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**TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA**



**Information Summary on
Alternatives For
Flood Control and Related
Water Resources Problems**

July 1980



The alternative solutions presented are conceptual in nature.

Whichever plan is ultimately selected will require detailed engineering study.

Introduction

The purpose of this information summary is to describe alternative solutions studied for flood control, water quality, recreation and associated problems and needs indigenous to the Truckee Meadows and Reno-Sparks metropolitan area.

Alternative plans are presented so that the public may assess the relative values of each plan and its effects.

This summary is intended to supply information for a better understanding of how interests and needs are affected by the problems and proposals under consideration.

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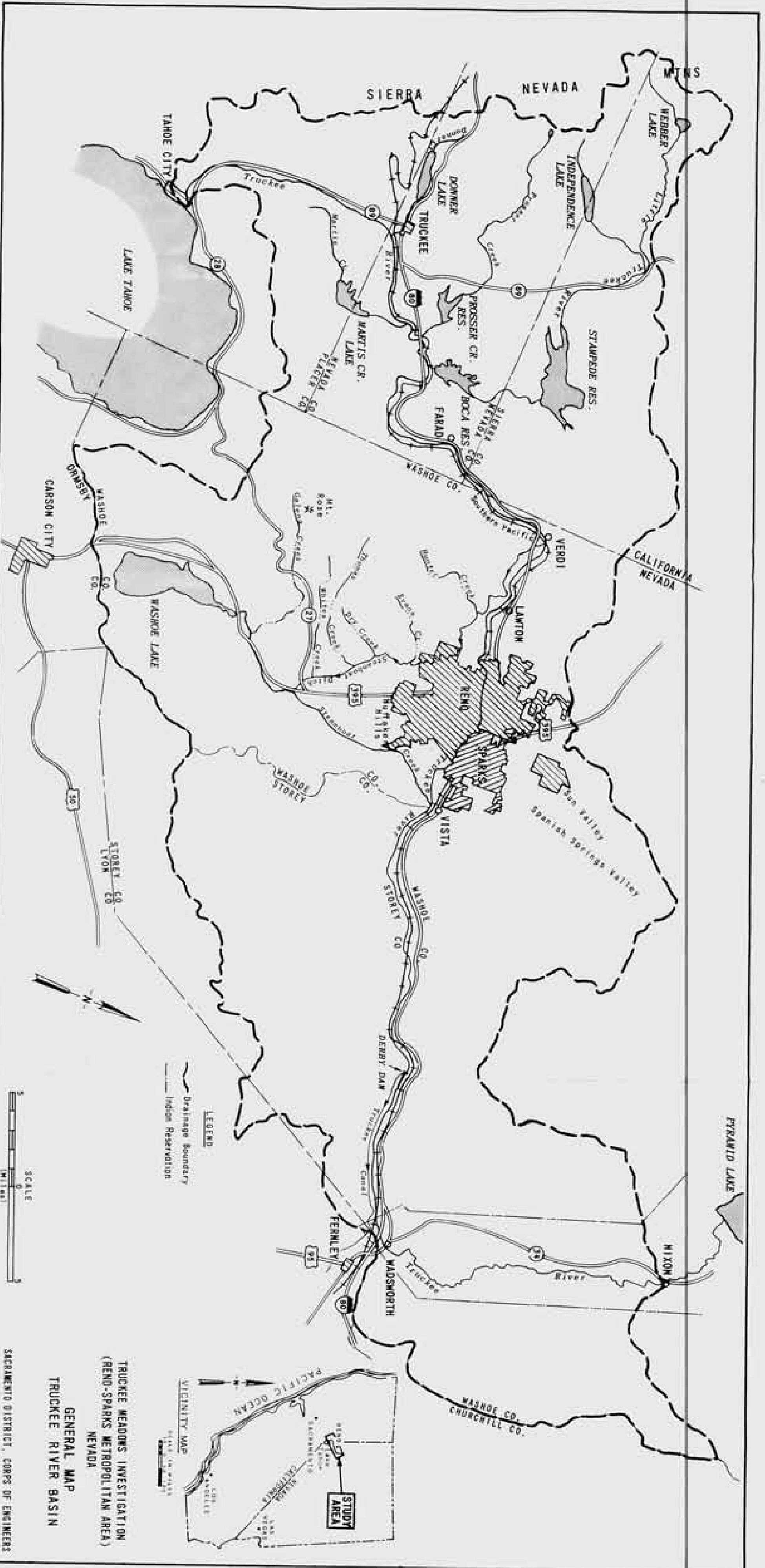
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Description of Study Area

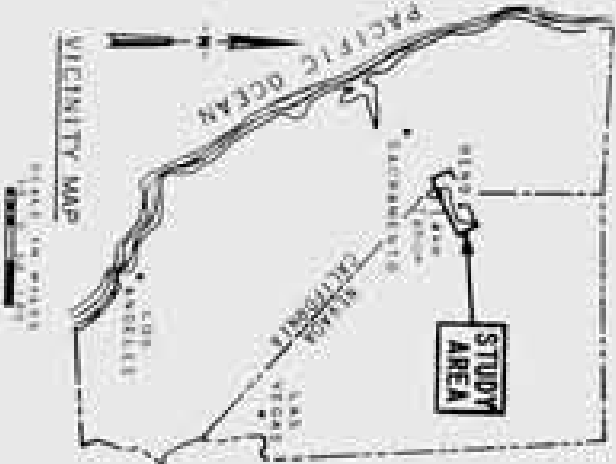
The Truckee River Basin comprises about 3,060 square miles in eastern California and western Nevada, as shown on Plate I. Most of the runoff from the Truckee River Basin originates above the city of Reno, Nevada. The drainage area upstream of Reno has 1,067 square miles with mountainous terrain on the eastern slopes of the Sierra Nevada, the crest of which forms the western boundary of the basin. Within this area, 506 square miles is tributary drainage to Lake Tahoe. The lake is 22 miles long and 12 miles wide, has a surface area of 192 square miles, and has an active storage capacity of about 745,000 acre-feet and contains about 125 million acre-feet. The Truckee River originates at the northwestern shore of the lake, where an outlet structure has been provided to regulate the outflow. From the lake, the river flows generally north and east through the cities of Truckee, California, and Reno, Sparks, and Wadsworth, Nevada, to Pyramid Lake, meandering approximately 110 miles. The principal tributaries of the Truckee River are Donner Creek, Martis Creek, Prosser Creek, Little Truckee River, and Steamboat Creek. Flows originating above Reno are partially regulated by Stampede, Boca and Prosser Creek, and Martis Creek reservoirs and Lake Tahoe.

The cities of Reno and Sparks and the Truckee Meadows area are located in western Nevada along the Truckee River about midway between Lake Tahoe and Pyramid Lake. Sparks adjoins Reno and is located to the east along the north bank of the Truckee River in the Meadows area. The elevation of these cities is about 4,500 feet, which is 1,700 feet lower than Lake Tahoe.

The area of Reno, Sparks, and Truckee Meadows is experiencing considerable industrial development and is currently one of the most rapidly growing areas in the United States. The 1970 population was 121,068 in Washoe County. The projected population for 1980 is 208,232 and for 1990 is 267,291.



LEGEND
 --- Drainage Boundary
 --- Indian Reservation



**TRUCKEE MEADOWS INVESTIGATION
 (RENO-SPARKS METROPOLITAN AREA)
 NEVADA
 GENERAL MAP
 TRUCKEE RIVER BASIN**

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
 1977 1982

History of the Investigation

This investigation is a resumption of the Truckee Meadows Investigation authorized on 7 February 1964 by resolution of the Committee on Public Works of the United States Senate.

A public meeting was held in November 1964 to determine desires of local interests, and studies were initiated in Fiscal Year 1965. The tentative flood control plan resulting from these studies consisted of storage on the mainstem of the Truckee River at Verdi, storage and interceptor facilities on Steamboat Creek, and channel improvements in Truckee Meadows. However, when presented with the plan, local interests opposed storage at Verdi because of industrial developments in the proposed reservoir area. Consequently, after further study, an office study concerning Verdi Dam and Reservoir and alternative reservoirs at the Lowton, Hirschdale, Truckee, and Gateway sites was presented to State and local officials. Because of continued lack of support the study was suspended in FY 1970. In May 1974 Washoe County requested the Corps to consider the economic feasibility of an alternative consisting of lowering the Vista reefs and channelizing the Truckee River. In FY 1975, a channel enlargement alternative was studied. Results of this preliminary study, which indicated the channel alternative would be feasible, were furnished the Washoe County Board of Commissioners in November 1975. In late 1976 Washoe County and the cities of Reno and Sparks requested that the Corps resume prior studies.

Existing flood control and conservation developments by the Bureau of Reclamation and the Corps of Engineers are summarized in the following paragraphs:

Projects completed by the Bureau of Reclamation in the Truckee River basin are: (a) the Newlands Project, (b) the Truckee River storage project, and (c) the Washoe project. The Newlands project, completed in 1915, consists of the Lake Tahoe outlet control structure, the 290,000 acre-foot Lahontan Reservoir and appurtenant power facilities on the Carson River near Fallon, the Derby Diversion Dam on Truckee River, the Truckee Canal extending from Derby Dam to Lahontan Reservoir, and the facilities for the distribution of irrigation water in the Carson River Basin in the vicinity of Fallon. The Truckee River storage project, completed in 1939, consists of the 40,800 acre-foot Boca Reservoir on the Little Truckee River, together with pertinent distribution facilities for irrigation. Completed in 1970, the portion of the Washoe project above Reno consists of the 30,000 acre-foot Prosser Creek Reservoir on Prosser Creek and the 225,000 acre-foot Stampede Reservoir on Little Truckee River, about 4 miles upstream of the Boca Reservoir. The completed three-reservoir complex of Boca, Stampede, and Prosser Reservoirs provides a total of 60,000 acre-feet of flood control storage and additional flood control protection to Reno, Sparks, and the Truckee Meadows area.

Developments by the Corps of Engineers include a channel modification project authorized by the Flood Control Act of 1954, consisting mainly of widening and deepening the Truckee River channel through Truckee Meadows for about 7.5 miles, extending from the downstream limits of Reno to a point near Vista; minor channel improvements at Lake Tahoe outlet; and minor channel improvements at intermittent points along the river above and below the Meadows area. This work was completed in 1963. Also, the Flood Control Act of 1962 authorized the 20,000 acre-foot Martis Creek Lake, completed in 1972, for flood control and future water supply.

Local interests provided channel improvements along the Truckee River, consisting of riprap and masonry retaining walls for stabilizing both banks through sections of downtown Reno. The work was accomplished about 1930 to 1935 by the Works Progress Administration (WPA) in cooperation with local interests. As a part of the local interests requirements for Martis Creek project, the city of Reno additionally improved the channel to carry a 14,000 cubic feet per second (cfs) flow through Reno. This work was completed in 1972.

Problems and Needs

Flooding

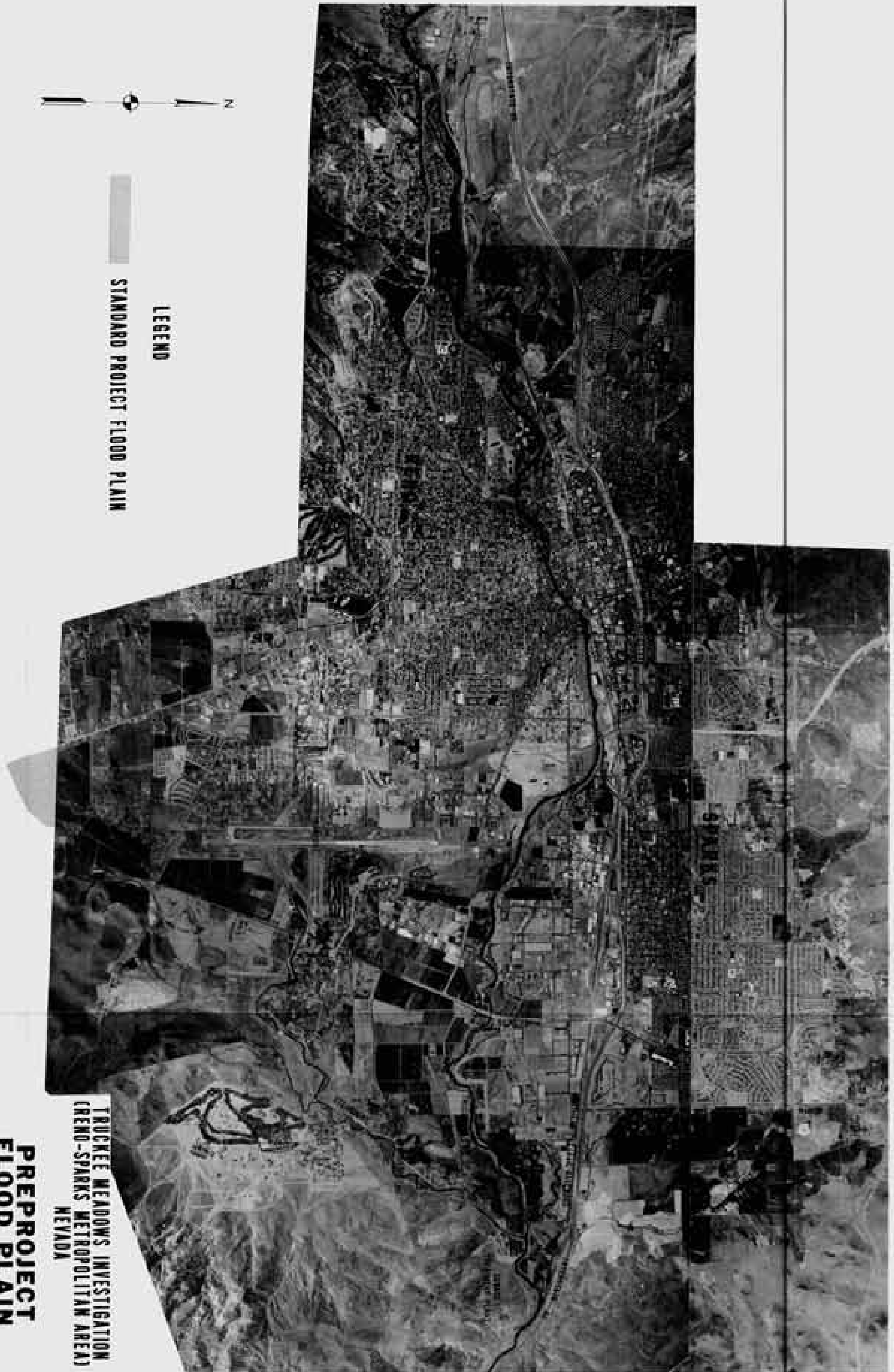
Reno, Sparks, and Truckee Meadows have had serious flood problems for many years, and historical accounts show that many damaging floods have occurred from winter rain-snowmelt and summer cloudbursts. Rainfloods, resulting from prolonged heavy rainfall over the drainage area and characterized by high peak flows of moderate duration, can occur in the area any time from November to April. Flooding is more severe when previous rainfall has caused the ground to be saturated, when the ground is frozen and infiltration is minimal, or when warm rain on snow in the higher elevations adds snowmelt to rainflood runoff.

Since about 1960, flood control works, consisting of reservoirs and channel modifications, have reduced the magnitude and frequency of flooding in the area; however, the flood of 1963 inundated a strip one to two blocks wide in Reno along each side of the Truckee River from Idlewild Park on the west to Coney Island Drive on the east. Potential flood damage was greatly reduced by advanced preparation and effective floodfighting. Floods in November 1950, December 1955, and January-February 1963, were similar in magnitude. These severe floods were the most damaging rainfloods because they occurred after residential and business areas of Reno began to spread to the south and southwest. In each flood event, residential, business, and agricultural areas were flooded. Although residential damage was minor, some residents were evacuated from their homes, and some rural residences were isolated by floodwaters and damaged roads. In agricultural areas, irrigation facilities were damaged, livestock was threatened, baled hay and hay stacks were lost, and sand, silt and other flood debris were deposited on the land. Sections of Steamboat, Lake, and Last Chance Ditches were washed out and streambanks were eroded. The Reno International Airport and about 4,000 acres of agricultural land in Truckee Meadows were also flooded.

The flood plain, shown on Plate 2, consists of the downtown section of Reno, a fringe area on the south and east of the city of Sparks, and the Truckee Meadows. The Meadows begins near the eastern city limits of Reno and extends to the narrow canyon at Vista.

The largest flood of record on the Truckee River in the study area occurred on 23 December 1955 when a peak flow of 20,800 cfs was measured at Reno. That flood caused extensive damage in downtown Reno and in Truckee Meadows. Another large flood occurred on 21 November 1950. During that flood, a maximum flow of 19,900 cfs was recorded at Reno. Damage was particularly heavy in downtown Reno where businesses were flooded and the Rock Boulevard Bridge was washed away, and flooding in Truckee Meadows was extensive.

Other large floods on the Truckee River occurred in 1907, 1937, and 1963.



TRUCKEE MEADOWS INVESTIGATION
 (RENO-SPARKS METROPOLITAN AREA)
 NEVADA

**PREPROJECT
 FLOOD PLAIN**

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
 JULY 1968

Historical flows and damages caused by the most recent significant floods in the area downstream of Verdi, based on prices and conditions at the time of the flood, are shown in the following tabulation.

| <u>Floods of Record</u> <u>(Reno Gage)</u> | | |
|---|----------------------------------|--|
| <u>Date of</u> <u>Flood</u> | <u>Peak</u> <u>Flow (cfs)</u> | <u>Estimated</u> <u>Damage (\$)</u> |
| Nov 1950 | 19,900 | \$2,470,000 |
| May 1952 | 7,950 | 230,000 |
| Dec 1955 | 20,800 | 1,680,000 |
| Feb 1963 | 18,400 | 1,680,000 |
| Dec 1964 | 11,300 | 1,320,000 |
| Jan 1980 | 8,650 | Not determined |

The Truckee Meadows, once predominantly rural-agricultural, is changing to an urban-industrial complex. The current estimate of damageable property in the Truckee Meadows Standard Project Flood Plain, excluding the value of lands, roads, bridges, utilities, and railroads, is \$1,244,000,000. Damages to existing development in the Truckee Meadows (Reno-Sparks metropolitan area) would amount to approximately \$170 million with a recurrence of the December 1955 flood and \$145 million with the February 1963 flood, assuming similar hydrologic and climatic conditions of the prior events.

Fish and Wildlife

The Truckee River and its tributaries support a diverse population of game and nongame fish including the Threatened Lahontan cutthroat trout and Endangered cui-ui. The once abundant population of the cui-ui, a lake sucker occurring only in Pyramid Lake, has declined greatly since the turn of the century. Diversion of the Truckee River water, degradation of water quality, blockage of spawning migration by Derby Dam, and the destruction of spawning habitat all contributed to the decline of the cui-ui and Lahontan cutthroat trout.

Recent efforts to restore the cui-ui and cutthroat trout include artificial propagation and stocking of Pyramid Lake and construction of the Pyramid Lake Fishway to reestablish spawning runs in the Truckee River. The Fish and Wildlife Service has determined that preservation and reestablishment of riparian vegetation would be helpful to lower water temperatures which are too high in the summer and to minimize sedimentation.

The Truckee River Basin supports a diverse and abundant wildlife community including deer, beaver, mink, Canada goose, sandpipers, swallows, warblers, and hawks. The abundance of wildlife species is due to the diversity of habitat types found in the basin. Many of these wildlife are attracted to the seasonal marshes and ponds, streams, pasture, and other agricultural lands of the Truckee Meadows area.

As the amount of native vegetation, seasonal marshes, agricultural lands, and range lands continues to diminish due to rapid urbanization and development, wildlife populations will decrease in number with a consequent loss of esthetic and hunting opportunities. This issue is a basic concern of the U. S. Fish and Wildlife Service, the Nevada Department of Wildlife, and the California Department of Fish and Game.

Recreation

Existing Recreation Areas.

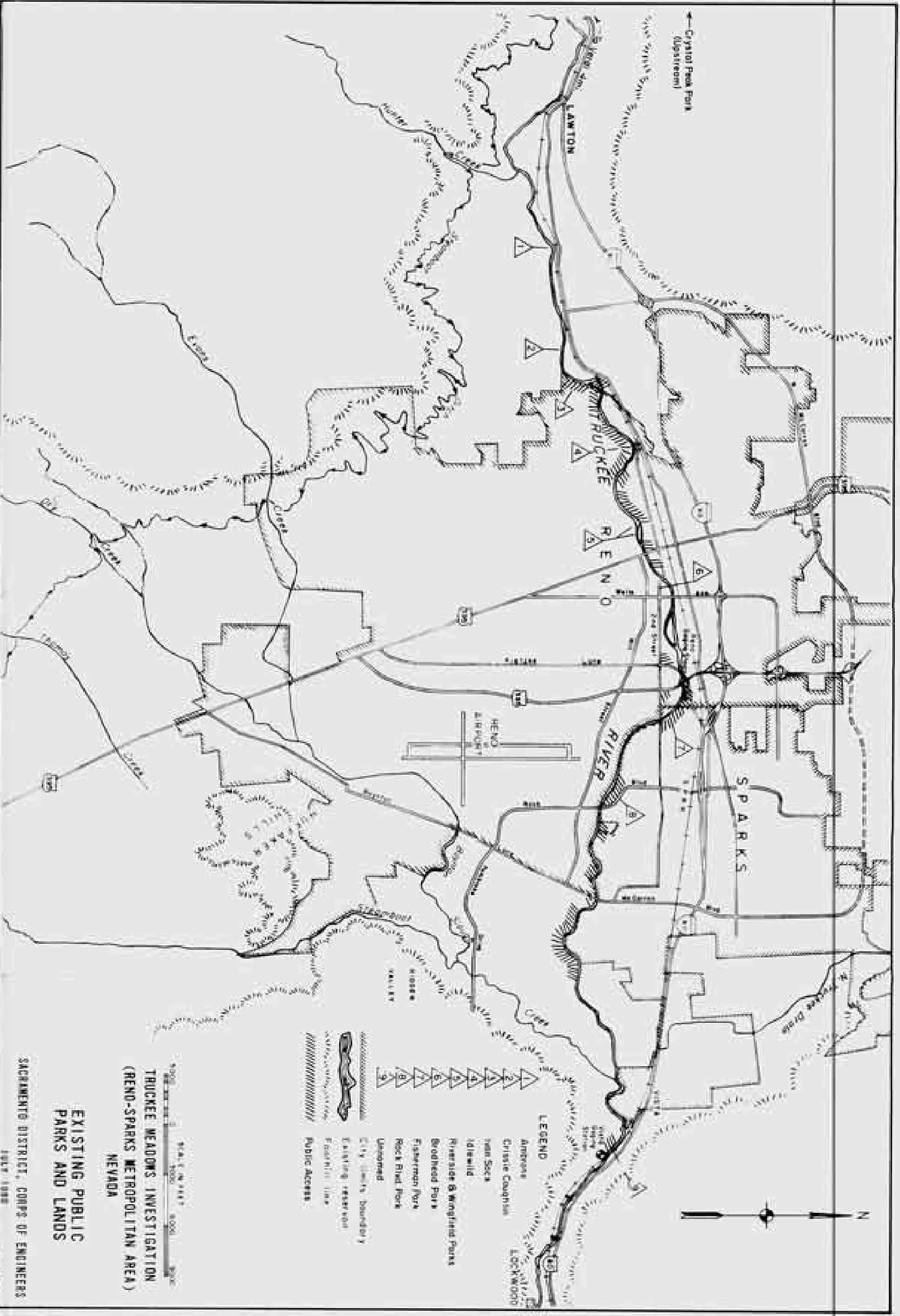
The following tabulation is an inventory of recreation areas located along the Truckee River from Verdi to Vista. No other recreation areas are known to exist along tributary streams being studied. Locations of the existing public lands and parks are shown on Plate 3.

| <u>Park</u> | <u>Agency</u> | <u>Remarks</u> |
|----------------------|--------------------|--|
| Verdi (Crystal Peak) | Washoe County | 7.7 acres: Picnic, fishing |
| Rock Blvd | Washoe County | 5 acres: Undeveloped |
| Ambrose | Washoe County | 4.3 acres: Undeveloped |
| Idlewild | The City of Reno | 48 acres: Picnic, bike path, two lakes, playground, pool, baseball, softball |
| Riverside | The City of Reno | 3 acres: Picnic, fishing |
| Wingfield | The City of Reno | 7 acres: Picnic, fishing, tennis, playground |
| Crissie Caughlin | The City of Reno | Undeveloped |
| Ivan Sack | The City of Reno | Picnic, fishing |
| Brodhead | The City of Reno | Picnic, fishing |
| Unnamed (Vista Site) | The City of Sparks | 17.5 acres: Undeveloped |

Existing Recreation Participation.

In 1974, a household survey of Washoe County residents showed the following activities as the 14 most popular (in order of frequency of participation): Alpine skiing, swimming, camping, walking, fishing, tennis, bicycling, golf, boating, hunting, baseball, picnicking, water skiing, and horseback riding.

The Nevada Department of Fish and Game estimated there were over 121,000 angler days on the Truckee River (within Washoe County) in 1972 and 56 angler days on Steamboat Creek. The total angler days on the Truckee River was larger than for any other one waterway in Washoe County.



**EXISTING PUBLIC
 PARKS AND LANDS**
TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
 1967-1968

Recreation Needs.

The State of Nevada's comprehensive Outdoor Recreation Plan, (SCORP) "Recreation in Nevada," 1977, identifies a need for recreation facilities for various regions within the State. Planning Region I, within which the Truckee River is located, is composed of six counties with Washoe County containing about 68 percent of the region's population. Within Washoe County, about 80 percent of the population is located in the Reno-Sparks area. Therefore, it is reasonable to assume that a significant portion of the recreation deficiencies occur in the project area. A 1974 household survey of Washoe County residents ascertained that the ten recreation facilities most needed are: bicycle paths, ice skating rink, community zoo, swimming facilities, bridle paths, tennis courts, children's zoo, jogging paths, handball courts, and children's camping facilities. Significantly, some of those activities that rank high in frequency of participation also rank high in the "need" category, indicating that the frequency of participation will increase if additional facilities were provided, i.e., there is an inadequate existing supply to meet current demand.

Water Quality

The Truckee River receives pollutants from three major sources: (1) irrigation return water, (2) urban runoff, and (3) effluent from wastewater treatment plants. The pollutants from the Reno-Sparks Joint Sewage Treatment Plant and irrigation return flow during the irrigation season are continuous and have remained relatively constant. However, as a consequence of the changing character of the community, urban stormwaters and the discharges of the treatment plant will become the dominant influence on the quality of the Truckee River, and the influence of the agricultural community will diminish.

Alternative Flood Control Plans

No Action

With the no action plan (Plan 5), the Federal Government would take no action to alleviate flood problems. The Truckee River and its adjacent flood plains would not be altered for flood control works. Existing fish and wildlife habitat would be left undisturbed, except when changed by flooding or unrelated processes. Washoe County and the cities of Reno and Sparks can be expected to continue to participate in the Federal Flood Insurance Program, which requires that future development be floodproofed to at least the elevation of the 100-year flood. However, no action would mean that floods occurring in the future, similar to floods in the past, would cause significant flood inundation damages to the Truckee Meadows, even with restrictions imposed on the developing flood plains. This alternative is developed in order to compare the effect of the proposed plans to conditions expected to occur with no Corps of Engineers participation. If a Standard Project Flood (SPF) or 100-year flood were to occur, the damages could be expected to be approximately \$408 million and \$145 million, respectively, if no action is taken to alleviate the flood problems.

Reservoirs on Truckee River Above Reno

Studies of the Truckee River indicated five possible storage sites which could be considered. These sites are at Lawton, about 3.5 miles upstream from Reno; at Verdi, about 1.5 miles upstream of the Lawton site; at Hirschdale, near the existing Boca Dam; at Truckee, California; and at Gateway, just upstream from the town of Truckee. There are environmental concerns because of potential destruction of the existing fishery. Of the five sites, the Verdi site demonstrated most potential. This and other potential flood control reservoir sites in the Truckee River and Steamboat Creek are shown on Plate 4.

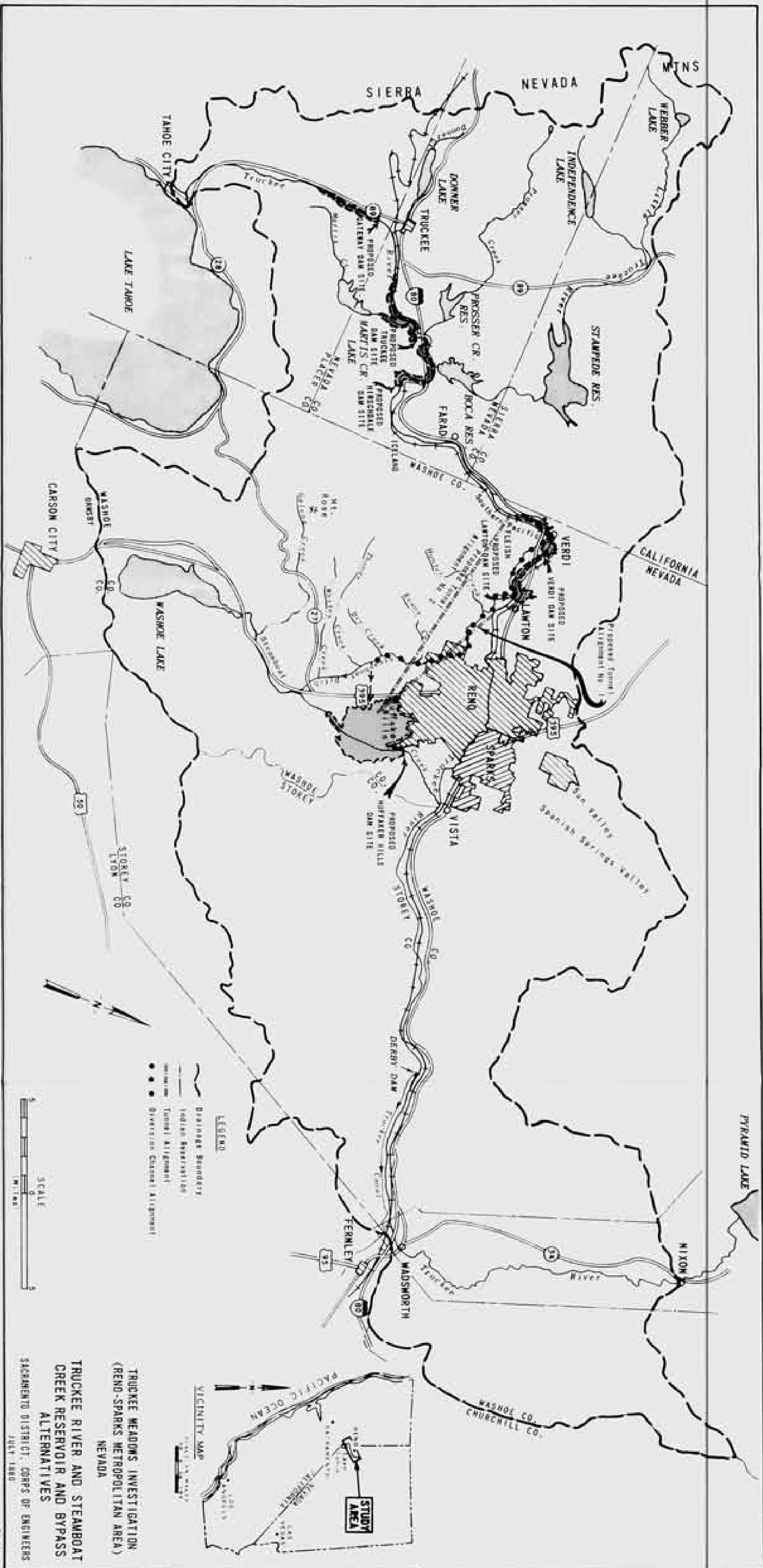
The Verdi damsite, located on the Truckee River about 5 miles upstream of Reno, would control about a 1,000-square-mile drainage area. The 33,000 acre-foot earthfill dry dam would be 160 feet high with a crest length of 3,200 feet and would be located near the existing diversion dam for the Highlands Canal and Washoe Powerhouse. Construction of the dam would require relocation of about 2 miles of Southern Pacific Railroad double track along the southern perimeter of the reservoir and construction of a new railroad bridge across the Truckee River downstream from the damsite. The Sierra Pacific Power Company's existing 3,350 kW capacity Verdi Powerhouse, located within the proposed reservoir area, would need to be abandoned. A Nevada State fish hatchery would have to be relocated and a new access road to Verdi provided. With present price levels and development in the reservoir area, the dam and the reservoir costs would exceed \$150 million. The Verdi dam will be considered further as part of the Environmental Quality Plan (Plan 8). Significant social, economic, and environmental impacts would result from the extensive relocations required for construction of a flood control dam.

Reservoir on Steamboat Creek

A dam and reservoir were considered on Steamboat Creek at Huffaker Hills. This facility could serve in combination with alternative plans which would provide flood protection to a portion of the Truckee Meadows. The Huffaker Hills reservoir site was considered in conjunction with levees, channel enlargement, a Steamboat Ditch bypass channel, or a tunnel bypass around Reno. These plan components are discussed in the subsequent paragraphs of this section. Presently there is great pressure to develop the Huffaker Hills reservoir site for residential and commercial use, and it is expected that most of the reservoir site will be developed soon. Extensive channel and levee work would also be necessary downstream on Steamboat Creek and along the Truckee River to provide a complete solution. This plan was determined to be infeasible.

Steamboat Ditch Bypass Channel

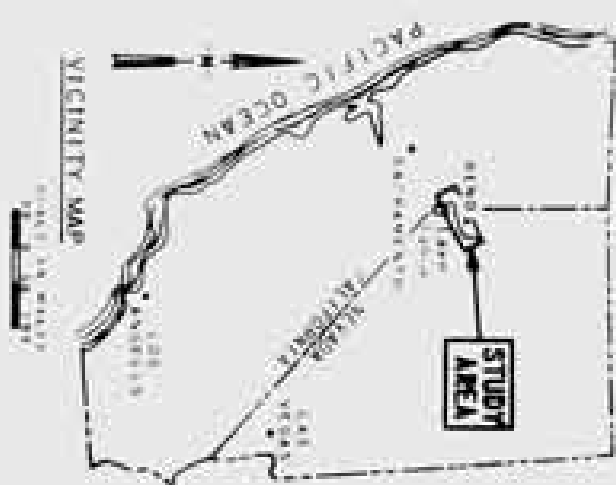
This alternative consists of diverting floodflows from the Truckee River 13 miles southwest of Reno, to the south along the existing Steamboat Ditch alignment and into Huffaker Hills reservoir which would be located on Steamboat Creek. Manually operated gates would control the flows from the Truckee River to Steamboat Ditch during flooding. The fishery would be maintained by constructing a sluiceway through the diversion dam. To assure efficient operation of the channel during major floods, a debris collection basin would be constructed upstream of the diversion dam. This plan was determined to be infeasible.



LEGEND

- Drainage Boundary
- Sedimentation
- Tunnel Alignment
- Diversion Channel Alignment

SCALE
0 1 2 3 4 5
MILES



TRUCKEE RIVER AND STEAMBOAT CREEK RESERVOIR AND BYPASS ALTERNATIVES
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
JULY 1980

Bypass Tunnels

This plan would provide for a small dam to be constructed on the Truckee River to divert floodflows south of Reno through a tunnel system to the proposed Huffaker Hills reservoir on Steamboat Creek. Two potential tunnel alignments were considered: (1) Truckee River near Hunter Creek to the reservoir at Huffaker Hills, and (2) Truckee River near Fleish to a reservoir at Huffaker Hills. This plan was determined to be infeasible.

Bypass Tunnel Through Reno

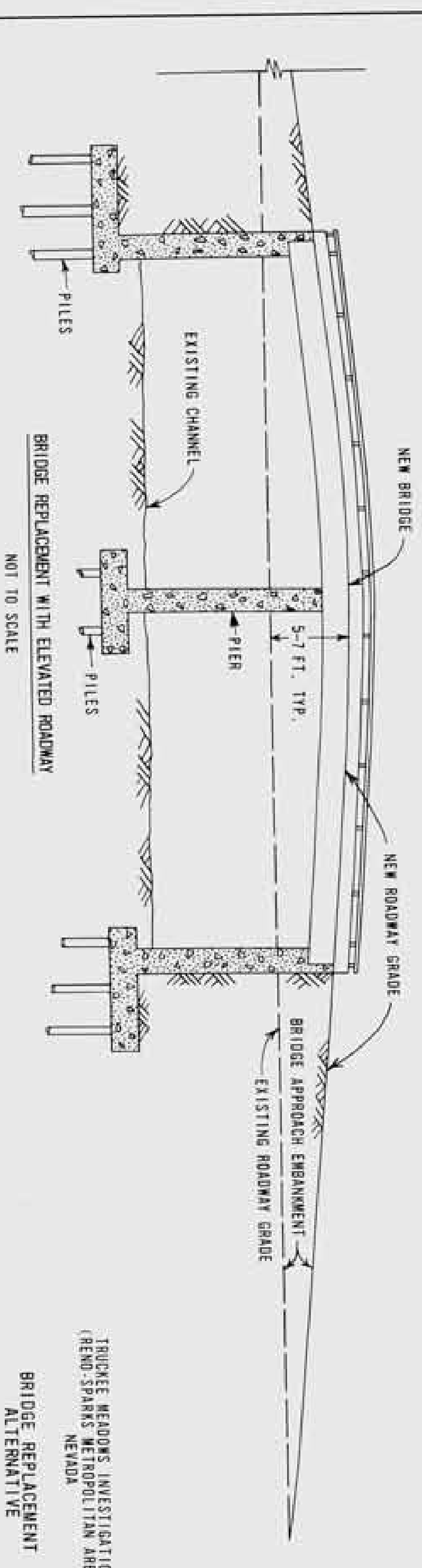
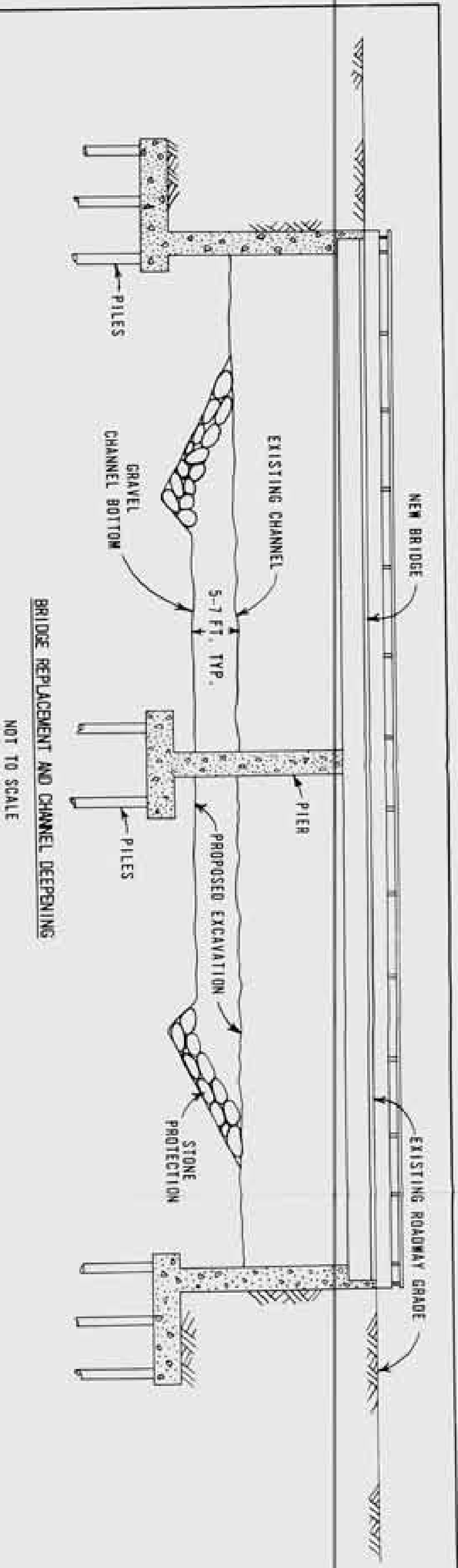
Relatively minor channel modifications in the Truckee River reach through Reno could provide up to 100-year protection. A high degree of flood protection could be provided by an alternative consisting of a bypass tunnel to be constructed through Reno. Two bypass tunnel alignments were studied, one along West Second Street and the other along the Southern Pacific Railroad. The Bypass Tunnel alternative would be used in part with the Channel-Levee and Levee plans (Plans 1, 2, 3, 4) for the Standard Project Flood level of protection.

Bridge Replacement and Floodwalls

Two bridge replacement and floodwalls alternatives are being considered. Plate 5 shows details on potential bridge replacement. The first alternative consists of replacing the existing Lake Street, Center Street, Virginia Street, and Sierra Street bridges with new bridges that are elevated about 7 feet to provide 2 feet of freeboard above the 100-year water surface elevation. Raising the bridges would elevate the roadways, which would need approach ramps from the existing roadway elevation up to the new roadway elevation. The approach ramps would impair sidewalk access to the existing businesses near these bridges and would also block existing cross streets and alleys.

A variation of this plan would consist of replacing these same four bridges with new bridges and deepening the river channel up to about 7 feet, starting at Wingfield Park and extending downstream for about 3500 feet. Sidewalk access to businesses and cross streets would not be affected with this alternative. The potential impact and mitigating measures for the channel deepening on the threatened and endangered fish species within the Truckee River will be studied in detail during future studies.

Both these alternatives include construction of floodwalls at critical locations along riverbanks to guarantee at least 2 feet of freeboard for the 100-year flood event. The Bridge Replacement and Floodwalls alternative would be utilized in part with the 100-year level of protection Channel-Levee plans (Plans 1 and 2). Plate 5 provides additional information on this alternative.



TRUCKEE MEADOWS INVESTIGATION
 (REND. SPARKS METROPOLITAN AREA)
 NEVADA

BRIDGE REPLACEMENT
 ALTERNATIVE

Channel Enlargement and Levees

The channel enlargement and levees alternatives (Plans 1 and 2) studied include channel improvements on portions of the Truckee River from U.S. 395 downstream to the Southern Pacific Railroad Bridge east of Vista and on Dry and Evans Creeks south of the airport. Levees would be constructed on portions of the Truckee River from Rock Boulevard downstream to Vista, on Steamboat Creek from Huffaker Hills to the Truckee River, and on Boynton Slough east of Boynton Lane. To provide 100-year or SPF protection, the plan also includes either bridge replacement and floodwalls with channel deepening or a bypass tunnel through downtown Reno. A flood overflow basin in the College Farms area could be used to reduce peak flows downstream of Vista. Plates 6 and 7 provide additional information on these alternatives.

Levees

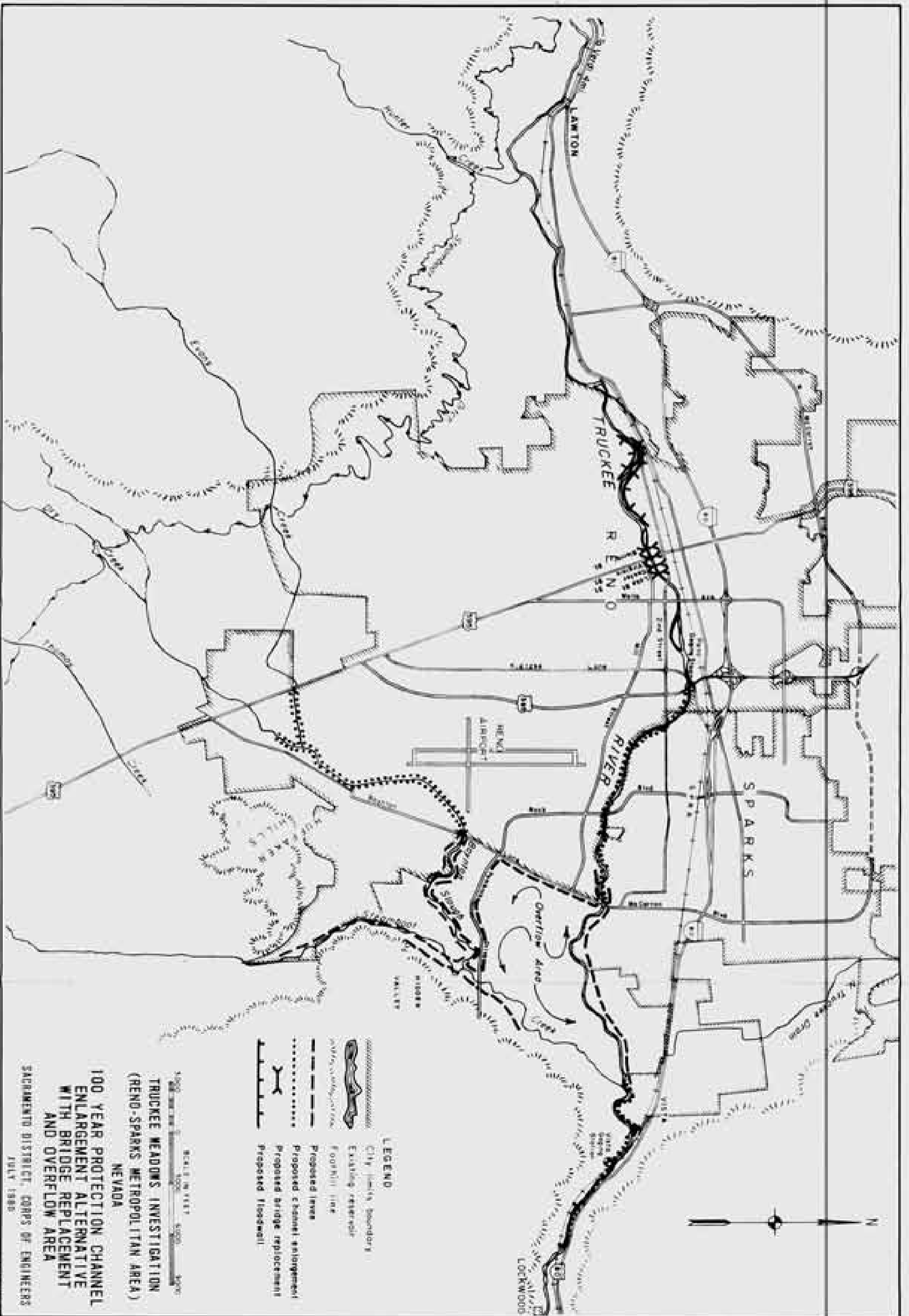
For levee projects with substantial levee heights in a highly developed urban area, the general Corps of Engineers policy is that at least SPF protection be provided. Providing SPF protection limits the risk of catastrophic damages and the loss of life which may occur due to levee failure.

To provide SPF protection would require an extensive levee system and bypass of flow in Reno via a tunnel along the railroad alignment. Two levee SPF protection concepts include (1) constructing setback levees along the Truckee River and tributaries and (2) providing an overflow area on the south side of the river below McCarran Boulevard (Plans 3 and 4). The overflow area would preserve some open space along the river and reduce the peak flow below Vista. Plates 8 and 9 provide additional information on these alternatives.

Nonstructural Measures

Nonstructural measures (Plan 6) are flood damage prevention measures implemented through local flood plain regulations. These regulations do not reduce flooding, but, they do regulate development so as to reduce flood hazards and minimize flood damage. Nonstructural measures that would apply to new and replacement development include elevating structures above the flood plain, enacting zoning ordinances and building codes, and maintaining open space easements in the floodway. Nonstructural measures that would apply to existing structures include raising the structures, providing watertight closures, building small walls or levees around individual structures, or permanently evacuating the structures from the floodway.

The Flood Insurance Program, administered by the Federal Emergency Management Agency, provides low cost flood insurance to existing properties in the flood plain. In return for making insurance available, the program obligates the community to adopt and enforce land use ordinances and other control measures that will reduce flood damages. Because the Truckee Meadows flood plain is already almost completely developed and because residual damages would be great, nonstructural measures by themselves are not a feasible alternative. However, in conjunction with structural measures, nonstructural alternatives may offer some benefits.



- LEGEND**
- City limits boundary
 - Existing reservoir
 - Footwall line
 - Proposed levee
 - Proposed channel enlargement
 - Proposed bridge replacement
 - Proposed floodwall

SCALE IN FEET
 1000 2000 3000 4000

TRUCKEE MEADOWS INVESTIGATION
 (RENO-SPARKS METROPOLITAN AREA)
 NEVADA
100 YEAR PROTECTION CHANNEL
ENLARGEMENT ALTERNATIVE
WITH BRIDGE REPLACEMENT
AND OVERFLOW AREA

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
 JULY 1988

National Economic Development Plan

The National Economic Development (NED) Plan addresses the planning objectives while maximizing net economic benefits to the national economy. The NED plan, Plan 7, consists of the 100-year level of flood protection provided by bridge replacements and floodwalls combined with channel deepening through downtown Reno, and channelization and placement of levees on the Truckee River, Steamboat Creek, Boynton Slough, Dry Creek and Evans Creek, as shown on Plate 10.

Environmental Quality Plan

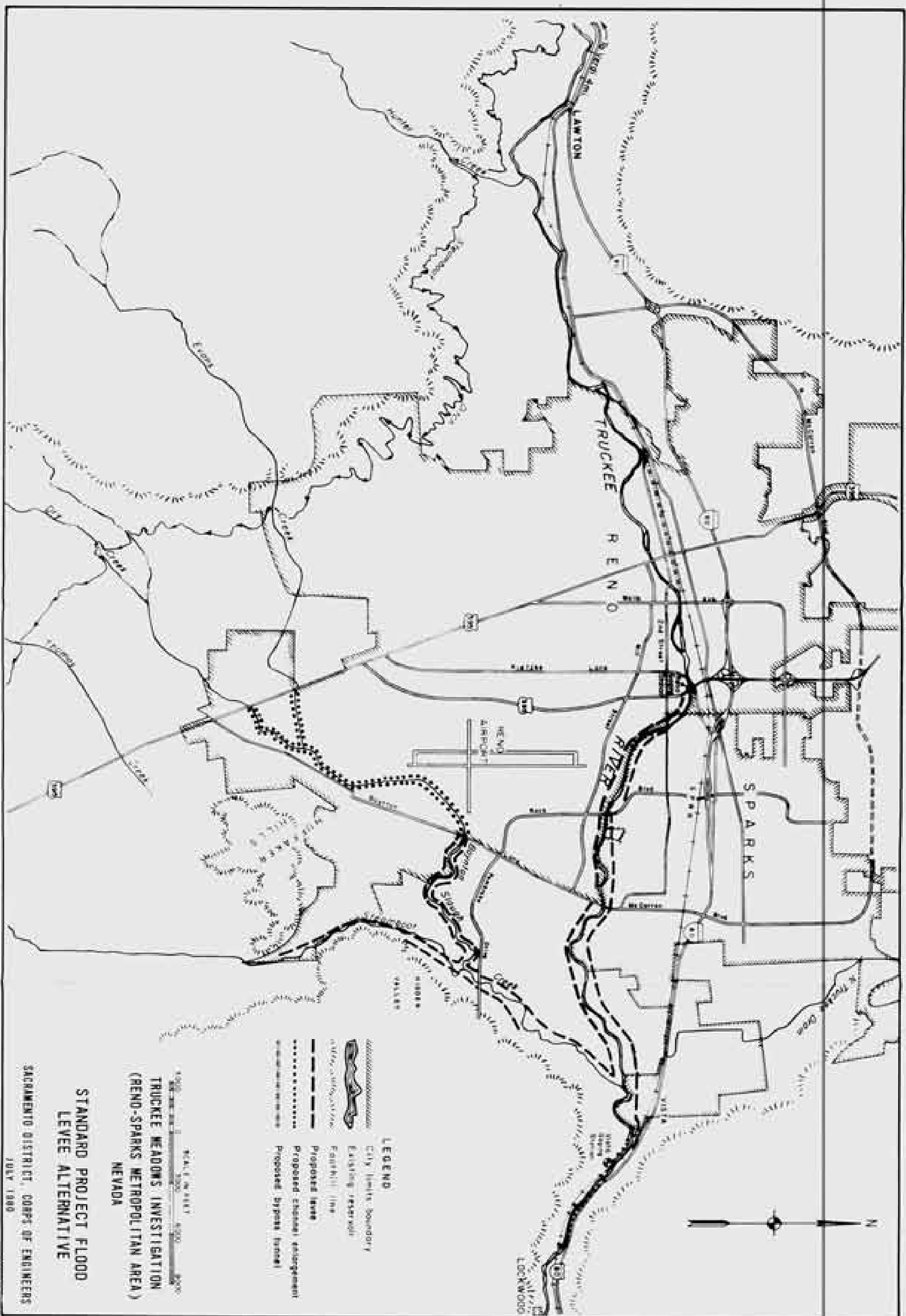
The goal of the Environmental Quality (EQ) Plan is the management, conservation, preservation, creation, restoration, or improvement of natural and cultural resources and ecological systems in the area under study. This plan emphasizes the enhancement, protection, and maintenance of the environment for the present and future. The plan formulated to maximize Environmental Quality endeavors to maximize net positive benefits and is not constrained by monetary requirements.

Specific Environmental Quality objectives consider:

- Management, protection, enhancement, or creation of areas of natural beauty and human enjoyment;
- Management, preservation, or enhancement of especially valuable or outstanding archeological, historical, biological, and geological resources and ecological systems;
- Enhancement of quality aspects of water, land, and air by control of pollution or prevention of erosion and restoration of eroded areas;
- Avoiding irreversible commitment of resources to future use.

The EQ plan developed to date (Plan 8) would provide flood control combined with open space, greenbelt, and natural resource and public use features. This plan consists of a dam on the Truckee River near Verdi, levee and channel work on the Truckee River and tributaries, and a flood overflow basin at the College Farms area. Lands would be acquired in easements and fee to improve and protect environmental resources and to allow recreational development along the Truckee River and its tributaries.

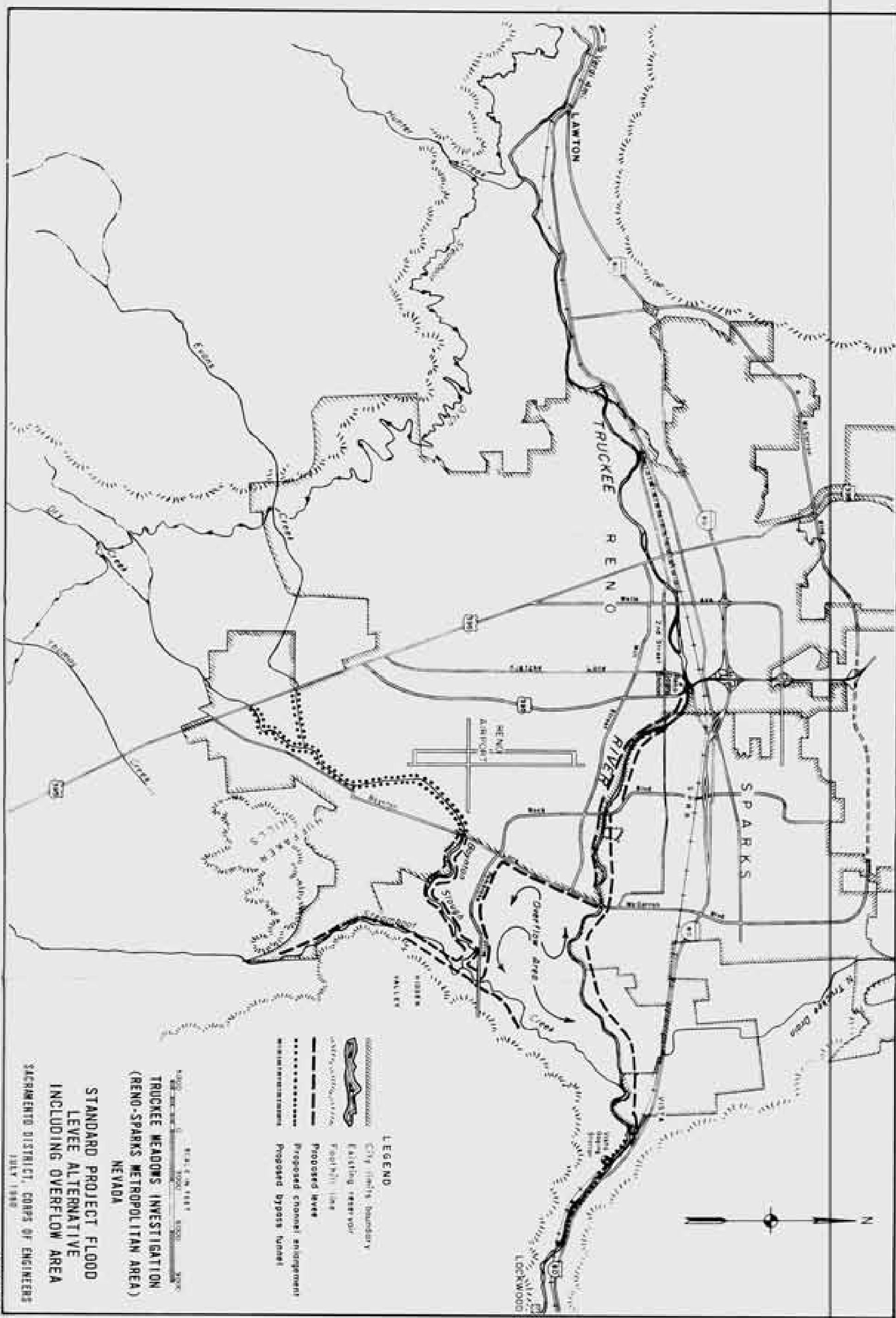
The dry dam would be designed so as not to impede the movement of fish in the Truckee River except during floods, when the excess water is stored. These actions would not only provide the needed flood protection but also minimize adverse impacts on the Threatened Lahontan cutthroat trout and the Endangered cui-ui.



**STANDARD PROJECT FLOOD
LEVEE ALTERNATIVE**

**TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA**

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
1987 1988



LEGEND

-  City limits boundary
-  Existing reservoir
-  Proposed levee
-  Proposed channel enlargement
-  Proposed bypass tunnel

TRUCKEE MEADOWS INVESTIGATION
 (RENO-SPARKS METROPOLITAN AREA)
 NEVADA

STANDARD PROJECT FLOOD
 LEVEE ALTERNATIVE
 INCLUDING OVERFLOW AREA
 SACRAMENTO DISTRICT, CORPS OF ENGINEERS
 JULY 1988

National Economic Development Plan

The National Economic Development (NED) Plan addresses the planning objectives while maximizing net economic benefits to the national economy. The NED plan, Plan 7, consists of the 100-year level of flood protection provided by bridge replacements and floodwalls combined with channel deepening through downtown Reno, and channelization and placement of levees on the Truckee River, Steamboat Creek, Boynton Slough, Dry Creek and Evans Creek, as shown on Plate 10.

Environmental Quality Plan

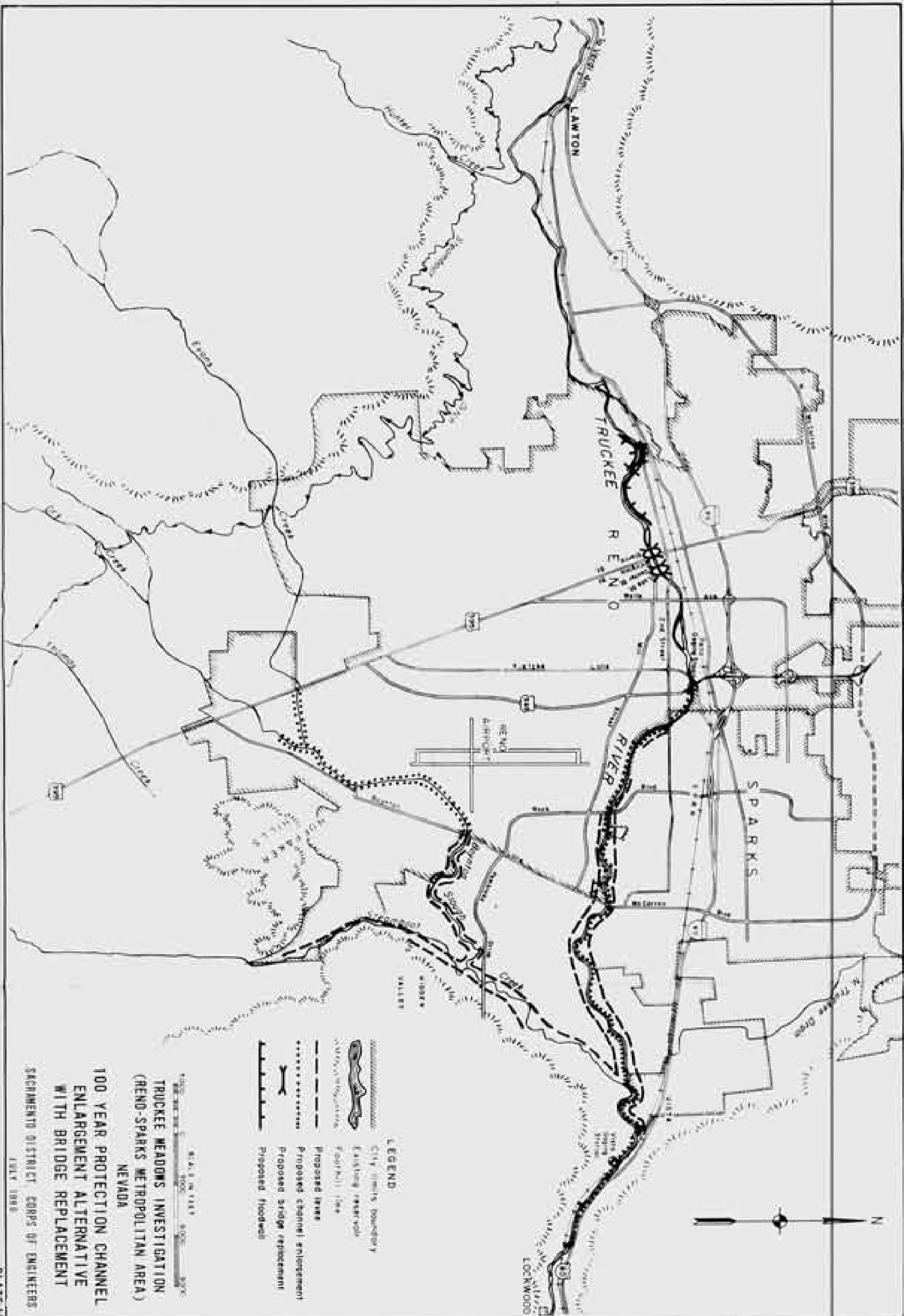
The goal of the Environmental Quality (EQ) Plan is the management, conservation, preservation, creation, restoration, or improvement of natural and cultural resources and ecological systems in the area under study. This plan emphasizes the enhancement, protection, and maintenance of the environment for the present and future. The plan formulated to maximize Environmental Quality endeavors to maximize net positive benefits and is not constrained by monetary requirements.

Specific Environmental Quality objectives consider:

- Management, protection, enhancement, or creation of areas of natural beauty and human enjoyment;
- Management, preservation, or enhancement of especially valuable or outstanding archeological, historical, biological, and geological resources and ecological systems;
- Enhancement of quality aspects of water, land, and air by control of pollution or prevention of erosion and restoration of eroded areas;
- Avoiding irreversible commitment of resources to future use.

The EQ plan developed to date (Plan 8) would provide flood control combined with open space, greenbelt, and natural resource and public use features. This plan consists of a dam on the Truckee River near Verdi, levee and channel work on the Truckee River and tributaries, and a flood overflow basin at the College Farms area. Lands would be acquired in easements and fee to improve and protect environmental resources and to allow recreational development along the Truckee River and its tributaries.

The dry dam would be designed so as not to impede the movement of fish in the Truckee River except during floods, when the excess water is stored. These actions would not only provide the needed flood protection but also minimize adverse impacts on the Threatened Lahontan cutthroat trout and the Endangered cui-ui.



- LEGEND**
- City limits boundary
 - Existing reservoir
 - Existing area
 - Proposed area
 - Proposed channel enlargement
 - Proposed bridge replacement
 - Proposed floodwall

SCALE IN FEET
 0 500 1000 1500 2000
 TRUCKEE MEADOWS INVESTIGATION
 (RENO-SPARKS METROPOLITAN AREA)
 NEVADA
 100 YEAR PROTECTION CHANNEL
 ENLARGEMENT ALTERNATIVE
 WITH BRIDGE REPLACEMENT
 SACRAMENTO DISTRICT, CORPS OF ENGINEERS
 JULY 1988

The reservoir located near Verdi would provide SPF flood protection and be operated to control the 14,000 cfs flow through Reno. Levees would be placed along the Truckee River, where necessary, to convey this flow downstream to Vista. Levees would also be placed along Steamboat Creek and Boynton Slough, with some channelization provided on Dry and Evans Creeks for SPF protection. An overflow area at the College Farms would be designed in the plan to provide a natural storage area for river flows exceeding the channel capacity. Flood easements would be acquired which would assure that the overflow area remain rural.

Recreation Plans

Proposed Recreation Development by Local Interests.

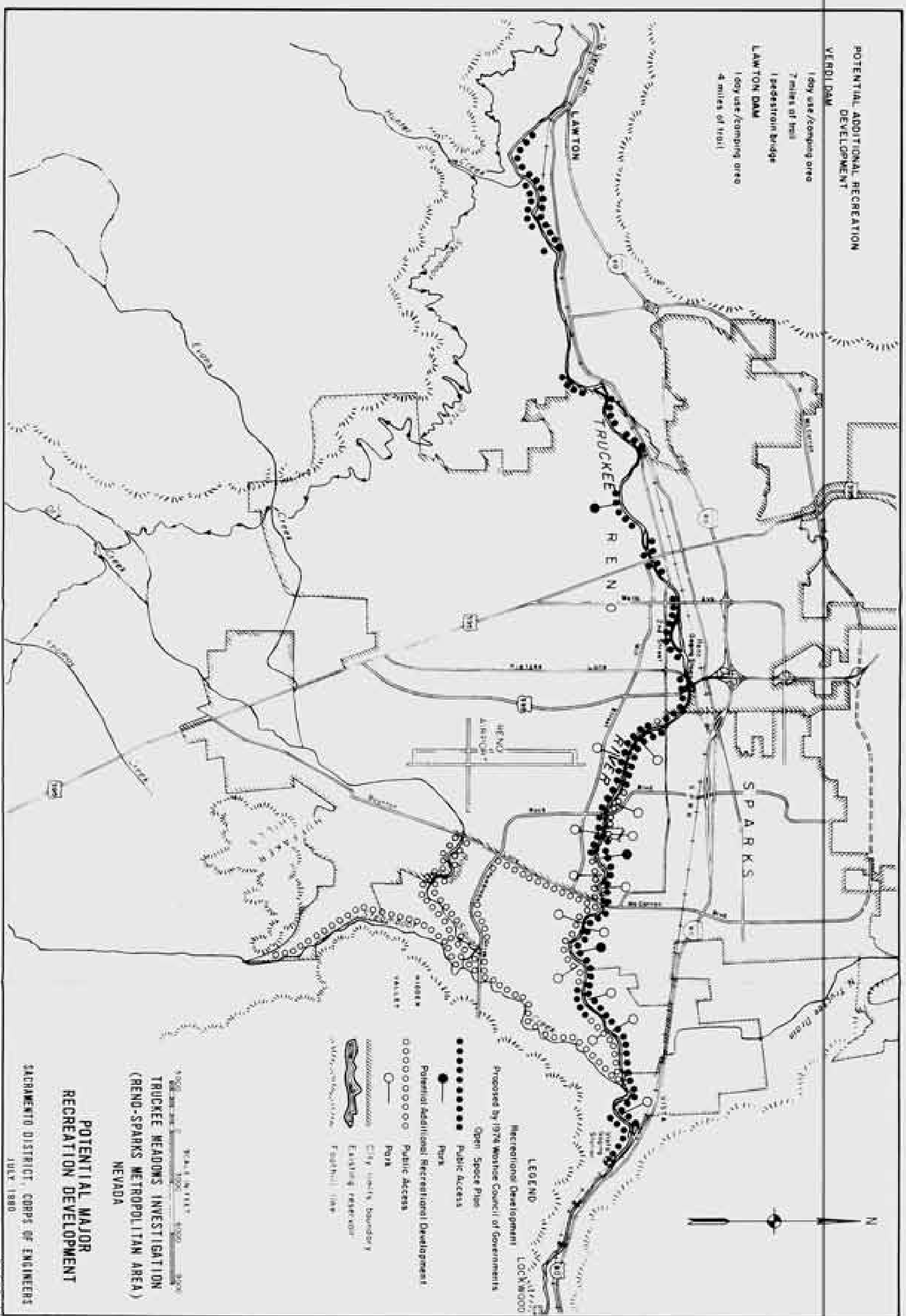
The Regional Planning Commission and the Washoe Council of Governments have proposed plans which would provide open space on either or both banks of the Truckee River from the California State Line to Vista. The plans include adding equestrian trails; constructing pedestrian bridges, bicycle paths, and new picnicking areas; and providing pedestrian access to the river for fishing and sunbathing. The intense local interest in these plans is demonstrated by the extensive planning effort and the commitment of local interests to implement the plans. The city of Sparks has already completed over 80 percent of its land acquisition and the city of Reno about 50 percent. In addition, the city of Sparks has passed an ordinance preventing future encroachment on the Truckee River.

The Corps of Engineers has utilized the local plans to prepare preliminary recreation plans that could be provided in conjunction with a flood control project. The preliminary plans include day use areas which would provide parking, water, restrooms, and picnicking facilities; overnight facilities; equestrian/hiking trails; and paved bicycle paths along proposed levees. The extent of recreation development depends on the desires of the local people and would be influenced by the particular flood control alternative selected. Plate 11 illustrates potential recreation sites that could be developed in conjunction with the various flood control alternatives. If all the sites shown on Plate 11 were developed, a major recreation development would be provided. Plate 12 shows an intermediate level of development of recreation sites and Plate 13 a small development.

If recreation development is included in a flood control alternative, a significant portion of the local needs for picnicking, bicycling, and fishing facilities could be satisfied. Potential public use could range from 500,000 to almost 2,000,000 recreation days per year. The total recreation cost could range up to about \$7 million for the major level of recreation development.

POTENTIAL ADDITIONAL RECREATION DEVELOPMENT
VERDI DAM

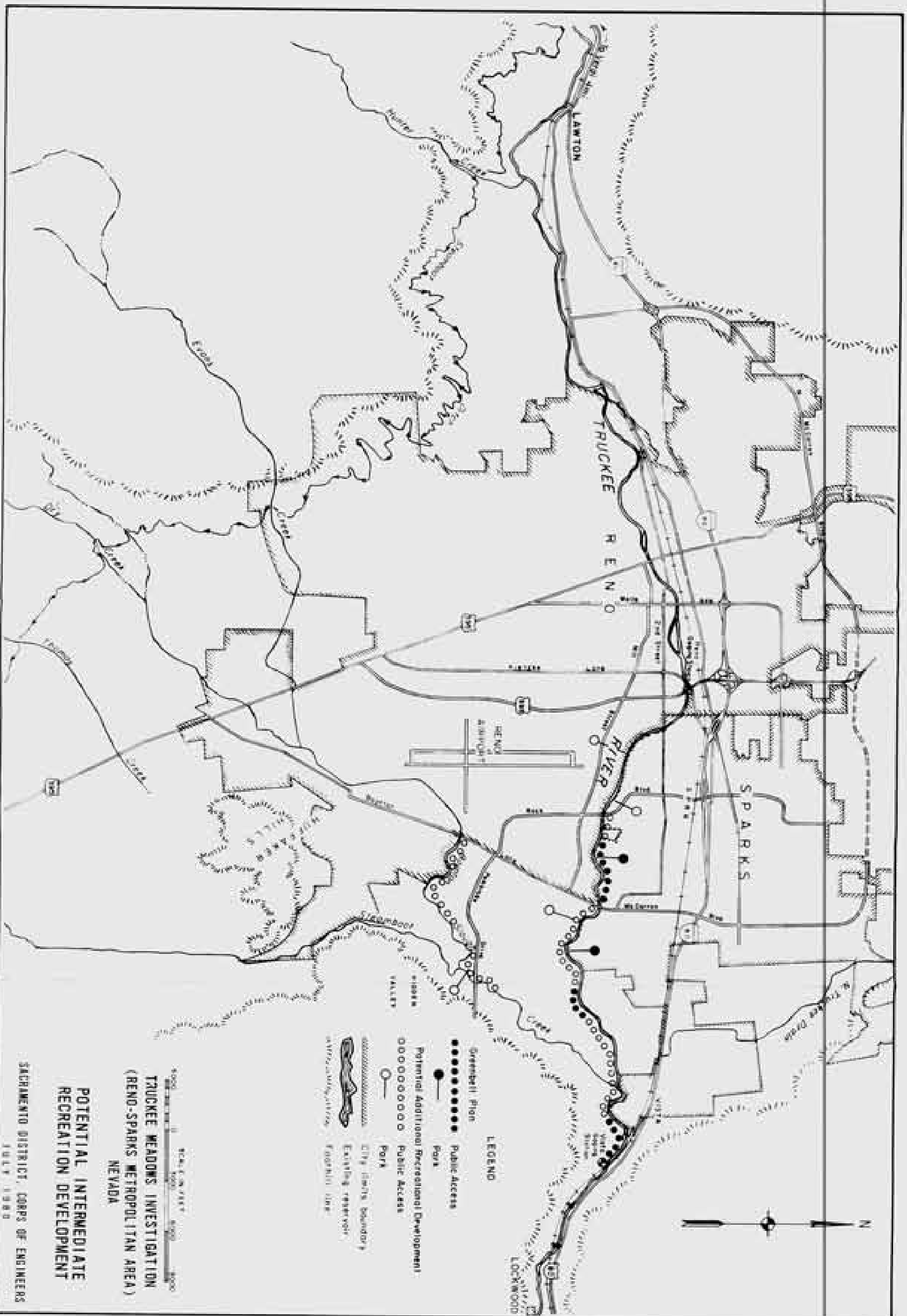
- 1 day use/camping area
7 miles of trail
- 1 pedestrian bridge
- LAWTON DAM
- 1 day use/camping area
4 miles of trail



POTENTIAL MAJOR RECREATION DEVELOPMENT

TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
1987, 1988



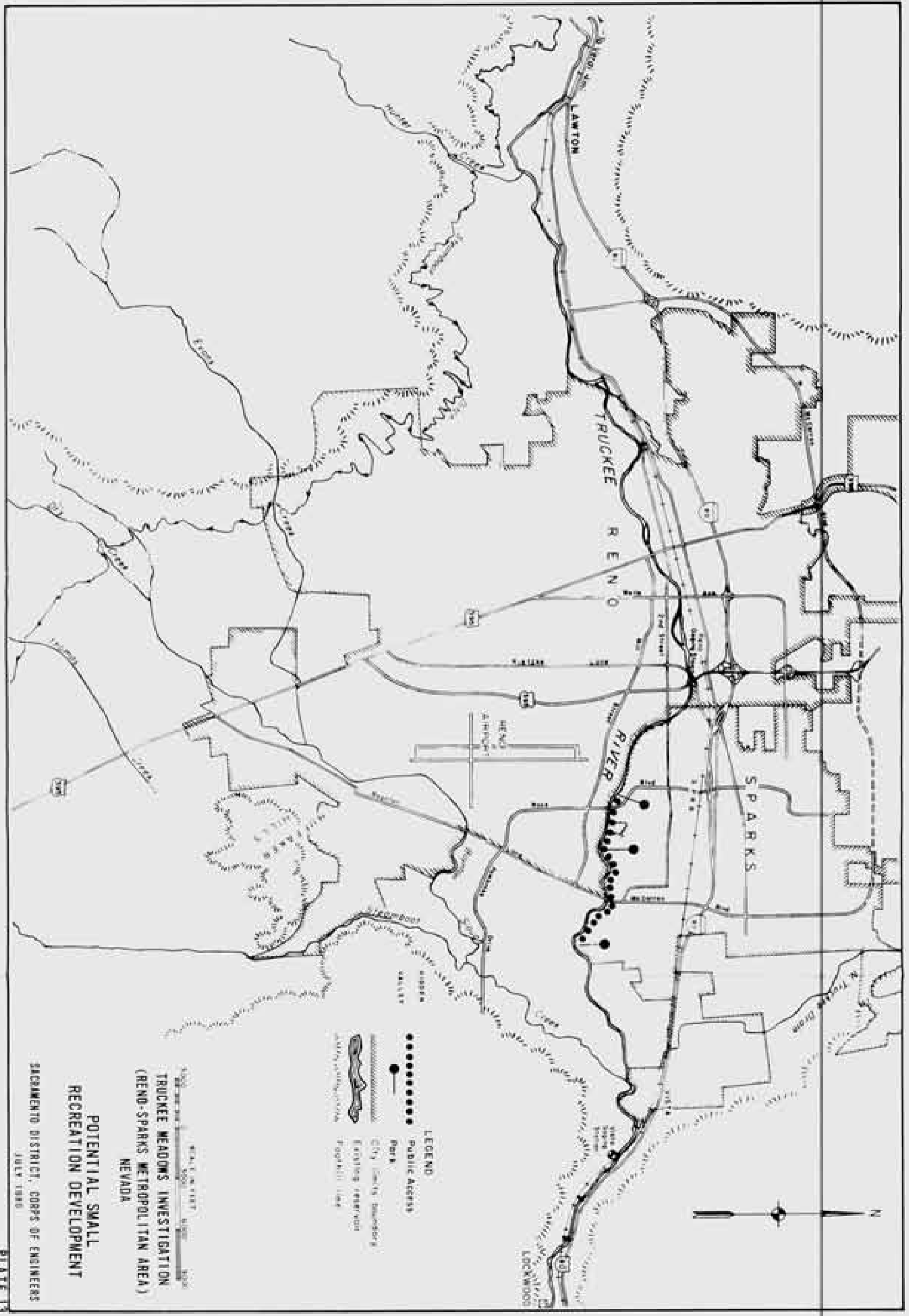
LEGEND

- Public Access
- Greenbelt Plan
- Potential Additional Recreational Development
- Public Access
- Port
- City Limits Boundary
- Existing Reservoir
- Railroad Line

Scale: 1 inch = 1000 feet

POTENTIAL INTERMEDIATE RECREATION DEVELOPMENT (RENO-SPARKS METROPOLITAN AREA) NEVADA

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
JULY 1980



LEGEND

- Public Access
- Park
- City Limits
- ~~~~~ Existing Reservoir
- ~~~~~ Topographic Line

SCALE IN FEET
 0 500 1000 1500 2000

POTENTIAL SMALL RECREATION DEVELOPMENT

SACRAMENTO DISTRICT, CORPUS OF ENGINEERS
 JULY 1980

The most important public input for recreation planning at this time is an expression of interest or no interest by the local people who will use and help pay for the recreation facilities. We suggest you advise us on which of these four alternative levels of recreation you believe appropriate:

1. None.
2. Small amount.
3. Intermediate amount.
4. Major amount.

If you indicate that you wish to have some level of recreation development, we can plan jointly to determine the types and locations of development to accompany any potential Federal proposal for flood control or other improvements in the Reno-Sparks area.

Fish and Wildlife Opportunities

Any water resource development measure, if ultimately selected, will likely affect in some way those factors which are presently causing the decline in the quantity and quality of fish and wildlife habitat. With advice from the Federal and State fish and wildlife agencies, we intend to develop a plan to avoid damage to fish and wildlife insofar as possible and to develop mitigation to offset any unavoidable damage. We also desire to develop enhancement features to improve fish and wildlife resources.

Some possibilities for improving fish and wildlife include the following:

1. Establishment of more riparian vegetation on berms of setback levees.
2. Provision of additional flows for fish.
3. Improvement of spawning gravels.
4. Acquisition in easement or fee of river lands and fencing to protect and improve riparian vegetation.

Another possible fish and wildlife feature could be a combination flood overflow and wildlife preserve easement area for migratory birds and other fish and wildlife at the College Farms area. Also, acquisition of remaining wetlands and seasonal marshes throughout the Truckee Meadows could preserve and improve these resources for scenic beauty, open space, and their fish and wildlife values.

For enhancement measures that assist other Federal programs such as Endangered Species or Natural Migratory Bird Conservation, costs could be 100 percent Federally funded. For ordinary fish and wildlife habitat enhancement, Federal costs would be 75 percent if non-Federal interests agree to provide 25 percent and all administration, operation, and maintenance. Mitigation costs would be shared between the Corps and the non-Federal sponsor in the same ratio as the costs for the project purposes requiring the mitigation.

An expression of interest or no interest about these measures is needed from the Federal and State fish and wildlife agencies and from the general public. We need your views to determine whether or not fish and wildlife measures should be included in a Federal proposal for flood control and other improvements.

Summary of Economic, Environmental, and Social Effects

The Water Resources Council has mandated that Federal and Federally assisted water and land activities be evaluated considering the achievement of Environmental Quality (EQ), and National Economic Development (NED), as co-equal national objectives. Achievement of these two national objectives is the basis for establishing the "Federal Interest" in the alternatives plans.

The additional consideration of Regional Development (RD) and Social-Well-Being (SWB) is specified in the Flood Control Act of 1970. The contributions to the RD account are determined by establishing the effect of a proposal on regional income, employment, population, economic base, environment, social development, and other factors. Contributions to the SWB account are determined by establishing the effects of a proposal on real income; security of life, health and safety; education, cultural and recreation opportunities; and emergency preparedness.

The alternatives presented in this brochure will produce changes, to varying degrees, in both the physical and human environment. The summary below includes information on both categories to give an overall picture of the effects of these alternatives.

TRUCKEE MEADOWS INVESTIGATION SUMMARY OF ECONOMIC-ENVIRONMENTAL-SOCIAL EFFECTS

| ALTERNATIVES | PLAN 1 | | PLAN 2 | | PLAN 3 | | PLAN 4 | | PLAN 5 | | PLAN 6 | | PLAN 7 | | PLAN 8 | |
|--|---|--|---|---|---|---|--|---|---|---|---|---|---|---|---|---|
| | CHANNEL-LEVEE PLAN | CHANNEL-LEVEE PLAN WITH OVERFLOW AREA | LEVEE PLAN | LEVEE PLAN WITH OVERFLOW AREA | NO-ACTION PLAN | NON-STRUCTURAL | NATIONAL ECONOMIC DEVELOPMENT (NED) PLAN | QUALITY (EQ) PLAN | NO-ACTION PLAN | NON-STRUCTURAL | NATIONAL ECONOMIC DEVELOPMENT (NED) PLAN | QUALITY (EQ) PLAN | NO-ACTION PLAN | NON-STRUCTURAL | NATIONAL ECONOMIC DEVELOPMENT (NED) PLAN | QUALITY (EQ) PLAN |
| <p>PLANNING OBJECTIVES</p> <p>1. Contribution to the Planning Objective</p> <p>a. Flood Control</p> <p>b. Recreation</p> <p>c. Environmental Quality (EQ)</p> <p>d. Air</p> <p>e. Water Quality</p> <p>f. Vegetation</p> <p>g. Fish</p> | <p>Provide a moderate degree of flood protection to 2,000 acres of industrial, commercial, residential and public properties. Develop a supplementary recreation plan for lands along Truckee River and tributaries. Three levels of flood protection are evaluated with this plan:</p> <ol style="list-style-type: none"> 1. 30% protection to downtown Reno including a bypass channel and bridge replacement; a high degree of flood protection throughout the meadows. 2. 100-year protection including replacement of 8 bridges in Reno, and a moderate degree of protection throughout the flood plain. 3. 60-year protection to flood plain lands below Reno. | <p>Similar to a Channel-Levee Plan except that channel improvements will be held to a minimum. Settlements and/or floodplains will provide protection against design floods. Levees will begin in the vicinity of US-395 crossing of Truckee River and continue downstream to Vista. Tributary streams will have the same general configuration of flood protection as Channel-Levee Plan.</p> | <p>Similar to Levee Plan except an overflow basin would be provided in the lower reaches of the Truckee Meadows, consisting of about 1,500 acres.</p> | <p>Same as Channel-Levee Plan.</p> | <p>Same as Channel-Levee Plan.</p> | <p>Same as Channel-Levee Plan with 100-year degree of protection.</p> | <p>EQ Plan provides 30% protection to 2,000 acres, and consists of a dam at Verdi to control flow through Reno to 12,000 cfs. Levees along Truckee River between McCarran Blvd. and Vista, levees along Steamboat Creek and Byron Slough, and some channelization on Dry and Steam Creeks. An overflow area would provide a natural storage area for flows exceeding channel capacity.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides a moderate amount of recreation development along the Truckee River and Steamboat Creek.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides a moderate amount of recreation development along the Truckee River and Steamboat Creek.</p> | <p>Same as Channel-Levee Plan.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides a moderate amount of recreation development along the Truckee River and Steamboat Creek.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides a moderate amount of recreation development along the Truckee River and Steamboat Creek.</p> |
| <p>1. Contribution to the Planning Objective</p> <p>a. Flood Control</p> <p>b. Recreation</p> <p>c. Environmental Quality (EQ)</p> <p>d. Air</p> <p>e. Water Quality</p> <p>f. Vegetation</p> <p>g. Fish</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> |
| <p>1. Contribution to the Planning Objective</p> <p>a. Flood Control</p> <p>b. Recreation</p> <p>c. Environmental Quality (EQ)</p> <p>d. Air</p> <p>e. Water Quality</p> <p>f. Vegetation</p> <p>g. Fish</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> | <p>Provides flood control for the developing urban-suburban lands in Reno and Sparks, Nevada, along the Truckee River and in the Truckee Meadows.</p> |

TRUCKEE MEADOWS INVESTIGATION
SUMMARY OF ECONOMIC-ENVIRONMENTAL-SOCIAL EFFECTS
(Continued)

| ALTERNATIVES | PLAN 1 | | PLAN 2 | | PLAN 3 | | PLAN 4 | | PLAN 5 | | PLAN 6 | | PLAN 7 | | PLAN 8 | | |
|---------------------------|---|--|---|---|---|--|-------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|--|-----------------------------|---------------------------------|---|--|
| | CHANNEL-LEVEE PLAN | | CHANNEL-LEVEE PLAN WITH OVERFLOW AREA | | LEVEE PLAN | | LEVEE PLAN WITH OVERFLOW AREA | | NO-ACTION PLAN | | NON-STRUCTURAL | | NATIONAL ECONOMIC DEVELOPMENT (NED) PLAN | | ENVIRONMENTAL QUALITY (EQ) PLAN | | |
| 1. Wildlife | Plan would adversely affect many small mammals, passerine birds and other animals inhabiting the riparian plant community. Removal of streamside vegetation would destroy their habitats. Natural flood plains and some wetlands would be protected from flooding, thus adversely affecting migratory waterfowl, shorebirds and other water-associated birds. | Same as Channel-Leeve Plan. An overflow basin would maintain agricultural and riparian vegetation. By being reserved, or zoned as rural, the integrity as a sanctuary for wildlife would be enhanced throughout the life of the project. | Plan would adversely affect many small mammals, passerine birds and other animals inhabiting the riparian plant community. Removal of streamside vegetation would destroy their habitats. Natural flood plains and some wetlands would be protected from flooding, thus adversely affecting migratory waterfowl, shorebirds and other water-associated birds. | Same as Levee Plan. An overflow basin would maintain agricultural and riparian vegetation. By being reserved, or zoned as rural, the integrity as a sanctuary for wildlife would continue throughout the life of the project. | Wildlife habits would be reduced by postleved development in the flood plain. | Marshes, seasonally flooded areas and agricultural lands which serve as wildlife habitats would be restricted to develop only the 100-year flood level. This zoning restriction would discourage development in the marshes and other low lying areas. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Pathway for migrating deer at the reservoir site would be preserved through easements for the reservoir. An overflow basin would maintain agricultural and riparian vegetation. By being reserved, or zoned as rural, the integrity as a sanctuary for wildlife would continue throughout the life of the project. |
| 2. Erosion | Significant reduction in erosion in areas where flood walls, ripraping and other bank protection will be constructed. | Same as Channel-Leeve Plan. No effect or reduction in erosion on right bank of Truckee River between McCarran Blvd. and Vista. | Significant reduction in erosion in areas where flood walls, ripraping and other bank protection will be constructed. | Same as Levee Plan. No effect or reduction in erosion on right bank of Truckee River between McCarran Blvd. and Vista. | No significant change. | No significant change. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Significant reduction in erosion due to controlled flows from the reservoir. | |
| 3. Social Well-Being | | | | | | | | | | | | | | | | | |
| a. Archeology and History | No known archeological sites affected, although archeological investigation will be made in future studies. | Same as Channel-Leeve Plan. | No known archeological sites affected, although archeological investigation will be made in future studies. | Same as Levee Plan. | No known effect. | No known effect. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | |
| b. Housing | Little effect on housing. The flood plains are projected to be highly developed by project year one. | The land within the overflow area will maintain its natural integrity. Residential properties would not be allowed as zoning ordinances would be in effect before project year one. | Little effect on housing. The flood plains are projected to be highly developed by project year one. | The land within the overflow area will maintain its natural integrity. Residential properties would not be allowed as zoning ordinances would be in effect before project year one. | This flood plains are projected to be highly developed by project year one. | Future housing within the flood plain would have to be protected by the 100-year flood level. No development would be allowed in the floodway. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | No building will be allowed within the overflow area of the reservoir storage area. | |
| c. Leisure Opportunities | Facilities would be provided to accommodate 720,000 recreation days annually, at project year one, and 1,100,000 recreation days ultimately. | Facilities would be provided to accommodate 720,000 recreation days annually, at project year one, and 1,100,000 recreation days ultimately. | Facilities would be provided to accommodate 1,000,000 recreation days annually, at project year one, and 1,000,000 recreation days ultimately. | Same as Levee Plan. | Open space is planned for along the Truckee River, but development is increasing adjacent to the river. | Zoning ordinances would provide open space along the Truckee River. Parks could be developed in accordance with zoning ordinances. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Facilities will be provided to accommodate 720,000 recreation days annually, at project year one, and 1,000,000 recreation days ultimately. | |
| d. Transportation | Would protect portions of Interstate 80 and Southern Pacific Railroad. Would also provide significant protection to joint- and inter-state commerce because of the amount of merchandise development located in the flood plain. | Same as Channel-Leeve Plan. | Would protect portions of Interstate 80 and Southern Pacific Railroad. Would also provide significant protection to joint- and inter-state commerce because of the amount of merchandise development located in the flood plain. | Same as Levee Plan. | No effect. | No effect. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | |
| e. Displacement of People | Details to be determined in future studies. Because of the dynamic growth which has occurred in the flood plain, especially along the Truckee River, implementation of this plan will be dependent on relocating residential and industrial properties. | Same as Channel-Leeve Plan. | Details to be determined in future studies. Because of the dynamic growth which has occurred in the flood plain, especially along the Truckee River, implementation of this plan will be dependent on relocating residential and industrial properties. | Same as Levee Plan. | Evacuation during flooding will continue. | Evacuation during flooding will continue. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | |
| f. Safety | Safety will be significantly enhanced in the Truckee Meadows because of the reduced frequency and depth of flooding. Safety conditions may be increased below Vista because of additional depths and discharges relating to confined flows upstream. | Same as Channel-Leeve Plan. | Safety will be significantly enhanced in the Truckee Meadows because of the reduced frequency and depth of flooding. Safety conditions may be increased below Vista because of additional depths and discharges relating to confined flows upstream. | Same as Levee Plan. | Continued development in the flood plain would increase hazard from flooding. | Flood hazards would be reduced for newly constructed housing in the flood plain. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Safety will be significantly enhanced in the Truckee Meadows. |
| g. Noise | Minor localized increases during construction period. | Same as Channel-Leeve Plan. | Minor localized increases during construction period. | Same as Levee Plan. | Increased development in the flood plain would increase noise, but not to unacceptable levels. | No effect. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | |
| h. Esthetic Values | Temporary esthetic degradation until revegetation is complete. Enhanced esthetic value with revegetation of riparian plant community. Bank protection will be placed on areas subjected to highly erosive forces. | Same as Channel-Leeve Plan. | Temporary esthetic degradation until revegetation is complete. Enhanced esthetic value with revegetation of riparian plant community. Bank protection will be placed on areas subjected to highly erosive forces. | Same as Levee Plan. | Esthetic values would be reduced due to development adjacent to the river. | Esthetic values would be preserved by open space along the Truckee River. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. | Same as Channel-Leeve Plan. |

TRUCKEE MEADOWS INVESTIGATION
SUMMARY OF ECONOMIC-ENVIRONMENTAL-SOCIAL EFFECTS
(Continued)

| ALTERNATIVES | PLAN 1 CHANNEL-LEVEE PLAN | PLAN 2 CHANNEL-LEVEE PLAN WITH OVERFLOW AREA | PLAN 3 LEVEE PLAN | PLAN 4 LEVEE PLAN WITH OVERFLOW AREA | PLAN 5 NO-ACTION PLAN | PLAN 6 NON-STRUCTURAL | PLAN 7 NATIONAL ECONOMIC DEVELOPMENT (NEED) PLAN | PLAN 8 ENVIRONMENTAL QUALITY (EQ) PLAN |
|-------------------------------------|--|--|--|--|--|--|--|--|
| 1. Community Growth | No significant effect by itself. Implementation of flood control in conjunction with other positive water resource needs will result in a more disciplined growth and land use plan. | Same as Channel-Lever Plan. | No significant effect by itself. Implementation of flood control in conjunction with other positive water resource needs will result in a more disciplined growth and land use plan. | Same as Levee Plan. | Continued rapid growth is projected for the area. | Growth may become more disciplined. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. |
| 4. Regional Development | | | | | | | | |
| a. Employment | Jobs will be created during the construction period. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. | Labor force is expected to increase with the increase in business and industry. | Same as No-Action Plan. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. |
| b. Local Government Finance | Loss of property tax revenue will be prevented since properties will be protected against flood damages. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. | Loss of property tax revenue will occur due to flood damages. | Loss of property tax revenue will occur due to flood damages to structures that are not flood proofed. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. |
| c. Land Use | Construction at river's edge would be reduced. | Construction at river's edge would be reduced. Agricultural flood areas would be maintained in over- | Same as Channel-Lever Plan. | Same as Channel-Lever Plan with Overflow. | Developing site preserving farmers to sell their land for the development of industrial and residential complexes. | Same as No-Action Plan. | Construction at river's edge would be reduced. | Construction at river's edge would be reduced. Agricultural flood areas may be displaced to provide additional space. |
| 5. Business and Industrial Activity | Closing of businesses due to flood waters or damages would be prevented (airport, trucking, etc.). | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. | Tourist industry could be temporarily affected due to floods. Trucking/warehouse firm services would be interrupted during flooding. | Same as No-Action Plan. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. |
| 6. Public Facilities | Flood damages to sewage treatment plant, railroad, utilities and roads would be prevented. Expansion of public recreation facilities would occur. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. | Flood damages to sewage treatment plant, railroad, utilities and roads would occur. | Same as No-Action Plan. Sewer facilities would be protected from 100-year floods. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. |
| 7. Public Services | Police, fire protection, ambulance and water services will be protected from interruptions caused by flood waters. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. | Police, fire protection, ambulance and water services will be interrupted by flood damages. | Same as No-Action Plan. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. |
| 8. Displacement of Farms | Some agricultural land within the levee system would be converted to public recreation areas. | Same as Channel-Lever Plan. Overflow areas would remain in agricultural use. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. Overflow areas would remain in agricultural use. | Developers are pressuring farmers to sell their lands for new development. | Same as No-Action Plan. No development would be allowed in the 100-year floodway. | Same as Channel-Lever Plan. | Same as Channel-Lever Plan. Some agricultural land within the levee system would be converted to public recreation areas. Overflow areas may be converted to wildlife sanctuary. |

Cost-Sharing Requirements

The Tabulations below list the Federal and non-Federal first and annual costs for all of the identified flood control alternatives. Under traditional cost-sharing methods, the Federal Government would design and construct the project. Non-Federal (State, County or local) interests would be responsible for providing all lands, easements, and rights-of-way for the project, including all relocations and alterations of buildings, houses, roads, highways, bridges, and utilities. Non-Federal interests are also responsible to pay for one-half of the costs of recreation lands and facilities. Also, non-Federal interests would maintain and operate all project facilities.

In June 1978, the President proposed revised cost-sharing criteria for Federally assisted water projects. These proposed criteria are intended to involve states more heavily in water project decisions and to insure uniformity governing cost sharing for flood control projects. States are required to contribute a 5 percent cash share of the first cost of the total project, and in addition, a non-Federal contribution of 20 percent of the cost of flood damage reduction measures. Non-Federal interests would also be responsible for one-half of the first costs of recreation development, and as with traditional cost sharing will be required to operate and maintain all project facilities.

ALTERNATE COSTS AND BENEFITS
OCTOBER 1979 PRICE LEVELS

7-1/8% INTEREST RATE
(Millions of dollars)

| PLAN | FIRST COST | | | ANNUAL COSTS | | | ANNUAL BENEFITS | | | NET BENEFITS | | | BENEFIT/COST RATIO | | |
|---|---------------|------------|-------|---------------|------------|-------|-----------------|------------|-------|---------------|------------|-------|--------------------|------------|-------|
| | FLOOD CONTROL | RECREATION | TOTAL | FLOOD CONTROL | RECREATION | TOTAL | FLOOD CONTROL | RECREATION | TOTAL | FLOOD CONTROL | RECREATION | TOTAL | FLOOD CONTROL | RECREATION | TOTAL |
| 1. SPF Channel-Level | 163.8 | 5.2 | 169.0 | 11.8 | 0.6 | 12.4 | 9.7 | 1.3 | 11.0 | -2.1 | 0.7 | -1.4 | 0.82 | 2.2 | 0.89 |
| 2. Channel-Level with overflow | 45.0 | 5.2 | 50.2 | 3.3 | 0.6 | 3.9 | 5.6 | 1.3 | 6.9 | 2.3 | 0.7 | 3.0 | 1.7 | 2.2 | 1.8 |
| A. 100-year | 181.9 | 5.2 | 187.1 | 13.1 | 0.6 | 13.7 | 9.1 | 1.3 | 10.4 | -4.0 | 0.7 | -3.3 | 0.69 | 2.2 | 0.76 |
| B. SPF | 156.4 | 7.1 | 163.5 | 11.3 | 0.8 | 12.1 | 8.0 | 1.7 | 10.7 | -2.3 | 0.9 | -1.4 | 0.86 | 2.1 | 0.88 |
| 3. SPF Level | 173.6 | 7.1 | 180.7 | 12.5 | 0.6 | 13.3 | 9.0 | 1.7 | 10.7 | -3.5 | 0.9 | -2.6 | 0.72 | 2.1 | 0.80 |
| 4. SPF Level with overflow | 43.4 | 5.2 | 48.6 | 3.2 | 0.6 | 3.8 | 7.9 | 1.3 | 9.2 | 4.7 | 0.7 | 5.4 | 2.5 | 2.2 | 2.4 |
| 7. National Economic Development (100-year Channel-Level) | 178.9 | 7.1 | 186.0 | 13.0 | 0.7 | 13.7 | 8.2 | 1.6 | 9.8 | -4.8 | 0.9 | -3.9 | 0.63 | 2.3 | 0.72 |
| 8. Environmental Quality | | | | | | | | | | | | | | | |

TRUCKEE MEADOWS
TRADITIONAL COST SHARING
(Millions of dollars)

| PLAN | FLOOD CONTROL | | | RECREATION | | | TOTAL | | | FLOOD CONTROL | | | RECREATION | | | TOTAL | | | |
|--|---------------|-------------|-------|------------|-------------|-------|---------|-------------|-------|---------------|-------------|-------|------------|-------------|-------|---------|-------------|-------|--|
| | FEDERAL | NON-FEDERAL | TOTAL | FEDERAL | NON-FEDERAL | TOTAL | FEDERAL | NON-FEDERAL | TOTAL | FEDERAL | NON-FEDERAL | TOTAL | FEDERAL | NON-FEDERAL | TOTAL | FEDERAL | NON-FEDERAL | TOTAL | |
| | COST | | | COST | | | COST | | | COST | | | COST | | | COST | | | |
| 1. SPF Channel-Level | 119.3 | 44.5 | 163.8 | 2.6 | 2.6 | 5.2 | 121.9 | 47.1 | 169.0 | 8.5 | 2.3 | 11.8 | .2 | .4 | 0.6 | 8.7 | 2.7 | 11.4 | |
| 2. Channel-Level w/overflow | 14.8 | 30.2 | 45.0 | 2.6 | 2.6 | 5.2 | 17.4 | 32.8 | 50.2 | 1.1 | 2.2 | 3.3 | .2 | .4 | 0.6 | 1.2 | 2.6 | 3.9 | |
| A. 100-year | 132.1 | 49.8 | 181.9 | 2.6 | 2.6 | 5.2 | 134.7 | 52.4 | 187.1 | 9.4 | 9.7 | 19.1 | .2 | .4 | 0.6 | 9.6 | 9.1 | 18.7 | |
| B. SPF | 115.4 | 41.0 | 156.4 | 2.5 | 2.6 | 7.1 | 118.9 | 44.6 | 163.5 | 8.2 | 3.1 | 11.3 | .3 | .5 | 0.8 | 8.5 | 3.6 | 12.1 | |
| 3. SPF Level | 123.5 | 50.1 | 173.6 | 2.5 | 2.6 | 7.1 | 127.0 | 53.7 | 180.7 | 8.6 | 3.7 | 12.5 | .3 | .5 | 0.8 | 9.1 | 4.2 | 13.3 | |
| 4. SPF Level with overflow | 15.3 | 28.1 | 43.4 | 2.6 | 2.6 | 5.2 | 17.9 | 30.7 | 48.6 | 1.1 | 2.1 | 3.2 | .2 | .4 | 0.6 | 1.3 | 2.5 | 3.8 | |
| 7. MED (100-year Channel-Level) | 81.5 | 117.4 | 178.9 | 2.5 | 2.6 | 7.1 | 85.0 | 121.0 | 186.0 | 4.4 | 8.6 | 13.0 | .3 | .4 | 0.7 | 4.7 | 9.0 | 13.7 | |
| 8. EQ | | | | | | | | | | | | | | | | | | | |
| PRESIDENT'S PROPOSED COST SHARING (Millions of dollars) | | | | | | | | | | | | | | | | | | | |
| 1. SPF Channel-Level | 122.8 | 41.0 | 163.8 | 2.3 | 2.9 | 5.2 | 125.1 | 43.9 | 169.0 | 8.8 | 3.0 | 11.8 | .2 | .4 | 0.6 | 9.0 | 3.4 | 12.4 | |
| 2. Channel-Level w/overflow | 23.7 | 11.3 | 35.0 | 2.3 | 2.9 | 5.2 | 36.0 | 14.2 | 50.2 | 2.4 | 0.9 | 3.3 | .2 | .4 | 0.6 | 2.6 | 1.3 | 3.9 | |
| A. 100-year | 136.4 | 45.5 | 181.9 | 2.3 | 2.9 | 5.2 | 138.7 | 48.4 | 187.1 | 9.7 | 3.4 | 13.1 | .2 | .4 | 0.6 | 9.9 | 3.8 | 13.7 | |
| B. SPF | 117.3 | 39.1 | 156.4 | 2.2 | 2.9 | 7.1 | 120.5 | 43.0 | 163.5 | 8.4 | 2.9 | 11.3 | .3 | .5 | 0.8 | 8.7 | 3.4 | 12.1 | |
| 3. SPF Level | 130.2 | 43.4 | 173.6 | 2.2 | 2.9 | 7.1 | 133.4 | 47.3 | 180.7 | 9.3 | 3.2 | 12.5 | .3 | .5 | 0.8 | 9.6 | 3.7 | 13.3 | |
| 4. SPF Level with overflow | 22.5 | 10.9 | 33.4 | 2.3 | 2.9 | 5.2 | 34.6 | 13.8 | 48.6 | 2.3 | 0.9 | 3.2 | .2 | .4 | 0.6 | 2.5 | 1.3 | 3.8 | |
| 7. MED (100-year Channel-Level) | 134.2 | 44.7 | 178.9 | 2.2 | 2.9 | 7.1 | 137.4 | 48.6 | 186.0 | 9.6 | 3.4 | 13.0 | .2 | .4 | 0.7 | 9.8 | 3.9 | 13.7 | |
| 8. EQ | | | | | | | | | | | | | | | | | | | |

Next Step in the Study

After members of the public and Government agencies have expressed their views regarding the alternatives set forth here, the Corps will continue the investigation. New proposals and combination plans will be more thoroughly investigated and additional analysis will be performed on those alternatives that meet with public approval. Finally, if an economically, environmentally, and socially acceptable plan is found, a recommended plan for flood control and related purposes on the Truckee River will be proposed for public comment at a final public meeting.

Comments

You are encouraged to review these alternatives and come forward with your comments and suggestions using the attached comment sheet. Fold the comment sheet and mail it postage free to:

District Engineer
Sacramento District, Corps of Engineers
ATTN: Investigations Section A
650 Capitol Mall
Sacramento, CA 95814

Definitions

100-Year Flood. - A flood event that occurs on the average once in every 100-years and has a 1 percent probability of occurring in any given year. In understanding floods, it is important to bear in mind that because a flood has a average likelihood of occurring once in 100 years doesn't mean it couldn't happen twice or more in the same year. It's just that the probability is small for such a flood happening so frequently.

Standard Project Flood. - A hypothetical flood representing the critical flood runoff volume and peak discharge that may be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic for the hydrologic region involved, excluding extremely rare combinations.

Benefit-Cost Ratio. - In simple terms, the Benefit-cost ratio is calculated by dividing the benefits of a project (stated in dollar damages prevented) by the projects total dollar cost.

Flood Control Benefits. - Reduction or prevention of flood damages. Benefits include reduction of flood emergency costs incurred in fighting floods, restoring levees, and rerouting traffic.

Flood Damages. - Physical damages include damages to or loss of buildings; loss of contents such as furnishings, equipment, materials, or inventory; damages to lot improvements including cleanup; and damages to roads and utilities. Also included in the flood damages are financial losses resulting from decreased production and increased living and operating costs within the flooded area and the loss of tax revenue to the county during the period of flooding.

Endangered species. - Any species which is in danger of extinction throughout all or a significant portion of its range.

Threatened species. - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

