

EVALUATION AND DEVELOPMENT OF
INSTITUTIONAL SYSTEMS FOR
ENVIRONMENTAL MANAGEMENT

**WATER QUALITY IMPACTS OF
LAND-DISTURBING ACTIVITIES**



This Project Is Being Conducted In Part
With Funds Provided By The United
States Environmental Protection Agency
Contract No. 68-01-3533, Entitled:

DEMONSTRATION OF STATE WATER QUALITY
MANAGEMENT PLANNING REGULATIONS FOR
CONTROL OF LAND DISTURBING ACTIVITIES
IN THE STATE OF NEVADA

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
SUMMARY	
Problem Statement	3
Recommended Solutions	3
Solution Development Process	10
RECOMMENDATIONS	
Legislative Action Proposal	27
Early Action Program	28
PROBLEM IDENTIFICATION	
Background	35
Land Disturbing Activities	38
Magnitude	46
Priorities	64
CONTROL TECHNIQUES	
Control Strategies	71
Implementing Strategies	78
Effectiveness	86
Resource Requirements	90
EXISTING INSTITUTIONS	
Framework	97
Federal	97
State	125
Regional/Local	160
EVALUATION SYSTEM	
Evaluation Model	167
Assessment of Authorities and Programs	180
Questionnaires	184
Data Collection Process	201
AGENCY EVALUATION	
Agency Capabilities	207
General Observations	212
AUTHORITY EVALUATION	
Agency/Activity Intervention	217
Agency/Authority Intervention	221
Apparent Deficiencies	221
General Observations	243
ALTERNATIVE SOLUTIONS	
Development of Alternatives	246
Alternative Evaluation	249
APPENDIX	
Abbreviations	251
Bibliography	252

OCT 21 1976

Introduction

The Federal Water Pollution Control Act was enacted by Congress to alleviate pollution threats and preserve and enhance the nation's water quality. The Act establishes national goals for pollution control, and gives the U.S. Environmental Protection Agency the authority and the responsibility of preserving water quality. The 50 states have, in turn, established state level programs for alleviating water quality problems. Section 208 of the Federal Water Pollution Control Act, as amended, provides for the development and implementation of area-wide waste treatment management plans, which, among other things, must establish a regulatory program providing for the control or treatment of all point and non-point sources of pollution.

The State of Nevada has in operation an effective permit program aimed at controlling point discharges of pollutants into the waters of the state. Attainment of Nevada's water quality standards, however, must be predicated upon a substantially greater degree of attention to pollutants from non-point sources. Non-point sources of pollution are diffuse, not easily identified nor always directly relatable to the source, and are caused by a broad spectrum of man's activities. Runoff and erosion from land-disturbing activities is the largest common denominator of the many types of diffuse pollution sources. The existing institutional sets and control authorities that operate within the state of Nevada are inadequate in terms of solution to the non-point water quality problem.

Initiation of this project was approved by EPA as a result of a technical proposal submitted by the Environmental Protection Services of the State of Nevada. The stated project goal is to "provide the State of Nevada with a management discharge of pollutants to waters of the state from land-disturbing activities." The project has been conducted as part of the Section 208 planning process, and has been largely financed by EPA funding. This interim report, covering the first year's effort in what is scheduled to be a two year program, details the recommended solutions, and describes the process used to develop those solutions.

Work on the project started in June, 1975, with James C. Breitlow, Nevada Department of Human Resources, Environmental Protection Services, as project director. The project team has consisted of consultants from four separate firms (Stevens, Thompson & Runyan, Inc.; Vasey-Scott Engineering Co.; Harper & Owes; and Organizational Consultants of the Northwest; a deputy attorney general, and staff support from Environmental Protection Services.

The project proceeded from seven key assumptions, which are listed below:

- (1) water quality is degraded by land-disturbing activities;
- (2) management techniques exist and are in the literature;
- (3) for effective regulation, neither the regulated entities nor regulating organizations need to have the water quality problem specifically demonstrated--demonstration from the literature and pilot 208 planning will suffice;

- (4) with any newly regulated entity, inertia and stress exist, in terms of attainment of the goal of the regulation;
- (5) due to limited administrative and other resources, implementation must be on a priority basis, in terms of geographical area and the particular land-disturbing activity;
- (6) the existing institutional sets and control authorities are inadequate in terms of solution of the water quality problem; and
- (7) the solution lies predominantly in management practices, as opposed to capital-intensive structures.

In order to assure that the methodology and recommendations were being developed on a sound basis, a project Sounding Board has been used throughout the study. This Sounding Board has acted in an advisory capacity, and has had significant impact on the study. Board membership has included the following:

Joe Dini, Jr. - State Assemblyman
Bob Stewart - Administrative Assistant and Press Secretary, Governors Office
Bruce Arkell - State Planning Coordinator, Governors Office
John MacIntyre - Assistant County Manager, Washoe County
Ernie Gregory - Director, Environmental Protection Services

Implementation of the recommended solutions will require the involvement of many persons, most of whom have only a superficial knowledge of the project results to date. As the size of the interim report is somewhat imposing, a rather detailed summary has been prepared. This summary is the first section in the interim report, and has also been printed as a separate document. It contains some sections of the interim report verbatim, while other sections are abridged.

Summary

PROBLEM STATEMENT

The Federal Water Pollution Control Act was enacted by Congress to alleviate pollution threats and preserve and enhance the nation's water quality. The Act establishes national goals for pollution control, and gives the U.S. Environmental Protection Agency the authority and the responsibility of preserving water quality. The 50 states have, in turn, established state level programs for alleviating water quality problems. Section 208 of the Federal Water Pollution Control Act, as amended, provides for the development and implementation of area-wide waste treatment management plans, which, among other things, must establish a regulatory program providing for the control or treatment of all point and non-point sources of pollution.

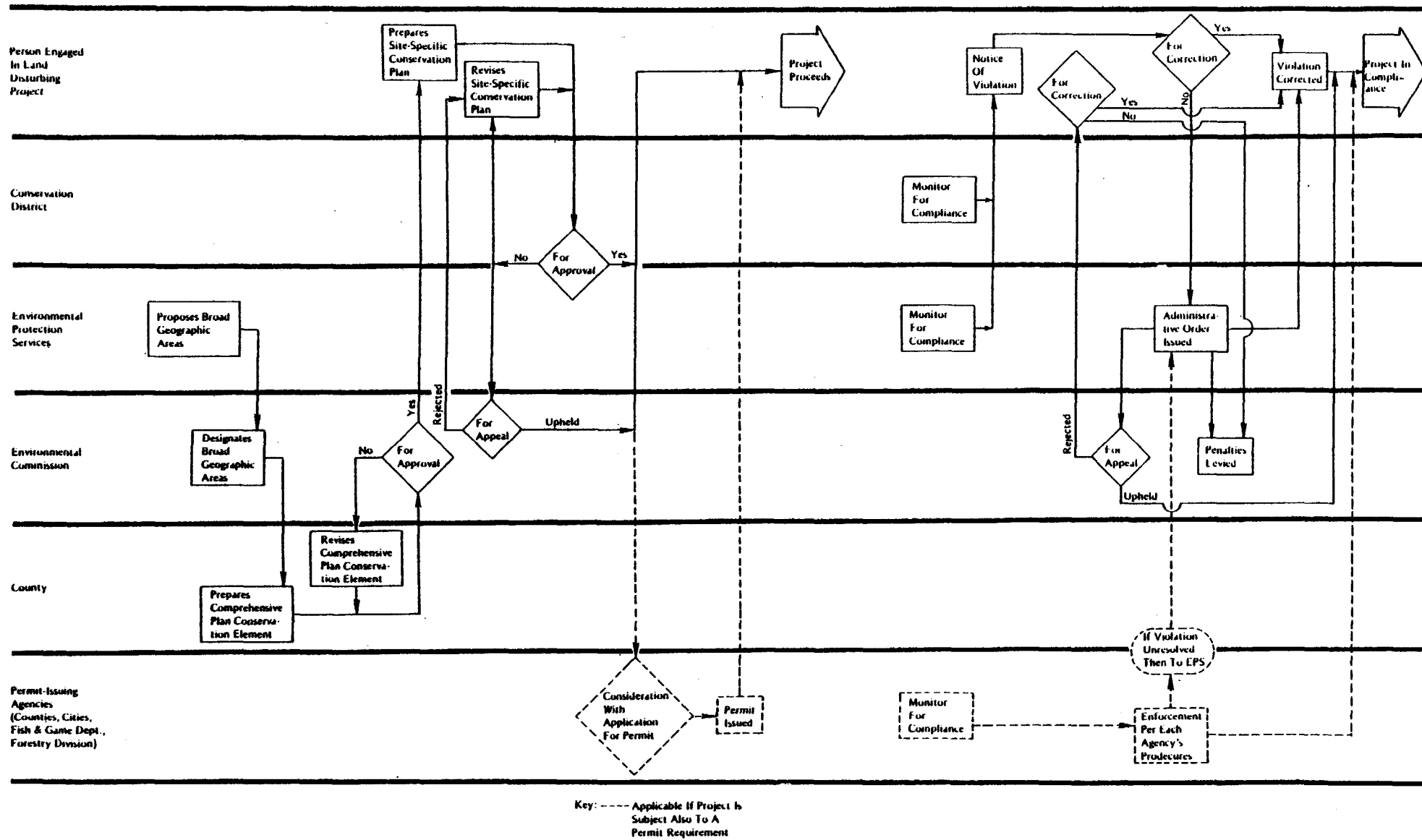
The State of Nevada has in operation an effective permit program aimed at controlling point discharges of pollutants into the waters of the state. Attainment of Nevada's water quality standards, however, must be predicated upon a substantially greater degree of attention to pollutants from non-point sources. Non-point sources of pollution are diffuse, not easily identified nor always directly relatable to the source, and are caused by a broad spectrum of man's activities. Runoff and erosion from land-disturbing activities is the largest common denominator of the many types of diffuse pollution sources. The existing institutional sets and control authorities that operate within the state of Nevada are inadequate in terms of solution to the non-point water quality problem. This project has been directed at identifying specific inadequacies in the institutional structure, and developing appropriate institutional solutions.

Initiation of this project was approved by EPA as a result of a technical proposal submitted by the Environmental Protection Section of the State of Nevada. The stated project goal is to "provide the State of Nevada with a management system for the control of accelerated erosion and attendant discharge of pollutants to waters of the state from land-disturbing activities." The project has been conducted as part of the Section 208 planning process, and has been largely financed by EPA funding. This interim report covering the first year's effort in what is scheduled to be a two year program, details the recommended solutions and describes the process used to develop those solutions.

RECOMMENDED SOLUTIONS

The efforts of this study have been directed at two possible methods of solving the runoff and erosion problem in Nevada. The first method is the recommended alternative, which will require legislative action by the 1977 session of the Nevada State Legislature for its implementation. The development of this alternative is described in the section on Alternative Solutions. The second area of emphasis is on actions which can be taken to assist in control of runoff and erosion within the

INSTITUTIONAL SYSTEM FOR RUNOFF AND EROSION CONTROL



existing institutional structure, thus requiring no legislative changes. This constitutes the Early Action Program, because implementation procedures can begin prior to any action by the Legislature.

Although some progress on controlling runoff and erosion can be made through implementation of the Early Action Program, it will take enactment of the legislative action proposal to fully meet water quality standards on a statewide basis. The importance of implementing the recommended solutions lies not only in attaining the state's water quality goals, but also in forestalling or intercepting federal interventions in this area by development of an effective state program that is acceptable in Nevada.

LEGISLATIVE ACTION PROPOSAL

The recommended alternative for legislation is being developed in two steps. The first step has been completed. This was a description of the major provisions of the proposed legislation, which is a general concept with only a few details. The second step, which is now in progress, is to present the recommended alternative for legislation to federal, state, regional and local agencies as well as user groups, associations, impacted parties, and the general public. Reaction and feedback from these meetings will be used to develop details to the degree necessary for bill drafting.

The recommended alternative as presented to agencies, user groups, etc., is diagrammed on the facing page and described below.

1. Upon the proposal of the Environmental Protection Services (EPS), the State Environmental Commission designates broad geographic areas requiring priority attention with respect to runoff and erosion problems. Then, as a part of the county comprehensive planning program, each county having jurisdiction in the designated areas develops a conservation plan element for such areas. The plan element should set forth the specific geographic areas where land-disturbing activities are of concern, the priorities among the different types of land-disturbing activities needing earliest attention, and recommended performance criteria for runoff and erosion from land-disturbing activities. Counties may receive assistance from EPS, conservation districts, and State Lands Division. Completed conservation plan elements need the approval of the State Environmental Commission.
2. Subsequent to the completion of county conservation plan elements, any person engaging, or proposing to engage, in a land-disturbing activity* of a certain magnitude develops a site-specific conservation

*The present intent is to define this term in the legislative bill in such a manner that it will cover each type of land-disturbing activity.

plan, setting forth measures to control runoff and erosion from a water quality standpoint. Implementation of this requirement will be phased, in terms of time and specific geographic area, according to the priorities set forth in the county conservation plan elements. Land disturbers may receive assistance from conservation districts (including the resources of the U.S. Soil Conservation Service), EPS, and numerous other agencies who render assistance. Site-specific conservation plans go through a review and comment procedure, and need the approval of the Conservation District and EPS. If a land-disturbing activity is already subject to other permit programs (e.g., building permits for construction) an approved site-specific conservation plan is needed prior to the issuance of such permit. (Because it is conceivable that unqualified power to disapprove a site-specific conservation plan can be abused for the political purpose of preventing the exercise of permit agencies' authorities, the power to disapprove shall be limited to a determination as to whether adequate runoff and erosion control measures are provided.) Appeal procedures are provided, as are provisions for inspection, enforcement, penalties and program evaluation.

EARLY ACTION PROGRAM

In addition to the recommended alternative for legislative action, several actions can be taken that will be directly supportive. These actions include both items that should be accomplished prior to the legislative action, as well as some that must necessarily follow.

1. Prepare a manual of standards and specifications for runoff and erosion control. The purpose of this manual is to provide to everyone involved in land-disturbing activities a reference of control measures which is tailored to Nevada. This would include structural and non-structural practices which will effectively prevent or abate runoff and erosion. Such a manual will be a key adjunct to the program that is to be created with the proposed legislation, with respect to the site-specific conservation plan requirement thereof. The manual will serve a dual role. First, the manual will serve as the criteria against which site-specific conservation plans are approved or disapproved. Second, the manual will serve to advise the persons engaged in land-disturbing activities as to the contents of a site-specific conservation plan and as to the type of expectations that the plan-approving authority has of the persons engaged in land-disturbing activities. Once assembled, the manual is to be used with discretion, fully considering any special circumstances of individual land-disturbing activities (e.g., emergency situations, unique environmental setting, etc.). The development and collation of such criteria have been done by several agencies over the years. What is needed is to put these criteria which have proven effective and reasonable in Nevada into one document.

The document should be assembled with informal public participation by a task force comprised of members of the agencies which have had past experience in developing and/or compiling such criteria, and which are to have principal roles to perform in the new program. The motivation and the leadership in the work of the task force is to be the responsibility of EPS. Upon completion of the task force efforts, the product will be proposed to the Environmental Commission and the Conservation Commission for their consideration, formal public participation and adoption. In addition, each conservation district will be presented the product of the task force effort for its adoption. This total effort should be completed by January 1978, to coincide with the anticipated effective date of the legislative requirement for site-specific conservation plans.

The several individual 208 planning programs in Nevada will develop and refine certain criteria that can be used with respect to the abatement and control of runoff and erosion; these 208 planning products are to be considered for augmenting the manual which is to be prepared in its initial form by January of 1978.

2. Develop memoranda of understanding with certain federal agencies. Not necessarily related to the proposed program to be created by legislation is the need to develop memoranda of understanding with the federal land management agencies as well as the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, HUD and the Economic Development Administration. If the protection of water quality were a matter of greater purpose for these agencies, the administration of their programs could yield more complete control of runoff and erosion. The infusion of a greater motivation toward water quality protection can be accomplished by establishing a partnership between EPS and these agencies. The memoranda of understanding should provide for an initial mutual review and agreement as to the adequacy of each agency's specifications and conditions with respect to runoff and erosion control that it attaches to any support or sanction it gives to projects having a land-disturbing nature. It is also intended that these memoranda will provide a mechanism for periodic mutual review of each agency's annual priorities for such things as funding support programs and public works projects. It is intended that such memoranda will be developed in the same spirit of intergovernmental and interagency coordination as espoused in Section 304(j) of the Federal Water Pollution Control Act, as amended.
3. Perform a prototype exercise of the program as set forth in the proposed legislation. EPS should take the lead in initiating a prototype program along the lines of the proposed legislation. This prototype program would involve EPS, one county, one conservation district, and one person engaged in a land-disturbing activity. Each would participate on a voluntary basis. The purpose of conducting such an exercise is three-fold: 1) to assist in developing

specific considerations yet needed in the legislative proposal; 2) to uncover any "bugs" that may exist in the present concept of the proposed program; and 3) to obtain some experience to assist in immediate implementation of the program once enacted. This exercise may be undertaken immediately but certainly ought to be conducted and completed by no later than the end of November, 1976.

4. Obtain preferential loan rates for qualified developers and other types of persons engaged in land-disturbing activities. A few governmental assistance programs are being administered to provide financial incentives for the abatement of runoff and erosion. In Nevada, for various reasons, such governmental incentive is not extensive. It is recommended that the principle of providing financial incentives be extended to non-governmental institutions. More specifically, a program should be established with Nevada lending institutions on the order of a program established recently by the Seattle Trust and Savings Bank. This bank is offering loans at more advantageous rates and terms if the bank customer takes positive steps to adopt energy conservation standards set forth by various federal, state and local agencies, utilities and professional associations. A quite similar concept was being developed under the efforts of this project for application to runoff and erosion control; the Seattle bank's energy conservation program can serve as a timely prototype. It is proposed that each of Nevada's major lending institutions be approached by EPS to ascertain whether market forces and individual bank management philosophies are receptive to such a program. If a program can be initiated, it can be coupled with two other recommendations proposed above -- that of preparing a manual of standards and specifications for runoff and erosion control, and that of developing site-specific conservation plans. Initiation of this recommendation can begin immediately.
5. Organize and refine education programs to increase awareness of runoff and erosion problems and solutions. In association with the other agencies who are working with the subject of land disturbances from an educational/assistance standpoint, EPS should construct a short educational program on the problem of runoff and erosion and approaches for its abatement. This effort should be conducted as an integral and first part of a public involvement program of the statewide 208 program, which is the responsibility of EPS. The recommendation responds to the firm belief held by several of the agencies and persons contacted throughout this project to the effect that a great part of the solution can be obtained where the concern for the problem and the approaches to its solution are brought to the attention of the people who are in various degrees responsible for the problem. The connection of this effort with the 208 statewide public involvement endeavor is called for on the

basis that both efforts attempt to identify and involve the pertinent publics with respect to water quality management in general and nonpoint source problems in particular. This effort may begin immediately, but should be well underway by later August.

6. Modify ongoing monitoring program. This recommendation is to result in change within EPS, primarily. EPS should review and modify as necessary and as within resource opportunities the design of its ambient water quality monitoring program for improved measurement of runoff and erosion problem areas. Such review and modification should include considerations for additional parameters, additional monitoring sites, and increased monitoring frequency. Similarly, intensive monitoring surveys, when designed, should be given an additional consideration for measuring the effects of runoff and erosion problems. It should be noted that such specific consideration of runoff and erosion contributions to water quality problems in the monitoring program has already been undertaken this year; the recommendation is to follow through on this start and to continue this direction annually.
7. Work with the Division of State Lands in its program for designation of areas of critical environmental concern. This recommendation is to have EPS work informally and immediately with the Division of State Lands with respect to the still-developing program of protecting areas of critical environmental concern. The work to be done with the Division of State Lands is to insure that water quality and runoff and erosion control considerations are adequately represented in the Division's general criteria for the designation of critical environmental areas. It is to be noted that the program of critical environmental areas is still in its formative stages; however, though the full potential of this program cannot be gauged yet, it is valuable to build into such program the importance of runoff, erosion and water quality as elements of critical environmental concern.
8. Develop memoranda of understanding with federal land management agencies. Another adjunct to the program proposed for enactment by the Legislature is to define the relationship of federal agencies to the state program. It has been recently reaffirmed by the U.S. Supreme Court that federal agencies must comply with only substantive, not procedural, requirements of state programs. Once the proposed legislation is enacted, it is recommended that voluntary cooperation of and participation by the federal land management agencies in the state program be obtained. The instruments defining the relationship of the federal agencies to their participation in the state program should be memoranda of understanding. Basically, the memoranda of understanding should acknowledge that the federal land management agencies agree to participate in the state program

as any other person engaged in a land-disturbing activity may be required to do. This recommendation is to be carried out as soon as the enactment of the program by the legislature is known. (If agreement can not be reached with a federal land management agency to cooperate in the state program, the state could develop and adopt certain substantive water pollution control requirements. The state could then request compliance with such requirements under the authority of Section 313 of the Federal Water Pollution Control Act, as amended, and Presidential Executive Order 11752.)

9. Leave the activity sector of urbanization open for further attention by the 208 planning agencies. After careful and extensive analysis of the urbanization activity sector, it was concluded that the land-disturbing aspects of urbanization are, for the large part, functions of other activity sectors (e.g., building construction, stream modifications). Consequently, recommendations for all such land-disturbing aspects of urbanization are covered under other recommendations of this section. The above is said with one exception: that aspect pertaining to increased runoff which results from the decrease in the ability of runoff water to percolate and infiltrate. This aspect should be handled via the 208 planning program inasmuch as the principal urban areas of the state are in locally designated 208 areas.

SOLUTION DEVELOPMENT PROCESS

PROJECT BACKGROUND

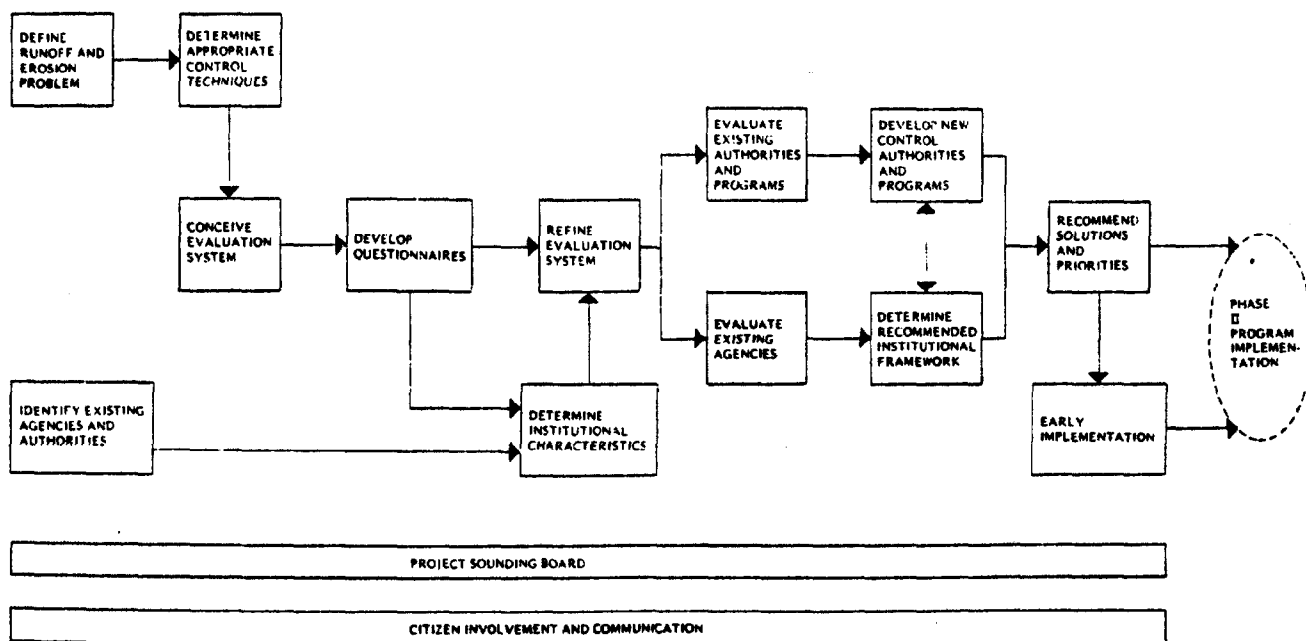
Work on this project was initiated in June, 1975, with James C. Breitlow, Nevada Department of Human Resources, Environmental Protection Services, as project director. The project team has consisted of consultants from four separate firms (Stevens, Thompson & Runyan, Inc.; Vasey-Scott Engineering Co.; Harper & Owes; and Organizational Consultants of the Northwest) a deputy attorney general, and staff support from Environmental Protection Services.

In order to assure that the methodology and recommendations were being developed on a sound basis, a project Sounding Board has been used throughout the study. This Sounding Board has acted in an advisory capacity, and has had significant impact on the study. Board membership has included the following:

Joe Dini, Jr. - State Assemblyman
Bob Stewart - Administrative Assistant and Press Secretary,
Governor's Office
Bruce Arkell - State Planning Coordinator, Governor's Office
John MacIntyre - Assistant County Manager, Washoe County
Ernie Gregory - Director, Environmental Protection Services

The project is statewide in scope, and is being conducted in two phases. The initial phase consists first of an evaluation of existing authorities and programs, and the present institutional framework. This is followed by the development of additional authority requirements, and modified institutional framework for the control of erosion and runoff from land-disturbing activities. The second phase will consist of the implementation of these programs. The illustration below is a project flow diagram for Phase I, showing the series of steps which have led to the recommended solutions. These steps are briefly summarized in the following paragraphs.

PROJECT FLOW DIAGRAM - PHASE I



RUNOFF AND EROSION PROBLEM

In structuring the program major emphasis was placed on the institutional aspects of solving the runoff and erosion problem, rather than on a detailed and precise scoping of the problem itself. Thus, the initial task in the project, was to identify the runoff and erosion problem only to the extent necessary to permit accomplishment of the remainder of the program.

Accelerated erosion is a man-caused phenomenon created by land-disturbing processes falling into one of the following general activity sectors:

- o Agriculture
- o Construction
- o Forestry
- o Military
- o Mining
- o Recreation
- o Stream Modification
- o Transportation
- o Urbanization

The character and magnitude of the erosion and resulting water quality problems vary significantly between activity sectors. In some instances the problems are severe but localized (e.g. mining and urbanization); in others the problems cover large areas of the state (e.g. grazing) but are less dramatic in terms of sediment yields per acre. The cumulative effect of runoff and erosion from all activity sectors is significant, and resultant degradation of water quality is a major environmental problem.

Mechanisms causing erosion are basically similar, regardless of the land-disturbing activity. Once environmental parameters such as precipitation, soil and topography are considered, the elements man influences are:

- o Vegetation cover with respect to bare soil
- o Compaction, which inhibits infiltration and increases surface runoff
- o Irrigation and similar water applications
- o Disruption of soil particles

The presence or absence of these elements for each land-disturbing activity is reasonably well established in existing literature. However, insufficient data exists to determine the quantity of erosion caused by these activities within Nevada. Their precise effect on water quality is even less defined. Thus, only general priorities can be established for erosion control. This general prioritization, however, is sufficient to accomplish the institutional portion of the project.

In close association with the acceleration of the erosion process by the activities of man is the function of runoff. Runoff from disturbed land areas serves not only to accelerate erosion but also to pick up and transport silt, sediment, nutrients, salts, and other pollutants to receiving waters. Water quality impacts of land-disturbing activities must be viewed not only from the narrow perspective of erosion and sedimentation but also from the broader standpoint of runoff from disturbed land carrying other pollutants that are associated with particular categories of land-disturbing activities.

Meshing the available information on the extent of different types of activities within Nevada, their erosion potential, and the known areas of water quality concern, it is possible to establish relative priorities for developing runoff and erosion control programs for the various activity sectors. They are grouped below into three categories, with no attempt to rank activities within categories:

High Runoff and Erosion Activity -	Agriculture - Grazing Agriculture - Irrigation Construction - Buildings Construction - Roads Recreation - Trails Stream Modifications Urbanization
Moderate Runoff and Erosion Activity -	Forestry Mining - Hard Rock Mining - Open Pit Transportation - Roads
Low Runoff and Erosion Activity -	Construction - Dams Construction - Transmission Military Recreation - Boats Recreation - Camps Transportation - Airports Transportation - Rail

APPROPRIATE CONTROL TECHNIQUES

The extent of erosion and the quality of runoff depends on several influencing factors: 1) topography including ground slope; 2) runoff quantities and rates; 3) climatic conditions including temperature, wind velocities, and rainfall quantities and intensities; 4) surface characteristics including soil types, geology, vegetative ground cover, surface coverings, and land use; and 5) stream channel characteristics. Man's activities can modify or influence these factors, accelerating the erosion process and adding pollutants to runoff.

To control erosion and the quality of runoff associated with man-related activities, it is necessary to control the impacts on the influencing factors. In addition, eroded soils and other pollutants must be discharged to surface waters in order for erosion to be considered a water quality concern. Thus, erosion control associated with improving or maintaining water quality can also be related to controlling the discharge of eroded soils to surface waters. Control strategies can then be divided into two major categories: those that are aimed at preventing or minimizing the erosion process (source controls); and those that are aimed at preventing or minimizing the discharge of eroded soils to surface waters (discharge controls).

The measures which can be implemented to control runoff and erosion and/or the resultant pollutant discharges to surface waters fall into two major types: physical and structural control measures; and management control measures. The physical and structural controls include reducing erosion rates by developing facilities which modify surface runoff quantities, rates or locations. They also include modifying surface characteristics, topography, or stream channel configuration to reduce erosion. In addition, physical and structural controls can be developed which treat runoff to remove eroded soils prior to discharge to surface waters.

Management control measures are mainly aimed at modifying or controlling activities which impact or influence erosion rates. These activities relate to both the disturbance of land and the use of water. The management measures attempt to control the location, extent, timing and specific practices of the activities so that they will have a minimal adverse impact on those factors which influence the rate of erosion and discharge of sediment to surface waters.

Based on the information developed for this project, several observations or conclusions can be made with respect to control techniques.

1. There are structural and/or management techniques available to adequately deal with essentially all facets of runoff and erosion, and resultant water quality problems.
2. In many cases the available technical solutions are so costly as to make them economically unattractive.
3. Vegetation, even in Nevada, is the cheapest, most effective method of holding soil in place over long time periods. Once it is lost, careful attention and significant expense will be needed to re-establish it.
4. Physical or structural erosion control facilities are needed at some point for most land-disturbing activities.

- 77-4701
EP 1.2:
EVI
5. For most accelerated erosion problems there are enough alternatives available that detailed evaluation will be required to develop the "best" solution to each problem.
 6. Source controls generally represent the lowest cost method of controlling runoff and erosion; management controls can be an effective method of implementing source controls.

EXISTING AGENCIES AND AUTHORITIES

The institutional framework which is presently involved in control of erosion and attendant pollution problems in Nevada is complex. It includes agencies at the federal, state, regional, and local levels. These agencies are involved through regulatory, financial, educational or public works mechanisms or some combination of these mechanisms. Their programs impact one or more of the activity sectors which contribute to water quality problems in Nevada.

One of the key premises underlying this project is that the existing institutional sets and control authorities are inadequate in terms of solution of the water quality problem. A detailed understanding of the existing situation is a prerequisite to developing recommendations for new authorities or programs. It was necessary, therefore, to develop as much information as possible on every agency presently or potentially involved in control of erosion and attendant water quality problems.

The screening out of uninvolved agencies, and subsequent development of detailed information on the involved agencies, was handled somewhat differently for federal and state agencies, as opposed to regional and local agencies.

An initial screening of all federal and state agencies active in Nevada yielded the following agencies that are, or could be, involved in some aspect of the control of runoff and erosion:

Federal -	Environmental Protection Agency Bureau of Land Management Soil Conservation Service Corps of Engineers Forest Service Federal Highway Administration Agricultural Stabilization and Conservation Service
State -	Environmental Protection Services Department of Fish and Game Department of Highways Department of Agriculture Division of Conservation Districts Division of Forestry Division of State Lands Division of Water Resources

An in-depth, structured interview was conducted with each of these agencies, using the interview process and questionnaires developed as part of the evaluation system for this project. The information extracted from the interview, together with all information garnered prior to the interview, provides clear insight into the operation of each agency in Nevada, and its role in the control of erosion and runoff from land-disturbing activities. The method used to evaluate agency capability is described in the following sections.

In determining the involvement of regional and local agencies in the control of runoff and erosion, a somewhat different problem was faced than with federal and state involvement. Whereas there are only 7 federal and 8 state agencies determined to be involved in erosion control in Nevada, the number of regional and local agencies directly involved is very large. These agencies include cities, counties, regional governments, conservation districts, irrigation districts, and the Cooperative Extension Service.

The sheer number of agencies involved made physical interview of each agency impossible within the time and budgetary constraints of this project. These agencies were grouped into units having similar authorities and a geographically mixed sample was chosen for interview. Those interviewed were:

Cities -	Elko North Las Vegas Reno Yerington
Counties -	Clark Elko Washoe
Regional -	Tahoe Regional Planning Agency Walker River Irrigation District Carson Valley Conservation District Cooperative Extension Service

To those agencies not interviewed, a paper-and-pencil questionnaire was sent requesting information similar to that obtained by interview.

The information obtained from regional/local agencies showed a wide variation with respect to awareness and action in the area of accelerated erosion and attendant water quality problems. At one extreme is the TRPA which is doing a detailed study with substantial emphasis on control of runoff and erosion and which has enacted a very strict grading ordinance. Conversely, the City of Yerington which is flat and has little land-disturbing activity within its boundaries, views runoff

and erosion as a very minor problem and is quite logically doing almost nothing about it. Cities and counties generally have a broad array of problems and demands placed upon a rather limited budget. Accordingly, only in areas where cities or counties perceive erosion and attendant water quality problems as a serious concern are they inclined to actively pursue corrective programs.

EVALUATION SYSTEM

As used in this project, the term institution embodies three concepts:

- o The governmental agencies operating within the State of Nevada which have the capacity to effect some impact on the activities of man which cause runoff and erosion, and attendant water quality problems.
- o Those activities of man which cause runoff and erosion. These include both public and private sector activities.
- o The interrelationships between regulators and regulated, in the form of interventions aimed at controlling runoff and erosion.

An institutional evaluation must examine both the governmental agencies involved, as well as their authorities and programs which provide mechanisms for intervention in the accelerated erosion process. The evaluation system, therefore, consists of two elements: a model for the evaluation of agencies; and assessment criteria for the evaluation of authorities and programs.

An evaluation model was developed specifically for use in the accomplishment of organizational level investigations for the State of Nevada. Implementation of this model provided this study the practicality and consistency necessary in the evaluation process.

While the model concept provides a comprehensive structure for organizational evaluation, the effectiveness of actual investigations is extremely dependent on the analytical ability and perseverance of the assigned analyst. The model does not provide a substitute for the human decision-making process; at best, it supports this function through the enforcement of a disciplined approach. Further, the evaluator should always anticipate "information gaps" in any organizational investigation. By following a basic model framework and procedure, the opportunity for collecting all available information and making a maximum number of substantiated judgments will be increased.

This model is most effective when used in conjunction with on-site investigations, because of the increased ability to gather information

and make direct observations. However, it can also be applied indirectly using information such as organizational profiles and available background materials on various units of government.

The structure was designed to meet the specific requirements for organizational evaluation required for this study. The model is built around the three basic functions of an organization -- planning, performance and control -- plus certain general measurements of organizational capability specifically related to this project. The three basic functions are further divided into evaluation categories as follows:

- Planning - Agency Contribution to Problem Solution
 Planning Structure
- Performance - Technical Performance
 Information Generation
 Staff Capabilities
- Control - Organizational Analysis
 Administrative Systems

The general measurements of organizational capability relating specifically to the requirements of this project are:

- Agency review and appeals procedures
- Degree of community involvement and support
- Degree of receptivity for revised/expanded role

The second step in the evaluation process is an assessment of the federal, state, and regional/local authorities or programs extant in Nevada which deal with the control of accelerated erosion and attendant water quality problems. The process of developing criteria for assessment involves an analysis of the functions of government and identification of those authorities and programs which might logically be employed in the control of runoff and erosion. Through a comprehensive review of existing authorities and programs in each function a compendium of authorities and programs dealing with the control of runoff and erosion in Nevada can be prepared. This compendium does not, of course, examine the adequacy or comprehensiveness of existing controls.

To deal with this issue requires a detailed analysis of the existing authorities and programs. For analytic purposes it was necessary to define the characteristics of an ideal authority or program aimed at the control of erosion and water quality problems. The ideal authority or program for control of runoff and erosion should:

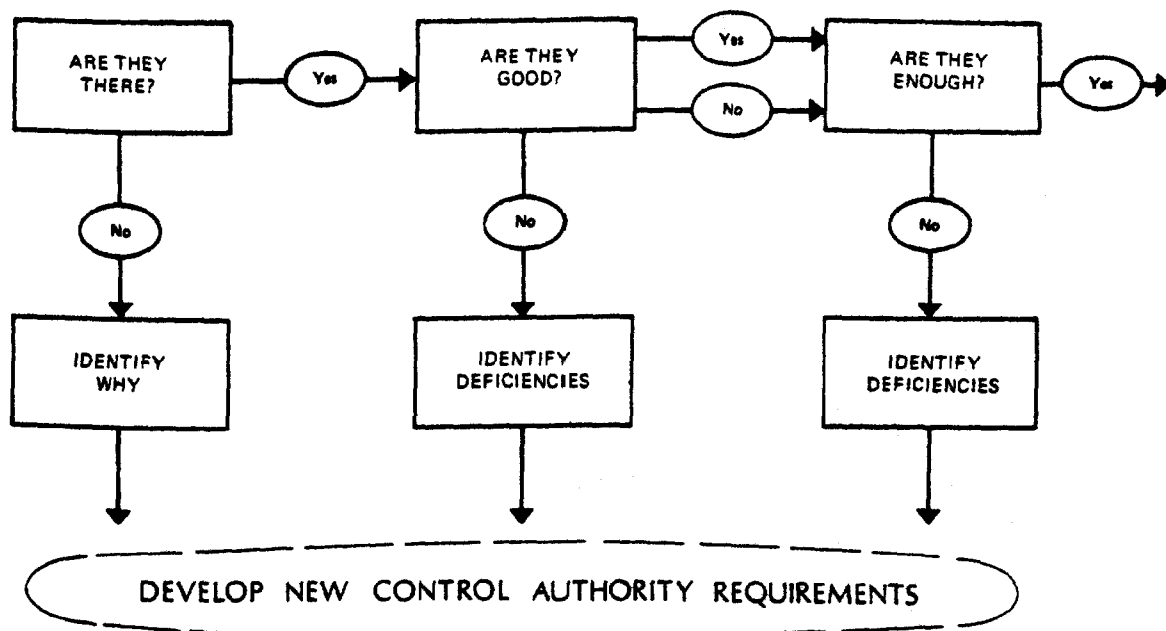
- o recognize water quality;
- o consider preventive or source control techniques;
- o factor in social and economic considerations;
- o provide rapid and simple procedures;
- o provide variance (or alternative) opportunities in the application of controls, but not open ended;
- o provide for public participation;
- o provide for periodic evaluation

Additionally, the total of all authorities and programs should:

- o cover the entire state.

Based on these characteristics an analysis can be made of the authorities and programs impacting each activity sector. This analysis follows a three-step procedure, diagrammed below:

ANALYSIS OF AUTHORITIES AND PROGRAMS



QUESTIONNAIRES

Data required for institutional evaluation must be collected in a consistent and comprehensive manner. This is best accomplished through the use of questionnaires, where answers are obtained to specific questions, thereby generating structured data and information. Because of the differing nature of the agencies about which information was needed, and the requirement that some agencies be contacted by mail while others were interviewed, three separate questionnaires were developed.

The following parameters were utilized for the purpose of selecting organizations to be interviewed:

- o All state agencies involved with the establishment of Environmental Policies and/or Programs.
- o All state and federal agencies responsible for land and/or water use control.
- o A sample of local units of government geographically disbursed and including:
 - . Counties
 - . Conservation Districts
 - . Irrigation Districts

To those local units of government not selected for interview, a paper-and-pencil questionnaire was sent. This provided each principally-involved agency operating within Nevada with an opportunity to supply information which could be incorporated into the evaluation process. Out of a total of 64 questionnaires sent out, 36 were returned for a response rate of 56 percent. In most cases, no attempt was made to follow-up with those agencies which did not respond. An exception was several key conservation districts where personal contact was made in lieu of the conservation district completing the questionnaire.

AGENCY CAPABILITIES

Evaluation of the agencies involved in control of runoff and erosion in Nevada was conducted in accordance with the methodology established by the evaluation model. The primary data source on the agencies of interest was the interview process which was structured to obtain information on specific topics. Aggregation of this data in various ways permits an assessment of the current or prospective capability of each agency to perform certain functions.

The functions to be considered for evaluation purposes were derived from the evaluation model, and included the following:

- o Capability to plan within the organization
- o Capability to implement within the organization
- o Capability to control within the organization
- o Functional assessment - end product planning
- o Functional support assessment - planning/technical assistance
- o Functional support assessment - financial assistance
- o Functional assessment - regulatory
- o Functional assessment - monitoring and assessment
- o Sensitivity to erosion as a problem in Nevada
- o Willingness to accept a greater role in erosion control
- o Community involvement
- o Capability to accept an expanded role in erosion control

As part of the post-interview process an analysis form was prepared for each agency, assigning a numeric value to each of the above functions. The ratings were subsequently reviewed with the interview team, and a consensus reached on each assigned value. This process assured consistency of ratings among all of the agencies interviewed. The completed set of analysis forms provides numeric values for the functional capabilities of each of the agencies selected for interview.

In accordance with the procedural steps developed as part of the evaluation model, the functional values were then aggregated into six components:

- o general organizational functioning
- o functional support
- o sensitivity to erosion problems
- o willingness to accept a greater role in control of runoff and erosion
- o community involvement
- o overall assessment of management's ability to accept an expanded role.

The values developed for these six components form the foundation for developing the agencies involvement in the alternatives which were considered for solution of the runoff and erosion problems.

AUTHORITIES AND PROGRAMS

The second aspect of the evaluation process is an evaluation of the authorities or programs extant in Nevada which deal with the control of runoff and erosion, and attendant water quality problems. Present programs range broadly in scope, magnitude and effectiveness, and include regulation, financial assistance, education and public works. Additionally, some of the programs deal with all activity sectors, while others deal

with only one or two. It is necessary, therefore, to examine the authorities and programs of each agency involved in runoff and erosion control in Nevada on the basis of their impact on each activity sector.

To accomplish an evaluation of authorities, the following specific tasks were undertaken:

- o A literature review of existing state statutes was conducted to identify those statutes which, in the most global sense, pertain to the control of erosion from land-disturbing activities.
- o Enabling legislation as it pertains to substate jurisdictional issues was reviewed.
- o Authorities and programs of the involved institutions were reviewed and discussed as part of the interview process.
- o Specific criteria were developed against which to assess the authorities and programs, as discussed in the evaluation system section.

This process identified each existing authority and program, and their relationship to each activity sector. Through the use of a matrix developed for each activity sector it is possible to display all identified authorities and programs which relate to that activity sector. Plotted along one side are the functions of government; along the other are the governmental organizations involved in some aspect of erosion control in Nevada. At appropriate intersections on the matrix, where an agency has a program or authority which impacts that activity sector, a symbol shows the existence of that program or authority.

Development of a complete set of charts, one for each activity sector, provides a compendium of authorities and programs dealing with runoff and erosion control in Nevada.

The final step in the process of evaluating existing authorities and programs is to determine the apparent deficiencies in the existing structure. This analysis of deficiencies is necessarily done individually for each activity sector.

Using the process discussed in the evaluation system section, three aspects of existing authorities and programs are analyzed:

- o Are they there?
- o Are they good?
- o Are they enough?

Through this procedure it is possible to develop an in-depth understanding of existing authorities and programs, then to derive the deficiencies or gaps in existing authorities and programs. The procedure was followed for each of the activity sectors, and resulted in a set of charts showing the existing authorities and programs by governmental function, together with the apparent deficiencies for each functional category.

ALTERNATIVE SOLUTIONS

The collection and analysis of data on runoff and erosion in Nevada, and on the existing institutional structure dealing with the runoff and erosion problem provides four basic pieces of information:

1. An identification of the non-point waste problems, with a general classification of the contribution made by each activity sector to runoff and erosion in Nevada.
2. A determination of control techniques which have been developed for the control of accelerated erosion which are appropriate for use in the State of Nevada.
3. An understanding of the capabilities of the agencies presently or potentially involved in the control of runoff and erosion, together with an assessment of their ability to assume an expanded role.
4. A compendium of existing authorities and programs dealing with the control of runoff and erosion in Nevada, and an identification of the apparent deficiencies.

Using all of the above information, plus the criteria established for defining an ideal authority, five alternative solutions were developed. The alternatives, which provide a wide range of general approaches to solving the accelerated erosion problems, are briefly summarized as follows:

Alternative 1 - Environmental Protection Services - Standards & Permits

The State Environmental Commission and Environmental Protection Services (EPS) would establish a permit program to control non-point sources. Specification standards for land-disturbing activities would be prepared by Environmental Protection Services with the help of the conservation districts, the Soil Conservation Service, and other appropriate agencies. Water quality monitoring and enforcement of standards would remain the responsibility of EPS.

Alternative 2 - Individual Activity Plans

Under this alternative a separate plan would be created for each of the various activity sectors with responsibility for the plan assumed by the state agency most closely related to that activity sector. The activity sectors considered significant for this purpose are: agriculture-grazing, agriculture-irrigation, construction-buildings, construction-roads, recreation trails, stream modifications, urbanization, forestry, mining, and transportation-roads.

Alternative 3 - County Conservation Plans

Each county would prepare a master plan which includes a conservation plan element with water quality considerations. Planning guidelines for the county master plans would be established by State Lands with assistance from Environmental Protection Services and the Soil Conservation Service. These same agencies would provide assistance to the counties as requested in plan preparation. The plans would be approved by the County Planning Commission, the counties themselves and the State Environmental Commission.

Alternative 4 - Site-Specific Conservation Plans

Under this alternative no land-disturbing activities would be permitted in certain specified areas without a conservation plan which included water quality considerations. The land-disturber would be responsible for preparation of the plan. If he requested, conservation districts, Soil Conservation Service, Environmental Protection Services, and others, would provide assistance in the plan preparation. After review and comment, the plan would be approved by the conservation district and the State Conservation Commission as well as EPS. If the activity were already covered by a permit program, such as subdivision requirements or building permits, approval of the conservation plan would become a prerequisite for permit issuance.

Alternative 5 - Environmental Economic Impact Statements

Under this alternative an environmental and economic impact statement would be required for all proposed actions having significant impact on the environment. Proposed actions would include projects of public agencies, projects receiving financial assistance from public agencies, and projects involving issuance of permits, entitlements, etc., from public agencies. The primary responsibility for the environmental impact statement would be by the involved public agency. The State Planning Coordinator would be responsible for issuance of guidelines and providing overall coordination.

Each of these alternatives was analyzed in detail to assess its effectiveness, cost, and acceptability. Using the project Sounding to assist in the evaluation, the recommended alternative, which is a combination of Alternatives 3 and 4, was developed. This recommended alternative is discussed in detail in the "Recommended Solutions" section as the legislative action proposal.

Recommendations

LEGISLATIVE ACTION PROPOSAL

The recommended alternative for legislation is being developed in two steps. The first step has been completed. This was a description of the major provisions of the proposed legislation, which is a general concept with only a few details. The second step, which is now in progress, is to present the recommended alternative for legislation to federal, state, regional and local agencies as well as user groups, associations, impacted parties, and the general public. Reaction and feedback from these meetings will be used to develop details to the degree necessary for bill drafting.

The recommended alternative as presented to agencies, user groups, etc., is diagrammed on page 29 and explained below.

1. Upon the proposal of the Environmental Protection Services (EPS), the State Environmental Commission designates broad geographic areas requiring priority attention with respect to runoff and erosion problems. Then, as a part of the county comprehensive planning program, each county having jurisdiction in the designated areas develops a conservation plan element for such areas. The plan element should set forth the specific geographic areas where land-disturbing activities are of concern, the priorities among the different types of land-disturbing activities needing earliest attention, and recommended performance criteria for runoff and erosion from land-disturbing activities. Counties may receive assistance from EPS, conservation districts, and State Lands Division. Completed conservation plan elements need the approval of the State Environmental Commission.
2. Subsequent to the completion of county conservation plan elements, any person engaging, or proposing to engage, in a land-disturbing activity* of a certain magnitude develops a site-specific conservation plan, setting forth measures to control runoff and erosion from a water quality standpoint. Implementation of this requirement will be phased, in terms of time and specific geographic area, according to the priorities set forth in the county conservation plan elements. Land disturbers may receive assistance from conservation districts (including the resources of the U.S. Soil Conservation Service), EPS, and numerous other agencies who render assistance. Site-specific conservation plans go through a review and comment procedure, and need the approval of the Conservation District and EPS. If a land-disturbing activity is already subject to other permit programs (e.g., building permits for construction) an approved site-specific conservation plan is needed prior to the issuance of such permit. (Because it is conceivable that unqualified power to disapprove a site-specific conservation plan can be abused for the

*The present intent is to define this term in the legislative bill in such a manner that it will cover each type of land-disturbing activity.

political purpose of preventing the exercise of permit agencies' authorities, the power to disapprove shall be limited to a determination as to whether adequate runoff and erosion control measures are provided.) Appeal procedures are provided, as are provisions for inspection, enforcement, penalties and program evaluation.

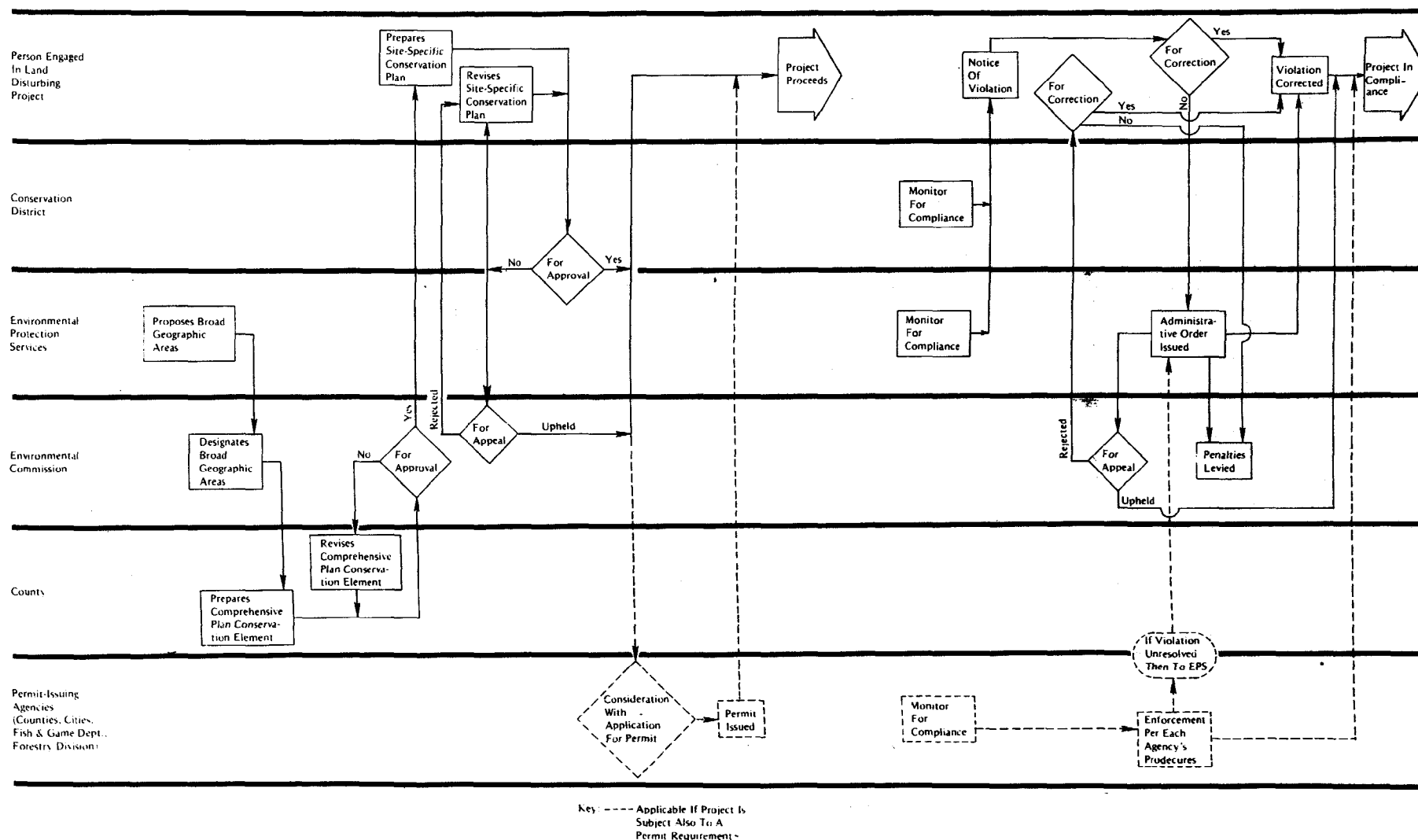
EARLY ACTION PROGRAM

In addition to the recommended alternative for legislative action, several actions can be taken that will be directly supportive. These actions include both items that should be accomplished prior to the legislative action, as well as some that must necessarily follow.

1. Prepare a manual of standards and specifications for runoff and erosion control. The purpose of this manual is to provide to everyone involved in land-disturbing activities a reference of control measures which is tailored to Nevada. This would include structural and non-structural practices which will effectively prevent or abate runoff and erosion. Such a manual will be a key adjunct to the program that is to be created with the proposed legislation, with respect to the site-specific conservation plan requirement thereof. The manual will serve a dual role. First, the manual will serve as the criteria against which site-specific conservation plans are approved or disapproved. Second, the manual will serve to advise the persons engaged in land-disturbing activities as to the contents of a site-specific conservation plan and as to the type of expectations that the plan-approving authority has of the persons engaged in land-disturbing activities. Once assembled, the manual is to be used with discretion, fully considering any special circumstances of individual land-disturbing activities (e.g., emergency situations, unique environmental setting, etc.). The development and collation of such criteria have been done by several agencies over the years. What is needed is to put these criteria which have proven effective and reasonable in Nevada into one document.

The document should be assembled with informal public participation by a task force comprised of members of the agencies which have had past experience in developing and/or compiling such criteria, and which are to have principal roles to perform in the new program. The motivation and the leadership in the work of the task force is to be the responsibility of EPS. Upon completion of the task force efforts, the product will be proposed to the Environmental Commission and the Conservation Commission for their consideration, formal public participation and adoption. In addition, each conservation district will be presented the product of the task force effort for its adoption. This total effort should be completed by January 1978, to coincide with the anticipated effective date of the legislative requirement for site-specific conservation plans.

INSTITUTIONAL SYSTEM FOR RUNOFF AND EROSION CONTROL



The several individual 208 planning programs in Nevada will develop and refine certain criteria that can be used with respect to the abatement and control of runoff and erosion; these 208 planning products are to be considered for augmenting the manual which is to be prepared in its initial form by January of 1978.

2. Develop memoranda of understanding with certain federal agencies. Not necessarily related to the proposed program to be created by legislation is the need to develop memoranda of understanding with the federal land management agencies as well as the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, HUD and the Economic Development Administration. If the protection of water quality were a matter of greater purpose for these agencies, the administration of their programs could yield more complete control of runoff and erosion. The infusion of a greater motivation toward water quality protection can be accomplished by establishing a partnership between EPS and these agencies. The memoranda of understanding should provide for an initial mutual review and agreement as to the adequacy of each agency's specifications and conditions with respect to runoff and erosion control that it attaches to any support or sanction it gives to projects having a land-disturbing nature. It is also intended that these memoranda will provide a mechanism for periodic mutual review of each agency's annual priorities for such things as funding support programs and public works projects. It is intended that such memoranda will be developed in the same spirit of intergovernmental and interagency coordination as espoused in Section 304(j) of the Federal Water Pollution Control Act, as amended.
3. Perform a prototype exercise of the program as set forth in the proposed legislation. EPS should take the lead in initiating a prototype program along the lines of the proposed legislation. This prototype program would involve EPS, one county, one conservation district, and one person engaged in a land-disturbing activity. Each would participate on a voluntary basis. The purpose of conducting such an exercise is three-fold: 1) to assist in developing specific considerations yet needed in the legislative proposal; 2) to uncover any "bugs" that may exist in the present concept of the proposed program; and 3) to obtain some experience to assist in immediate implementation of the program once enacted. This exercise may be undertaken immediately but certainly ought to be conducted and completed by no later than the end of November, 1976.
4. Obtain preferential loan rates for qualified developers and other types of persons engaged in land-disturbing activities. A few governmental assistance programs are being administered to provide financial incentives for the abatement of runoff and erosion. In Nevada, for various reasons, such governmental incentive is not

extensive. It is recommended that the principle of providing financial incentives be extended to non-governmental institutions. More specifically, a program should be established with Nevada lending institutions on the order of a program established recently by the Seattle Trust and Savings Bank. This bank is offering loans at more advantageous rates and terms if the bank customer takes positive steps to adopt energy conservation standards set forth by various federal, state and local agencies, utilities and professional associations. A quite similar concept was being developed under the efforts of this project for application to runoff and erosion control; the Seattle bank's energy conservation program can serve as a timely prototype. It is proposed that each of Nevada's major lending institutions be approached by EPS to ascertain whether market forces and individual bank management philosophies are receptive to such a program. If a program can be initiated, it can be coupled with two other recommendations proposed above -- that of preparing a manual of standards and specifications for runoff and erosion control, and that of developing site-specific conservation plans. Initiation of this recommendation can begin immediately.

5. Organize and refine education programs to increase awareness of runoff and erosion problems and solutions. In association with the other agencies who are working with the subject of land disturbances from an educational/assistance standpoint, EPS should construct a short educational program on the problem of runoff and erosion and approaches for its abatement. This effort should be conducted as an integral and first part of a public involvement program of the statewide 208 program, which is the responsibility of EPS. The recommendation responds to the firm belief held by several of the agencies and persons contacted throughout this project to the effect that a great part of the solution can be obtained where the concern for the problem and the approaches to its solution are brought to the attention of the people who are in various degrees responsible for the problem. The connection of this effort with the 208 statewide public involvement endeavor is called for on the basis that both efforts attempt to identify and involve the pertinent publics with respect to water quality management in general and nonpoint source problems in particular. This effort may begin immediately, but should be well underway by later August.
6. Modify ongoing monitoring program. This recommendation is to result in change within EPS, primarily. EPS should review and modify as necessary and as within resource opportunities the design of its ambient water quality monitoring program for improved measurement of runoff and erosion problem areas. Such review and modification should include considerations for additional parameters, additional monitoring sites, and increased monitoring frequency. Similarly, intensive monitoring surveys, when designed, should be given an

additional consideration for measuring the effects of runoff and erosion problems. It should be noted that such specific consideration of runoff and erosion contributions to water quality problems in the monitoring program has already been undertaken this year; the recommendation is to follow through on this start and to continue this direction annually.

7. Work with the Division of State Lands in its program for designation of areas of critical environmental concern. This recommendation is to have EPS work informally and immediately with the Division of State Lands with respect to the still-developing program of protecting areas of critical environmental concern. The work to be done with the Division of State Lands is to insure that water quality and runoff and erosion control considerations are adequately represented in the Division's general criteria for the designation of critical environmental areas. It is to be noted that the program of critical environmental areas is still in its formative stages; however, though the full potential of this program cannot be gauged yet, it is valuable to build into such program the importance of runoff, erosion and water quality as elements of critical environmental concern.
8. Develop memoranda of understanding with federal land management agencies. Another adjunct to the program proposed for enactment by the Legislature is to define the relationship of federal agencies to the state program. It has been recently reaffirmed by the U.S. Supreme Court that federal agencies must comply with only substantive, not procedural, requirements of state programs. Once the proposed legislation is enacted, it is recommended that voluntary cooperation of and participation by the federal land management agencies in the state program be obtained. The instruments defining the relationship of the federal agencies to their participation in the state program should be memoranda of understanding. Basically, the memoranda of understanding should acknowledge that the federal land management agencies agree to participate in the state program as any other person engaged in a land-disturbing activity may be required to do. This recommendation is to be carried out as soon as the enactment of the program by the legislature is known. (If agreement can not be reached with a federal land management agency to cooperate in the state program, the state could develop and adopt certain substantive water pollution control requirements. The state could then request compliance with such requirements under the authority of Section 313 of the Federal Water Pollution Control Act, as amended, and Presidential Executive Order 11752.)

9. Leave the activity sector of urbanization open for further attention by the 208 planning agencies. After careful and extensive analysis of the urbanization activity sector, it was concluded that the land-disturbing aspects of urbanization are, for the large part, functions of other activity sectors (e.g., building construction, stream modifications). Consequently, recommendations for all such land-disturbing aspects of urbanization are covered under other recommendations of this section. The above is said with one exception: that aspect pertaining to increased runoff which results from the decrease in the ability of runoff water to percolate and infiltrate. This aspect should be handled via the 208 planning program inasmuch as the principal urban areas of the state are in locally designated 208 areas.

Problem Identification

BACKGROUND

EROSION

Several different classes of erosion are recognized to exist.

Wind erosion refers to the transport of loose surface soils by air movement. It is believed to affect water quality principally by dislodging, then scattering light soil particles which are then easily picked up by precipitation runoff.

Rainfall causes erosion in several stages:

- o Sheet erosion is the removal of relatively uniform soil layers through the splash of raindrops and transport of the loosened soil by overland flow.
- o Rill erosion results from overland flow concentrating to cut small channels.
- o Gully erosion occurs as the small channels deepen due to the concentration of prolonged flow of large storms and the repetition of successive storm flows following the same channels.

Stream banks may be eroded by flowing water scouring soils from the banks and bed. For purposes of erosion control, three classifications of stream channels are recognized:

- o Sensitive channels include all perennial streams with unstable banks and beds, plus intermittent streams with no riparian vegetation in dirt channels.
- o Resistive channels have considerable riparian vegetation and flow over flat slopes.
- o Stable channels have solid rock beds and banks, or are intermittent with well established riparian vegetation.

Mass soil movements are the downslope displacement of a portion of the land surface. These include landslides, mudflows, and downward creep.

Erosion varies with different soils, but several common parameters exist:

- o Bare soil exposes the particles to dislocation by wind and water action.
- o Removal of vegetation eliminates the roots system which holds soil particles in place.
- o Compaction, either artificial or by repeated traffic, reduces infiltration and increases surface runoff.
- o Activity or traffic grinds soil particles to fine dust, rendering them susceptible to displacement by wind or water.
- o Steep slopes increase runoff quantities and relocation, hence scouring action rises.
- o Application of water, as with irrigation, can result in runoff containing soil particles.

CLIMATE

Nevada is the most arid of the United States. Rainfall averages less than 10 inches annually. Only in small portions of Nevada does the annual rainfall approach even 20 inches. These are mostly the upper elevations of the higher mountains. Much of the state lies in the Sierra Nevada rain shadow which reduces precipitation to annual rates of 3 to 6 inches.

Generally, precipitation is seasonal throughout the state, most of it appearing as snow. Most small streams dry up during part of the year, while some carry exceptionally high slug flows at periodic intervals. Flash floods often appear in washes or gullies with little warning and dissipate quickly, causing severe erosion at unprotected facilities.

Nevada is not a state noted for high sustained winds. However, even light winds may cause significant erosion because of the arid climate. High gusts may still occur though, especially in canyons and mountain passes. Certain localities, such as Washoe Valley, are particularly noted for this phenomenon. Wind-caused erosion is a significant problem, but does not directly affect water quality except where it occurs in the immediate vicinity of a large water surface, such as a major lake.

Volcanic soils cover 22 percent of Nevada while slopes exceed 15 percent grade on about a third of the state area. Earthquakes are a possibility throughout Nevada, especially in the western half. Studies conducted in Oregon of 47 mass soil movements found only 5 in areas undisturbed by man. Volcanic soils covered only 37 percent of the Oregon study area yet 44 (94%) of the movements occurred therein. South or southwest slopes appeared more stable than others, perhaps because the soils were drier and shallower. Slopes steeper than 45 percent accounted for 39 (83%) of the movements. Thus, Nevada has considerable potential for mass soil movements.

HISTORICAL

During the hundred-odd years of Nevada's development, considerable activity creating erosion problems has occurred at various sites. Many of these are still detectable today. The most prominent of these activities have been:

- o Lumber removal for mine and railroad construction
- o Mining disruption and tailing remains
- o Overgrazing of cattle and sheep

Large-scale lumbering is over. Extensive mining, such as the region surrounding Virginia City, will not appear again. Overgrazing continues in some areas, though with a new aspect. Wild horses have been protected

for the past two years and herds have increased in some valleys by 15 to 30 percent. Where grazing for cattle or sheep was already established, overgrazing is now a problem.

It is almost impossible to place a quantity on the past effects of these activities today. Some recovery has been achieved, either by reforestation or range management, and in other cases conditions have stabilized. Yet much of the disruption remains, with considerable variation in degree from one location to another.

PRESENT SITUATION

Natural erosion processes are accelerated by many of the activities of man. For the purpose of this study, the following land disturbing activity categories have been identified:

- o Agriculture
- o Forestry
- o Construction
- o Mining
- o Recreation
- o Stream Modifications
- o Military Use
- o Urbanization
- o Transportation

In each of these activities, accelerated erosion and runoff is caused by one or more of the following factors:

- o Alterations of land characteristics
- o Application of water
- o Alteration of hydrologic regime

In close association with the acceleration of the erosion process by the activities of man is the function of runoff. Runoff from disturbed land areas serves not only to accelerate erosion but also to pick up and transport silt, sediment, nutrients, salts and other pollutants to receiving waters. Water quality impacts of land-disturbing activities must be viewed not only from the narrow perspective of erosion and sedimentation but also from the broader standpoint of runoff from disturbed land carrying other pollutants that are associated with particular categories of land-disturbing activities.

LAND DISTURBING ACTIVITIES

AGRICULTURE

Irrigated Farming

Due to the arid climate, essentially all crops raised in Nevada must be irrigated to attain significant yields. Livestock feed is the principal crop. For farming, top soil is loosened and much of it kept bare so the crop has optimum growing conditions. It is thus easily eroded if precautions are not taken.

Irrigation distributes water to the soil by one of several methods:

- o Drip irrigation applies water from a pipe directly to the root system of the plant. It is most commonly used for permanent crops such as orchards.
- o Sprinklers use a pump to spray water from a nozzle. Portable or fixed systems may be employed.
- o Flooding simply allows water to flow from a canal across a field through rills or the plow furrows.

The most noticeable effect irrigation has on water quality is high concentration of suspended soil particles in the return flow. However, attendant pesticides and fertilizers may also detract from the quality. Flood irrigation is the method most commonly used in Nevada since it requires the least capital investment. Yet it makes the least efficient use of the water, while generating return flows of up to 25 percent or more of the total quantity withdrawn. These return flows have a significant negative impact on water quality.

A study conducted in eastern Washington, an area essentially the same as Nevada, found suspended solids in the return flow can range from about 80 to 800 mg/l, with Jackson turbidity units of 50 to 200. Suspended soil particles will be found in runoff from most farms but will be most prevalent from areas with slopes exceeding 5 percent. In the Yellowstone Basin, field measurements indicate that the total dissolved solids concentration in surface return flows is about 1.6 times that in the diverted irrigation water.

Grazing

Livestock is the principal agricultural enterprise in Nevada. Private land holdings center on water rights which determine the amount of stock the private party can raise. However, most land remains under federal control with grazing rights leased by BLM to private parties. Grazing rights are sold in terms of Animal Unit Months (AUM), defined as feed for one cow or five sheep during one month.

In arid regions such as Nevada, overgrazing can be a serious problem. Removal of too much vegetation will accelerate erosion. Much of the soil loss is to wind but when rain falls or snow melts, loose soil is carried away by the runoff.

Livestock tend to create trails which expose bare soil to the elements. Repeated travel compacts these trails reducing infiltration and resulting in higher runoff rates. Over a period of time, the trail surface is ground to dust and erosion takes place either by wind or water runoff. This trampling effect is heightened when it occurs on stream banks.

A North Carolina study found suspended solids were 108 mg/l from a pasture after 9 years of grazing versus 30 mg/l from a control field. In Wisconsin, a similar watershed study found no significant soil loss from non-grazed fields but 0.14 tons/acre/year lost from grazed pasturage. Both studies were conducted in climates markedly different from Nevada but they suggest something of the erosion potential associated with grazing.

Feed lots have been identified as a potential source of BOD during periods of precipitation runoff. Sediment quantities have not been identified, however. During the winter months almost all livestock in Nevada is confined to some form of a feed lot. Continual stock management in such confined space can be expected to generate considerable mud or dust, to be carried away by spring runoff.

FORESTRY

Very little land in Nevada is suitable for commercial forests. During the development of the railroads and mines of the 19th century, much of the usable lumber of the region was cut. Most of this land has since been reforested. However, the commercial quantity is so small that harvests occur only intermittently.

Erosion due to runoff is the most significant source of pollution from forests. Of the five forest management phases, harvest and transporting the logs are the two most critical in terms of erosion. Two harvest methods are recognized in the west:

- o Selection of specific trees or tree clusters is adopted for tolerant species under severe competition for moisture, nutrients, and light.
- o Clearcut removes all trees in a given area. It is economical and establishes an even-aged stand of trees which are usually fast growing.

Once trees are cut, they must be transported to a yarding area for loading onto trucks and shipment. Several transportation methods are normally employed:

- o Skid trails are made by dragging logs with tractors to the yarding areas.
- o Roads are necessary for trucks to remove the logs from the yarding area and may be needed to channel logs from the point of cutting into the yarding area.
- o Cables, such as the high lead or skyline system, may be employed to collect logs into the yarding area.
- o Balloons or helicopters may be used to collect logs in extremely steep terrain.

Selection of harvest and transportation methods involves several trade-offs. Clear cutting may cause more erosion than any other harvest technique using the same transportation method, yet it is the only technique which allows cable and aerial systems to be employed. At this time sufficient data relative to Nevada is not adequate to make a distinction between these tradeoff combinations in terms of erosion.

Measurement in other states have found over 3 times the sediment from logged areas as from an unlogged control area, even where no logging roads existed. Further study of a 61-acre logged parcel found about 15.6 acres of logging roads with sediment about 85 times that of a similar control area. These roads all met standards established by the U. S. Forest Service. Identified sources of forest sediment include: the general harvest area, skid trails, yarding areas, burned over land, forest debris, landslides, and disturbed stream banks.

Quantity of sediment depends on several factors:

- o Amount and intensity of rainfall
- o Susceptibility of ground cover and soils to erosion
- o Quantity and placement of debris

CONSTRUCTION

Generally speaking, construction work falls into four phases:

- o Clearing and grubbing
- o Rough grading
- o Facility construction
- o Site restoration

Clearing and grubbing together with rough grading create extreme erosion conditions for two reasons:

- o Exposure of large areas of bare soil which can then be removed by wind and water
- o Compaction of soil which reduces infiltration, thus increasing the percentage of rainfall runoff

These are the two principal causes of erosion in most construction activities. Certain types of construction projects may result in further sediment-producing actions due to demolition or physical disruption of a stream bed. Construction techniques which may be expected to create sediment are mentioned below under various types of construction projects.

Transmission - Pipelines for oil and gas in addition to power lines are included.

- o Site clearing, which may be repeated from time to time while the facility is in use
- o Access roads which will be used for future maintenance
- o Campsites for temporary housing of construction crews
- o Cofferdams and stream diversions necessary to cross water bodies

Roads - These may also include railways and parking lots.

- o Clearing and grubbing to remove all organic matter
- o Grading extensive areas with large compacted cuts and fills. May also require borrow pits and/or spoil disposal
- o Debris burning with resulting solid waste
- o Stream modifications, either temporary or permanent, which may change velocities
- o Bridge or culverts at all waterways, resulting in some disruption to stream bed and probably dewatering
- o Drainage ditches and changes in soil percolation

Dams - Temporary construction devices have similar characteristics to permanent installations.

- o Extensive stream disruption for a long time period
- o Excavation and disposal of large soil quantities
- o Dewatering through pumps producing highly turbid wastewater
- o Roads for very heavy traffic with all disruptions thereto

Buildings - Extensive, multiple structure developments down to single units must be considered.

- o Demolition which may be extensive
- o Site clearing and grubbing
- o Grading requirements vary but are always present
- o Foundation excavation and possibly dewatering
- o Restoration may be long delayed

Due to the wide diversity of construction projects and variations site characteristics, sedimentation rates or quantities are difficult to establish. One EPA source suggests that developing urban areas release from 1,000 to 100,000 tons of sediment per year for each square mile.

MINING

Early development of Nevada was due almost solely to mining interests. The state still has extensive deposits of a variety of minerals, many actively being exploited. Others are known to exist only in lower grades than can be economically recovered with existing technology.

Two principal waste products are generated by mining:

- o Mine spoil results from open pit excavations for such minerals as copper
- o Tailings remain after processing ore from hard rock or open pit operations. Portions of this material are often the consistency of dust.

Both of the above waste products are highly erodible and are produced in vast quantities when related to the actual amount of ore extracted. They are generally inert and perhaps toxic, so vegetation cover is nonexistent. There may also be a leachate from the mine wastes which causes water quality concerns.

Open pit and contour mining operations create large areas of disturbed land which is difficult to restore to original condition. Erosion and sediment problems are compounded when the operations occur in mountainous areas, as compared with flat land.

Once extracted, ore must be concentrated before it can be economically transported any distance. Most concentrating techniques are aqueous, with the resulting wastewater containing large quantities of solids. Reuse of the water is common practice, especially in arid regions, but at some point the water can no longer be economically reclaimed. It must then be disposed of. In Nevada, it is generally ponded for evaporation or percolation.

Concentrated ore will require some form of transportation to reach a market. Usually, either a highway or railroad is employed, but pipelines are occasionally used. The construction and operation of these transportation systems has some effect on runoff and erosion.

Quarry operations also produce sediment. Two basic types of operations exist:

- o Rock quarries usually employ drilling, blasting, and crushing to create usable stone. The resulting dust is highly erodible.
- o Sand and gravel extraction is usually from a sedimentary deposit in or near a stream bed. Even if the material is not washed, the bed is often disturbed with resulting turbidity.

Another mining practice which may contribute to erosion is assessment work required under the mining claim law. This activity, which is required to legally maintain a claim, frequently consists of grading or bulldozing which disrupts the topography and vegetative cover.

RECREATION

The recreational activities which cause erosion are those requiring direct use of the land, such as off-road vehicles. Concern is directed at facilities which specifically alter the land characteristics.

Trail and unimproved roads would seem to be the principal source of erosion. Activities requiring various types of trails and roads are listed below in an approximate order relating to erosion:

- o Motorcycle and off-road vehicles
- o Horseback riding
- o Skiing
- o Hiking
- o Hunting and fishing

Erosion concerns for trails are similar to roads; exposure of bare soil, compaction, and grinding action of repeated travel. Steepness of grade is a major factor. Mechanical breaking up of soil particles by motor vehicles, and to a lesser extent by hooves and feet, increases the erosion potential. Erosion becomes acute where trails are intentionally aligned straight down slopes, as with motorcycle hill climb routes. Ski trails appear to be less of a problem since compaction is minimal and vegetation is not totally removed. However, where ski slopes are chained to remove vegetation, erosion may be significant.

Campgrounds are a second scene of erosion. However, since campsites are relatively flat and small, erosion potential is local. Ideally vegetation, including grass, is retained at these sites. But repeated use will usually eliminate much of the ground cover and compact the soil. In an arid environment, a long time is necessary for vegetation to regenerate once it is removed, whatever the reason.

Power boats in waterways can create wakes which will erode banks through wave action. Banks may also be damaged by launching boats of any type at undeveloped sites.

STREAM MODIFICATIONS

Channel straightening is often associated with many developments; irrigation, residential, and transportation. It is most frequently a flood control technique intended to improve drainage. Basically it increases stream velocity, through raising the slope of the channel.

Higher velocities accelerate erosion, unless protective measures are taken.

Restrictions, such as culverts and bridges, also raise stream velocities. In many cases, turbulence is introduced, increasing erosion potential.

In some locations in Nevada, stream channels are periodically deepened in order to maintain flows in a controlled channel. Significant amounts of sediment are dislodged in this process, with a resulting large but temporary increase in suspended solids.

MILITARY USE

About 3.8 million acres, or 5-1/2 percent of the state, is controlled by the Department of Defense and the Energy Research & Development Agency, which succeeded the Atomic Energy Commission. Much of this land is used for bombing ranges and weapons testing. The soil disruption is significant but very localized. Large quantities enter the air as dust. However, these ranges are located in sinks so there is no runoff or resulting water quality problem. The nuclear test site has no perennial streams and little rainfall so runoff is small.

URBANIZATION

It is well known that runoff rates have increased with the density of urban development. An increase in impervious surfaces due to streets, buildings, and parking lots forces precipitation into runoff, since it can no longer infiltrate into the soil. Large contiguous areas with impervious surface have a greater effect than smaller scattered sites with the same total amount of impervious surface. Runoff from these impervious services normally contains significant quantities of sediments and pollutants.

A second aspect of increased urban flows is the "improved" stream channels. The natural hydraulic regime is considerably altered by straightened and paved channels, such as pipes. Velocities are thus increased, intensifying the impact of runoff from storms by increasing downstream flows. Modern development trends attempt to maintain the natural hydraulic regime to avoid increasing the flooding problems downstream. However, once the natural hydraulic regime is destroyed by urbanization, it is difficult to reestablish.

Erosion and sedimentation changes from urbanization are not well documented. A study at Bel Pre Creek, Maryland, found that a 15 percent increase in urban land development increased runoff by 30 percent and sediment by 14 percent. Another report, by EPA, suggests a stabilized urban drainage basin produces about 200 to 500 tons of sediment per year for each square mile.

TRANSPORTATION

Roads occupy the major portion of all surface area devoted to transportation. The proportion of paved to unpaved roads is less clear, but in rural regions like Nevada, the unpaved portion can be expected to greatly exceed the paved portion. Paved road surfaces resist erosion, but increase precipitation runoff. Ditches are normally located along both sides of the surface to carry away the runoff. These are often dirt, even along paved roads, and vegetation to resist erosion is scarce in Nevada road ditches. Cut and fill slopes exist on most roads. These may have some attempt at landscaping on modern roads and in developed areas, but many are essentially bare of vegetation. Thus the potential for erosion even along paved roads is high.

Unpaved road surfaces are erodible almost by definition. Many have no surface material other than dirt. Vehicle traffic will break up the material into easily erodible particles. These roads often have steeper grades than paved roads which compounds the problem.

Many unpaved roads in Nevada use fords instead of bridges to cross streams. This creates a continual source of sediment right in the water course. Additionally, unpaved roads are frequently built adjacent to streams because this location requires a minimum of grade preparation. This practice sometimes results in mass soil movements into stream channels.

Nevada's highway maintenance practices may tend to increase erosion. Slopes and ditches are manicured at regular intervals with a grader blade. This is done to remove wind eroded materials, but also removes whatever vegetation may exist and eliminates the small semi-stabilized channels established by runoff. The total effect on erosion is not known, but it is a case when working one erosion problem causes another.

Another maintenance practice which may impact water quality is the winter sanding and salting done by the State and County Highway Departments. By their nature, these operations are conducted on steep slopes in areas of significant winter precipitation.

Railroad track is usually bedded in gravel, thus resisting erosion along the bed. However, a clear area on both sides of the track is denuded of vegetation and dirt ditches are provided for drainage. Extensive cuts are often needed to maintain acceptable grades. These slopes are only slightly less than critical and usually cleared of vegetation. Erosion potential is thus quite high. Fill slopes seem less likely to erode due to the limited area for collecting runoff.

Airports are constructed as flat as possible. Soils are usually compacted, even for unpaved fields, by plane traffic, if nothing else. Vegetation is not discouraged, since it reduces dust. However, without irrigation, vegetation is not extensive in Nevada. Wind erosion by prop wash tends to be high. Runoff may cause some erosion but it is likely most soil particles so collected were originally discharged by prop wash.

MAGNITUDE

LAND AREAS

Land area in Nevada totals about 70,700,000 acres, of which only about 8,500,000 acres are in private ownership. Several categories of land use exist, some of which are multiple.

Irrigation, mostly in private ownership, comprises about 917,000 acres and is closely associated with stream valleys. Most of it is devoted to raising winter feed for livestock. Water control structures have been installed for about 20 percent of the acreage. These include facilities such as lined ditches, pipe, gates and valves.

Grazing range includes over 56,600,000 acres, located throughout most of the state. About 48,400,000 acres are under the Bureau of Land Management administration; the rest of the ownership is mixed. Quality of forage varies enormously. Some of this land is as good public grazing as exists in the United States, while other areas are nearly barren salt flats.

Forests are almost completely controlled by the U.S. Forest Service with about 5,100,000 total acres. Less than 1,000,000 acres can be considered even remotely as commercial timber; however, almost all is used for grazing. Some public land, under the Bureau of Land Management, also has value as forests. Generally, forests exist only at higher mountain elevations in fairly distinct parts of the state.

Parks and Wildlife areas occupy approximately 2,900,000 acres. Some of the areas designated as nature preserves are sinks and waste land which have no other existing use. These include national wildlife refuges as well as State Parks and wildlife areas.

Military uses, principally bombing ranges and nuclear testing, encompass about 3,800,00 acres. These are in fairly remote dry locations.

Urban or otherwise developed acreage totals about 270,000. Population centers are usually clustered about water sources along the stream valleys.

Miscellaneous uses total about 1,700,000 acres. Most of this is owned by the Bureau of Reclamation or the Indian reservations, but small parcels are held by other federal agencies. Also included in this category is land devoted to transportation and mining. The land area used by transportation, especially roads, cannot be easily established. Existing mining activity can be defined but considerable areas have been disturbed through the years by prospecting or are abandoned mines. Only the sites with significant finds were ever recorded.

Locations and the total area of worthless diggings is impossible to define or identify except by a surface survey.

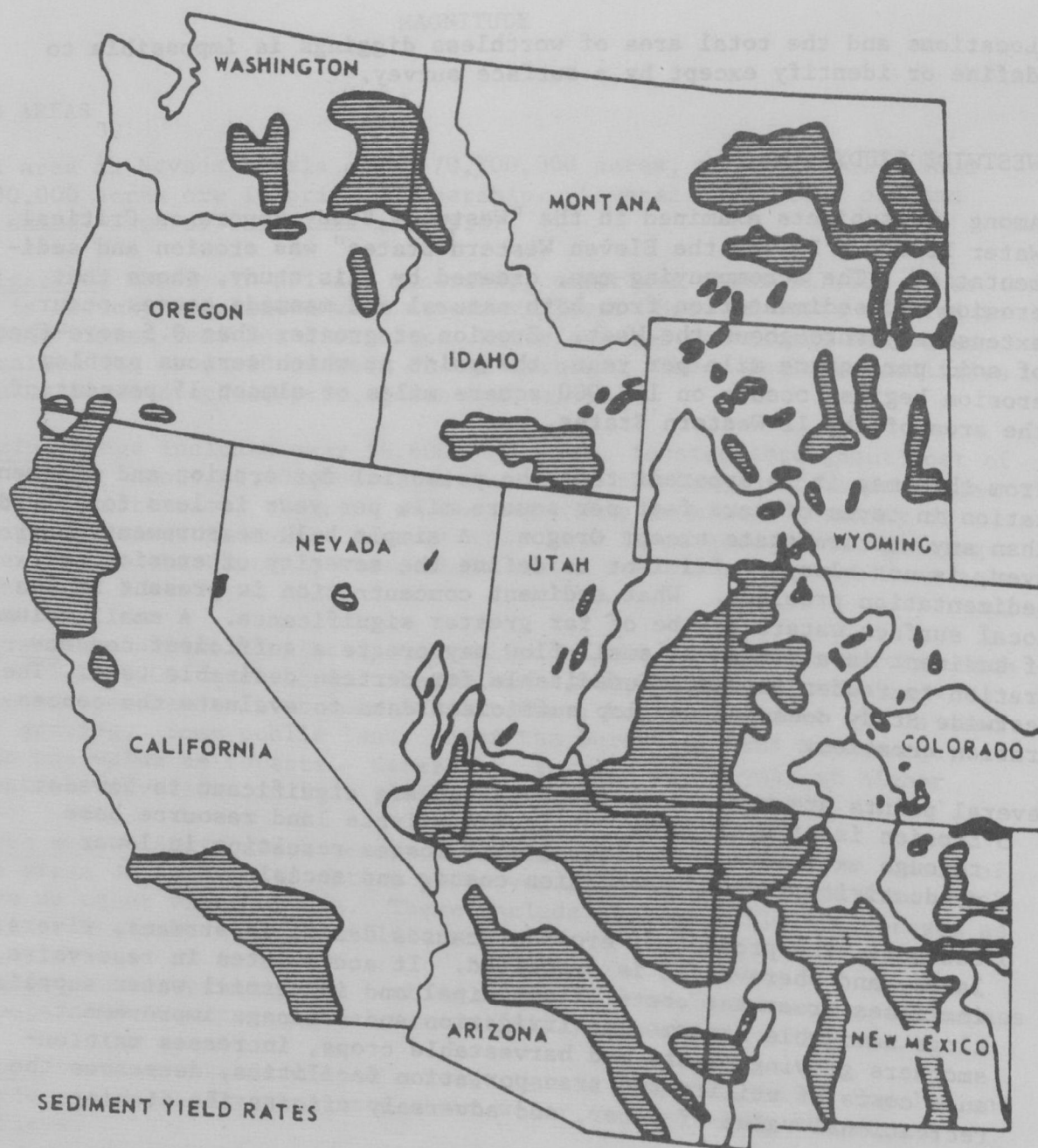
WESTWIDE STUDY

Among the subjects examined in the "Westwide Study Report on Critical Water Problems Facing the Eleven Western States" was erosion and sedimentation. The accompanying map, created by this study, shows that erosion and sedimentation from both natural and manmade causes occur extensively throughout the West. Erosion at greater than 0.5 acre-feet of soil per square mile per year, the point at which serious problem erosion begins, occurs on 155,000 square miles or almost 15 percent of the area of the 11 Western States.

From this map it is apparent that the potential for erosion and sedimentation in terms of acre feet per square mile per year is less for Nevada than any western state except Oregon. A simple bulk measurement, however, is not always sufficient to define the severity of erosion and sedimentation problems. What sediment concentration is present in the local surface waters may be of far greater significance. A small volume of sediment in a stream of small flow may create a sufficient concentration to render the water unsuitable for certain desirable uses. The Westwide Study does not develop sufficient data to evaluate the concentration question.

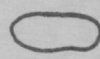
Several points are made in the Study which are significant to Nevada:

- o Erosion is affecting the public and private land resource base through excessive agricultural soil losses resulting in lower productivity, higher production costs, and social costs.
- o Sediment, the product of erosion, causes damage in streams, rivers, lakes, and wherever it is deposited. It accumulates in reservoirs, increases treatment costs of municipal and industrial water supplies, clogs navigable streams and irrigation and drainage improvements, smothers growing plants and harvestable crops, increases maintenance costs of utility and transportation facilities, decreases the recreational value of water, and adversely affects the fishing resources.
- o The erosion-sedimentation process also is a major contributor to salt loading in western streams.
- o Sedimentation and erosion problems occur in range, grassland, forest, cropland, and urban areas in some form in all of the Western States, but they are greatly accelerated where man's activity has modified the vegetative cover.



SEDIMENT YIELD RATES

 $>0.5 \text{ ac. ft. mi}^2 \text{ yr.}$

 $<0.5 \text{ ac. ft. mi}^2 \text{ yr.}$

AREAS OF HIGH SEDIMENT YIELD — WESTWIDE STUDY AREA

NEVADA WATER QUALITY INVENTORY REPORT

The First Annual Report concluded that the 1983 goal of PL92-500 for water quality which provides life support and recreation support needs cannot be realistically achieved within Nevada by the presently defined effluent limitations. One reason is pollution from diffuse nonpoint sources. Another and more significant reason is the contribution from numerous small point sources (now classified by EPA as nonpoint sources) like runoff from urban areas, irrigated and livestock agriculture. Effluent limitations for such sources have not been developed and may not be economically practicable in any event.

Many pollution sources caused by man are listed in the First Annual Report but no quantities are provided. However, two generalizations were estimated:

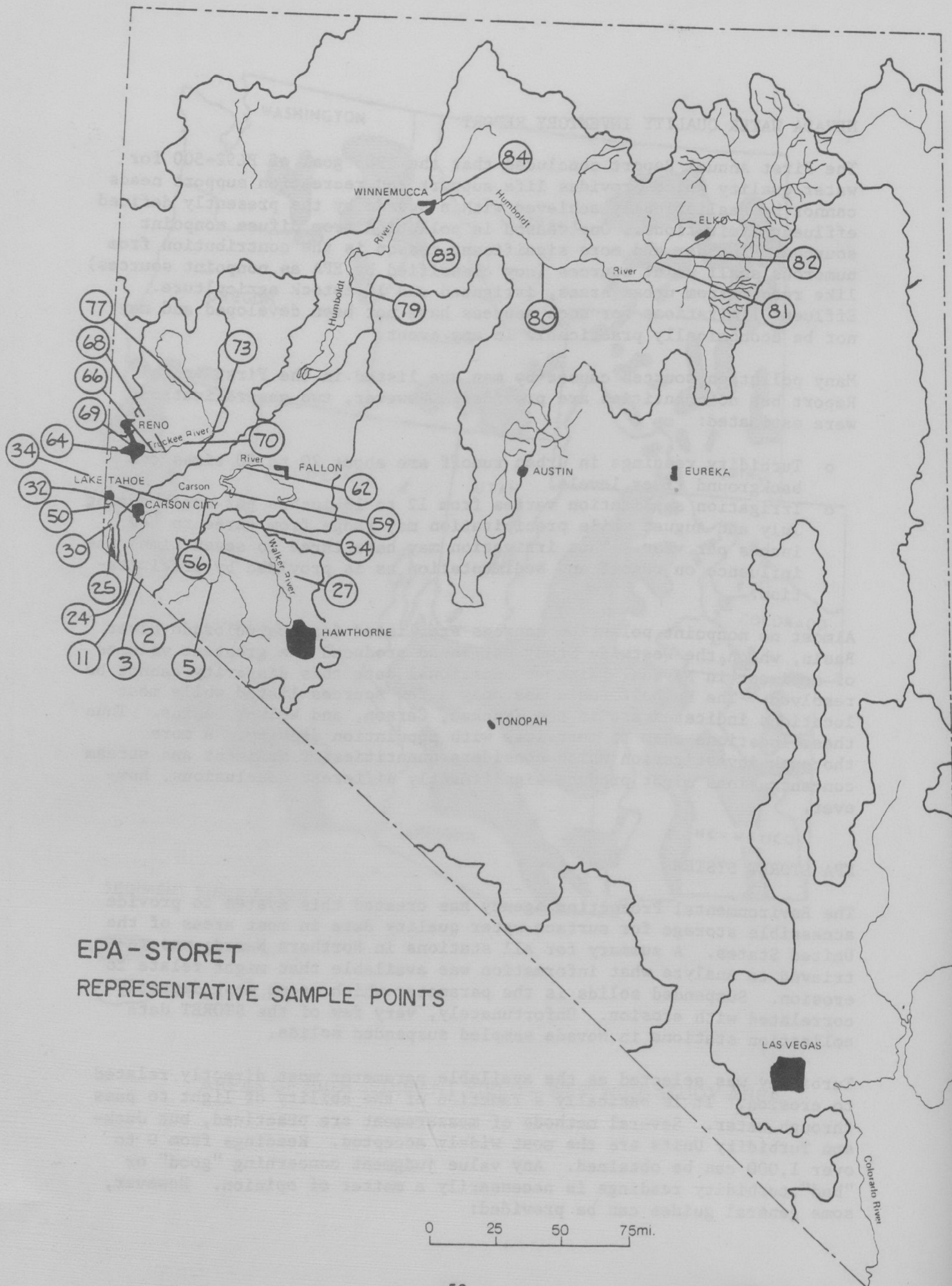
- o Turbidity readings in urban runoff are about 20 to 30 times the background river levels.
- o Irrigation application varies from 12 to 18 inches per month during July and August while precipitation may range from three to ten inches per year. Thus irrigation may have three to seven times the influence on runoff and sedimentation as is provided by precipitation.

Almost no nonpoint pollution sources are listed for the Colorado River Basin, which the Westwide Study estimated produced the greatest volumes of sediment in Nevada. Without additional data this disparity cannot be resolved. The Humbolt Basin has only a few sources listed while most locations indicated are in the Truckee, Carson, and Walker Basins. Thus these locations seem to correlate with population density. A more thorough investigation which considers quantities of sediment and stream concentrations might produce significantly different conclusions, however.

EPA STORET SYSTEM

The Environmental Protection Agency has created this system to provide accessible storage for surface water quality data in most areas of the United States. A summary for all stations in Northern Nevada was retrieved to analyze what information was available that might relate to erosion. Suspended solids is the parameter which seems most directly correlated with erosion. Unfortunately, very few of the STORET data collection stations in Nevada sampled suspended solids.

Turbidity was selected as the available parameter most directly related to erosion. It is basically a function of the ability of light to pass through water. Several methods of measurement are practiced, but Jackson Turbidity Units are the most widely accepted. Readings from 0 to over 1,000 can be obtained. Any value judgment concerning "good" or "bad" turbidity readings is necessarily a matter of opinion. However, some general guides can be provided:



EPA-STORET WATER QUALITY DATA

	Loc. #	# Samples	Mean	Max.	Min.	Beg.	End
Lake Tahoe	25	2	0.155	0.20	0.11	73/05/02	73/08/08
	30	2	0.20	0.28	0.12	73/05/09	73/08/08
	50	40	3.564	100	0.06	69/10/01	75/06/11
Truckee River	64	6	5.833	15.0	0.00	72/08/02	72/10/11
	69	63	2.960	10.0	0.14	69/02/11	74/06/06
	66	6	10.0	20.0	0.00	72/08/02	72/10/11
	68	6	5.20	11.0	3.50	73/11/01	74/06/06
	70	64	5.07	23.0	0.17	69/02/18	74/06/06
	73	63	4.155	14.0	0.17	69/02/18	74/06/06
	77	6	20.67	35.0	5.0	72/08/02	72/10/11
Carson River	3	2	5.70	7.0	4.40	73/06/27	74/05/15
	11	1	3.10	3.10	3.10	73/10/24	73/10/24
	24	71	6.979	46.0	0.78	69/01/15	75/07/16
	32	8	10.175	16.0	3.40	73/10/26	75/07/16
	34	70	12.341	80.0	1.20	69/01/13	75/07/10
	56	3	25.333	60.0	3.0	75/01/02	75/09/04
	59	8	9.100	19.5	1.10	69/05/08	75/07/17
	62	8	9.263	14.0	5.5	69/05/08	75/07/17
Walker River	2	3	8.733	20.0	2.70	67.12.28	73/07/27
	5	1	8.40	8.40	8.40	74/08/13	74/08/13
	27	7	24.24	85.0	7.50	74/08/15	75/07/10
	34	70	12.341	80.0	1.20	69/01/13	75/07/10
Humboldt River	82	5	14.4	22.0	10.0	70/04/01	75/02/26
	81	5	11.8	15.0	8.0	70/04/01	75/02/26
	80	1	38.0	38.0	38.0	75/02/26	75/02/26
	84	5	25.5	54.0	14.5	70/04/01	75/02/26
	83	5	32.2	84.0	15.0	70/04/01	75/02/26
	79	5	14.1	23.0	11.0	70/04/01	75/02/26

- o Less than 10 JTUs in a stream is not readily visible to an observer and may be considered acceptable for almost any use.
- o Above 50 JTUs water will be murky and is usually thought to indicate a problem to some degree.
- o EPS standards consider greater than 10 JTU is a problem for cold water fisheries; for warm water fisheries greater than 50 JTU is a problem.

About 75 stations along the Truckee, Carson, and Walker Rivers had sampled turbidity to some degree. However, only seven stations existed along the Humboldt River. Representative sampling points for these rivers are indicated on the accompanying map. Turbidity data from these stations was then tabulated from the source to the terminus for each river.

Several cautions must be observed in considering these tables.

- o Dates of sampling vary considerably. Some information was collected in 1967 and in every year since. Thus no table presents a true picture of actual stream conditions at a specific point in time.
- o Number of samples vary from point to point.
- o Samples were randomly collected yet turbidity is highly affected by seasonal flow variations. Rainfall runoff may seriously alter readings but no correlation to precipitation is available.
- o Turbidity is only generally related to erosion. While 100 JTUs is clearly indicative of a more severe erosion problem than a reading of 10, the relationship is not direct. When values are only marginally different, say 20 JTUs versus 15 JTUs, it is not clear which value indicates the worst erosion problem. Turbidity depends on particle size, chemistry, and shape, in addition to simply aggregate bulk of the sample particles.

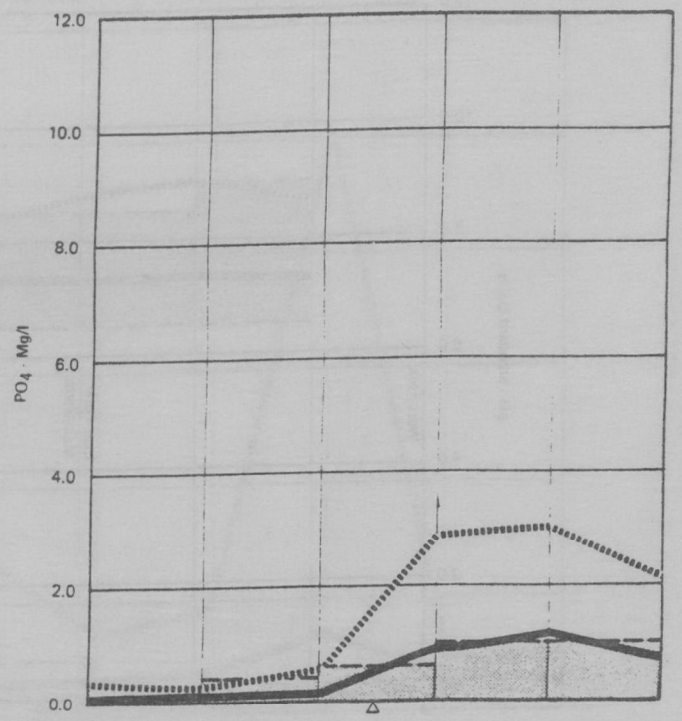
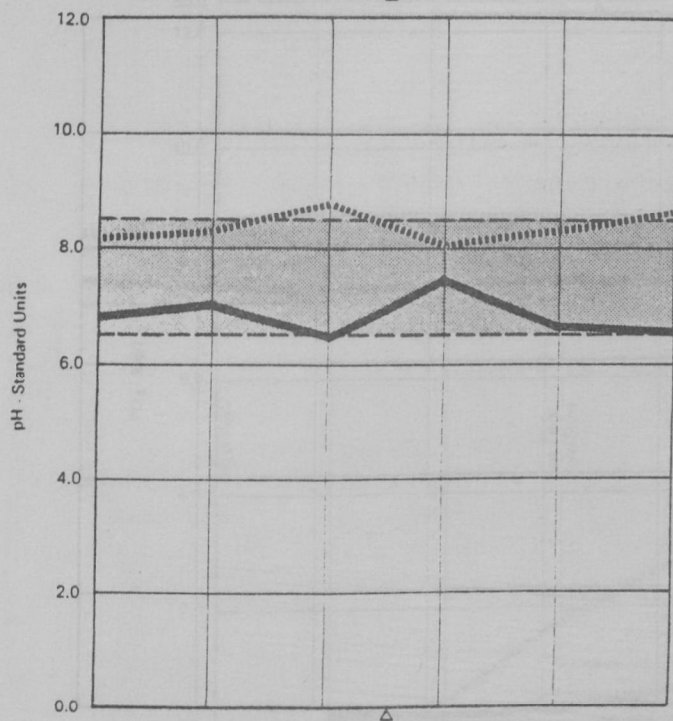
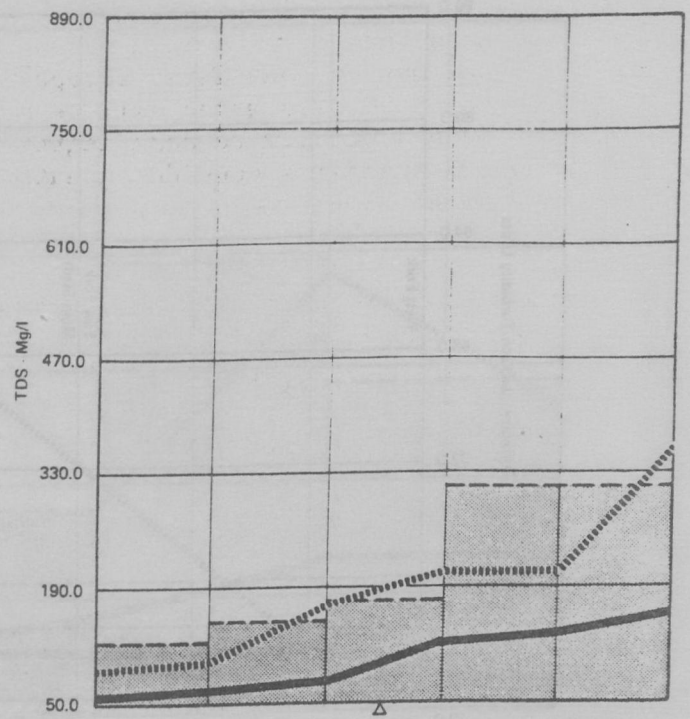
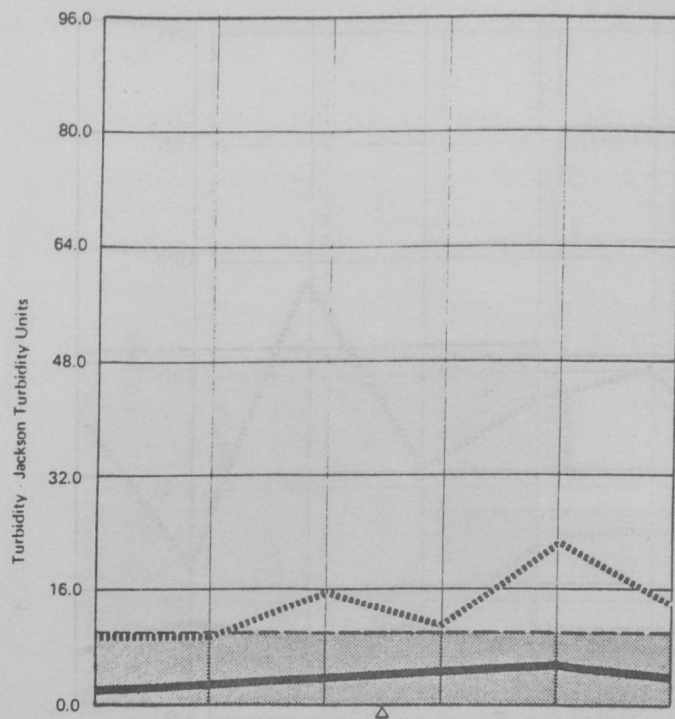
Some conclusions from the table on the facing page agree with expectations. Turbidity does generally rise as the stream proceeds to terminus. Water downstream of reservoirs, such as Rye Patch, is clearer than upstream.

The highest recorded readings on each river are:

Truckee	35
Carson	80
Walker	85
Humboldt	84

These values are easily large enough to cause concern. But this data alone is insufficient to indicate any meaningful conclusions concerning erosion magnitude. A regular sampling program which correlates with rainfall conducted over several years would be needed to conclusively demonstrate the presence or absence of sites with serious erosion.

To better assess the actual water quality in the rivers for which data is available the STORET System was tapped for data on total dissolved solids (TDS), pH, and phosphates (PO₄). These data, together with the data on Turbidity are plotted on the following pages. When compared against state standards for the various parameters significant violations are apparent at various points on each of the rivers.



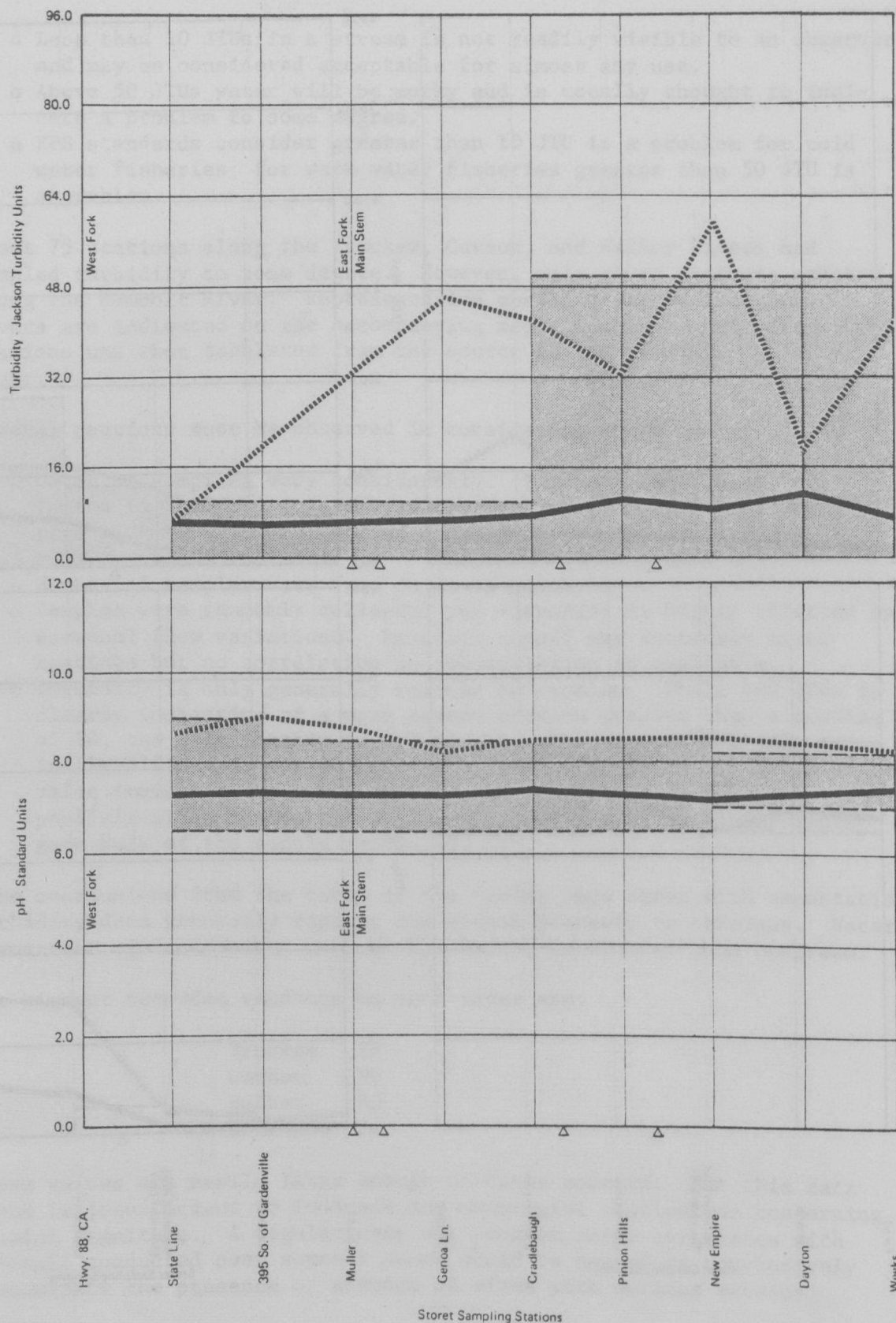
Storet Sampling Stations

Storet Sampling Stations

Storet Station	Location
310000	Farad
310001	Idlewild
310002	McCarran Blvd.
310003	Lagomarsino
310004	Clark Station
310005	Ceresola

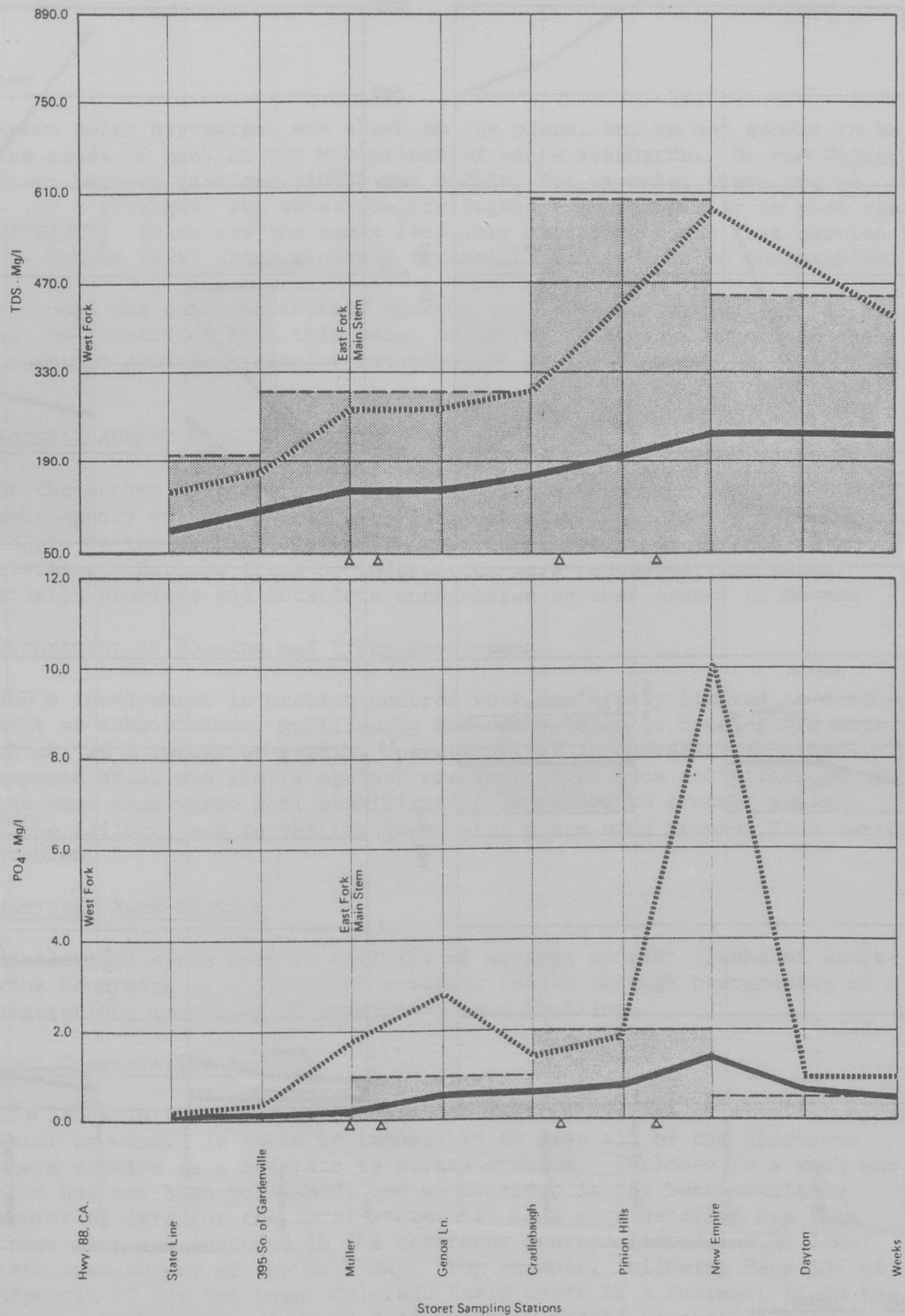
- State Standard
- Maximum Observed Value
- Mean Observed Value
- △ Point Discharges

Truckee River



Storet Station	Location
310008	Hwy. 88, CA.
310010	State Line
310011	395 So. of Gardnerville
310012	Muller
310013	Genoa Ln.
310014	Cradlebaugh
310021	Pinion Hills
310015	New Empire
310022	Dayton
310016	Weeks

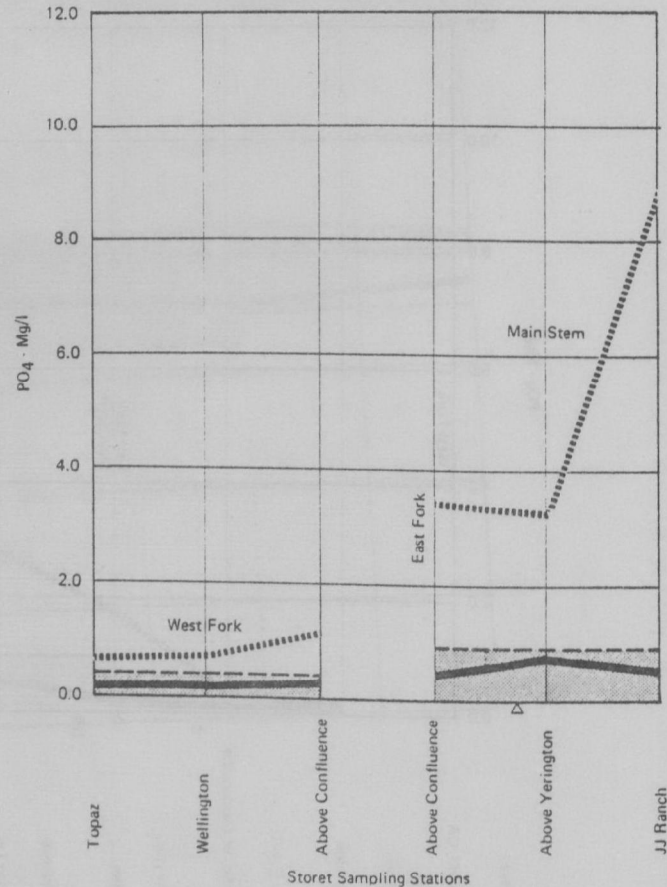
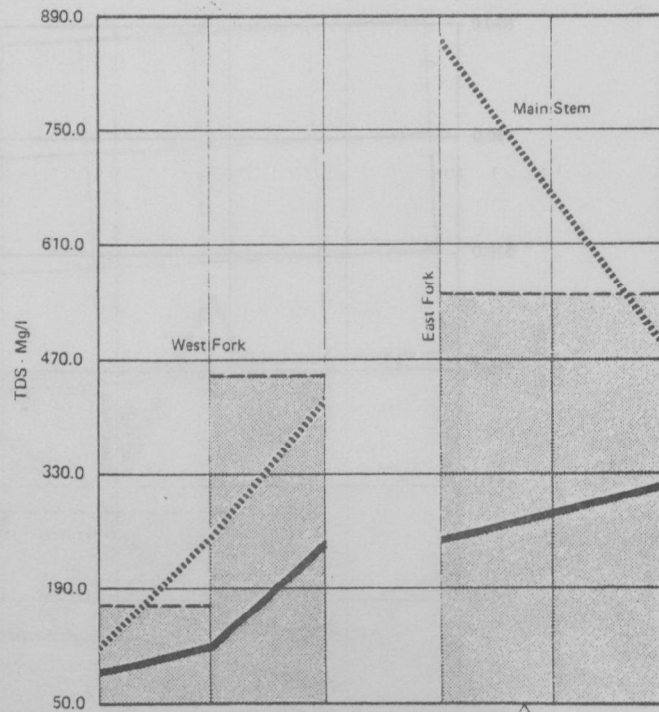
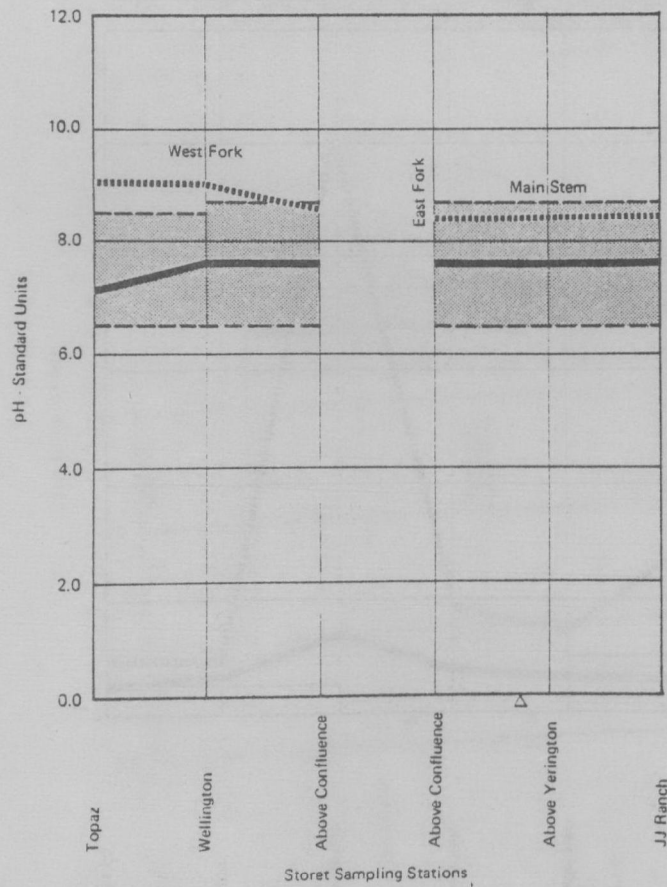
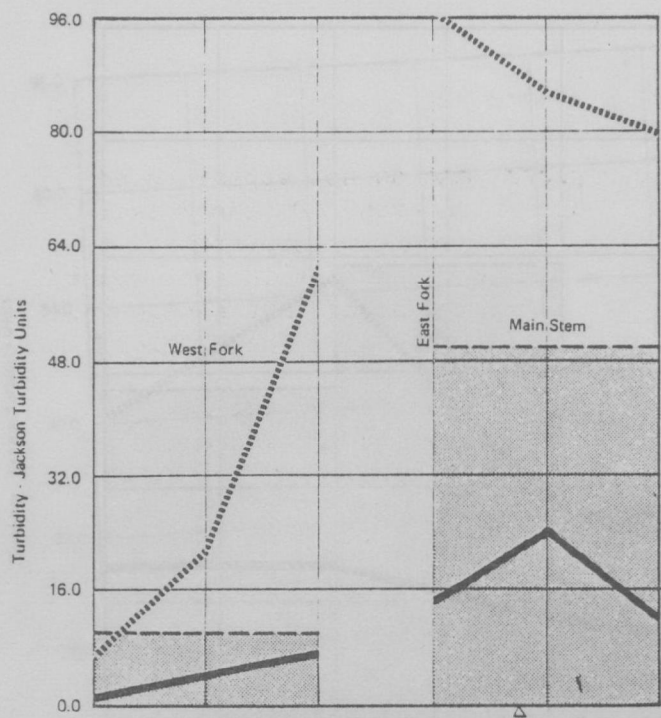
- State Standard
- Maximum Observed Value
- Mean Observed Value
- △ Point Discharges



Storet Station	Location
310008	Hwy. 88, CA.
310010	State Line
310011	395 So. of Gardnerville
310012	Muller
310013	Genoa Ln.
310014	Cradlebaugh
310021	Pinion Hills
310015	New Empire
310022	Dayton
310016	Weeks

- State Standard
- Maximum Observed Value
- Mean Observed Value
- △ Point Discharges

Carson River



Storet Station	Location
310024	Topaz Lake
310025	Wellington
310026	Above Confluence
310029	Above Confluence
310031	Above Yerington
310030	JJ Ranch

- State Standard
- Maximum Observed Value
- Mean Observed Value
- Δ — Point Discharges

Known point discharges are shown on the plots, and do not appear to be the cause of many of the violations of state standards. On the Walker River between stations 310025 and 310026, for example, there are no point discharges, yet water quality degrades substantially in that reach of river. There are the known feed lots operating along that section of the Walker River which probably are major contributors to the problem.

Although the exact activities causing the water quality violations can not be identified from this data, it can be reasonably concluded that non-point sources are major contributors of pollutants.

FEDERAL AGENCY EROSION CONCERNS

At the outset of the project letters were sent to each Federal Government Agency with some responsibility or activity in Nevada which might relate to the problem of erosion and runoff from land disturbing activities. Certain items of information were requested, including erosion problems and locations encountered by that Agency in Nevada.

Department of Housing and Urban Development

HUD's involvement in erosion control work is largely limited to development of subdivisions, multifamily and other types of housing projects in which, as a result of grading operations, it is necessary to treat exposed areas and slopes against erosion. Most such activities occur in the Reno area where soil stabilization is needed to protect against slope failure, and in the Las Vegas area where wind erosion is a serious problem.

National Park Service

Accelerated slope wash in vicinity of springs on east flanks of Grapevine Mountains as a result of trespass cattle through overgrazing of vegetation, trampling of vegetation, and trailing.

Soil Conservation Service

All lands in the state are subject to various degrees of erosion, either water or wind. It would be impossible to list all of the locations where erosion is a moderate to severe problem. Enclosed is a work map that has not been published, but we consider it the best available source of data for the total state. It is a more detailed map than those that are included in the reference sources listed in the lower left hand corner of the Work Map. For example, following Page 157 of Appendix VI for the Lower Colorado Basin there is a Sediment Yield Map. Copies of these Type I River Basin reports should be available in the State Library or State Engineer's Offices.

There are various types of erosion problems. Some examples are as follows: Pine Valley, a tributary of the Humboldt River, has a very serious channel degradation problem. At the lower end of the Valley channels are 25-30 feet deep, and in some places over 100 feet in width. In the upper watershed and on the side tributaries, there are active gully heads. A number are cutting back into wet meadows. Water tables are being lowered. This results eventually in total destruction of wet meadows.

In the Tahoe Basin new highways, new housing areas, ski runs and other disturbed areas produce critical sediment source areas which end up polluting the pristine waters of the lake.

On the Little Humboldt River in Humboldt County, there are active sand dunes. These sand dunes continue to encroach on the river channel. This, in turn, results in flooding of a sizeable area in crop production.

The Carson River in Douglas County is also degrading. However, the greatest concern to local residents is the stream bank erosion that is occurring. Some effort has been made to rip-rap critical areas, but more work will be needed to solve the problem.

Department of the Navy

The NRM Branch of this Command is concerned primarily with two activities in Nevada - the Naval Ammunition Depot at Hawthorne and the Naval Air Station at Fallon. Erosion problems include washouts resulting from overirrigation on some outleased areas and possibly some wind erosion.

Energy Research and Development Administration

Except for a few small springs, there are no perennial surface waters on the Nevada Test Site, thus we have never considered it necessary to give specific consideration to mitigation of water pollution from surface erosion there.

Bureau of Reclamation

Flashflooding - all Reclamation lands
Offroad vehicles - all Reclamation lands
Wind - all Reclamation lands not under water

Corps of Engineers

Specific Corps studies underway in Nevada include (1) the authorized Humboldt River and Tributaries project, which is in the advanced planning stage; (2) the authorized Gleason Creek Dam project, on which we are also performing advance planning studies; and (3) the Truckee River and Tributaries Investigation, under which we are conducting a channel modification study of the Truckee Meadows area. The Humboldt River is

a meandering river constantly eroding its banks, especially during high flows. Water resources development being considered for the Humboldt River basin would provide for increased irrigation water and recreation use in addition to the flood control function which would reduce flood peaks and their associated erosive forces. Although no additional facilities on Humboldt River, Truckee River, or Gleason Creek are being studied strictly for erosion control, some flood control alternatives being considered would attenuate peak flood flows and thereby reduce erosion that usually accompanies such events.

United States Geological Survey

Because erosion is a natural phenomenon, it occurs regularly everywhere throughout Nevada. The rates of natural erosion vary greatly from place to place. Some of the products and results of natural erosion are beneficial and some cause problems to man and his environment. However, very few data are available to categorize or evaluate natural erosion in Nevada.

Some specific erosion problems recognized in Nevada are as follows:

- (a) Urbanization at Lake Tahoe accelerates erosion and therefore increases sediment yields to the lake. The probable acceleration of erosion by urbanization allegedly causes increased nutrient loads to be delivered to the lake which assumedly accelerate lake eutrophication. Increased sediment transport also modifies the streambed environment and associated biota, causes increased turbidity both in the streams and the lake, and can clog drainage structures.
- (b) The falling base levels of Pyramid and Walker Lakes caused by lowering lake levels during historic times have caused dramatic channel erosion along the lower reaches of the Truckee and Walker Rivers. This erosion affects the streambed biologic environment causing decreased fish migration for spawning, increases turbidity in the lakes, and in some cases causes loss of valuable farm land by streambank erosion.
- (c) Numerous examples of erosion of agricultural land probably exist throughout the state, that ~~are~~ at least partly caused by improper irrigation practices. The erosion results in the loss of valuable topsoil and causes deleterious results to the natural watercourses that receive the eroded sediment.
- (d) Non-revegetated or poorly revegetated mine dumps furnish eroded material to streams that receive storm runoff. The streams are then physically and probably chemically degraded by the material in transit. Many mine dumps probably fit this category throughout the state.

- (e) Increasing streamflow in Las Vegas Wash during the last several decades has probably been a major cause of the dramatic erosion along the lower reaches of the Wash. This channel erosion undoubtedly affects the stream biota and also causes an abnormally heavy discharge of sediment into Lake Mead with probable deleterious effects on the lake water and environment near the mouth of the wash. Any significant increases in streamflow resulting from accelerated wastewater discharge or other sources will cause similar problems in almost any area.
- (f) Accelerated erosion related to urbanization in the Reno, Carson City, and Las Vegas areas probably furnishes above normal sediment loads to streams that receive storm runoff water from these urban areas. The bad effects on the receiving waters are similar to those listed above under other erosion problems.
- (g) Landslides caused or accelerated by man's activities can cause major erosion problems in specific areas. A good example of the nature of this type of problem is described in the recent USGS open-file report on the Leviathan mine landslide in the upper Carson River basin of California.
- (h) Mining and dredging of stream channels or areas that drain immediately to stream channels generally causes abnormally great sediment transport by the streams with many of the resulting deleterious effects described above under other problems. Several recent examples of this type of activity probably exist in Nevada.
- (i) Natural erosion is a problem in many areas of the state. It is particularly troublesome when it is of the severe and intense variety caused by flash floods. It then affects receiving waters in the ways described above, plus the sediment transport and deposition can be a severe physical hazard to persons or property in its path.
- (j) Artificial channel changes of natural streams usually cause erosion of the channels with inherent problems to streamflow and receiving waters similar to many of those listed above. Several examples of this type problem occur within the state.
- (k) Probably numerous other less common examples of erosion and problems occur throughout the state. They probably are caused by both natural and man-related activities. Any of man's activities that alter the natural drainage or runoff regime can be expected to increase erosion and its related problems.

Bureau of Land Management

Many problems and locations have been identified through the cooperative efforts of the general public and local, State, and Federal governmental agencies and/or groups. However, some problems have been identified by the inventory and analysis program. Generally, most problems are being caused by livestock forage over-utilization, natural or geologic gully erosion, mineral exploration, off-road vehicular use, private land uses (urban development), and mineral extraction. Specific locations and detailed information on problem areas may be gathered by contacting the respective District Offices.

COUNTY EROSION CONCERNS

To better understand the feelings and problems at the county level, a letter was sent to the County Engineer in each county. This letter asked several questions concerning the extent that water quality problems associated with erosion and land disturbing activities are a problem in that county, the types of activities which were of greatest concern as causers of accelerated erosion, what actions were being taken to alleviate problems and what type of additional assistance or authority was needed at the county level to combat existing problems.

This letter was followed by a telephone interview to expedite receipt of the desired information and provide an opportunity to discuss the problems.

The responses varied widely with the two most populated counties, indicating that erosion problems in at least portions of their areas are of major concern. The other counties expressed minor or no concern over erosion or land disturbing activities in their areas. Several engineers indicated that they had no idea of the magnitude of the problem in their county, but as far as they knew, there was no problem. This probably represents both a lack of problem definition and the fact that most counties have not had to address these problems in the past. It appears that the local awareness of the problems is related to the population of the county. This probably represents the impact of urbanization and construction in the more populated counties.

The primary concerns expressed by the county engineers were with the land disturbing activities of urbanization, construction, transportation and recreation. Water quality problems caused by mining, grazing, irrigation and forestry were felt to be of minor or no concern by every county official contacted. Virtually, every county expressed concern about the problem of flash floods. Several county engineers indicated that wind erosion was also a significant problem.

Ongoing programs to alleviate problems at the county level included maintenance work by county road crews, cooperation and technical liaison with the Soil Conservation Service and local Soil Conservation Districts and participation in local 208 planning efforts.

To be more effective in combating existing problems, several counties cited a need for additional manpower, additional funding or technical assistance. Several county engineers also suggested a better definition of what constitutes problems, and the need for guidelines or standards to measure them. None of the counties felt that they needed additional authority to handle the existing problems.

The county engineer survey showed an increasing awareness, at the local level, of the problems caused by accelerated erosion. Probably the most comprehensive efforts of erosion control are being made in the Lake Tahoe Basin, where the grading ordinance of the T.R.P.A. has the strictest controls in Nevada. Washoe County places restrictions on subdivision ordinance to obtain better control of this problem. These regional and local government actions show concern for the problems of erosion and attendant water pollution even though the magnitude of the problem has not been quantified.

LOCAL EROSION CONCERNS

During November and December of 1975, the State Land Use Planning Agency held a series of public workshops designed to obtain public input on various aspects of land use activity. Included as part of their workshop program was a questionnaire containing three questions on erosion and runoff from land disturbing activities. The questionnaire with summarized responses is on the following page.

Among the conclusions that can be drawn is that more than half of the respondents indicated an opinion that various kinds of land uses cause erosion and water pollution. This opinion is most held by the urban respondents (97%) and less by the non-urban (46%). Statewide, urbanization, construction and agriculture (grazing and other) were deemed to be prime causes. This same attribution was made by the urban respondents, but among the non-urban respondents the only significant plurality formed around agriculture.

All tabulations resulted in clear majorities believing land use planning is a good approach in protecting water quality from the effects of erosion. Even clearer majorities believe that existing agencies and laws are not doing enough to control man's uses of land that cause erosion and that additional governmental effort is needed. Again, planning was the most preferred type of program in all tabulations, followed by preferences for technical assistance programs (except among urban respondents, who attached about equal preference to regulatory programs). In all tabulations, local and state governments were the most favored for involvement in control programs.

Special Environmental Questions

	<u>Number of Respondents</u>		
	Urban 60	Non-Urban 233	Statewide 293

- Erosion and resulting water pollution from man's use of land near my community are caused primarily by:

Recreation	12%	12%	12%
Transportation	20%	6%	8%
Urbanization	72%	11%	23%
Construction	48%	14%	17%
Mining	3%	14%	12%
Grazing	17%	10%	11%
Other Agriculture	18%	10%	12%
None	3%	54%	44%
- Is land use planning a good approach in protecting water quality from the effects of erosion?

Yes	90%	68%	72%
No	7%	21%	18%
No Opinion	3%	9%	8%
- If you don't think that existing agencies and laws are doing enough to control man's uses of land that cause erosion, what types of governmental programs would you recommend?

<u>Level of Government</u>			
None	3%	14%	12%
Federal	28%	6%	10%
State	57%	28%	34%
Regional	43%	14%	20%
Local	55%	62%	60%
<u>Type of Program</u>			
Planning	62%	48%	51%
Regulatory	55%	21%	28%
Financial Assist	38%	25%	28%
Technical Assist	52%	37%	40%

PRIORITIES

In order to establish control priorities, some system of values is necessary. To define the extent of accelerated erosion and attendant pollution it would be desirable to know how many pounds of sediment were produced from an average acre for each land use activity and the resulting impact on water quality. Some data exists which allows estimates to be formulated for a few uses.

Irrigation return flows in terms of annual acre-feet can be established from the State Engineers "Alternate Plans for Water Resource."

<u>Area</u>	<u>Total Use</u>	<u>Withdrawal</u>	<u>Consumption</u>	<u>Return</u>
I	333,000	316,000	133,000	183,000
II	1,946,000	887,000	388,000	499,000
III	1,454,000	1,432,000	609,000	823,000
IV	377,000	339,000	203,000	136,000
V	289,000	147,000	100,000	47,000
VI	240,000	239,000	128,000	111,000
Total	4,639,000	3,360,000	1,561,000	1,799,000

Total use includes public drinking, industrial, rural and electric power. The bulk of the supply is drawn from streams, but well and spring sources are included. Irrigation can thus be seen as the largest water user. Suspended solids in irrigation return flows were previously shown to range from 80 to 800 mg/l. This would indicate an annual range of sediment from 196,000 to 1,956,000 tons per year.

Unfortunately, insufficient data exists to establish similar values for other land use activities. Sediment from other activities would depend principally on rainfall. Available data for sediment rates was obtained in locations like North Carolina, Maryland or Wisconsin. While useful from an illustrative viewpoint, it does not seem sufficiently valid for Nevada to establish meaningful comparisons with irrigation sediment. Considerable work has been done by the Soil Conservation Service but their concern is towards soil per se, not water quality. A future data collection program to establish relative sediment and water quality values for Nevada is desirable. At present, priorities can only be assigned on an intuitive basis.

In a general way the matrix on the following page provides a relative view of the potential severity of erosion within activity groups. The actual extent of accelerated erosion and attendant pollution is dependent on the extent, nature and location of each of the activities.

Some activities are easily suited to management which will reduce potential erosion. Facilities design, forest practices and construction are all amenable to operating techniques which will reduce sediments actually reaching streams. Since some form of permit is already required before these activities can be undertaken, administration of erosion and sediment reduction practices would be relatively simple.

	Activity in Water Bared Soil Compaction	Debris/Burning Dewatering Disruption	Drainage Change Grinding Slope Change	Vegetation Removal Water Added Wind (Artificial)
Agriculture: grazing irrigation	X X X	X	X	X X X
Forestry	X X	X X		X
Construction: building dams roads transmission	X X X X X X X X X X	X X X X X X X X X	X X X X	X X X X X
Recreation: boats camps trails	X X X X X	X	X X	X X
Stream Modifications	X	X X		
Military	X	X		X
Mining: hard rock open pit	X X X X X X	X X X	X X X X X	X
Urbanization	X X		X X X	X
Transportation: airports railroads roads	X X X	X	X X X X X	X X

It would seem logical to devote immediate corrective efforts to the most manageable activities with the greatest impact on water quality. These would seem to be activities in concentrated areas which are accessible and discharge water on a regular basis. Irrigation appears to be the most significant activity in terms of erosion and water quality.

Another group are those existing facilities which are in close proximity to water courses. Urban development and transportation systems fall in this category.

Remaining land use areas should not be considered for erosion control as an aspect of water quality until data exists to assign quantitative priorities. Exceptions may exist for a few specific problem areas causing state-wide concern, but none can be identified at present.

From the above concepts, a map can be sketched showing "Areas of Concern" for water quality in Nevada with respect to erosion. The key elements of this map are:

- o Perennial streams
- o Runoff areas exceeding 5 inches per year
- o Sediment yield areas exceeding 0.2 acre-feet per year
- o Irrigated area
- o Urban areas

The geographic areas described by this map would seem to be those which should receive initial attention.

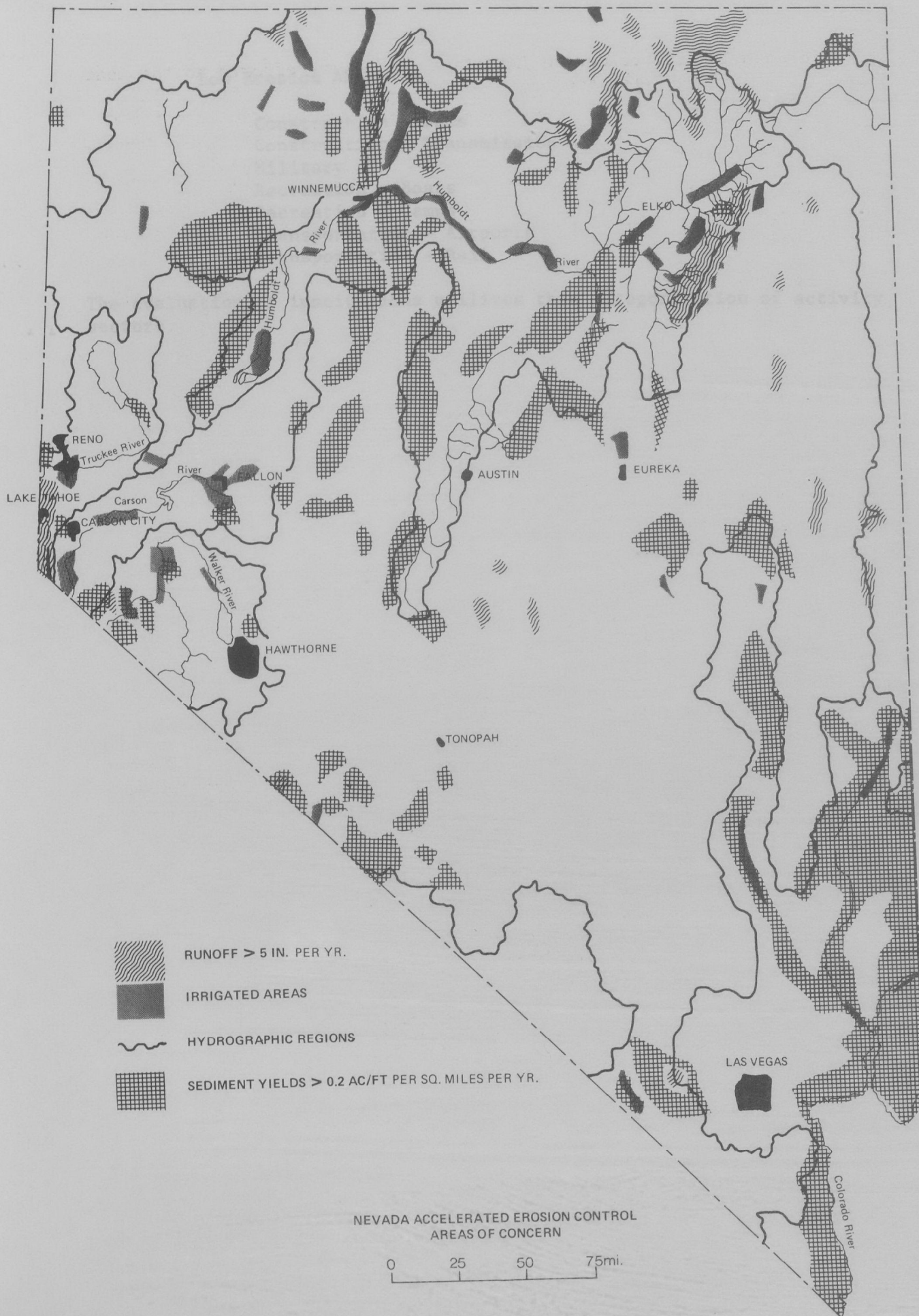
Meshing the available information on magnitude of identified activities within Nevada, their erosion potential, and the areas of concern, it is possible to establish relative priorities for developing erosion control programs for the various activity sectors. They are grouped below into three categories, with no attempt to rank activities within categories:

High Erosion Activity

- Agriculture - Grazing
- Agriculture - Irrigation
- Construction - Buildings
- Construction - Roads
- Recreation - Trails
- Stream Modifications
- Urbanization

Moderate Erosion Activity

- Forestry
- Mining - Hard Rock
- Mining - Open Pit
- Transportation - Roads



Low Erosion Activity

Construction - Dams
Construction - Transmission
Military
Recreation - Boats
Recreation - Camps
Transportation - Airports
Transportation - Rail

The evaluation of institutions utilizes this categorization of activity sectors.

Control Techniques

The discussion of control techniques for runoff and erosion has been divided into four sections. These sections discuss Control Strategies, Implementing Strategies, Effectiveness, and Resource Requirements. Although many of the techniques have been utilized in Nevada, the information presented is based on the literature. Some controls will undoubtedly prove more effective in Nevada than will others.

CONTROL STRATEGIES

BASIC PRINCIPLES

The extent of erosion and the quality of runoff depends on several influencing factors. These factors consist of: 1) topography, including ground slope; 2) runoff quantities and rates; 3) climatic conditions, including temperature, wind rates, and rainfall quantities and intensities; 4) surface characteristics, including soil types, geology, vegetative ground cover, surface coverings, and land use; and 5) stream channel characteristics. Man's activities can modify or influence these factors, accelerating the erosion process and adding pollutants to runoff.

To control erosion and the quality of runoff associated with man-related activities, it is necessary to control the impacts on the influencing factors. In addition, eroded soils and other pollutants must be discharged to surface waters in order for erosion to be considered a water quality concern. Thus, erosion control associated with improving or maintaining water quality can also be related to controlling the discharge of eroded soils to surface waters. Control strategies can then be divided into two major categories: those that are aimed at preventing or minimizing the erosion process (source controls); and those that are aimed at preventing or minimizing the discharge of eroded soils to surface waters (discharge controls).

The measures which can be implemented to control runoff and erosion and/or the resultant pollutant discharges to surface waters fall into two major types: physical and structural control measures, and management control measures. The physical and structural controls include reducing erosion rates by developing facilities which modify surface runoff quantities, rates or locations. They also include modifying surface characteristics, topography, or stream channel configuration to reduce erosion. In addition, physical and structural controls can be developed which treat runoff to remove eroded soils prior to discharge to surface waters.

Management control measures are mainly aimed at modifying or controlling activities which impact or influence erosion rates. These activities relate to both the disturbance of land and the use of water. The management measures attempt to control the location, extent, timing and specific practices of the activities so that they will have a minimal adverse impact on those factors which influence the rate of erosion and discharge of sediment to surface waters.

Control strategies can be characterized in the following manner:

Control of Runoff and Erosion

Structural and Physical Techniques

Modification of surface characteristics

Modification of topography

Modification of surface runoff

Modification of channel characteristics

Management Techniques

Minimize impacts on surface characteristics

Minimize impacts on topography

Minimize impacts on channel characteristics

Restrict activities in areas or times of high erosion potential.

Control of Discharges of Eroded Soils and other Pollutants to Surface Waters

Structural and Physical Techniques

Treatment associated with collected and in-channel drainage.

Treatment associated with Surface runoff

Management Techniques

Restrict location of activities

Restrict water use

These control strategies are described in greater detail in the following sections.

CONTROL OF RUNOFF AND EROSION

Structural and Physical

Modification of Surface Characteristics

Brush Control - Eradicating pinyon-juniper, sage and other brush, and replacing with more desirable vegetation.

Seeding - Establishing adapted plants by seeding to provide soil cover and to hold soils in place in the root zone.

Tree and Shrub Planting - Planting tree or shrub seedlings or cuttings to establish desirable cover and root zones.

Critical Area Planting - Stabilizing severely eroded areas by establishing vegetative cover.

Crop Residue and Mulching - Utilizing crop residues or mulches for soil cover.

Cover and Green Manure Crop - Establishing a crop of close-growing grasses, legumes, or small grain used primarily for seasonal protection and for soil improvement.

Riprap - Utilizing large rock or aggregate as cover for soils in areas with high erosion potential or critical water quality concern.

Chemical Binders - Adding chemical binders to soils to increase cohesion and/or to secure soils until vegetation is established.

Concretes and Cements - Covering soils with nonerodable concretes and cements in limited areas with high erosion potential or critical water quality concern; especially applicable to gravel and dirt roadways.

Soil Compaction - Increasing soil cohesion or strength through mechanical compaction.

Chiseling and Subsoiling - Loosening the soil, without inversion and with a minimum of mixing of the surface soil, to shatter restrictive lower layers that inhibit water movement or root development.

Pervious Areas - Replacing impervious soil cover with pervious materials to improve infiltration.

Fire Protection - Utilizing a variety of measures to prevent and control fires which remove vegetation and other organic soil cover, including constructing roads, trails, fire breaks, and water storage and transport facilities.

Modification of Topography

Contour Terracing - Developing water storage capacity along the contour by excavating and placing soil as an embankment along the downstream side.

Contour Furrowing and Trenching - Making furrows and/or trenches along the contour to reduce runoff velocities and slopes.

Retaining Walls - Constructing retaining walls to prevent mass soil movement into surface waters. Also used to decrease area of soils exposed to erosion and to enable slope modification (see below).

Slope Modification - Grading or otherwise modifying surface slopes in areas where erosion potential is great or in close proximity to surface waters.

Wind Breaks - Placing structures or vegetation (usually trees or tall brush) in areas susceptible to wind erosion to reduce wind velocities.

Modification of Surface Runoff

Field Diversion - Constructing an interception channel near the contour to divert runoff to a waterway.

Pitting - Making shallow pits or basins of suitable capacity and distribution to retain water and increase infiltration.

Diversions and Dikes - Diverting water away from eroding areas through use of structures, dikes, or channels.

Drop Structures and Gully Plugs - Placing concrete, masonry, sheet piling or earth structures in eroded channels or gullies below the top of the bank to control grade, prevent further erosion and provide sediment storage.

Channelization - Constructing channels and associated structures to transport runoff waters (see channel modification).

Water Spreading - Diverting channeled or concentrated runoff to flat areas for flow velocity reduction and/or infiltration.

Pervious Areas - Replacing impervious soil cover with pervious materials to increase infiltration and reduce surface runoff.

Temporary Storage - Developing facilities which include temporary storage of rainfall or runoff (e.g., roof tops, parks; parking lots) to reduce runoff velocities and peak flows.

Modification of Channel Characteristics

Channel Lining - Protecting channel bottoms and banks with concrete or riprap. Stream bank protection can also be used to retard flows along the bank, and promote deposition instead of erosion.

Reservoirs and Detention Basins - Providing for either temporary or permanent water storage to reduce flow velocities and peak flow quantities.

Grassed Waterway or Outlet - Using a natural or constructed waterway or outlet shaped or graded and establishment of suitable vegetation as needed for the safe disposal of runoff.

Revetments - Placing materials on the stream bank to protect it from erosion by stream flow.

Sills - Placing structures of rock, masonry, rails, etc., at channel grade to prevent stream downcutting.

Jacks and Jetties - Building projections in the stream channel to divert currents away from a vulnerable bank.

Channel Changes - Constructing a new waterway or channel with improved characteristics with respect to existing and potential erosion.

Management Techniques

Minimize Impacts on Surface Characteristics

Staged Development - Completing construction and land development projects in stages or increments in order to minimize the extent of ground cover disruption and soil exposure.

Fire Prevention and Suppression - Employing a variety of measures for the control and prevention of fires which remove vegetation and other organic soil cover, including restricting access by the public and conducting fire prevention education programs.

Access Controls - Limiting or restricting access for activities which remove soil cover or disrupt surface characteristics, including livestock, wildlife, and vehicular traffic.

Proper Grazing Use - Grazing at an intensity which will maintain adequate cover for soil and maintain or improve the quantity and the quality of desirable vegetation; includes rotation and deferred grazing in which one or more grazing units are rested at planned intervals throughout the growing season of key plants, and generally no unit is grazed at the same time in successive years.

Proper Cropping and Use - Using close growing crops on erodible land includes strip cropping which is a systematic arrangement of cultivating crops in strips or bands across the general slope or on a contour to reduce water erosion and approximately at right angles to the prevailing winds to reduce wind erosion.

Selection of Construction Materials - Utilizing construction materials with low erodability; includes measures such as using cements and concretes in road construction rather than dirt or gravel.

Impervious Surface Controls - Limiting the use of impervious materials in instances where surface runoff rates will be increased adversely.

Minimize Impacts on Topography

Slope Controls - Minimizing increases in ground slopes occurring from land-disturbance activities; includes practices such as spreading or filling with excess soils from construction and mining activities rather

than constructing mounds or berms and includes establishing maximum construction slopes.

Contour Farming - Conducting farming operations on sloping cultivated land in such a way that plowing, land preparation, planting and cultivating are done on the contour, resulting in contoured rills.

Minimize Impacts on Channel Characteristics

Restrictions on Channel Material Removal - Limiting or restricting removal of materials within stream channels; includes restrictions on gravel mining and borrow operations for construction activities.

Channel Modification Controls - Establishing design criteria for projects which result in changes to stream channels. Criteria can include establishing maximum flow velocities and requiring design features as described under structural and physical control techniques.

Restrict Activities In Areas or Times of High Erosion Potential

Activity Scheduling For Erosion Control - Scheduling land disturbing activities so that ground cover removal or soil exposure operations are not taking place or are at a minimum during spring runoff or seasonal periods of high rainfall.

Stream Setbacks - Preserving buffer or natural vegetation areas adjacent to streams channels by restricting activities in order to minimize erosion in critical areas.

Land Use Restrictions for Erosion Control - Restricting the type and level of activities and/or requiring specific structural, physical, or management controls on the basis of land classifications which reflect erosion potential.

CONTROL OF DISCHARGES OF SEDIMENTS AND OTHER POLLUTANTS TO SURFACE WATERS

Structural and Physical Techniques

Treatment Associated With Collected Or In-Channel Drainage

Detention Basins and Reservoirs - Providing for flow velocity reduction by developing ponds or lakes behind a flow restriction device or through channel modifications in order to settle and remove suspended sediment.

Sediment Filters - Constructing filters of gravel, sand, or other materials which trap and remove sediments as waters flow through the filter.

Debris Basins - Removing and storing sediment by constructing a dam with spillway above channel grade; by excavation below grade, or both. Water retention is not an intended function of the structure.

Drop Structure - Placing concrete, masonry, sheet piling or earth structures in eroded channels to reduce flow velocities and remove and store sediment.

Sediment Traps - Constructing wells or weirs in channels and drainage collection facilities to settle and store sediments; used mainly in conjunction with storm drain inlets and catch basins in urban drainage systems.

French Drains - Using perforated pipe to discharge collected storm drainage to groundwater so that sediment can be filtered and removed by natural soils.

Treatment Associated With Surface Runoff

Buffer Areas - Maintaining or restoring vegetation adjacent to stream banks in order to reduce runoff velocities and settle and remove sediment; also includes placing structures or vegetation adjacent to streams to provide wind breaks to reduce the transport of sediments to surface waters by wind.

Pervious Material Placement - Establishing pervious areas for discharge of runoff to groundwaters where sediment can be filtered and removed by natural soils.

Filter Dikes - Using gravel, straw, hay, or other materials to construct temporary or permanent dikes in which sediment is filtered and removed as surface water flows through the dike.

Management Control Techniques

Restrict Location of Activities

Stream and Lake Shore Setbacks - Restricting activities in areas adjacent to surface waters in order to maintain maximum distances for the travel of eroded soils, thus enabling natural settling and filtering of sediments.

Buffer Area Maintenance - Restricting development or activities in natural vegetation areas which serve as natural settling and removal systems for sediments in runoff.

Wetlands Maintenance - Preserving natural wetlands areas which tend to settle and remove sediments from runoff; can include restricting activities in wetlands areas such as filling and development.

Restrict Water Use

Water Application Rates - Restrict the amount of water that can be used in a specific activity, e.g., application of irrigation water.

Water Discharge Rates - Restrict the amount of water that can be discharged to a receiving body, thereby limiting sediment quantities.

IMPLEMENTING STRATEGIES

Control techniques are often implemented by the activities which are impacting or accelerating the runoff and erosion process. Governmental units or agencies can have several roles in influencing implementation, however. One potential governmental role is in regulating activities and requiring implementation of desired runoff and erosion control practices and techniques. Another potential governmental role is in providing economic assistance or tax advantages to activities which institute runoff and erosion control practices. In addition, government units or agencies can provide technical assistance or carry out education programs to gain acceptance and aid in implementing runoff and erosion controls.

Activities which impact or accelerate runoff and erosion can be under either public or private control. For example, livestock grazing on federal lands administered by the Bureau of Land Management is under public control. Thus, control practices implemented by the activities which impact or accelerate runoff and erosion can be carried out by governmental units or agencies as well as private individuals or businesses. In addition, governmental bodies can take responsibility for implementing specific runoff and erosion control programs. For example, buffer areas adjacent to waterways could be purchased and maintained by a governmental unit in order to reduce discharge of eroded soils to surface waters.

REGULATORY PROGRAMS

One means of influencing the implementation of control mechanisms is through the establishment of regulatory programs which place requirements and/or restrictions on activities which impact or accelerate runoff and erosion. A variety of approaches exist in instituting a regulatory program depending on the objectives to be accomplished and on the institutional framework which will administer and enforce the program. Each program has certain common elements, however, including a defined set of regulations, a means of enforcement, and a defined area in which

the regulations apply. The alternatives possible for these elements are shown in the figure below, with a discussion of them following.

Elements of Regulatory Programs For Runoff and Erosion Control

Scope of Regulations	Type of Regulations	Enforcement Mechanisms	Area of Application
Regulate Specific Activities	Specification Standards	Permits	Jurisdictional Areas State County Cities & towns Special districts
Regulate Impacts on Natural Features	Performance Standards	Licensing	
Regulate Sediment Discharges to Surface	Discretionary Requirements	Monitoring	Erosion Sensitive Areas Sensitive lands Wet lands areas Shoreline areas Surface water drainage areas
	Plan Conformance	Inspection Project Plan Review	

Scope of Regulations

Regulatory programs can be established which apply to a specific activity because of its importance or relative contribution to runoff and erosion problems. Examples could include the regulation of live-stock grazing, grading and construction, or irrigated agriculture. In this way, regulations can be based on the characteristics of the specific activity and can include regulation of the type of practices or techniques which may be employed in conducting the activity.

Regulatory programs can also be established which place restrictions on the amount of eroded soil and other pollutants which can be discharged to surface waters. This can be accomplished through regulations which require specific treatment processes prior to discharge or by establishing requirements for the maximum amount or concentration of suspended sediment and other pollutants in discharges.

A third approach could be a regulatory program aimed at establishing requirements and/or restrictions on the manner in which activities can modify or impact natural features which influence erosion. These features include topography, runoff, surface characteristics, and channel characteristics. Regulations or standards can then be established for each feature. An example would be regulations for surface runoff which require that natural runoff rates cannot be increased as the result of modifications by any land-disturbing activity.

Type of Regulations

Regulations can establish requirements and/or restrictions for runoff and erosion control in a number of ways. These include the use of specification standards, performance standards, discretionary requirements established on a case-by-case basis, and requirements established by a specified plan.

Specification Standards

Specification standards establish detailed restrictions and/or requirements for implementing specific erosion control practices. Examples of specification standards include requirements for paving all roads receiving over a specified traffic loading, or requirements for all land development projects to include the construction of holding ponds with a capacity sufficient to retain runoff associated with storms having a recurrence frequency of 25 years.

Performance Standards

Performance standards establish requirements for the performance of erosion control measures. This can be accomplished by establishing maximum allowable erosion rates, maximum sediment discharge rates, or maximum allowable impacts on natural features. Examples of performance standards include requirements that the amount of soil which erodes from a roadway cannot exceed that which would occur from that same land area prior to construction, or requirements that land development projects cannot increase runoff rates over those occurring naturally during a storm having a recurrence frequency of 25 years.

Discretionary Requirements

Regulations can establish requirements and/or restrictions for erosion control which are specified on a case-by-case basis, dependent on the discretion of a governmental unit, agency, or commission. Criteria or guidelines are usually developed to serve as the basis for determining specific requirements or restrictions.

Plan Conformance

Regulations can require conformance with specific comprehensive plans which establish varying restrictions and/or requirements for erosion control on a location, time, and/or activity basis. The requirements or restrictions can be in the form of either specification or performance standards for each varying condition addressed or established in the plan. This enables requirements or restrictions to be established in a comprehensive manner, taking into account conditions existing at various locations within the planning area for various time frames. It is also possible to modify requirements or restrictions as conditions change by updating the plan. A number of different types of plans can be specified as the basis for regulating erosion control, including land use plans, water quality and waste management plans, drainage and flood control plans, and specific erosion control plans.

Land Use Plans - The process of assigning zoning classifications or allowable uses to land areas can include using criteria for minimizing runoff and erosion and its effects on water quality. It is also possible to include control requirements or restrictions as part of zoning classification descriptions.

Water Quality and Waste Management Plans - Plans can be developed which establish water quality standards and waste load allocations for specific water bodies. Requirements and restrictions for runoff and erosion control can then be established to meet these standards and allocations.

Drainage and Flood Control Plans - The planning for drainage facilities and flood control can include the use of criteria aimed at runoff and erosion control. Restrictions and requirements established by these plans would then help minimize runoff and erosion problems.

Runoff and Erosion Control Plans - A plan can be developed specifically for runoff and erosion control. The plan can develop requirements and restrictions on an area basis for any or all land-disturbing activities. The requirements or restrictions could be based on analysis of present runoff and erosion problems, water quality conditions, and the potential for runoff and erosion problems based on analysis of natural features.

Enforcement Mechanisms

The enforcement of regulations is usually necessary to assure their being followed or implemented as specified. A number of mechanisms exist for enforcement, including the use of permits, licensing, monitoring, inspection, and project plan reviews.

Permits

A permit is a written warrant granted by a governmental unit or agency which conveys the right to conduct a specific activity, normally for a given period of time and/or at an identified location. It then becomes unlawful to conduct the activity without having a valid permit. This system can be utilized to administer and enforce regulations by making compliance with the erosion control requirement or restrictions necessary to obtain and hold a permit. It is often required that the applicant must provide detailed information concerning the proposed activity prior to being granted the permit in order to assure compliance with the regulations. Activities which can require a permit for enforcement of erosion control regulations include construction, grading, land development, and discharge of surface waters in closed conveyance systems.

Licensing

Any individual or enterprise which conducts or undertakes a specific activity can be required to obtain and hold a license. A condition for doing so may be that the individual or enterprise must be familiar with runoff and erosion control regulations and that he conform with the regulations which apply to that activity. The license can then be revoked if applicable regulations are not complied with. Activities with which licensing can be used for regulating runoff and erosion control include land development and construction.

Monitoring

A program can be established to monitor compliance with regulatory programs and/or to assist in establishing discretionary requirements or modify specific requirements. Monitoring programs can use aerial photography or field surveys to assess runoff and erosion rates and to assure that control mechanisms are being implemented as required. Water quality monitoring programs can also be utilized to assess problems associated with suspended sediments in rivers, streams, and lakes. Monitoring programs can then ascertain the success of control regulations as well as help enforce them.

Inspection

Visual inspection is a means of assuring that runoff and erosion control mechanisms are implemented as required. This can be accomplished in conjunction with permit and licensing programs whereby the individual

who obtains a permit or license notifies the regulatory agency or governmental unit at specified times during or after instituting runoff and erosion control mechanisms. The governmental unit or agency then performs the inspection to assure that control requirements are met. Inspection can also be accomplished on a random basis and carried out without the need for notification by those required to implement runoff and erosion control mechanisms.

Project Plan Review

A review of project plans, layouts, and construction details can be required prior to undertaking specified activities. This review process can then make sure that required runoff and erosion control mechanisms will be implemented as part of the project and can confirm the appropriateness of specific designs.

Area of Application

The area to which regulatory programs apply can vary. It can coincide with the jurisdictional area of the governmental unit, agency, or commission which is responsible for enforcing and administering the programs. This could be the entire state, a county, a city or town, or a special district such as a soil conservation district.

Regulatory programs for runoff and erosion control can also be applied to special areas where there is a potential for runoff and erosion problems. These areas can include sensitive lands which are determined on the basis of natural features including topography, surface characteristics, runoff quantities and rates, climatic conditions and stream channel characteristics. Other areas which can be considered for special control regulations include wetlands, shorelines, and drainage areas for surface waters in the state. The regulatory programs would then apply only in the selected area or areas, thereby reducing the requirements for administration and enforcement.

ECONOMIC PROGRAMS

Governmental units or private sector agencies can assist in the implementation of runoff and erosion control mechanisms through economic programs. These programs can include direct economic assistance in the form of grants or loans to individuals developing runoff and erosion control facilities. Tax incentives can also be used which provide economic incentives to those implementing desired control mechanisms. It is also possible to include some elements of runoff and erosion control in development activities financed by the private sector.

Grants and Loans

Funds can be provided to any individual or enterprise which implements desired runoff and erosion control mechanisms. These funds can be in the form of either direct grants, or low interest loans aimed at assisting runoff and erosion control. The criteria by which funds are dispersed can be either discretionary, determined on a case-by-case basis, or can be determined by needs established on an area-wide basis through comprehensive planning. Funds can also be provided from one governmental unit to another, as in the case of RC&D funds provided by SCS to a county for establishment of an erosion control program.

A difficulty in administering funding assistance programs is in determining appropriate allocations of monies among assistance requests. Normally, available funds are not sufficient to meet all desired expenditures and prioritization systems must be developed and administered. Grants for capital expenditures can also have the effect of promoting capital intensive problem solutions since those implementing the controls can look on assistance monies as being essentially free. Thus, if those implementing the controls must finance operations and maintenance costs, solutions will be sought which minimize these costs, often at the expense of capital expenditures. A final problem can be in delaying implementation of some controls by those waiting for assistance. This can be especially critical if the program is under-funded and those implementing controls attempt to wait for assistance.

Tax Incentives

Taxing policies can be developed which provide economic incentives to those implementing desired runoff and erosion control mechanisms. One means of providing tax incentives is through policies which reduce property taxes for those areas which are excluded from development and maintained in a natural state, including buffer areas adjacent to shorelines, wetland areas, and other areas which have high potential for runoff and erosion problems if disturbed. Another means of providing tax incentives is through investment tax credits for facilities constructed for the purpose of runoff and erosion control.

Private Sector Financing

Many industrial, commercial or agricultural projects obtain financing from a bank or other financial institution. As part of the process of securing this private sector financing the prospective borrower must normally submit to the lender a detailed plan for the project. A component of this plan could be resource conservation plan, with runoff and erosion control as an integral part of the conservation plan. Either the terms of the financing, or the availability of financing could be partially dependent on the adequacy of the resource conservation plan.

EDUCATION PROGRAMS

Education programs can be utilized by governmental agencies to provide planning or technical assistance to those implementing runoff and erosion control mechanisms. Education programs can also be used to inform individuals as to the need for runoff and erosion control, and thus gain acceptance for implementing control mechanisms as part of carrying out various activities.

Planning or Technical Assistance

Many governmental agencies have the capability to provide planning or technical assistance in the area of runoff and erosion control. This assistance may be in the form of publications dealing with one or more aspects of runoff and erosion control. Typical titles include: "Guides for Controlling Sediment from Secondary Logging Roads"; "The Control of Pollution from Hydrographic Modifications"; and "Methods and Costs for Stabilizing Fine-Sized Mineral Wastes." These publications are made available at little or no cost to any individual who requests them for use in working to effect a solution to a runoff or erosion problem.

Government agencies also provide technical assistance in the form of field evaluations and recommendations for specific problems and locations. Many federal and state agencies participate in review of proposed projects, or assist in the development of site-specific or comprehensive plans by other agencies.

Another approach to planning or technical assistance is for a governmental agency to actually work directly with an individual who perceives that he has a runoff or erosion problem. The Cooperative Extension Service and the Soil Conservation Service through the local Conservation Districts provide technical assistance in this way. A technical specialist may assist the individual in the preparations or review of plans designed to minimize runoff and erosion on a planned or existing project. This assistance is normally provided at no direct cost to the individual, but may require a commitment of some sort by the recipient of the assistance.

General Information

These programs can be conducted as advertising campaigns in which runoff and erosion control needs and mechanisms are described, in an attempt to educate the general public and minimize practices which accelerate runoff and erosion. In this way people can become generally aware of the importance of controlling runoff and erosion, and the broad spectrum of activities which can generate erosion and attendant water quality problems.

Education programs can also be aimed at specific activities in which governmental agencies work closely with groups in developing improved practices and implementing mechanisms for runoff and erosion control. Such programs can include discussions or seminars with activity oriented groups (e.g., cattle ranchers, or developers) covering specific aspects of runoff and erosion causes and concerns, and appropriate control mechanisms.

EFFECTIVENESS

The amount of eroded material discharged to a receiving water from a given land area can be estimated with a function based on the Universal Soil Loss Equation (1). This function is as follows:

$$Y(S) = \sum_{i=1}^n \{A_i \cdot (R \cdot K \cdot L \cdot S \cdot C \cdot P \cdot SD)_i\}$$

where: Y(S) = sediment loading from the area under consideration, tons/year discharged to receiving waters.
n = number of subareas in the area
A_i = acreage of subarea i, acres
Rⁱ = The rainfall factor, usually expressed in units of rainfall-erosivity index; EI/year
I = the soil erodibility factor, commonly expressed in tons per acre per EI unit
L = the slope-length factor, dimensionless ratio
S = the slope-steepness factor, dimensionless ratio
C = the cover factor, dimensionless ratio
P = the erosion control practice factor, dimensionless ratio
SD = the sediment delivery ratio, dimensionless, a factor which takes into account the transport distance and characteristics of the travel path from the erosion site to the point of discharge to surface waters.

The above equation provides only an approximation of sediment loading, however, with its accuracy dependent on the complexity of the area being analyzed and its size. The estimated range of accuracy for the sediment loading equation is as follows (2):

<u>Predicted Loading</u> (MT/ha/year)	<u>Estimated Range of Accuracy</u> (MT/ha/year)
0.1	0.001 ~ 1.0
1	0.1 ~ 5
10	5 ~ 15
100	50 ~ 150
1,000	500 ~ 1,500

Estimates of the effectiveness of erosion control strategies can be no more accurate than estimates of the amounts of eroded soils being controlled or reduced. In addition, little actual data has been gathered

- (1) Midwest Research Institute, Cost and Effectiveness of Control of Pollution from Selected Non-Point Sources, National Commission Water Quality, Washington, D. C., 1975.
- (2) U. S. Environmental Protection Agency, Interim Report on Loading Functions for Assessment of Water Pollution from Nonpoint Sources, 1975.

to determine the effectiveness of specific control mechanisms. This fact was underscored in the following recommendation made by Midwest Research Institute in a report for the National Commission on Water Quality (1):

To verify how effective various (erosion) controls in fact are, field measurements are needed. Even if measurements were made for a given location, their applicability to other geographic locations requires careful assessment. The present state of the art is still evolving and a real need for continuing research in this area is clearly suggested. Research dealing with local conditions in various urban centers in the country is especially needed to establish trends and comparisons with respect to various control practices.

Generalized estimates can be made of the potential reduction in erosion rates associated with certain control techniques. On the following page, the figure gives values for the "C" factor in the sediment loading equation for various ground cover conditions. The sediment loading varies in direct proportion with the value given for the "C" factor; e.g., if the "C" factor is reduced from 0.5 to 0.25, the theoretical reduction in sediment loading to 50%.

It can be seen from the various "C" factor values that reductions in erosion rates from fifty to eighty percent could be achievable through the use of control techniques aimed at modifying ground cover. This would occur if the existing ground has little modifying cover (10%) and the control technique results in this condition to one of appreciable ground cover (50%).

In addition, estimates have been made for reductions in sediment loads which may be achieved by using a combination of best practices. These include both the control of erosion rates, and the control of discharges of eroded soils to surface waters in appropriate combinations. Using best practices, it is estimated that sediment discharges can be reduced by 60 to 80 percent of that which would result from land disturbing activities with no control (1).

The effectiveness of management control measures is difficult to estimate because of the variability of the manner in which they can be applied. If land disturbing activities can be scheduled to take place during times of no rainfall, the increased erosion rates accompanying the activity can be essentially eliminated. Controls on the location of activities can also have major effects on reducing sediment loadings. The sediment loading to surface waters decreases as the distance from the erosion source increases. This relationship has been estimated for the eastern United States in the following equation (2):

"C" Values for Permanent Pasture, Rangeland, and Idle Land (2)

Vegetal Canopy Type and height of raised canopy ^a	Canopy Cover ^b (%)	Type ^c	Cover that contacts the Surface					
			Percent ground cover					
Column No.	2	3	4	5	6	7	8	9
No appreciable canopy		G	0.45	0.20	0.10	0.042	0.013	0.003
		W	0.45	0.24	0.15	0.090	0.043	0.011
Canopy of tall weeds or short brush (0.5 m fall height)	25	G	0.36	0.17	0.09	0.038	0.012	0.003
		W	0.36	0.20	0.13	0.082	0.041	0.011
	50	G	0.26	0.13	0.07	0.035	0.012	0.003
		W	0.26	0.16	0.11	0.075	0.039	0.011
	75	G	0.17	0.10	0.06	0.031	0.011	0.003
		W	0.17	0.12	0.09	0.067	0.038	0.011
Appreciable brush or bushes (2 m fall height)	25	G	0.40	0.18	0.09	0.040	0.013	0.003
		W	0.40	0.22	0.14	0.085	0.042	0.011
	50	G	0.34	0.16	0.085	0.038	0.012	0.003
		W	0.34	0.19	0.13	0.081	0.041	0.011
	75	G	0.28	0.14	0.08	0.036	0.012	0.003
		W	0.28	0.17	0.12	0.077	0.040	0.011
Trees but no appre- ciable low brush (4 m fall height)	25	G	0.42	0.19	0.10	0.041	0.013	0.003
		W	0.42	0.23	0.14	0.087	0.042	0.011
	50	G	0.39	0.18	0.09	0.040	0.013	0.003
		W	0.39	0.21	0.14	0.085	0.042	0.011
	75	G	0.36	0.17	0.09	0.039	0.012	0.003
		W	0.36	0.20	0.13	0.083	0.041	0.011

^a Average fall height of waterdrops from canopy to soil surface: m = meters.

^b Portion of total-area surface that would be hidden from view by canopy in a vertical projection (a bird's-eye view).

^c G: Cover at surface is grass, grasslike plants, decaying compacted duff, or litter at least 5 cm (2 in.) deep

W: Cover at surface is mostly broadleaf herbaceous plants (as weeds) with little lateral-root network near the surface and/or undecayed residue.

$$S_d = D^{-0.22}$$

where:

S_d = sediment delivery ratio

D = distance from receiving water in feet.

This equation is a rough approximation and is dependent on the characteristics of the travel path from the erosion source and on the erosion rate. It does show that locational controls in general can be effective in reduction of sediment loadings to surface waters, however.

By controlling sediment loadings to surface waters, other pollutants can be reduced as well since a variety of materials are present in the soil. The discharge of materials which are for the most part insoluble is reduced in the same proportion as the reduction in sediment loading. These pollutants include heavy metals, insoluble pesticides, organic matter, and phosphorus. Materials which are soluble are reduced mainly by those controls which reduce the contact between soils and water. These are mainly the controls on surface characteristics and runoff locations. The discharge of soluble pollutants, which include salts, soluble pesticides, and acids can in fact be increased by some erosion control practices which increase the contact time between soils and water or which result in increased infiltration and leaching of pollutants in groundwater flows.

RESOURCE REQUIREMENTS

CONTROL TECHNIQUES

Resources required to implement runoff and erosion controls can be defined in terms of dollar costs and time. However, the specific resources required to implement controls vary widely, are dependent on the level of control desired, on the physical characteristics of the area in which controls are being implemented, and on the characteristics of the activity associated with the accelerated erosion process. As runoff and erosion rates increase, the cost of controls becomes greater to provide a given level of reduction in sediment discharge. Also, costs increase for achieving higher reductions in sediment loading from a given erosion source. The costs associated with permanent controls are usually higher than those for temporary ones. Thus, the characteristics of the activity accelerating the erosion process are important in determining control costs.

In addition, resource requirements for runoff and erosion controls vary depending on whether the controls are being implemented to correct an existing problem or are being implemented in conjunction with a new activity (such as a new housing development project) to minimize or prevent runoff and erosion problems from occurring in the future. In general, both time and dollar costs are lower for implementing controls which prevent future problems than for those aimed at correcting existing problems. This can be especially true for activities which remove vegetative ground cover, such as construction and grazing. As an example, preventive controls can be implemented by an activity to maintain a minimum desired ground cover, thereby minimizing the runoff and erosion process. If ground cover is greatly reduced, however, extensive corrective controls with higher costs may be required such as channelization of runoff with treatment for removal of sediment. In addition, once ground cover has been destroyed, extremely long periods of time may be required for re-vegetation, particularly in an arid environment.

Appendix VIII for each of the three "Comprehensive Framework Studies" embracing parts of Nevada, lists total land areas needing some form of erosion control and approximate total costs. Unit costs used for the Great Basin Region, a hydrographic region which includes 85% of the land area of Nevada, are shown below:

Water Spreading	\$ 100/acre
Road and Trail Rehabilitation	2,000/mile
Stream Bank Stabilization	500/mile
Contour Trenching	35/acre
Stabilization of Mine Dumps	15/acre
Tree Planting	90/acre
Seeding	10/acre
Brush and Weed Control	4/acre

Gully Stabilization	2,500/mile
Debris Basins	10,000/each
Diversion Dams	20,000/each
Dikes	1,000/mile
Fence	1,400/mile
Contour Farming	2/acre

Estimated total costs for erosion control in Nevada came to about \$70 million needed before 1980. An additional \$80 million would be needed before the year 2000.

ACTIVITY CONTROLS

Earlier, sectors of land-disturbing activities which cause accelerated runoff and erosion were identified. In examining resource requirements for control of runoff and erosion, it would be useful to have specific resource requirements relating to each activity sector. The availability of data in the literature is spotty, with substantial information on some activities, and little or none on others. In addition, the available information tends to be generalized for the United States, and does not relate specifically to conditions in Nevada. The information in the following sections, however, provides some indication of the costs associated with runoff and erosion control for certain activity sectors.

Mining

Fine-sized mineral wastes from ore milling plants require stabilization to prevent erosion and resultant water pollution. This stabilization can be attained by physical, chemical or vegetative methods, or by a combination of methods. The table shown on the following page, gives cost estimates for various types of stabilizations. Although broadly generalized, these costs provide some concept of the magnitude of costs involved, and provide a comparison of different methods.

Construction

The primary reference source on costs of erosion control associated with construction is an EPA report, "Comparative Costs of Erosion and Sediment Control, Construction Activities." It develops detailed cost estimates for 25 methods used by the construction industry to control erosion. These estimates are summarized in the second table.

Costs for Control of Erosion from Mining Wastes

Type of Stabilization	Effectiveness	Maintenance	Approximate cost per acre, dollars ¹
Physical:			
Water sprinkling	Fair	Continual	
Slag (9-inch depth):			
By pumping	Good	Moderate	\$350- 450
By trucking	do	do	950-1,050
Straw harrowing	Fair	do	40- 75
Bark covering	Good	do	900-1,000
Country gravel and soil:			
4-inch depth	Excellent	Minimal	250- 600
12-inch depth	do	do	700-1,700
Chemical:			
Elastomeric polymer	Good	Moderate	300- 750
Lignosulfonate	do	do	250- 600
Vegetative:			
4-inch soil cover and vegetation	Excellent	Minimal	300- 650
12-inch cover and vegetation	do	do	750-1,750
Hydroseeding	do	do	200- 450
Matting	do	do	600- 750
Chemical-vegetative	do	do	120- 270

¹Based on average tailings, costs could be revised upwards for acidic tailings requiring limestone or other neutralizing additives.

Reference: Dean, K. C., Havens, R., Glants, M.W., "Methods and Costs for Stabilizing Fine-Sized Mineral Wastes," U.S. Department of the Interior, Bureau of Mines, Report #7896, 1975.

Costs for Control of Erosion from Construction Sites

Item	Unit Costs
Gravel and Earth Check Dam	\$.83 - 1.84/cf
Rock Riprap Check Dam	\$6.71 - 8.17/cf
Concrete Check Dam	\$217 - 598/cy
Concrete Chute	\$5.40/sf
Diversion Dike	\$12.93/cy
Erosion Check	\$3.43/lf
Filter Berm	\$10.63/cy
Flexible Erosion Control Mats	\$1.18/sf
Gabions	\$12.67 - 30.10/sy
Level Spreader	\$1.63 - 3.80/lf
Sandberg Barriers	\$3.10/Sack
Sectional Downdrain	\$10.91 - 14.55/lf
Sediment Retention Basin	\$10.51 - 13.78/cy
Straw Bale Inlet Protection	\$55 per inlet
Excelsior Mat	\$12,200/acre
Jute Mesh	\$7,700/acre
Straw or Hay	\$1,200/acre
Woodchips (3 in. layer)	\$8,000/acre
Woodchips, fertilizer and seed	\$3,100/acre
Sod	\$11,300 - 14,000/acre
Chemical Soil Stabilization	\$1,300/acre

The actual costs of controlling erosion on any construction site vary substantially, as erosion rates and control techniques are dependent on climate, topography, soils, and many other variables. The EPA report attempts to develop the cost of a typical erosion and sediment control plan, and arrives at an average cost per acre of about \$1,350.

Irrigated Agriculture

The casual relationships between agriculturally derived wasteloads and irrigation practices are complex, and not well understood. Irrigation return flows carry sediments and other pollutants, but it is neither possible nor desirable to completely eliminate return flows. Improvement in irrigation practices can, however, substantially reduce the quantity of pollutants associated with irrigation return flows.

The costs of improved irrigation practices are of two types: capital costs; and operations and maintenance costs. Both are a function of the irrigation system employed, and can vary over a wide range. Installation costs of permanent solid set sprinkler systems for example, can run as high as \$950 per acre.

In the report prepared for the National Commission on Water Quality, "Cost and Effectiveness of Point Source Pollution Control Options for Irrigated Agriculture" three levels of pollution control were defined:

- o Low level - non-structural changes in existing irrigation practices that will achieve some reduction in pollutant loading
- o Medium level - structural and non-structural changes in present practices that will maximize reduction in pollutant loading
- o High level - structural and non-structural changes in practice and, if necessary, treatment of wastewaters, such that any discharged wastewater does not impair stream quality.

Cost estimates were developed to achieve each level, using annualized capital costs, plus annual operating and maintenance costs. For the Great Basin and Colorado regions these costs range from \$5 per acre per year for low level control, to \$102 per acre per year for high level.

Urbanization

Urban stormwater runoff contributes significantly to the pollutant loads of receiving waters in urban areas. A study of stormwater abatement alternatives for the Atlanta area has been conducted by the Corps of Engineers. Although a similar study for Reno or Las Vegas would yield somewhat different results, the Corps study is representative of the costs and benefits associated with storm water treatment alternatives for any urbanized area. The results are tabulated in the following figure.

Cost and Effectiveness of Various Storm Water Treatment Alternatives for a Design Storm of 0.4 Inches (Atlanta, Georgia)^a

Treatment Scheme	Capital Cost (\$ million)	Annual O&M (\$ million)	Expected Percent Removal		(\$/lb)	
			Suspended Solids	BOD	Suspended Solids Removal	BOD Removal
Storage/sedimentation	371	11	51	11	0.36	52.96
Dissolved air flotation (includes pretreatment by screening)	396	28	77	57	0.34	14.78
Microstraining	379	13	70	50	0.28	12.38
Filtration (including pre-screening plus chlorination)	418	47	65	40	0.54	28.15
Rotating biological discs	393	22	70	54	0.34	14.03
Physical-chemical (2-stage lime clarification, dual media filtration, ammonia stripping, carbon adsorption, lime recalcination)	773	45	93	94	0.51	16.10

^aCovers an area of 609.3 square miles.

IMPLEMENTATION

The resource requirements for governmental strategies to assist or ensure implementation of runoff and erosion control mechanisms are dependent on the level of control desired and on the specific implementing strategy being utilized. Costs associated with these programs are primarily related to the numbers and types of personnel utilized in the program. In addition, economic programs have costs directly related to the monies spent in implementing runoff and erosion controls.

The resources required to implement a regulatory program are dependent on its specific provisions. In general, manpower and cost requirements are lowest for administering regulations in the form of specification standards since little administration effort is needed to determine specific control requirements which are specified in the standards. Discretionary and performance standards require higher manpower and dollar cost levels since greater efforts are required to determine the appropriateness of specific controls. In addition, greater costs are expended in these programs in gathering and maintaining information which serves as the basis for determining runoff and erosion control needs. Types of information needed to administer discretionary and performance standards include descriptive information on physical characteristics of the land area, and information on water quality levels in the various surface waters of the area under consideration.

Economic programs require resources which are equivalent to the costs of controls being assisted or funded by the programs. Thus, estimates of these cost requirements must be made in order to adequately fund these types of programs. In addition, manpower is required to administer the programs. The manpower needed can be considerable to ensure that public monies are being spent as authorized.

Resources expended in administering education programs are mainly related to the amount of manpower utilized. The level of expertise required in these programs is normally high since the individual providing assistance must have sufficient education and knowledge to assist in selecting, designing, and implementing the appropriate runoff and erosion control mechanisms. The actual resource requirements are a function of level of assistance required in implementing controls.

**Existing
Institutions**

FRAMEWORK

The institutional framework which is presently involved in control of erosion and attendant pollution problems in Nevada is complex. It includes agencies at the federal, state, regional, and local levels. These agencies are involved through regulatory, financial, educational or public works mechanisms or some combination of these mechanisms. Their programs impact one or more of the activity sectors which contribute to water quality problems in Nevada.

One of the key premises underlying this project is that the existing institutional sets and control authorities are inadequate in terms of solution of the water quality problem. A detailed understanding of the existing situation is a prerequisite to developing recommendations for new or refined authorities or programs. It was necessary, therefore, to develop as much information as possible on every agency presently or potentially involved in control of erosion and attendant water quality problems.

The screening out of uninvolved agencies, and subsequent development of detailed information on the involved agencies, was handled somewhat differently for each level of government - Federal, State, and Regional/Local.

FEDERAL

A large number of Federal agencies operate to varying extents within the State of Nevada. Using literature available on roles of Federal agencies, such as the United States Government Manual, it is possible to screen out many agencies that are obviously not involved in any aspect of runoff and erosion control. This initial screening provided the following list of federal agencies which are, or might be, involved in the control of accelerated erosion and attendant water quality problems in Nevada.

- U.S. Fish and Wildlife Service
- Bureau of Mines
- Bureau of Land Management
- Department of the Navy
- Bureau of Indian Affairs
- Farmers Home Administration
- Department of the Air Force
- Federal Highway Administration
- Bureau of Reclamation
- Geological Survey
- Department of Housing and Urban Development
- Corps of Engineers
- Economic Development Administration
- Environmental Protection Agency

National Park Service
Soil Conservation Service
Energy Research and Development Administration
Forest Service
Agricultural Stabilization and Conservation Service

Direct contact, either in the form of a letter or a meeting was made with each of these agencies to determine the extent of their involvement in the control of accelerated erosion. A copy of a typical inquiry letter is shown on the following page. That is followed by examples of two response letters: the letter from SCS indicating substantial involvement; and the letter from the U.S. Fish and Wildlife Service indicating minimal involvement.

Based on the information obtained from the initial meetings and response letters, the following Federal agencies were identified as ones which are, or could be, significantly involved in the control of accelerated erosion in Nevada:

Environmental Protection Agency
Bureau of Land Management
Soil Conservation Service
Corps of Engineers
Forest Service
Federal Highway Administration
Agricultural Stabilization and Conservation Service

An in-depth, structured interview was conducted with each of these agencies, using the interview process and questionnaires described in the evaluation system section of this document. The information extracted from the interview, together with all information garnered prior to the interview, provides clear insight into the operation of each agency in Nevada, and its role in the control of erosion and runoff from land disturbing activities.

Starting on page 108 are standardized summaries on the seven Federal agencies of interest in this project, describing the agency, its authorities and programs relating to control of runoff and erosion. These summaries were initially developed using the information provided in answer to the preliminary letter or meeting with the agency. They were completed following the interview process and reflect all the data and information developed on the agency by this project.



STATE OF NEVADA
DEPARTMENT OF HUMAN RESOURCES
ENVIRONMENTAL PROTECTION SERVICES
CAPITOL COMPLEX
CARSON CITY, NEVADA 89710

August 6, 1975

District Engineer
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Sir:

The State of Nevada is developing a management system for the control of accelerated erosion and attendant discharge of pollutants to waters of the State from land disturbing activities (i.e., agriculture, construction, mining and silviculture). We have found that attainment of Nevada's water quality standards and goals must include increased control of man-caused erosion. Present authorities for the control of accelerated erosion from land disturbing activities are spotty, unconsolidated, variably enforced, and difficult to inventory.

One of the first tasks in initiating a State erosion control management program is to fully identify and evaluate all the existing controls and authorities. After evaluation of existing authorities, new control authority requirements will be developed where needed to form a comprehensive management system.

The Corps of Engineers has been identified as having an influence on the management of water quality and controls of accelerated erosion. Certain items of information describing the role that the Corps of Engineers plays in the State of Nevada regarding erosion control are critical to our endeavor. These items are listed below:

1. Authority and legislation related to Corps work in erosion control;
2. Specific programs initiated by or participated in by the Corps relating to erosion control;
3. Erosion problems and locations encountered by the Corps in Nevada;
4. Erosion control techniques employed by the Corps;
5. Criteria, guidelines, handbooks, etc., relating to erosion control used in Corps projects;

District Engineer, Sacramento Dist.
August 6, 1975
Page 2

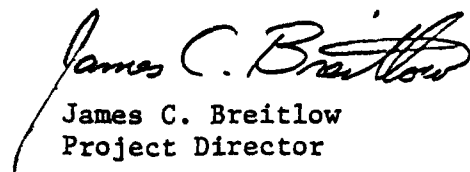
6. Listings of Corps technical publications relating to erosion control;
7. Identification of perceived deficiencies in present Corps erosion control authorities or programs;
8. Formal and informal working relationships with other agencies and organizations pertaining to erosion control;
9. Organization chart of Corps functions and programs in Nevada with an indication of budgets and numbers of personnel;
10. Anticipated future roles of the Corps in erosion control.

This agency is not necessarily interested in obtaining new authority for itself in the control of erosion. Rather, we are taking an initiative to determine and establish changes and additions to the present framework of institutions and authorities as necessary to effect the most appropriate means of attaining water quality goals vis-a-vis the problems posed by accelerated erosion from land-disturbing activities. Your cooperation in this effort is most appreciated. I look forward to receiving the above-outlined information by August 22, if at all possible.

I will keep you informed of developments in the management program. The name of a person on your staff with whom I can discuss this program will be quite helpful. If you wish, I can be reached at (702) 885-4670.

For your information, I am writing a similar request to the District Engineer of the Los Angeles District.

Sincerely,


James C. Breitlow
Project Director

rd

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P. O. Box 4850, Reno, Nevada 89505

RECEIVED
August 15, 1975
RUG 18 1975

James C. Breitlow, Project Director
Department of Human Resources
Division of Health
Capitol Complex
1209 Johnson Street
Carson City, Nevada 89701

Environmental Protection

Dear Mr. Breitlow:

We are flattered to be identified as the premier Federal agency pertaining to control of accelerated erosion. We do have considerable expertise in this field and feel we can provide constructive service to all states, including Nevada.

Below are our answers to the items listed in your August 4 letter.

1. Major authorities SCS implements to solve erosion and other problems.
 - a. Public Law 46, 74th Congress 1935.
 - b. Flood Control Act, Public Law 534, 78th Congress 1944 (not applicable to Nevada).
 - c. Public Law 566, 83rd Congress, 1954.
 - d. Public Law 1021, 84th Congress, 1956 (not applicable to Nevada).
 - e. Food and Agriculture Act, Public Law 703, 87th Congress, 1962.
 - f. Rural Development Act, Public Law 92-419, 1972.

These laws are more adequately explained in the enclosed brochures, USDA-Ag Inf. Bulletin No. 345 and Land Use Planning Assistance available through USDA.

2. Specific programs initiated by the Soil Conservation Service in Nevada.

For this item we can only provide you a few examples to show the diversity of our assistance.

- a. Plans have been developed with individual farmers, ranchers and units of government. Most of them would reflect some aspect that relates to erosion control. For example, canals, drop structures, land leveling and other measures are part of a plan for irrigated acreages. Designs and specifications are such that irrigation

waters are moved on and off the fields at non-erosive velocities. For ranch plans, ranges are improved for sustained production, but better range also results in less erosion. Resource data are provided to units of government. This data may be used as a basis for ordinances that control erosion on streams, highways, and other land areas.

Construction has been completed on four P. L. 566 watersheds. Each contain provisions to control erosion. Land treatment measures have been applied on the upper drainages and those projects with floodwater retarding structures have capacity in the reservoirs to contain fifty (50) years or more of sediment accumulations. To date no projects have been implemented in RC&D areas, but several projects are pending where erosion control measures are being considered. River Basin studies for the Humboldt and Central Lahontan areas address themselves to the magnitude of erosion problems and offer alternatives for solving these problems.

3. Erosion problems and locations encountered by SCS in Nevada.

All lands in the state are subject to various degrees of erosion, either water or wind. It would be impossible to list all of the locations where erosion is a moderate to severe problem. Enclosed is a work map that has not been published, but we consider it the best available source of data for the total state. It is a more detailed map than those that are included in the reference sources listed in the lower left hand corner of the Work Map. For example, following Page 157 of Appendix VI for the Lower Colorado Basin there is a Sediment Yield Map. Copies of these Type I River Basin reports should be available in the State Library or State Engineer's Offices.

There are various types of erosion problems. Some examples are as follows: Pine Valley, a tributary of the Humboldt River, has a very serious channel degradation problem. At the lower end of the Valley, channels are 25-30 feet deep, and in some places over a 100 feet in width. In the upper watershed and on the side tributaries, there are active gully heads. A number are cutting back into wet meadows. Water tables are being lowered. This results eventually in total destruction of wet meadows.

In the Tahoe Basin new highways, new housing areas, ski runs and other disturbed areas produce critical sediment source areas which end up polluting the pristine waters of the Lake.

On the Little Humboldt River in Humboldt County, there are active sand dunes. These sand dunes continue to encroach on the river channel. This, in turn, results in flooding of a sizeable area in crop production.

The Carson River in Douglas County is also degrading. However, the greatest concern to local residents is the stream bank erosion that is occurring. Some effort has been made to rip-rap critical areas, but more work will be needed to solve the problem.

4. Erosion Control Techniques Used by SCS.

Erosion control is achieved by vegetative or structural means. SCS has nearly every specialist needed to help individuals or groups solve erosion problems. These specialists include soil scientist, geologist, range conservationist, agronomist, plant materials specialist, engineers, hydrologist and others. The SCS philosophy is to stop erosion where it starts. Generally, the first increment of control is achieved by vegetative means. (Example - Plant grass, trees or shrubs on a slope.) If this isn't adequate to achieve control, the next step is a structural measure. This could include terraces, diversions, drop structures, debris structures or floodwater retarding structures. Some of the general techniques are outlined in the bundle of brochures labeled "Broad Techniques for Controlling Erosion". These are non-technical materials made available to cooperators.

When Conservation Plans are developed "Job Sheets" are often given to the cooperator. These job sheets are developed on a national, regional, state and county basis.

5. Criteria, Guidelines, Handbooks, Relating to Erosion Control.

It is difficult and time consuming to list all of the items requested. Mostly, SCS develops handbooks for specific programs (Example, Watershed Protection Handbook or Resource Conservation and Development Handbook). These handbooks outline how these authorities can be implemented. Then there are handbooks or manuals for specific fields, such as, engineering. These are detailed technical publications used for design of various measures. We have enclosed an "Engineering Field Manual", "Structural Design Handbook, Section 6", and a "Chute Spillway Handbook, Section 14". Numerous other handbooks for other fields are available and all have some chapter or section that relates to erosion control.

6. Listing of SCS Technical Publications.

To respond to your request, on or about August 15, there is not

6. Listing of SCS Technical Publications. (Continued)

sufficient time to develop a list. Very few publications relate exclusively to erosion control. As indicated above, our handbooks or publications have a section or chapter that relates directly or indirectly to erosion control. If such a list is needed for your work, it might work out best if we arranged a conference with you and our principal staff members who are expert in particular fields. At this conference each staff member could discuss with you technical materials we use in our work and a list could be prepared that would best serve your needs.

7. Identification of Perceived Deficiencies in SCS Erosion Control Authorities.

Generally, SCS authorities are adequate to handle a wide variety of erosion problems. Naturally, all of these authorities are established to operate within our democratic form of government. This is as it should be. Because of this, the use of SCS authorities by citizen groups is voluntary. Funds for these programs are provided annually by Congress. Often funding limits the availability of technical manpower to plan and construct projects. Lack of funds also limits new construction starts. Our authorities also contain certain limitations, so that our work doesn't significantly overlap or duplicate the work of other agencies. For example, under P. L. 566, there are limitations as to size of watershed, size of structures, and number of recreation developments. This is not a deficiency. Most consider it wise legislation. As with most major federal construction programs, erosion control measures in certain SCS programs are subject to economic and environmental analyses. These analyses can be time consuming, but they do safeguard the public interest and funds.

8. Formal and Informal Working Agreements With Other Agencies.

Agreements specifically dealing with erosion control have not been developed with any agency. However, numerous agreements dealing with many aspects of conservation exist between SCS and other federal and state agencies. These agreements are called "Memorandums of Understanding". As described in AIF Bulletin No. 345 on Page 4, SCS has agreements with each conservation district. Agreements are developed at the National level as well as at the State level. Some State Agreements are supplementary to National Agreements. On a National level, there are agreements with the Corps of Engineers, Farmers Home Administration, and other agencies on how to work cooperatively on Public Law 566 projects. These agreements are not about erosion control, but indirectly they can involve erosion. On a State level SCS frequently enters into agreements.

8. Formal and Informal Working Agreements With Other Agencies. (Continued)

An example is an agreement with the Bureau of Land Management on how to handle "Coordinated Ranch Plans". Again, erosion control is not the principal part of the agreement, but the Plans developed with a rancher can have a significant effect on erosion.

Often SCS enters into agreements with agencies or units of government for specific jobs. Sometimes these agreements reimburse SCS for work. An example is a county who provides a sum of money for a soil survey. Counties use the information to establish ordinances on land use. The ordinance may restrict land use so that erosion is decreased or at least not accelerated. Another example is an agreement with the State Engineer for setting priorities for Flood Hazard Analyses Studies. Again, these studies provide information that can effect erosion control. In summary, SCS or conservation districts can have formal or informal agreements with nearly any agency that can be named. Conservation districts when asked to develop a Conservation Plan execute a Cooperative Agreement with nearly every cooperator with which they work.

9. Organization Chart of SCS Functions and Programs.

Attached is a copy of Personnel Memorandum NV-41 (Rev. 9) which describes the SCS organization in Nevada. Reading this will give you a better understanding of the positions that have responsibility for the various SCS functions and programs. Also attached is a National SCS organizational chart. Nevada has fourteen field offices headed by a District Conservationist. These offices have zero to seven additional employees.

In Nevada the current budget, including reimbursables, is about two million. The budget vacillates from year to year. During the current fiscal year if Congress appropriates sufficient funds, another half million may be available for construction of an RC&D recreational project. It is impossible to identify which portion of this budget will be used for planning and constructing erosion control measures.

The current personnel ceiling in Nevada is 90 people. This ceiling also changes annually. A few years ago, it was over 100. This reflects national trends. SCS once had about 18,000 people and currently we have about 13,000.

10. Anticipated Future SCS Role in Erosion Control.

I believe SCS will continue to have an important role in erosion control. Whether it is an increasing role is dependent on congressional legislation. SCS under the Rural Development Act was given a charge

Breitlow, Dept. of Human Resources
August 15, 1975

6

10. Anticipated Future SCS Role In Erosion Control (Continued)

to do Land Inventorying and Monitoring every five years. However, this cannot be carried out until funds are appropriated.

I hope the above material basically fills your needs. As indicated, time has not allowed a complete listing of all material requested. Even if time were available, the volume of material might have been overwhelming. If you should have specific, additional questions, you may want to consider arranging a conference so you can talk directly with some of our principal staff.

Sincerely,



GERALD THOLA
State Conservationist

cc:
Norman Ritter
Ray Huxtable

Enclosures (Under Separate Cover)



United States Department of the Interior

FISH AND WILDLIFE SERVICE

1500 N.E. IRVING STREET
P.O. BOX 3737
PORTLAND, OREGON 97208

Reference: ES

Mr. James C. Breitlow
Department of Human Resources
Environmental Protection Services
Capitol Complex
Carson City, Nevada 89710

October 24, 1975
RECEIVED
OCT 30 1975

Environmental Protection

Dear Mr. Breitlow:

Your letter of October 3, 1975 requested information regarding our Service's role in erosion control.

Actually we have only what might be called a peripheral authority in erosion control matters. We are frequently asked for input into proposed management plans and development plans of other Federal agencies. Should such plans appear to have facets that might result in excessive erosion and attendant impairment of water quality, we attempt to bring our concerns to the attention of the responsible agency.

Of course on lands that we own we attempt to be good stewards and manage those lands in accordance with good soil conservation practices.

I'm sorry we could not be of more help.

Sincerely yours,

Donald H. Reese
Regional Supervisor
Div. of Ecological Service



Save Energy and You Serve America!

AGENCY NAME: U. S. Environmental Protection Agency
100 California Street
San Francisco California 94111

NEVADA OFFICES: None

TELEPHONE: (415) 556-7285

AGENCY ORGANIZATION:

Paul DeFalco, Jr. - Regional Administrator. Five divisions

GENERAL TYPE OF ACTIVITY:

Toward the principal end of reducing air and water pollution, EPA has evolved into a regulatory agency with a supporting financial assistance function. Another activity of comparable magnitude is to assure that state and local pollution control agencies develop and maintain comprehensive pollution control programs.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

Federal Water Pollution Control Act, as amended (particularly
Section 208)

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND
WATER QUALITY MANAGEMENT:

The principal program is the administration of 208 planning, conducted locally in four designated 208 areas and conducted by EPS in the balance of the state. The EPA approach is to use 208 planning to assess water quality impacts and to specify reduction measures (with emphasis on the concept of best management practices in association with improved institutional capabilities). This, then, would lead to the use of 208 planning recommendations in the terms and conditions of NPDES permits, where such permits would have to be issued. With respect to the relationship of the construction grant program to runoff and erosion control, EPA's current thinking is to narrow the eligibility of construction grant projects. Hence, the construction grant program may be counted on only with respect to Step 1 planning, without any promise that Step 2 or Step 3 phases will ensue.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

EPA's views on the physical problem were not ascertained. Rather, EPA perceives the problem from the standpoint that institutional capabilities and relationships are inadequate presently to manage the existing and potential physical problems on a continuous, total-environment basis. This definition of the problem applies not only in Nevada, but nationally as well.

EFFECTIVENESS OF PROGRAMS:

EPA recognizes that there are limitations to the effectiveness of a discharge permit program as applied to runoff and erosion problems. Hence, EPA is placing extensive reliance on the 208 planning program. This program has not proceeded far enough to enable an assessment of its effectiveness. However, EPA has been devoting substantial time to assuring itself that the 208 program will produce effective plans and management processes.

EROSION CONTROL TECHNIQUES:

EPA's principal approach to controlling runoff and erosion problems is the development and implementation of best management practices which emphasize preventive or source control techniques. This approach is based on applying a base level combination of best management practices to runoff and erosion problems; if, in a specific area, water quality goals cannot be attained with the base level practices, additional control measures are to be applied.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

There are in excess of 325 employees in EPA, Region IX. EPA planning grants to various 208 agencies in Nevada approximate \$1.8 million.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

As mentioned above, EPA feels that the application of NPDES discharge controls on most runoff and erosion sources of pollution cannot result in effective management of the problem. Another deficiency in existing authorities lies in the existence of separate statutes for air quality management, water quality management and hazardous/residual/solid waste management. This situation impedes EPA's efforts to administer intermedia programs.

Regarding budget deficiencies, limitations on available funds in the construction grant program is a major reason for limiting the eligibility of runoff and erosion control projects for funding.

AGENCY NAME: Bureau of Land Management

NEVADA OFFICES: Nevada State Office
Room 3008 Federal Building
300 Booth Street
Reno, Nevada 89502

District offices in Carson City,
Winnemucca, Battle Mountain, Elko,
Ely and Las Vegas

TELEPHONE: 784-5455

AGENCY ORGANIZATION:

A state director is administrative head in Nevada. District managers located in each district office.¹

GENERAL TYPE OF ACTIVITY:

The role of the Bureau of Land Management (BLM) is one of managing the national resource lands for multiple use consistent with environmental protection and public welfare.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

Economy Act (Act of June 30, 1932)
Taylor Grazing Act (Act of June 28, 1934, as amended).
Soil Conservation and Domestic Allotment Act (Act of April 27, 1935, as amended).
Public Law 566, Watershed Protection and Flood Prevention Act (Act of August 4, 1954, as amended)
Federal Water Pollution Control Act (Act of June 30, 1948, as amended)
Public Land Administration Act (Act of July 14, 1960).
Water Resources Research Act (Act of July 17, 1964, as amended).
Classification and Multiple Use Act (Act of September 19, 1964, as amended).
Water Resources Planning Act (Act of July 22, 1965, as amended).
Water Quality Act (Act of October 2, 1965).
Clean Water Restoration Act (Act of November 3, 1966).
State Enabling Legislation for Soil and Water Conservation District in States Affected.
National Environmental Policy Act of 1969 (PL 91-190, January 1, 1970).
Executive Order 11514, Protection and Enhancement of Environmental Quality (March 5, 1970).
Mineral Leasing Act of Feb. 25, 1920, as amended (30 U.S.C. 181-287).
Minerals Act of July 31, 1947 as amended (30 U.S.C. 601-604).
Federal Water Pollution Control Act Amendments of 1972 (PL 92-500, October 18, 1972).
Endangered Species Act of 1973 (PL 93-205).
Sikes Act Extension for Wildlife (PL 93-452, October 14, 1974).

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND WATER QUALITY MANAGEMENT:

Inventory and analysis of the erosion condition classes in general categories of stable, slight, moderate, critical and severe has been completed on 80 percent of BLM lands. Livestock grazing management plans have been implemented on 7.5 million acres. Fire rehabilitation has been completed on many wildfire areas within the last twenty years. Other programs include range and watershed improvement covering one million acres of brush control and/or seeding, 9,500 miles of fencing and 3,400 water control structures. BLM is involved extensively in land use planning. This involves land inventories which become part of the unit resource analysis and socio-economic studies, incorporating policy guidance and existing agreements. All of these are ingredients to multiple land use plans which attempt to draw the many different aspects of national range management together into one coordinated program. The agencies with which the BLM works most frequently are the Geological Survey, State Lands, U.S. Forest Service, Department of Fish and Game, and the State Planning Coordinator.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

Most problems are being caused by livestock forage over-utilization, natural or geologic gully erosion, mineral exploration, off-road vehicular use, private land uses (urban development), and mineral extraction. The BLM views runoff from land disturbing activities as being only a minor problem in Nevada. While the BLM does recognize the potential relationship between land disturbing activities and water quality, it feels that for the most part, the disturbance of land rarely affects the water quality of Nevada, and where it does affect water quality, it is only in isolated areas.

EFFECTIVENESS OF PROGRAMS:

The BLM knows if its programs are being carried out by a detailed reporting system based on plans which have manpower allocations. The state office reviews progress of programs with the district offices and similarly, the Washington office of BLM meets and reviews program progress with the state BLM office. The BLM assesses the effectiveness of its land use planning effort through evaluations (i.e. determinations of how often the planning is used in agency decisions and operations) and also by the mechanism of public feedback to the land use planning effort. The BLM feels that it is moderately effective in providing this program inasmuch as it is a new program and as such has been somewhat general in the early stages. The BLM feels that the people impacted by the land use planning do not have a consensus of opinion on the effectiveness of this program. It varies from enthusiastic support to angry opposition.

EROSION CONTROL TECHNIQUES:

Present vegetation cover is being manipulated by application of chemicals or mechanical methods in areas of increased erosion caused by a brush competition problem. Other techniques in use include contour terracing, ripping, pitting, drops, detention dams, diversion and dikes. Criteria and guidance are summarized in BLM Manuals 7000 through 7400.

With respect to data collection, the BLM conducts inventories of the public lands. This involves soil types, plant types and numbers, etc. There is also policy guidance out of Washington BLM which says that there will be water quality data collected. However, at this point, BLM has not collected such data themselves; rather, BLM has relied on obtaining data collected and developed by other agencies. The other data is collected on a regular basis. However, the regularity varies depending on the particular resource being inventoried. The BLM does not feel that its data is too satisfactory in terms of meeting its needs, due to limitations on funding.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

There are approximately 215 permanent employees with approximately another 200 temporary employees. The annual budget approximates \$15 million.

Approximately 7-1/2 percent of the annual budget is devoted to the BLM's land use planning programs.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

Environmental constraints prohibit the application of erosion control practices in many areas. No other authority or program deficiencies are obvious.

AGENCY NAME: Soil Conservation Service

NEVADA OFFICES: Nevada State Office
P. O. Box 4850
Reno, Nevada 89505

District conservationists located
in Minden, Reno, Las Vegas, Yerington,
Elko, Winnemucca, Eureka, Ely, Tonopah,
Caliente, Battle Mountain, Wells,
Fallon and Lovelock

TELEPHONE: (702) 784-5304

AGENCY ORGANIZATION:

A state office headed by a State Conservationist which supports each headed by a District Conservationist. The SCS operates under the direction of 32 local Conservation Districts.

GENERAL TYPE OF ACTIVITY:

The Soil Conservation Service is active in data collection and dissemination in the areas of conservation, erosion control, agricultural practices and development, soil surveys and analyses, water development in small watersheds and many other areas.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL OR WATER QUALITY MANAGEMENT:

Public Law 46, 74th Congress, 1935
Flood Control Act, Public Law 534, 78th Congress 1944 (not applicable to Nevada)
Public Law 566, 83rd Congress, 1954
Public Law 1021, 84th Congress, 1956 (not applicable to Nevada)
Food and Agriculture Act, Public Law 703, 87th Congress, 1962
Rural Development Act, Public Law 92-419, 1972

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND WATER QUALITY MANAGEMENT:

Plans have been developed with individual farmers, ranchers and units of government. Canals, drop structures, land leveling and other measures are part of a plan for irrigated acreages. Construction has been completed on four P.L. 566 watersheds. Each contain provisions to control erosion. River basin studies for the Humboldt and Central Lahontan areas address themselves to the magnitude of erosion problems and offer alternatives for solving these problems.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

All lands in the state are subject to various degrees of erosion by either water or wind. Pine Valley has a very serious channel degradation problem. In the upper watershed and on the side tributaries, there are active gully heads. Water tables are being lowered. In the Tahoe Basin new highways, new housing areas, ski runs and other disturbed areas produce critical sediment source areas which end up polluting the pristine waters of the Lake. On the Little Humboldt River in Humboldt County, there are active sand dunes. The Carson River in Douglas County is also degrading. However, the greatest concern to local residents is the stream bank erosion that is occurring.

The major contributors to accelerated erosion in Nevada are, first, grazing by removing the vegetation, trampling the soils, and pulverizing the soils. Perhaps equal to grazing as a cause is construction in its different forms including recreational home development, commercial and industrial development, mobile home development, and residential development. The primary reason these factors contribute to accelerated erosion control problems is the stripping of land. Other problems rated moderate include campgrounds and channeling or other stream modifications. The SCS acknowledges some very localized contributions to the problem from roads.

EFFECTIVENESS OF PROGRAMS:

The SCS feels its efforts in grazing programs are only as effective as the land owner wants them to be and can afford to be. The SCS provides soils data to units of local governments on the basis of which they can develop control ordinances. The SCS feels that the effort expended in this regard has had some effect, but again it is entirely voluntary. The only way SCS can check to see if this effort is being effective is to watch for the adoption of new ordinances.

EROSION CONTROL TECHNIQUES:

Erosion control is achieved by vegetative or structural means. SCS has nearly every specialist needed to help individuals or groups solve erosion problems.

SCS develops handbooks for specific programs and handbooks on specific fields. These are detailed technical publications used for design of various measures. Very few publications relate exclusively to erosion control.

Information generation and transmission is a very large program of SCS in consideration of the fact that SCS is a cooperative type of

agency. The information SCS collects on soils is distributed through agricultural schools and public meetings. SCS rates the quality of the data as very high and feels that the people that receive the data similarly rate it as very high. The improvement of its data collection and dissemination process is a continual goal in the annual plans of operation.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

Nevada has fourteen field offices headed by a District Conservationist. These offices have zero to seven additional employees.

Budget: about two million dollars
Current personnel ceiling: 90 people

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

Generally SCS authorities are adequate to handle a wide variety of erosion problems. Often funding limits the availability of technical manpower to plan and construct projects. Lack of funds also limits new construction starts. Our authorities also contain certain limitations, so that our work doesn't significantly overlap or duplicate the work of other agencies.

AGENCY NAME: Corps of Engineers
South Pacific Division
630 Sansome Street, Room 1216
San Francisco, California 94111

NEVADA OFFICES: None

TELEPHONE: (415) 556-0914

AGENCY ORGANIZATION:

Northern Nevada is administered by the Sacramento District and Southern Nevada by the Los Angeles District. Both are under the South Pacific Division.

GENERAL TYPE OF ACTIVITY:

The Corps of Engineers is a resource development agency.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

Authority comes from either Congressional authorization or several special continuing authorities that permit authorization by the Chief of Engineers of small projects with specific monetary limitations.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND WATER
QUALITY MANAGEMENT:

1. The authorized Humboldt River and Tributaries project, which is in the advanced planning stage.
2. The authorized Gleason Creek Dam project, also in the advanced planning stage.
3. The Truckee River and Tributaries Investigation, under which a channel modification study of the Truckee Meadows is being conducted.

Programs currently available in Nevada include reservoir planning on the Humboldt River, flood control studies, and a stream bank erosion study. There is a division of labor between the Corps of Engineers and the Soil Conservation Service whereby the former tends to take on work in the lower watersheds and the latter takes on work in the upper watersheds.

The major function undertaken by the CE is public works. This includes reservoirs, channels, recreation areas, stream bank erosion protection, etc. The CE is also involved in regulatory programs affecting accelerated erosion and runoff from land-disturbing activities.

The agencies with which the CE tends to work most are: The Division of Water Resources, Division of Colorado River Resources, State Planning Coordinator, local groups on specific projects, BLM and the Forest Service if these two agencies are involved in a Corps project, the SCS and the Bureau of Reclamation.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

The Corps of Engineers view runoff from land-disturbing activities as being only a minor problem in Nevada.

EROSION CONTROL TECHNIQUES:

Erosion control techniques employed by the Corps are typical of those in the civil engineering field. They include various stabilization practices such as channel realignment, numerous methods of bank protection, storage facilities that provide flow regulation and flood plain management practices that allow for natural stream flow but regulate adjacent development so as to minimize the destructive effects of erosion. Engineering pamphlet (EP) 310-1-1 lists publications used by the Corps in all applications, including erosion control.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

- A. Total Agency - all personnel and programs.
- B. Agency personnel and budget levels specifically related to water quality management and erosion control.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

No perceived deficiencies in present Corps erosion control authorities or programs.

AGENCY NAME: U. S. Forest Service

NEVADA OFFICES: Toiyabe National Forest
111 N. Virginia St. Room 601
Reno, Nevada 89501

Humboldt National Forest
Mountain City Highway
Elko, Nevada 89801

TELEPHONE: (702) 584-5331 (Reno)
(702) 738-6409 (Elko)

AGENCY ORGANIZATION:

There are two national forests in Nevada. Both have forest supervisors who administer many smaller offices, ranger stations, etc. throughout the state.

GENERAL TYPE OF ACTIVITY:

The role of the Forest Service is the management of forest lands for the best combination of multiple uses, that is, to provide a continuous flow of timber while protecting the watersheds. The Forest Service is a producing agency as well as a service organization.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

Any specific programs participated in or cooperated in with other agencies would be covered under the written authority of a given Act, Executive Order or Regulation.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND
WATER QUALITY MANAGEMENT:

The Forest Service's goals and objectives are to initiate grazing allotment plans which provide for water developments, revegetation, etc., to maintain the grazing allotments, and to implement the plans. Annual goals of the Forest Service are established in the beginning by the receipt of a budget letter from the Washington office, whereupon a group composed of rangers, a forest supervisor and staff, congregate and develop a plan of action which goes to Washington, is considered in Washington, and is handed back down. The grazing allotment plans are followed up by range inspections. This involves photo transects and water quality monitoring. The Forest Service may phase out the special use permits for recreational home developments that have a very bad impact on the environment. They put stipulations on special use permits for commercial and industrial developments. In terms of mining, the Forest Service develops with miners, an operating plan

in the nature of a gentlemen's agreement to consider the ways in which the operation of a mining activity can mitigate the adverse impacts of that activity. The Forest Service works on erosion control with the Fish and Game Department, the Division of Forestry, the Division of State Parks, Environmental Protection Services, Division of Lands and Land Use Planning, Desert Research Institute, Renewable Natural Resources Division of the University of Nevada-Reno, Bureau of Land Management, Soil Conservation Service, Fish and Wildlife Service, National Park Service, Geological Survey, Bureau of Mines, Bureau of Reclamation and the Corps of Engineers. The Forest Service has been involved to some extent in the development of 303 (e) plans. The nature of their involvement has been quick reviews of the plans to determine the impact of the plans on the Forest Service programs.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OF WATER QUALITY:

The Forest Service feels that in Nevada, most of the land-disturbing activities are major contributors, where they occur, to our water quality problems. Of these, grazing (especially in terms of stream bank trampling and free access to streams), mining (especially in association with roads), and roads in general, are the major causes of our water quality problems. Those activities which are not deemed to be very extensive as contributors to the problem are irrigated agriculture, campgrounds, logging and railroads.

EFFECTIVENESS OF PROGRAMS:

The Forest Service feels its grazing allotment plans are having only some impact on the problem due to limits of funds and personnel. However, where there are efforts being made relative to developing and implementing allotment plans, the Forest Service feels it is very effective in controlling the problem. They anticipate that more sophisticated monitoring capabilities will accrue to the Forest Service and thereby enable the Forest Service to do an improved job. Their impact on commercial and industrial developments has been very effective. With respect to mining, the Forest Service feels it has a moderate impact on the effect of mining on water quality, due to the economic influence of the miners. They really have no legal authority to do an effective job. The Forest Service is hindered by an 1872 mining law giving the "right" to mine. They believe their special use permits on new trails and roads are very effective.

EROSION CONTROL TECHNIQUES:

In terms of data collection and dissemination, data is collected on an as-needed basis for planning. This involves water quality, timber, and range data.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

There are approximately 100 employees in the Toiyabe National Forest with 40 of the employees in the central office and the remainder in the district offices.

The grazing allotment plans involve approximately 25% of the Forest Service's budget resources.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

In terms of staff commitment to attaining environmental goals, the staff knows that there is a need, but seem to be limited in knowing what to do about environmental problems.

AGENCY NAME: Federal Highway Administration

NEVADA OFFICES: Division Administrator
106 East Adams
Carson City, Nevada 89701

TELEPHONE: (702) 885-5331

AGENCY ORGANIZATION:

The Division Administrator heads a single Nevada office which provides technical and financial assistance to the State through the Nevada Highway Department.

GENERAL TYPE OF ACTIVITY:

The FHWA is involved in providing planning assistance to the State Highway Department and provides this assistance by helping establish priorities and traffic needs, and by providing guidelines which include consideration of erosion and erodibility of soils in the routing of roads.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROLS
OR WATER QUALITY MANAGEMENT:

None enumerated.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND
WATER QUALITY MANAGEMENT:

The type of programs administered by the Federal Highway Administration in Nevada is essentially a financial assistance program with an overview function to see that the procedures of the State Highway Department are conforming with the previously agreed upon procedures that meet Federal Highway Administration requirements. FHWA is also involved in technical assistance in a limited way by reviewing plans and designs for highways that are developed by the State Highway Department. In terms of control guidelines, regulations, monitoring, and enforcement, most of this function has been delegated to the State Highway Department. The FHWA has only to review, in terms of spot checks, the procedures of the State Highway Department to make sure they continue to conform to the FHWA guidelines, specifications, and standards. The principal agency with which the FHWA works is the State Highway Department. FHWA works with no other agency at any level of government in Nevada without working through and with the State Highway Department. The FHWA also works occasionally with the Bureau of Land Management.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

In terms of highways and roads being a land-disturbing activity during construction and maintenance, the FHWA views the runoff from this land-disturbing activity as being only a minor problem in Nevada. The FHWA has no opinion as to the impact that all factors have on accelerated erosion problems in Nevada. The only factor identified was highways and roads. Only to some small minor extent does FHWA feel that this factor is a contributing factor to our water quality problems. When this factor is a contributing factor, it is primarily during construction of highways and roads and to a lesser extent during the period between the completion of construction and the time when the banks and road cuts can be stabilized.

EFFECTIVENESS OF PROGRAMS:

FHWA feels that their planning assistance with the State Highway Department is very effective from an erosion control standpoint and has no additional plans for the future regarding their planning assistance program. The FHWA feels that in terms of highways and roads the State Highway Department is always the most effective agency in dealing with the accelerated erosion control problems associated with highways.

EROSION CONTROL TECHNIQUES:

The FHWA relies primarily on its "Federal Highway Program Manual" as a handbook for liaison and sediment control techniques during highway construction.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

The FHWA's program of technical and financial assistance with the State Highway Department has a budget of approximately \$30 million per annum and a staff of highway engineers.

AGENCY NAME: Agricultural Stabilization and Conservation Service

NEVADA OFFICES: Nevada State Office
P. O. Box 360
Reno, Nevada 89502

District offices are located in
Elko, Fallon, Caliente, Winnemucca,
Yerington and Lovelock

TELEPHONE: (702) 784-5411

AGENCY ORGANIZATION:

There is a state committee supported by a state staff with an executive director. Six district offices are served by county committees in each of the 17 Nevada counties.

GENERAL TYPE OF ACTIVITY:

The principal role of ASCS is to administer cost-sharing programs whereby 50-75 percent of the costs of installing selected practices funded by the ASCS. This is primarily for water conservation and irrigation practices. The agency is organized with a state office in Reno and six county offices.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

None enumerated

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND
WATER QUALITY MANAGEMENT:

In responding to the problems caused by over-grazing, the ASCS provides funds for better range practices. The goals of the agency are to conserve and improve the quality of the limited amount of water available for all uses, to prevent or reduce soil erosion on crop range and watershed lands, to develop or improve stands of forest trees for timber production and to create new, or improve existing, wildlife habitat. The agencies with which ASCS works include the Fish and Game Department, Environmental Protection Services, U.S. Forest Service, Soil Conservation Service, Division of Forestry, Conservation Districts, Bureau of Land Management, and the State Department of Agriculture.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

The ASCS views the extent of the runoff problem from land-disturbing activities as minor. However, ASCS feels that some land-disturbing activities do cause major problems in localized areas. The major contributor to the problem where it exists seems to be over-grazing coupled with retarded grass growth due to brush. Of a somewhat moderate nature, mining is considered to be a problem. All other activities seem to be considered as not very extensive in contribution to water quality problems in Nevada.

EFFECTIVENESS OF PROGRAMS:

The ASCS feels that its range practices programs have a limited impact due to the fact that the public range is very preponderant in Nevada. Without controls on the public range, the controls on the private range are, by necessity, very limited in effect. ASCS feels that it is very effective in providing financial assistance. It feels that the recipients would rate ASCS as very effective in providing the services.

EROSION CONTROL TECHNIQUES:

These are primarily financial support of SCS techniques and practices by individual land owners.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

There are fifteen employees of the ASCS in the State of Nevada, four of whom work in the State office in Reno. The budget is approximately \$700,000 per year.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

The ASCS is not satisfied with the cooperation between their agency and Environmental Protection Services, Fish and Game Department, and most state agencies in general. However, the ASCS feels the cooperation is improving.

STATE

The project team possesses substantial knowledge on the workings of Nevada State Government. Accordingly, it was possible to easily make an initial screening down to those State level agencies that are, or should be, involved in the control of runoff and erosion. The following agencies survived the initial screening:

- Environmental Protection Services
- Department of Fish and Game
- Department of Highways
- Department of Agriculture
- Division of Conservation Districts
- Division of Forestry
- Division of State Lands
- Division of Water Resources

Each of these agencies was then interviewed to determine the nature of their present and potential future involvement in the control of runoff and erosion.

A parallel activity which was essentially complete prior to the State agency interviews was a review of authorities relating generally to the subject of erosion control. This authority survey consisted of a detailed search of the Nevada Revised Statutes to identify all sections pertaining to erosion control, either directly or indirectly. These authorities, once identified, were indexed by agency to display the statutory authorities granted to each agency.

On the following pages are standardized summaries of the eight State agencies of interest in this project, describing the agency, its authorities and programs relating to control of accelerated erosion in Nevada. Also included are summaries of many of the Nevada Revised Statutes under which these agencies have authority. Although they were not interviewed, the State Environmental Commission is included in the summaries. Environmental Protection Services works very closely with the State Environmental Commission and implements the regulations and standards which the Commission adopts.

AGENCY NAME: State Environmental Commission

NEVADA OFFICES: State Office
201 South Fall Street
Carson City, Nevada 89710

TELEPHONE: (702) 885-4670

AGENCY ORGANIZATION:

Norman Glaser, Chairman; eight other members, five of whom are officials of other state agencies; one staff person: Kenneth Boyer, Executive Secretary

GENERAL TYPE OF ACTIVITY:

The Commission considers and adopts rules and regulations, including water quality standards, for administration by EPS.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL OR WATER QUALITY MANAGEMENT:

NRS Chapters 445 which provides broad authorities.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND WATER QUALITY MANAGEMENT:

None other than the aforementioned adoption of rules and regulations administered by EPS.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

None ascertained.

EFFECTIVENESS OF PROGRAMS:

Not applicable

EROSION CONTROL TECHNIQUES:

Not applicable.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

Manpower is as stated above, although EPS provides substantial staff support. Budget is minimal, and primarily applied to operating costs.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

None ascertained.

CITATION: NRS Chapters 444 & 445 KEY FUNCTION: Environmental Protection
Air & Water Pollution, Solid Waste KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Regulatory Other Regulatory Other	(Copy .526 & .529 in total) (445.526 & .529) Penalties for violation of air pollution statutes or regulations. (445.601)	All	Up to \$5,000 per day	Aggrieved party may file notice of <u>appeal</u> with the State Envir- onmental Commission within 10 days after date of notice of action by the Depart- ment. (445.498)	

AGENCY NAME: Department of Human Resources
Environmental Protection Services

NEVADA OFFICES: 201 South Fall Street
Carson City, Nevada 89710

TELEPHONE: (702) 885-4670

AGENCY ORGANIZATION:

The Chief of Environmental Protection Services is directly under the head of the Department of Human Resources.

GENERAL TYPE OF ACTIVITY:

The basic mission of Environmental Protection Services (EPS) is to maintain water and air quality in the State of Nevada. EPS also has a secondary role relating to solid waste disposal, which at this time they are handling as a planning level assignment.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

Authorities under which EPS works most frequently are NRS 444 and 445.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL
AND WATER QUALITY MANAGEMENT:

The 303(e) plans prepared for the State of Nevada were done under the direction of EPS. The primary state agencies which provided meaningful support were Water Resources, and Fish and Game. The main way in which EPS has control over erosion matters relates to their approval function on subdivisions. As part of the review and approval process, EPS reviews water quality, sewage disposal and water pollution aspects of every proposed subdivision in the state. They are also working very closely with TRPA on developing the Tahoe Basin Erosion Control Program. The only agencies with which EPS works directly in matters of accelerated erosion are local and regional.

The major regulatory role performed by EPS relates to the permit program. Through this program they are inheriting some 90 plus existing permits issued by EPA, and have issued some 3-4 themselves. Their regulatory role is one of compliance monitoring in which they assure that the permit holder is living up to the conditions of his permit. They have the ability to levy both civil and criminal fines in the event of noncompliance.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

The major contributors to the erosion problem are development in all of its many facets--recreational homes, commercial, industrial, residential, streets, highways and the activities of off-road vehicles. Moderate contributors are logging, urban runoff, and the various modifications of stream channels. Also contributing to the problem but to a lesser degree, are grazing, irrigated agriculture, mining, country roads, and the various third level or access roads that are common throughout the state.

EFFECTIVENESS OF PROGRAMS:

The community education and involvement program of EPS is not very good. At the present time, it consists primarily of a small amount of public relations work in the way of news releases and speaking engagements on the part of the EPS staff. The whole is not very formal or structured and is greatly in need of improvement. The relationship with TRPA and with the local northern political jurisdictions is excellent. With the southern political jurisdictions, it is admittedly not very good.

EROSION CONTROL TECHNIQUES:

The collection of data on air quality and water quality is a major function of EPS. Water quality is collected monthly and air quality data is collected on a continuous basis. In addition, specific water quality or air quality information is collected in support of special project activities. Most of the data is used internally in the EPS program. As part of the recently adopted permit program, permit holders will be required to collect and provide to EPS water quality data. EPS is developing a quality assurance program and a compliance monitoring program to assure the validity of the data being supplied.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

Total employment of EPS is 22 people.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER, OR BUDGET:

None enumerated.

CITATION: NRS Chapters 444 & 445 KEY FUNCTION: Environmental Protection
Air & Water Pollution, Solid Waste KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Reg. Certification	Department of Human Resources (Environmental Protection)				
	Department approves local solid waste management plans (444.510).	Urbanization			
Technical Assistance Planning Financial Assistance	Department advises, consults, etc., with Federal Government, states, municipalities, etc., in formulation of plans for and establishment of any solid waste management system.	Urbanization			
	Accepts and administers loans and grants for solid waste management systems - planning, construction, and operation (444.570).				
	Designates state agency for required purposes of Solid Waste Disposal Act (42 U.S.C. §§ 3251-3259) (444.590).				
Reg. Other	Department may bring action v. violator of solid waste management statute or regulations (444.600).	Urbanization	Civil action in district court.		
Regulatory; Other Standards	State, its agencies and all political subdivisions, must comply with all State laws and regulations and local ordinances applicable to private persons engaged in same type of work, altering the material condition of land or vegetation (445.015).	All			
Regulatory Permits	Bureau of Environmental Health (Environmental Protection, in fact) issues <u>permits</u> to allow construction of building, sewage systems, etc., in the Lake Tahoe Basin, and to allow piers, breakwaters, removal of sand, etc., in Lake Tahoe (445.080).	Construction Urbanization Recreation Transportation	Misdemeanor 445.120		
Regulatory Other	Bureau of Environmental Health (Environmental Protection, in fact), enforces regulations and statutes to carry out protection of Lake Tahoe Watershed (445.100).	All	Misdemeanor 445.120		

CITATION: NRS Chapters 444 & 445 KEY FUNCTION: Environmental Protection
Air & Water Pollution, Solid Waste KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Legislative Declaration	Public policy of State to restore chemical, physical and biological integrity of water in Nevada; Prevent, reduce and eliminate pollution; Plan development and use including restoration, preservation and enhancement of land and water resources; and Consult, cooperate, etc., with other states, agencies, and Federal Government to fulfill objectives (445.132).	All			
Regulatory Permit Certification Other Technical assistance Financial assistance Planning	Department (Of Human Resources) is designated the State water pollution control agency for all purposes of Federal water pollution control legislation (<u>except</u> enacting regulations). Department authorized to take all necessary actions to secure benefits of Federal legislation (water pollution) (445.211).	All			
Regulatory Permit Certification Other Technical assistance Financial assistance Planning	Director of Department of Human Resources, powers and duties: Perform any acts consistent with water pollution statutes and Federal requirements of NPDES; Administer and enforce statutes and regulations and all orders and permits issued by Department;	All			
Technical assistance Planning Financial assistance Technical	Advise, consult, and cooperate with other agencies, states, Federal Government, etc., in furthering purposes of water pollution statutes Qualify for, accept, and administer loans, grants, etc., from Federal Government, etc.	All			

CITATION: NRS Chapters 444 & 445 KEY FUNCTION: Environmental Protection
Air & Water Pollution, Solid Waste KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY(S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Technical assistance	Encourage, etc., studies, surveys, etc., by contract, grant or other	All			
Reg. Other	Maintain and require maintenance of records, etc., necessary to prepare reports.	All			
Planning Technical assistance	Develop comprehensive plans to eliminate and prevent pollution, etc., and encourage improvements necessary (445.214)	All			
Planning Technical assistance	Department shall establish continuing planning process consistent with applicable requirements resulting in plans for all waters of State (445.257).	All			
Regulatory Other	Director may do following for violation of statutes, regulations, permit: Issue order (.324); Commence civil action (.327, .331). Request Attorney General institute criminal proceedings (.334, .337).	All	Injunction or up to \$10,000 fine/day Up to \$25,000 fine/day and up to 1 year in jail.	If 2nd violation, \$50,000 fine and up to 6 years in jail.	
	Department is final authority on water pollution in State (.334)	All			
Legislative Declaration	Policy of Nevada:	All			

CITATION: NRS Chapters 444 & 445 Environmental Protection KEY FUNCTION: Air & Water Pollution, Solid Waste KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Regulatory Other Technical assistance Financial assistance Planning	Department is: Designated as air pollution control agency of state for purposes of Federal Act. Authorized to take all necessary actions to secure benefits of Federal Act. (445.456)	All			
Regulatory Other Planning	Department shall: Make determination and issue orders to implement statutes.				
Financial assistance	Apply for and receive grants or funds.				
Technical assistance	Cooperate and contract with other government agencies and Federal government.				
Technical assistance	Conduct investigations, research, etc.				
Regulatory Permits Technical assistance Planning	Require preliminary plans and specifications and other information necessary to process permits.	All			
Regulatory Other	Institute proceedings to prevent continued violation of director's orders and enforce provisions of statutes. Take action in accordance with regulations and orders of commission to prevent, abate, and control air pollution. (445.473)				
Technical assistance Financial assistance	Department may: Cooperate with Federal government, states, locals, etc., to prevent air pollution. Apply for grant from Federal government. Develop measures for control of air pollution in Nevada. (445.474)	All			

AGENCY NAME: Nevada State Department of Fish and Game

NEVADA OFFICES: 1100 Valley Road
P. O. Box 10678
Reno, Nevada 89510

Region I
P. O. Box 489
Fallon, Nevada 89406

Region II
1375 Mountain City Highway
Elko, Nevada 89801

Region III
4747 West Vegas Drive
Las Vegas, Nevada 89108

TELEPHONE: (702) 784-6214 (Reno)
(702) 385-0285 (Las Vegas)
(702) 738-5332 (Elko)
(702) 423-3171 (Fallon)

AGENCY ORGANIZATION:

The staff under the direction of the Department Director carries out the policies set by the State Board of Fish and Game Commissioners.

GENERAL TYPE OF ACTIVITY:

The role of the Fish and Game Department is to promote and protect the fish and wildlife resources and their habitat in the State of Nevada. They carry out survey, management, enforcement, boating safety and R & D programs that place emphasis on all facets of wildlife needs.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL OR WATER QUALITY MANAGEMENT:

Powers and duties spelled out in NRS 501.165.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND WATER QUALITY MANAGEMENT:

The Department offers cooperative assistance with the land management agency to land owners to develop land management plans and provide technical assistance to private owners of land. The Department works with BLM, U. S. Forest Service, Environmental Protection Services, Geological Survey, U. S. Fish and Wildlife Service, Department of Highways, State Agriculture Department, Division of Water

Resources, Division of Parks, Division of Forestry, various Councils of Governments, Irrigation Districts, Conservation Districts, and the National Park Service.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

Grazing, especially grazing on stream banks, is a major contributor to runoff and accelerated erosion problems in Nevada. Another major contributor is channeling or other stream modifications. Also listed was highway construction and roads. Of moderate concern are recreational home development, commercial and industrial development, residential development and mining.

EFFECTIVENESS OF PROGRAMS:

The effectiveness of their efforts in reducing the impacts on water quality is not rated as very high. The way that the Department feels more effectiveness can be attained is by obtaining more expertise in the Department to provide more fundamental and sound information from which to advise the land management agencies and the private land owners. This cooperative technical assistance approach is the same approach that is applied to the other moderate or major contributing factors, such as the channeling or other stream modifications, and various developments. The effectiveness of their review process is assessed primarily by visual observation, and the Department feels that recipients of this service would rate the Department as very effective in providing the service.

EROSION CONTROL TECHNIQUES:

The Department carries out surveys and inventories of wildlife populations and habitat to collect basic data for resource management decisions, season and harvest recommendations and technical assistance efforts. They also provide progress reports made on individual projects to land management agencies.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

The staff numbers approximately 140 people with five fish hatcheries and seven wildlife management areas.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

None enumerated.

CITATION: NRS Chapters 503, 501 KEY FUNCTION: Fish & Game Control
Esp. Re: Erosion KEY ACTIVITY: Agriculture

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Regulatory: Permit to dredge using suction or vacuum equipment required.	Department of Fish and Game Person submits application to Department to use vacuum or suction dredge equipment; specifies type, size and location where equipment will be used. If Department determines not harmful to fish, it issues permit to applicant (507.425).		Unlawful to dredge w/o permit, operate equipment not specified in permit, or operate outside area specified in permit.		License fees
	Department of Fish and Game No procedure in statute - possibly in regulation. Probably simple enforcement by Fish and Game Warden with peace officer powers (503.430)		Misdemeanor to deposit or allow to pass into waters of State deleterious substance.		License fees
Regulatory	Board of Fish and Game Commissioners shall establish policy for the acquisition of lands, water rights, and easements for management, propagation, protection and restoration of wildlife; entry, access to, and occupancy and use of property including lease of grazing rights, sale of agriculture and timber products, exploration and extration of minerals, oil, gas, or thermal power on lands controlled by Department (501.181).				License fees

CITATION: NRS 503 KEY FUNCTION: Fish and Game KEY ACTIVITY: _____

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Regulatory Permit to dredge river or lake bottoms Prohibition from passing into waters any substance deleterious to fish Policies may be established & regulations adopted as necessary for preservation, protection, restoration of wildlife (including fish) and its habitat	Any person wishing to dredge must submit permit application to Fish and Game Department, and permit will be granted if Department determines such dredging will not be deleterious to fish (.425) None stated (.430) State Board of Fish and Game Commissioners, which is advised by County Game Management Boards, the State Fish and Game Advisory Board, and the State Wildlife Damage Control Advisory Committee (wildlife depredation matters only)	Other All	Misdemeanor Misdemeanor	Normal court appeals, Variance opportunities none stated Normal court appeals, no variance procedures	

AGENCY NAME: Nevada State Highway Department

NEVADA OFFICES: Headquarters
1263 S. Stewart
Carson City, Nevada 89701

District I
1200 North Main
Las Vegas, Nevada 89101

District III
P. O. Box 111
Elko, Nevada 89801

District IV
P. O. Box 477
Ely, Nevada 89315

District V
P. O. Box 791
Tonopah, Nevada 89049

District VI
P. O. Box 326
Winnemucca, Nevada 89445

TELEPHONE: (702) 885-5440 (Carson City)
(702) 385-0351 (Las Vegas)
(702) 738-7284 (Elko)
(702) 289-4471 (Ely)
(702) 482-6475 (Tonopah)
(702) 623-2536 (Winnemucca)

AGENCY ORGANIZATION:

The State Highway Engineer is the administrative head of the Department. Policies are set by the State Highway Board consisting of the Governor, Attorney General and State Controller.

GENERAL TYPE OF ACTIVITY:

The role of the State Highway Department is to build and maintain roads throughout Nevada.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

Powers and duties spelled out in NRS 408.135, 484.739, 484.743.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND WATER QUALITY MANAGEMENT:

The only area of erosion control over which the highway department has any responsibility is that associated with state and county highways. In all road designs, erosion aspects are taken into consideration. Although there is a certain amount of runoff and resulting erosion, particularly from paved surfaces, the feeling is that in the overall scheme of erosion control and water quality management the amount contributed by highways is negligible. The State Highway Department is already doing everything possible within the funds available to control erosion on highway right-of-ways. Since highway design and maintenance is their only responsibility, they have no future plans for broader erosion control responsibilities.

The State Highway Department works with BLM, SCS, the State Forestry and Federal Forestry Departments on erosion control matters.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

Although runoff from land disturbing activities has some impact on their activities, the Highway Department views wind erosion as a significantly greater problem. Grazing and urban runoff were considered as having moderate impact, while offroad vehicles, access roads, and recreational activities (such as trails and vacation homes) were identified as having some impact on erosion.

EFFECTIVENESS OF PROGRAMS:

The overall capability of the staff is considered to be excellent. This is particularly true in view of a fairly recent substantial reduction in staff, which theoretically at least, allowed only the best employees to remain. The spectrum of available skills is very large, and a comment was made that the capability to accomplish almost any assignment is available somewhere within the Department.

EROSION CONTROL TECHNIQUES:

The primary data collected by the Highway Department for dissemination relates to traffic volumes, accident statistics, O&D, revenue projections, and materials information. This data is made available to other state agencies and local political jurisdictions for use in their planning and design work. For use within the department they have been recently collecting substantial information on noise, air quality, and runoff quantities (no quality data) from highways. This data is primarily for use within the Department in meeting design standards on future projects.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

The Department currently has approximately 1,300 employees, with 450 of these in the Carson headquarters office. In addition, there are district offices in Las Vegas, Reno, Elko, Ely, Tonopah, and Winnemucca.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

None enumerated.

AGENCY NAME: Nevada State
Department of Agriculture

NEVADA OFFICES: 350 Capitol Hill Avenue
P. O. Box 1209
Reno, Nevada 89504

215 East Bonanza Road
P. O. Box 389
Las Vegas, Nevada 89101

946 Idaho Street
P. O. Box 630
Elko, Nevada 89801

TELEPHONE: (702) 784-6401 (Reno)
(702) 385-0231 (Las Vegas)
(702) 738-7211 (Elko)

AGENCY ORGANIZATION:

The executive director heads the Department and implements the policies of the State Board of Agriculture.

GENERAL TYPE OF ACTIVITY:

The role of the State Department of Agriculture is to provide service to and regulation of state agricultural activities.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

The primary responsibilities of the State Department of Agriculture are spelled out in NRS 561.015.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND
WATER QUALITY MANAGEMENT:

The overall goals and objectives of the State Agriculture Department are those established by the state legislature. The Department prepares an annual program plan, which is designed to respond to the mandate of the legislature. The only activity sectors in which the Department of Agriculture has any erosion control impact whatsoever are grazing and irrigated agriculture. In both instances their involvement is minimal, being limited primarily to working with the University of Nevada-Reno on programs to educate agricultural interests relative to erosion control. They have no plans to expand their role in this area of endeavor. They do provide technical assistance primarily in the form of bulletins to extension agents on various subjects.

Current involvement of the State Agricultural Department in erosion matters is limited basically to working with the Soil Conservation Service and BLM.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

Statewide, the Agriculture people view erosion and runoff from land disturbing activities as a moderate problem. Those activities identified as major contributors to erosion in Nevada included grazing, mining, and urban runoff. Those identified as moderate included irrigated agriculture, recreational home development and commercial/industrial development. In the case of grazing, the problem is simply one of removal of vegetation and thereby exposure of erodible soil. The mining problem is related both to the actual mining activity and perhaps more significantly to the access to the mine. Urban runoff is simply a case of impervious surfaces that accumulate significant quantities of debris which are washed away by the periodic rainfall. The major erosion problem within the State of Nevada is not water related, but is rather wind erosion.

EFFECTIVENESS OF PROGRAMS:

The main feedback loop on the Department's effectiveness is the complaint process, which surfaces very quickly if they are not doing an effective job. Most of the activities of the Department are ongoing continuous functions which vary little from year to year. The primary means of measuring overall performance is what has been accomplished this year versus what was accomplished in previous years.

EROSION CONTROL TECHNIQUES:

Data collection and dissemination is a very minor function of the Department. They work with the U. S. Department of Agriculture and the University of Nevada-Reno in collecting and disseminating certain statistical information. They annually publish a booklet called "Nevada Agricultural Statistics" which has essentially no information in it on the subject of erosion, or erosion control. It is primarily statistics on agricultural activity and output for the year.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

Total permanent staff is about 60 people, with an additional 15 to 18 seasonal employees.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

Many of the Department's activities are really constrained by budgetary limitations, and their performance is simply the best they can do with the limited resources available. In many instances they have very few people assigned to a function while they are trying to cover the entire state.

CITATION: NRS 324,010 - ,290 KEY FUNCTION: Reclamation of DESERT Lands KEY ACTIVITY: Agriculture

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Regulatory Approval Standards Planning Reg. Stats. Planning Technical assistance Reg. other approval	State Commission of Industry, Agriculture and Irrigation, established to seek grants of federal lands under "Carey Act" and to select, manage, and dispose of such lands (.030). Establish rules and regulations (.060). Determine circumstances of disposition of lands (time, manner and conditions of entry or sale) (.070).	Agriculture			Appropri- ation (to start); then fees and charges on sale of lands (.100)

AGENCY NAME: Nevada State Department of Conservation and
Natural Resources, Division of Conservation
Districts

NEVADA OFFICES: 201 South Fall Street
Carson City, Nevada 89710

TELEPHONE: (702) 885-4363

AGENCY ORGANIZATION:

The State Conservation Commission oversees the operations of the local Conservation Districts. They have an administrator who is the only full-time employee.

GENERAL TYPE OF ACTIVITY:

Primary role is to work with, assist, and coordinate the work of the individual conservation districts of the state.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

The Conservation District law is found in NRS 548.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND
WATER QUALITY MANAGEMENT:

Offers planning assistance in the field with the individual districts. Works with the conservation districts, the SCS, and the BLM. A closer working relationship is anticipated with the Environmental Protection Services and the Division of Forestry.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

The Division views runoff and accelerated erosion from land-disturbing activities as a major problem in Nevada. Of all the different types of land-disturbing activities occurring in Nevada, the Division feels that grazing, residential development, and roads are the most major contributors to the problem. Somewhat more moderate contributors to the problem are irrigated agriculture, mining, recreational home development, and urban runoff.

EFFECTIVENESS OF PROGRAMS:

The Division assesses the effectiveness of their efforts by viewing the activeness of the conservation districts. The Division feels that it is very effective in providing this planning assistance and feels likewise that the recipients (the conservation districts) of this service would rate the Division as being very effective.

EROSION CONTROL TECHNIQUES:

The Division does not conduct a data acquisition program.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

One staff person and a part-time secretary to a Commission comprised of nine persons. The resources available are minimal and involve, essentially, the time and expertise of the administrator.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER, OR BUDGET:

None enumerated.

Resource Conservation

CITATION: NRS 548

KEY FUNCTION: (esp erosion)

KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Financial and Technical	Conservation Districts have power: to finish, via agreements, financial or other aid to any agency or occupier of lands (.360); to carry out preventive & control measures, with consent of occupier (.355); to provide occupier the equipment, seeds & other material (.365); to operate facilities in performance of operations authorized by NRS 548 (.370)	All			Appropriations
Planning	Conservation Districts have power to develop plans detailing acts, procedures, etc., for effectuating the plans, incl specification of engineering operations, methods of cultivation, growing of vegetation, cropping programs, tillage practices, and changes in the use of land; & to provide such plans to land occupiers (.375)	All			
Regulatory (land use regs requiring necessary engineering operations, cultivation methods, cropping and tilling practices, retirement of erosive areas from cultivation, and other provisions as may control erosion)	Conservation Districts may petition State Conservation Commission to formulate regs; Commission may hold hearings; Commission may approve petition or more likely hold referendum among land occupiers of district, in which case the Commission may enact regs into law if majority of votes cast favors regs; adopted regs are binding upon all land occupiers and agencies administering lands in the district; enforcement via inspection by Commission and/or District and thence by Commission petition to court for order to perform required work (and for authorization to perform work at occupier's expense if occupier does not perform in reasonable time).	All	Court order to perform work	Appeal by occupier by petition of Commission to ammend, supplement or repeal regs in same manner as adopting regs. Variance obtained by petition to Bd of Adjustment, whose determination is appealable to the court by any petitioner	
Legislative Policy	Failure to accomplish the conservation and controlled development of natural resources is to handicap economic development and cause degradation of environmental conditions important to future generations. Increasing demands on natural resources must be recognized and must be conserved, protected and developed at such levels of quality as will meet the needs of people of the State.				

AGENCY NAME: Nevada State Department of Conservation
and Natural Resources, Division of Forestry

NEVADA OFFICES: State Office
201 South Fall Street
Carson City, Nevada 89701

Nevada Youth Training Center
Elko
Nevada 89801

Forestry
Mount Charleston
Nevada 89100

TELEPHONE: (702) 885-4350 (Carson City)
(702) 738-5137 (Elko)
(702) 872-5483 (Mount Charleston)

AGENCY ORGANIZATION:

The State Forester-Firewarden is executive head of this division. He answers to the director of the Department of Conservation and Natural Resources.

GENERAL TYPE OF ACTIVITY:

Forestry protection and preservation - the purpose of the State Forestry Division is to look after some nine million acres of state private lands which are classified as forest lands. They provide fire protection to some 3,000,000 acres of the forest land.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

The 1971 session of the Nevada legislature passed a forest practices law, which provides the Nevada Division of Forestry with very strong control over the forest practices. These regulations contain very strong provisions relating to acceleration of erosion on forest lands.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND
WATER QUALITY MANAGEMENT:

The 1971 law prohibits such things as building a road within 200 feet of any body of water, crossing any body of water, etc. They maintain a very strong regulatory, monitoring and enforcement roll with respect to commercial forests. Forestry deals with

each of the other agencies in the area of erosion control. They have agreements with BLM, Forest Service, and other agencies relating to a variety of matters.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

Forestry views accelerated erosion from land disturbing activities as a relatively minor problem. Their scope of work is with forest erosion, caused by logging, access roads and recreational home development in forest lands.

EFFECTIVENESS OF PROGRAMS:

The agency feels it is generally very effective. Approximately 30% of the total resources of the Division of Forestry are expended on planning assistance. It could be more effective, with one of their primary problems being a difficulty in providing inputs in a timely fashion.

EROSION CONTROL TECHNIQUES:

The agency at this time provides little in the way of data. They are working on a desert forestry program and anticipate that as this program develops they will be providing data on suitability of various practices, and vegetation, for use in desert areas. They also, on a request basis, provide information relative to specific plant recommendations.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

The Forest Service is organized with the main office in Carson City with about 15 people and district offices in Reno (30 people), Elko (6 people), and Las Vegas (3 people).

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

None enumerated.

CITATION: NRS 527.050 & .100 KEY FUNCTION: Protection of Trees and Flora KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Regulatory: Permit Other Approval	Unlawful to cut, remove, destroy, etc., any tree, roots, flora, etc., without permit from the owner, the State Forester-Firewarden, or parks division. Enforced by State Forester-Firewarden, public officials in charge of federal lands, and peace officers.	All		Does not apply to native Indians and gathering for food or medicinal use.	
Standards Permit Planning	State Forester-Firewarden establishes regulations for enforcement, including issuance of permit to collect, and designating of issuing authority (527.050).		Public offense proportionate to value destroyed at <u>least</u> \$10 fine and at least a misdemeanor.		
Regulatory: Other Approval	Unlawful to cut evergreens, remove, destroy, etc., without written permission from owner specifying locality and number of trees to be cut	All		Doesn't apply to trimming by public utility or to a logging operation.	
Standards Planning	To sustain productivity and to <u>preserve water-supplying functions of Nevada forest lands</u> , State Forester-Firewarden (with approval of State Board of Forest and Fire Control) shall adopt regulations governing cuttings, stump heights, etc., and other evergreen cutting practices (527.100).		Misdemeanor, min. fine \$10 (527.120).		

CITATION: NRS 528 **KEY FUNCTION:** Erosion Control **KEY ACTIVITY:** Forestry

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
<u>Statutory Reqmnt</u> Trails, landings, roads, & fire-breaks shall be located, constructed, used and left such that erosion is limited to a reasonable minimum that will not impair soil productivity or appreciably diminish water quality (.055)		Forestry	Presumably denial, revocation suspension of permit Misdemeanor		
<u>Statutory Reqmnt</u> NLT 11/15 water-breaks &/or culverts shall be constructed for all trails, roads & firebreaks to divert runoff from same, and to divert runoff to an area having the filter capacity to remove sediment. Shall be installed at certain intervals depending on slope (.055) - .0554)		Forestry	Ditto	<u>Variance:</u> If weather or soil conditions prevent meeting 11/15 date, drainage shall be maintained by hand. <u>Variance:</u> Where terrain or other factors precludes proper diversion of waterflow from trails slash shall be scattered on trails sufficient to hold erosion to minimum. <u>Variance:</u> Outsloped drainage structures permitted in lieu of waterbreaks or culverts.	

CITATION: NRS 528 KEY FUNCTION: Erosion Control KEY ACTIVITY: Forestry

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
<u>Regulatory</u> Certificate required for conversion of timberland to other use (.082-.088)	Application made to State Forester, with conversion plan detailing soil characteristics, conversion techniques, future use, time schedule, and with performance bond. Certificate may be denied for non-compliance with forest practice regulations, for unsatisfactory provision for stabilization and rehabilitation of disturbed soils in order to minimize erosion, and other reasons. Bond may be reduced proportionate to number of acres stabilized or rehabilitated. Certificate may be suspended or revoked for failure to comply with certificate conditions or for any reason for which denial can be made.	Forestry	Denial, suspension, revocation of certificate Misdemeanor	Appeal by hearing of State Forester	Appropriation
<u>General</u>	State Forester, acting in accordance with the policies adopted by State Board of Forestry, shall administer all above provisions (.040); Board may adopt regulations regarding timberland conversion (.060)	Forestry			
<u>Legislative Policy</u>	To preserve natural water supply in the interest of economic welfare of the State The provisions of .010-.090 shall not be construed to condone any activity causing significant degradation of water quality				
Technical and Financial Assistance	State Forester may develop nursery sites for the production and procurement of tree seeds and plants in order to conserve water resources, renew timber supply, and bring about benefits resulting from reforestation and establishment of windbreaks (.100-.140)	Forestry			

CITATION: NRS 528 KEY FUNCTION: Erosion Control KEY ACTIVITY: Forestry

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
<u>Regulatory</u> Permit required prior to logging or cutting operations	Permit application made to Div of Forestry, and must be accompanied by a logging plan. The plan must specify volume of timber to be removed, time required for removal, revegetation plan, slash disposal/cleanup plans, road construction/erosion control measures. A performance bond, in an amount set by State Forester, also required. State Forester may deny permit for failure to comply with forest practice rules, for prospect that logging operation will cause significant soil erosion & siltation, and for other reasons. Permit issued for calendar year, and is renewable. Performance bond may be reduced proportionate to number of acres reforested. Permit may be suspended or revoked for failure to comply with forest practice rules, permit conditions, logging plan. (.042-.047)	Forestry	Denial, suspension, revocation of permit Misdemeanor	If permit denied, applicant may have hearing with State Forester	
<u>Statutory Prohibition</u> No tractor logging on slope of 30 degrees or more	Variance request must include data on soils, reproduction capability, erosion hazards, drainage features, methods of logging, and other info as may be required by State Forester. In acting on request, State Forester must consider expected destruction of litter cover, soil erosion. Performance bond reqd (.048)	Forestry	Ditto	Variance may be requested of State Forester; Appeal of denied variance may be by hearing of State Forester	
<u>Statutory Prohibition</u> No felling, skidding, rigging, road or landing construction, vehicle operation within 200' of body of water	In granting variance request, committee must determine that preserving watersheds, water quality standards, fish & wildlife and preventing significant soil erosion will not be compromised. (.053)	Forestry	Ditto	Variance may be requested of a committee of State Forester, F&G Director, & State Engineer	
<u>Statutory Regmnt</u> Upon completion of logging: trails, roads, & landings shall be seeded (.057)	Seed shall be approved by State Forester	Forestry	Misdemeanor		

CITATION: NRS Ch 528 & 1975 Stats, Ch. 371 KEY FUNCTION: Forest Practice & Reforestation KEY ACTIVITY: Agriculture

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Technical assistance Planning Financial assistance	State Forestry Fire Warden cooperates with all to establish and develop nursery site(s) to produce tree seeds and plants, accept (.100-.140 & Ch. 371)	Agriculture	Misdemeanor		Contributions, can sell land

AGENCY NAME: Nevada State Department of Conservation and
Natural Resources
Division of State Lands

NEVADA OFFICES: State Office
201 South Fall Street
Carson City, Nevada 89710

TELEPHONE: 885-4363

AGENCY ORGANIZATION:

The administrator is head of this division within the Department of Conservation and Natural Resources. The administrator is responsible to the department director.

GENERAL TYPE OF ACTIVITY:

The mission of the organization is to establish standards and guidelines for statewide land use planning and to establish and prepare plans for areas of critical concern.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL
OR WATER QUALITY MANAGEMENT:

The State Land Use Planning Agency (SLUPA) was formed as a result of a 1973 state law (NRS 321).

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND
WATER QUALITY MANAGEMENT:

SLUPA has prepared a program for state land use planning in Nevada to develop an efficient system of land use planning and decision making or regulatory procedures. SLUPA works with all state, federal and local agencies that have anything to do with erosion control in one form or another.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

The only areas rated as moderate or major were in the area of development, both commercial/industrial, and residential. The only way in which SLUPA will get involved in erosion matters as they relate to developments, will be in critical areas.

EFFECTIVENESS OF PROGRAMS:

At this time the effectiveness and efficiency of the organization and staff is excellent. Their program of support to county or city planning departments is considered very effective by SLUPA and the receivers of the service would rate the service as very effective.

EROSION CONTROL TECHNIQUES:

SLUPA is not really a data collecting agency, but rather more of an accumulator of other people's data. They have spent considerable effort in trying to identify existing data sources within the state and plan to continue this effort.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

At this time, SLUPA consists of an administrator, two planners and a secretary all housed in an office in Carson City.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

None enumerated.

CITATION: NRS 321.730 - .810 KEY FUNCTION: State Land Use Planning KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Planning Technical Assistance	Director of Conservation and Natural Resources: Development State Land Use Plan process. Coordinate activities of State Land Use Planning Agency with: All Federally assisted or financial planning programs re land use; All regulatory activities of air and water pollution standards; Flood plain zoning plans (Sec./Army re 33 U.S.C. §§ 642 et seq.; Areawide agencies designated under 42 U.S.C. §§ 3301 et seq.; Planning activities of local governments and regional planning commissions, and Federal agencies.	All			
Regulatory Standards Zoning Other	Director holds hearings to development State Land Use Program. Invite participation by local agencies. Make land use data available to public (321.730).				
Regulatory Zoning Standards	Director, through State Land Use Planning Agency, shall: Designate areas of critical enviromental concerns. Promulgate standards and criteria for conservation and use of land and other resources. Adopt a land use plan and criteria and standards for use of land, water, resources. Promulgate procedures to accomplish above, including public hearing. (321.77).	All			
Financial assistance	Director to cooperate with Federal Government and apply for any land use planning grants, etc. (321.800).	All			Federal
Regulatory Other	All provisions of State Land Use Planning Agency statutes shall be enforced by Director and political subdivisions. If being violated, Director may bring action in court to insure compliance or injunction for relief from noncompliance (321.810).	All	Court action and injunction		

AGENCY NAME: Nevada State Department of Conservation and
Natural Resources, Division of Water Resources

NEVADA OFFICES: 946 Idaho Street
Elko, Nevada 89801

State Office
201 S. Fall Street
Carson City, Nevada 89701

4220 Maryland Parkway, Suite 305
Las Vegas, Nevada 89101

TELEPHONE: (702) 885-4380 (Carson City)
(702) 732-2562 (Las Vegas)
(702) 738-7211 (Elko)

AGENCY ORGANIZATION:

The State Engineer is executive head of the Division of Water Resources. He is responsible to the Director of the Department of Conservation and Natural Resources.

GENERAL TYPE OF ACTIVITY:

The role of the Division is to provide for the administration of the state's water resources.

AUTHORITY AND LEGISLATION IN THE AREA OF EROSION CONTROL OR WATER
QUALITY MANAGEMENT:

The water law is given in NRS 416, NRS 532 to NRS 538 and NRS 542 to NRS 544.

SPECIFIC NEVADA PROGRAMS RELATED TO EROSION CONTROL AND
WATER QUALITY MANAGEMENT:

The Division was involved in the development of the 303(e) basin plans through the state study team, reviewing and commenting on the draft plans. They work mostly with the Bureau of Reclamation, Corps of Engineers, SCS, Fish and Game Department, Division of Parks, Division of Forestry, Division of Colorado River Resources, Environmental Protection Services, Irrigation Districts and county governments. The Division performs a planning function for water resources prefeasibility plans. Approximately 20% of the Division's efforts are devoted toward this end. The Division offers assistance with respect to information on water rights, on the construction and maintenance of dams, and on flood control considerations. Approximately 15% of the Division's efforts are devoted toward this function. The

regulatory function (approximately 50% of the Division's resources) includes the permit and certification activities of the Division, as well as the physical distribution of the water.

SPECIFIC NEVADA PROBLEMS RELATED TO EROSION OR WATER QUALITY:

The Division views runoff from land disturbing activities as a moderate problem in Nevada. None of the several different types of land disturbing activities were viewed to be a major cause of the water quality problem. Among the moderate causes of water quality problems are irrigated agriculture, various developments, and channeling or other stream modifications.

EFFECTIVENESS OF PROGRAMS:

The Division feels it is very effective in its regulatory function and its data collection program. The Division feels that its planning efforts are very effective for setting general parameters. Approximately 15% of the Division's efforts are devoted toward technical assistance. It is a very high priority and is felt to be very effective. The regulatory function accounts for approximately 50% of the Division's resources and is felt to be very effective. There have been very few appeals of decisions made by the Division.

EROSION CONTROL TECHNIQUES:

The Division conducts resource inventories of water availability and water use. Data is also gathered to determine the effects of water use on groundwater table fluctuations. Data is collected in terms of land use inventories to help assess the needs for water. Data is collected on a regular basis and is more frequently collected where development is increasing.

MANPOWER AND BUDGET LEVELS OF THE AGENCY:

There are 32 people in the Carson office, 5 in the Elko office, and 4 in the Las Vegas office. There are 10 to 12 part-time summer employees who work as water distributors for the Division. There is an annual budget of approximately \$1 million.

DEFICIENCIES IN EXISTING AUTHORITIES, MANPOWER OR BUDGET:

None enumerated.

CITATION: Chapter 416 - 1975 Statutes **Control Development of**
KEY FUNCTION: Geothermal Resources **KEY ACTIVITY:** Mining

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Regulatory Standards Technical assistance	State Engineer adopts regulations, sets the standards and procedures for preventing pollution and waste in development of geothermal resources.	Mining			

REGIONAL/LOCAL

In determining the involvement of regional and local agencies in the control of runoff and erosion, a somewhat different problem was faced than with Federal and State agency involvement. Whereas there are only 7 Federal and 8 State agencies determined to be involved in erosion control in Nevada, the number of regional and local agencies directly involved is very large. These agencies include cities, counties, regional governments, conservation districts, irrigation districts and the Cooperative Extension Service.

The sheer number of agencies involved made physical interview of each agency impossible within the time and budgetary constraints of this study. These agencies were grouped into units having similar authorities and a geographically mixed sample was chosen for interview. Those interviewed were:

Cities:

- Elko
- North Las Vegas
- Reno
- Yerington

Counties:

- Clark
- Elko
- Washoe

Regional:

- Tahoe Regional Planning Agency
- Walker River Irrigation District
- Carson Valley Conservation District
- Cooperative Extension Service

To those agencies not interviewed, a paper-and-pencil questionnaire was sent requesting information similar to that obtained by interview.

The information obtained from regional/local agencies showed a wide variation with respect to awareness and action in the area of accelerated erosion and attendant water quality problems. At one extreme is the TRPA which is doing a detailed study with substantial emphasis on control of runoff and erosion and which has enacted a very strict grading ordinance. Conversely, the City of Yerington which is flat and has little land disturbing activity within its boundaries, views runoff and erosion as a very minor problem and is quite logically doing almost nothing about it.

Cities and counties generally have a broad array of problems and demands placed upon a rather limited budget. Accordingly, only in areas where cities or counties perceive erosion and attendant water quality problems as a serious concern are they inclined to actively pursue corrective programs. Of the cities and counties interviewed or responding to the paper-and-pencil questionnaire, only one county and three cities indicated that erosion is a major or moderate problem in their area. Based on the review of authorities for cities and counties, which are on the following pages, existing authorities are sufficient to have some impact on erosion through initiation of local action, if local jurisdictions are so motivated.

Irrigation districts are essentially single purpose organizations, that purpose being the collection, storage and distribution of water for irrigation purposes. They build, operate and maintain facilities for water storage and distribution, but have no authority to enforce any program for control of erosion or water quality. The permanent full-time staff of each district is less than five employees, all of whom are solely involved in water storage and distribution.

The State of Nevada is subdivided into 33 conservation districts, each of which is headed by a five-member Board of Supervisors. Conservation Districts, which operate under statutory authority granted by NRS 548, have as their primary role the protection of all removable natural resources on private lands. Statutory authorities granted under NRS 548 are summarized in the table on Page . All types of land owners are eligible to join, although a distinction is made between people who live off their land (farmers and ranchers) and those who just own land. A conservation district offers planning and technical assistance for its membership by utilizing the expertise of the Soil Conservation Service, as Conservation Districts have no paid employees. The Conservation Districts set priorities for the SCS technical activities, consistent with local goals and objectives. The SCS and the Conservation Districts have entered into memos of understanding setting up the working partnerships, which state that the districts will set direction, policy and priorities for the district program, and the SCS will adhere to it.

The role of the Cooperative Extension Service is in education, away from the University, concentrating in the areas of agriculture, home economics, community resource development and 4-H. There are offices to serve each county, within the state. These offices are partially funded by the county, partially by state funds, and partially by federal funds. The program is administered through the State Land Grant University at the University of Nevada-Reno, whose resources are directly available. In terms of technical expertise and other services, the agency is primarily an educational arm, using scientific knowledge and principles to help improve agriculture and assist in solving related problems. The CES works closely with local and other government agencies.

CITATION: NRS 266, 267 KEY FUNCTION: City Government KEY ACTIVITY: Urban

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Planning, Technical assistance, Financial assistance	City Council (Commission) may acquire, improve, equip, operate and maintain, convert to or authorize: curb and gutter projects, drainage projects, storm sewer projects, sidewalk projects, street projects, water projects. (266.261) Commission (267.120)	Urbanization Transportation Recreation Construction			Powers granted to municipalities by Ch. 271 & 704A of NRS
Planning, Technical, assistance, Financial assistance	Any governing body of a municipality may acquire, improve, equip, operate and maintain: a drainage or flood control project, a sewerage project, a sidewalk or street project, a water project, etc. (271.265) & (267.395)	Urbanization Transportation Recreation Construction			G.O. Bonds 267.400
	Governing body of any municipality may request Federal government to undertake any "Project" for the municipality and obtain contracts etc. to fulfill requests. (267.505)	Urbanization Transportation Recreation Construction			Bonds 350.010 350.070

CITATION: NRS Ch. 244 KEY FUNCTION: County Government KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Tech. assist. Financial " Planning "	Board of County Commissioners in counties over 200,000 has power to construct, operate, maintain, and improve, water facilities, including aqueducts, canals, reservoirs, storm sewers, etc. (244.366)	All			
Financial as- sistance	County Commissioners: authorized to hold an election to sell bonds to secure federal aid for a public works project (244.385)	All			
Financial as- sistance	County Commissioners: authorized to make the required contribution or cooperation to secure available federal aid (244.415)	All			
Technical as- sistance Financial as- sistance Planning	Board of County Commissioners is authorized to acquire, improve, operate, maintain, and improve a drainage and flood control project, etc. (244.804)	All			
Technical as- sistance Financial as- sistance Planning	Board of County Commissioners: authorized to acquire, improve, operate, maintain, and improve drainage projects, storm sewer projects, water projects, etc. (244.865)	All			244.866 General Funding & Levy Bonds

CITATION: NRS Chapters 403 & 405 KEY FUNCTION: County - Maintain Highways KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Regulatory Technical & Financial Assistance Planning	Board of County Commissioners has control over matters regarding construction, maintenance, and repairing of public highways within its county (403.090).	Construction Urbanization Transportation			
Financial Assistance	Board of County Commissioners may expend funds for grading, <u>draining</u> , <u>maintaining</u> , etc (including sprinkling or oiling roads) roads. Purchase of material and machinery for construction of superstructures necessary for the perfection of <u>drainage</u> of a highway (403.470).	Construction Urbanization Transportation			Gen. Fund Appropriation & hwy. & bridge fund; bonds
Regulatory Permit Standards Other Approval	Anyone conducting water across public road or highway shall construct and maintain culvert, bridge, etc., and not allow water to flood, etc., the road. Board of County Commissioners approves the culvert, etc., and forms standard plan and specifications (405.120).	All	Civil action for cost of repairing or constructing necessary culvert, etc., & costs of suit (405.130-150).	PENALTIES Criminal penalty for failure to construct culvert, etc., up to \$500 fine (405.170). Same penalty for negligently allowing water to flow across public road, etc. (405.180)	

CITATION: NRS Ch. 278 KEY FUNCTION: Regional/Local - Planning & Zoning KEY ACTIVITY: All

AUTHORITIES	AGENCIES, PROGRAMS & PROCEDURES	ACTIVITY (S)	PENALTIES	APPEALS AND VARIANCES	FUNDING
Regulatory - permit certificate standards zoning	Governing body of the city, county or region may divide it into districts; within the districts, it may regulate and restrict: erection, construction, reconstruction, alteration, repair or use of buildings, structures or land. Regulations shall be designated to preserve the quality of air and water resources. To promote the conservation of open space and the protection of other natural and scenic resources from unreasonable impairment to protect property in areas subject to floods landslides and other natural disasters. To insure that the development on land is commensurate with the character and physical limitations of the land. (278.250)	All		Board of Adjustment hears appeals where appellant feels there is error in the enforcement of any zoning regulations, etc. Decides requests for variances. Decides requests for special use permits. (278.300)	

Evaluation System

As used in this project, the term institution embodies three concepts:

- o The governmental agencies operating within the State of Nevada which have the capacity to effect some impact on the activities of man which cause runoff and erosion, and attendant water quality problems.
- o Those activities of man which cause runoff and erosion. These include both public and private sector activities.
- o The interrelationships between regulators and regulated, in the form of interventions aimed at controlling runoff and erosion.

An institutional evaluation must examine both the governmental agencies involved, as well as their authorities and programs which provide mechanisms for intervention in the accelerated erosion process. The evaluation system, therefore, consists of two elements: a model for the evaluation of agencies; and assessment criteria for the evaluation of authorities and programs.

EVALUATION MODEL

An evaluation model was developed specifically for use in the accomplishment of organizational level investigations for the State of Nevada. Implementation of this model is intended to provide this study the practicality and consistency necessary in the evaluation process.

While the model concept provides a comprehensive structure for organizational evaluation, the effectiveness of actual investigations is extremely dependent on the analytical ability and perseverance of the assigned analyst. The model does not provide a substitute for the human decision-making process; at best, it supports this function through the enforcement of a disciplined approach. Further, the evaluator should always anticipate "information gaps" in any organizational investigation. By following a basic model framework and procedure, the opportunity for collecting all available information and making a maximum number of substantiated judgments will be increased.

The model can accept both content modification and technical refinement resulting from actual field experience. This model is most effective when used in conjunction with on-site investigations, because of the increased ability to gather information and make direct observations. However, it can also be applied indirectly using information such as organizational profiles and available background materials on various units of government.

The structure was designed to meet the specific requirements for organizational evaluation required for this study. The model is built around the three basic functions of an organization--planning, performance and control--plus certain general measurements of organizational capability specifically related to this project. The three basic functions are further divided into evaluation categories as follows:

Planning

Agency Contribution to Problem Solution
Planning Structure

Performance

Technical Performance
Information Generation
Staff Capabilities

Control

Organizational Analysis
Administrative Systems

The general measurements of organizational capability relating specifically to the requirements of this project are:

Agency review and appeals procedures
Degree of community involvement and support
Degree of receptivity for revised/expanded role

CRITERIA FOR ORGANIZATIONAL EVALUATION

In order to analyze the basic organizational functions utilizing the evaluation categories, and hence to develop an assessment of overall organizational capability, it is necessary to establish criteria for each of the evaluation categories. Summary criteria are displayed below for each category of evaluation.

AGENCY CONTRIBUTION TO PROBLEM SOLUTION

- A-1 Agency relationship to Nevada environmental goals
- A-2 Agency responsiveness to specific expressed needs/problems
- A-3 Potential for improvement to the erosion control system
- A-4 Potential for impact on erosion problems

PLANNING STRUCTURE

- B-1 Completeness and general quality of agency plans
- B-2 Plan feasibility with respect to attainment of stated goals
- B-3 Responsiveness to planning parameters
- B-4 Innovative characteristics and technical quality

TECHNICAL PERFORMANCE

- C-1 Actual (composite) performance level of all tasks
- C-2 Achievement of planned results
- C-3 Operational response: the address and solution of problems
- C-4 Maintenance of schedule

INFORMATION GENERATION

- D-1 Significance/authenticity of generated information
- D-2 Quantity and consistency of technical reporting
- D-3 Dissemination of information to appropriate sources
- D-4 Technical caliber of final agency reports

STAFF CAPABILITIES

- E-1 Management capability
- E-2 Staff technical capability
- E-3 Attitude with respect to task achievement

ORGANIZATIONAL ANALYSIS

- F-1 Effectiveness measures
- F-2 Efficiency measures
- F-3 Appropriateness of expenditures

ADMINISTRATIVE SYSTEMS

- G-1 Internal operational monitoring
- G-2 Response to correspondence and inquiries
- G-3 Regulatory process

GENERAL MEASUREMENTS

- H-1 Agency review and appeals procedures
- H-2 Degree of community involvement and support
- H-3 Degree of receptivity for revised/expanded role

METHODOLOGY

In this topic, a brief description of the recommended methodology is given for obtaining relevant information required for each of the criteria presented in the preceding section.

AGENCY CONTRIBUTION TO PROBLEM SOLUTION

A-1 Agency Relationship to Nevada Environmental Goals

Determine the relationship existing between the agency and the significant components of the relevant goals statements as they are described in the State of Nevada's environmental plans. Specifically, compatibility testing should be conducted to measure the agency statement of goals and objectives against the State's environmental goals and objectives, implementation plan and stipulated end results.

Ascertain the degree to which the accomplishments of the agency are likely to contribute to the achievement of the state environmental plan requirements.

A-2 Agency Responsiveness to Specific Expressed Needs/Problems

Rate the responsiveness of the agency, in a general sense, to the authenticated needs and problems being expressed in the erosion control system. If no obvious relationship exists, the evaluator should request that the agency director describe any needs/problems that influenced the development of the agency plans for erosion control.

A-3 Potential for Improvement to the Erosion Control System

Assess the potential improvements, or advancements in the "state of the art," that can conceivably result from the successful accomplishment of the agency's goals. For example, will the agency be likely to contribute technical substance and experience to the knowledge base of the related areas of the runoff and erosion control system, and provide a positive movement toward the attainment of specified goals contained within the state environmental goals?

A-4 Potential for Impact on Erosion Problems

Any specific runoff and erosion problem(s) noted by the agency should be reviewed by the evaluator. If erosion problems have not been identified by the agency, the evaluator can attempt to develop a possible connection between the agency's goals and the erosion targets stipulated in the Task Report. A summary assessment should be developed from the working of the agency being evaluated.

PLANNING STRUCTURE

B-1 Completeness and General Quality of Agency Program Plan

Review the agency program plan to determine whether it contains all of the standard elements required in a usable plan. The following components must be included in the plan:

- o Statements of purposes (goals/objectives)
- o An outline, or a description of the problem(s)
- o The planned course of action (tasks)
- o Expected results
- o Resource requirements
- o All necessary justifications and responsibility assignments
- o A schedule

Further, an analysis should be made to determine if the planned resources have actually been assigned (in terms of manpower and dollars) and whether the plan has been extended and detailed beyond the level of the original agency statement of work. The evaluator should also judge whether the agency plan represents a functional working document or has been used primarily as a sales tool.

B-2 Plan Feasibility With Respect To Attainment Of Stated Goals

A plan should indicate the probability of agency goals/objectives attainment that can be reached if the tasks are accomplished in the prescribed manner. In this situation, the evaluator must make a subjective judgment. It should also be stated whether, in the evaluator's opinion, the likely degree of goal attainment will be substantial or limited. Further, it should be determined if the stipulated goals and objectives are realistic and definitive.

B-3 Responsiveness To Planning Parameters

A plan should be based upon an objective assessment of the problems and needs of the clients and constituents for whom service is provided. The evaluator should determine what factors were considered in developing plans. Specifically, what social and economic constraints exist which influence plan development.

B-4 Innovative Characteristics And Technical Quality

Make an overall assessment, from a technical standpoint, of the general quality of the plan. For example, does it evidence advanced thinking and concepts in its construction and is it original? Compare the requirements of the plan with the visible, or demonstrated, technical capabilities of the agency director to judge whether he was likely to have either prepared, or directly supervised, the actual development.

TECHNICAL PERFORMANCE

C-1 Actual (Composite) Performance Level Of All Tasks

A measurement should be made of the actual versus planned level of accomplishment. The evaluator should attempt to determine whether the agency is likely to achieve the desired erosion control system end results based upon its performance to date. It will also be supportive to the analysis to note whether the agency director is addressing and accomplishing the difficult tasks as well as those which are less demanding.

C-2 Achievement Of Planned Results

Assess the probability that the desired end results will be attained. The results should be validated (to the extent possible) through analysis rather than total reliance on verbal comments and interpretation by staff members. The evaluator should attempt to determine, in those instances where it is applicable, if the designated target population is receiving the planned agency services.

C-3 Operational Response: The Address and Solution Of Problems

Examine major, identifiable problems which have arisen and evaluate the agency's demonstrated response to each situation. Determine whether an aggressive, or passive, attitude has been shown with respect to obstacles and the formulation of remedial solutions; the originality and resourcefulness demonstrated by the agency under these conditions should be evaluated. Notations should also be made of any tendencies to bypass difficult or unforeseen situations.

C-4 Maintenance Of Schedule

Test both for historical maintenance of established schedules and the general attitude toward meeting deadlines. In instances where the agency has fallen behind schedule, analyze attempts to regain the appropriate schedule position.

INFORMATION GENERATION

D-1 Significance/Authenticity Of Generated Information

Determine if the agency is generating a sufficient amount of appropriate technical data as an output. The data/information being produced should be carefully reviewed for significance and value.

D-2 Quantity and Consistency Of Technical Reporting

Assess the agency's consistency in maintaining a programmed schedule for data preparation and output. Analyze the historical level of performance in this area and note the degree of concern evidenced by agency personnel toward the development and perpetuation of technical information generated by this or a similar type of program.

D-3 Dissemination Of Information To Appropriate Sources

Examine the established data distribution pattern; determine whether the agency-generated information is being transmitted to the appropriate recipients. Ascertain how serious an attempt has been made

by the agency to determine who should receive this information and the general comprehensiveness of the distribution plan. Evidence should be sought that indicates the agency's apparent concern with making the information available to concerned/affected individuals/agencies.

D-4 Technical Caliber Of Final Agency Reports

It has been assumed, in establishing this particular criteria statement that all agencies will be required to generate final, formal reports, the possible exceptions being those oriented primarily toward the acquisition of land. The evaluator should attempt to assess the character and correctness of the planned final document through interrogation of the agency director and his staff. This should be supported with a judgment of the seriousness with which the agency views this responsibility.

STAFF CAPABILITIES

E-1 Management Capability

A judgment must be developed concerning the agency director's apparent management capabilities as an organizer, motivator and supervisor of work. The evaluator should also place a valuation on the director's inferred degree of dedication toward the accomplishment of runoff and erosion control programming.

E-2 Staff Technical Capability

Assess the collective credentials and quality of the staff with respect to the total agency requirements.

E-3 Attitude With Respect To Task Achievement

Assess the apparent degree of staff dedication to erosion control programming and the level of determination shown toward meeting program objectives and deadlines.

OPERATIONAL ANALYSIS

F-1 Effectiveness Measures

The evaluator should probe to identify the criteria used to assess organizational effectiveness by the Department Director. Specifically, how does the Director tell strengths and weaknesses of the organization?

F-2 Efficiency Measures

The evaluator should probe to identify the parameters used to assess organizational efficiency. Specific parameters should be discussed with the Director including: cost estimate versus actual expense; planned versus actual manpower; and planned versus actual schedule. Where variances exist, specific justifications should be discussed with the Director.

F-3 Appropriateness Of Expenditures

The evaluator should ask the Director to explain budget estimate parameters. How does the agency or organization develop budget plans? What type of measures are used to assess unit cost values? Does the agency conduct comparative analysis of various projects or tasks?

ADMINISTRATIVE SYSTEMS

G-1 Internal Operational Monitoring

The evaluator should determine if the agency maintains key logs and records that provide good historical visibility of the agency's operations. Specific questions should be raised in regard to records on environmental concerns with special emphasis on problems of controlling runoff and erosion.

G-2 Response To Correspondence And Inquiries

The evaluator should review the agency's procedures on inquiries and correspondence. Specifically, the evaluator should ascertain approximate response time for answering questions and requests for information. In particular, determine if accurate records are maintained on specific environmental and erosion control inquiries.

G-3 Regulatory Processes

The evaluator should assess the agency's regulatory procedures (if applicable). Special emphasis should be placed on adequate documentation of requirements, decision and programs designed to enhance or maintain the environment.

GENERAL MEASUREMENTS

H-1 Agency Review And Appeals Procedures

The evaluator should probe to identify the agency's formal and informal review and appeals procedures. Special emphasis should be placed

on the process used by both other agencies and the general public to resolve disagreements and conflicts on environmental issues. Specifically, does the agency have a review or appeals panel? If so, who serves on it and what are their duties and responsibilities?

H-2 Degree Of Community Involvement And Support

The evaluator should inquire as to process and procedures used by the agency to gain understanding of the community's concerns. Additionally, the agency's plans and programs to gain community support should be discussed. Special emphasis should be placed on identifying special constituent groups of the agency.

H-3 Degree Of Receptivity For Revised/Expanded Role

Assess the current program focus of the agency in response to runoff and erosion control system and concepts. Review the clarity of programs in relation to the agency's goals and objectives.

To what extent do they view erosion and runoff as a problem within Nevada, particularly relative to other perceived problems?

PROCEDURAL STEPS

Use of the evaluation model requires collection and analysis of data in a comprehensive and consistent manner. Questionnaires developed for data collection are described in a subsequent section of this report.

The questionnaires were designed to obtain detailed information on each of the criteria for organizational evaluation previously described. An actual organizational assessment, however, requires consolidation of this information into specific evaluation factors. A total of 12 evaluation factors were selected, and an analysis form prepared to be used in developing numeric values for the evaluation factors. The analysis form, shown on the following pages, provides a mechanism of utilizing the questionnaire data to derive evaluation factor values.

Based upon discussions with the Sounding Board, a review of the literature on Institutional Evaluation, as well as a brief field test of an interview questionnaire, the 12 evaluation factors were aggregated into 6 components for organizational assessment. The diagram on page 179 shows the procedural steps.

The following is a summary of the six components:

Interviewer: _____

Agency: _____

Date: _____

Agency Code: _____

INSTITUTIONAL EVALUATION MODEL
Analysis Form

rating -- "0" - if not applicable
 "1" - lowest rating
 "5" - highest rating

	Rating
1. A. <u>Capability to Plan</u> within Organization (review responses to questions 2 and 3) <u>RATIONALE:</u>	
B. <u>Capability to Implement</u> within organization (review responses to questions 1, 5, 6, 7 and 8) <u>RATIONALE:</u>	
C. <u>Capability to Control</u> within organization (review responses to questions 8, 9, 10, 11, 12 and 13) <u>RATIONALE:</u>	
2. Functional support assessment - <u>Planning</u> (review responses to questions 1, 6 and 7) <u>RATIONALE:</u>	
3. Functional support assessment - <u>Technical Assistance</u> (review responses to questions 1, 6 and 7) <u>RATIONALE:</u>	
4. Functional support assessment - <u>Financial Assistance</u> (review responses to questions 1, 6 and 7) <u>RATIONALE:</u>	

	Rating
5. Functional support assessment - <u>Guideline and Regulatory Assistance</u> (review responses to questions 1, 6 and 7) <u>RATIONALE:</u>	
6. Functional support assessment - <u>Monitoring and Assessment</u> (review responses to questions 1, 6 and 7) <u>RATIONALE:</u>	
7. <u>Sensitivity to erosion (run-off) problem</u> (review responses to questions 2D, 4, 5, 6, 10F and 18) <u>RATIONALE:</u>	
8. <u>Willingness to accept greater role in erosion control</u> (review responses to questions 6E, 7H, 8C, 9H, 10F, 16, 17, 18, 19 and 21) <u>RATIONALE:</u>	
9. <u>Community Involvement</u> (review responses to questions 1, 13, 14, 15, 16 and 17) <u>RATIONALE:</u>	
10. <u>Overall Assessment of Management's ability to accept expanded role.</u> (review responses to questions 10, 11, 12, 13, 14, 16, 17, 18, 19, and 21) <u>RATIONALE:</u>	

1. General Organizational Functioning -- This category relates to the overall ability of the organization to plan, implement and control-- the three categories of organizational functioning. Planning refers to the ability of an organization to define work output and process objectives, to set target dates, and to allocate resources.

Once organizational plans are developed, implementation becomes possible. Each organization is assessed on its ability to meet the goals, objectives and tasks identified in their agency plan.

Organizational control was viewed as the ability of an organization to assure consistency between planned and actual operation; and, to identify and mediate problems prior to their reaching crisis proportion.

2. Functional Support -- Five separate areas are under the general heading of functional support: planning; planning and technical assistance; financial assistance; guideline and regulatory assistance; and monitoring and assessment. Functional support is viewed as the capability and effectiveness of an agency to provide support and service in these functional areas. Obviously, some agencies provide a wider range of support than do others who are more specialized. As such, the assessment of capability and effectiveness on each separate area must be considered.
3. Sensitivity to Runoff and Erosion Problems -- This criteria was specifically chosen to provide an indicator of awareness to the problems under study. To the extent that an organization does not view runoff and erosion control as "its concern" or does not perceive it as a significant problem, then it is unlikely that the organization will commit its resources to the problem.
4. Willingness to Accept a Greater Role in Erosion Control -- While some agencies may not currently be involved in providing support in the area of erosion control, these same agencies may be both willing and capable of providing it. Moreover, some existing organizations, either due to their enabling legislation or to their goals, plans and programs, may currently be involved but are neither interested nor willing to continue in this role. Finally, assessing agencies along this criteria enables the project staff to identify the "form" of support (financial, planning, etc.) that these organizations were willing and able to provide, if at all.
5. Community Involvement -- This criteria was used to assess the organization in two ways; one was the capability of the agency to solicit and involve the public in planning and decision-making process, the other was the capability of the agency to provide information and educational packages.

PROCEDURAL STEPS

Evaluation
Factor

Valuation

Component
Average
Value

Significant
Component
Statements

Evaluation
Report
Assembly

1A - CAPABILITY TO PLAN

(1)

1B - CAPABILITY TO IMPLEMENT

1C - CAPABILITY TO CONTROL

2 - PLANNING

3 - TECHNICAL/PLANNING ASSISTANCE

4 - FINANCIAL ASSISTANCE

5 - REGULATORY

6 - MONITORING & ASSESSMENT

7 - SENSITIVITY TO EROSION

8 - ACCEPTANCE OF GREATER ROLE

9 - COMMUNITY INVOLVEMENT

10 - CAPABILITY FOR GREATER ROLE

(2)

+

(3)

+

+

(4)

Composite
Statistical
Rating

(5)

Summary
Analysis and
Findings

Supplemental
Information

NOTES:

- (1) The numerical ratings assigned by the evaluator within each category.
- (2) Average Valuation for each component (e.g., combinations of 1A, 1B & 1C).

- (3) Isolation and assembly of significant statements pertaining to each component. These should be extracted from the "Comments" section of the Evaluation Format and used as the primary basis for the documentation process.
- (4) Total project average. composite of the six components.
- (5) Main body of evaluation report: documented observations, findings and recommendations

6. Overall Assessment of Management's Ability to Accept an Expanded Role -- This final criteria provides an overall assessment of the focus and direction of the organization as perceived by senior management. This view from "the top" of an organization is a strong indicator of the likelihood of success in an expanded role, notwithstanding the capability of the agency as viewed from its resource set to implement an expanded role.

ASSESSMENT OF AUTHORITIES AND PROGRAMS

The second step in the evaluation process is an assessment of the governmental authorities or programs extant in Nevada which deal with the control of accelerated erosion and attendant water quality problems. Present programs for the control of accelerated erosion from land-disturbing activities are viewed as spotty, unconsolidated, and variably enforced. Federal land management agencies exert some control. State agencies and their subdivisions provide additional forms of regulations. Conservation districts and irrigation districts sponsor voluntary control programs. Cities and counties possess building and grading authorities which pertain to some extent.

Certain criteria were developed in order to conduct the assessment. The process of developing criteria begins with the listing of standard functions which traditionally comprise governmental authorities and programs in general. These functions include:

- o The establishment of goals, policies, and objectives;
- o the establishment of standards, either performance or specification;
- o the development of plans, both comprehensive and site-specific;
- o the issuance of permits to conduct specific activities - major permit categories include land operations, stream operations, water use, effluent discharge, resource allotment, and building construction;
- o the approval of plans developed by others;
- o the monitoring of activities conducted by others;
- o enforcement of regulations, usually coupled with permit, standard or plan approval authorities;
- o the provision of financial assistance, in the form of grants, loans, or incentives;
- o education on runoff and erosion control, either in the form of technical assistance or the raising of public awareness of runoff and erosion problems;
- o the construction, operation and maintenance of public works aimed at runoff and erosion control.

Taking one activity sector at a time, the authorities and programs pertinent to runoff and erosion control are then compared to the functions listed above. This comparison begins a 3-step process to analyze the

adequacy and appropriateness of existing authorities and programs. The process, diagrammed on the following page, shows a logical sequence of three questions, the answers to which lead to the identification of needs for new or refined authorities and programs.

The first question basically asks whether each one of the governmental functions is present in existing authorities or programs (e.g., do standards exist for a particular activity sector?). Two alternative responses are possible; either the functions are present ("they are there") or they are not. If the functions are not present, the task is to identify why not.

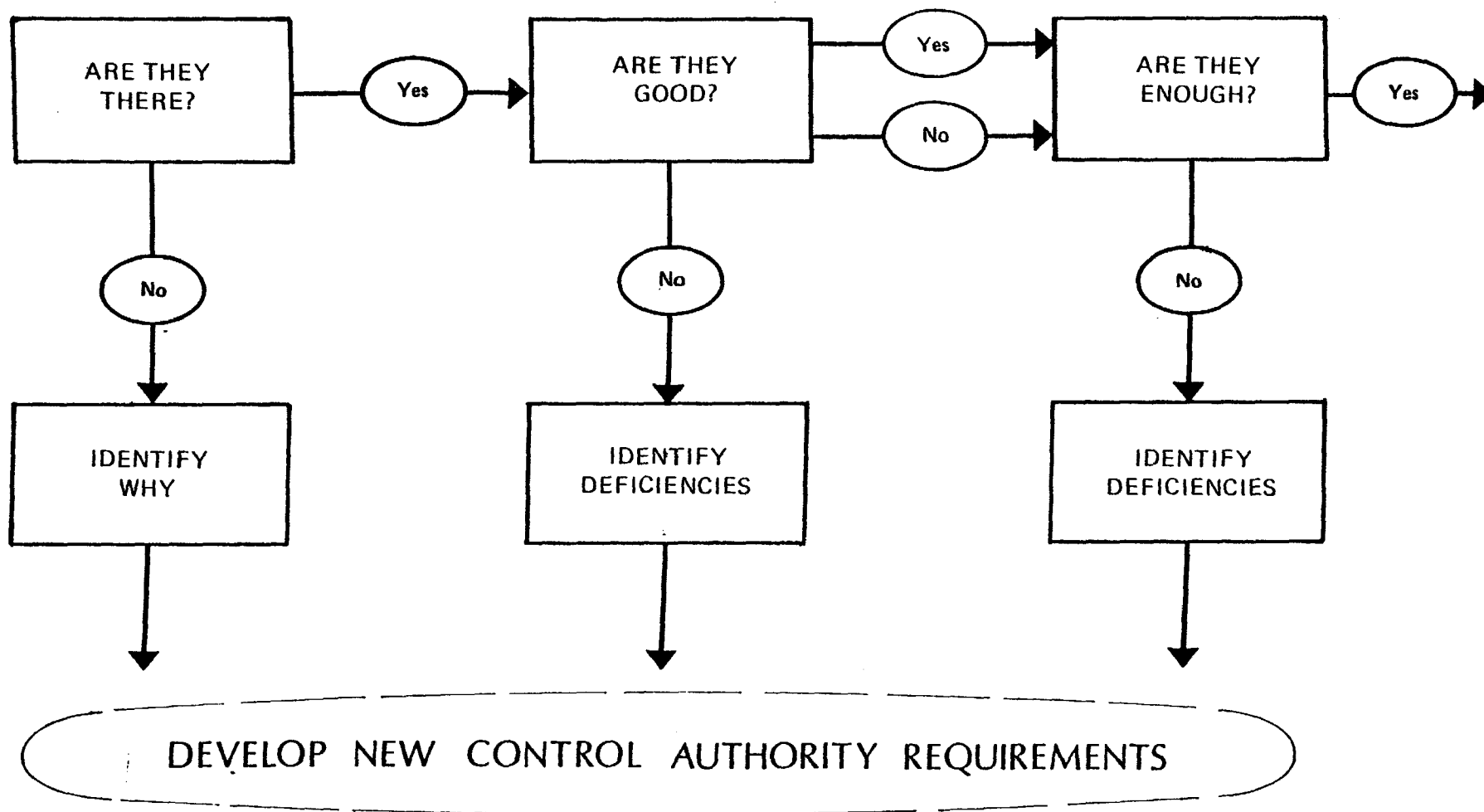
Assuming that the functions are present, the second question is a qualitative assessment; that is, with respect to each function present, are the existing authorities appropriate ("are they good")? For example, if the function of standards is present, is the type of standards "good"? To answer this, it is necessary to define the characteristics of an ideal authority or program aimed at the control of erosion and attendant water quality problems. A comprehensive list of "ideal" characteristics includes the following:

1. provide the earliest control;
2. utilize preventive (source control) techniques;
3. factor in social and economic considerations;
4. provide governmental approval of activities;
5. require little paperwork;
6. provide rapid procedures for approval or disapproval;
7. provide variance opportunities, but not open ended;
8. provide appeal procedures;
9. mesh assistance with regulations;
10. be flexible to allow proper application to local situations;
11. provide baseline levels of control;
12. cause the least stress to the regulated and regulator;
13. closely approximate existing authorities;
14. provide for adequate notice;
15. provide effective sanctions;
16. provide for public participation;
17. be periodically reviewed and updated;
18. be comprehensive in their coverage.

These characteristics can be aggregated into eight generalized characteristics, as follows:

1. recognize water quality;
2. consider preventive or source control techniques;
3. factor in social and economic considerations;
4. provide rapid and simple procedures;

ANALYSIS OF AUTHORITIES AND PROGRAMS



5. provide variance (or alternative) opportunities in the application of controls, but not open ended;
6. provide for public participation;
7. provide for periodic evaluation.

Additionally, the total of all authorities and programs should:

8. cover the entire state.

The answers to Question two serve to evaluate the appropriateness of existing programs and authorities. The evaluation is completed once the adequacy of programs and authorities is assessed.

This is the third question, the answer to which reflects whether a governmental function fulfilled by an authority or program has enough resources or coverage needed to meet the potential problems posed by an activity sector. For example, if erosion standards exist for residential building construction and none exist for commercial building construction, this situation would reflect a lack of coverage.

By going through this 3-step process for each activity sector, function by function, existing authorities and programs can be evaluated. However, once the evaluation is completed, it must be viewed in its entirety with respect to all of the functions. This is necessary in order to avoid the pitfall of concluding that all of the functions which may be evaluated as deficient need to be strengthened. For example, if five functions are deemed deficient, only one or two may need strengthening for the purpose of attaining water quality goals.

QUESTIONNAIRES

The evaluation system requires collection of data in a comprehensive manner consistent with the criteria, and supporting methodology described previously. This is best accomplished through the use of questionnaires, where answers are obtained to specific questions, thereby generating structured data and information.

Because of the differing nature of the agencies about which information was needed, and the requirement that some agencies be contacted by mail while others were interviewed, three separate questionnaires were developed.

Questionnaire #1 was intended for use in interviewing those federal agencies operating within the State of Nevada which do not play an active or dominant role in runoff and erosion control. For these agencies, the major thrust of inquiry related to the nature of their programs and resources which are now, or could be in the future, beneficial in controlling runoff and erosion in Nevada.

Questionnaire #2 was designed to gather in-depth information about the agencies identified as key in implementing any successful erosion control program in Nevada. It was used in the interviews of all agencies which could potentially have a major role in a new or modified runoff and erosion control program.

Questionnaire #3 is a paper-and-pencil questionnaire intended for mail distribution to regional and local agencies which could be involved in an erosion control program. It was used instead of personal interviews.

The questionnaire forms used are included on the following pages. The Data Collection Process section provides details on specifically how the questionnaires were used in collecting the data required for this project.

NEVADA ACCELERATED EROSION CONTROL PROJECT
QUESTIONNAIRE #1

Interviewed by: _____

Agency: _____

Person Interviewed: _____

Agency Code: _____

Title: _____

General Content Areas

- * General View Erosion Control Problem in Nevada
- * Specific Views of Non-point Source Erosion Control
 - * Factors which impact and extent of impact
 - * Agencies response to these factors
 - * Future plans of agency
- * Agencies' view of Nevada's ability to:
 - * Recognize problems
 - * Impact problems

Questions

1. Tell me a little about your agency.
 - A. Does your agency have Resource Management and/or control responsibility?
 - B. What resources and programs of your agency are available in Nevada?
2. To what extent do you view erosion as a problem in Nevada?

none some moderate major

3. What are some of the factors which you see as contributing to erosion in Nevada?

Note to Interviewer: For each factor identified ask:

- A. How does this impact erosion in Nevada?
- B. To what extent do you feel it is a contributing factor?

Note to Interviewer: For each factor not raised by respondent (see list) ask:

What about _____? Do you view it as a contributor? Then 3A & B

Questionnaires (#1 & #2)

Agency Name: _____

Agency Code: _____

What are some of the factors which you see as contributing to erosion in Nevada?

NOTE TO INTERVIEWER: For each factor identified ask: A. To what extent do you feel it is a contributing factor?

B. How does this impact erosion in Nevada?

Factors	Extent				How
	None	Some	Moderate	Major	
1. Grazing.....					
2. Irrigated Agriculture					
3. Camp Grounds.....					
5. Recreational Home Development.....					
6. Commercial/Industrial Development..					
7. Mobil Home Development					
8. Residential Development.....					
9. Recreation Trails					
10. Logging.....					
11. Urban Runoff.....					
12. Highways.....					
13. Roads.....					
14. Access Roads.....					
15. Railroads.....					
16. Channeling or other Stream Modifications					

4. Note to Interviewer: For those non-point source factors identified as moderate or major ask:

A. How does your agency respond to _____?

B. What do you see as the future?

5. Let me move to a more general topic. Federal agencies generally provide one or more services directly or indirectly to state agencies. For example, in Nevada, does your agency offer planning assistance on erosion control? ____ Yes ____ No

If Yes, a. Could you tell me a little bit about what your agency does in this regard?

b. What types and extent of resources is the agency currently committing?

c. What about the future?

Note to Interviewer: Ask same set for

* Technical Assistance

* Financial Assistance

* Control Guidelines, Regulations, Monitoring and Enforcement.

6. On another topic: Generally, how satisfied are you with the cooperation between your agency and the various state and local agencies you work with?

A. Which state or local agencies do you find easiest to work with? Why?

B. Which do you find most difficult? Why?

7. In a similar vein, which state or local agencies do you feel would be effective in dealing with non-point source erosion problems? Why?

A. Which do you feel would be least effective? Why?

8. By the way, what do you believe are the major factors limiting an effective non-source point erosion control system in Nevada?

9. Do you have any suggestions how these adverse factors may be best dealt with?
10. In dealing with the problems of erosion control, several approaches can be taken. Which approach do you feel would be most effective and why?
 - * Education - planning and technical assistance
 - * Regulatory - scope, type, enforcement mechanism, area
(see attachment)

(Note to Interviewer: Probe willingness to accept this role as part of the agency's responsibilities)
11. Is there anything else you can tell me which you feel might be helpful in this study?

Other questions from review of agency file, as appropriate, should be asked.

NEVADA ACCELERATED EROSION CONTROL PROJECT
QUESTIONNAIRE #2

Interviewed by: _____ Agency _____
Person Interviewed: _____ Agency Code _____
Title: _____

General Content Areas

1. Capability to plan, implement, and control within organization
2. Overall effectiveness measures
3. Functional assessment of support capabilities:
 - * Comprehensive planning
 - * Provision of technical assistance
 - * Ability to provide financial assistance
 - * State-wide
 - * Local government
 - * Private sector
 - * Regulatory responsibilities
 - * Monitoring and enforcement
4. Sensitivity to erosion problems and willingness to deal with problems
5. Community education and involvement process

Questionnaire

1. Would you tell me a little about your agency?
 - A. What is the role or mission of your organization?
 - B. How is the agency organized; for example, are there District operations provided?
 - C. What types of resources are available (money, manpower, facilities).
2. Could you tell me about the internal program planning process your agency uses?
 - A. What are your agency's goals and objectives?
 - B. How are your agency's goals established?
 - C. How are priorities set for programs or services?
 - D. What are some of the key parameters used in your planning process?
 - E. How does your agency know if your plans are being accomplished?

3. As you may know, Nevada Environmental Protection Services has developed an environmental plan. To what extent was your agency involved in its development?

none some moderate major

If none, go to question 4; otherwise ask:

- A. Could you tell me a little bit about how your agency was involved?
B. How do your goals and plans relate to those in the state's plans?

4. To what extent do you view non-point source erosion as a problem in Nevada?

none some moderate major

5. What do you believe are major contributors to erosion in Nevada?

NOTE TO INTERVIEWER: For each ask:

- A. How does this impact erosion in Nevada?
B. To what extent do you feel it is a contributor to the erosion control problem?

NOTE TO INTERVIEWER: For each item not raised by respondent (see list) ask:

What about _____? Do you view it as a contributor? Then ask 5A and B above.

6. NOTE TO INTERVIEWER: For those rated a moderate or major.

- A. How does your agency respond to _____?
B. Could you tell me a little about the type and extent of resources your agency expends on the erosion problem?
C. What impact do you feel your agency is having?
D. How do you assess the effectiveness of this effort?
E. What about the future? What plans does your agency have to deal with this aspect of erosion?

Questionnaires (#1 & #2)

Agency Name: _____

Agency Code: _____

What are some of the factors which you see as contributing to erosion in Nevada?

NOTE TO INTERVIEWER: For each factor identified ask: A. To what extent do you feel it is a contributing factor?
B. How does this impact erosion in Nevada?

Factors	Extent				How
	None	Some	Moderate	Major	
1. Grazing.....					
2. Irrigated Agriculture					
3. Camp Grounds.....					
5. Recreational Home Development.....					
6. Commercial/Industrial Development..					
7. Mobil Home Development					
8. Residential Development.....					
9. Recreation Trails					
10. Logging.....					
11. Urban Runoff.....					
12. Highways.....					
13. Roads.....					
14. Access Roads.....					
15. Railroads.....					
16. Channeling or other Stream					
Modifications					

7. Let me move to a more general topic:

Would you tell me a little about functions performed by your agency?

For example, does your agency offer planning and technical assistance on environmental concerns and more specifically on erosion control?

Planning/Technical Assistance
yes no

If yes, ask:

- A. Could you tell me a little about the process of providing this support, e.g., How does your agency provide the service?
- B. What type and extent of resources is the agency currently committing?
- C. To what extent does your agency view the service as a major priority?

not at all low moderate high

- D. Generally who are the recipients of this service? (NOTE TO INTERVIEWER: If response is "the public", probe to find out what segment, e.g., special interest groups receive this service).
- E. How do you assess the effectiveness of this effort?
- F. How effective do you feel your agency is in providing the service?

not at all somewhat moderate very

- G. How do you think the recipients of the service would rate your agency in terms of effectiveness?

not at all somewhat moderate very

- H. What about the future?

NOTE TO INTERVIEWER Ask the same set of questions for:

- * End Product Planning
yes no
- * Financial Assistance
yes no
- * Guidelines and Regulatory
yes no
- * Monitoring and Enforcement
yes no

8. Let me move to a new subject. Could you tell me about your agency's internal control process?

A. How do you measure overall performance?

B. How do you identify potential problem areas, e.g. in performance or scheduling?

C. What happens when you identify a potential problem -- could you give me an example of how you deal with a typical problem.

NOTE TO INTERVIEWER: Probe for any tendency to by-pass or ignore problems.

9. Along this same line, one area I am very interested in is the information process of your agency. Could you tell me the types of data your agency collects and/or disseminates which you believe are helpful in assessing problems of erosion? If none go to question 10:

A. Would you tell me about the data collection process?

B. How often is the data collected?

C. What form of quality control is used to assure quality and consistency of data?

D. Who are the recipients of the data you collect? (Probe to see if agency knows how other agencies utilize this data).

E. How do you assess the quality of the data collection process and content

F. How would you rate the quality of your data collection and dissemination process?

Not at all

Low

moderate

high

G. How do you think the recipient of this data would rate your agency in terms of the data it receives?

Not at all

Low

moderate

high

H. What plans does your agency have to improve its collection and dissemination process?

Questionnaire #2
Page 6

10. Let me ask you a little about the management capabilities of your organization.
 - A. Could you tell me how you view your role as a manager? (Probe about how the manager plans, motivates, organizes and controls the agency).
 - B. Generally, what do you look for in a new staff-member?
 - C. How about the type of individual you view as a manager, what skills and background do you feel are important?
 - D. How do you measure the overall quality of your staff?
 - E. What do you do when a member of your staff is not performing well?
 - F. How would you assess your staff's commitment to attaining environmental goals?
11. As a manager, how do you assess the effectiveness and efficiency of your staff and your agency?
12. Are you satisfied with your agency's internal control process? If you could change anything to improve control, what would you do?
13. Could you tell me about your agency's regulatory role? (Probe for documentation, consistency, decision process and review process).
14. Would you tell me about your agency's review and appeals procedures? If none, skip to 15.
 - A. Is there an independent review process? If so, describe who reviews and their duties and responsibilities?
 - B. How do you assess the equity in the review and appeal process?
 - C. Roughly what percentage of these appeals are upheld?
 - D. Are there formal procedures for appeals?
15. Does your agency view community education and involvement as a primary role?
 - A. What processes, formal or informal, are used?
 - B. How does your agency involve the general public in planning and review of agency operations?
16. By the way, what do you believe are the major factors limiting an effective accelerated erosion control system in Nevada?
17. Do you have any suggestions how these adverse factors may be best dealt with?

18. In dealing with the problems of erosion control, several approaches can be taken. Which approach do you feel would be most effective, and why?
- * Education - planning and technical assistance
 - * Financial Assistance
 - * Regulatory - scope, type, enforcement mechanism, area
- (Note to Interviewer: Probe willingness to accept this role as part of the agency's responsibilities)
19. Assuming erosion control is to become a more significant aspect of your agency's operations, what changes would be required?
- A. How would this occur?
 - B. What problems would you anticipate?
 - C. What could be done to resolve these problems?
 - D. How would you assess the effectiveness of your agency's response to this revised requirement?
20. What state, Federal, and local agencies do you work with in matters of accelerated erosion?
21. How satisfied are you with the cooperation between your organization and each of these agencies?
22. In a similar vein:
- A. Which state or local agencies do you feel are or would be most effective in dealing with accelerated erosion problems? Why?
 - B. Which do you feel are or would be least effective? Why?
23. Is there anything else you can tell me which you feel might be helpful in this study?

Other questions from review of agency file, as appropriate, should be asked.

Local Agency Survey

Questionnaire #3
Page 1

Agency Name: _____

1. What type of organization do you represent?

___ Regional Planning Agency

___ Conservation District

___ Irrigation District

___ City Government

___ County Government

If you have checked City or County:

Which Department do you represent?

___ Executive Office

___ Clerks Office

___ Planning Department

___ Public Works

2. How many people are employed by your organization? (Note: If you have checked City or County, please answer for your Department only.)

___ no paid employees

___ 7 - 10 paid employees

___ 1 - 3 paid employees

___ 11 - 20 paid employees

___ 4 - 6 paid employees

___ 21 or more paid employees

Agency Service Orientation

3. Public agencies provide a variety of services to their constituencies. Please indicate the relative emphasis your agency or organization assigns to each of the following. (If your agency does not provide service in a specific area, please check none):

EMPHASIS OF AGENCY

Service	None	Very Low	Moderate	High
Public Health				
Public Safety				
Social Services				
Public Education				
Environmental Protection				
Public Works				
Land Use Planning & Control				
Economic Productivity				

4. As you know, erosion and runoff from land disturbing activities (e.g., mining, agriculture grazing, construction, forestry, roads) can cause water pollution. To what extent do you believe that erosion and runoff from land disturbing activities represent a problem in the State of Nevada?

Not at all

Somewhat

Moderate

Major

Questionnaire #3, Page 2

5. The following is a list of land disturbing activities which are possible contributors to the problem of erosion and runoff. Please indicate to what extent you view each as contributing to erosion and runoff in your area. Then please indicate whether or not your agency has regulations to control this activity.

Activity	Extent of Contribution to Erosion Problems				Does your Agency Regulate this Activity	
	None	Some	Moderate	Major	Yes	No
1. Grazing _____						
2. Irrigated Agriculture _____						
3. Camp Grounds _____						
4. Recreational Home Development _____						
5. Commercial/Industrial Development _____						
6. Mining _____						
7. Residential Development _____						
8. Recreational Trails _____						
9. Logging _____						
10. Urban Runoff _____						
11. Highways _____						
12. Roads _____						
13. Access Roads _____						
14. Railroads _____						
15. Chaneling or other Stream Modifications _____						

6. Which of the following approaches do you currently use to control or limit erosion and runoff from land disturbing activities?

Approach	Extent of Use			
	None	Very Low	Moderate	High
Planning				
Technical Assistance				
Financial Assistance				
Public Works (Design & Installation)				
Regulation				
Zoning				
Subdivision ordinances				
Grading ordinances				
Street and Road ordinances				
Grazing permits				
Mining Permits				
Pollutant Discharge Controls				

Agency Variance Procedure

7. Public agencies generally provide a procedure which permits applicants to obtain a variance from a standing requirement (for example, a zoning ordinance). Would you please describe, in general, how an applicant goes about requesting and obtaining a variance?

Agency Appeals Procedure

8. If your agency has regulatory responsibilities, would you please describe, in general, how an applicant goes about appealing a decision (except for subdivisions)?

Approaches to Impact Problems Associated with Erosion

9. If you were able to provide additional effort, to what extent do you believe additional effort in each of the following approaches would reduce the likelihood of erosion and runoff?

Approach	Effectiveness			
	None	Some	Moderate	Major
Planning				
Technical Assistance				
Financial Assistance				
Public Works (Design & Installation)				
Regulation				
Zoning ordinances				
Subdivision ordinances				
Grading ordinances				
Street and Road ordinances				
Grazing permits				
Mining permits				
Pollutant Discharge Controls				

Acceptability of Approaches

10. Based upon your experience, how willing is your agency to accept additional responsibility for each of the following approaches?

Greater Role in:	ACCEPTABILITY			
	Not at all	Somewhat	Moderate	Major
Planning				
Technical Assistance				
Financial Assistance				
Public Works (Design & Installation)				
Regulation				
Zoning ordinances				
Subdivision ordinances				
Grading ordinances				
Street and Road ordinances				
Grazing permits				
Mining permits				
Pollutant Discharge Controls				

Organizational Level for Additional Responsibility

11. Assuming that additional responsibility were given to governmental agencies for limiting and controlling erosion and runoff from land disturbing activities, which level of government do you feel would be the most effective in offering the following?

Type of Service	LEVEL OF GOVERNMENT			
	Local Agency (City, County, etc.)	Regional	State	Federal
Financial Assistance				
Technical Assistance				
Planning				
Regulation				
Monitoring and Inspection				
Public Works Projects				

Comments, if any:

Effectiveness of Other State Agencies

12. A number of state agencies are currently providing services which serve to control and limit erosion and runoff from land disturbing activities. How effective do you feel each of the following agencies is in dealing with erosion and runoff concerns?

EFFECTIVENESS

Agency	No contact	Not at all	Somewhat	Moderate	Very
Environmental Protection Services (formerly Bureau of Env. Health)					
Department of Fish and Game					
Department of Highways					
Department of Agriculture					
Division of Conservation Districts					
Division of Forestry					
Division of State Lands					
Division of Water Resources					

Other:

13. What do you believe are the major factors limiting a more effective erosion and runoff control system in Nevada?

14. Do you have any suggestions how these limiting factors may be best dealt with?

For additional information, contact:

Your Name_____
Phone

DATA COLLECTION PROCESS

As a result of the work performed early in the project, the basic agencies and programs relating to runoff and erosion control in Nevada were identified. In order to fully analyze these agencies and programs within the context of the evaluation model, specific additional detailed information was required.

The project staff attempted to evaluate the maximum number of organizations feasible within cost constraints. The preferred method of data collection is through personal interviews. An alternate, but less effective method, is to mail out a paper-and-pencil questionnaire.

As anticipated, resources available for on-site investigations were limited in comparison to the eligible array of active organizations. Because of this condition, a priority framework was established to assure a maximum degree of evaluative coverage by the project staff.

The following parameters were utilized for the purpose of selecting organizations to be interviewed:

- o All state agencies involved with the establishment of Environmental Policies and/or Programs.
- o All state and federal agencies responsible for land and/or water use and control.
- o A sample of local units of government geographically disbursed and including:
 - o Counties
 - o Cities
 - o Conservation Districts
 - o Irrigation Districts

The agencies selected for interview and the questionnaire used for each were the following:

Agency	QUESTIONNAIRE		
	#1	#2	#3
<i>Federal</i>			
Environmental Protection Agency	X		
Bureau of Land Management		X	
Soil Conservation Service		X	
Corps of Engineers	X		
Forest Service		X	
Federal Highway Administration	X		
Agricultural Stabilization and Conservation Service		X	
<i>State</i>			
Environmental Protection Services		X	
Department of Fish and Game		X	
Department of Highways		X	
Department of Agriculture		X	
Division of Conservation Districts		X	
Division of Forestry		X	
Division of State Lands		X	
Division of Water Resources		X	
<i>Regional/Local</i>			
Tahoe Regional Planning Agency		X	
Clark County		X	
Elko County		X	
Washoe County		X	
North Las Vegas		X	
Yerington		X	
Reno		X	
Elko		X	
Irrigation District (one)		X	
Conservation District (one)		X	
Cooperative Extension Service		X	
Other Cities			X
Other Counties			X
Other Irrigation Districts			X
Other Conservation Districts			X

INTERVIEWS

The information required on the selected organizations was secured through personal interviews. These interviews were conducted by a

three-man team consisting of Jim Breitlow, Nevada Department of Human Resources, Environmental Protection Services; Gordon Ebling, Stevens, Thompson & Runyan, Inc.; and Bruce Scott, Vasey-Scott Engineering Inc. The initial interview was conducted with the Soil Conservation Service in Reno on January 19, 1976. All three members of the team participated in that interview in order to calibrate the questionnaire and interview process. Each subsequent interview was conducted by one member of the team and took from one to three hours. The duration of the interview and the actual team member conducting the interview depended on the agency being interviewed.

Each interview consisted of the following steps:

1. A phone contact was made to establish the date and time of the interview, as well as the interview participants. In each case an attempt was made to secure time with the senior person or persons in the organization. The attempt was successful in most instances.
2. A follow-up letter was sent confirming the interview, and describing the content areas to be covered.
3. The team member scheduled to conduct the interview reviewed all descriptive materials about the agency that had already been collected.
4. The interview was conducted, using the appropriate questions, as contained in Questionnaire #1 or #2.
5. A complete set of interview notes was prepared.
6. A summarized set of interview observations and conclusions was prepared, and sent to the interviewed agency for review, comment, and verification.

MAIL-OUTS

To those local units of government not selected for interview, a paper-and-pencil questionnaire was sent. This provided each principally-involved agency operating within Nevada with an opportunity to supply information which could be incorporated into the evaluation process. Tabulated on the following page is a listing of agencies to which questionnaires were sent, and an indication of which agencies responded. In most cases, no attempt was made to follow-up with those agencies which did not respond. An exception was several key Conservation Districts where personal contact was made at the request of the Districts in lieu of the Conservation District completing the questionnaire.

	RESPONSE	
	Yes	No
<i>Cities</i>		
Boulder City	X	
Caliente		X
Carlin		X
Carson City	X	
Ely		X
Fallon	X	
Gabbs		X
Henderson	X	
Las Vegas	X	
Lovelock	X	
Sparks	X	
Wells		X
Winnemucca		X
<i>Counties</i>		
Churchill		X
Douglas	X	
Esmeralda	X	
Eureka	X	
Humboldt	X	
Lander		X
Lincoln	X	
Lyon		X
Mineral		X
Nye		X
Pershing	X	
Storey		X
White Pine		X
<i>Irrigation Districts</i>		
Carson-Truckee Water Conservancy District		X
Carson Water Subconservancy District		X
Pershing County Water Conservation District	X	
Truckee-Carson Irrigation District		X
Washoe County Water Conservation District	X	
		Cont'd

	RESPONSE	
	Yes	No
<i>Conservation Districts</i>		
Big Meadow	X	
Carson Valley		X
Clark County	X	
Clover		X
Dixie Valley		X
Duck Valley	X	
Esmeralda		X
Eureka	X	
Fernley	X	
Gerlach	X	
Jiggs	X	
Kings River		X
Lahontan		X
Lamoille	X	
Lander	X	
Lincoln	X	
Mason Valley		X
Northeast Elko	X	
North Truckee		X
Owyhee		X
Pahrump	X	
Paradise Valley	X	
Quinn River		X
Ruby	X	
Smith Valley	X	
Sonoma	X	
Starr Valley		X
Stillwater		X
Tahoe-Verdi	X	
Tonopah	X	
Vya		X
Washoe Valley	X	
White Pine		

Out of a total of 64 questionnaires sent out, 36 were returned for a response rate of 56 percent.

Agency Evaluation

Evaluation of the agencies involved in control of runoff and erosion in Nevada was conducted in accordance with the methodology described in the preceding section. The primary data source on the agencies of interest was the interview process which was structured to obtain information on specific topics. Aggregation of this data in various ways permits an assessment of the current or prospective capability of each agency to perform certain functions.

AGENCY CAPABILITIES

The functions to be considered for evaluation purposes were derived from the evaluation model, and included the following:

- o Capability to plan within the organization
- o Capability to implement within the organization
- o Capability to control within the organization
- o Functional assessment - end product planning
- o Functional support assessment - planning/technical assistance
- o Functional support assessment - financial assistance
- o Functional assessment - regulatory
- o Functional assessment - monitoring and assessment
- o Sensitivity to erosion as a problem in Nevada
- o Willingness to accept a greater role in erosion control
- o Community involvement
- o Capability to accept an expanded role in erosion control

Immediately upon completion of an interview, a summarized set of interview observations and conclusions was prepared, and sent to the interviewed agency for review, comment, and verification. An example of interview observations and conclusions appears on the following pages. It is the information on the State Division of Forestry, as modified by that agency. Similar summaries were prepared for each interviewed agency.

As a second part of the post-interview process, an analysis form was prepared for each interviewed agency by the interviewer. The ratings were subsequently reviewed with the interview team, and a consensus reached on each assigned value. This process assured consistency of ratings among all of the agencies interviewed.

The rating system uses numeric values of one (1) through five (5), with (1) the lowest rating and (5) the highest. Both the highest and lowest values were used sparingly, in order to provide a reasonable distribution of all numeric values. A cipher (0) was used to signify that a function was not applicable to a particular agency. On page 210 is a sample of the analysis form used for each agency which provides a rationale for assignment of the numeric values.



STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF FORESTRY

CAPITOL COMPLEX
CARSON CITY, NEVADA 89710

NEVADA DIVISION OF FORESTRY

The purpose of the Nevada Division of Forestry is to protect 9 million acres of State and private forest and watershed lands. About 70,000 of this total is commercial forest lands and is protected by the Forest Practices Act. Approximately 3.2 million acres of the total receives direct fire protection.

The NDF is organized with the main office in Carson City (15 people) and district offices in Reno (22 people), Elko (7 people) and Las Vegas (3 people). A nursery in Reno has 3 people. Staffing has increased over the past few years. Forestry and financial assistance are provided under some programs. Relative to the lands designated commercial forest, the Division has a very strong regulatory, monitoring and enforcement role.

Prior to 1971 the NDF attempted to regulate soil erosion on private commercial forestlands under a law that was vague. The 1971 Legislature passed a strong forest practices act. This act required 1) a harvesting permit; 2) omitting areas within 200 feet of a live stream; 3) revegetating disturbed roads, landings and skid trails; 4) restricting tractor use on slopes over 30%. In addition this act required a Timberland Conversion Certificate before Timberlands could be converted to other uses. This certificate program required soil, topographic and conversion information to minimize soil erosion. A law suit resulted when the Forest Practice Act was enforced upon a large timber industry. As a result in 1973 the law was amended to allow variances to the 200 stream buffer and 30% steepness restriction when adequate supporting environmental data was provided.

The major factor limiting an effective accelerated erosion control system in Nevada is the lack of precipitation. Under normal circumstances the best erosion prevention techniques are vegetative, but the precipitation levels in Nevada are just not sufficient to support any meaningful vegetation in many areas. Alternatives to vegetation are so costly as to be prohibitive.

In dealing with erosion problems on a Statewide basis the best approach is probably a combination of education, financial assistance, and regulation. Individual activities would have to

be examined and assessed as to whether they are more susceptible to education, financial assistance, regulation, or a combination of the aforementioned. The feelings seem to be that the agency best equipped to deal with erosion control matters would be an agency already interfacing with the particular offender. Forestry has recently gotten a good hold on erosion on forest lands. Similarly, a relationship could be established between the Department of Agriculture and the agricultural sector, and segment by segment you could come to grips with the erosion problem. Admittedly, dealing with the agricultural interests will be much more difficult than with the forestry interest simply because it is a much larger economic sector. In the same vein, urban erosion and run-off is probably best handled by city governments.

Interviewer: Gordon Ebling

Agency: State Highways

Date: January 22, 1976

Agency Code: _____

INSTITUTIONAL EVALUATION MODEL
Analysis Form

rating -- "0" - if not applicable
 "1" - lowest rating
 "5" - highest rating

	Rating
1. A. <u>Capability to Plan within Organization</u> _____ (review responses to questions 2 and 3) <u>RATIONALE:</u> The plans and programs of the Highway Department are carefully and systematically conceived, using substantial external input.	4
B. <u>Capability to Implement within organization</u> _____ (review responses to questions 1, 5, 6, 7 and 8) <u>RATIONALE:</u> Their programs are generally completed on time and within budget.	4
C. <u>Capability to Control within organization</u> _____ (review responses to questions 8, 9, 10, 11, 12 and 13) <u>RATIONALE:</u> The Department appears to be well organized and run in an effective professional manner.	4
2. <u>Functional support assessment - Planning</u> _____ (review responses to questions 1, 6 and 7) <u>RATIONALE:</u> They work with cities and counties in developing roadway plans and do an effective job.	4
3. <u>Functional support assessment - Technical Assistance</u> _____ (review responses to questions 1, 6 and 7) <u>RATIONALE:</u> They provide some technical assistance to cities and counties, and do an average job of providing it.	3
4. <u>Functional support assessment - Financial Assistance</u> _____ (review responses to questions 1, 6 and 7) <u>RATIONALE:</u> They provide a minor amount of financial assistance to counties, and do not see it as a major Department function.	2

	Rating
5. Functional support assessment - <u>Guideline and Regulatory Assistance</u> (review responses to questions 1, 6 and 7) <u>RATIONALE:</u> Their regulatory role is very minor, relating primarily to load limits. This they do effectively.	2
6. Functional support assessment - <u>Monitoring and Assessment</u> (review responses to questions 1, 6 and 7) <u>RATIONALE:</u> They do an effective job of monitoring highway construction and maintenance.	4
7. <u>Sensitivity to erosion (run-off) problem</u> (review responses to questions 2D, 4, 5, 6, 10F and 18) <u>RATIONALE:</u> Water related erosion along highways is of only moderate concern--erosion in other areas is of no concern.	2
8. <u>Willingness to accept greater role in erosion control</u> (review responses to questions 6E, 7H, 8C, 9H, 10F, 16, 17, 18, 19 and 21) <u>RATIONALE:</u> They are currently doing all that they can to control erosion along highway right-of-ways. No interest in other activity sectors.	2
9. <u>Community Involvement</u> (review responses to questions 1, 13, 14, 15, 16 and 17) <u>RATIONALE:</u> They devote a large amount of effort to interfacing with the public, and are quite effective.	4
10. <u>Overall Assessment of Management's ability to accept expanded role.</u> (review responses to questions 10, 11, 12, 13, 14, 16, 17, 18, 19, and 21) <u>RATIONALE:</u> Their orientation is so strongly highways that their ability to accept an expanded role is no better than average, even though the people are quite capable.	3

The completed set of analysis forms provides numeric values for the functional capabilities of each of the agencies selected for interview. The chart on page 213 displays the numeric values assigned for each function to all of the agencies that were interviewed.

In accordance with the procedural steps developed as part of the evaluation model, the functional values were aggregated into six components:

- o general organizational functioning
- o functional support
- o sensitivity to erosion problems
- o willingness to accept a greater role in control of runoff and erosion
- o community involvement
- o overall assessment of management's ability to accept an expanded role

The chart on page 214 shows the numeric values developed for the six components.

GENERAL OBSERVATIONS

In reviewing the evaluation of the agencies of interest, as well as the basic data compiled on these agencies, certain general observations can be made relative to their present or prospective roles in the control of runoff and erosion.

1. The only agencies with a high level of sensitivity to the runoff and erosion problem are the agencies specifically created to respond to that problem--SCS, Division of Conservation Districts and TRPA. None of these agencies, however, is judged high in their capability to accept a revised or expanded role. The SCS is not interested in a revised role; the Division of Conservation Districts has only one full-time employee; TRPA is restricted in terms of both manpower and geographic jurisdiction.
2. Most state agencies are highly specialized in terms of their range of responsibilities (e.g., Forestry, Highways, etc.) and express little or no interest in expanding their breadth of responsibility. Hence any responsibility for control of runoff and erosion is limited in most cases to only a few activity sectors per agency.
3. Of the agencies rated above average in their willingness to accept a greater role, EPS is the only state agency which appears able to interface with all activity sectors. An aggregation of all Nevada Conservation Districts also interfaces all activity sectors on a statewide basis.
4. No agency at any level presently has assigned responsibility for statewide coordination of the various agency activities aimed at the control of runoff and erosion in Nevada.

AGENCY EVALUATION

AGENCY EVALUATION																											
		Federal							State							Regional/Local											
Factor		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin.	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	Trip A	Clark County	Elko County	Washoe County	North Las Vegas	Yerington	Reno	Elko	Irrigation Districts	Conservation Districts	Cooperative Extension Service
1A	- CAPABILITY TO PLAN	3	4	3	4	5	2	4	4	1	4	2	1	3	4	2	4	4	2	2	4	1	2	2	1	4	2
1B	- CAPABILITY TO IMPLEMENT	4	4	5	4	4	3	4	4	2	4	3	1	4	3	4	3	4	3	3	4	4	3	4	3	4	4
1C	- CAPABILITY TO CONTROL	3	4	4	5	5	4	5	4	4	4	4	3	3	3	5	3	4	3	3	4	3	3	4	3	3	3
2	- PLANNING	0	5	4	5	5	0	0	3	0	4	0	0	3	1	2	4	4	2	2	4	1	2	3	0	3	4
3	- TECHNICAL/PLANNING ASSISTANCE	2	1	5	3	2	3	0	3	3	3	2	3	3	4	3	2	4	0	0	0	0	0	0	0	0	4
4	- FINANCIAL ASSISTANCE	4	0	3	0	1	4	5	4	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0
5	- REGULATORY	4	4	0	3	4	0	0	3	2	2	4	1	4	0	4	4	4	2	4	4	2	4	3	0	1	0
6	- MONITORING & ASSESSMENT	3	4	3	2	3	4	5	4	2	4	4	5	4	0	4	4	4	1	3	3	2	4	3	4	3	4
7	- SENSITIVITY TO EROSION	2	2	5	3	3	2	3	3	3	2	2	5	2	2	3	5	2	4	4	1	1	3	4	3	3	3
8	- ACCEPTANCE OF GREATER ROLE	3	3	1	1	4	1	1	5	2	2	3	3	1	2	2	5	4	3	4	3	3	3	3	2	4	2
9	- COMMUNITY INVOLVEMENT	2	4	4	2	4	0	2	2	3	4	2	2	3	5	3	5	4	3	4	4	4	4	4	3	3	4
10	- CAPABILITY FOR GREATER ROLE	5	3	3	4	4	2	1	3	3	3	2	1	2	3	4	3	4	3	4	3	2	4	3	1	2	3

AGENCY EVALUATION

AGENCY EVALUATION		Federal								State								Regional/Local								
Factor	EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin.	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	TRPA	Clark County	Elko County	Washoe County	North Las Vegas	Yerington	Reno	Elko	Irrigation Districts	Conservation Districts	Cooperative Extension Service
GENERAL ORGANIZATIONAL FUNCTION	3	4	4	4	5	3	4	4	3	4	3	2	3	3	4	3	4	3	3	4	3	3	3	2	4	3
FUNCTIONAL SUPPORT	3	3	4	4	3	3	5	3	3	3	2	2	3	3	3	3	4	2	3	4	2	3	3	2	2	4
SENSITIVITY TO EROSION	2	2	5	3	3	2	3	3	3	2	2	5	2	2	3	5	2	4	4	1	1	3	4	3	3	3
ACCEPTANCE OF GREATER ROLE	3	3	1	1	4	1	1	5	2	2	3	3	1	2	2	5	4	3	4	3	3	3	3	2	4	2
COMMUNITY INVOLVEMENT	2	4	4	2	4	0	2	2	3	4	2	2	3	5	3	5	4	3	4	4	4	4	4	3	3	4
CAPABILITY FOR GREATER ROLE	5	3	3	4	4	2	1	3	3	3	2	1	2	3	4	3	4	3	4	3	2	4	3	1	2	3

5. Local government capability in runoff and erosion control is roughly proportional to the population of the jurisdiction, making for a vast difference in capability between the most populated and least populated counties and cities.
6. Local governments and districts are very sensitive to the imposition of additional requirements by a higher level of government without a concomitant provision of resources to accomplish the additional work.
7. Local governments and districts are generally opposed to the imposition of any controls by a higher level of government which have the appearance of eroding local authority.
8. The community involvement programs of regional/local agencies are generally more effective than those of federal and state agencies.

Authority Evaluation

The second aspect of the evaluation process is an evaluation of the authorities or programs extant in Nevada which deal with the control of runoff and erosion, and attendant water quality problems. To accomplish an evaluation of authorities, the following preliminary tasks were undertaken:

1. A literature review of existing state statutes was conducted to identify those statutes which, in the most global sense, pertain to the control of erosion from land disturbing activities.
2. Authorities and programs of the involved institutions were reviewed and discussed as part of the interview process.
3. Enabling legislation as it pertains to substate jurisdictional issues was reviewed.
4. Specific criteria were developed against which to assess the authorities and programs, as discussed in the evaluation system section.

The actual evaluation of authorities and programs was a three-step process:

1. An inventory of agency/activity intervention mechanisms was prepared.
2. A detailed review was made to determine the nature of the authorities and programs as they relate to each activity sector.
3. An analysis of the appropriateness and adequacy of the existing interventions was made to determine the apparent deficiencies in the present set of authorities and programs.

This three-step process is elaborated below.

AGENCY/ACTIVITY INTERVENTION

The first step in the evaluation of authorities for the runoff and erosion was to examine the interface between government agencies and erosion causing activities.

In identification of the runoff and erosion problem in Nevada the major categories of land disturbing activities were identified, and grouped according to their accelerated erosion impact:

High Runoff and Erosion Activity

- Agriculture - Grazing
- Agriculture - Irrigation
- Construction - Buildings

- Construction - Roads
- Recreation - Trails
- Stream Modifications
- Urbanization

Moderate Runoff and Erosion Activity

- Forestry
- Mining - Hard Rock
- Mining - Open Pit
- Transportation - Roads

Low Runoff and Erosion Activity

- Construction - Dams
- Construction - Transmission
- Military
- Recreation - Boats
- Recreation - Camps
- Transportation - Airports
- Transportation - Rail

Governmental agencies have various mechanisms for intervening in the accelerated erosion process. The control programs are detailed in the section on Control Techniques. Although ranging broadly in scope, magnitude and effectiveness, they can be broadly grouped into four categories:

Regulatory - permit programs of all types, performance and specification standards, and plan preparation and/or approval.

Financial - grants, loans and incentives.

Education - planning assistance, technical assistance, and public awareness.

Public Works - construction, operation and maintenance of facilities intended for erosion control.

The detailed information collected on the agencies of interest to this project provides an understanding of programs and actions used by each governmental agency involved in the control of accelerated erosion. On the following page is a matrix showing the governmental intervention mechanisms and their relationship to activity sectors.

For the activity sectors considered to be high or moderate erosion activities, the matrix displays all of the identified interventions. As this identification process requires considerable time and effort, it was concluded that similar work was not justified for low erosion activities. Accordingly, that portion of the matrix dealing with low erosion activities is incomplete.

AGENCY/ACTIVITY INTERVENTION

AGENCY/ACTIVITY INTERVENTION		Federal							State							Regional/Local						
Activity Sectors		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin.	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	TRPA	Counties	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service
HIGH EROSION ACTIVITY	AGRICULTURE - GRAZING	•	•			•		•			•						•			•		
	AGRICULTURE - IRRIGATION	•		•	•			•			•					•				•		
	CONSTRUCTION - BUILDINGS		•	•		•			•				•				•	•	•			
	CONSTRUCTION - ROADS		•		•	•	•			•	•		•				•	•	•			
	RECREATION - TRAILS		•	•		•							•					•	•			
	STREAM MODIFICATIONS	•	•	•	•	•		•	•	•						•	•	•	•			
	URBANIZATION	•		•		•										•	•	•	•			
MODERATE EROSION ACTIVITY	FORESTRY	•	•			•		•	•				•	•			•					
	MINING - HARD ROCK	•	•			•			•													
	MINING - OPEN PIT	•	•			•			•	•							•		•			
	TRANSPORTATION - ROADS	•	•			•	•				•							•	•			
LOW EROSION ACTIVITY	CONSTRUCTION - DAMS		•	•	•	•								•		•		•	•			
	CONSTRUCTION - TRANSMISSION		•			•							•				•	•	•			
	MILITARY																					
	RECREATION - BOATS																					
	RECREATION - CAMPSITES		•	•		•							•	•			•	•				
	TRANSPORTATION - AIRPORTS																					
	TRANSPORTATION - RAILWAYS																					

Regulatory

Financial Assistance

Education (Technical Assistance)

Public Works

-  Regulatory
-  Financial Assistance
-  Education (Technical Assistance)
-  Public Works

AGENCY/AUTHORITY INTERVENTION

The actual authorities or programs extant in Nevada cover the full spectrum of possibilities. Additionally, some of the programs deal with all activity sectors, while others deal with only one or two. It is necessary, therefore, to examine the authorities and programs of each agency involved in erosion control in Nevada on the basis of their impact on each activity sector.

Through the use of a matrix developed for each activity sector it is possible to graphically display all identified authorities and programs which relate to that activity sector. Plotted along the side are the functions of government; along the top are the governmental organizations involved in some aspect of runoff and erosion control in Nevada.

At appropriate intersections on the matrix where an agency has a program or authority which impacts that activity sector a symbol shows whether the intervention is primary or secondary. An example of a primary intervention is the issuance by BLM of allotment permits on lands within its jurisdiction. An example of a secondary intervention is the assistance provided by SCS to cooperators in the preparation of site-specific plans.

Development of a complete set of charts, one for each activity sector, provides a compendium of authorities and programs dealing with erosion control in Nevada. These charts are shown on Pages 223 through 232.

APPARENT DEFICIENCIES

The final step in the process of evaluating existing authorities and programs is to determine the apparent deficiencies in the existing structure. This analysis of deficiencies is necessarily done individually for each activity sector.

Using the process discussed in the evaluation system section, three aspects of existing authorities and programs are analyzed:

- o Are they there?
- o Are they good?
- o Are they enough?

Through this procedure it is possible to make observations and develop an in-depth understanding of existing authorities and programs, and then to derive the apparent deficiencies or gaps in existing authorities and programs. The procedure was followed for each of the activity sectors, and resulted in a set of charts showing the existing authorities and programs by governmental function, together with the apparent deficiencies for each functional category. A series of charts, one for each activity sector, was developed and is shown on Pages 233 through 242.

AGENCY / AUTHORITY INTERVENTION

ACTIVITY SECTOR: AGRICULTURE-GRAZING

AGENCY / AUTHORITY		Federal							State							Regional/Local					
INTERVENTION		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin.	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	Counties	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service
REGULATORY	POLICY	Primary	Primary			Primary			Primary												
	STANDARDS - PERFORMANCE		Primary			Primary			Primary												
	SPECIFICATION																				
	PLAN - SITE SPECIFIC		Primary	Secondary		Primary			Primary	Secondary										Primary	
	COMPREHENSIVE	Secondary	Primary	Secondary		Primary			Primary												
	PERMITS - LAND OPERATIONS		Primary			Primary															
	STREAM OPERATIONS																				
	WATER USE														Primary						
	DISCHARGE																				
	ALLOTMENT		Primary			Primary														Primary	
	BUILDING																				
	PLAN APPROVAL								Primary	Primary											
	MONITORING		Primary	Primary		Primary			Primary	Primary											
	ENFORCEMENT		Primary			Primary			Primary												
FINANCIAL	GRANTS						Primary														
	LOANS										Primary										
	INCENTIVES											Primary									
EDU- CATION	TECHNICAL ASSISTANCE	Primary	Primary	Primary					Primary				Primary						Secondary	Primary	Primary
	PUBLIC AWARENESS		Primary			Primary						Primary							Primary	Primary	Primary
PUBLIC WORKS	CONSTRUCTION		Primary			Primary													Primary	Primary	Primary
	OPERATIONS & MAINTENANCE		Primary			Primary													Primary	Primary	Primary



Primary



Secondary

AGENCY / AUTHORITY INTERVENTION

ACTIVITY SECTOR: AGRICULTURE-IRRIGATION

AGENCY / AUTHORITY INTERVENTION		Federal							State							Regional/Local						
ACTIVITY SECTOR: AGRICULTURE-IRRIGATION		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin	ASCS	Environmental Protection Service	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	Counties	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service	
REGULATORY	POLICY	■		■	■				■	■						■						
	STANDARDS PERFORMANCE								■													
	SPECIFICATION			■					■													
	PLAN SITE-SPECIFIC			▨					■	■									■	■		
	COMPREHENSIVE	▨		■	■				■							■						
	PERMITS LAND OPERATIONS																					
	STREAM OPERATIONS																					
	WATER USE															■						
	DISCHARGE								■													
	ALLOTMENT																					
	BUILDING																					
	PLAN APPROVAL																					
	MONITORING			■						■	■											
	ENFORCEMENT									■												
FINANCIAL	GRANTS			■				■											■			
	LOANS									■												
	INCENTIVES																					
EDUCATION	TECHNICAL ASSISTANCE	■		■					■							■				▨	■	
	PUBLIC AWARENESS			■					■			■				■				■	■	
PUBLIC WORKS	CONSTRUCTION				■														■	■		
	OPERATIONS & MAINTENANCE				■														■	■		

 Primary
 Secondary

AGENCY / AUTHORITY INTERVENTION

ACTIVITY SECTOR: CONSTRUCTION-BUILDING

AGENCY / AUTHORITY		Federal							State							Regional/Local					
INTERVENTION		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin.	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	Counties	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service
REGULATORY	POLICY																				
	STANDARDS - PERFORMANCE																				
	SPECIFICATION																				
	PLAN - SITE SPECIFIC																				
	COMPREHENSIVE																				
	PERMITS - LAND OPERATIONS																				
	STREAM OPERATIONS																				
	WATER USE																				
	DISCHARGE																				
	ALLOTMENT																				
	BUILDING																				
	PLAN APPROVAL																				
	MONITORING																				
	ENFORCEMENT																				
FINANCIAL	GRANTS																				
	LOANS																				
	INCENTIVES																				
EDU- CATION	TECHNICAL ASSISTANCE																				
	PUBLIC AWARENESS																				
PUBLIC WORKS	CONSTRUCTION																				
	OPERATIONS & MAINTENANCE																				

 Primary
 Secondary

AGENCY / AUTHORITY INTERVENTION

ACTIVITY SECTOR: CONSTRUCTION-ROADS

AGENCY / AUTHORITY INTERVENTION		Federal							State							Regional/Local					
ACTIVITY SECTOR: CONSTRUCTION-ROADS		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	Counties	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service
REGULATORY	POLICY	Primary				Secondary				Primary											
	STANDARDS - PERFORMANCE								Primary												
	SPECIFICATION						Secondary			Primary											
	PLAN - SITE SPECIFIC						Secondary			Primary								Primary	Primary		
	COMPREHENSIVE		Primary							Primary								Primary	Primary		
	PERMITS - LAND OPERATIONS		Primary							Primary				Primary				Primary	Primary		
	STREAM OPERATIONS																				
	WATER USE																				
	DISCHARGE				Primary																
	ALLOTMENT																				
	BUILDING																				
FINANCIAL	PLAN APPROVAL								Primary	Primary				Primary				Primary	Primary		
	MONITORING		Primary	Primary	Primary				Primary					Primary				Primary	Primary		
	ENFORCEMENT		Primary	Primary	Primary				Primary					Primary				Primary	Primary		
	GRANTS						Primary			Secondary								Secondary			
EDUCATION	LOANS																				
	INCENTIVES																				
PUBLIC WORKS	TECHNICAL ASSISTANCE	Primary		Primary			Secondary			Primary				Secondary					Secondary		
	PUBLIC AWARENESS			Primary															Primary	Primary	
	CONSTRUCTION		Primary	Primary	Primary					Primary								Primary	Primary		
	OPERATIONS & MAINTENANCE		Primary	Primary	Primary													Primary	Primary		

 Primary
 Secondary

AGENCY / AUTHORITY INTERVENTION

ACTIVITY SECTOR: RECREATION-TRAILS

AGENCY / AUTHORITY		Federal							State							Regional/Local					
INTERVENTION		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	Counties	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service
REGULATORY	POLICY	Primary												Primary							
	STANDARDS PERFORMANCE																				
	SPECIFICATION																				
	PLAN SITE SPECIFIC			Secondary														Primary			
	COMPREHENSIVE		Primary			Primary								Primary				Primary			
	PERMITS LAND OPERATIONS		Primary			Primary								Primary							
	STREAM OPERATIONS																				
	WATER USE																				
	DISCHARGE																				
	ALLOTMENT																				
	BUILDING																				
	PLAN APPROVAL		Primary			Primary								Primary							
	MONITORING		Primary	Secondary		Primary				Primary				Primary							
	ENFORCEMENT		Primary			Primary								Primary							
FINANCIAL	GRANTS			Primary																	
	LOANS																				
	INCENTIVES																				
EDUCATION	TECHNICAL ASSISTANCE			Primary		Primary				Primary			Primary							Secondary	
	PUBLIC AWARENESS		Primary							Primary			Primary	Primary							
PUBLIC WORKS	CONSTRUCTION		Primary	Secondary		Primary											Primary	Primary			
	OPERATIONS & MAINTENANCE		Primary	Secondary		Primary											Primary	Primary			



Primary



Secondary

AGENCY / AUTHORITY INTERVENTION

ACTIVITY SECTOR: STREAM MODIFICATIONS

AGENCY / AUTHORITY		Federal							State							Regional/Local					
INTERVENTION		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin.	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	Counties	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service
REGULATORY	POLICY	Primary			Primary	Primary			Primary					Primary							
	STANDARDS PERFORMANCE								Primary												
	SPECIFICATION				Primary		Secondary			Primary											
	PLAN SITE SPECIFIC			Secondary	Secondary												Primary	Primary	Primary		
	COMPREHENSIVE	Secondary			Primary				Primary												
	PERMITS LAND OPERATIONS		Primary		Primary	Primary								Primary							
	STREAM OPERATIONS				Primary				Primary							Primary					
	WATER USE																				
	DISCHARGE																				
	ALLOTMENT																				
	BUILDING																				
	PLAN APPROVAL								Primary							Primary					
	MONITORING		Primary	Primary	Primary	Primary			Primary					Primary		Primary					
	ENFORCEMENT		Primary	Primary	Primary	Primary			Primary					Primary		Primary					
FINANCIAL	GRANTS			Primary				Primary													
	LOANS																				
	INCENTIVES																				
EDUCATION	TECHNICAL ASSISTANCE	Primary		Primary	Primary														Secondary		
	PUBLIC AWARENESS			Primary					Primary										Primary	Primary	
PUBLIC WORKS	CONSTRUCTION				Primary												Primary	Primary	Primary		
	OPERATIONS & MAINTENANCE				Primary											Primary	Primary	Primary	Primary	Primary	

 Primary
 Secondary

AGENCY / AUTHORITY INTERVENTION

ACTIVITY SECTOR: URBANIZATION

AGENCY / AUTHORITY		Federal							State							Regional/Local					
INTERVENTION		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	Counties	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service
REGULATORY	POLICY																				
	STANDARDS PERFORMANCE SPECIFICATION	Secondary																			
	PLAN SITE SPECIFIC			Secondary																Secondary	
	COMPREHENSIVE	Secondary																			
	PERMITS LAND OPERATIONS																				
	STREAM OPERATIONS																				
	WATER USE																				
	DISCHARGE	Secondary																			
	ALLOTMENT																				
	BUILDING																				
	PLAN APPROVAL																				
	MONITORING																				
ENFORCEMENT																					
FINANCIAL	GRANTS																				
	LOANS																				
	INCENTIVES																				
EDUCATION	TECHNICAL ASSISTANCE																				
	PUBLIC AWARENESS																				
PUBLIC WORKS	CONSTRUCTION																				
	OPERATIONS & MAINTENANCE																				

 Primary

 Secondary

AGENCY / AUTHORITY INTERVENTION

ACTIVITY SECTOR: FORESTRY

AGENCY / AUTHORITY		Federal										State					Regional/Local					
INTERVENTION		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	Counties	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service	
REGULATORY	POLICY	■			■				■				■									
	STANDARDS PERFORMANCE								■													
	SPECIFICATION		■			■							■									
	PLAN SITE SPECIFIC		■			■			■					■								
	COMPREHENSIVE	▨	■			■			■					■			■					
	PERMITS LAND OPERATIONS		■			■								■								
	STREAM OPERATIONS																					
	WATER USE																					
	DISCHARGE				■				■													
	ALLOTMENT																					
	BUILDING																					
	PLAN APPROVAL													■								
	MONITORING		■		■	■			■	■				■								
	ENFORCEMENT		■		■	■			■	■				■								
FINANCIAL	GRANTS	▨					■							■								
	LOANS																					
	INCENTIVES																					
EDU. CATION	TECHNICAL ASSISTANCE	■	■		■	■			■				■							▨	■	
	PUBLIC AWARENESS												■									
PUBLIC WORKS	CONSTRUCTION		■		■	■								■								
	OPERATIONS & MAINTENANCE		■		■	■								■								

 Primary
 Secondary

AGENCY / AUTHORITY INTERVENTION

ACTIVITY SECTOR: MINING-HARD ROCK
& OPEN PIT

AGENCY / AUTHORITY		Federal							State							Regional/Local					
INTERVENTION		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin.	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	County	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service
REGULATORY	POLICY																				
	STANDARDS PERFORMANCE																				
	SPECIFICATION																				
	PLAN SITE SPECIFIC																				
	COMPREHENSIVE																				
	PERMITS LAND OPERATIONS																				
	STREAM OPERATIONS																				
	WATER USE																				
	DISCHARGE																				
	ALLOTMENT																				
	BUILDING																				
FINANCIAL	PLAN APPROVAL																				
	MONITORING																				
	ENFORCEMENT																				
	GRANTS																				
EDUCATION	LOANS																				
	INCENTIVES																				
	TECHNICAL ASSISTANCE																				
PUBLIC WORKS	PUBLIC AWARENESS																				
	CONSTRUCTION																				
PUBLIC WORKS	OPERATIONS & MAINTENANCE																				

 Primary

 Secondary

AGENCY / AUTHORITY INTERVENTION

ACTIVITY SECTOR: TRANSPORTATION-ROADS

AGENCY / AUTHORITY		Federal							State							Regional/Local						
INTERVENTION		EPA	BLM	SCS	Corps of Engineers	Forest Service	Federal Highway Admin	ASCS	Environmental Protection Services	Fish & Game	Highways	Agriculture	Division of Conservation Districts	Forestry	State Lands	Water Resources	Counties	Cities	Irrigation Districts	Conservation Districts	Cooperative Extension Service	
REGULATORY	POLICY	■	■		■	▨				■							■	■				
	STANDARDS PERFORMANCE																					
	SPECIFICATION				■	▨				■			■				■	■				
	PLAN SITE SPECIFIC		■		■	▨				■				■			■	■				
	COMPREHENSIVE																					
	PERMITS LAND OPERATIONS		■		■																	
	STREAM OPERATIONS																					
	WATER USE																					
	DISCHARGE																					
	ALLOTMENT																					
	BUILDING																					
	PLAN APPROVAL	N/A																				
	MONITORING		■			■				■	■											
	ENFORCEMENT		■			■																
FINANCIAL	GRANTS					■																
	LOANS																					
	INCENTIVES																					
EDU- CATION	TECHNICAL ASSISTANCE	■	■	■	■	■			■	■		▨							▨	■		
	PUBLIC AWARENESS											■							■	■		
PUBLIC WORKS	CONSTRUCTION	N/A																				
	OPERATIONS & MAINTENANCE		■							■							■	■				

 Primary
 Secondary

ACTIVITY SECTOR

AGRICULTURE - GRAZING

		OBSERVATIONS	APPARENT DEFICIENCIES
	GOALS/POLICIES /OBJECTIVES	- o EPA - Best management practices to control to extent possible - o BLM, FS - Multiple land use consistent with environmental concerns and public welfare	- o No goals for non-federal lands - o BLM, FS - Goals are not primarily concerned with quality of receiving waters
	STANDARDS	- o BLM, FS - Performance standards concerning forage - o EPS - Water quality standards	- o No forage standards for non-federal lands - o BLM, FS - Standards are not primarily concerned with quality of receiving waters - o EPS - Standards do not consider preventative or source control techniques, do not adequately consider economic factors
	PLANS	- o BLM, FS - Multiple land use plans for wide areas - o EPS - Comprehensive water quality plans for wide areas using EPA guidelines - o BLM, FS - Develop grazing allotment plans (site-specific) - o Cooperators develop site-specific plans with conservation district assistance	- o BLM, FS - Multiple land use plans are not primarily concerned with quality of receiving waters - o Allotment plans don't factor in water quality - o Conservation plans are not primarily concerned with quality of receiving waters, and do not include public participation - o No site-specific plans for much of the private grazing lands - o Most plans do not consider preventative or source control techniques
PROGRAMS	REGULATORY	- o WR - Water use and place of use permits - o BLM, FS - Permits for land operations and allotments - o Irrigation districts issue informal allotments - o SCS, F&G monitor erosion statewide - o BLM, FS monitor and enforce permit users - o EPS monitors and enforces water quality on major streams	
	FINANCIAL	- o ASCS has limited 30-50% grants for range management on private lands - o AG has a small loan program	- o Except EPS - Interventions are not primarily concerned with quality of receiving waters - o EPS - Difficult to relate water quality problems to source - o BLM, FS - Allotment procedures are complex - o Public works not primarily concerned with water quality - o SCS, F&G - Monitor but have no intervention mechanisms other than education
	EDUCATION	- o EPA, SCS, F&G, CES offer technical assistance - o BLM, SCS, FS, F&G, Div. Cons. Dist., Cons. Dist., CES - Public awareness	- o There is no plan approval - o Interventions are not rapid and simple - o Interventions do not adequately consider social and economic factors
	PUBLIC WORKS	- o BLM, FS, Irrig. Dists. do public work on their lands - o Cons. Dists. provide equipment to cooperators for public works	

ACTIVITY SECTOR

AGRICULTURE - IRRIGATION

		OBSERVATIONS	APPARENT DEFICIENCIES
	GOALS/POLICIES /OBJECTIVES	- o EPA - Best management practices to control to extent possible - o CoE, SCS - Indirectly set policies through water resource development - o F&G, WR - Availability of water for all beneficial uses	o SCS, CoE, F&G, WR - Goals are not primarily concerned with quality of receiving waters
	STANDARDS	- o EPS - Water quality standards - o SCS - Specification standards for erosion control and ditch maintenance	- o EPS - Standards do not consider preventative or source control techniques and do not adequately consider economic factors - o SCS - Standards only apply to SCS-assisted projects, and are not primarily concerned with quality of receiving waters
	PLANS	- o CoE, WR - Comprehensive water resource plans - o EPS - Comprehensive water quality plans for wide areas using EPA guidelines - o F&G - Site-specific plans for their lands - o Irr. Dists. - Site-specific plans for irrigation districts - o Cons. Dists., SCS - Site-specific plans for cooperators	- o Except EPS, plans are not primarily concerned with quality of receiving waters - o No site-specific plans for some irrigated lands - o Most plans do not consider preventative or source control techniques
PROGRAMS	REGULATORY	- o WR - Water use and place of use permits - o EPS - Discharge permits - o SCS, EPS, F&G - Monitor erosion and stream conditions statewide - o EPS - Monitors and enforces water quality on major streams	
	FINANCIAL	- o SCS, RC&D and 566 grants for designated projects - o ASGS, AG, Irr. Dist - Limited financial assistance for irrigation operators	- o EPS - Difficult to relate water quality problems to source - o Irrig. Dists., WR - Are not primarily concerned with quality of receiving waters - o CoE, Irrig. Dists., Cons. Dists. - Public works not primarily concerned with water quality - o There is no plan approval - o SCS, F&G - Monitor but have no intervention mechanisms other than education - o Interventions are not rapid and simple - o Interventions do not adequately consider social and economic factors
	EDUCATION	- o EPA, SCS, F&G, WR, CES - Technical assistance - o SCS, F&G, Div. Cons. Dists., WR, Cons. Dist., CES - Public awareness	
	PUBLIC WORKS	- o CoE, Irr. Dist. - Public works - o Cons. Dists. - Provide equipment to cooperators for public works	

ACTIVITY SECTOR

CONSTRUCTION - BUILDING

		OBSERVATIONS	APPARENT DEFICIENCIES
PROGRAMS	GOALS/POLICIES /OBJECTIVES	- o EPA - Best management practices to control to extent possible - o Counties, Cities set policy through adoption of comprehensive plans	o Counties, Cities - Goals are not primarily concerned with quality of receiving waters
	STANDARDS	- o EPS - Water quality standards - o Counties, Cities - Subdivision and grading standards	- o EPS standards relate to discharge and water quality while cities, counties relate to land use - o Cities, counties set own standards - no statewide consistency - o EPS - Standards do not consider preventative or source control techniques
	PLANS	- o EPA, BLM, CoE, FS, EPS, Counties, Cities - Comprehensive plans cover most of the area of the state - o Cons. Dists. - Assist in preparation of site-specific plans for cooperators	- o EPA, BLM, CoE, FS, Counties, Cities - Plans are not primarily concerned with quality of receiving waters - o Most plans do not consider preventative or source control techniques - o No site-specific plans for much of the building construction activity
	REGULATORY	- o Forestry, FS - Land use permits - o CoE - Discharge permits - o Counties, Cities - Subdivision approvals and building and grading permits - o Counties, Cities, Forestry - Plan approval - o Forestry, FS, CoE, Counties, Cities - Monitor and enforce permit compliance - o EPS - Subdivision approval - o SCS, F&G - Monitor erosion statewide	
	FINANCIAL	o SCS - Grants under RC&D	- o Counties, Cities - Interventions are not primarily concerned with quality of receiving waters - o Forestry, FS - Land use permits without standards - o Interventions are not rapid and simple - o Counties, Cities - Do not consider preventative or source control techniques - o Counties, Cities - Public works not primarily concerned with water quality - o EPS - Difficult to relate water quality problems to source
	EDUCATION	- o EPA, SCS - Technical assistance - o SCS, Cons. Dists., CES - Public awareness	- o SCS, F&G - Monitor but have no intervention mechanisms other than education - o Interventions do not adequately consider social and economic factors
	PUBLIC WORKS	o Counties, Cities - Public works within their jurisdictions	

ACTIVITY SECTOR **CONSTRUCTION - ROADS**

		OBSERVATIONS	APPARENT DEFICIENCIES
GOALS/POLICIES /OBJECTIVES		- o EPA - Best management practice to control to extent possible - o BLM, FS - Multiple land use consistent with environmental concerns and public welfare - o FHWA, Highways - Construct roads consistent with good engineering design practices	o Only EPA concerned with water quality
	STANDARDS	- o FHWA, Highways - Specification standards on highway design and construction - o EPS - Standards for subdivision approval - o EPS - Water quality standards	- o FHWA, Highways - Standards are not primarily concerned with quality of receiving waters - o FHWA, Highways - Standards deal only with road right-of-way - o EPS - Standards do not adequately consider economic factors - o EPS - Standards do not consider preventative or source control techniques
	PLANS	- o BLM, FS, Highways - Statewide comprehensive planning - o Counties, Cities - Comprehensive planning including road locations - o Highways, Counties, Cities - Site-specific plans for new roads and improvements	- o BLM, FS, Highways, Counties, Cities - Plans are not primarily concerned with quality of receiving waters - o Most plans do not consider preventative or source control techniques
PROGRAMS	REGULATORY	- o BLM, FS, Forestry, Highways - Land use permits - o CoE - Discharge permits - o Counties, Cities - Street and road ordinances - o EPS - Subdivision approval - o Highways - Plan approval for highway encroachments - o SCS, F&G - Monitor erosion statewide - o BLM, CoE, FS, Highways, Forestry, Counties, Cities - Monitor and enforce permit compliance	
	FINANCIAL	o FHWA, Highways - Construction grants	- o Interventions are not primarily concerned with quality of receiving waters - o Runoff concerns limited to right-of-way - o SCS, F&G - Monitor but have no intervention mechanisms other than education - o Public works not primarily concerned with water quality - o Interventions are not rapid and simple - o Interventions do not adequately consider social and economic factors
	EDUCATION	- o EPA, SCS, FS, Highways - Provide technical assistance - o SCS, Highways, Cons. Dists., CES - Public awareness	
	PUBLIC WORKS	o SCS, CoE, Highways, Counties, Cities - Public works	

ACTIVITY SECTOR

RECREATION - TRAILS

		OBSERVATIONS	APPARENT DEFICIENCIES
	GOALS/POLICIES /OBJECTIVES	- o EPA - Best management practices to control to the extent possible - o BLM, FS - Multiple use consistent with environmental concerns and public welfare - o Forestry - Management and protection of state Forestry-administered lands	- o No goals on non-federal lands (except state Forestry who regulates only a small percentage) - o BLM, FS - Goals are not primarily concerned with quality of receiving water
	STANDARDS	- o No specification standards relating to construction or maintenance of trails or the operation of ORV's - o EPS - Water quality standards	- o EPS - Standards do not consider preventative or source control techniques, and do not adequately consider economic factors - o Except for EPS, no standards exist
	PLANS	- o BLM, FS - Multiple land use plans for wide areas - o SCS - Site-specific plans for RC&D and 566 projects - o Counties - Comprehensive plans include recreation trails in some counties	- o BLM, FS, SCS, Counties - Plans are not primarily concerned with quality of receiving waters - o Most plans do not consider preventative or source control technique - o No site-specific plans for some recreation trails
PROGRAMS	REGULATORY	- o BLM, FS - Land use permits - o Forestry - Land use permits for development; use regulation for fire control - o BLM - Plan approval - o F&G - Monitors stream conditions - o BLM, FS, Forestry - Monitor and enforce permit compliance	
	FINANCIAL	o SCS - Limited grants under RC&D and PL 566	- Except EPS - o Difficult to relate water quality problems to source - o Interventions are not primarily concerned with quality of receiving waters - o BLM and FS do not exercise control on ORV's, except for organized ORV events - o F&G - Monitors but has no intervention mechanisms other than education - o Public works not primarily concerned with water quality
	EDUCATION	- o BLM, FS, SCS, F&G, Forestry - Offer technical assistance - o BLM, FS F&G, Forestry, Cons. Dists., CES - Public awareness	- o Interventions are not rapid and simple - o Interventions do not adequately consider preventative or source control techniques - o Interventions do not adequately consider social and economic factors
	PUBLIC WORKS	o BLM, FS, SCS, Counties, Cities, NPS, State Parks - Public works	

ACTIVITY SECTOR STREAM MODIFICATIONS

	OBSERVATIONS	APPARENT DEFICIENCIES	
GOALS/POLICIES /OBJECTIVES	- o EPA - Best management practices to control to extent possible - o CoE - Maintain navigable waters, flood control, water resource development - o F&G, WR - Availability of water for all beneficial uses - o F&G - Protect wildlife habitat - o Forestry, FS - Watershed management	o CoE, WR, Forestry, FS - Goals are not primarily concerned with quality of receiving waters	
STANDARDS	- o CoE, Highways - Specifications on stream operations and modifications - o EPS - Water quality standards - o WR - Channel maintenance and dam construction specifications	- o EPS - Standards do not consider preventative or source control techniques, and do not adequately consider economic factors - o CoE, Highways, WR - Relate to erosion, but not to quality of receiving waters	
PLANS	- o CoE - Comprehensive water resource plans - o EPS - Comprehensive water quality plans for wide areas using EPA guidelines - o CoE, Irr. Dists., SCS, Counties, Cities - Site-specific plans	- o Except EPS - Plans are not primarily concerned with quality of receiving waters - o Most plans do not consider preventative or source control techniques	
PROGRAMS	REGULATORY	- o BLM, FS, Forestry - Permits for land operations - o CoE, WR, F&G - Permits for stream operations - o F&G, WR - Plan approval - o SCS - Monitors erosion statewide - o BLM, CoE, FS, EPS, F&G, WR, Forestry - Monitor and enforce permit compliance - o EPS - Monitors and enforces water quality and major streams	
	FINANCIAL	o ASCS - Limited 30-50% grants for private parties	- o Except EPS, F&G - Interventions are not primarily concerned with quality of receiving waters - o F&G - Dredging permits without standards - o F&G doesn't use habitat protection authority - o SCS - Monitors but has no intervention mechanisms other than education - o EPS - Difficult to relate water quality problems to source - o Public works not primarily concerned with water quality
	EDUCATION	- o SCS, EPA, CoE - Technical assistance - o SCS, F&G, Cons. Dists., CES - Public awareness	- o Interventions do not adequately consider preventative or source control techniques - o Interventions do not adequately consider social and economic factors
	PUBLIC WORKS	o CoE, Counties, Cities, Irr. Dists. - Public works	

ACTIVITY SECTOR

URBANIZATION

		OBSERVATIONS	APPARENT DEFICIENCIES
GOALS/POLICIES /OBJECTIVES		- o EPA - Best management practices to control to the extent possible - o Cities, Counties - Set policy through adoption of comprehensive plans	- o No statewide consistency with respect to water quality policies of cities/counties - o Cities, Counties - Goals not primarily concerned with quality of receiving waters
	STANDARDS	- o EPS - Water quality standards - o Forestry - Standards for development in forest areas under their jurisdiction	- o EPS, Forestry - Standards do not adequately consider economic factors - o EPS - Standards do not consider preventative or source control techniques - o Forestry - Standards are not primarily concerned with quality of receiving waters
	PLANS	- o CoE - Flood plain studies, flood control planning - o Cities, Counties - Master plans, area development plans - o EPS - Comprehensive water quality plans for wide areas using EPA guidelines - o WR - Comprehensive water resource plans - o Cons. Dist., SCS - Site-specific plans for cooperators	- o Except EPS - Plans are not primarily concerned with quality of receiving waters - o Most plans do not consider preventative or source control techniques
	REGULATORY	- o F&G - Permits for wildlife habitat and flood control dredging - o Forestry - Permits for land use - o WR - Water use and place of use permits - o EPS, CoE - Discharge permits for cities, counties - o EPS, Cities, Counties - Subdivision approvals - o CoE, EPS, Counties - Monitor and enforce permit compliance	
PROGRAMS	FINANCIAL	- o Counties - Incentives in the form of greenbelt laws to maintain open space - o EPA, SCS - Limited financial assistance under PC 366, 208 programs	- o Except EPS, F&G - Interventions are not primarily concerned with quality of receiving waters - o EPS - Difficult to relate water quality problems to source - o EPS, F&G - Permit authority exists without standards; authorities are not used - o Interventions are not enough with respect to increased velocities and quantity - o Authorities are very open-ended - o Public works not primarily concerned with water quality
	EDUCATION	o EPA, SCS, CoE, F&G, Highways, Forestry, Cons. Dist., state lands, CES - Technical assistance and public awareness	- o Interventions are not rapid and simple - o Interventions do not adequately consider preventative or source control techniques - o Interventions do not adequately consider social and economic factors
	PUBLIC WORKS	o CoE, Counties, Cities - Public works	

ACTIVITY SECTOR

FORESTRY

		OBSERVATIONS	APPARENT DEFICIENCIES
PROGRAMS	GOALS/POLICIES /OBJECTIVES	- o EPA - Best management practices to control to extent possible - o FS, BLM - Multiple use consistent with environmental concerns and public welfare - o Forestry - Proper management of state forest resources	o FS, BLM - Goals are not primarily concerned with quality of receiving waters
	STANDARDS	- o BLM, FS, Forestry - Set specification standards for forestry operations - o EPS - Water quality standards	- o BLM, FS, Forestry - Standards are not primarily concerned with quality of receiving waters - o EPS - Standards do not consider preventative or source control techniques and do not adequately consider economic factors - o No source control technique standards for existing problems
	PLANS	- o BLM, FS, Forestry - Site-specific plans for areas under their jurisdiction - o BLM, FS, Forestry, Counties - Comprehensive plans for areas under their jurisdiction - o EPS - Comprehensive water quality plans for wide areas using EPA guidelines	o BLM, FS, Forestry - Plans are not primarily concerned with quality of receiving waters
	REGULATORY	- o BLM, FS - Land use permits - o Forestry - Land use permits and logging plan approval - o EPS, CoE - Discharge permits - o EPS, BLM, FS, CoE, Forestry - Monitor and enforce permit compliance - o F&G - Monitors stream conditions	
	FINANCIAL	- o ASCS - Grants for private lands - o Forestry - Free tree program	- o Except EPS - Interventions are not primarily concerned with quality of receiving waters - o Apparent overlap between Corps permits and other permits - o F&G - Monitors but has no intervention mechanisms other than education - o EPS - Difficult to relate water quality problems to source - o Public works not primarily concerned with water quality
	EDUCATION	- o EPA, SCS, FS, F&G, CES, Forestry - Technical assistance on request - o SCS, FS, CES, Cons. Dist. - Public awareness education	- o Interventions are not rapid and simple - o Interventions do not adequately consider preventative or source control techniques - o Interventions do not adequately consider social and economic factors
	PUBLIC WORKS	o BLM, FS, Forestry - Public works on their lands	

ACTIVITY SECTOR

MINING - HARD ROCK AND OPEN PIT

		OBSERVATIONS	APPARENT DEFICIENCIES
PROGRAMS	GOALS/POLICIES /OBJECTIVES	- o EPA - Best management practices to control to extent possible - o FS, BLM - Goal to better control mining on lands they administer	- o No goals for hard rock mining - o No goals for non-federal land - o FS, BLM - Goals are not primarily concerned with quality of receiving waters
	STANDARDS	- o EPS - Water quality standards - o FS, BLM, Highways - Specification standards for open pit sand and gravel	- o BLM, FS - No authority to set standards on hard rock mining and little authority in other areas - o EPS - Standards do not consider preventative or source control techniques, and do not adequately consider economic factors - o Except EPS - Standards are not primarily concerned with quality of receiving waters
	PLANS	- o BLM, FS - Some site-specific plans - o BLM, FS, EPS, Counties, WR - Some mining activities covered by comprehensive plans and master plans	- o Except EPS - Plans are not primarily concerned with quality of receiving waters - o Most plans do not consider preventative or source control techniques - o No site-specific plans for some mining lands
	REGULATORY	- o Counties, BLM, FS - Land use permits for some types of mining - o CoE, F&G - Some controls on stream operations - o WR - Water use and place of use permits - o EPS, CoE - Discharge permits - o F&G - Monitors stream conditions - o BLM, FS, CoE, EPS, Counties - Monitor and enforce permit compliance - o SCS - Monitors erosion statewide	
	FINANCIAL	o EPA, FS - Demonstration grants	- o Except CoE, EPS, F&G - Interventions are not primarily concerned with quality of receiving waters - o Federal, state, and local intervention authorities are very limited - o No plan approvals exist - o BLM, FS - Mining claim patent procedures are not rapid and simple - o No public works programs - o Interventions do not adequately consider preventative or source control techniques
	EDUCATION	- o EPA, BLM, SCS, FS, F&G, CES - Technical assistance - o BLM, SCS, FS, Cons. Dists., CES - Public awareness programs	- o Interventions do not adequately consider social and economic factors - o SCS - Monitors but has no intervention mechanisms other than education - o EPS - Difficult to relate water quality problems to source
	PUBLIC WORKS	None	

ACTIVITY SECTOR

TRANSPORTATION - ROADS

		OBSERVATIONS	APPARENT DEFICIENCIES
	GOALS/POLICIES/OBJECTIVES	- o EPA - Best management practices to control to extent possible - o BLM, FS, Counties, Cities, Highways - Maintenance and operational goals - o Highways - Some erosion control policies and goals	o Except for EPA, goals are not primarily concerned with quality of receiving waters
	STANDARDS	- o FS, Forestry, Highways, Counties, Cities - Specification standards for maintenance - o EPS - Water quality standards	- o Except EPS - No standards exist for controlling the water quality impacts of existing roads - o Road administering agencies do not set standards for erosion or water quality outside the right-of-way - o Except EPS - Standards are not primarily concerned with quality of receiving waters - o EPS - Standards do not consider preventative or source control techniques do not adequately consider economic factors
	PLANS	o BLM, FS, Counties, Cities, Highways - Site-specific planning for road maintenance	- o Most plans do not consider preventative or source control techniques - o Plans are not primarily concerned with quality of receiving waters - o Almost no "planning" for existing roads other than maintenance - o No public input
PROGRAMS	REGULATORY	- o BLM, FS - Land use permits - o BLM, FS, Highways, Counties, Cities - Site-specific plans - o F&G, BLM, FS, Highways - Monitor existing roads	
	FINANCIAL	o FHWA - Grants to state	- o Interventions are not primarily concerned with quality of receiving waters - o There is almost no regulatory intervention - o Very little money available for anything other than routine maintenance - o F&G, Highways - Monitor but have no intervention mechanisms other than education - o Public works not primarily concerned with water quality - o No plan approvals
	EDUCATION	- o EPA, BLM, SCS, FS, FHWA, F&G, CES, Highways - Technical assistance - o BLM, FS, Cons. Dist., CES - Public awareness	o Interventions do not adequately consider preventative or source control techniques
	PUBLIC WORKS	o BLM, FS, Highways, Counties, Cities - Road maintenance	

GENERAL OBSERVATIONS

The preceeding set of charts identifies the apparent deficiencies in existing authorities and programs as they relate to each activity sector. In addition, there are some observations and conclusions that can be made relative to the aggregate of existing authorities and programs.

1. There is essentially no financial assistance available for controlling runoff and erosion at any level of government other than federal.
2. Regional and local governments have broad legal authority under which reasonably effective regulatory programs to control runoff and erosion may be developed. However, most do not have adequate resources nor sufficient cause to implement such programs.
3. From the perspective of persons involved in land-disturbing activities there are several activity sectors with a proliferation of authorities. (Nine separate agencies have some regulatory authority over stream modifications.) However, most authorities either are not concerned with water quality, or are not effective or appropriate for controlling water quality impacts of runoff and erosion.
4. It is difficult for a state to significantly alter existing federal programs or authorities to meet specific state requirements. Through the use of memoranda of understanding, however, it is possible to derive maximum advantage from available programs, and to gain substantive compliance by federal agencies with state programs.
5. Not many agencies include water quality considerations in developing their plans and programs.
6. Although many state agencies have statewide authority, few really have an impact over more than one activity sector.
7. There are many potential sources of educational information and technical assistance on the subject of controlling runoff and erosion. In most instances, however, persons conducting land-disturbing activities must request assistance.

*Alternative
Solutions*

The collection and analysis of data on runoff and erosion in Nevada, and on the existing institutional structure dealing with the runoff and erosion problem provides four components of information:

1. An identification of the non-point waste problems, with a general classification of the contribution made by each activity sector to runoff and erosion in Nevada.
2. A determination of control techniques which have been developed for the control of accelerated erosion which are appropriate for use in the State of Nevada.
3. An understanding of the capabilities of the agencies presently or potentially involved in the control of runoff and erosion, together with an assessment of their ability to assume an expanded role.
4. A compendium of existing authorities and programs dealing with the control of runoff and erosion in Nevada, and an identification of the apparent deficiencies.

This information provides the basis on which to develop possible alternatives for controlling runoff and erosion on a statewide basis. Several other considerations provided further direction in development of alternative solutions. These included:

1. Three of the key assumptions on which the project is based:
 - o with any newly regulated entity, inertia and stress exist, in terms of attainment of the goal of the regulation;
 - o due to limited administrative and other resources, implementation must be on a priority basis, in terms of geographical area and the particular land disturbing activity;
 - o The solution lies predominantly in management practices, as opposed to capital-intensive structures.
2. Inputs from interviewed agencies and the Project Sounding Board.
 - o The lowest level of government which can effectively perform a function is the best level to place that responsibility.
 - o There is essentially no additional state money to implement an erosion control program.
 - o A combination of education, financial assistance and regulations is required to effectively control erosion.

3. The general knowledge and understanding of Nevada and its state regional and local agencies. This "feel" is based on experience, the interview process, and discussions of the project with interested groups, officials and the general public.
4. The 8 generalized ideal authority characteristics outlined in the authority evaluation section.

One of the most significant authority characteristics is that the total of all authorities or programs should cover the entire state. There are surprisingly few agencies whose authority allows this coverage. Most state agencies have authority over only a portion of the area of the state even though their jurisdiction is statewide. The Highway Department, for example, is only concerned with highway rights-of-way, and State Forestry exercises control over specific, designated forest areas. Agencies which do cover the entire state in their particular activity sectors include Water Resources, Environmental Protection Services, State Lands and Fish and Game. In addition, an aggregation of cities and counties, or of Conservation Districts provides statewide coverage.

DEVELOPMENT OF ALTERNATIVES

Using the institutional evaluations and all the other information generated to date, five alternative solutions were developed. These alternatives provide a wide range of general approaches to solving the accelerated erosion problems. Specific details were not developed until after a recommended alternative was selected.

ALTERNATIVE 1 - ENVIRONMENTAL PROTECTION SERVICES - STANDARDS & PERMITS

Under this alternative, the State Environmental Commission and Environmental Protection Services (EPS) would establish a permit program to control non-point sources. Specification standards for land disturbing activities would be prepared by Environmental Protection Services with the help of the Conservation Districts, the Soil Conservation Service, and other appropriate agencies. Water quality monitoring and enforcement would remain the responsibility of EPS. Except for forest practices and state highways, which are already regulated at the state level, certain counties could be delegated the enforcement responsibility under this alternative. Environmental Protection Services would enter into memoranda of understanding with State Forestry, State Highways and Fish and Game to assure cooperation in the area of erosion sensitivity and water quality orientation of their existing programs and regulations. Technical assistance from the Soil Conservation Service and others would be used by both the regulators and the regulated. The State Environmental Commission would have the power under this alternative to hear appeals and grant variances.

It is anticipated that the enabling legislation of the State Environmental Commission would not require change for the Commission to adopt new regulations in this area. If this is the case, no legislative

changes would be required. The anticipated cost would be the addition of about 3 persons to the staff of Environmental Protection Services.

ALTERNATIVE 3 - INDIVIDUAL ACTIVITY PROGRAMS

Under this alternative a separate program would be created for each of the activity sectors of major concern in the control of runoff and erosion. The activity sectors considered significant for this purpose are: agriculture-grazing, agriculture-irrigation, construction-buildings, construction-roads, recreation trails, stream modifications, urbanization, forestry, mining, and transportation-roads. In developing this alternative, examples of individual activity programs were created for two activities.

The first related to stream modifications. Under this activity program, no stream modifications would be allowed without a permit from Water Resources. For dredging activities, Fish and Game would be required to issue the permit, and for forest practices the Division of Forestry would be required to issue the permit. Specification standards would be established by the Division of Water Resources and Fish and Game. These standards would be reviewed by the irrigation districts, the counties, improvement districts, and other interested parties and would be approved by Environmental Protection Services, and where appropriate, State Forestry. If the irrigation districts adopt state standards, no permits would be required for stream modifications. Variances could be issued by the Division of Water Resources with the consent of Environmental Protection Services, Fish and Game, and where appropriate, State Forestry.

This particular activity program would require legislative changes, primarily NRS 533. Estimated additional cost would be one staff person with Water Resources.

A second individual activity program was developed for irrigated agriculture. Under this plan adjustments would be made in the state water law and the state environmental commission law to include new water quality considerations. The Division of Water Resources, with Environmental Protection Services, would establish pollution source control regulations in conjunction with all new water rights. For existing water rights two types of incentives would be established. The first would provide a conservation incentive by eliminating the acreage limitation and allowing water saved through conservation and good farming practices to be used on new lands or sold as excess by the water right owner. The second would remove the present disincentive so that a water right owner would not use more water than necessary solely to protect his water right. This activity program would also include specification standards adopted by Environmental Protection Services and the State Environmental Commission. These standards would be prepared by the Conservation Districts with the assistance of the University of Nevada, irrigation districts, Water Resources, the farm bureau, and others. Monitoring and enforcement under this concept would be primarily by the Division of Water Resources, the

irrigation districts, and Fish and Game. Also, a part of this program could be tax incentives to irrigators who make improvements for water conservation or who meet specification standards.

Anticipated legislation would be changes in NRS 533 and NRS 445. The cost is estimated to be an additional 4 staff for the Division of Water Resources, one person for the Environmental Protection Services, and an additional cost associated with metering equipment for on-farm water uses.

ALTERNATIVE 3 - COUNTY CONSERVATION PLANS

In Alternative 3 each county would prepare a master plan which includes a conservation plan element with water quality considerations. Planning guidelines for the county master plans would be established by State Lands with assistance from Environmental Protection Services and the Soil Conservation Service. These same agencies would provide assistance to the counties in plan preparation. The plans would be approved by the County Planning Commission, the counties themselves and the State Environmental Commission. Working with the counties, Environmental Protection Services, Soil Conservation Service, Conservation Districts, and other interested parties would develop activity specification standards. The counties would also develop ordinances and issue permits to control water quality effects of activities which were not otherwise controlled, such as mining or irrigated agriculture.

Monitoring of water quality would be done by Environmental Protection Services. Enforcement of the permits would be by the counties. If the county requested, or failed to enforce the permits, the state could assume responsibility. The state would provide financial assistance to the counties for developing the conservation plans.

Changes in the existing legislation would be required to amend NRS 278. Additional costs under this alternative would include the monies provided by the state to the counties for developing conservation plans. Also additional manpower would be required by EPS as a result of the increasing need for water quality monitoring.

ALTERNATIVE 4 - SITE SPECIFIC CONSERVATION PLANS

Under this alternative no land-disturbing activities would be permitted in certain specified areas without a conservation plan which included water quality considerations. The land disturber would be responsible for preparation of the plan. If he requested, Conservation Districts, the Soil Conservation Service, Environmental Protection Services, and others, would provide assistance in the plan preparation. After review and comment, the plan would be approved by the conservation district and the State Conservation Commission as well as EPS. If the activity were already covered by a permit program, such as subdivision requirements or building permits, approval of the conservation plan would become a prerequisite for permit issuance. Water quality in this alternative

would be monitored by Environmental Protection Services. In some cases the counties would monitor and enforce the program, but the primary permit agency would be the Conservation District and Environmental Protection Services jointly. Appeals on the water quality element would be heard by the State Environmental Commission.

Legislative changes required to implement this alternative would be amending NRS 548. Estimated costs include additional staff of approximately 3 persons to the Conservation District staff and approximately 2 persons to the staff of EPS.

ALTERNATIVE 5 - ENVIRONMENTAL/ECONOMIC IMPACT STATEMENTS

Under this alternative an environmental and economic impact statement would be required for all proposed actions having significant impact on the environment. Proposed actions would include projects of public agencies, projects receiving financial assistance from public agencies, and projects involving issuance of permits, entitlements, etc., from public agencies. The primary responsibility for the environmental impact statement would be by the involved public agency. The State Planning Coordinator would be responsible for issuance of guidelines and providing overall coordination.

A new NRS statute would be required which would set forth the topics to be covered including the water quality impacts from erosion and runoff. Costs are estimated to be one additional staff member in the State Planning Coordinator's office as well as additional staff in other state and local agencies involved in preparing the environmental impact statements.

ALTERNATIVE EVALUATION

As the alternatives were developed, a test for alternatives was created to insure that all met the general criteria established by the study as well as other factors. The test included:

1. The alternative must satisfy the 8 generalized authority characteristics discussed in the Authority Evaluation section.
2. The alternative should create no new agencies, and give any new programs or authorities to existing agencies consistent with the agency evaluation.
3. The alternative should satisfy EPA's requirement to develop effective controls for non-point pollution sources in Nevada.
4. The alternative should be politically acceptable within Nevada.
5. The alternative should satisfy the major apparent deficiencies which were determined in the Authority Evaluation. (Many of

the deficiencies are minor in nature and will be considered further as details of the recommended alternative are developed.)

The five alternatives were presented to the Project Sounding Board at the meeting held on May 14, 1976. The Project Sounding Board made constructive suggestions, and critically reviewed each of the five proposed alternatives. They felt that Alternative 1 provided too much control at the state level. The Sounding Board had consistently indicated that the lowest possible level of government would be the best location for a program of this type. Also, there appeared to be some opposition to a permit program, in favor of the concept of plan approval.

Alternative 2, the individual activity plans, was rejected because of the complexity of establishing a new set of activity controls and the required legislative changes for each of 10 separate activities. There is no simple way to insure coordination so that each activity is regulated both fairly and equitably. Further, there is a reluctance to make changes in the existing water law.

Alternative 5, requiring economic and environmental impact statements, was felt to be too cumbersome and involved to be a practical alternative. Environmental impact statements are expensive and time consuming to prepare. Once prepared, it is very difficult to determine the appropriate course of action. That is, what do you do with them? How do you translate the impact statement into some type of a control mechanism to protect from non-point source pollution problems?

A combination of Alternative 3 and Alternative 4 was felt to be the preferred approach. This would allow the counties to retain control and still provide the local expertise of the Conservation Districts for specific locations and plan preparation.

The reactions and thoughts of the Sounding Board were utilized to develop the recommended alternative which has previously been discussed in the section of the report entitled "Recommendations." Details associated with this recommended alternative will be developed based on discussions with impacted groups, individuals, state agencies, conservation districts, and others. At the present time, the recommended alternative is being discussed with as many groups and affected agencies as possible in all areas of the state.

Appendix

ABBREVIATIONS

AG	-	Nevada State Department of Agriculture
ASCS	-	Agricultural Stabilization and Conservation Service
AUM	-	Animal Unit Months
BOD	-	Biochemical Oxygen Demand
BLM	-	Bureau of Land Management
CD	-	Conservation District
CES	-	Cooperative Extension Service
CE	-	Corps of Engineers
EPA	-	Environmental Protection Agency
EPS	-	Environmental Protection Services
F & G	-	Nevada Department of Fish & Game
FHWA	-	Federal Highway Administration
FORESTRY	-	Nevada Division of Forestry
FS	-	United States Forest Service
HIGHWAYS	-	Nevada Highway Department
JTU	-	Jackson Turbidity Unit
NPS	-	National Park Service
pH	-	Measure of acidity and alkalinity
PO ₄	-	Phosphates
RC&D	-	Resource Conservation & Development
TDS	-	Total Dissolved Solids
SCS	-	Soil Conservation Service
TRPA	-	Tahoe Regional Planning Agency
WR	-	Nevada Division of Water Resources

BIBLIOGRAPHY

Carson River Basin Council of Governments, "Water Quality Management Plan for the Carson and Walker River Basins," 1975.

CH₂M-Hill, Inc., "Agricultural Return Flow Management in the Sulphur Creek Drainage Area," 1974 draft.

Economic Research Service, Forest Service, Soil Conservation Service, University of Nevada, "Water and Related Land Resources, Central Lahontan Basin, Nevada-California," 1975.

Environmental Protection Section: State of Nevada, "Nevada Water Quality Inventory Report," 1975.

State of Nevada, Division of Water Resources & University of Nevada, "Water for Nevada, Forecasts for the Future - Agriculture", 1974

Pacific Southwest Inter-Agency Committee, Water Resources Council, "Watershed Management, Great Basin Region Comprehensive Framework Study," 1971.

State of Nevada, Division of Water Resources, State Engineer's Office, "Alternatives Plans for Water Resource Use," 6 volumes, 1974.

U.S. Environmental Protection Agency, "Methods and Practices for Controlling Water Pollution from Agricultural Nonpoint Sources," 1973.

U.S. Environmental Protection Agency, "Processes, Procedures and Methods to Control Pollution Resulting from Old Construction Activity," 1973.

U.S. Environmental Protection Agency, "Processes, Procedures and Methods to Control Pollution from Mining Activities," 1973.

U.S. Environmental Protection Agency, "Processes, Procedures and Methods to Control Pollution Resulting from Silvicultural Activities," 1973.

U.S. Environmental Protection Agency, "Methods for Identifying and Evaluating the Nature and Extent of Nonpoint Sources of Pollution," 1973.

University of Nevada, "Placer Mining in Nevada," 1936.

U.S. Department of Interior, "Westwide Study Report on Critical Water Problems Facing the Eleven Western States," 1975.

National Commission on Water Quality, "Yellowstone River Basin Regional Impact Assessment," 1976.

- U.S. Environmental Protection Agency, "Interim Report on Loading Functions for Assessment of Water Pollution from Nonpoint Sources," 1975.
- U.S. Environmental Protection Agency, "Comparative Costs of Erosion and Sediment Control, Construction Activities," 1975.
- Dean, K.C., Havens, R., Glantz, M.W., "Methods and Costs for Stabilizing Fine-Sized Mineral Wastes," U.S. Department of the Interior, Bureau of Mines, Report #7896, 1975.
- National Commission on Water Quality, "Cost and Effectiveness of Point Source Pollution Control Options for Irrigated Agriculture," 1975.
- National Commission on Water Quality, "Study and Assessment of the Capabilities and Cost of Technology for Control of Pollutant Discharges from Urban Runoff."
- "United States Government Manual," 1975/1976, Revised May 1, 1975.
- Nevada Revised Statutes.
- State of Nevada, Division of Water Resources, "Hydrologic Atlas," 1972.
- Pacific Southwest Inter-Agency Committee, "Factors Affecting Sediment Yield and Measures for the Reduction of Erosion and Sediment Yield," 1968.
- Midwest Research Institute, "Cost and Effectiveness of Control of Pollution from Selected Non-Point Sources," National Commission on Water Quality, Washington, D.C., 1975.
- Tahoe Regional Planning Agency, "Grading Ordinance No. 5," 1972.
- "Approaches to Urban and Rural Erosion and Sediment Control, Administrative and Legislative Actions to Extend State Programs," Mary M. Garner, 1972.
- U.S. Environmental Protection Agency, Office of Water Planning and Standards, Washington, D.C., "Report on State Sediment Control Institutes Program," 1975.
- State of Idaho, Division of Environment, Department of Health and Welfare, "Survey of Nonpoint Source Pollution Programs," 1975.
- ASCE, "The Concept Institution in Water Management Usage," Norman Wingert, 1973.
- State of Washington, Council on Environmental Policy, "SEPA Guidelines," 1975.
- Regional Environmental Management, "An Analysis of Institutional Forms," L. Edwin Coate, 1975.

National Association of Conservation Districts, "Suggested Guidelines and Standards for Erosion and Sediment Control Programs," 1972.

National Association of Counties Research Foundation, "Community Action Guidebook for Soil Erosion and Sediment Control," 1970.

U.S. Department of Agriculture, Soil Conservation Service, "Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas," 1975.

State of Idaho, "The Executive Branch Reorganization Staff of Idaho State Government," 1971.