres) to provide wildlife benefits.

Objective Specifics

Water quality improvement is needed throughout the Southern Great Plains. Filter strips should be established to suitable wildlife cover to provide nesting habitat and corridors.



WEST REGION



Marc Liverman, *Oregon Department of Fish and Wildlife*
Tom Hemker, *Idaho Fish and Game Department*

STATEMENT OF PROBLEM

Landscape Changes

Agriculture affects more than 179 million acres in the West, almost 40 percent of the region's land area. It is the primary use of most private land in the West. Livestock grazing is the most prevalent agricultural use, with forest management ranked second. Rugged terrain and lack of adequate moisture limit crop production to 33 million acres (about 7 percent of the western land base). However, crop production dominates the use of areas with fertile soils and available water. The number of farms has decreased by about half since 1930, as agricultural technology has improved. Simultaneously, farm size has increased several-fold. Reclamation projects and development of irrigation technology have been major factors stimulating these changes. More than 121,000 western farms and 16.7 million acres (about half of all western cropland) are irrigated.

Fifty-nine percent of the original wetlands (more than 5 million acres) have been lost throughout the West. Almost 1.4 million acres (38 percent) of Oregon's wetlands have been converted. Losses of wetlands in arid areas are particularly detrimental to wildlife and have reached 52 percent in Nevada, for example.

Wetlands in the Central Valley of California have been reduced from more than 4 million to about 300,000 acres. The natural flooding of the remaining Central Valley wetlands has been eliminated by flood-control and water-development projects. Consequently, the wetlands must be managed by artificial and intentional flooding with scarce, expensive water. Seventy percent of these remaining wetlands are privately owned.

About 58.8 million acres (76 percent) of the nonfederal rangeland in the West need conservation treatments due to historic grazing that has rendered its condition inadequate for conserving soil and water. Grassland that cannot adequately conserve soil and water also is incapable of providing suitable wildlife habitat.

Wildlife Impacts

Eighty percent of the wildlife species in the West use the agricultural landbase. In Oregon, 134 species regularly occur only on lands where livestock grazing is the primary land use. The intensification of agriculture, especially in irrigated areas, has contributed to a 68-percent decrease in harvest of ring-necked pheasants, and a 60-percent decrease in the number of hunters since 1970.

In the shrub/steppe of the Northwest, Columbian sharp-tailed grouse populations have plummeted in recent years, as their breeding range has been reduced by more than 90 percent. Until the CRP established more than 1 million acres of undisturbed grass habitat in this area, this species was considered a likely candidate for federal listing as a threatened species.

The Central Valley of California provides wintering habitat for 60 percent of the waterfowl in the Pacific Flyway, nearly 25 percent of the continental waterfowl population. It is the primary wintering area for cackling Canada geese, the threatened Aleutian Canada goose and several other endangered species. Fifty-five percent of California's threatened and endangered species depend on Central Valley wetlands. These sensitive species now must survive on less than 10 percent of the wetlands that once supported them in the Central Valley.

Agricultural practices contribute to water-quality conditions adverse to aquatic wildlife. As a result of aquatic habitat impacts, more than half of the streams and rivers in Oregon do not support the full, expected range of beneficial public uses.

Impacts to streams and rivers from nonpoint source pollution, irrigation withdrawals and instream obstructions have caused disruptions to many populations of anadromous fish—those that spend most of their lives in the ocean but return to fresh headwater streams to spawn. Only 120 of more than 400 stocks of anadromous fish in the Northwest and California are secure, 214 are considered "at risk" and 106 are extinct. As of March 1994, four stocks were

federally listed as threatened or endangered. Several other subspecies of salmonids now are under consideration for listing. Many irrigation diversions impede passage of adult salmon attempting to return to their spawning grounds and juvenile salmon (smolts) as they migrate from spawning grounds to the ocean. Unscreened irrigation intakes capture and kill salmon smolts directly. Excessive withdrawal of water for irrigation reduces instream flows below critical levels necessary to support salmonids.

Recreational/Economic Impacts

Restoration of these declining wildlife populations to reasonable levels by voluntary habitat incentive programs would provide vast benefits to the people and economies of the West.

Restoration of 1980-level pheasant populations could double the economic value of pheasant hunting in the West. Money spent by pheasant hunters has declined from about $90 million dollars per year in 1980 to about $45 million in 1990. The decline of anadromous fisheries has had severe consequences for commercial and recreational fisheries industries throughout the West.

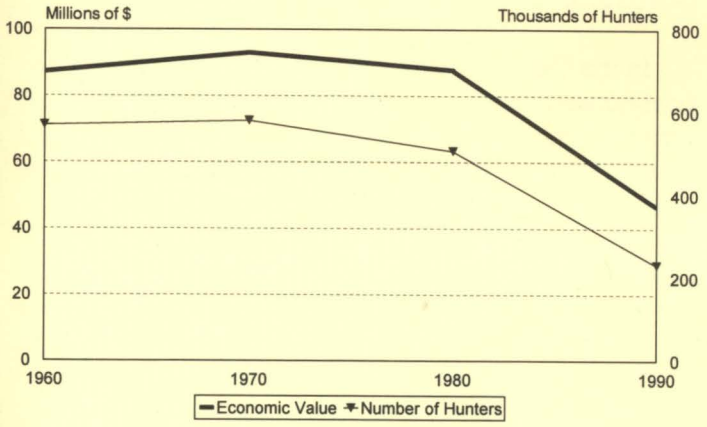


Figure 1. Economic value of pheasant hunting in the West. A large decline in pheasant populations has realized a 50-percent decrease in hunter expenditures from 1980 to 1990.

Coastal communities in Washington, Oregon and California experienced substantial losses due to reduced salmon harvests. In 1993, the total personal income value of commercial salmon harvest for coastal communities was $14million compared with an average of $75 million for the years 1976-1992. The 1993 recreational salmon harvest provided those same communities with $21 million in 1993, down from the 1976-1992 multi-year average of $39 million. Although agriculture was only one of many factors influencing that decline, improved agricultural practices are important to salmon restoration.

WILDLIFE GOALS

Shrub/Steppe and Grassland Species Goal:

- Restore Columbian sharp-tailed grouse to a level sufficient to justify its removal from the list of candidates for federal listing as a threatened species. Reverse population declines of other shrub/steppe wildlife species, such as sage grouse, long-billed curlew, lark sparrow and loggerhead shrike. Enhance local breeding populations of upland-nesting ducks in California's Central Valley.

Farm Wildlife Species Goal:

- Restore ring-necked pheasant populations to 1980 levels. Reverse population declines of other farm wildlife species.

Wetland-dependent Species Goal:

- Support a wintering population of 4.7 million ducks in California's Central Valley. Reverse population declines of sensitive and listed wetland wildlife species.

Aquatic and Riparian Species Goal:

- Stabilize and restore populations of threatened and endangered species such as Pacific salmonids. Meet state objectives for improving the quality of sport fisheries, especially resident trout. Reverse population declines of riparian species such as willow flycatchers and mountain quail.

Forest Species Goal:

- Reverse population declines of forest wildlife species, including native Hawaiian birds.

HABITATS NEEDED TO MEET GOALS

Shrub/Steppe and Grassland Objectives:

- Slow the conversion of native grassland and sagebrush habitat to cropland.
- Establish or maintain 3.6 million acres of relatively undisturbed grassland in large blocks (at least 80 acres), especially in the Palouse, within the range of Columbian sharp-tailed grouse and sage grouse, and in

important waterfowl nesting areas region- wide such as the Central Valley of California.

Improve condition of 1.5 million acres of private rangeland, especially within the range of Columbian sharp-tailed grouse and sage grouse.

Objective Specifics

Conversion of surplus, marginal cropland to grassland is critical to restoring and maintaining viable populations of Columbian sharp-tailed grouse in southern Idaho, northern Utah, eastern Washington and eastern Oregon. Successful population restoration can remove grouse from consideration for federal listing as a threatened species. Idaho has the largest existing grouse populations, which are dependent on CRP in the southeastern portion of that state.

Range management improvements needed include incorporation of grazing systems that feature rotation, deferment and rest components. Better livestock distribution will enhance range habitats and can be achieved by developments such as fencing and water delivery systems. Incentive programs should encourage exclusion of livestock from areas at high risk of resource damage and with poor recovery potential.

In the Central Valley of California, at least 110,000 acres of undisturbed upland grassland are needed. These grasslands should be near wetlands that are flooded during spring and summer.

Farm Habitat Objectives:

- ✧ Establish 2 miles of strip cover (field borders, filter strips and grass waterways) at least 20-feet wide per section (about 5 acres) of intensively farmed cropland.
- ✧ Develop and maintain at least three 10-acre blocks of multi-year (five-year minimum) permanent cover per section of intensively farmed cropland.

Objective Specifics

The vast majority of wildlife species in the West would benefit from practices which provide greater vegetative diversity in agricultural landscapes. Maintaining continuous vegetative cover on cropland and set-aside acres will help conserve soil and improve water quality while providing higher-quality habitat than bare soil in summer fallow fields.

Ring-necked pheasant and Hungarian partridge populations will increase dramatically with parcels of permanent cover interspersed throughout intensively cropped areas, especially where irrigation is common. Cover should be composed of dense grass and forbs or ungrazed wetlands and riparian areas.

Wetland Objectives:

- ✧ Protect existing functional wetlands.
- ✧ Restore the functions of 462,000 acres (10 percent of existing wetlands) of degraded wetlands, including 120,000 acres in the Central Valley of California.
- ✧ Flood 100,000 acres of rice fields in the Central Valley of California during winter.
- ✧ Provide spring/summer water for 50,000 acres of drained wetlands in the Central Valley of California.

Objective Specifics

The highest wildlife priority for wetland restoration in the West is the Central Valley of California. However, other priority areas include cienegas in Arizona, inland wetlands and brackish ponds in Hawaii, low elevation wetlands in Idaho, the Carson-Truckee, Humboldt and Walker River systems in Nevada, and Coos Bay marshes in Oregon.

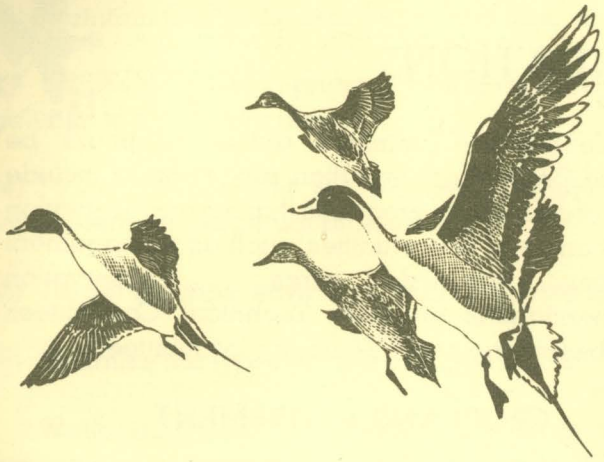
In the Central Valley, two major habitat needs are post-harvest flooding of rice fields for winter waterbird habitat and spring/summer flooding of drained wetlands that could provide waterbird breeding habitat.

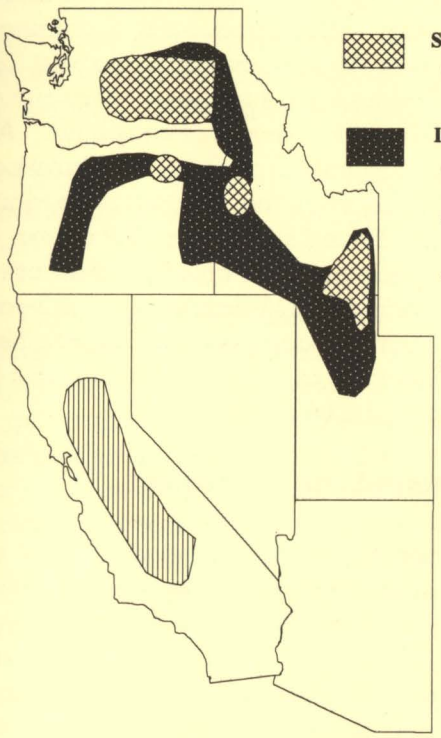
Forestland Objectives:

- ✧ Improve management of private forestland for fish and wildlife habitat by incentives to maintain mature forest conditions on: (1) 600,000 acres of forested riparian areas along fish-bearing streams; and (2) 2.7 million acres of forested uplands.
- ✧ Improve management of tropical forests in Hawaii.

Riparian/Aquatic Habitat Objectives:

- ✧ Install 7,500 fish screens on irrigation intakes.
- ✧ Remove or modify 600 irrigation-related barriers to passage of migrating fish.
- ✧ Restore 870,000 acres of privately owned rangeland riparian areas.
- ✧ Restore riparian habitat on at least 1 million acres (3 percent of current cropland acreage)





of small cropland floodplains in "hot spots" for aquatic wildlife.

- ✧ Develop and protect 27,300 miles (662,000 acres) of filter strips and woody riparian vegetation 100-feet wide on each side of streams that support anadromous fish.

Objective Specifics

The highest-priority aquatic habitats in the West are those that can or could support self-sustaining populations of salmon and other anadromous fish. The habitat objectives should be targeted to these streams and rivers.

Irrigation practices need to be optimized to meet the needs of aquatic ecosystems for minimum quantity, quality and timing of instream flows, to remove and prevent obstructions to fish passage, and to prevent entrainment of organisms into intake systems. Installation of fish screens on irrigation intakes and removal or modification of barriers to fish passage are mechanisms to enhance survival rates of salmon smolts enroute to the ocean.

Riparian habitat should consist of continuous corridors of shrubs and trees along streams to provide shade for the entire channel. Streambanks should be revegetated to the extent that less than 5 percent of their surface area consists of exposed soils.

Filter strips, especially in cropland areas, would improve the quality of water in these streams by trapping sediments in surface runoff, thus enhancing reproduction. Salmon spawning beds should consist of less than 20-percent fine sediments in the substrate. Filter strips should be established to vegetation that would provide aquatic benefits while also providing suitable habitat for farm wildlife.

FARM BILL RECOMMENDATIONS

Two major avenues are available for conserving wildlife in agricultural landscapes—best management practices and cropland retirement. The habitat needs of some species can be met entirely with proper use of BMPs. Other species thrive only on retired, relatively undisturbed cropland planted with appropriate cover types. Both are addressed in the objectives and recommendations of this report. Most existing conservation and commodity programs can be adjusted readily to benefit wildlife while maintaining the integrity of their intended purposes. Many of these adjustments can be made without additional financial expenses.

USDA ADMINISTRATION

Wildlife needs traditionally have not been among the priorities of USDA's farm programs. Consequently, many opportunities to accommodate wildlife in conservation and commodity programs have been missed. Adjustments to USDA policies and administration would foster an enhanced ability to recognize and react to such opportunities.

Recommendations:

(1) The 1995 Farm Bill should elevate wildlife to coequal status with soil conservation and water quality as USDA's primary conservation goals. Every conservation program, plan and action should consider wildlife habitat needs as seriously as soil and water conservation needs.

(2) The transfer of taxpayer funds to farmers should be based on comprehensive land stewardship, including wildlife, rather than on commodity production.

(3) NRCS, the USDA agency with technical resource management expertise, should administer all of USDA's conservation programs, including CRP and ACP.

(4) NRCS should be funded and staffed adequately to accomplish its conservation mandates.

(5) State Technical Committees, mandated under the 1990 Farm Bill, should be implemented and utilized fully by NRCS. These Committees should be given broader authority to develop priorities, guidelines and specifications that will appropriately tailor national USDA programs to meet local conservation needs. State Technical Committee authority should be extended beyond conservation programs to include aspects of commodity programs that have conservation implications and opportunities, such as management of annual set-aside acres. Conservation recommendations of State Technical Committees should be binding on CFSA county committees.

CROPLAND RETIREMENT

Past and present U.S. agriculture policies have, among other things, stimulated and sustained overproduction. Since 1954, an average of about 325 million acres have been planted to major crops out of a total of about 420 million acres of cropland. An additional average of 30 million acres of cropland per year has been idled during this period by various set-aside programs. Since 1986, when CRP began, a total of nearly 60 million acres of cropland has been idled or diverted by various USDA programs each year. This excess production capacity is being maintained largely on unsuitable land at an unnecessary cost to the nation's natural resources.

Long-term Land Retirement

Many environmental and wildlife needs cannot be met without a sensible approach to reducing excess production capacity through long-term idling of surplus cropland. From a natural resources standpoint, there are good and bad ways to idle cropland. Annual land-retirement programs, such as the ACR, have been managed so poorly as to provide few or even negative environmental benefits. Long-term land retirement, such as provided by CRP, Water Bank and WRP, has proven to provide substantial environmental benefits while helping control commodity surpluses.

Conservation Reserve Program

CRP has restored more wildlife habitat and enhanced more wildlife populations than any action ever taken in this country. Ironically, these valuable results were incidental to its primary supply-control and erosion-reduction objectives.

Recommendations:

(1) Transfer CRP administration to NRCS, with program priorities and guidance from State Technical Committees.

(2) Maintain CRP at least at its current size.

(3) Wildlife should be a primary goal, to ensure greater benefits to this public resource.

(4) Place greater, but not exclusive, emphasis on longer-term or perpetual protection.

(5) Target the most environmentally valuable sites.

(6) Optimize the types of land enrolled in CRP.

Wetlands should be accepted, along with optimal amounts of associated uplands. Increase CRP's use along streams, drainage and irrigation ditches, and riparian areas where water quality and aquatic species' populations are degraded. Allow partial field enrollments, including large blocks of land and strips.

(7) Establish higher-quality vegetative covers that provide suitable habitat and perform other important functions.

Vegetative covers unsuitable for habitat—such as fescue, Bermudagrass and loblolly pines—should not be permitted in publicly funded conservation programs. In general, native vegetation—preferably grass/forb mixes—should be emphasized in place of tame grass monocultures, and mixed hardwoods should be planted instead of monoculture pine plantations. Existing unsuitable covers should be upgraded on renewed contracts. Wildlife food plots should be allowed.

(8) Improve vegetation management.

The habitat value of even suitable grassland vegetation types can decline if left undisturbed for a few years. However, to benefit wildlife, disturbance must be conducted carefully. Judicious management should replace emergency exploitation of CRP forage. Emergency uses of CRP forage, as conducted in the past with little control or foresight, usually are harmful to wildlife and should be abolished. Likewise, weed control should be allowed only to the extent necessary to control state-designated noxious weeds. Management activities could include strip disking, burning, mowing, or *limited* haying and grazing.

Water Bank Program

The Water Bank Program performs unique and valuable functions. In the Central Valley of California, less than 10 percent of the original wetlands remain. Because of extensive hydrologic modifications, practically all of the remaining wetland acres must be flooded artificially. The Water Bank provides almost all the water available in those wetlands during the breeding season.

In the Prairie Potholes, Water Bank provides an optimal 3:1 upland/wetland ratio targeted to encompass entire wetland complexes. Neither CRP nor WRP have been implemented consistently to protect functioning prairie wetland ecosystems fully and effectively.

Recommendations:

(1) The vital functions of the Water Bank must be maintained and expanded.

Wetlands Reserve Program

WRP performs functions that are critical to achieving a sufficient net gain in wetlands acreage.

Recommendations:

(1) Fully fund WRP and expand it to all states.

(2) Targeting should be designed more carefully to help achieve wildlife restoration goals.

(3) WRP should offer less-than-perpetual easements, with proportionally reduced compensation.

(4) Farmed wetlands should be eligible where justified by a sufficient net resource gain.

(5) The interdependence between wetlands and associated uplands should be acknowledged in some areas, such as the Prairie Pothole region, by allowing sufficient upland buffer areas to protect the wetlands and provide nesting habitat.

Environmental Easement Program

If EEP were implemented and funded, as authorized in the 1990 Farm Bill, it could provide functions that filll an important gap between CRP and WRP.

Recommendations:

(1) EEP should be reauthorized and implemented to protect native prairies, riparian areas, wetlands, buffer strips along drainage and irrigation ditches, and other unique wildlife habitats in farm landscapes.

Farmers Home Administration Easements

The FmHA's debt restructure and wetland easements can provide the public with meaningful

environmental returns on its money invested in struggling farmers.

Recommendations:

(1) Both of FmHA's easement programs should be retained and implemented more aggressively.

(2) All lands being sold by FmHA, regardless of whether the lands officially are considered "in inventory," should be subject to easements on environmentally sensitive areas.

Short-term Land Retirement

The Acreage Conservation Reserve

The ACR, a short-term (generally annual) cropland set-aside program, is of little, no or even negative value for wildlife as it has been administered by USDA for decades. The acreage idled under ACR varies drastically from year to year, inhibiting proper vegetation management. Considering that many millions of acres, on average, are idled through this program each year, the potential benefits to wildlife are tremendous.

Recommendations:

(1) ACR should be eliminated and replaced with long-term retirement programs.

(2) If the ACR is not eliminated, it should be replaced largely with multi-year (three- to five-year) set-asides. The multi-year set-aside acres should be planted to or allowed to grow up in suitable cover types that are self-sustaining and undisturbed for three to five years.

(3) Any remaining acres that are to be idled annually must be properly managed to prevent erosion, provide wildlife benefits and improve water quality.

Needed changes in administration and management of annual set-aside acres include:

- enforcing conservation provisions;
- eliminating unnecessary mandates to control weeds that are not state-designated as "noxious";
- permitting ACR and multi-year acres to be arrayed in linear strips, such as field borders and filter strips, where such strips would benefit wildlife;
- ensuring that covers are planted at appropriate times;
- maintaining continuous vegetative cover; and
- eliminating the inspection fee for wildlife food plots.

BEST MANAGEMENT PRACTICES

Swampbuster

Swampbuster has been tremendously valuable to wetland-dependent wildlife. The rate of wetland losses to agriculture has declined substantially since Swampbuster made USDA subsidies conditional upon protecting existing agricultural wetlands. If Swampbuster is weakened or eliminated, the Corps of Engineers is unlikely to be able to shoulder the burden of protecting the nation's agricultural wetlands. Hence, the nation's goals for restoring wetland-dependent wildlife likely would not be met, and widespread population declines would continue.

Recommendations:

(1) Swampbuster must be retained and not weakened.

(2) Swampbuster should be enforced more consistently and effectively.

Conservation Compliance

Conservation compliance benefits aquatic wildlife by reducing sedimentation of surface waters. However, sedimentation rates have not been reduced sufficiently in many areas due to weakening of the erosion control objectives of the program. In addition, myriad opportunities to achieve terrestrial wildlife benefits have been neglected.

Recommendations:

(1) The soil loss tolerance rate, "T," should be re-established as the minimum standard for farming operations.

(2) Alternative Conservation Systems should be phased out within five years.

(3) Greater emphasis should be placed on conservation plans stressing the planting of wildlife-beneficial vegetative species that still will accomplish soil and water conservation objectives.

Sodbuster

Sodbuster was intended to reduce the conversion of native prairie to highly erodible cropland by requiring that a conservation plan be implemented upon conversion. However, extensive prairie conversion has continued simultaneously with implementation of CRP. Continued loss of native prairie will prevent the attainment of goals for stabilizing and restoring prairie wildlife.

Recommendations:

(1) Sodbuster should be strengthened to stem the conversion of native prairie to cropland.

(2) CRP participants and operators should be prohibited from converting native grassland to cropland.

Water Quality Incentives Program

The functions of WQIP reduce sedimentation and, therefore, are vitally important to aquatic wildlife. WQIP also could, and should, be beneficial to some species of terrestrial wildlife.

Recommendations:

(1) Transfer WQIP administration to NRCS, with program priorities and guidance from State Technical Committees.

(2) WQIP should be continued in the 1995 Farm Bill, fully funded and aggressively implemented.

(3) Water-quality plans should incorporate benefits to terrestrial wildlife whenever possible.

Agricultural Conservation Program

ACP cost shares conservation practices deemed worthwhile by local farmer committees. Inadequate targeting and prioritization have hampered ACP's achievement of measurable wildlife benefits. Nevertheless, a cost-share program of some type which will foster conservation practices on active agricultural land is vital to providing meaningful wildlife benefits.

Recommendations:

(1) Transfer ACP administration to NRCS, with program priorities and guidance from State Technical Committees.

(2) Foster new, innovative wildlife conservation practices, such as:

- flood harvested rice fields in the Mississippi Delta and Central Valley of California to reduce soil and nutrient loss, and provide winter habitat for waterfowl and other wetland birds;
- convert cool-season grass pastures to warm-season grasses in the Northeast, Southeast, Midwest and Southern Great Plains to dramatically improve habitat value for many grassland species;
- install beaver dam flow regulators in the Northeast and Southeast to allow beaver ponds to be maintained at levels that do not interfere with agricultural activities;
- maintain crop stubble through autumn and winter in the Southern Great Plains to provide significantly better habitat than bare soil; and
- improve grazing management of private pastures and rangeland across the country to enhance the value of those acres for wildlife.

Watershed Protection and Flood Prevention Program

The PL-566 program could be very effective at restoring watershed functions and improving water quality. However, for decades it has been implemented in ways that, overall, have been detrimental to aquatic and wetland wildlife.

Recommendations:

(1) Ongoing transformation of the PL-566 program needs to continue or the program should be eliminated. It should utilize predominately non- structural, vegetative practices and emphasize wetland and aquatic ecosystem restoration.

PRIVATE, NON-INDUSTRIAL FOREST PROGRAMS

The Forestry Title of the Farm Bill is an effective route to influence the use and management of PNIF. The two Stewardship programs (Stewardship Incentive and Forest Stewardship) have made positive wildlife and other natural resource accomplishments by fostering management of PNIF that considers multiple resources beyond just board and fiber production.

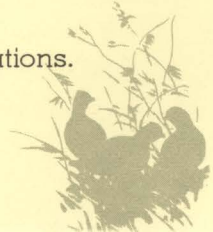
Recommendations:

(1) The two Stewardship programs and the Forest Legacy Program should be retained and expanded.

(2) Cease using taxpayer dollars to subsidize high cash-value monoculture tree farms which provide limited public benefits and for which adequate market incentives already exist. Use public funds instead to promote forest practices—such as restoration of mixed native hardwoods or long-leaf (instead of loblolly) pines—that provide broader public benefits and for which market incentives are insufficient.

(3) Provide a demonstration of sustainable tropical forestry in Hawaii, along with incentives to implement management of tropical forestland.

(4) Encourage longer (sawtimber) rotations.



(5) Promote controlled burning as a management tool.

(6) Eliminate the 25-percent limit on SIP funds eligible for use on forest management plans.

(7) Allow states to provide some SIP cost-share funds.

(8) Require landowners to reimburse SIP funds if conversion to non-forest use occurs within 10 years.

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