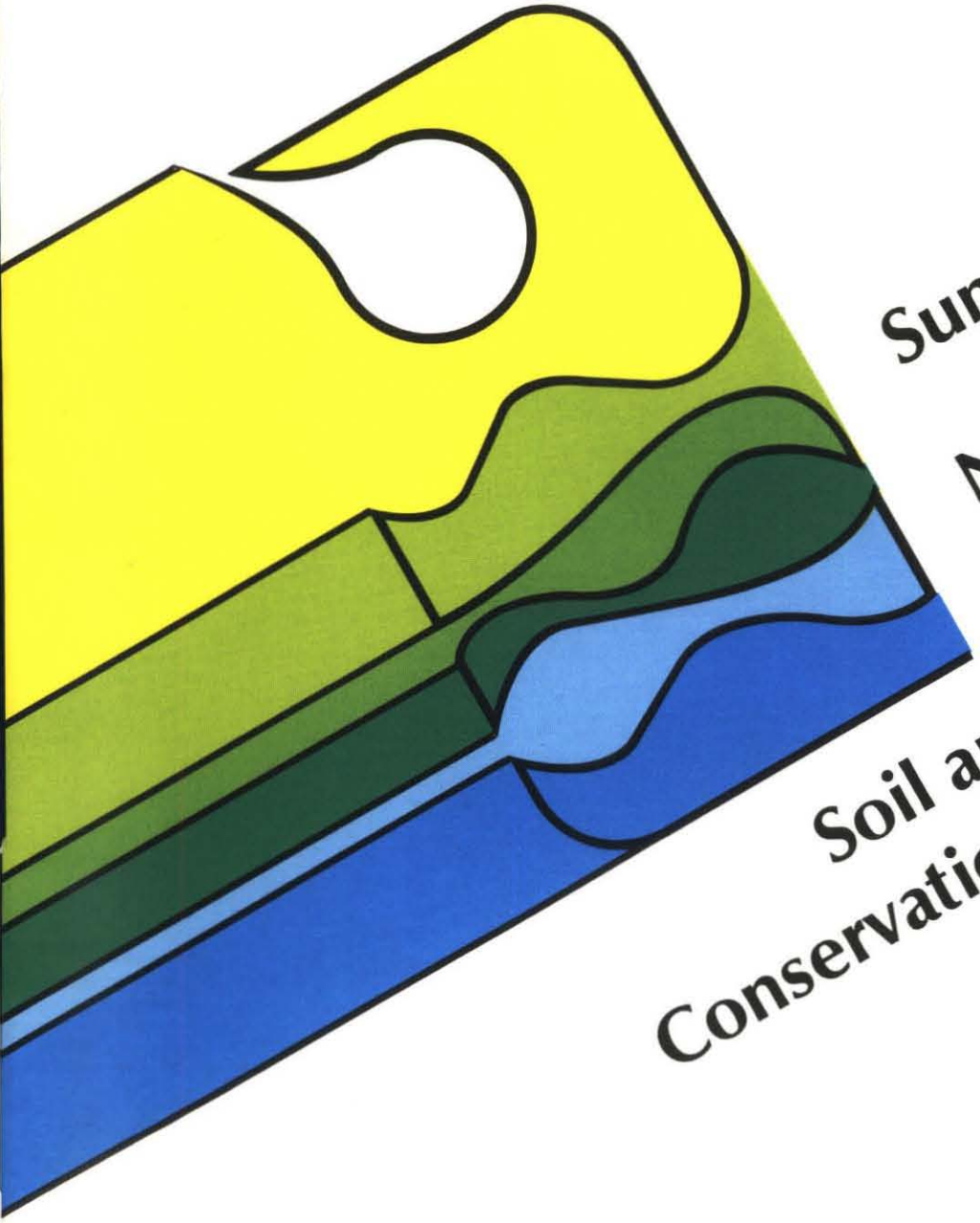

Summary of the Nebraska Soil and Water Conservation Strategy

Nebraska Natural Resources Commission

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STATE OF NEBRASKA

State Water Planning and Review Process

SUMMARY OF THE NEBRASKA SOIL AND WATER CONSERVATION STRATEGY

Nebraska Natural Resources Commission

February 1986

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Photographs in this report were provided by the Natural Resources Commission, Soil Conservation Service, Game and Parks Commission, State Historical Society, University of Nebraska, University of Nebraska-Lincoln Cooperative Extension Service, Nebraska Farmer Company, and Andrew Aandahl.

Foreword

Nebraska is blessed with abundant soil and water resources. These natural resources have been developed and used by industrious people during the state's brief history to make Nebraska a leader in agricultural production. This progress and success, however, has come at the expense of resource depletion.

The notion that Nebraska's natural resources could be exhausted was foreign to early settlers. They saw endless prairie, and recognized the promise which the state's lands held for agriculture. As a result, settlement in Nebraska was rapid. By the turn of the century, hardy pioneers had plowed nearly 15 million acres of virgin prairie. Federal settlement programs and the demand for grain increased cultivated acreage to over 20 million acres by the end of World War I.

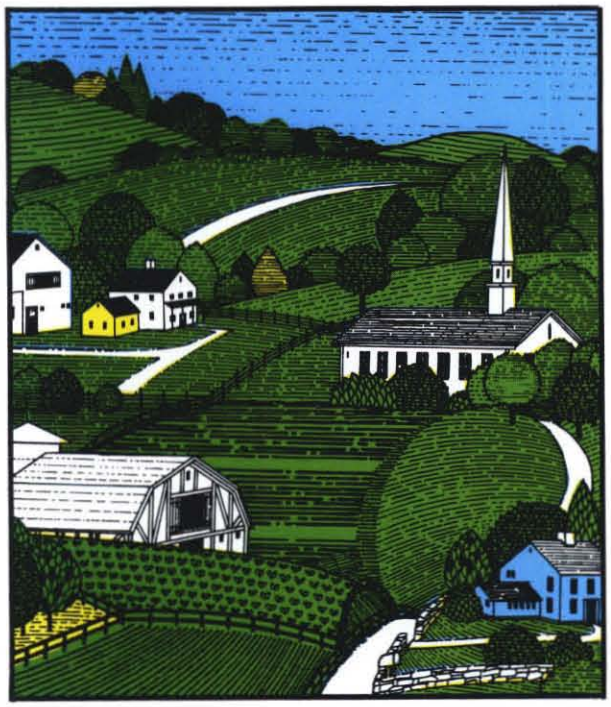
With the depression and drought of the 1930's came a realization that 'a lotta this land shoulda never been plowed up.' Half of the organically rich layer of topsoil had washed or blown away in one lifetime. For the first time in this country's history many people recognized that there were no new frontiers--we needed to take care of what we had.

Federal soil and water conservation programs which began in the mid-1930's were quickly linked to local and state efforts. These programs continue to be effective today. About 60 percent of the agricultural land in the state is now adequately protected--all on a voluntary basis. The lands on which soil continues to erode excessively, irrigation water is wasted or range and pasture are not properly grazed are the focus of the Soil and Water Conservation Strategy.

The Strategy respects private property rights, but it also acknowledges that occasionally a part of those rights need to be sacrificed for the common good. When productive soil becomes damaging sediment and a pollutant, or when a water supply is diminished or contaminated, the resulting problems represent a concern to society as a whole.

The impacts of this trade-off between private property rights and the common good are weighed in the Strategy. The impacts of past and current policies are also examined. The Strategy then looks to the future, and its long-range planning confirms the need for concern, cooperation, and commitment by all farmers, ranchers, units of government, interest groups, and citizens across the state.

The Strategy proposes a commitment today to influence a better tomorrow.



This publication is one of a set of publications on the State Soil and Water Conservation Strategy. The set includes:

A. Report on the State Soil and Water Conservation Strategy-1986.

B. Summary of the State Soil and Water Conservation Strategy.

C. Action Plan for Implementation of the State Soil and Water Conservation Strategy.

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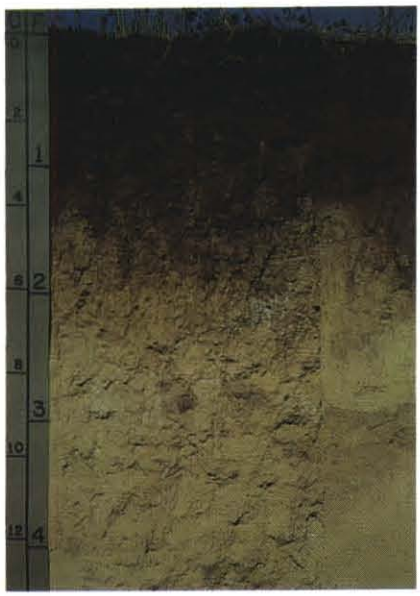
Chapter 1

EROSION, MISMANAGEMENT, AND CONSERVATION



The dark, rich topsoil is the layer most often eroded and lost.

Fertile soil and clean water--few Nebraskans would argue the importance of these two resources to our lives and our state. Yet, our waterways are often muddied by soil which has been washed off the fields by rainfall or excess irrigation water. This erosion, in addition to contributing pollutants to streams, is especially damaging because it removes mostly topsoil, the most productive layer in the soil profile. Topsoil is a renewable resource, but nature replenishes it much more slowly than it is being removed from many fields.

Nebraskans can take pride in the fact that about 60 percent of our land is adequately protected from excessive erosion. Now we must renew our efforts to protect the remaining 40 percent.

EROSION AND MISMANAGEMENT

Since the pioneers first broke the prairie sod, excessive amounts of fertile soil have been eroding from unprotected land. Instead of holding the rain where it falls, unprotected lands allow too much water to run off. In addition to causing the loss of soil, fertilizer, and pesticides, this water represents a lost opportunity, because it is not stored in the soil root zone where it would later help produce crops. On irrigated lands, this means that more water must be taken from streams or pumped from wells to make up for what is lost. More irrigation means more water lost to evaporation, unproductive plants, or streams.

The land does not have to be plowed to become erosion prone. Overgrazing grassland will not only reduce its productivity, it will eventually result in erosion, by either water or wind, that will completely destroy its ability to produce.

This kind of mismanagement of our soil, water, and rangeland resources results in irretrievable losses to the landowner and every other Nebraskan as well. Everyone shares in the loss, and everyone must take part in conserving these resources to be successful in preserving the quality of life they provide.

Muddy water from eroding fields carries sediment and other pollutants to streams.

WATER EROSION

Erosion by water may be caused by rainfall or snowmelt, or by human activities, such as irrigation. Raindrops falling on bare soil dislodge soil particles, which are carried away in runoff water. 'Sheet' erosion removes a thin but fairly uniform layer of soil. This type of erosion is barely visible,

recognized only by muddy runoff and the resulting sediment bed at the base of the slope. Erosion of this type is the most widespread, yet it is easy to overlook and hard to recognize as a serious problem.

As runoff water moves in sheets down a slope, it gains momentum and begins to concentrate, forming channels 2 to 4 inches deep. This 'rill' erosion is nearly always present below areas of sheet erosion. Once the water has concentrated, recurring runoff follows the same rills. This deepens them into 'ephemeral' erosion which is characterized by channels from 4 to 18 inches deep. If left unchecked, ephemeral erosion will turn into gullies.

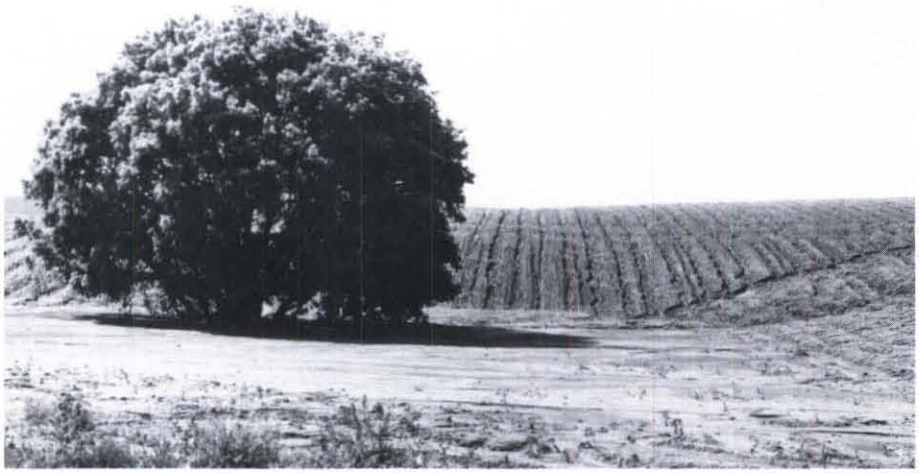
'Gully' erosion is the most visible type of erosion and is typified by ditches greater than 18 inches deep. Once started, gullies can grow deeper and wider very rapidly because the gully cuts below the level where organic matter and soil structure help to hold the particles together. Contrary to popular belief, the lack of gullies in a field does not mean there are no erosion problems. Most soil is removed by sheet, rill, and ephemeral erosion, not by gully erosion.

Erosion by water takes place on rangeland as well as on cropland. Continuous overgrazing on rangeland reduces the vegetative cover, decreases productivity, and eventually permits erosion to take place. On heavier rangeland soils, runoff increases and starts sheet erosion. The runoff then concentrates in cattle trails and swales to cause gullies.

WIND EROSION

Wind blowing over bare, dry soil dislodges soil particles, causing them to collide with one another. Particles are eventually reduced in size enough to be carried aloft. This type of erosion removes the nutrient-rich topsoil just as surely as water erosion.

The Dust Bowl of the 1930's was a dramatic example of the devastating effects of wind on bare, dry soil. Although our wind erosion problems



Sheet, rill, and ephemeral erosion remove the most topsoil and deposit sediment that damages crops, roads, and the environment.

Gully erosion is easy to recognize and difficult and expensive to control.

Sandhills 'blowouts' caused by wind erosion may take years, even decades, to heal.

today don't match those of the 1930's, wind can cause serious erosion, especially in western Nebraska. Once started, it is nearly impossible to stop this type of erosion until the wind stops blowing and ground cover can be reestablished.

Nebraska's 23 million acres of rangeland, including 11 million in the Sandhills, are also susceptible to this type of erosion when left without proper ground cover. On sandy rangeland soils, blowouts occur where the wind moves the sand, cutting off and covering plants until significant areas are devoid of vegetation.

Accelerating soil and water conservation would help reach the national goal of fishable, swimmable waters sooner.

EROSION DAMAGES

Erosion caused by poor land and water management affects everyone in Nebraska. It affects farmers and ranchers directly through the loss of productivity on farmland and rangeland. Productivity of farmland decreases with the loss of structure, organic material, and nutrients in the topsoil. Rangeland productivity declines with continuous overgrazing and then erosion permanently reduces the productivity of the grass and other forage plants.

Erosion also affects landowners through increased production costs. Farmers may be able to offset losses of topsoil with additional fertilizer and irrigation water, but continued erosion eventually causes production costs to increase. Overgrazed rangeland produces less forage, increasing the cost of inputs to maintain production.

Other damages caused by erosion directly affect the public. Part of the soil washed off fields is deposited in road ditches and culverts, preventing them from carrying away drainage water. This can result in increased flooding, and damages to roads, utilities, and crops. Some of this soil is carried beyond the ditches and culverts and into our streams, lakes, and reservoirs. If deposited in streams, it reduces the waterway's capacity to carry water. In lakes and reservoirs, it reduces water storage capacity. The rest of this once-productive soil remains in the water as suspended sediment--the major surface water pollutant in Nebraska.

In addition to these damages, sediment causes more problems by carrying other pollutants into our waterways. These include organic compounds, nitrogen, phosphorus, pesticide residue, and pathogens. These pollutants make water less desirable for municipal supplies, recreation, industrial consumption and cooling, and aquatic wildlife. Holmes Lake in Lincoln is an example of this type of impact. This lake is polluted by sediment, which limits the kinds of recreational activities it can be used for. Public use of many of our streams, lakes, and reservoirs is limited or denied due to similar pollution by sediment.

MISMANAGEMENT OF WATER

Water from several sources is often managed improperly. The first source is the most abundant and widespread--precipitation. The other sources are streamflow and groundwater.

More water runs off where rain falls on unprotected or inadequately treated land. This allows less water to soak into the soil, reducing the amount stored in the root zone for later use by plants.

In many places, crops and lawns are irrigated to make up for a lack of moisture in the soil. When rainfall is not stored, more irrigation water is required to replenish the soil moisture. Also, the water diverted or pumped for this purpose is not always used efficiently, so the demand on the source is even greater.

Excess water is often applied to lawns in cities and crops on farms. Some of this excess is lost through evaporation when lawn sprinklers or center pivots are operated during the hottest, windiest part of the day. In other cases, excess water applied by lawn sprinklers or gravity irrigators is carried away by gutters in city streets and county road ditches. In some cases, it is recaptured to be used again, but much of it flows away in rivers and streams.

WATER MISMANAGEMENT DAMAGES

Where less water infiltrates and is stored in the soil, crops suffer greater and more frequent deficiencies in soil moisture. Insufficient soil moisture causes crop stress, lowers yields, and reduces income. On irrigated lands, more water must be applied to make up for the water that runs off. If irrigation is mismanaged, the damage is compounded. Over-irrigating not only wastes valuable water and increases erosion, but also uses more energy, which increases the irrigator's costs. If the source is groundwater, excessive pumping can cause depletion of the groundwater supply, which lowers the water table. This costs the irrigator even more because water must be pumped from greater depths and wells may need to be deepened.

Over-irrigation can also waste fertilizer and pesticides, causing groundwater pollution. Agricultural chemicals that are applied but not used by plants may dissolve and move downward into the groundwater. This 'leaching' can occur in nearly any type of soil, but is more rapid on irrigated, sandy soils. These chemicals, principally fertilizer nitrates, may then pollute the drinking water supplies of nearby farms and towns. Nitrate levels exceeding the Department of Health's safe drinking water standards have been measured in the water supplies of more than 30 Nebraska towns. In some cases, wells have been shut down, and towns have been faced with the problem of finding new drinking water supplies. Whenever nitrate levels exceed the standards, the town must provide bottled water for children less than six months old.

CONSERVATION BENEFITS

Soil and water conservation benefits are shared by all Nebraskans, either directly or indirectly. Among soil conservation benefits are proven economic returns. Water management benefits include improved groundwater and surface water quality.

The present generation has the opportunity to preserve these resources to achieve benefits for themselves, and at the same time, to provide for future generations. This opportunity has never been greater. Each day that passes finds less fertile soil to save and less clean water to protect.

SOIL CONSERVATION BENEFITS

The economic benefits of conserving and protecting our soil and water generally exceed the associated costs. A watershed in southeast Nebraska was studied by the Soil Conservation Service (SCS) to determine the effects on net income of applying land treatment to soils eroding at 31 to 40 tons per acre per year. The results showed an increase in income of $84.50 per acre each year when projected over a 50-year period. In Missouri, SCS calculated that average annual benefits from applying 15 different conservation systems on four different slope groups could vary from $118 to $161 per acre every year over a 75-year period.

Several years ago, SCS estimated that $335 million worth of potential production increases and/or cost reductions could be realized annually in Nebraska by the application of soil and water conservation practices. This is the average loss to individual landowners, and to the state as a whole, every year it continues. The longer action is delayed, the greater the losses will be.

Conservation and good management provide economic and environmental benefits to all Nebraskans.

WATER MANAGEMENT BENEFITS

Water quality in Nebraska's streams and lakes will improve if conservation practices are applied. These practices can reduce runoff, which would reduce the amount of soil eroded into our waterways. By doing so, they would also prevent the transport of pesticides and other agricultural chemicals into our surface water. As much as 95 percent of these 'invisible' pollutants could be kept out of our waterways by holding soil and water on the fields.

Groundwater quality also can be protected by water conservation practices. Good management of irrigation water combined with soil conservation practices will greatly reduce the incidence of nitrates and pesticides leaching out of the root zone and into our groundwater supply. Since most Nebraskans rely on groundwater supplies for their drinking water, accelerating conservation now would help preserve the quality of this vital resource far into the future.

Water conservation measures also produce economic benefits because more efficient use of irrigation water and precipitation can reduce production costs. Less pumping for irrigation is required, and fertilizers and pesticides are used more efficiently and wasted less often. Cutting waste and increasing efficiency reduce costs for the wise producer willing to implement water management measures.

Conservation and good management will help make our surface water and groundwater safe to drink.

A STRATEGY FOR IMPROVING MANAGEMENT

The good soil and water stewards in Nebraska are responsible for the vast amount of land in the state which is adequately protected and responsibly managed. The land which remains unprotected suffers damage that must be as apparent to its owners and managers as it is to good stewards, but for some reason they have not made the necessary commitment to conservation action. Something more is needed to accelerate adoption of effective management and conservation by these people. A State Soil and Water Conservation Strategy has been developed to accomplish this.

DEFINITION OF THE STRATEGY

Effective means of management and conservation have been devised and proven, but adoption has been slow. The Soil and Water Conservation Strategy has been developed to accelerate the rate at which additional conservation land treatment, range management systems, and water use efficiency practices are applied in total resource management systems. The Strategy identifies problems and remedies; presents potential actions and alternatives; and makes recommendations for action by the Governor, Legislature, various state and federal agencies, and landowners.

The Strategy is the culmination of a process of examining and evaluating conservation efforts. It is detailed in the full report and summarized in this document. The Strategy will be supplemented with an Action Plan for implementation, which will be kept current through continuous monitoring and revision to track progress. It will become a continuing part of the State Water Planning and Review Process.

Reports on the Strategy will be published periodically to keep it up to date and improve its coverage. For several years, at least, it will be published biennially. This first report concentrates on soil conservation. The following ones will focus more on water conservation and water use efficiency.

DEVELOPMENT OF THE STRATEGY

The Strategy was developed under the leadership of the Natural Resources Commission (NRC) with assistance from the SCS, and input from natural resources districts (NRD's) and the public. Its initiation

was approved and the work was organized in the fall of 1983. Committees were formed and an SCS employee was assigned to the NRC to work on the Strategy. Meetings were held with NRD directors and staff, local SCS employees, and others with an interest in the Strategy to get their input. A symposium was held in February 1985, which included extensive public involvement, national speakers, and small discussion groups.

The NRC and the SCS cooperated with many state and federal agencies to develop the Strategy. The action items, the key to this Strategy, were developed through negotiations with the following agencies: the Board of Educational Lands and Funds, Nebraska Department of Education, Nebraska Department of Agriculture, and natural resources districts. In addition, the heads of many state agencies or their designated representatives served on an executive committee which oversaw and coordinated the development of the Strategy.

Interested citizens, state officials, and nationally recognized speakers contributed to the Strategy at the 1985 Soil Symposium.

Chapter 2

EROSION AND CONSERVATION IN THE PAST

Early agricultural practices in Nebraska left the soil exposed to wind and water.

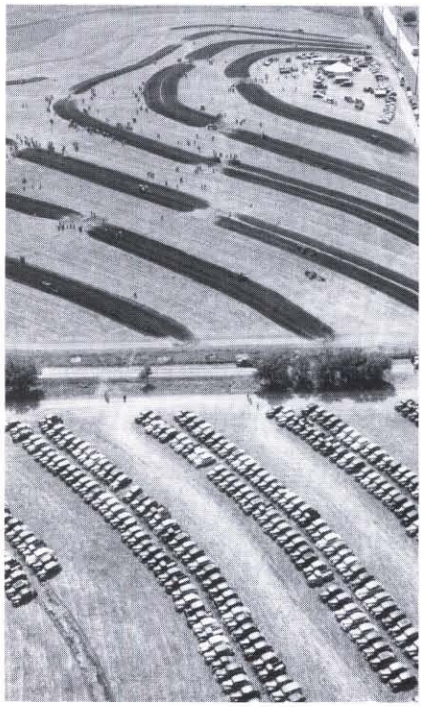
Erosion has threatened every civilization since the beginning of agriculture 8,000 years ago. Many ancient civilizations did not even recognize that mismanagement of their soil and water resources was a serious problem. Erosion, waterlogging, and accumulation of salts in the soil over decades or centuries produced a 'slow-motion disaster' that led to the declines of some great civilizations, including those of Phoenicia, Babylon, Greece, and the Roman Empire. The Greek philosopher Plato commented in 380 B.C. that 'the land is like the skeleton of a sick man, all the soft earth having wasted away leaving only the bare framework.'

Early settlers in this country, and many of those who followed, paid little more attention to erosion than the ancient Greeks. Land was plentiful in the west and they could move on if theirs became 'worn out.' By the 1930's, much of the Midwest was being intensively farmed without benefit of conservation measures and erosion was severe. The nation was in the midst of its worst depression, and prices paid to farmers for their products were severely depressed when drought hit the Midwest. Drought, the Dust Bowl, and the depression forced many farmers to abandon their land, leaving behind an enormous erosion problem.

The dust storms of the 1930's darkened the skies from the Great Plains to the nation's capitol.

HISTORIC CONSERVATION PROGRAMS

The first steps by the federal government toward controlling the nation's erosion problems were taken in the late 1920's and early 1930's. In April 1935, after skies over Washington had been darkened by midwestern dust storms, both houses of Congress unanimously passed the Soil Conservation Act. This act and subsequent legislation established the principal federal agencies that implement federal conservation programs.



Nebraska was an early leader in soil and water conservation.

SOIL CONSERVATION

The SCS, which was established by the Soil Conservation Act, sponsored many demonstration projects throughout the country, including three in Nebraska. Landowners agreed to carry out land use practices, including crop rotation or cover crops. They also contributed some of the labor and materials needed to install erosion control measures including terraces, diversions, contour furrows, check dams, and strip cropping. The SCS furnished the technical design and layout, and labor and materials which the landowner could not furnish. The Agriculture Stabilization and Conservation Service (ASCS) was established in 1936 to administer the Agriculture Conservation Program. It provided, and still offers, cost-sharing payments for installing conservation practices.

Limitations in the demonstration project program made it apparent that this soil conservation program could be more effective if carried out through local conservation districts. Nebraska began forming local districts in 1938, and was the first state west of the Mississippi to complete the task 12 years later.

By the 1940's, terraces were a common feature of conservation systems. Contour farming and grassed waterways were also gaining acceptance in the fight against soil erosion. Early research on stubble mulch farming (now called conservation tillage) began in the late 1940's at the University of Nebraska.

A pilot watershed program, begun in Nebraska in 1952, offered a new approach to management of small watersheds. The success of this new program resulted in passage of the Watershed Protection and Flood Prevention Act in 1954. This act promoted the use of land treatment on individual farms to control erosion, and larger floodwater retarding structures to control erosion and flooding in the watersheds. The Great Plains Conservation Program, established in 1956, offered additional assistance for a wide range of practices in the semi-arid, western two-thirds of the state. This broad spectrum of programs provided landowners in Nebraska a full range of conservation practices for all land uses, allowing the state to maintain its leadership in conservation and watershed programs.

The 1960's witnessed trends toward farm consolidations, larger tillage equipment, and monoculture cropping systems, forcing changes in some older practices. Less strip cropping was used, and many small terraces were either replaced with bigger terraces, to accomodate the larger tillage equipment, or were farmed over. Conservationists switched their emphasis to larger terraces, parallel terraces, and tile drained terraces.

Another system that evolved during the 1960's and 1970's was conservation tillage. For centuries it was necessary to control weeds by tilling the soil, but that was changed by the development of selective herbicides to control weeds. Research demonstrated that tillage operations could be reduced, leaving much of the previous year's crop residue on the surface to protect the soil, while yields were maintained. Further research has shown that for many soils, tillage can be eliminated.

Conservation tillage, which includes many reduced tillage systems, can reduce erosion by as much as 75 percent and still maintain or improve yields. It has become the single most important practice for managing water from precipitation and controlling wind and water erosion. While it will not always reduce erosion to the rate at which soil can be replenished, it is a very important first step in complete resource management systems.

Even with the proven benefits, acceptance of conservation tillage was slow until the 1970's, when increasing costs of fuel and labor made this practice a more popular alternative. Since fuel costs have stabilized, acceptance has leveled off.

Conservation tillage can save soil, reduce costs, and maintain good yields.

CONSERVATION TILLAGE?

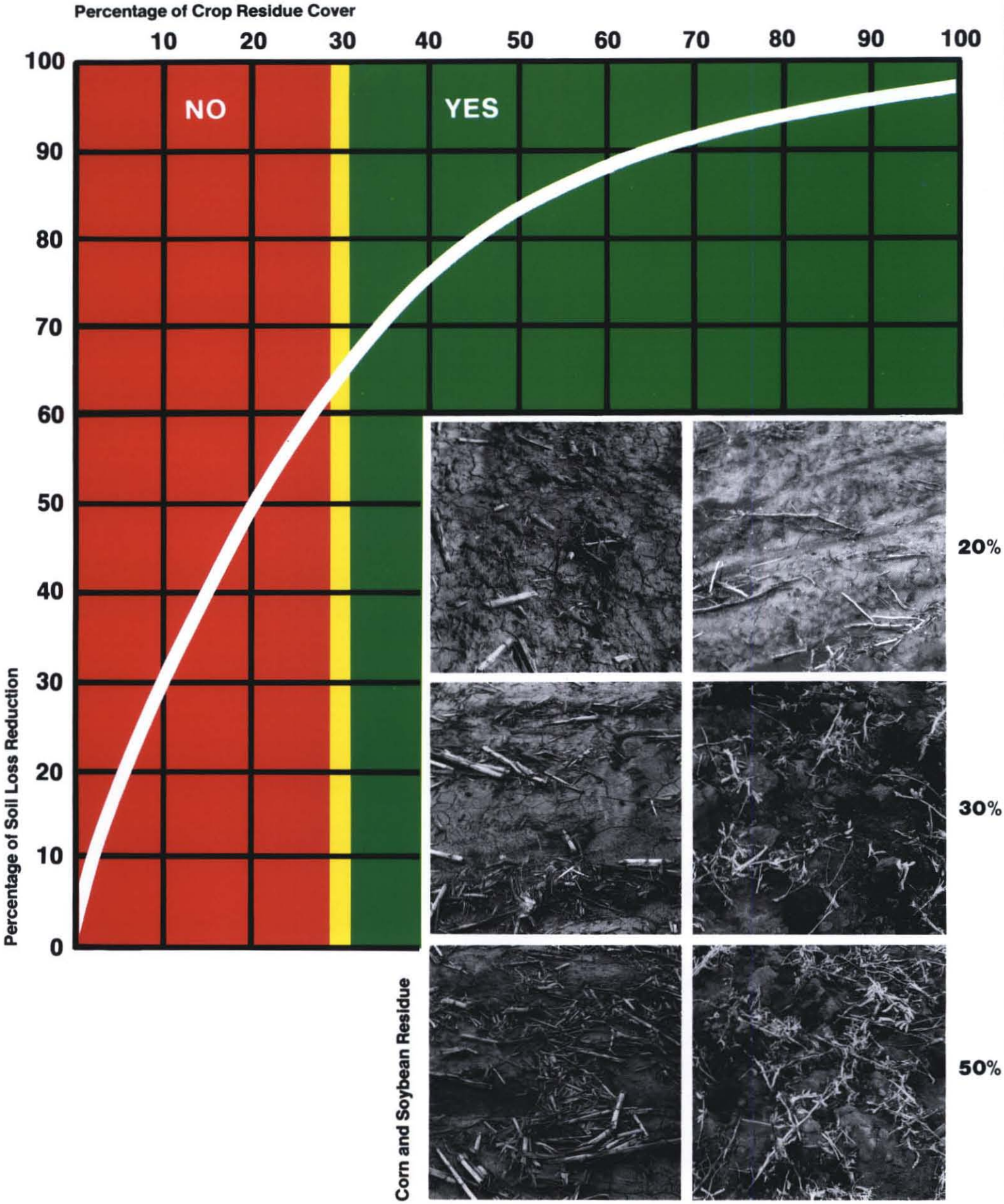
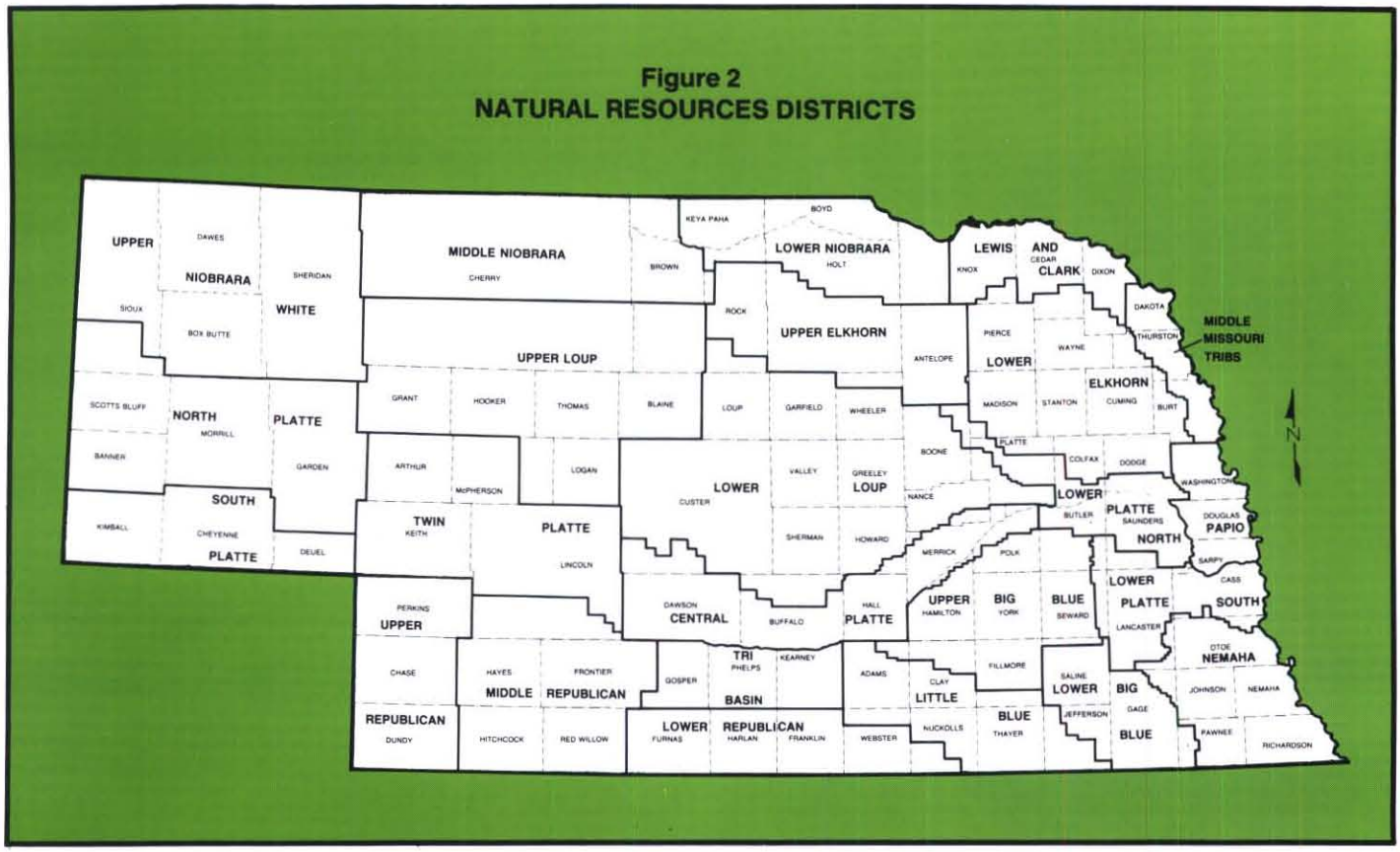


Figure 1
CONSERVATION TILLAGE



Nebraska's conservation efforts took a unique turn in 1972 when most local resources organizations consolidated into 24 NRD's. The NRD's are political subdivisions of state government with the authority to levy a tax to fund conservation programs. They were launched in 1972 with a strong mandate for developing and conserving the state's soil and water resources.

WATER CONSERVATION

Soil and water conservation are often inseparable. Many practices such as conservation tillage conserve both soil and water. When soil erosion is brought under control, runoff is reduced, water is conserved and plants make greater beneficial use of the water stored in the soil. Terraces and contour farming have accomplished these goals for hundreds, or even thousands of years. More recently, improvements to irrigated land

Tailwater recovery systems with re-use pits conserve irrigation water and energy.

have been introduced to improve water conservation.

Since 1950, there have been major changes in irrigation systems. Most of the early changes were intended to bring new land under irrigation, and water conservation was an incidental benefit. Leveling cropland to a planned grade, adjusting the length of runs, and providing adequate drainage were the first steps taken toward improving irrigation water management. Recent innovations to conserve water and energy such as tailwater recovery, surge, and cablegation systems have automated gravity systems and reduced labor requirements, so they are gaining in popularity.

The introduction of the center pivot system in the 1950's revolutionized sprinkler irrigation. This new system minimized labor and made it possible to irrigate land that had never been considered irrigable before. It gave the operator greater control of water application rates, but it also allowed lands to be irrigated where erosion was difficult to control. On those lands proper irrigation water management and careful use of other conservation practices was even more essential.

Irrigation water management, including irrigation scheduling, improved water conservation in both gravity and sprinkler systems. Irrigation scheduling using soil moisture blocks, timely climatic data, and other techniques was particularly helpful in improving the efficiency of sprinkler systems. This type of management has even greater potential to conserve water, reduce pollution, and increase profits in the future.

TRENDS IN LAND USE AND CONSERVATION

The first nationwide Conservation Needs Inventory was started in 1956. This inventory provided information for each county, watershed, and land-resource area in the country. This included: (1) basic soils, slope, erosion, and land use data, (2) current and potential land use by capability classes, (3) conservation (land treatment) needs, and (4) the delineation and needs of all small watersheds.

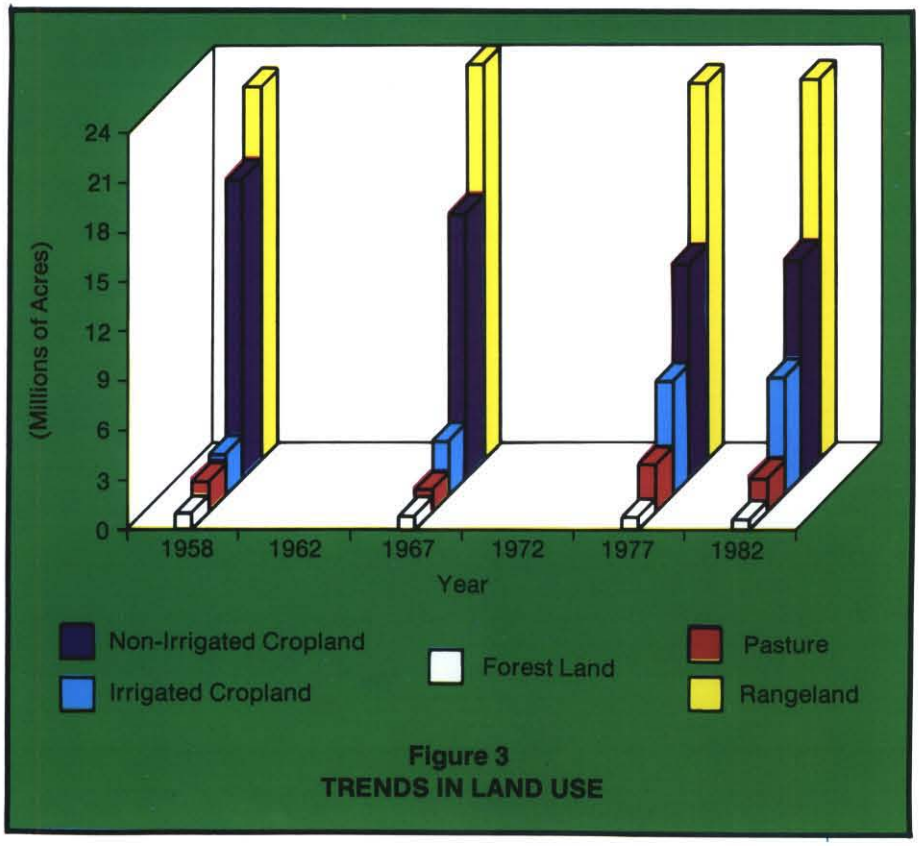


Figure 3
TRENDS IN LAND USE

The original inventory was published in 1962. It has since been updated and expanded in 1967, 1977, and 1982. These four inventories show several trends in land use in the state. Acres of non-irrigated crops have declined while acres of irrigated cropland have steadily increased; Nebraska presently ranks second in the nation behind only California in irrigated acreage. Acres of rangeland have remained nearly stable. Acres of pasture, on the other hand, have fluctuated over the years. A gradual loss of forest land, which does not include farmstead and field windbreaks planted by conservationists, has occurred. Much of the loss is generally attributed to conversion to crops or grassland. The decrease of 300,000 acres is small in comparison to cropland, but it is a large percentage of the small amount of forest land.

To fully understand the conservation needs of Nebraska's lands, it is necessary to know what types of land are being used for agricultural production. The SCS classifies all lands within eight land capability classes. The first four classes are suitable for cropland; limitations on use increase from Class I through Class IV. The re-

The SCS classifies all land into eight land capability classes to denote its erosion hazards and potential for different land uses.

maining four classes have such severe limitations that the soils are not suitable for cultivation.

In 1967, 81 percent of Nebraska's cropland was on land classes I through III--the flatter, better suited lands. By 1982, only 78 percent of cropland was in the same three classes. This decrease is matched by a 3 percent increase in cropland in classes VI and VII--the steeper, marginal lands. This does not mean that a loss in one is a direct gain in the other, because the total amount of cropland increased, but it is apparent that Nebraskans are farming more marginal, erosion-prone land than in previous years. These marginal lands often require expensive erosion control measures to prevent excessive losses of the productive topsoil.

Trends in treated and untreated cropland area are shown in Table 1. A steady decrease in untreated acreage, matched by an increase in adequately treated acreage, indicates that steady progress has been made in protecting the state's cropland. This has been partially offset by the addition of more erosion-prone land to total cropland.

Table 1
TRENDS IN ADEQUATELY TREATED AREA

Year	Total Area Cropped	Adequately Treated	Inadequately Treated
		(Millions of Acres)	
1967	20.00	7.00	13.00
1977	19.90	9.95	9.95
1982	20.20	12.50	7.70

COOPERATION IN CONSERVATION

Conservation activities are carried out and funded by agencies on three levels. At the local level, NRD's are the principal conservation agency. At the state level, the NRC and the Conservation and Survey Division (CSD), Cooperative Extension Service (CES), and Agriculture Research Division (ARD) of the University of Nebraska work with the public on conservation of soil and water. At the federal level, the U.S. Department of Agriculture's SCS, ASCS, and Agricultural Research Service (ARS) have been the leaders. Agencies at all three levels often cooperate with one another to provide all of the needed elements for managing soil and water resources. These activities include providing technical assistance, research, and demonstration projects; furnishing public information; assisting with education in schools; promoting a sense of stewardship; and furnishing funding as an incentive for resource management.

The federal ARS and the ARD of the University often cooperate in research and demonstration projects. Public information programs are administered by the CES, the SCS, and the NRD's. These agencies also provide materials that are used by teachers to educate school children. The SCS provides all the technical specifications and most of the technical assistance for installing conservation practices.

In addition to providing information, education, and technical assistance, four resource agencies provide cost-sharing funds as an incentive to apply conservation practices. Some of these practices require no more than management of crops, equipment, or techniques, and cost little. Others involve land shaping and construction and are very expensive. Public expenditures to share those costs are appropriate because of the long term cost to society from lost agricultural productivity and off-site damages from runoff and sediment. For an individual farmer, it could take as long as 15 to 20 years for the benefits to equal the costs of certain practices. In many cases, cost-share funds are more necessity than incentive when the landowners cannot afford the cost of the practices needed.

Funding for cost-sharing programs is provided by local, state, and federal agencies. At the local level, 16 of Nebraska's 24 NRD's now provide local funds for cost-sharing on conservation practices. In 1985, this assistance amounted to $2.3 million. Financial assistance has been provided by the State of Nebraska through the NRC since 1977. In fiscal year 1985, this assistance amounted to $1.4 million. The federal ASCS has provided cost-sharing funds to individuals as an incentive for applying conservation practices since the 1930's. In 1985, this source of assistance amounted to $5 million. That same year, the SCS provided $1.5 million to cost-share with landowners in organized watershed projects and in the Great Plains Conservation Program.

In the past, there have been inconsistencies in federal assistance programs to farmers. Technical assistance and cost-sharing for conservation were provided by the SCS and ASCS, while other farm programs of-

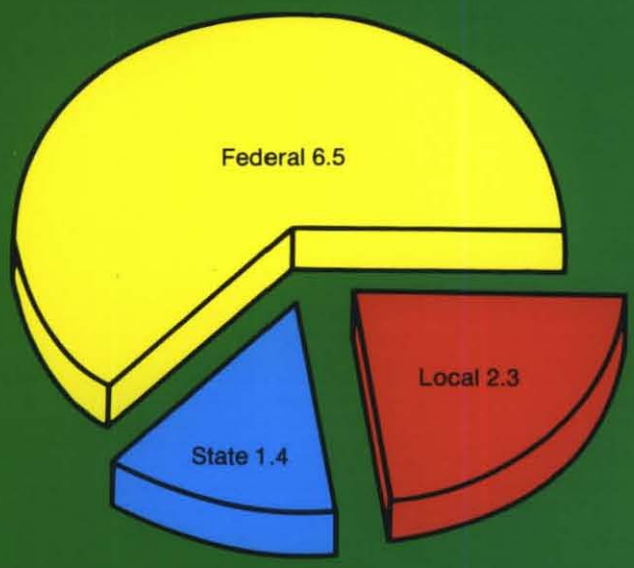


Figure 4
COST-SHARING FUNDS APPROPRIATED BY GOVERNMENTS IN FISCAL YEAR 1985

(Millions of Dollars)

fered production supports to farmers without regard to the management of their soil and water resources. Those who abused their soils received benefits that were sometimes greater than the benefits provided to conservation farmers. For example, in the calculation of cropland bases, farmers with a high percentage of close-sown crops received a lower feed grain base, and subsequently lower production supports.

The 1985 farm bill could correct many of these inconsistencies. It contains a 'sod-buster' provision to keep highly erodible land in perennial vegetation, a long term diversion program to remove very erosive land from row crop production and reseed it to grass or woodlands, and a measure of cross compliance linking conservation and production support programs. This cross compliance measure requires that erosion be controlled by 1995, or the eroding land is ineligible for crop support programs.

Chapter 3

CURRENT CONSERVATION AND NEEDS

Conservation measures have already been applied to much of the land in Nebraska, but millions of acres still need treatment. Some conservation is needed on every type of rural land, and the cost of achieving it will be substantial.

CONSERVATION NEEDS

In 1982, about 60 percent of the land in the state was adequately treated to hold the erosion rate below the tolerable limit. These treated areas contain much of the class I and II land, which is the easiest and least expensive to treat. The remaining 40 percent contains a high percentage of the poorer classes of land, which are the most difficult and expensive to treat.

NON-IRRIGATED CROPLAND

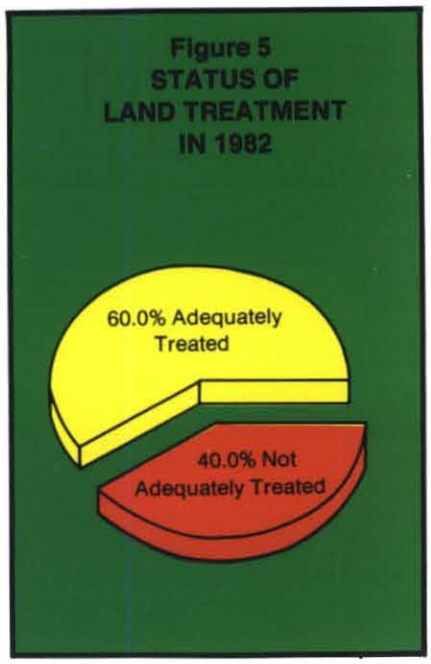
There are 13.2 million acres of non-irrigated cropland in Nebraska, and 5.3 million acres of this land need erosion control. Much of the area not adequately treated is in land classes III and IV. This land will be expensive to treat, because both management and practices requiring construction are needed in most cases. The practices normally recommended for cropland treatment include:

(1) Conservation tillage
(2) Contour farming
(3) Strip cropping
(4) Conservation cropping systems
(5) Terraces
(6) Sediment and water control basins
(7) Grassed waterways or underground outlets
(8) Diversions
(9) Fertilizer and pesticide management

IRRIGATED CROPLAND

There are 7.1 million acres of irrigated cropland in Nebraska. About 3.3 million acres need better irrigation water management and 1.5 million of these acres also need erosion control. Erosion is taking place: (1) under center pivots on rolling to steep land, (2) where gravity irrigation runs are too steep and too long, and (3) where coarse-textured soils are subject to wind erosion. Practices needed to control erosion caused by center pivots are the same as those for non-irrigated cropland. Erosion under gravity irrigation could be reduced by changing the irrigation ditches or gated pipe in the delivery system to shorten the runs. It might also be done with grading to reduce the slope, while maintaining cover with conservation tillage or ecofallow. Crop or tree barriers also could be used to control wind erosion.

Irrigation water management needs include installing a meter and using moisture blocks, tensiometers, or a soil probe to assist in scheduling irrigation. Cablegation and surge systems would improve irrigation water management and reduce labor requirements.



Terraces are one of the earliest and most effective conservation measures.

RANGELAND

Of the 23.1 million acres of rangeland in the state, 69 percent are now managed well enough to sustain the resource. The remaining 31 percent need better management to protect the resource.

Though 478,000 acres need to be reseeded, the remaining acres can be adequately treated by implementing planned grazing systems. These systems generally include cross fencing, livestock water development, rotation grazing, critical area seeding, and grade control structures.

PASTURE

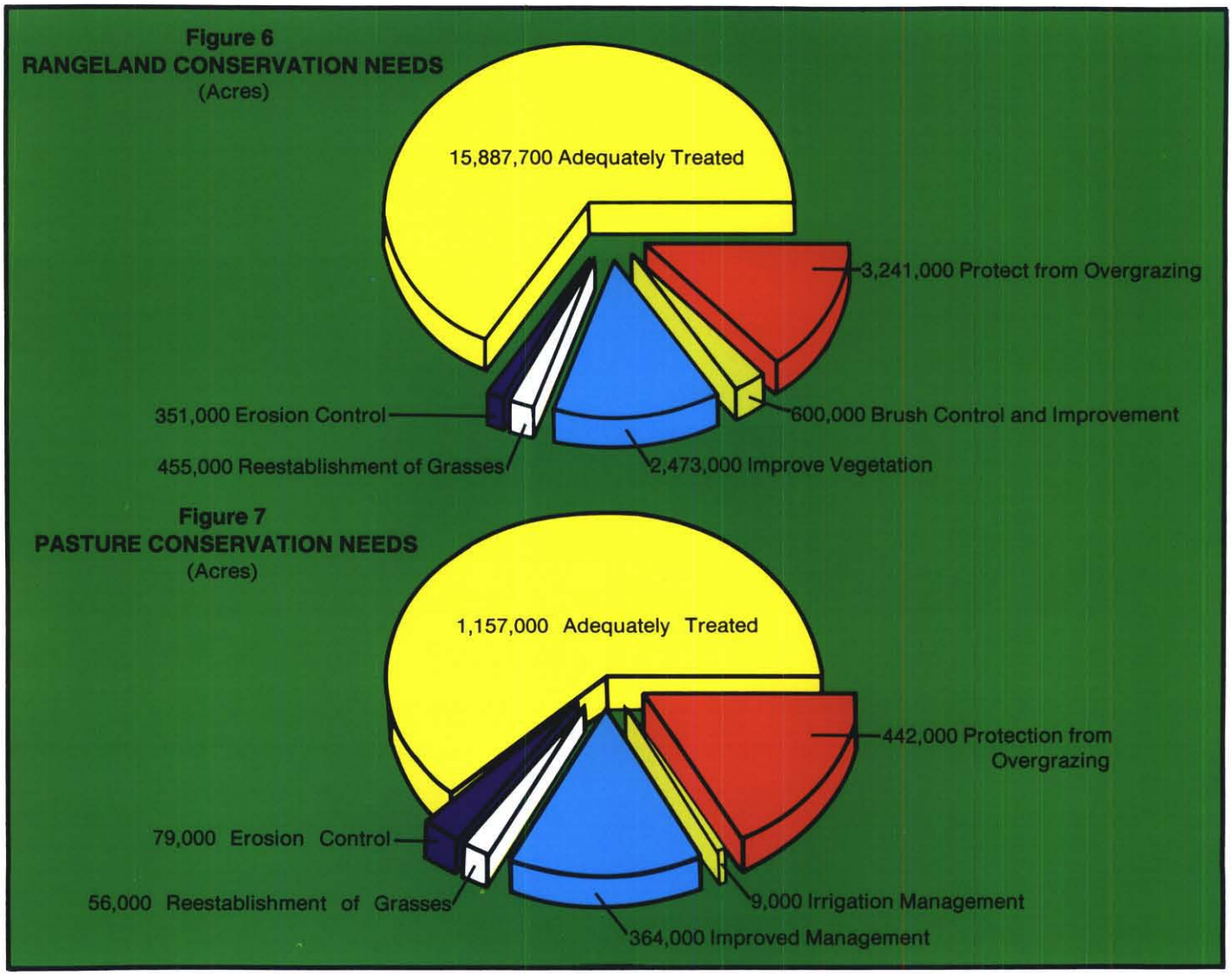
The 1982 National Resources Inventory shows that 54 percent of the state's 2.1 million acres of pasture are adequately treated. The remaining 46 percent need a variety of treatment. The major practices needed on these lands are pasture planting, critical area planting, planned grazing systems, irrigation water management, and grade control structures.

FOREST LAND

Forest land, excluding windbreaks, occupies 732,000 acres in Nebraska and 43 percent of this is considered adequately treated. Of the 345,000 acres needing treatment, only 56,000 acres need erosion control with critical area seeding, diversions, waterways, and grade control structures. Treatment of the remainder requires applying timber stand improvement and planned grazing systems on the grazed portion.

OTHER LAND

There are 736,000 acres in farmsteads, mines, pits, and other rural uses. Approximately 60,000 acres need some form of erosion control treatment, usually critical area seeding. This category also includes 109,000 acres that are considered not feasible to treat.



CONSERVATION FUNDING NEEDS

Millions of acres still need treatment with conservation practices ranging from simple changes in tillage practices to structural measures such as terraces, or conversion from cropland back to grassland. Unfortunately, those acres include some of the most difficult and expensive to treat, but treatment must be started soon. Like most preventive maintenance programs, the longer treatment is delayed, the more expensive it becomes. The quantity and quality of soil and water resources diminishes at an accelerating rate as the land is left unprotected. As this occurs, the cost of treatment often increases and losses take years to replace.

With an accelerated effort, the time it takes to achieve a high level of treatment throughout the state could be reduced to 35, or 25, or even 15 years. The annual cost would be greater if it were done in 15 years, but the damage to the natural resource base would be reduced, so the net effect could be more beneficial in the long term than if it took 35 years to finish.

TOTAL COST

The total cost of adequately treating 100 percent of Nebraska's agricultural land needing treatment is estimated to be $750 million, based on conservation needs shown in the National Resources Inventory. This cost was estimated using current resource conditions and prices. The total cost can be broken down into needs for different land use categories, as shown in Figure 8.

ANNUAL COSTS

Nearly all of Nebraska's agricultural land could be adequately treated, but there would always be a small amount of land in transition that could not be protected at any given time. Those conservation leaders who contributed to the development of the Strategy agreed that 80 percent of the land still needing treatment could be adequately treated in a reasonable period of time. That would result in 92 percent of all agricultural land in the state being protected.

Completing 80 percent of the estimated $750 million worth of work would cost $600 million. If 65 percent cost-sharing is needed to complete that work, the total amount of cost-sharing funds needed from local, state, and federal sources would be $390 million. The balance of the cost would be paid by the landowners.

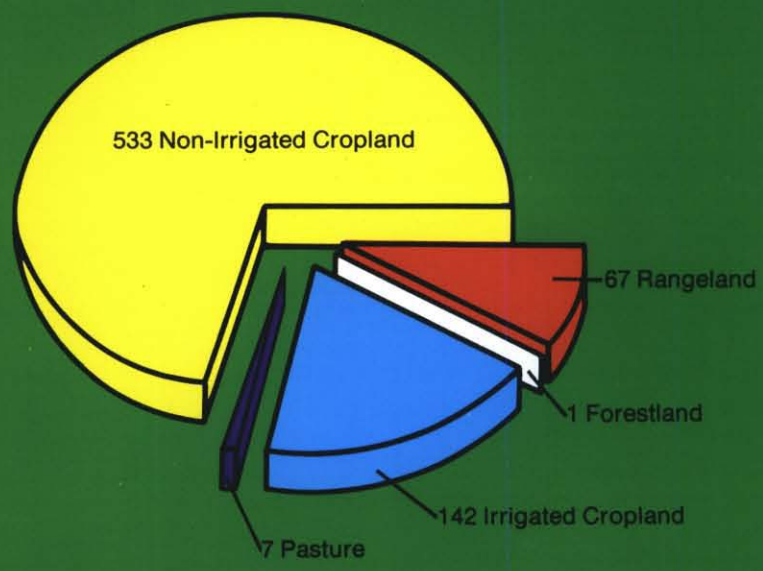


Figure 8.
COST BY LAND USE CATEGORY OF TREATING ALL AGRICULTURAL LAND NEEDING TREATMENT
(Millions of Dollars)

The estimates of annual state costs in Table 2 were made assuming that federal and NRD funds would continue at current levels.

Selecting the time goal for treating 80 percent of the remaining needs requires consideration of the cost involved, as well as the physical ability of farmers, conservation technicians, and contractors to do the work. If the job is to be completed in 15, rather than 35 years, the difficulty and cost of rapidly increasing the number of technical experts and construction contractors needed to accelerate land treatment must be considered.

Table 2
ESTIMATED ANNUAL COSTS FOR COST-SHARING ON CONSERVATION

Time for Completion	Cost-sharing Total	Total Cost Per Year	Federal and NRD Cost	State Cost
(Years)		(Millions of dollars)		
15	390	26.0	8.7	17.3
25	390	15.6	8.7	6.9
35	390	11.1	8.7	2.4

Chapter 4
CONSERVATION GOALS

It is vital that all Nebraskans recognize that 'we do not inherit the land from our ancestors, we borrow it from our children.' Much of the land in Nebraska is now protected from excessive runoff and erosion, and it can be passed on to future generations with pride. Nevertheless, some land still remains so unprotected that it will become a burden to future generations.

A cure has been found for the cancer of soil erosion--conservation land treatment and practices. The individuals who have custody of the untreated land have apparently not heard the good news, don't believe it, or can't afford the treatment. These landowners, and much of the public, do not realize that the costs to the state in lost resources, production, and economic activity will be greater in the long run than the cost of accelerating treatment.

Conservation will preserve the productivity of the soil and the way of life it provides.

Conservation helps preserve clean, clear water by preventing erosion that is responsible for sediment and other pollutants in streams.

Accelerating the application of soil and water conservation practices would also help reduce the pollution of surface and groundwater. The concentrations of fertilizer nitrates and pesticides in groundwater increase year by year because groundwater moves much more slowly than water in streams, and there is less opportunity underground for chemical reactions that reduce pollution. The most effective way of reducing this type of pollution is to prevent it from leaching out of the root zone. The sooner conservation practices are applied, the better groundwater quality will remain.

Soil and water conservation practices would also reduce the amount of sediment and attached agricultural chemicals that reach streams and lakes. Sediment, a non-point source of pollution, is one of the major pollu-

tants of surface water in Nebraska. A national program for cleaning up this country's surface waters was established in the Clean Water Act. Under this program, great strides have been made in cleaning up point sources of pollution, but success has been limited in reducing pollution from nonpoint sources. To achieve the national goal, the amount of sediment from erosion would have to be reduced. Accelerating the application of conservation practices would help meet the nation's clean water goals that much sooner.

At the current rate of progress, it will take nearly 50 years to protect the remaining untreated land. Many people are now aware that in 50 years, the losses in soil productivity, the economy, and the environment will be too great. Those who assisted in the development of this Strategy realized that changes were needed, so new goals for conservation activities were established.

GOALS OF THE SOIL AND WATER CONSERVATION STRATEGY

The Strategy is aimed at sustaining the ability of the soil and water resources to support a high quality of life for present and succeeding generations. To do this, it must motivate land managers to accelerate the use of conservation practices that (1) reduce erosion to an acceptable level within each land use, (2) make maximum use of precipitation, reducing runoff and minimizing groundwater pumpage, (3) use the most efficient systems of irrigation, fertilizer, and pesticide management that also conserve water and protect water quality, and (4) maintain rangeland, pasture, and forest resources in a condition in which the key species can be maintained.

LAND TREATMENT

Ideally, Nebraskans should strive to use each acre within its capability and treat it according to its needs. From a practical standpoint, though, achieving 100 percent land treatment is not possible because of the continual changes in land use, ownership, and farm programs.

Therefore, a goal of completing 80 percent of the remaining treatment needs while maintaining the existing land treatment has been established for the State of Nebraska. Achieving this goal would raise the total amount of adequately protected land to 92 percent. Less extensive programs could then be continued to deal with the remaining eight percent and with maintenance.

The number of acres of cropland, rangeland, and pasture that need treatment and the number that will have to be treated to achieve the goal of 80 percent of the remaining needs are shown in Table 3. Also shown are the number of acres with excessive erosion that will be adequately treated if the total needs, such as improving the condition of rangeland, are achieved.

All acres of cropland that need treatment are eroding at a rate that is damaging their ability to produce. Much of the state's soil loss is concentrated on this cropland, especially the acres in classes IV and VI. Most of the acres of grassland primarily need treatment to raise their condition to good or excellent. Accomplishing this will also adequately protect 80 percent of the acres that are eroding at a rate greater than the tolerable limit.

Relatively little land in Nebraska is in forest. The National Resources Inventory shows a total of only 732,000 acres of this land use. It also shows that 123,000 acres are eroding at a rate greater than the tolerable limit. The state's goal is to adequately treat a minimum of 98,000 of these acres. It also calls for improving grazing management on the portion that is being grazed to raise the condition of 58,000 acres to at least good condition.

WATER CONSERVATION

Generally, water can be conserved in two ways: by managing water from

Table 3
TREATMENT GOALS FOR THE MAJOR LAND USES

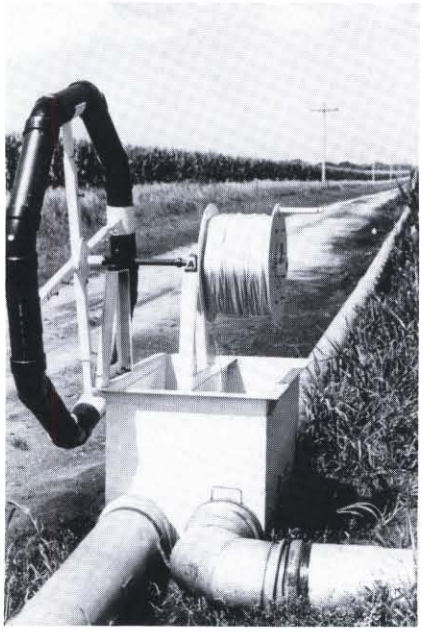
Land Use	Strategy Goal	Area Needing Treatment	Total Treatment Goal	Eroding Area in Treatment Goal
	(Percent)		(Millions of Acres)	
Cropland	80	8.5	6.8	6.8
Rangeland	80	8.3	6.6	1.1
Pasture	80	1.4	1.1	0.2

precipitation and storing it in the soil, and by reducing the amount withdrawn from storage or streamflow for consumptive uses. Of the more than 7 million acres of irrigated cropland, 25 percent needs improved irrigation water management and 22 percent needs erosion control. The state's goal is to accomplish maximum precipitation management for erosion control and proper irrigation water management on 3.3 million acres of this irrigated land.

TIME PERIOD FOR ACCELERATION

It has been estimated that nearly 50 years would be required to protect the remaining inadequately treated lands. The amount of funds required to reduce the time needed to 35, 25, or even 15 years is shown in Chapter 3. The benefits from reducing the time period and preserving our resources that much sooner will also be greater because there will be more resources left to save. In view of the level of treatment that could reasonably be attained, the executives responsible for the development of the Strategy have established a state goal of 25 years for adequately treating 80 percent of the remaining unprotected lands.

Good range management will improve productivity and provide adequate cover to protect the soil from erosion.



Where it can be used, cablegation conserves water and energy while reducing labor and costs.

STATE FUNDING GOAL

For the past 50 years federal, state, and local governments have cooperated in soil and water conservation in Nebraska, but it has only been in the last 15 years that the state and local districts have contributed significant amounts of funds to cost-sharing. Some NRD's have provided local funds for cost-sharing since 1973, the year after their establishment. The state contribution was limited to personnel services until 1977, when the first state funding for cost-sharing with landowners on conservation practices was authorized.

Funding for cost-sharing and for technical assistance has been a major reason for the successes of the partnership to date, and will be even more important in the future. To achieve the state's goal of 80 percent in 25 years, and assume its rightful position in this effort, Nebraska must increase the Soil and Water Conservation Fund to at least $6.9 million per year. The federal government must continue its support at least at the present level, and NRD's must also maximize their financial and promotional efforts to reach the state's goals.

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Chapter 5

ACTIONS AND ALTERNATIVES

Accelerating the process of protecting the state's soil, water, and grassland resources requires the active participation of landowners, agencies, and lawmakers. This Strategy recommends a number of actions by executives and legislators that would lead to increased conservation activities by key agencies and individuals. Many of the actions are tried and proven, and simply need to be accelerated. Some have not yet been tried in Nebraska, but they have been effective elsewhere.

Hundreds of people helped develop this Strategy. They suggested actions that fall under eight different categories. All of the actions under six of the categories can be accomplished administratively by the Governor, state agencies, or local districts. These six are: public information, education in schools, research, soil stewardship, management of publicly owned land, and inter-agency coordination.

The seventh category, incentives, can only partially be accomplished administratively. The remaining incentive actions and the regulatory actions (category eight) will require the enactment of laws by the Legislature and Governor.

PUBLIC INFORMATION

A wealth of information on management systems to protect soil and water resources is presently available. In addition, new research data is being developed continually. A reliable source of easily understood information is needed by farmers and ranchers so they can practice conservation and maximize their profits. The general public also needs reliable information so they can be sure that the state's resources and its economy are sustained. The public has assumed the responsibility for sharing in the cost of conservation practices. They should then be prepared to accept the responsibility to keep themselves well-informed on the impact of those funds and the status of conservation.

The Strategy includes actions that are listed in the full Strategy report and detailed in the Action Plan which would strengthen existing public information efforts.

Conservation education in schools is as necessary to future consumers as future farmers.

EDUCATION IN SCHOOLS

The children of today are the farmers and consumers of tomorrow. They need to be able to make sound decisions in the future. They deserve an education on soil and water resources so they can intelligently control their own destiny. Education on resource conservation could be improved in most schools by actions included in this Strategy to assist school systems and teachers in developing adequate programs for teaching conservation.

RESEARCH

Research on soil and water management has produced new machines, new methods of tillage and irrigation, and better methods of conserving resources, but many questions still are unanswered and many systems could still be improved. Research projects often yield valuable data that are not useful until they reach the hands of farmers and ranchers. Results of these projects must be translated into information on practical applications that can be easily understood and applied. The action items included in the Strategy are intended to provide essential research, and ensure the transfer of the results of this research to farmers and ranchers.

Research and technology transfer play a vital role in conservation.

SOIL STEWARDSHIP

A feeling of sincere reverence for nature, especially the land, is part of many people's beliefs. It comes from appreciating the beauty of nature and understanding the total relationship of humans to the earth. Many people nurture stewardship outside their church-related activities, and a few denominations provide strong stewardship teachings.

Part of stewardship is a commitment to take care of the land. This commitment is one of the foundations of conservation. Once it is made, action to conserve the land and water follows naturally.

This Strategy recognizes that there are many people who would respond favorably to programs on soil and water stewardship, and recommends actions to reach them.

MANAGEMENT OF PUBLICLY OWNED LAND

Some land is owned by government agencies, including federal and state agencies and local districts. Part of it is managed for public use, and part is leased to individuals for crop and livestock production.

State law directs each state agency to have a conservation plan to control erosion on these lands. Part of this Strategy is to ensure that, as a minimum, state and federally owned land is managed so that the soil and water resources are sustained and the land serves as a model for private owners. Several action items in this category are detailed in the full report and the Action Plan.

INTER-AGENCY COORDINATION

Agencies at all levels of government are expected to play a major role in implementation of the Strategy. They include the NRC, all 24 NRD's, SCS, Cooperative Extension Service, Conservation and Survey Division, Board of Educational Lands and Funds, Nebraska Department of Agriculture, Game and Parks Commission, and the Department of Education. Many of the recommended actions could be strengthened by coordination and cooperation among these agencies, so actions promoting interagency cooperation are included in the Strategy. The degree of success in implementing the Strategy will be a measure of the effort applied to this element.

INCENTIVES

There are several incentives, in the form of financial assistance or tax relief, that can be used to encourage the application of conservation practices. Some people apply conservation practices to their land without financial assistance from any agency, but in many instances, incentives are the most effective means of getting conservation action.

Some incentives that are recommended by this Strategy could be implemented by administrative action or a change in policy by a state agency or an NRD. These include adding provisions in the Nebraska Soil and Water Conservation Program to provide for targeting, a set-aside program, and long term agreements. The NRC could administratively establish standards for the level of cost-sharing in this program that would enable it to meet the goal of the Strategy. Other incentives could be provided by actions to remove property tax inequities for conservation practices, and to encourage NRD's to promote conservation tillage.

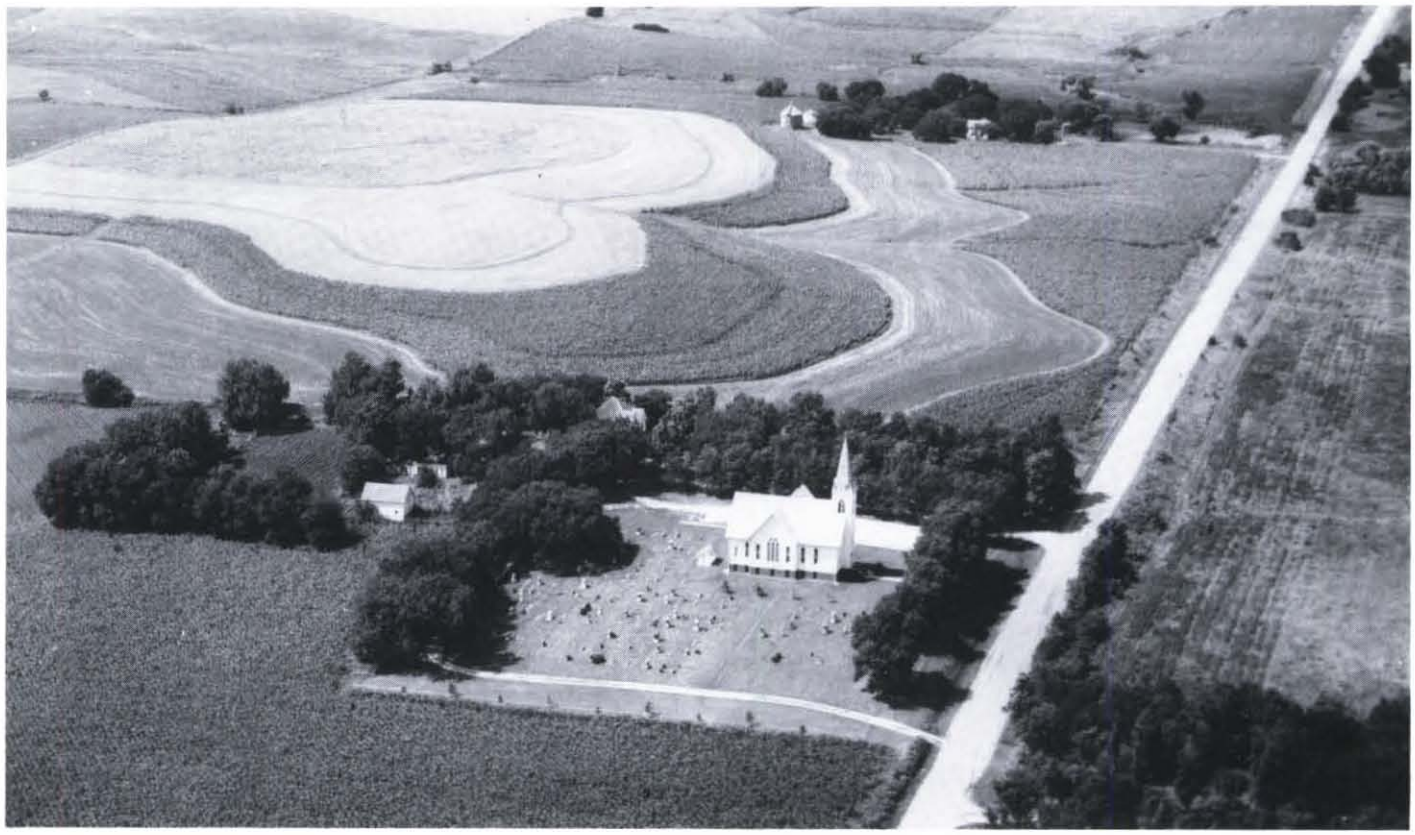
Additional incentives could only be provided by the Governor and the Legislature. Alternatives that require the enactment of legislation include increased appropriations to the Nebraska Soil and Water Conservation Fund; expanded authorities for the same Fund; additional authorities for NRD's to increase local funding for cost-sharing; and funds to hire additional technical assistance during peak load periods.

REGULATIONS

Current voluntary programs, including information, education, technical assistance, and incentives, have produced some good results. However, after 50 years, many Nebraskans still have not taken any action. Some do not recognize the problems, some refuse to acknowledge the problems, and others will not make the necessary commitment to alleviate either the damage to the resource or the problems suffered by their neighbors. They will not start something new or different unless forced to act.

Lawmakers in Iowa realized this about 10 years ago, and enacted a statute mandating the application of conservation practices when neighboring lands are damaged. Implementation of practices approved for cost-sharing to comply with regulations is conditioned on the availability of cost-sharing funds, so the financial impact on the individual is significantly reduced. This has proven to be a very effective approach within its limited scope.

Knowledge and stewardship must often be supplemented with financial assistance to conserve soil and water.



The Strategy offers five alternatives which would regulate activities that cause excessive erosion or water pollution. The first is to enact a Sediment and Erosion Control Law. It would give an agency or district the authority to prescribe and enforce erosion control policies and regulations.

The second regulatory alternative would be to enact a state law similar to federal 'sodbuster' legislation. It would prohibit tilling grassland or forested land if the soil is highly erodible, unless an erosion control plan has first been approved by the NRD.

A third alternative would provide a means of correcting situations where erodible soils have already been plowed and excessive erosion is occurring. The fourth would add to existing requirements that state and local governments conserve soils on lands they own. The fifth would be to strengthen state and local authority for management of groundwater. Present laws would be revised to provide effective controls to prevent pollution and preserve the water supply.

Chapter 6

RECOMMENDATIONS

Fifty years of conscientious efforts by government agencies, private organizations, and individuals have produced great strides in conserving Nebraska's soil, water, and grassland resources. Nevertheless, much land in the state is still eroding faster than nature can restore its topsoil. Droughts and depressions come and go, but as the topsoil is lost, the natural productivity of the land is eroded away forever.

A carefully selected combination of administrative and policy actions is vital to achieving the state's conservation goals.

If the effort to conserve soil and water is not accelerated, it will take nearly 50 more years to reach a reasonable level of conservation. Even if the agencies currently involved in research, education, and stewardship improve their activities and coordination, much greater funding and regulation will be required to shorten the period to 25 years.

The actions and alternatives discussed in Chapter 5 would provide the means to accelerate conservation efforts to achieve the state's conservation goals. To be effective, the proper balance of alternatives must be selected by the Legislature, Governor, agencies, and NRD's. The recommendations of the Natural Resources Commission are presented in the following sections.

ADMINISTRATIVE ACTIONS

The actions listed in the Action Plan under the first six elements, and part of the seventh, can be taken at this time by local districts and state agencies on their own initiative. They already have the necessary authority, responsibility and funds. There are also some state and federal programs that provide financial assistance to cooperating landowners that agencies can use to help in implementing those actions.

RECOMMENDATION #1

It is recommended that the actions designed to promote education, stewardship, research, public information, agency management and cooperation, and incentives, which are listed and explained in detail in the Action Plan, be implemented administratively by the designated agencies and organizations. These actions have been discussed by those involved, and it should be possible to implement them in a reasonable period of time. Some will be fairly simple to put into practice, others will entail more difficulty and require more time, but they are all possible.

EXECUTIVE ACTIONS

Some recommended activities require action by the Governor, in addition to agencies and NRD's, to accomplish their intended results. Some require authorization by the Governor, and others require the Governor's advocacy.

RECOMMENDATION #2

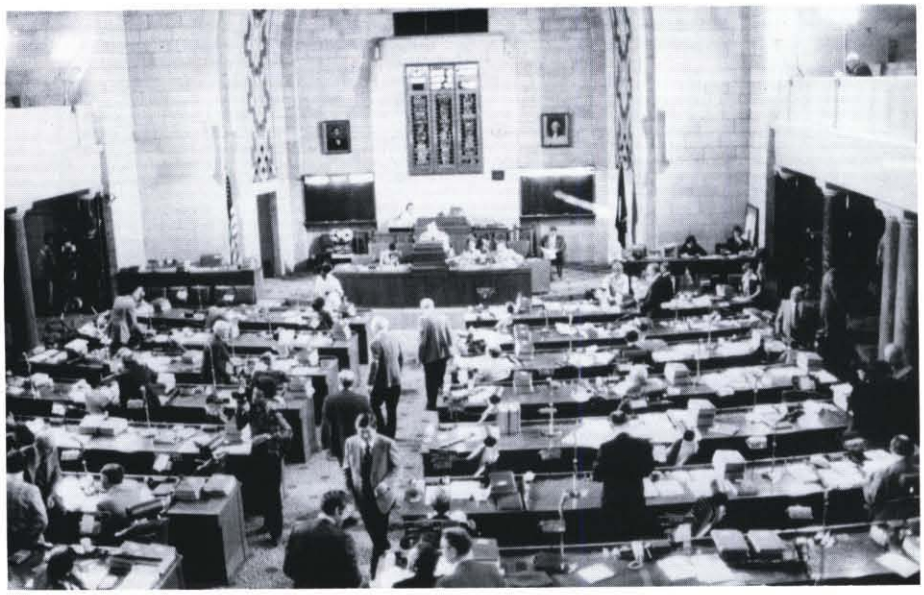
The Commission recommends that the Governor take the following executive actions, and advocate actions by independent organizations and agencies as follows:

- -Authorize the Director of Natural Resources to provide personnel to strengthen the public information activities of the NRC in soil and water conservation.
- -Encourage expansion of the Energy Conservation Project and further involvement of the NRC in promoting conservation tillage statewide.
- -Encourage coordination between NRC and the Departments of Agriculture and Education to strengthen conservation education in the school system.
- -Encourage University of Nebraska-Lincoln research on soil and water and the translation of findings to water and land use decision makers.
- -Encourage each state agency with responsibility for management of public lands to have and carry out a written policy.
- -Establish a coordinating committee under NRC leadership for implementing the Strategy and stress the importance of implementation by all state agencies.

Executive action by the Governor is essential to the success of the State's Soil and Water Conservation Strategy.

POLICY ACTIONS

Some of the most effective means of convincing people to apply conservation practices require additional funds and authorities which can be provided only by the Governor and Legislature. The following incentives and regulations are recommended by the NRC.



Legislation is required to implement some needed conservation actions.

INCREASE STATE FUNDS FOR COST-SHARING

The first alternative requiring legislation would be to increase appropriations to the Nebraska Soil and Water Conservation Fund to encourage and financially assist more farmers and ranchers in applying conservation practices. It has been estimated that a total of about $390 million in cost-sharing funds from state and federal sources would be required to adequately treat 80 percent of the remaining problem areas. An increase in annual funding would be needed to reach the newly established goal of 25 years for treating that 80 percent.

RECOMMENDATION #3

It is recommended that the Governor and the Legislature increase appropriations to the Nebraska Soil and Water Conservation Fund for cost-sharing with landowners to $6.9 million per year. This level of cost-sharing funds will be needed to meet the state's soil conservation goals within 25 years, instead of 40 to 50 years.

EXPAND THE AUTHORITIES OF THE SOIL AND WATER CONSERVATION PROGRAM

The next alternative would modify the way these cost-sharing funds could be spent. There are many practices not funded by the Nebraska Soil and Water Conservation Program that could have direct water quality and water conservation benefits. Included are nitrate management, irrigation scheduling, feedlot waste control systems, and buffer strips. The statutes authorizing the program would have to be amended to: (1) allow funding of practices for the purposes of protecting the quality and quantity of surface and groundwater, and/or (2) fund practices with a life of less than 10 years. This would permit more emphasis to be placed on prevention of pollution.

RECOMMENDATION #4

It is recommended that the Legislature and Governor amend the statutory authorities in the Soil and Water Conservation Program to allow funds to be used for certain practices that have water conservation and water quality benefits, as well as soil conservation benefits. Draft legislation prepared as part of the Action Plan would serve as the basis for preparing a legislative bill.

INCREASE DISTRICTS' AUTHORITY FOR FUNDING

The third alternative would be to raise more cost-sharing funds at the local level in addition to providing them from the state's general fund. Natural resources districts could be given the authority to increase taxes specifically for this purpose. During fiscal year 1985, thirteen NRD's provided cost-sharing funds to landowners to assist in applying conservation practices. In several of these NRD's, the demand exceeded the available funds. Five of the 24 were at or very near the maximum levy of $0.035 per $100 valuation with no way to increase cost-sharing funds. Raising the NRD taxing limit to $0.040 per $100 valuation would permit an average NRD with a valuation of one billion dollars to bring in an additional $50,000 for cost-sharing.

RECOMMENDATION #5

It is recommended that the Legislature and Governor enact legislation authorizing NRD's to increase their maximum tax levy when necessary to provide additional funds for cost-sharing. Those districts with cost-sharing programs that have already reached the limit of their tax authority should be given the ability to increase it from $0.035 to $0.040 per $100 valuation for the specific purpose of cost-sharing.

PROVIDE MORE TECHNICAL HELP

Another alternative must be considered if action is taken to accelerate conservation significantly. Many conservation measures can be applied only with the planning and help of trained technicians. More technicians will be needed if the level of work increases substantially over the current level. The total of federal, state, and local cost-sharing funds has been about $11 million per year, and it is estimated that more technicians will be needed when the level approaches or exceeds $15 million per year. Legislation would be required to authorize and fund the hiring of personnel for this job.

Given the need to reduce the federal deficit, it is unlikely that there can be an increase in federal funding for SCS technicians. Increases in funding will probably have to come from either the state or the NRD's.

Timely technical assistance must be provided to accelerate the application of conservation practices.

The state could alleviate the potential shortage of technicians by providing state employees to work on the application of conservation practices. These employees could be assigned to work with and under the supervision of the District Conservationist in the local field offices. Another option would be for the state to enact legislation that would authorize the transfer of state funds to the SCS so they could hire the technicians. A portion of the Nebraska Soil and Water Conservation Program funds could be transferred, similar to the transfer of funds between federal agencies. Still another option would be to provide additional state funds to NRD's to hire additional technicians where needed. The number of additional technicians that would have to be hired could be reduced if volunteers were used to help SCS personnel.

RECOMMENDATION #6

It is recommended that the Legislature and Governor authorize the expenditure of, and appropriate funds for, hiring temporary part-time employees to help the SCS provide technical assistance during peak work-load periods. When total federal, state, and local cost-sharing funds reach about $15 million per year, funds should be appropriated to the NRC to be allocated for additional technical assistance.

SEDIMENT AND EROSION CONTROL REGULATIONS

The first regulatory alternative is to enact a Sediment and Erosion Control Law. Over 20 states have given some combination of state and local entities authority to prescribe and enforce soil erosion regulations. In this state, the NRC could be directed to establish state erosion control policies and guidelines. There would be several options for enforcement of those policies. The responsibility could be assigned to a state agency, such as NRC, or the NRD's could supplement and enforce state policies. Enforcement of the regulations could, at least initially, be dependent on receipt of complaints from landowners or agencies being damaged by sediment. As an alternative, initiation could be the responsibility of the NRD alone. Remedial action could also be dependent on the availability of cost-sharing funds.

Legislation of this type could provide some benefits before any enforcement action is ever taken. It could cause landowners to become more aware of the erosion on their land, and its effect on their neighbors. This increased understanding could produce more voluntary application of practices.

RECOMMENDATION #7

It is recommended that the Legislature and Governor enact a Sediment and Erosion Control Law similar to proposed legislation currently being considered by the Legislature that would promote fulfillment of the goals of the Soil and Water Conservation Strategy.

Most people will support and observe regulations they believe are reasonable and necessary.

RESTRICT PLOWING OF ERODIBLE LANDS

Another alternative would be to enact a state law similar to federal 'sodbuster' legislation. It would prohibit tilling grassland or forested land if the soils are highly erodible, unless an erosion control plan has first been approved by the NRD. Soil survey maps will provide the information needed to develop the required management plans. Soil surveys have been completed for most of the state, and the whole state will be finished by 1989. Working with the SCS and local NRD, the landowner or developer could prepare a plan to control erosion. They could also learn more about the land and how to make their operation profitable. On borderline soils, such as very sandy land, a bond could be required in the amount that it would take to restore the land to grass in case the venture failed.

RECOMMENDATION #8

It is recommended that the Legislature and Governor enact a law restricting the plowing of grasslands or forested lands with highly erodible soils without approval of a conservation plan by the NRD. A state program would be more flexible and responsive than federal 'sodbuster' legislation if proposed legislation prepared in conjunction with the Strategy were enacted.

PROVIDE FOR RESTORATION OF ABANDONED LAND

The next regulatory alternative would provide a means of correcting situations where erodible soils have already been plowed and excessive erosion is occurring. Legislation could provide authority for an NRD to use state funds to restore protective vegetation on abandoned, eroding land. The state could place a lien on the property to recover its costs, and it could authorize the NRD to enter bankruptcy proceedings to submit claims for the cost of revegetation.

New authorities are required to allow conservation agencies to treat abandoned, eroding lands.

RECOMMENDATION #9

It is recommended that a law be enacted to provide the means to restore vegetation on eroding, abandoned land. Natural resources districts should be given the authority to use state funds for treating the land and act on behalf of the state to recover costs.

REQUIRE CONSERVATION ON PUBLIC LANDS

There are some statutory requirements for development and implementation of conservation plans on state-owned lands, and most agencies attempt to control erosion on their lands. However, no agency has the authority or responsibility to monitor compliance with existing requirements or to enforce them when needed.

Existing requirements do not apply to lands owned by local governments, especially roads. Where federal and state funds are used for construction of state and county roads, erosion control practices must be used. Where counties construct roads without federal or state funds, there are no erosion control requirements or accountability.

RECOMMENDATION #10

It is recommended that the Legislature and the Governor enact legislation requiring that state agencies and political subdivisions control erosion on roadsides and other publicly owned land. An agency should be designated to establish standards, monitor compliance and enforce regulations.

Good soil and water management will maintain productivity and reduce pollution of groundwater.

IMPROVE GROUNDWATER MANAGEMENT

The final alternative would be to strengthen state and local authority for management of groundwater. Present groundwater management laws could be improved in at least two respects. First, authorized regulations in both control areas and management areas are directed primarily at water supply problems. Little authority is given for control of water quality problems, particularly those that result from application of fertilizers and pesticides. Second, if an NRD is unwilling to initiate groundwater management in an area of need, the state has no authority to act. The quantity and quality of groundwater could be better protected if present laws were revised to provide the districts with additional tools and incentives needed for conserving the groundwater resource.

RECOMMENDATION #11

It is recommended that legislation be enacted to strengthen state and local authority for managing groundwater. A state agency should be given the authority to take the initiative to establish a groundwater control or management area if the NRD does not act, and districts should be given more authority to protect groundwater by controlling pollutants such as fertilizer and pesticides.

BALANCING INCENTIVES AND REGULATIONS

To reach the state's goals for soil and water conservation, a balanced program of education, incentives, and regulations is needed. Incentives are needed to make some practices affordable, but they will have to be supplemented with regulations.

Nebraska will have to join the other 24 states that regulate soil erosion. Regulatory control of soil loss is needed, just as regulation of groundwater waste was needed in 1975, or the state's most valuable resource base will eventually be irreparably damaged.

The cost of getting conservation on the land will not change regardless of how it is accomplished. If incentives are not provided, and there is no cost-sharing for mandatory conservation, the cost will simply be shifted from the public to the individual. In that case, the total cost of the program would undoubtedly increase because there would be some additional costs to the state. Enforcement of regulations would incur costs, and those costs would probably increase as regulations became more stringent. To be most effective, the costs must be balanced between the public and private sector, and between incentives and regulations.

The NRC recommendations are intended to provide a balance between incentives and regulations. Neither incentives nor regulations alone would be satisfactory or effective, but the proper balance of the two would conserve the state's resources, the base for the future quality of life of its citizens.

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APPENDIX A

List of Items in the Action Plan

To successfully implement the Soil and Water Conservation Strategy, the Natural Resources Commission has developed an Action Plan. This plan contains Action Items which fall under the eight categories described in Chapter 5. The Action Plan describes how each item is to be implemented, who will implement it, and projected dates for implementation.

A. Education in Schools

1. Provide for a conservation coordinator in the Department of Education.
2. Develop conservation classes for Vo-Ag and general high school students.
3. Coordinate teacher training workshops.
4. Promote outdoor classrooms and field trip farms.
5. Provide for teacher scholarships for conservation training sessions.
6. Require conservation training for teacher certification.

B. Public Information

1. Expand the public information activities of the Natural Resources Commission (NRC).
2. Assemble a speakers bureau.
3. Expand the Cooperative Extension Service (CES) targeted energy program.
4. Develop public conservation programs (CES).
5. Develop computer technology on crop budgets vs. erosion control.

C. Soil Stewardship

1. Recognize soil and water stewards.
2. Provide resource information to schools of divinity.
3. Develop course of study for youth religious classes.
4. Provide stewardship information to local clergy (NRD's).
5. Provide resource information to religious publications.

D. Research

1. Review research on ag chemical leaching, and increase if necessary.
2. Collect data on topsoil thickness vs. production to demonstrate value of topsoil.
3. Arrange an inter-agency cooperative research seminar.
4. Evaluate research for inclusion in tech guides and conversion to user form.

E. Incentives

1. Increase funds for Nebraska Soil and Water Conservation Program (NSWCP).
2. Add provisions to NSWCP for targeting, set-aside programs, and long-term agreements.
3. Raise NRD taxing limits to provide more funds for cost-sharing.
4. Encourage NRD's to promote conservation tillage.
5. Remove property tax inequities for conservation farming.
6. Expand NSWCP to allow funding of practices more directly related to pollution control.

F. Regulations

1. Enact a Sediment and Erosion Control Law.
2. Require land treatment above state funded reservoirs.
3. Restrict the plowout of fragile land (NRD's).
4. Include the Strategy in the NRD Master Plan.
5. Mandate county roadside erosion control.
6. Enact legislation to allow the State to fund conservation technicians.
7. Strengthen state and local authorities for groundwater management.

G. Management of State Owned Land

1. Encourage a conservation policy by each managing agency.
2. Encourage the Board of Educational Lands and Funds (BELF) to develop a multi-year conservation plan.
3. Offer variable lease periods as a management incentive.
4. Revise Memorandum of Understanding (BELF, NRC, SCS).
5. Reciprocate training sessions (BELF, SCS).
6. Require the use of conservation easements to protect conservation on land sold to private owners.

H. Inter-Agency Coordination

1. Assign responsibility for implementing the Strategy to NRC.
2. Coordinate publicity among agencies through the CES task force on conservation tillage.
3. Provide for an inter-agency committee to oversee Strategy.