

SANDOVAL - LOS ALAMOS COUNTIES

SEDIMENT CONTROL PLAN

DRAFT

To Library

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P.O. Box 1868, Santa Fe, NM 87501

N54

Superintendent
Bandelier National Monument
Los Alamos, NM 87544

February 5, 1979

FEB	
✓	<i>JN 2/7</i>
✓	<i>VH 2/7</i>
✓	<i>EB 2/14</i>
✓	<i>LT 2/15</i>
✓	<i>JDL 2/27</i>
✓	<i>FILE</i>

Dear Sir :

Enclosed is a draft of the Sediment Control Plan for Sandavol and Los Alamos Counties, for your review. The public hearing was held on January 29, 1979, concerning this report. If you so desire, written comments can be submitted to the Natural Resources Department of the State of New Mexico .

Sincerely,

Edward J. Korzdorfer
Edward J. Korzdorfer
District Conservationist



TABLE OF CONTENTS

	<u>Page</u>
Summary.	1
Introduction	2
Methods and Procedures	5
Physical Description	9
The Erosion Assessment	13
Best Management Practices.	16
Implementation Recommendations	59
References	60

Tables

Table 1 - Land Use In Sandoval - Los Alamos Counties.
Table 2 - Land Ownership and Administration, Sandoval-Los Alamos .
Table 3 - Erosion Assessment, Sandoval - Los Alamos Counties . . .
Table 4 - Best Management Practices, Sandoval-Los Alamos Counties.

Appendix

Exhibit 1 - Field Data Sheet

Exhibit 2 - Erosion Control Map

Summary

The Federal Clean Water Act establishes a program for eliminating discharge of pollutants into the nation's waters by 1985 with an interim goal of making the waters suitable for fishing and swimming by 1983. This Act recognizes two types of pollution. Point source pollution enters waters from a specific conveyance, while nonpoint source pollution is diffuse in nature and enters water from a broad geographic area. Sediment is a nonpoint source of pollution. Section 208 of the law requires states to develop a water quality management plan which will identify pollution sources, assess the impact on water quality, and determine methods for controlling pollution.

The water pollution control agency for New Mexico, the Water Quality Control Commission, has assigned to the Soil and Water Conservation Division the responsibility for preparing that part of the statewide Section 208 plan dealing with sediment. The Division, electing to proceed on a county-by-county basis, worked with local Soil and Water Conservation Districts to determine the water quality impacts resulting from sediment and to develop Best Management Practices.

This Sandoval-Los Alamos Counties Sediment Control Plan was prepared by the Division in cooperation with the Sandoval, Cuba, Central Rio Grande and Santa Fe Soil and Water Conservation Districts. A Sandoval and Los Alamos Counties Erosion Map was prepared to assess the water quality problem due to sediment. The District Supervisors identified problem areas and developed Best Management Practices on the basis of local experience.

The problem assessment shows the most serious sediment problem comes from the Rio Puerco Watershed. Past or present grazing management which has reduced native cover and increased runoff caused much of the erosion. Roads and trails, past and present, cause much of the gully erosion.

Cuba and Sandoval Soil and Water Conservation Districts determined practices needed to reduce erosion and sediment include: proper grazing use and related practices, erosion control practices, brush management and revegetation practices.

It is recommended that this plan be carried out on the local county level. Soil and water conservation districts are proposed as the local management agency with U. S. Forest Service and Bureau of Land Management as management agencies for the lands they control.

Introduction

Congress, stimulated by intense public interest, enacted the Federal Water Pollution Control Act Amendments of 1972, PL 92-500. The Act was amended by the Federal Clean Water Act of 1977, PL 95-217. The Clean Water Act represents a bold, ambitious, and comprehensive approach to restore the nation's waters from a heavily polluted condition to one that is "fishable and swimmable" by 1983. An additional goal is to eliminate water pollution by 1985.

The United States Environmental Protection Agency is to undertake a number of programs to achieve the objectives of the Clean Water Act. Among the activities, which include a permit program to control effluents from municipal and industrial discharges, grants-in-aid for treatment works for cities and towns, and the control of dredge and fill operations in navigable waters, is a program identified as a Continuing Planning Process.

This program calls upon each state to develop an assessment of water quality problems within the state, identify measures necessary for abating or reducing water pollution, and recommend implementation programs to control water pollution. "Section 208" is one of three water quality planning programs required under various sections of the Federal Clean Water Act. Water quality planning under Section 208 requires that two significant issues, regional waste water management and nonpoint sources of water pollution, be addressed.

Two general types of water pollution are recognized--point source discharges and nonpoint source pollution. Point sources are those discharges which enter the nation's waters by way of discrete or discernable conveyances such as pipes or conduits. Water treatment is necessary to remove pollutants before the effluent is discharged from point sources.

Nonpoint sources of water pollution are more difficult to define; they are diffuse in origin or are areawide sources, such as a concentration of septic tanks or urban stormwater runoffs. The Federal Clean Water Act (PL 95-217) defines six types of nonpoint sources: agricultural and silvicultural activities, including irrigation; mining activities; construction activities; salt water intrusion into fresh water; waste disposal activities; and, land or subsurface disposal of pollutants. Originating from a broad geographic area, the impact of nonpoint pollutants is substantial.

Sediment, which is an end product of soil erosion, is the result of storm water moving over land, washing particles of soil into streams, rivers and lakes. Soil erosion and sediment are major problems in New Mexico and nationwide. Sediment is, by volume, the greatest single pollutant of surface water, and it is also the principal carrier of some chemical pollutants (1). Sediment can also damage fish populations and spawning beds and damage reservoirs.

Erosion, a natural phenomenon, can be accelerated by land disturbance as a result of man's activities. Land treatment or proper management can reduce the effects of sediment resulting from erosion.

Controlling erosion and the subsequent control of sediment as a nonpoint source of pollution is not new to New Mexico's farmers, ranchers and foresters. Soil and Water Conservation Districts, through the auspices of working agreements with the USDA Soil Conservation Service and other agencies, have been cooperating with landowners to provide assistance to them to reduce erosion. The technology of sediment control has been developed over the past 40 years through the conservation programs of the districts, the SCS and other agencies working with them.

Of particular interest to landowners and others concerned with sediment and erosion control, Section 208 of the Federal Clean Water Act mandates that each state develop a comprehensive planning process to address nonpoint source pollution. Each state is to assess the water quality impacts resulting from erosion and storm water runoff from agricultural lands, rangelands, mining and construction activities and silvicultural practices.

The keystone to the planning process is the development of Best Management Practices (BMP's). The BMP's are to be practical and feasible measures or combinations of measures which will reduce nonpoint source pollution to a level compatible with water quality goals. The Clean Water Act requires that BMP's be developed in the Section 208 planning process.

In New Mexico, the Water Quality Control Commission is the state agency responsible for water pollution abatement. The Commission, made up of constituent state agencies with an interest in water, has delegated the 208 planning responsibilities dealing with sediment to the Soil and Water Conservation Division.

A part of the Natural Resources Department, the Division's chief responsibilities are to administer and coordinate the conservation programs of New Mexico's local Soil and Water Conservation Districts which are legal subdivisions of the state. Each district is responsible for conservation program planning and application within its boundaries.

Through agreements with the districts, the Soil Conservation Service provides technical and professional services to individual land users who need conservation planning assistance. The person or group who receives assistance in planning and carrying out conservation work on a voluntary basis is called a "cooperator". Cost-share and incentive programs for conservation application are provided by the SCS and other USDA agencies such as the Forest Service and the Agricultural Stabilization and Conservation Service (ASCS).

The sediment portion of the state's Section 208 Plan has evolved as a result of intensive local and grass roots participation on the part of soil and water conservation district board members, landowners cooperating with the districts, and state and federal agencies. Although the Division has provided the technical and professional leadership and has coordinated the planning process, the districts have provided the water quality assessments due to erosion, and have determined the Best Management Practices based on the assessments. Additionally, the participation of the districts and landowners has been heavily relied on in formulating recommendations for implementation programs for nonpoint source pollution control.

This combination of forces--the Division, districts and landowners--has resulted in this Sandoval and Los Alamos Counties Sediment Control Plan. It will be incorporated into the State Plan to be adopted by the Water Quality Control Commission, to be submitted by the Governor to EPA for final review and adoption.

This County Plan was prepared in cooperation with Sandoval, Cuba, Central Rio Grande and Santa Fe Soil and Water Conservation Districts. It is the belief of the Division and the districts that the assessment, determination of problems and the development of Best Management Practices has resulted in a plan based on a reasonable assessment of the water quality impact resulting from sediment in the county and BMP's that are reasonable, practical and feasible.

It has been the philosophy of conservation districts that conservation can be best effected through voluntary participation and incentive. This plan, we feel, is consistent with the philosophy.

Methods and Procedures

To carry out the assignment of preparing the sediment control portion of the State Water Quality Management Plan, the Soil and Water Conservation Division prepared a plan of work.

Because erosion and sediment production can occur on all lands within the state the Soil and Water Conservation Division determined that a problem assessment and a plan should be prepared for each county in New Mexico with help from Soil and Water Conservation Districts. County plans would then be used to formulate state priority areas, determine best management practices and make recommendations for implementing the sediment control part of the plan. Activities included in the plan of work directed toward completing county plans were:

1. Conduct four workshops in different areas of the state to inform district supervisors and other leaders about the federal law and the New Mexico Water Quality Planning Program.
2. The Division 208 Project Coordinator meet with each Soil and Water Conservation District Board of Supervisors and secure their assistance to:
 - a. complete the county erosion and sediment assessment
 - b. identify problem areas
 - c. evaluate water quality impacts of erosion by problem areas
 - d. develop best management practices to reduce erosion and sediment to a reasonable and practical level
 - e. make proposals for implementing the plan in the county.
3. Complete the county erosion map and the problem assessment.
4. Division 208 Project Coordinator draft the county plan using the erosion assessment and BMPs and implementation recommendations presented by the districts.
5. Districts review and comment on the county plan.
6. Present the plan to a public meeting in the county after incorporating district comments into the plan.
7. Complete the final County Sediment Control Plan for approval and implementation.

A state level Technical Advisory Committee was appointed to provide technical direction to the Division Staff. This Technical Advisory Committee included representatives from: Forest Service, Bureau of Land Management, Bureau of Indian Affairs, Corps of Engineers, Soil Conservation Service, State Forester, State Land Office, State Planning Office, Environmental Improvement Division, State Department of Game and Fish, and Technology Application Center of the University of New Mexico.

The committee met several times during the planning process furnishing recommendations on erosion assessment techniques, scope and procedure for planning.

The Division conducted a workshop for district supervisors in Albuquerque, NM, April 13, 1977, for districts in the northwestern part of the state.

The Division 208 Project Coordinator met individually with the Cuba and Sandoval District Boards of Supervisors to inform them of the 208 planning program and discuss preparation of the county erosion control plan. Upon completion of the orientation, the district and the Division entered into a contract for the district to help prepare the county erosion assessment, review the completed county erosion map, determine water quality impacts of erosion in the county, determine problem priority areas, develop Best Management Practices and recommend implementation procedures.

There was an existing county erosion map prepared a few year earlier by Soil Conservation Service as part of the Upper Rio Grande River Basins Survey. This erosion map was furnished to the Division Staff for their use. The Division Staff used the general soil map, prepared by SCS in September, 1972, in cooperation with NM Agriculture Experiment Station, as a base to prepare an erosion map for use in this plan. The general soil map shows soil associations which are landscapes, or geographic areas, that have distinctive proportional patterns of soils. Soils and erosion maps were also made available to the Division by U.S. Forest Service and Bureau of Land Management for use in preparing the county erosion map.

Using information from these erosion and soils maps the Division Staff began preparing a county erosion map for use in this plan. Field studies were made of major soil types in the county to check present erosion rates and test the reliability of the erosion map provided by the Districts.

The Universal Soil Loss Equation, developed by Agriculture Research Service, was used for the field studies. This equation $A=RK(LS)CP$ is used to estimate average annual sheet and rill erosion expressed in tons of soil loss per acre or converted to acre feet per square mile. Factors used in this equation are:

- A = Average annual predicted soil loss in tons per acre (Acre feet per square mile)
- R = Rainfall factor
- K = Soil erodibility factor
- LS = Slope factor considering slope gradient and length
- C = Cover factor
- P = Practice factor considering conservation practices on the ground at the time of evaluation

Individual values for each factor are obtained using SCS, New Mexico Agronomy Technical Note No. 28, Oct., 1975.

The field evaluations involved recording R and K values from Technical Note 28 on to the field data sheet, (Exhibit 1); slope length and gradient, LS Factor, was measured on the ground; cover, C factor, was determined from an average of several samples; and practice, P factor, was determined from observation of the site.

The erosion rates for each soil type were weighted according to their percentage of the soil association to determine the erosion rate for the soil association. This evaluation of current erosion rates for soil associations correlated very closely with the existing district erosion map therefore it was used, with some changes, for the county erosion map in this plan. Refer to exhibit 2.

Major drainage basins were delineated on the county erosion map showing areas of the county with surface drainage into streams or closed basins.

After the county erosion map was completed by the Division and reviewed by the Districts, the field copy of the map was furnished to the Technology Application Center of the University of New Mexico. Technology Application Center prepared the final county erosion map showing areas by erosion category and by drainage basins.

Upon completion of the work copy of the county erosion map, the Division 208 Project Coordinator met with the Soil and Water Conservation Districts in the county to review the map. Representatives of the Cuba and Sandoval Soil and Water Conservation Districts along with local individuals and representatives of the Forest Service, Soil Conservation Service, Bureau of Indian Affairs, and New Mexico Cattle Growers Association made up the planning group.

Review of the erosion map considered erosion areas and their relation to drainage basins so they could determine the effects of erosion in the county on water quality. The planning group then determined problem priority areas based on the impact these areas have on water quality.

Using their experience of carrying out a conservation program in Sandoval and Los Alamos Counties, the District Supervisors determined best management practices which would control erosion to a reasonable and practical level.

The county planning group recommended procedures for implementation of the 208 Plan to control sediment pollution to a reasonable, practical level.

Using information developed by conservation districts and the county planning group, a draft county erosion plan was prepared. The draft was circulated to districts and agencies for review and comment. After receiving and incorporating review comments, the plan was prepared for public presentation.

A public meeting was held in Bernalillo, NM, on January 29, 1979, to present the county plan and receive comments. Comments received from this meeting are included as an addendum to this plan.

Physical Description

Sandoval County, in geographic northwest New Mexico, lies in the Rio Grande and Upper Colorado River Basins.

About 42 percent of the land is in federal ownership; about 27 percent of the land is owned by Indians; about 3 percent of the land is owned by the state; and about 28 percent of the land is privately owned.

Acreage of Indian Pueblos and Reservations is as follows:

	<u>Total Acreage in County (1973)</u>
Eastern Navajo	59,449
Canoncito Navajo	1,440
Jicarilla Apache	135,334
Cochiti Pueblo	28,779
Jemez Pueblo	88,867
Laguna Pueblo	35,218
Sandia Pueblo	17,604
San Felipe Pueblo	48,930
San Ildefonso Pueblo	640
Santa Ana Pueblo	44,589
Santa Clara Pueblo	16,420
Santo Domingo Pueblo	65,480
Zia Pueblo	112,511

Most of the topography in Sandoval County consists of mountainous areas, high mesas, and rough-broken terrain that is drained by numerous dry washes and intermittent arroyos. Much of the landscape has been severely eroded and, except for the mountainous areas, vegetative cover is sparse.

The Jemez and Nacimiento Mountains are located in the northeast part of the county. The area is drained by Jemez River and Rio Puerco which are intermittent except in higher elevations of the tributary areas. Jemez River joins the Rio Grande in the county; however, the Rio Puerco leaves Sandoval County, enters Bernalillo County, and joins the Rio Grande near Bernardo in Socorro County. Redondo Peak is located in this area and is the highest elevation at 11,254 feet.

The Continental Divide separates the Rio Grande and Upper Colorado River Basins in the northwestern part of the county. West of the Continental Divide, dry washes and intermittent arroyos drain toward the San Juan River. The landscape is rough and broken and is badly eroded.

The Cebolleta Mountains extend into the southwest part of the county. Elsewhere, there are high mesas and peaks and, in general, the landscape is rough and broken. A prominent landmark, Cabezon Peak, is located in this area.

About half-way through White Rock Canyon, the Rio Grande enters Sandoval County. The river travels in a southwesterly direction and leaves the county near Corrales. From the west, Jemez River joins the Rio Grande near Angustura, and Santa Fe and Galisteo Creeks enter the river from the east near Cochiti and Santo Domingo Pueblos. The lowest elevation in the county (about 5,300 feet) occurs where the Rio Grande leaves Sandoval County and enters Bernalillo County.

The Rio Grande emerges from White Rock Canyon near Cochiti Pueblo. From this point south, the valley widens and is occupied by several Indian pueblos and non-Indian towns and villages that extend from Cochiti Pueblo to the towns of Bernalillo and Corrales. Most of its inhabitants, commercial activities, and irrigated lands are located in this part of the Rio Grande Valley of Sandoval County.

There are three Life Zones, namely: Canadian, Transition, and Upper Sonoran. Vegetative types include forests (pine, fir, spruce) in the higher elevations, woodland (pinon, juniper), grassland, and semidesert brush in the eroded areas and lower elevations.

The grazing of native rangeland by domestic livestock is the most extensive land use in Sandoval County. Significant quantities of irrigated farming can also be found along the mainstream of the Rio Grande, with smaller amounts occurring along the tributary areas of the Rio Puerco and Jemez Rivers. The principal crops grown are livestock forage in the form of alfalfa hay or greenchop and permanent pasture. Other crops grown include the small grains and corn silage. Small tracts of chili and apples are also raised in the area near Bernalillo and Corrales. Timber harvesting, along with wildlife and recreation, are significant in the higher elevations.

Los Alamos County lies entirely within the Rio Grande Basin. About 93 percent of the land is in federal ownership, and about 7 percent of the land is privately owned. There are no Indian or state lands in the county.

Part of the Santa Fe National Forest is in Los Alamos County. The net acreage of this forest in Los Alamos County in 1966 was 27,340 acres.

Los Alamos County was formed during World War II to provide security and isolation for the Manhattan Project (development of the atomic bomb). Its landscape consists of high mountain and plateau areas dissected by deep canyons and arroyos. The county is located on the east flanks of the Jemez Mountains and is bounded by Sierra de los Valles (El Valle Grande) on the west; Indian Pueblo and forest lands on the north and east; Canyon de los Frijoles on the west; and the Rio Grande in the southeast corner. Most of the county is 7,000 or more feet in elevation. Elevations range from 10,320 feet along the crest of Sierra de los Valles to about 5,350 feet along the Rio Grande.

A number of east-west tributaries drain the county to the Rio Grande. Except for Rio Frijoles, streams are intermittent and flow only during snowmelt and after storms. The only surface water reservoir is a small pond in the city of Los Alamos, and since no lands are irrigated in the county, streamflow is not used for this purpose.

The following data from the Los Alamos weather station (Elevation 7,410 feet) is representative of climatic conditions in this vicinity:

Maximum monthly average temperature (July) is 68.0 degrees F.
Minimum monthly average temperature (January) is 28.4 degrees F.
Mean yearly average temperature is 48.3 degrees F.
Average precipitation is 18.0 inches.

There are three Life Zones, namely: Canadian, Transition and Upper Sonoran. The latter zone is confined to a narrow strip along the Rio Grande. Vegetative types are forest (pine, fir, spruce) in the mountains and woodland (pinon, juniper) in the lower elevations.

Land use in Los Alamos County is quite varied. It is probably the only county in New Mexico where the agricultural uses of land do not comprise the majority. As can be seen from Tables 1 and 2, it does not contain farming operations, either dry or irrigated. It should be noted, however, that agricultural uses are significant because grazing does occur on National Forests within the county boundaries. Other significant land uses are those related to recreation and the production of wildlife. The most important land use is that which is related to defense.

Sandoval and Los Alamos counties have a semiarid continental climate with considerable ranges of temperature and precipitation because of elevation and topography differences. These counties are about 800 miles from the Gulf of Mexico, which is the source of moisture for summer rains which flows inland from a general southeasterly direction. The predominant source of moisture in winter is the westerly air circulation from the Pacific Ocean. Average annual precipitation ranges from 8 inches in the Rio Grande Valley to over 21 inches in the mountain areas. The snow season is from October through April for most of this area. Mean annual temperatures range from 54 degrees in the Rio Grande Valley to 40 degrees in high mountain valleys. The daily range of temperature is near 34 degrees. Extremes to temperature are 109 degrees in the Rio Grande Valley, and 41 degrees below zero in the mountain valleys. Because of elevation, summers are generally cool.

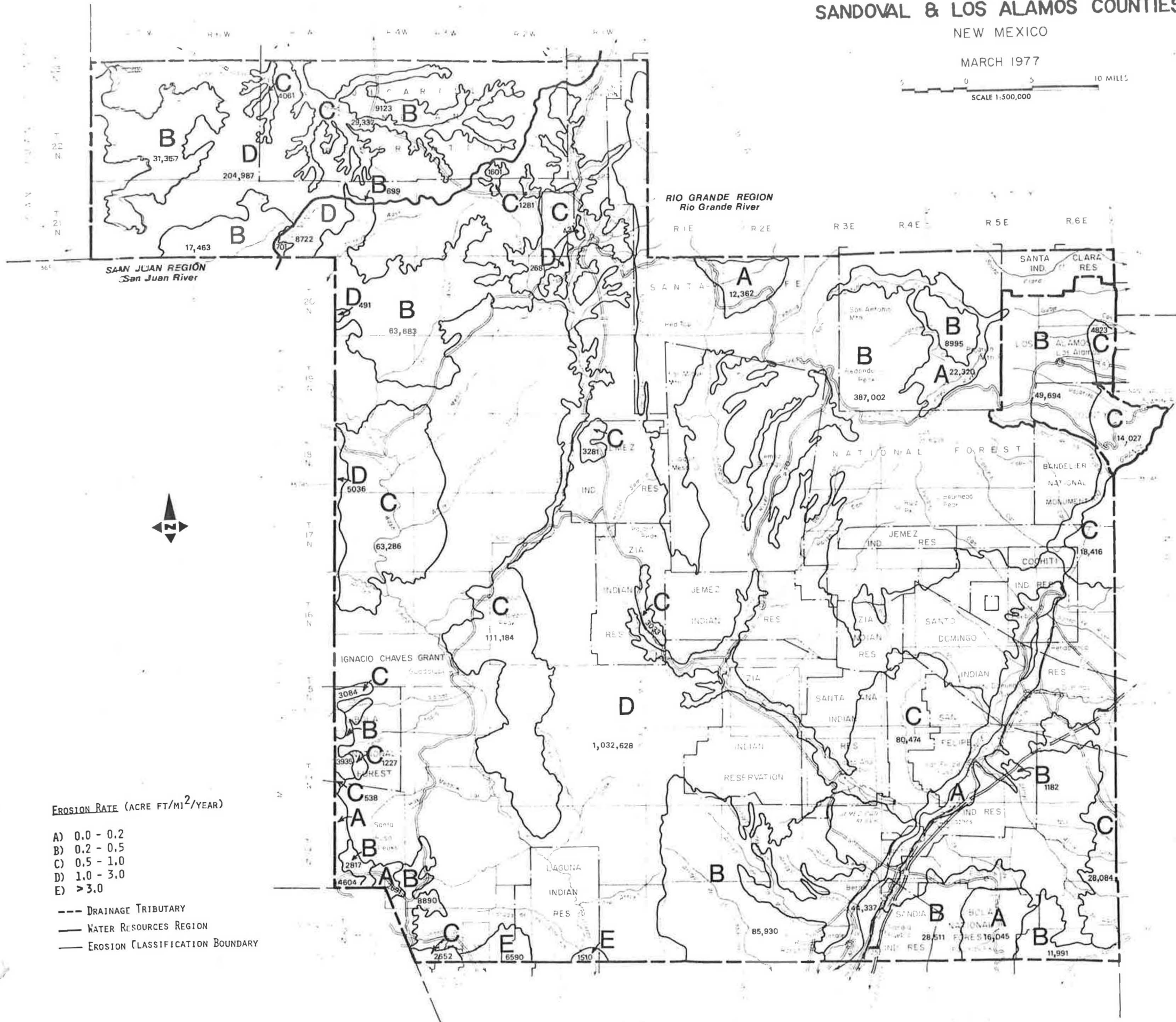
The average freeze-free period ranges from 111 to 174 days, May to October, in most of the area, but high mountain valleys have only a little over one month. Sunshine occurs about 70 percent of the possible hours, or about 3,200 hours annually.

SANDOVAL & LOS ALAMOS COUNTIES

NEW MEXICO

MARCH 1977

SCALE 1:500,000



EROSION RATE (ACRE FT./MI²/YEAR)

- A) 0.0 - 0.2
- B) 0.2 - 0.5
- C) 0.5 - 1.0
- D) 1.0 - 3.0
- E) > 3.0

- DRAINAGE TRIBUTARY
- WATER RESOURCES REGION
- EROSION CLASSIFICATION BOUNDARY

Table 1

Land Use in Sandoval and Los Alamos Counties ^{3/}
(1968-70 Data)

	<u>Area in Acres</u>
Inland Water	1,467 *
Urban and Built Up	27,186
Roads	12,928
Cropland, Irrigated	17,050
Cropland, Non-Irrigated	1,800
Defense	30,625
Parks	29,226
Commercial Timber	317,522
Grazing Lands	<u>2,010,196 *</u>
Total	<u><u>2,448,000</u></u>

Table 2

Land Ownership and Administration (1966-1967 Data) ^{3/}
 Sandoval and Los Alamos Counties

	<u>Area in Acres</u>
Indian Lands	650,380
Federal Lands	
National Forests	398,568
Bureau of Land Management	588,449
Defense	30,625
Miscellaneous Federal	34,103
State Lands	80,192
Private Lands	665,764
Total Area	<u><u>2,448,000</u></u>

* Adjusted to recent data from the U. S. Army Corps of Engineers and NM Department of Game and Fish.

The Erosion Assessment

Erosion categories used for preparing the erosion map are expressed in terms of acre-feet of soils lost per square mile. Erosion rate categories are shown as estimated average annual soil loss from the site evaluated. Erosion categories and rates are:

<u>CATEGORY</u>	<u>ACRE FEET PER SQUARE MILE PER YEAR</u>
A	0 - 0.2
B	0.2 - 0.5
C	0.5 - 1
D	1 - 3
E	OVER 3

An acre-foot of soil is a volume of soil required to cover one acre one foot deep, or 43,500 cubic feet, or 1,613 cubic yards.

Problem areas were identified in order of priority and their impact on water quality determined. They are shown as follows starting with the highest priority:

I. The Rio Puerco

The Rio Puerco drainage is located along the western half of Sandoval County. This watershed does carry a heavy load of sediment which results mainly from sheet and gully erosion that is caused by a number of factors. Some of these factors include surface mining, improper road development and maintenance, and grazing that has reduced the cover of native plants. According to the erosion survey, the majority of areas in this drainage are yielding from 1 to 3 acre-feet of soil per square mile per year. Most other areas are yielding soil in the range of 0.5 to 1.0 acre-feet per square mile per year. A small area in Sandoval County in the Rio Puerco drainage is considered critical which means that these areas are yielding soil in excess of 3 acre-feet per square mile per year.

Most of the soils in this drainage are unstable and therefore very susceptible to detachment and movement by water. There are many areas within the drainage that have steep slopes where large amounts of runoff and subsequent soil movement does occur.

II. Jemez River

This watershed covers an extensive area in the eastern half of Sandoval County. Its upper reaches are in Rio Arriba County with the water course flowing south and emptying into the Rio Grande north of Bernalillo. Except toward the bottom of this drainage where flows become highly concentrated, soils are relatively uniform throughout the watershed. They are sandy, detach easily, and are readily moved by water unless sufficient vegetative cover is present to hold them in place. As can be seen from the erosion survey, this drainage also yields from 1 to 3 acre-feet per square mile per year of soil over the majority of its area.

However, there are significant areas toward the northern end of the the drainage that yield lower amounts of soil, with one area yielding less than 0.2 acre-feet per square mile per year. Erosion most generally comes in two forms--sheet and gully. Many factors have contributed to an increased incidence of active erosion in the more severe areas. Some of these factors include improper road construction, improper road maintenance, and inadequate grazing and timber management practices.

III. The Upper San Juan

The San Juan drainage encompasses the extreme northwest corner of Sandoval County. Soils in the drainge are quite variable as they range from a silty clay loam to a fine sandy loam. As can be seen from the erosion survey, the majority of areas in this drainage yield from 1 to 3 acre-feet of soil per square mile per year. Smaller yields are evident in other areas where the soils are somewhat more stable and slopes not quite so severe. Factors contributing to the heavier erosion rates include deteriorated vegetative resources resulting from past grazing management and the improper construction and maintenance of roads.

IV. Rio Grande Tributaries

This includes a series of many smaller drainages that carry surface runoff directly to the Rio Grande. Soils are generally of a sandy loam texture and are therefore quite unstable if sufficient vegetative cover is not present to hold them in place. Generally speaking, grazing management, inadequate road construction, and the increased use of off-road vehicles has contributed to areas showing moderate to severe rates of erosion (Category C and D). Most of the area is in Erosion Category B. However, there are significant areas on the east side of the Rio Grande that show moderate rates of erosion (Category C).

V. Cropland

The sediment yield on irrigated cropland is very minimal due to the flat slopes and the relatively thick vegetative cover that is characteristic of most fields. Soils are quite variable ranging from a clay loam to a sandy loam. Most areas that have been put into production recently will tend to have a soil texture that is very sandy. Provided that cover is maintained on the surface, sediment yield even on these areas is almost nonexistent.

Sediment yields on dry cropland may be slightly higher than on those lands that are irrigated. However, when compared to the yield of sediment on wildland areas, the result is not significant. Practices related to reducing slope and establishing permanent vegetative cover could reduce the yield of sediment on dry cropland in an adequate fashion.

After review of the erosion may by the county 208 planning group, the county erosion map was completed in final form by the Technology Application Center of the University of New Mexico. Acreage was measured by erosion categories by drainage basins. See Table 3.

TABLE 3-

EROSION ASSESSMENT
SANDOVAL AND LOS ALAMOS COUNTIES

Acres by Drainage Basins			
Erosion Category	Rio Grande Region Rio Grande River	San Juan Region San Juan River	Total Acres
Acre ft./sq. mi./yr.			
A (0.0 - 0.2)	102,359	--	102,359
B (0.2 - 0.5)	653,331	58,642	711,973
C (0.5 - 1.0)	336,991	33,601	370,592
D (1.0 - 3.0)	1,049,989	204,987	1,254,976
E (More than 3.0)	8,100	--	8,100
Total	2,150,770	297,230	2,448,000

Best Management Practices

The regulations to implement Section 208, PL-92-500, define Best Management Practices (BMP's) as "a practice or combination of practices that is determined by a state after assessment, and examination of alternative practices, as the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals."

Best management practices for erosion and sediment control may be conservation practices, used locally, which experience has proven to be effective for controlling erosion and improving water quality. A conservation practice is defined as: "A measure commonly used to meet a specific need in planning and carrying out soil and water conservation programs for which standards and specifications have been developed." Standards and specifications for conservation practices are found in Section IV of the Soil and Water Conservation District Technical Guide.

The Technical Guide, prepared by SCS and adopted by the District, contains technical information on the conservation of soil, water, and related plant and animal resources specifically related to the District. It provides working tools for SCS employees, assisting the District, including:

1. Soil descriptions and interpretations,
2. Alternatives for land and water use,
3. Alternative resource management systems,
4. Standards and specifications for conservation practices used in resource management systems, and
5. Cost-return information.

In this plan, Best Management Practices listed are those practices proven by the experience of conservation districts to be effective for controlling erosion. It is not intended that all BMP's are needed on all lands. Application of BMP's must be based on a site specific conservation plan developed with adequate technical assistance as may be provided by conservation districts and with participation of the landowner or operator.

This plan is county-wide in nature and provides a list of Best Management Practices needed to control or reduce sediment to a reasonable and practical level. It does not take the place of a site specific plan. For example, a conservation plan developed in cooperation with the local soil and water conservation district. The site specific plan for individual land units, where nonpoint source problems are identified, will be necessary to implement this plan.

Best Management Practices identified by land use and erosion rates in order of priority are:

I. Rangeland with heavy rates of erosion (Category)

- Planned grazing systems
- Range seeding
- Fencing
- Ponds
- Brush management
- Critical area treatment
- Grade stabilization structures

II. Rangeland with moderate erosion rates

- Planned grazing systems
- Range seeding
- Fencing
- Ponds
- Brush control
- Grade stabilization structures

III. Surface mined areas

- a. Reclamation measures
- b. Diversion
- c. Critical area planting
- d. Tree planting

IV. Urbanizing lands

- Critical area planting
- Sediment or debris basins
- Grade stabilization structures

V. Road systems

Guidelines for the planning, construction and maintenance of roads should be developed. These guidelines would properly address erosion control, vegetation management and water disposal. Recreational vehicle use is a significant contributor to erosion and this should also be addressed.

These guidelines would be applicable mostly to roads having a good chance to develop erosion problems. Included here would be county roads, older state highways and roads servicing energy exploration sites. There is little problem on recently constructed state highways.

VI. Dry cropland

- Terraces
- Seed to permanent grass cover
- Strip cropping
- Cropping systems

VII. Irrigated cropland

- Conservation cropping systems
- Irrigation water management
- Land leveling
- Irrigation pipeline

VIII. Irrigated pasture and hayland

- Pasture and hayland management
- Irrigation water management

Best Management Practices
Sandoval and Los Alamos Counties

Planned Grazing Systems, including:

- Proper grazing use
- Deferred grazing
- Fencing
- Livestock water development
 - Pond
 - Troughs or Tank
 - Pipeline
- Well
- Spring development

Range seeding

Gully Erosion Control practices, including:

- Grade stabilization structures
- Rock and brush dam
- Debris basin
- Diversion Dam
- Diversion

Floodwater Retarding Structure

Critical Area Treatment, including:

- Critical area planting
- Grazing land mechanical treatment

Brush Management

Stream Channel Stabilization

Streambank Protection

Road construction incorporating erosion control structures and erosion control techniques.

Road maintenance to control erosion and prevent runoff and flow concentrations.

Terraces

Conservation Cropping System

Irrigation Water Management

Pasture and Hayland Management

Best Management Practice

PLANNED GRAZING SYSTEMS

Definition

A system in which two or more grazing units are alternately rested from grazing in a planned sequence over a period of years, and the rest period may be throughout the year or during the growing season of the key plants.

Purpose

1. To maintain or improve the composition and vigor of the vegetation on all sites
2. To increase water infiltration thereby reducing runoff and erosion

Where Applicable

On all rangeland, grazable woodland, and grazed wildlife land.

Planning Considerations

1. This practice may be planned in conjunction with grazing programs for other land uses.
2. Livestock numbers and forage available must be in balance. Cooperators should be discouraged from going into a planned grazing system if they are overstocked for the system.
3. Determine the quantity and quality of the forage resources available to the ranch and balance them with the livestock feed requirements by seasons.
4. Provide for access to pastures during periods of supplemental feeding of livestock.
5. Animal husbandry practices and herd management must be considered for the various kinds and classes of livestock on the ranch.
6. For optimum livestock performance, provide adequate water in each grazing unit. (Check storage facilities and supply, if the source is from wells and springs.)
7. The number, size, and arrangement of pastures and the number of individual herds will largely determine the kind of grazing system the operator is able to manage. Sometimes it is practical to group small pastures into a grazing unit as well as dividing large pastures to provide additional grazing units.

8. Provide for grazing units which have been fully utilized during one grazing period to have the opportunity for regrowth before they are scheduled to be grazed again.
9. Grazing systems must be flexible. Plans must take into consideration such things as: drought, ephemeral spring growth, and other range improvement programs (brush management, reseeding, etc.)
10. Proper grazing use will be used to govern the time of movement from one unit to another.

Best Management Practice

PROPER GRAZING USE

Definition

Grazing at an intensity which will maintain enough cover to protect the soil and maintain or improve the quantity and quality of desirable vegetation.

Purpose

To (1) increase the vigor and reproduction of key plants, (2) accumulate litter and mulch to increase intake and reduce runoff and sediment yields, (3) improve or maintain the condition of the vegetation, (4) increase forage production.

Where applicable

On all rangeland, native pasture, grazable woodland, and grazed wildlife land, and recreation land.

Planning Considerations

1. The key grazing area and the key species within each grazing unit (pasture) should be determined except on very small areas of rangeland.
2. Percent remaining of the key forage species can be determined by the methods for determining utilization by key species

Best Management Practice

DEFERRED GRAZING

Definition

Postponing grazing or resting grazing land for a prescribed period.

Purpose

1. Improve the vigor of the plant community and improve plant composition.
2. Protect areas that have been reseeded or following brush management.
3. Improve hydrologic conditions, reduce soil loss and sedimentation.
4. Exclude domestic livestock from special use areas for prescribed periods.
5. Protect areas following wild fire.
6. Protect areas for seed production and harvest.

Where applicable

On all rangeland, native pasture, grazable woodland, recreation and wildlife land.

Planning Considerations

1. On overused native grazing lands that are in poor and fair condition, areas should be seasonally deferred from grazing until a decision can be made as to whether or not reseeding or grass management is the best and most economical way to improve the grazable resources. Some sites are not feasible to reseed using the present known methods and, therefore, must be improved by applying grass management principles.
2. On seeded areas, whether they are areas seeded following brush management or areas converted from cropland to rangeland, such areas should be deferred from grazing long enough to allow seedlings to become established.
3. On areas where brush is being treated by use of chemicals or mechanical means, the area should receive one growing season's deferment or more if adequate moisture is not available to allow suppressed understory plants to become vigorous and healthy enough to withstand grazing.
4. On native hay meadows that are grazed, the regrowth fields should be deferred from grazing and from the last hay harvest until after frost.

5. On sites that are unusually erosive, the site should be deferred immediately prior to and during the season of high rainfall or strong winds to keep as much plant cover on the ground surface as possible during the critical erosion period.
6. On areas burned by wild fire, the burned areas should be deferred from domestic livestock grazing for four to six months or longer to protect weakened plants, depending upon time and conditions of the burn.
7. On certain areas or sites where insects are being used to control certain species of vegetation, the areas should be deferred when insect population is high and control measures are being carried out.

Best Management Practice

FENCING

Definition

Enclosing or dividing an area of land with a suitable permanent structure that acts as a barrier to livestock. (Does not include electric or other temporary fences.)

Purpose

This practice is to facilitate proper grazing use of forage by providing a means for controlling the numbers of livestock and season of use, and to permit the application of better range management practices, such as deferred or rotation-deferred grazing.

Where applicable

This practice is applicable (1) on all rangeland or pastureland where additional boundary or cross fencing will facilitate proper forage management; (2) where needed to provide protection to seeded areas, eroded areas, poisonous plant areas, or other critical or special areas; and (3) where needed to separate different land uses, such as special-use areas.

Best Management Practice

POND

Definition

A water impoundment made by constructing a dam or embankment, or by excavating a pit or "dugout."

Ponds constructed by the first of these methods are referred to hereinafter as "Embankment Ponds" and those constructed by the latter method as "Excavated Ponds." Ponds resulting from both excavation and embankment are classified as "Embankment Ponds" where the depth of water impounded against the embankment at spillway elevation is 3 feet or more.

Purpose

Ponds are constructed to provide water for livestock, and other related uses.

Scope

This guide establishes the minimum acceptable quality for the design and construction of class (a) ponds located in predominantly rural or agricultural areas when:

1. Failure of the structure would not result in loss of life; in damage to homes, commercial or industrial buildings, main highways, or railroads; or in interruption of the use or service of public utilities.
2. The product of the storage times the effective height of the dam does not exceed 3,000 where the storage is defined as the original volume (acre-feet) in the reservoir at the elevation of the crest of the emergency spillway and the effective height of the dam is defined as the difference in elevation (feet) between the emergency spillway crest and the lowest point in the cross section taken along the centerline of the dam.
3. The vertical distance between the lowest point along the centerline of the dam and the crest of the emergency spillway does not exceed 20 feet.

Conditions Where Practice Applies

Site Conditions

Site conditions shall be such that the peak rate of runoff that can be expected to occur once in 25 years can be safely passed through (1) a natural or constructed emergency spillway, or (2) a combination of a principal structural spillway and an emergency spillway, except that a storm of 10-year frequency may be used for drainage areas less than 20 acres in size.

Drainage Area

The drainage area above the pond must be protected against erosion to the extent that expected normal sedimentation will not shorten the planned effective life of the structure.

The drainage area shall be large enough that surface runoff, together with groundwater flow, will maintain an adequate supply of water in the pond.

Depth

The topography and soils of the site shall permit storage of water at a depth and volume which will insure a dependable supply, considering beneficial use, sedimentation, season of use; and evaporation and seepage losses.

Foundation

The area on which a dam is to be placed shall consist of material that has sufficient bearing strength to support the dam without excessive consolidation. The foundation must consist of or be underlain by relatively impervious material which will prevent excess passage of water.

Reservoir Area

Where surface runoff is the primary source of water for a pond, the soils shall be impervious enough to prevent excessive seepage losses, or shall be of a type that sealing is practicable.

Best Management Practice

TROUGH OR TANK

Definition

A trough or tank with needed devices for water control and waste water disposal installed to provide drinking water for livestock.

Scope

This practice covers all trough or tank installations to provide livestock watering facilities supplied from a spring, reservoir, well or other source.

Purpose

To provide watering facilities at selected locations which will bring about the desired protection of vegetative cover through proper distribution of grazing or better grassland management.

Conditions Where Practice Applies

This practice applies where there is a need for new or improved watering places to permit the desired level of grassland management and reduce health hazards to livestock.

Best Management Practice

PIPELINE

Definition

Pipeline installed for the conveyance of water for livestock.

Scope

This practice covers pipelines of less than 4 inches inside diameter installed for livestock watering.

Purpose

To convey water from source of supply to points of use.

Conditions Where Practice Applies

Where conveyance of water in a closed conduit is desirable or necessary to conduct water from one point to another, conserve the supply, or for reasons of sanitation.

Best Management Practice

WELL

Definition

A well constructed or improved to provide water for irrigation, livestock, wildlife, or recreation.

Scope

This practice applies to drilled, driven and dug wells developed to supply water from an underground source. It does not include pumps installed in the well, or above ground installations such as pumping plants, pipelines or tanks.

Test wells established for investigational purposes prior to the installation of a permanent well are considered temporary and are not covered by this standard.

Purpose

To facilitate proper use of vegetation on range, pastures and wildlife area; to supply the water requirements of livestock and wildlife; to provide an adequate supply of water for conservation irrigation; and to provide for human use at recreation sites.

Conditions Where Practice Applies

All irrigation wells shall be planned and located to serve as a source of water for an irrigation water distribution or conveyance system designed to facilitate the conservation use of the soil and water resources on a farm or group of farms.

Irrigation wells are limited to geological site conditions where sufficiently large volumes of underground water are available at a rate which will permit practical irrigation of the land on which the water is to be used. Wells may be the only source of supply or they may supplement other sources. The land on which the water is to be used must be suitable for the production of locally adapted crops under irrigation farming. The water quality must be such that it will not materially reduce the productive capacity of the soil on which it is to be used.

Wells are applicable on ranges, pastures, wildlife, and recreation areas where present facilities are inadequate, and the underground water supply is adequate in quantity and quality for the purpose to be served and can be developed at an economical cost.

Wells for livestock water must be adequately dispersed in location to facilitate distribution of grazing.

All wells shall comply with state water laws and regulations. Wells at recreation sites shall comply with applicable regulations of the state Department of Health and Environment, or other state agency having jurisdiction.

Best Management Practice

SPRING DEVELOPMENT

Definition

Improving springs and seeps by excavation, cleaning, capping, or providing collection and storage facilities. Does not include Trough, Tank, or Pipeline.

Purpose

Spring developments usually are made to improve the distribution or to increase the quantity of livestock water supplies, but may be made for irrigation if water in suitable quantity and quality is available.

Conditions Where Practice Applies

Development shall be confined to springs or seepage areas that appear able to furnish a dependable supply of suitable water during the planned period or periods of use.

The need for, and feasibility of, protection from flooding, sedimentation, and contamination shall be considered in determining the suitability of a site for development.

Best Management Practice

RANGE SEEDING

Definition

Establishing adapted plants by seeding on rangeland. (Does not include pasture and hayland planting.)

Purpose

To (1) prevent excessive soil and water loss; (2) produce more forage on rangeland or land converted to range from other uses.

Where applicable

On rangeland, grazeable woodland and grazed wildlife land.

Planning Considerations

(1) Land to be seeded must have soil and climate that can support a satisfactory cover of adapted range forage plants; and the land must not have enough of the desired species to recover within a reasonable period through grazing management alone. (2) Management following seeding should be able to maintain the stand. (3) Consider the economic response from seeding. (4) Consider rodent and insect population before scheduling seeding.

Best Management Practice
GRADE STABILIZATION STRUCTURE

Definition

A structure to stabilize the grade or to control head cutting in natural or artificial channels. (Does not include structures used in drainage and irrigation systems primarily for water control.)

Scope

This practice applies to all types of grade stabilization structures.

Purpose

Grade stabilization structures are installed to stabilize the grade and control erosion in natural or artificial channels, prevent the formation or advance of gullies, and reduce environmental and water pollution hazards.

Conditions Where Practice Applies

These structures apply where the concentration and flow velocity of water are such that structures are required to stabilize the grade in channels or to control gully erosion.

Best Management Practice

DAM, ROCK AND BRUSH

Definition

Constructing barriers of rock, brush, woven wire, posts, other material or combinations thereof across small channels or depressions to control surface runoff.

Purpose

The purpose of this practice is to reduce the velocity of water that is concentrated in small waterways and decrease its erosive capacity.

Where applicable

This practice applies to sites where:

1. Runoff is concentrated and is deepening small incipient gullies.
2. Runoff is being lost without benefiting the lands on which it originates.
3. The slope of the channel can be decreased, materially reducing the flow velocity to cause sediment deposition and/or check bank cutting.
4. The drainage area of the structure does not exceed 100 acres and the channel slope does not exceed 4 percent.

Best Management Practice

DEBRIS BASIN

Definition

A barrier or dam constructed across a waterway or at other suitable locations to form a silt or sediment basin.

Purpose

To preserve the capacity of reservoirs, ditches, canals, diversions, waterways, and streams; to prevent undesirable deposition on bottomlands and developed areas; to trap sediment originating from construction sites; and to reduce or abate pollution by providing basins for deposition and storage of silt, sand, gravel, stone, agricultural wastes, and other detritus.

Conditions Where Practice Applies

This practice applies where physical conditions or land ownership preclude the treatment of the sediment source by the installation of erosion control measures to keep soil and other material in place, or a debris basin offers the most practical solution to the problem.

Best Management Practice

DAM, DIVERSION

Definition

A structure built to divert part or all of the water from a waterway or stream into a different watercourse, an irrigation canal or ditch, or a waterspreading system.

Scope

This practice applies to structures of a permanent nature, constructed of materials having an expected life span consistent with the purpose for which the structure is designed. It does not include Diversion, Floodwater Diversion, Floodwater Retarding Structure or Grade Stabilization Structure.

Purpose

The purpose of a diversion dam is (1) to divert part or all of the water from a waterway in such a manner that it can be controlled and applied to a beneficial use, or (2) to divert periodic damaging flows from a watercourse to another watercourse having characteristics which reduce the damage potential of the flows and reduce soil erosion.

Conditions Where Practice Applies

Where a diversion dam is needed as an integral part of an irrigation system or a water spreading system which has been designed to facilitate the conservation use of soil and water resources.

Where it is desirable to divert water from an unstable watercourse to a stable water course.

Where the water supply available is adequate for the purpose for which it is to be diverted.

Where the construction of a dam and the diversion of water are permitted by applicable state statutes and regulations.

Best Management Practice

DIVERSION

Definition

A channel with a supporting ridge on the lower side constructed across the slope.

Scope

This practice covers the installation of all diversions except floodwater diversions.

Purpose

The purpose of this practice is to divert water from areas where it is in excess to sites where it can be used or disposed of safely.

Conditions Where Practice Applies

This practice applies to sites where:

1. Runoff from higher lying areas is damaging cropland, pastureland, farmsteads, or conservation practices such as terraces or stripcropping.
2. Surface and shallow subsurface flow is damaging sloping upland.
3. Required as a part of a pollution abatement system, or to control erosion and runoff on urban or developing areas and construction sites.

Diversions shall not be substituted for terraces on land requiring terracing for erosion control.

Diversions are not usually applicable below high sediment producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with or before the diversions.

Best Management Practice
FLOODWATER RETARDING STRUCTURE

Definition

A single-purpose structure providing for temporary storage of floodwater and for its controlled release.

Scope

This practice applies to class (a) structures where the product of the storage (in acre-feet at the elevation of the crest of the emergency spillway) and the height of the dam (in feet as measured from the lowest point in the original cross section on the centerline to the crest of the emergency spillway) is less than 3000. A class (a) structure is defined as a structure located in rural or agricultural areas where damage due to failure is limited to farm buildings, agricultural land, or township or county roads.

Purpose

Floodwater retarding structures are installed to reduce flood damages downstream by controlling the release rate from flood flows of predetermined frequencies. They may also permit the use of more economical channel improvements or stabilizing structures in the channel downstream.

Conditions Where Practice Applies

This practice applies only to sites meeting all of the following conditions:

1. The construction of the structure is permitted by applicable state statutes and regulations.
2. Topographic, geologic, and soils conditions at the proposed site are satisfactory for the development of a feasible dam and reservoir.
3. The sediment yield at the site is not excessive.

Best Management Practice

CRITICAL AREA PLANTING

Definition

Planting vegetation such as trees, shrubs, vines, grasses, or legumes on critical areas. (Does not include tree planting mainly for wood products.)

Purpose

To stabilize the soil, thereby: reducing sediment and runoff which degrades downstream areas, and reducing damage from windborne soil.

Where Applicable

On natural or manmade highly erodible or severely eroded areas, where vegetation is difficult to establish with usual seeding or planting methods. This practice is applicable on slopes with gradients of 2:1 or less. Other means will be needed on steeper slopes.

Planning Considerations

A critical area is defined as land which has been disturbed by construction or altered by past overuse or mismanagement and which requires special treatment, management, and/or materials to return it to an ecologically acceptable condition.

Noneroded landscapes near the site provide a guide to critical or non-critical situations. Slope shapes, lengths, and gradients of disturbed areas should conform as nearly as practical with nearby noneroded landscapes before revegetation is attempted.

Present native vegetation on nearby nondisturbed areas is frequently the best guide to potential vegetation for the site. However, planned land use should also be a prime consideration when selecting species.

Best Management Practice
GRAZING LAND MECHANICAL TREATMENT

Definition

Renovation, contour furrowing, pitting, or chiseling native grazing land by mechanical means.

Purpose

1. Improving plant cover quickly by reducing competition of undesirable plants.
2. Aerating the soil
3. Increasing rhizome activity of desirable plants
4. Retarding runoff and increasing available moisture, reducing erosion, and protecting lower lying land or structures from siltation
5. Creating basins for seedling establishment

Where applicable

1. On native grazing land where perennial plants have the potential to increase
2. Where soil and slope are suitable to each method and type of equipment used
3. Where grazing will be managed to allow plants to respond to this treatment

Best Management Practice

BRUSH MANAGEMENT

DEFINITION

Management and manipulation of stands of brush by mechanical, chemical, or biological means or by controlled burning on rangeland and pastureland. (Includes reducing excess brush to restore natural plant community balance and manipulating brush stands through selective and patterned control methods to meet specific needs of the land and objectives of the land user.)

PURPOSE

To improve or restore a quality plant cover to (1) reduce sediment and improve watershed quality, (2) increase quality and quantity of food and/or cover of desirable plants for livestock and wildlife.

WHERE APPLICABLE

1. On brush infested soils where the potential vegetation is dominantly grasses and forbs suitable for forage production.
2. Where adjustments in grazing management alone will not restore the kind of plant cover needed to attain the conservation objectives within a reasonable time.
3. Where control of woody phreatophytes is necessary to conserve moisture.

SCOPE

Brush management objectives and procedures may vary depending upon the kinds of land and intended uses. Objectives may be:

1. To manipulate numbers, species, and distribution of brush to approximate that of natural plant community for the site when the primary use is by domestic livestock.
2. To clear brush from lands for improved plant cover on pastureland.

1/ "Brush" as used in this standard includes woody half-shrubs, shrubs, and trees which invade lands on which they are not part of the natural (climax) plant community or which occur in amounts significantly in excess of that which is natural to the site.

Planning Considerations

In protecting land use and environmental values:

A. Conservationists are to assist landusers to fully consider:

1. Possible costs, hazards, and technical requirements of the practice and the kind of grazing management and maintenance measures that will be needed to insure success.
2. Safe handling and disposal of herbicides to avoid injury to humans, domestic animals, desirable plants, and fish or other wildlife and any contamination of nearby crops.
3. Federal, state, and county laws and regulations governing the use of herbicides and labeling. The uses for which a herbicide has been registered are included in the information provided on the label of the commercial product. By reading the label, determine the proper uses for which the produce is intended. Herbicides approved for specified uses in New Mexico are listed in the New Mexico Extension Service publication, 400-A-15, "Chemical Weed Control Guide". Refer to the label on the commercial product for detailed information concerning dosage, application and precautions. Certain precautions may be noted in the publication that are not included on the label but are applicable to local conditions in New Mexico.
4. The method of brush management with the least potential hazard to man, animals, and the environment will be used whenever feasible.

B. The need for brush management is governed by the kind and amount of infestation of brush and the land-use objective. Infestation is based on the percent of crown canopy of the dominant and associated species, or on the number of plants per acre. See the attached tabulation of Degree of Infestation by species.

The technique computation used will be documented to substantiate the degree of infestation for the brush to be manipulated. The following techniques may be useful.

In determining canopy cover and plant count, the most familiar technique which has proven accurate may be used.

A heavy infestation indicates the brush is thick enough to suppress other vegetation and hinder movement of some kinds of animals.

A medium infestation indicates the brush is significantly affecting other vegetation.

A light infestation indicates brush presence is recognizable but not in sufficient quantity to appreciably affect other vegetation.

For some land uses, infestation of brush may be desirable. For others, it may be desirable to reduce some species to prevent later infestations that may require more costly measures.

- C. In all cases, a plan should be prepared as a design for each brush management treatment method. The plan will include:
1. A location or sketch map.
 2. Treatment method.
 3. Follow-up measures, if needed.
 4. Degree of reduction agreed upon by cooperator.
 5. Reference to or prescription for deferment.
 6. Check out procedure and certification of completion.

DEGREE OF INFESTATION BY SPECIES

<u>Kind of Brush</u>	<u>Percent Canopy Cover</u>			<u>Plants per acre</u>		
	<u>Dense</u>	<u>Medium</u>	<u>Light</u>	<u>Dense</u>	<u>Medium</u>	<u>Light</u>
Catclaw				over 200	100-199	10-99
Cholla				over 250	130-250	20-129
Creosotebush				over 250	130-249	30-129
Juniper				over 250	100-249	30-99
Mesquite	over 25	10-24	5-9			
Pinyon				over 250	100-249	30-99
Pricklypear				over 250	130-299	20-129
Rabbitbrush	over 35	15-34	5-14			
Sagebrush (Sand)	over 35	20-34	5-19			
Sagebrush (Big)	over 35	20-34	5-19			
Shinnery Oak	over 30	15-29	5-14			
Shrub Oak	over 30	15-29	5-14			
Tarbrush				over 300	130-299	30-129
Yucca	over 20	10-19	5-9			
Saltcedar*	over 25	10-24	5-9			
Willow*	over 30	15-29	5-14			

* Will be reduced only where a usable stand of grass can be established and where removal of the brush will not contribute to streambank erosion or where it is done as contribution to wildlife habitat improvement.

Best Management Practice
STREAM CHANNEL STABILIZATION

Definition

Stabilizing the channel of a stream with suitable structures.

Scope

This practice covers the structural work done to control aggradation or degradation in a stream channel. It does not include work done to prevent bank cutting or meander.

Conditions Where Practice Applies

This practice applies to stream channels undergoing damaging aggradation or degradation that cannot be feasibly controlled by clearing or snagging, by the establishment of vegetative protection, or by the installation of upstream water control facilities, and which require the application of structural measures.

Best Management Practice

STREAMBANK PROTECTION

Definition

Stabilizing and protecting banks of streams, lakes, estuaries or excavated channels against scour and erosion by vegetative or structural means.

Scope

This practice covers the measures used to stabilize and protect the banks of streams, lakes, estuaries, and excavated channels.

Purpose

Streambank protection is established to stabilize or protect for one or more of the following purposes:

1. To prevent erosion, loss of land, or damage to utilities, roads, buildings, or other facilities adjacent to the eroding area.
2. To maintain the capacity of a channel.
3. To control channel meander which would adversely affect downstream facilities.
4. To reduce sediment loads causing damages and pollution or to improve areas for recreational use or as a habitat for fish and wildlife.

Conditions Where Practice Applies

This practice applies to streams, lakes, estuaries or excavated channels, where the banks are subject to erosion from the action of water, ice or debris or to damage from livestock or vehicular traffic.

Best Management Practice

Terraces

Terrace, Basin

A form of level terrace with closed ends constructed on non-cropland with permeable soils and designed to impound a given amount of runoff from the drainage area above it.

Scope

This guide covers the planning and design of basin terraces. It does not apply to Gradient, Level, or Parallel Terraces, or Diversions.

Purpose

Basin terraces are constructed to retain runoff from non-cropland areas, check erosion on the lower slopes, prevent gully development, reduce flooding, increase infiltration opportunity and reduce pollution from sediment and runoff.

Conditions Where Practice Applies

This practice is applicable on sites where:

1. Runoff from higher lying areas will damage crop or pastureland; conservation practices such as terraces, farm ponds, and similar structural installations; roads, buildings, or other cultural features.
2. The soil is deep and capable of absorbing and storing extra water.

Best Management Practice

Terraces

Terrace, Gradient

Definition

An earth embankment or a ridge and channel constructed across the slope at a suitable spacing and with an acceptable grade.

Scope

This standard covers the planning and design of gradient terraces. It does not apply to diversions.

Purpose

Gradient terraces are constructed to reduce erosion damage and pollution by intercepting surface runoff and conducting it to a stable outlet at a nonerosive velocity.

Conditions Where Practice Applies

Gradient terraces normally are limited to cropland having a water erosion problem. They shall not be constructed on deep sands or on soils that are too stony, steep, or shallow to permit practical and economical installation and maintenance. The topography must be such that farmable terraces can be constructed. Gradient terraces may be used only where suitable outlets are or will be made available.

Best Management Practice

Terraces

Terrace, Level

Definition

An earth embankment or a ridge and channel constructed across the slope at a suitable spacing with no grade.

Scope

This standard covers the planning and design of level terraces. It does not apply to Diversions.

Purpose

Level terraces are constructed to conserve moisture, to control erosion, and reduce pollution.

Conditions Where Practice Applies

Level terraces shall be constructed only on deep soils that are capable of absorbing and storing extra water without appreciable crop damage and in areas where the rainfall pattern is such that storage of rainfall in the soil, rather than removal, is practical and desirable.

They shall not be constructed on deep sands or on soils that are too stony, steep, or shallow to permit practical and economical installation and maintenance. In cultivated areas the topography must be such that farmable terraces can be constructed.

Best Management Practice

Terraces

Terrace, Parallel

Definition

An earth embankment or a ridge and channel in parallel constructed across the slope at a suitable spacing and with an acceptable grade.

Purpose

Parallel terraces are constructed to reduce erosion and pollution, conserve moisture, and provide a more farmable terrace system.

Conditions Where Practice Applies

Parallel gradient terraces normally are limited to cropland having a water erosion problem. Gradient terraces may be used only where suitable outlets are or will be made available.

Level terraces are limited to deep soils that are capable of absorbing and storing extra water without appreciable crop damage and in areas where the rainfall pattern is such that storage of rainfall in the soil, rather than removal is practical and desirable.

Terraces shall not be constructed on deep sands or on soils that are too stony, steep or shallow to permit practical and economical installation and maintenance. The topography must be such that farmable terraces can be constructed.

Best Management Practice

CONSERVATION CROPPING SYSTEM

DEFINITION:

Growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes, as well as rotations in which the desired benefits are achieved without the use of such crops.

PURPOSE

To improve or maintain good physical condition of the soil; maintain or improve organic matter and soil fertility; protect the soil during periods when erosion usually occurs; help control weeds, insects, and diseases; and meet the need and desire of farmers for an economic return.

WHERE APPLICABLE

On all cropland and on certain recreation and wildlife land.

PLANNING CONSIDERATIONS

A conservation cropping system includes the kinds of crops which have the ability to protect and improve the soil, as well as crops which allow soil deterioration. The entire system may need to be reinforced by cultural and management measures, as well as mechanical practices. The combination of crops grown, cultural measures, and mechanical practices should control erosion under any crop in the rotation.

In most areas of New Mexico, the main purpose of the conservation cropping system is maintenance of good soil physical condition, and recycling of organic matter. However, erosion control should be a prime consideration when planning a conservation cropping system in areas subject to wind or water erosion.

Some of the factors to consider in selecting cropping systems are: The kind of soil, climatically adapted crops, the kind and sequence of crops, tillage methods, use of crop residues, manure and fertilizers, green manure crops, insect and disease control, market demands, and the availability and management of quality irrigation water.

Best Management Practice

IRRIGATION WATER MANAGEMENT

Definition

Determining and controlling the rate, amount and timing of irrigation water application to soils to supply plant water needs in a planned and efficient manner.

Purposes

To effectively utilize the available irrigation water supply in managing and controlling the moisture environment of crops to promote the desired crop response; to minimize soil erosion and loss of plant nutrients; to control undesirable water loss; and to protect water quality.

Conditions Where Practice Applies

This practice is adapted to all lands that are suitable for irrigation and that have a water supply of suitable quality and quantity.

An adapted conservation irrigation system must be available, either as a portable system or a system that has been established on the land to be irrigated.

The irrigator shall have the knowledge and capability to manage and apply irrigation water in such a manner that the objectives mentioned above under "Purpose" can be reasonably attained. The knowledge should include such things as:

1. How to determine when irrigation water needs to be applied based on crop water-use rates and stages of plant growth.
2. How to measure or estimate the amount of water required for each irrigation including the leaching needs.
3. How to compute the amount of water delivered to an area.
4. The normal time needed for the soil to absorb the required amount of water and how to detect changes in intake rate.
5. How to adjust stream size, application rate or irrigation time as necessary to compensate for changes in such factors as intake rate or amount of water to be applied.

6. How to recognize erosion caused by irrigation.
7. How to estimate the amount of irrigation runoff from an area.
8. —How to evaluate the uniformity of water application.

Best Management Practice
PASTURE AND HAYLAND MANAGEMENT

Definition

Proper treatment and use of pastureland or hayland.

Purpose

To prolong life of desirable forage species; to maintain or improve the quality and quantity of forage; and to protect the soil from erosion and reduce water loss.

Where Applicable

On all pastureland or hayland where plants are to be managed for long-term production (5 years or more).

Planning Considerations

I. Pasture and Hayland

A. Fertilizing

- (1) Fertilize to meet the needs of the plant and the desires of the operator.
- (2) Use soil tests or tissue analysis to determine needs in absence of local experience or trials.
- (3) Make split applications of nitrogen on grasses at intervals during the growing season.
- (4) Use phosphorous in split applications, as needed, to maintain legumes.
- (5) Varying the ratio between nitrogen and phosphorous fertilizers can help maintain a balance between grasses and legumes in mixtures.
- (6) NMSU Circular 403 "Fertilizer Guide for N.M." provides guidance on fertilizer requirements.

B. Irrigation Water Management

- (1) Establish frequency of irrigation that will be required to maintain soil moisture above 50 percent available water holding capacity during months of peak water use.
- (2) When practical, use the established frequency during the entire season in combination with time of harvest, (either by grazing or cutting).
- (3) When possible, irrigate immediately after harvesting.
- (4) Amounts of water applied at each irrigation will be adjusted to match consumptive use. (See Local Irrigation Guide).
- (5) Irrigation frequency and amount will be increased or altered when soil and/or irrigation water is high in soluble salts.
- (6) Excessive water, allowed to stand on fields, will cause premature stand thinning and increase disease and undesirable vegetation. Adequate surface drainage should be provided.

II. Pastureland (Irrigated)

- A. Daily rotation systems provide highest yields and permit very intensive use of irrigated pasture. Management factors needed to maintain maximum pasture growth are:
- (1) Provisions for an adequate regrowth period.
 - (2) Provisions for keeping livestock off while irrigating or when pasture is wet.
 - (3) Adequate, timely irrigation.
 - (4) Adequate use of fertilizer.
 - (5) When needed, provisions for scattering droppings and clipping rank vegetation.
- B. Stocking rates vary with climate, soil, type of grass and/or legume, availability and quality of irrigation water, fertilizer use, and other management practices. Suggested initial stocking rates for rotation systems on irrigated pasture vary from 10 to 20 AUM/acre where irrigation water is adequate. Observations and experience are the best guides for determining stocking rate.

- C. On new seedings, the best way to establish future grazing height is to take the 1st crop for hay.

III. Hayland (Irrigated)

- A. Harvesting should be based on stage of growth and the objectives of the operator. Harvesting at various stages of growth has an influence on protein content, total dry matter, percentage of leaves vs stems, total fiber, and total available carbohydrates in roots.
- B. Continuously cutting alfalfa at an immature stage, such as the prebud or bud stage, will reduce total yield and cause the stand to deteriorate prematurely. Stand thinning is due primarily to a continuous reduction of food reserves in the roots. Alfalfa with low root reserves is especially susceptible to winter killing. However, alfalfa cut at an immature stage has higher protein content and higher feeding value per pound than when cut at later stages. Thus, it becomes a question of very high quality feed vs total forage and stand longevity. The most damage to stand vigor occurs when alfalfa is cut at an immature stage shortly before frost in the fall.
- C. The values in the table below are indicative of changes, with maturity, of alfalfa. Other legumes would be similar.

Harvest Frequency (days)	16	21	28	35	42
Percent Bloom	0	5	15	75	100
Percent Leaves	55	47	45	34	34
Percent Stems	45	53	55	66	66
Percent Protein (leaves)	30	29	27	27	23
Percent Protein (stems)	15	13	11	12	12
Percent Protein (forage)	23	21	18	17	16
Dry Matter (tons)*	3.0	4.0	4.3	5.7	6.6
Relative Root Weights	2	3	4	7	9
Percent Total Available Carbohydrates in Roots	23	25	28	36	29
Basal Shoot Rating**	1	3	4	5	8

* These yields were converted to tons from small samples. Yield differences from cutting at various growth stages may be less from larger samples.

**The basal shoot rating is based on a scale of 1 to 10. Alfalfa should always be cut before the basal shoots are tall enough that cutting removes the tops (growing point). When the growing point of basal shoots is removed, rapid regrowth is delayed until new basal shoots develop.

- D. Mixed grass/legume hay is nearly as high in protein and feed value as legumes seeded alone. Grass/legume mixtures generally produce 15 to 25 percent more forage than legumes seeded alone. When adapted grass species are seeded with a legume in a ratio of about 50-50, the grass will fill in areas where alfalfa dies out, thus reducing weedy vegetation.

Implementation Recommendations

The Sandoval and Los Alamos Counties planning groups determined that Best Management Practices identified in this plan should be carried out on a voluntary basis with cost-share incentive provided for those practices which require cash outlay to install. The local Soil and Water Conservation District is recommended as the management agency using their working relations with landowners and operators.

Districts enter into cooperative agreements with landowners and operators to help them plan and apply conservation practices.

Districts have working agreements with state and federal agencies to provide technical assistance to landowners and operators within the district. State agencies include the New Mexico Division of State Forestry and the Cooperative Extension Service. Federal agencies include agencies in U. S. Department of Agriculture and U. S. Department of Interior.

This system of working agreements can be used to help carry out this plan on private and state-owned lands. Control and management treatment of federal lands, U. S. National Forests and National Resource lands, remains the responsibility of the federal land management agency, U. S. Forest Service and Bureau of Land Management.

References

1. Agriculture Research Service
Control of Water Pollution from Cropland, Vol. 1, November 1975
2. Leroy W. Hacker
Soil Conservation Service, Soil Survey of Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico.
3. New Mexico State Engineer Office
Bernalillo County Water Resources Assessment for Planning Purposes
4. Soil Conservation Service
General Soil Map, December 1973
5. Soil Conservation Service
New Mexico Agronomy Technical Note No. 28, October 1975

FIELD DATA SHEET

Site Location:

County:

Field Office:

Section:

T

R

Soil Series Name:

K Value

Slope length (ft.)

SL Factor from table

Slope gradient (%)

Rainfall (R) Factor: from map

Percent Cover Readings: (1)

(2)

(3)

(4)

(5)

AVERAGE

Cover Factor (C)

Practice Factor (if any)

otherwise use 1.0

Soil Loss in Tons Per Acre (A)

 $A = (K)(SL)(R)(C)(P) =$

Tons/AC

Tons/AC X .346

Ac. Ft./Sq. Mi.