STATE OF NEVADA
Kenny C. Guinn, Governor

NEVADA DIVISION OF WILDLIFE
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EAST CARSON RIVER
Draft Fisheries Management Plan

Prepared By

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EAST CARSON RIVER
Fisheries Management Plan

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ABSTRACT

The East Fork of the Carson River originates in California, but there are approximately 21 river miles in Nevada before it merges with the West Carson River. Wild salmonid populations and fishing in the East Carson River (in Nevada) historically have been poor and the fishery has been managed mostly as put-and-take. Environmental conditions such as high spring runoff, high suspended sediment, high water temperature, and toxic mine runoff all have been speculated to negatively influence trout survival.

The objective of this management plan (from FY 2002 - 2011) is to continue monitoring angler use and harvest and fish populations. Additionally, environmental conditions that may impact fish such as turbidity, temperature, pH, and dissolved oxygen will be monitored. We will continue to stock 9,500 catchable rainbow and 3,100 catchable and 10,000 fingerling brown trout. The fishery will continue as put-and-take and harvest regulations, too, will remain the same.

RESOURCE DESCRIPTION

Introduction

The Carson River is a perennial, high order river consisting primarily of an east fork, a west fork, and the main stem. The headwaters of the east fork originate in the Sierra-Nevada Mountain Range in Alpine County, California at nearly 10,500 feet in elevation. It's length spans 56 river miles and it drops in elevation about 6,500 feet. There are ten small, high alpine reservoirs along the East Carson River and tributaries in California with the primary purpose of storing water for agricultural needs. In Nevada, most of the east fork from the NV-CA Border to Dresslerville is adjacent to U.S. Forest Service managed land. The remainder either passes through Washoe Indian Reservation or other private property. From the border to the West Carson River confluence the East Carson River is approximately 21 river miles. There also are several irrigation diversions, mostly in Carson Valley, with a few being very large. Five small water storage reservoirs in Nevada supplement low, summer flows when water becomes vital to ranch and farm lands. The west fork, in Nevada, is adjacent to private property. It consists of many diversions and the primary channel was relocated long ago. When the east and west forks join near Genoa, NV they create the main stem of the Carson River which flows to its terminus in the Carson Sink near Fallon, NV.

During the 1830's and 1840's, white explorers such as Joseph Walker, John Fremont, and Kit Carson discovered and explored the Carson River. Shortly after, settlers occupied the river and by 1859, Comstock mining had begun. Farming, ranching, and logging also were becoming increasingly important during this time. Large disturbances to the river occurred when dams were built for water diversion; when large amounts of mercury were lost during milling of the ores for gold; and when

the river was dredged to provide easy boat and raft passage, to recuperate lost mercury-gold amalgam, and to easily float large concentrations of logs. Further damage occurred from logging, toxic chemical mine runoff, upland and riparian grazing, road construction, channelization, and urbanization.

The State of Nevada owns the bed and shores of the Carson River from the present ordinary and permanent high water mark. This was the opinion of the Attorney General in 1976 that hinged on the navigability of the river. In 1862, the Territorial Legislature granted the right to float logs and clear and dredge the channel for navigation. All this lead the courts, in 1972, to deem the river navigable from the state line to the Carson Sink. Anglers can legally walk in any portion of the channel, but they must enter at legal, public access sites.

A fishery is comprised of fish, their interaction with other aquatic organisms, the habitat they occupy, and the contribution the surrounding watershed has on the aquatic environment. Finally, a fishery includes human interaction, specifically the harvest of fish for recreation or consumption. Nevada Division of Wildlife currently manages the East Carson River as a cold water, put-and-take fishery. A put-and-take fishery described by NDOW states "... management is directed towards providing fishing opportunity for hatchery stocked catchable sized fish with rapid harvest turnover in the fish population structure" (Nevada Department of Fish and Game, unkn. date). This management concept is adopted when there is less natural opportunity for fish to reproduce or where harvest is great in a limited resource.

Physical Conditions

The Carson River watershed is presented in Attachment 1 (from California Department of Water Resources, 1991) and the East Carson River is depicted in Attachment 2. The East Carson River averages a drop in gradient of 23 feet per mile with the upper section set in a canyon and having many rapids and few pools. The first two river miles have a gradient drop of 50 feet per mile. The grade then decreases the next seven miles to a 25 to 38 feet drop per mile. Once in the Carson Valley (downstream of Ruhenstroth Dam) the slope lessens to about a 17 feet drop per mile. River substrates are comprised mostly of bedrock while gravel bars cover the flood plain. Few gravel beds, however, exist in the channel from the CA-NV border to Ruhenstroth Dam (Nevada Department of Fish and Game, NDFG, 1955). In the upper Carson Valley, as the slope flattens, the river substrate is composed primarily of large cobble and the banks are made up of sandy loam and finer material. Farther downstream, beyond the town of Minden, sand and silt dominate bottom substrates.

The small, high alpine reservoirs in the upper East Carson River are thought to provide enough flows for the fishery and maintain water quality (Nevada Division of Environmental Protection, NDEP, 1996). However, these reservoirs do little to regulate flows during high, seasonal runoff. A U.S. Geological Survey (USGS) discharge gage is located at Horseshoe Bend and Attachment 3 portrays historical monthly river

discharges. Discharges vary greatly; 1987 was the beginning of a western drought, which did not rebound until 1993. Since 1995, there has been good, consecutive water years. Seasonal discharges also vary substantially with spring runoff generally producing high peak flows. Attachment 4 describes the typical trend in average, monthly flow rates at Horseshoe Bend (monthly flow rates were averaged from 1940 to 1969) (taken from Nevada Division of Water Resources, 1975). This primarily shows four months of very high flows occurring annually in the East Carson River.

Water Quality

Little has been done to consistently document temporal and spatial differences in water temperatures in the East Carson River. In general, temperatures remain in the 30's and 40's during the winter and rarely exceed 75 F in the upper river (above Ruhenstroth Dam) during the summer. However, water temperatures, at times, approach or exceed 80 F. More information is needed regarding seasonal water temperatures and how they respond to flow rates and air temperatures.

Sediment pollution is of large concern in the East Carson River. Suspended silt and sand typically increase from November through June (USGS, 1993, 1994, and 1995) and generally exceeds water quality standards (see NDEP, 1994). Again, there are large gaps in this data. Highly subjective, turbidity measurements (i.e., visual observations were made occasionally during a visit to the river; it was arbitrarily classified as muddy, slightly muddy, or clear) have been observed by NDOW over about a 20 year period. Attachment 5 summarizes this data based on water flows and shows that muddy water conditions dominate the river for nearly two months out of the year. Sediment pollution should be better quantified.

Leviathan Mine has created water quality problems in the East Carson River since the early 1950's. Mining began in 1863 to extract copper sulfate for processing silver ores along the Comstock. In 1951, sulfur was mined creating millions of cubic yards of waste. When holding ponds breached, sulfuric acid and heavy metal toxins made it downstream (there are several tributaries to the river, including Bryant Creek). NDOW documented fish kills in the East Carson River in 1954 and 1959 as far as 10 miles downstream of the Bryant Creek confluence. Acid runoff and heavy metals continue to leach from tailings and drain into tributaries and possibly the East Carson River and is of great concern.

Treated sewage is no longer discharged into the East Carson River, however, low levels (lower than the national average) of orthophosphate, ammonia, and nitrate from agricultural runoff still contribute to poor water quality in the river (USGS, 1998). Mercury in the East Carson River occurs naturally and from historical mining, but has only been detected within the water column (NDEP, 1985).

Biological Conditions

Benthic macroinvertebrates have been collected either at Sheep Bridge or Apple Orchard by NDOW during fall since 1994. In general, important trout prey (Ephemeroptera, Plecoptera, and Tricoptera) are well represented (see NDOW, 1994, 1995, 1996, and 1997). However, total invertebrate abundance in the East Carson River is usually half that found in the Main Carson River near Carson City and Dayton, but species richness is much greater in the east fork (NDOW, 1994). Spatial differences may be characteristic of habitat degradation or natural environmental differences such as elevation, channel morphology, or primary production. USGS also has studied invertebrates and data is being analyzed. No work yet in the East Carson River documents impacts of poor water quality or environmental conditions (particularly high flows or high turbidity) on benthic invertebrate communities.

Description of Fisheries

The East Carson River has a rich history of fish stocking since the late 1870's. Most commonly stocked fish in the early years include rainbow and cutthroat trout. Other fishes stocked consist of brown trout, brook trout, bream, crappie, yellow perch, black bass, and carp. Recently, the dominant catchable-sized (>8 inches), hatchery fish stocked consist primarily of rainbow and brown trout (Attachments 6). Brown trout comprise the majority of subcatchable trout (<8 inches, but mostly 2-3 inch fingerlings are stocked) (Attachment 6).

Trout of catchable size were consistently stocked at Sheep Bridge from the mid 1960's through the mid 1990's. This was discontinued after 1995 for several reasons: few anglers were observed fishing this area, harvest of stocked fish was poor, and trout survival was poor. Recent stocking efforts concentrate closer to the towns of Gardnerville and Minden because of increased angling pressure. Ruhenstroth Dam, both above and below, and Lutheran Bridge are stocked with catchable trout. Fingerling brown trout continue to be stocked upstream of Bryant Creek down to Sheep Bridge. The present annual allocation is 8,300 catchable rainbow trout, 2,000 catchable brown trout, and 10,000 fingerling brown trout.

Angler use and harvest are measured in two ways; 1) monthly roving creel surveys and, 2) annual mail-in creel surveys (i.e., 10% angler questionnaire data). Roving creel survey angler use and harvest history are presented in Attachment 7. Fishing use and success are variable but, nevertheless, annual catch rates always exceeded 0.5 fish per hour.

Mail-in creel survey data (Attachment 7) provides good, but similar information on a larger scale than roving creel survey. Each angler caught an estimated average of 1.5 to 3.5 fish per trip throughout the mid- to late 1990's. This data also estimates there are from 400 to 1,800 angler days on the East Carson River annually and total angler

success (i.e., harvest) is greater than 80 percent of all trout stocked annually (see Attachment 8). This suggests that the put-and-take fishery is highly successful. It also appears that when annual angler days are low, catch rates are greater than when angler days are high (Attachment 6), suggesting that competition among anglers influences individual angler success.

Local, Douglas County residents, by far, exploit the fishery in the East Carson River. Attachment 9 portrays the average percent usage (based on angler days) of anglers from different counties and states from 1990 to 1998. Anglers from nearby Carson City are the second highest users while anglers living elsewhere in the state rarely utilize this resource.

The East Carson River from Ruhenstroth Dam to Highway 88 is primarily an urban fishery and future demands will probably increase as the angling population expands. The general population in Douglas County increased 4.2 percent per year from 1990 to 1997 (Nevada Division of Water Planning, 1998). However, angler abundance does not show a similar increase for the East Carson River. Angler use appears to increase during years of good water flow, although no statistical relationship exists (NDOW, 1995).

As we continue having adequate snow pack and runoff and the human population base continues to increase in Douglas County, it is predicted the angling population and, thus, angler use will accelerate. In an extreme case, the angler population from Douglas County will increase, as does the general population, at 4.2% per year. Annual angler numbers and annual angler days for the East Carson River currently (1998) average approximately 1,266 and 7,728 respectively, and, therefore, by the year 2011 an expected 2,159 anglers will fish 13,170 days. Additionally, Douglas County anglers made up 70% of angler use and caught an estimated 8,528 fish (1998) and, therefore, harvest may approach 20,927 fish by the year 2011.

In the early 1850's, local newspapers reported that trout (presumably cutthroat trout and mountain whitefish) were extremely abundant and easily taken by anglers (from news articles summarized by Bob McQuivey, 1998, unpbl. report). This persisted for about 20 years with several factors leading to their decline. For example, massive log drives destroyed aquatic habitat and the pitch from logs proved detrimental to fish. Log jams were removed with dynamite and the explosions killed tremendous numbers of trout. Irrigation ditches stranded large numbers of fish that eventually would die. Additionally, fish populations were affected from discharge of chemical waste and mud at mill sites.

Other, more direct, factors also contributed to the decline of native fishes. For example, quick lime or giant powder cartridges were used to kill masses of fish for food; fishing parties would harvest hundreds of fish through angling; and nets commonly were used to collect an abundance of fish. Exotic fish stocking (catfish, salmon, brown trout, and brook trout) began in the 1870's to augment the declining native fish populations and many people noted that non-native species out competed the natives. By the

1880's, both native and stocked trout were rarely caught and chubs, large minnows, catfish, and carp were the predominant creel.

Barriers to upstream migrations likewise created problems for native fishes. Water diversion dams were frequently built in the late 1800's without fish passage structures. Ruhenstroth Dam, a relict, hydroelectric dam built between 1910 and 1912, is a good example of what continues to impede fish passage upstream.

As previously mentioned, Leviathan Mine drainage created water quality problems that killed fish in the East Carson River (EPA, 1998; Nevada Department of Fish and Game, 1975). In 1975, NDOW stated mine pollution impaired the East Carson River from maintaining natural and stocked trout populations. Today, the area impacted is unknown, including how fish communities respond to toxic mine runoff. Work by U.S Environmental Protection Agency and other State Agencies continue to diagnose the impacts and search for long-term remediation.

Also noted earlier, both high and low flows experienced in the East Carson River directly and indirectly impact fish. High suspended sediments are assumed to negatively influence benthic insect populations by increasing drift (see Waters, 1995). High and rapid flows presumably reduce spawning success of fishes and increased suspended sediments negatively impact hatching success or fry survival. Additionally, mid-day water temperatures that exceed 75°F and sometimes 80°F negatively impact cold water fishes. Water temperature has a direct relationship with flow rate and in 1973 Nevada Division of Water Resources suggested a minimum flow for sustaining a fishery in the East Carson River at 40 cfs while a minimum of 200 cfs is required to maintain a viable sport fishery.

Proper habitat, too, must be available for fish to propagate and maintain their populations. NDFG (1955) stated there is a range of good to poor spawning habitat below Ruhenstroth Dam, but good areas are rare for trout to spawn above the dam. USGS (1998) reported habitat degradation (based on riparian vegetation, stream channel modification, bank stability, and bank erosion) in the East Carson River, but damage occurs at less than the national average.

Attachment 10 describes fish population surveys by NDOW since 1994 from two sites in the East Carson River. The most upstream sampling site, Apple Orchard, is located a couple miles downstream from the NV/CA Border. Rainbow trout densities generally are low, but no fish recently have been stocked here. There, too, is no evidence of wild rainbow trout reproduction and recruitment based on length of fish. Catchable rainbow trout (>8 inches), however, have been stocked above Ruhenstroth Dam and may contribute to populations occurring at Apple Orchard. California Department of Fish and Game additionally stocks catchable rainbow trout near Markleville, CA and these fish possibly migrate downstream. Low population densities, small average sizes, and small range of sizes (i.e., for a natural, healthy fish population) suggest that stocked fish rarely survive beyond their first year in the river.

The presence of brown trout at Apple Orchard may result from the annual stocking of 5,000 to 20,000 fingerlings in the upper river. However, these fish are difficult to distinguish from natural trout production. The average size brown trout also is relatively small with few growing beyond 12.0 inches suggesting very poor survival beyond one to two years old. High spring runoff and high concentrations of suspended sediments may directly and indirectly influence survival of these young fish. Therefore, other stocking strategies should be considered to increase population abundance in the upper stretches.

The farthest downstream sampling site occurs several hundred yards below Ruhenstroth Dam. The greatest abundance of rainbow trout, brown trout, and mountain whitefish occur here (Attachments 11). High abundance of both brown trout and mountain whitefish suggest their spawning migrations coincide with our sampling and Ruhenstroth Dam completely impedes further upstream migrations. Catchable, hatchery rainbow and brown trout, however, are stocked abundantly here and also contribute to high population densities during electrofishing surveys.

Again, based on size of fish, there is no indication that many trout survive for long below Ruhenstroth Dam. Harvest, through angling, probably contributes greatly to a narrow population size frequency. Additionally, poor habitat and physical environmental conditions, both during high spring runoff and when the flow is low due to irrigation or drought, may contributed to poor, long-term survival and poor wild trout production. On the other hand, I speculate that some fish survive adverse flow conditions by taking refuge in large irrigation canals in Carson Valley. This type of protection is not available for fish in the upper, steeper sloped section of the river.

What plagues the East Carson River are numerous water quality issues that impact coldwater fishes. That is, environmental conditions such as high spring flows, high water temperatures, heavy metal and acid mine runoff, sediment pollution, and poor spawning habitat possibly negatively impact hatchery trout survival and wild trout production. Quantification of these environmental factors are a prerequisite to clearly define problems with the fishery

FISHERIES MANAGEMENT

Management Prescription

According to Taylor et al. (1995) the environment should be evaluated and problems diagnosed prior to implementing a management plan. Since data is limited, this management plan uses the best available information. This management plan will allow for further resource monitoring to better diagnose fishery concerns. Currently, the East Carson River is dominated by a put-and-take fishery management concept and should continue as such for reasons stated earlier. It also is managed as a put-grow-and-take fishery, but with limited success. In addition to stocking fingerling brown trout, fingerling, and possibly catchable, Lahontan cutthroat trout should be stocked.

Goals, Objectives, and Strategies

Angler use and harvest of stocked fish will be evaluated through roving creel surveys and mail-in creel surveys. The principal Biologist or Seasonal Aide will conduct roving creel surveys at least twice per month during peak use (from March through October). Game Wardens assigned to the East Carson River also will augment creel survey information when patrolling the area. Mail-in creel surveys will be collected annually from NDOW's Reno staff. Harvest regulations will remain the same throughout the 10 year period.

Based on, historical mail-in creel survey data, the stocking rates chosen for the next 10 years should generate daily catch rates between 0.8 and 3.5 and from 80 to 100 percent of the catchable trout stocked are predicted to be harvested. Trends in angler use over the next 10 years will allow for possible future modification of trout stocking allocations

Fish survival and possible wild trout production will be monitored through annual electrofishing survey. Sites include upstream of Bryant Creek inflow, Apple Orchard, Sheep Bridge, and below Ruhenstroth Dam. This data will help determine the possible impacts on fish populations from angler harvest and/or environmental conditions.

Environmental factors that may influence trout distribution and survival should be monitored. This includes monitoring turbidity upstream of Bryant Creek inflow, Apple Orchard, Ruhenstroth Dam, and Lutheran Bridge twice a month from January through June and once monthly through October. Basic physical and chemical water quality parameters (temperature, dissolved oxygen, and pH) also should be monitored in conjunction with turbidity measurements. Stowaway TidBit Temperature Loggers will help monitor diurnal variations at Sheep Bridge and Lutheran Bridge from June to October to avoid loss during spring flooding.

Benthic invertebrates will be sampled three times a year, once just after spring runoff when a safe reliable sample can be collected in replicate using a Surber Sampler, once in the fall of the year, and once during winter before spring flows increase. Sampling will occur upstream of Bryant Creek inflow, Apple Orchard, Sheep Bridge, and below Ruhenstroth Dam. The goal is to determine the extent benthic invertebrate communities are impacted by high spring flows and other environmental conditions.

A minimum of 35 trips to the East Carson River are expected a year (total for all NDOW employees). A round trip is approximately 80 miles (from Carson City), thus estimating travel 3,400 miles per year (includes travel from Reno and Fallon). Attachment 11 summaries approximate annual Man Days required and Attachment 12 lists additional equipment required to accomplish all the goals of this management plan.

Implementation and Evaluation Schedule

All work described above will be completed in the first nine years and an annual progress report will be written for each year. During the year 2011, time will be spent evaluating the plan, writing a final report, and preparing recommendations (i.e., a new management plan). Attachment 13 summarizes the 10-year implementation schedule.

Stocking Schedule

Since the East Carson River will continue primarily as a put-and-take fishery concept, then stocking will occur during times of high angler use and when environmental conditions favor immediate trout survival. A total of 9,5000 catchable rainbow trout will be stocked along with 3,100 catchable brown. Stocking will occur at Ruhenstroth Dam and at Lutheran Bridge with a maximum of 2,500 to be stocked during alternating weeks.

There is increasing interest for anglers to fish the upper river above Ruhenstroth Dam. Sheep Bridge has relatively easy vehicle access to stock 2,000 catchable and 10,000 fingerling brown trout

Cooperative efforts between High Sierra Fly Casters and NDOW will continue by supplying the club with 35,000 brown trout eggs each November to rear (refrigerator or Vibert Box incubation) upstream of Ruhenstroth Dam.

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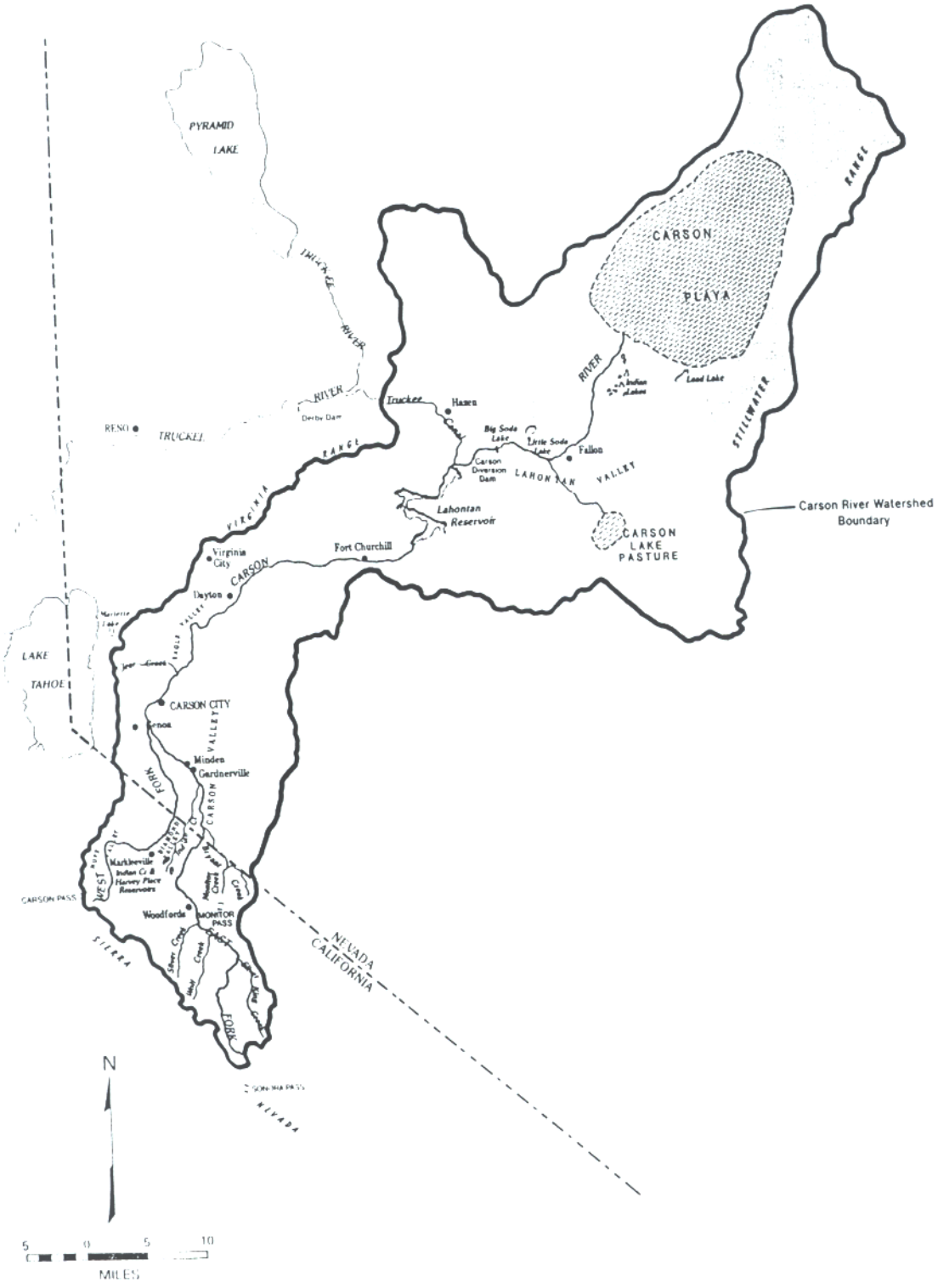
CARSON RIVER WATERSHED



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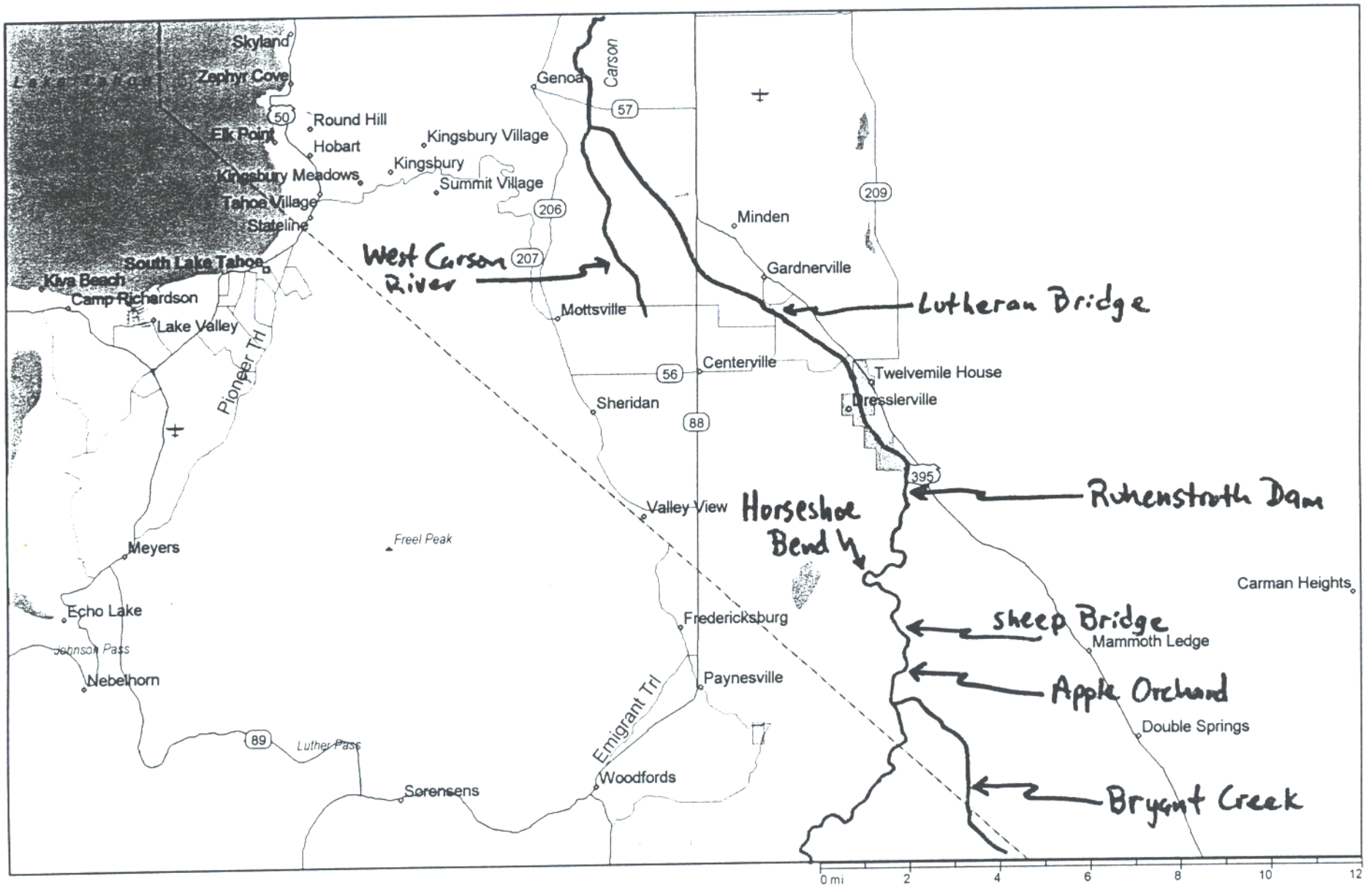
EAST CARSON RIVER



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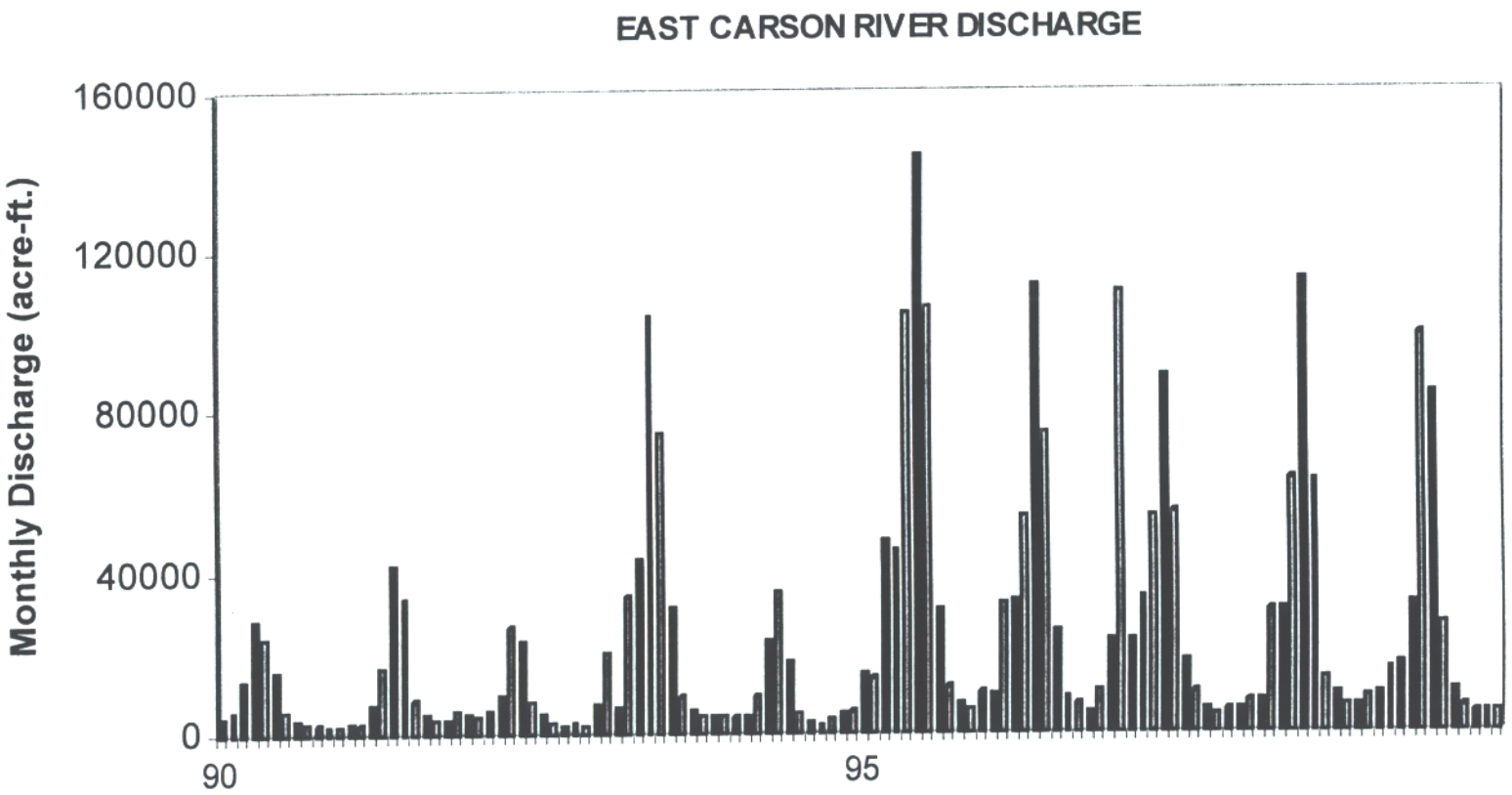
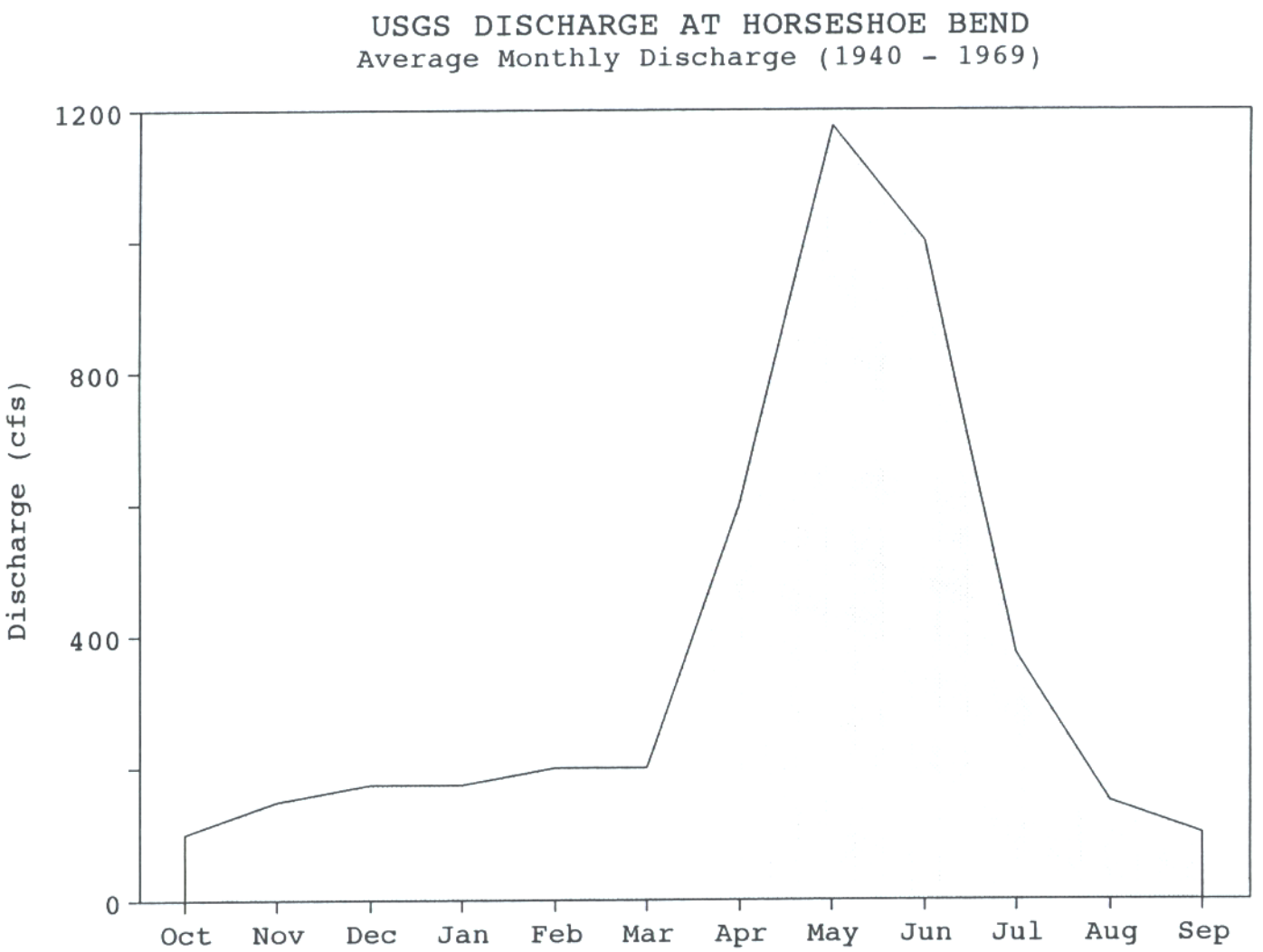
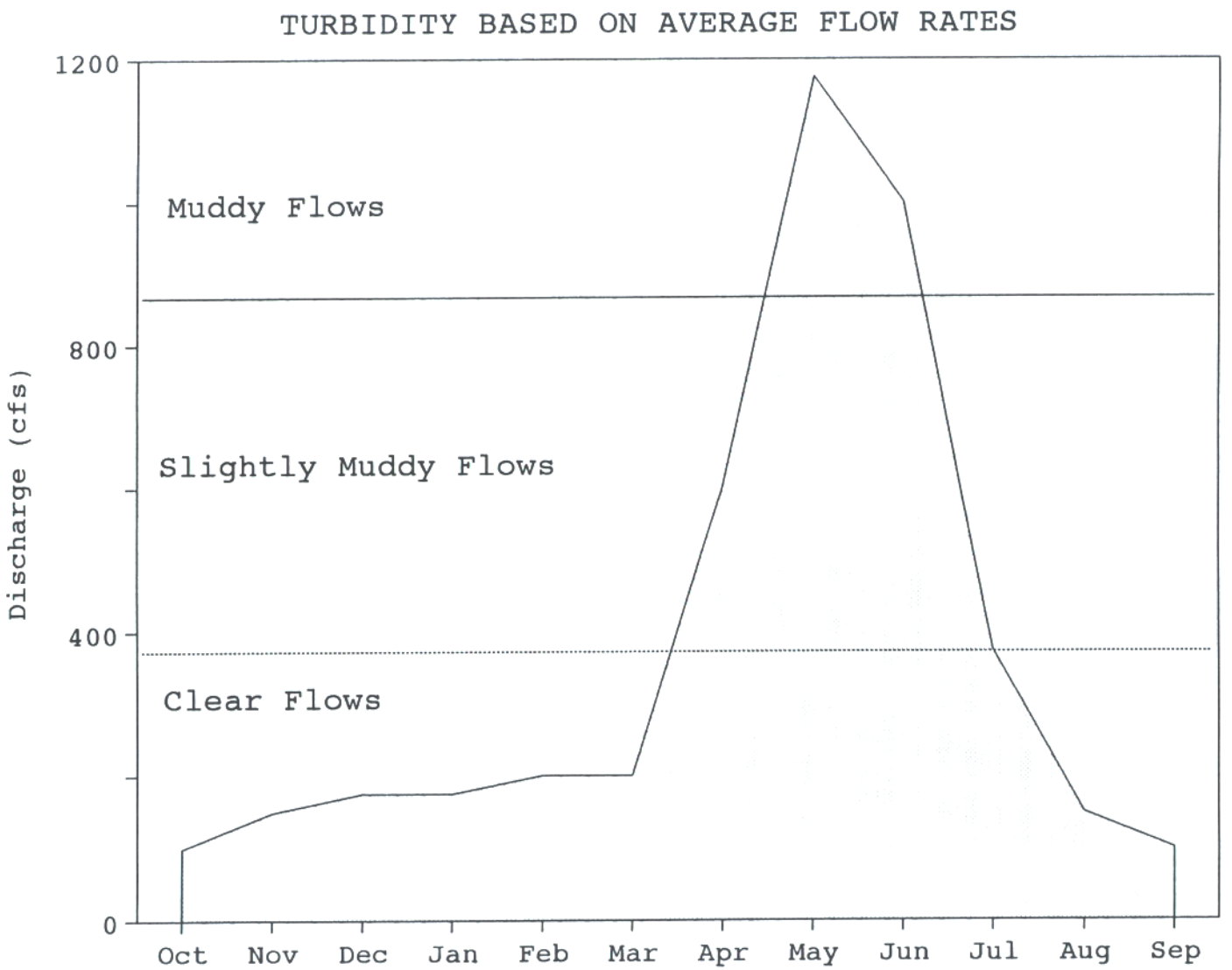
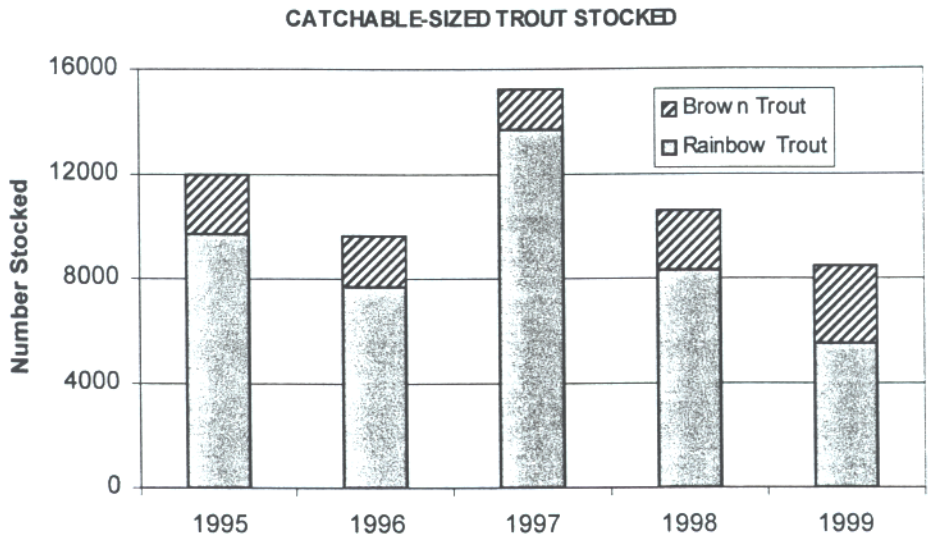
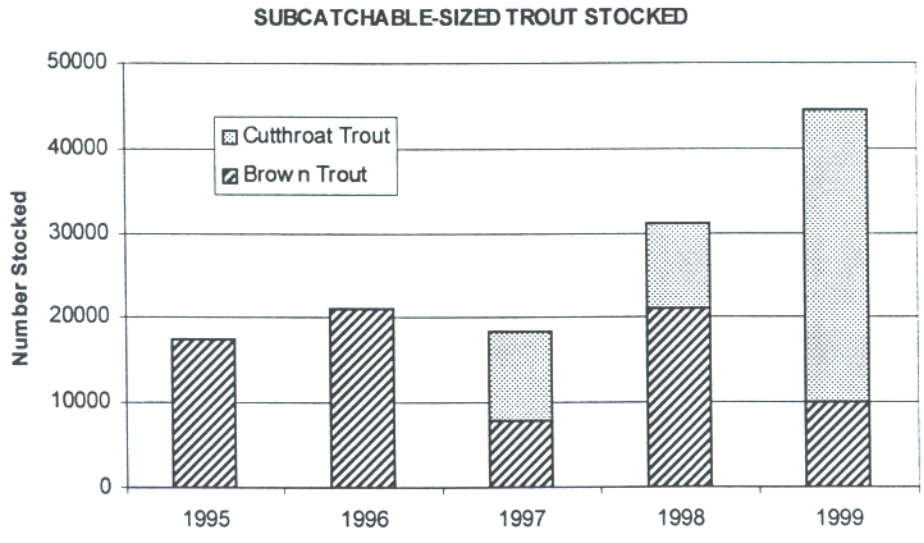


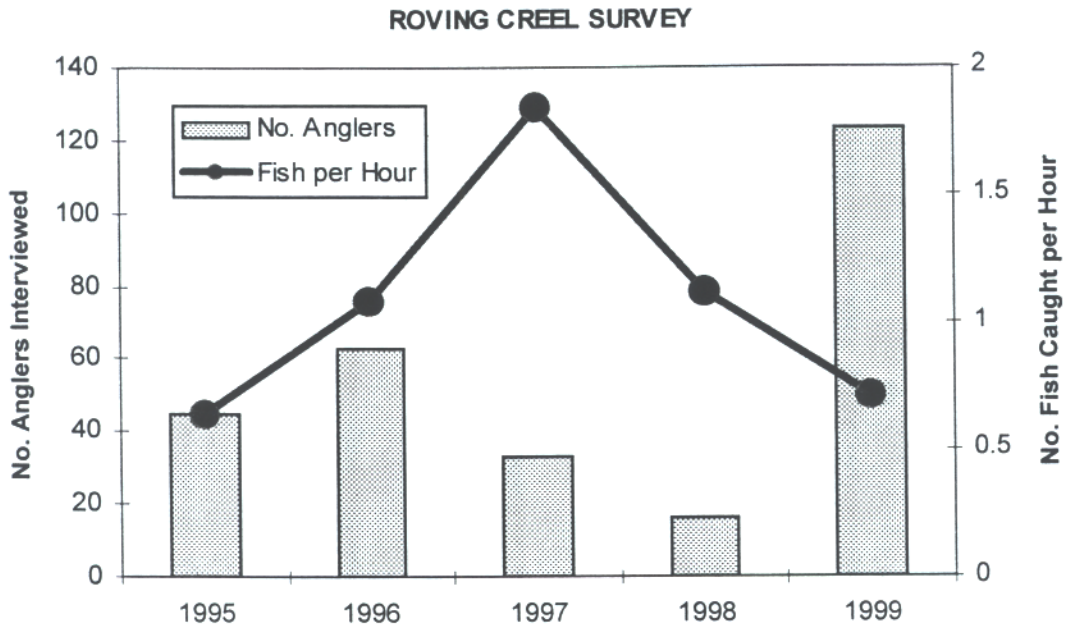

USGS DISCHARGE AT HORSESHOE BEND
Average Monthly Discharge (1940 - 1969)
Discharge (cfs)
1200
800
400
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep

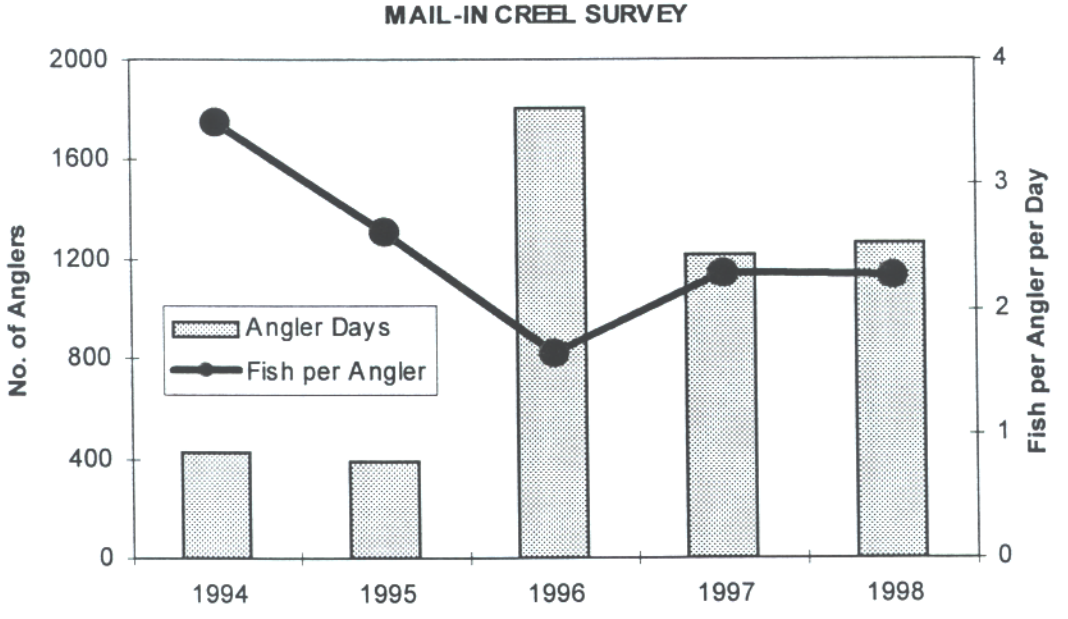
Attachment 5



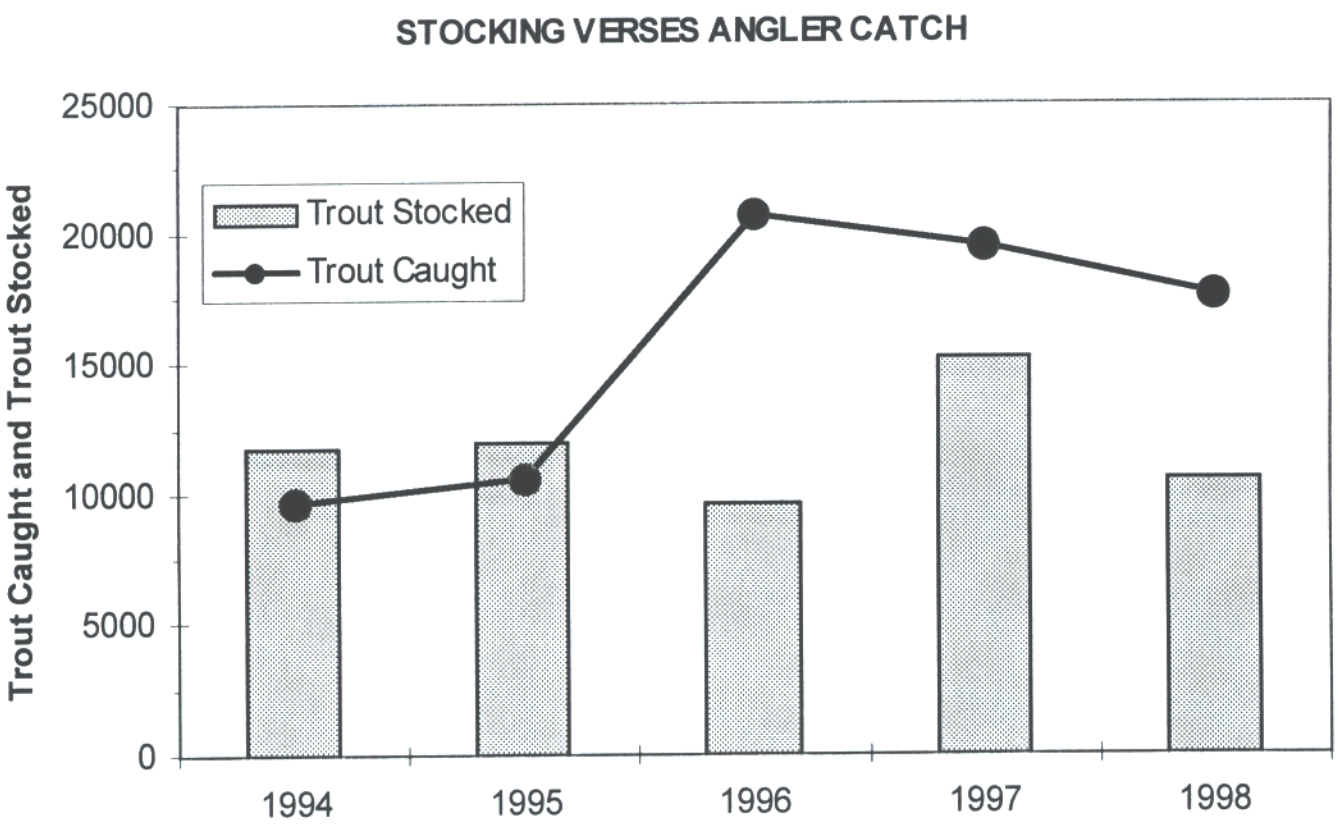

CATCHABLE-SIZED TROUT STOCKED
Number Stocked
16000
12000
8000
4000
0
1995
1996
1997
1998
1999
Brown Trout
Rainbow Trout

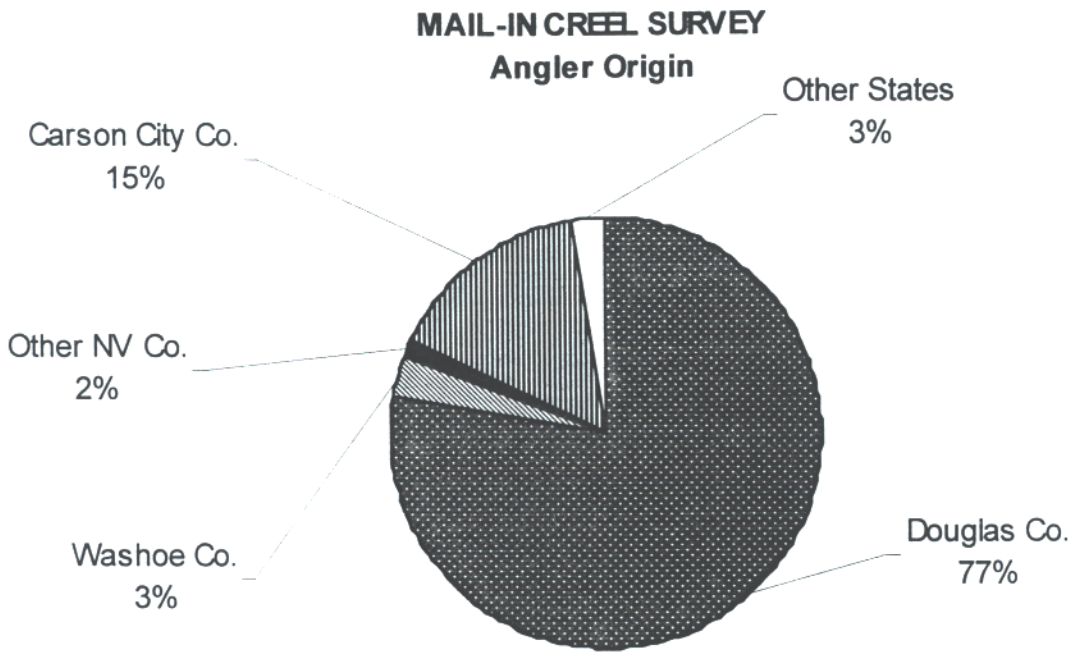

SUBCATCHABLE-SIZED TROUT STOCKED
Number Stocked
50000
40000
30000
20000
10000
0
1995
1996
1997
1998
1999
Cutthroat Trout
Brown Trout


ROVING CREEL SURVEY
No. Anglers Interviewed
No. Fish Caught per Hour
No. Anglers
Fish per Hour
140
120
100
80
60
40
20
0
2
1.5
1
0.5
0
1995
1996
1997
1998
1999


MAIL-IN CREEL SURVEY
No. of Anglers
Fish per Angler per Day
Angler Days
Fish per Angler
2000
1600
1200
800
400
0
4
3
2
1
0
1994
1995
1996
1997
1998

Attachment 8




MAIL-IN CREEL SURVEY
Angler Origin
Other States
3%
Carson City Co.
15%
Other NV Co.
2%
Washoe Co.
3%
Douglas Co.
77%

Attachment 10

ELECTROFISHING SURVEY SUMMARY

APPLE ORCHARD	1994	1995	1996	1997	1998	1999
Rainbow Trout: No. Caught	5	1	1	1	0	13
Size Range	8.1 – 11.8	11.0	11.8	12.8		5.6 – 12.0
Avg. Size	10.1	11.0	11.8	12.8		8.8
No. per Mile	85	17	17	17		72
Brown Trout: No. Caught	21	13	11	4	4	14
Size Range	4.0 – 12.9	3.5 – 11.9	4.2 – 12.0	7.5 – 10.5	4.0 – 7.3	3.7 – 11.8
Avg. Size	7.4	7.4	7.5	10.6	5.5	7.6
No. per Mile	359	222	445	68	22.1	78
Mt. Whitefish: No. Caught	1	4	1	1	2	21
Size Range	6.0	7.6 – 10.2	13.5	11.3	6.3, 12.2	5.1 – 17.0
Avg. Size	6.0	9.3	13.5	11.3	9.2	10.0
No. per Mile	17	68	17	17	11.0	117

BELOW RUHENSTROTH DAM	1994	1995	1996	1997	1998	1999
Rainbow Trout : No. Caught	8	2	4	13	23	4
Size Range	7.0 – 12.0	9.8, 10.8	4.5 – 117	5.3 – 11.3	8.3 – 10.9	3.1 – 10.6
Avg. Size	9.7	10.3	8.8	7.6	9.9	7.8
No. per Mile	142	36	75	628	179	44
Brown Trout: No. Caught	13	14	8	10	2	25
Size Range	4.7 – 14.8	3.8 – 8.0	5.9 – 15.8	7.2 – 21.0	5.1, 8.8	4.3 – 12.8
Avg. Size	5.2	6.1	12.2	11.1	7.2	10.2
No. per Mile	231	249	150	483	15.5	273
Mt. Whitefish: No. Caught	7	6	28	5	5	20
Size Range	8.4 – 14.5	8.6 – 14.4	8.6 – 15.3	8.7 – 15.8	9.8 – 17.4	4.0 – 13.3
Avg. Size	11.6	11.8	11.6	11.2	13.2	6.3
No. per Mile	124	107	516	241	39	218

Attachment 11

MAN DAYS

PRINCIPAL BIOLOGIST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Creel Survey			0.5x2d*	0.5x2d*	0.5x2d*	0.5x2d*	0.5x2d*	0.5x2d*	0.5x2d*	0.5x2d*		
Invert. Collection	0.5*				1				1			
Invert. ID/Enumeration		5				5				5		
Water Quality	0.5x2d*	0.5x2d	0.5x2d*	0.5x2d*	0.5x2d*	0.5x2d*	0.5*	0.5*	0.5*	0.5*		
Electrofishing Survey									2			
Report Writing	5											5
Total	6	6	2	2	3	7	1.5	1.5	4.5	6.5		5

WARDENS/BIOLOGISTS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Creel Survey (1411)			0.5x2d		0.5x2d	0.5x2d	0.5x2d	0.5x2d	0.5x2d			
Electrofishing Survey (1402)									2			
Electrofishing Survey (3 Bios)									6			

CONSERVATION AID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Creel Survey					0.5*	0.5x2d*	0.5x2d*	0.5x2d*				
Invert. Collection						1						
Invert. Sample Sorting						3						
Water Quality					0.5*	0.5x2d*	0.5x2d*	0.5x2d*				
Total					1	4	2	2				

* Shared duties occurring on the same field day

Attachment 12

Equipment List	Approximate Price
STATISTIX for WINDOWS	375.00
Micrsoft ACCESS for WINDOW	400.00
Pentax 10 x 50 Binoculars	210.00
Bushnell Laser Yardage Pro Rangefinder	350.00
Oakton pH Tester w/calibration kit	120.00
Optic StowAway Tidbit	220.00
Optic Shuttle Data Transporter	210.00
Hanna Portable Turbidity Meter w/cuvettes	460.00
YSI 55 D.O. meter	825.00
Surber Stream Sampler	280.00
Aquatic Kit Net	160.00
TOTAL	3,610.00

Attachment 13

IMPLEMENTATION SCHEDULE

Fiscal Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Trout Stocking	X	X	X	X	X	X	X	X	X	X
Creel Survey	X	X	X	X	X	X	X	X	X	X
Electrofishing Survey	X	X	X	X	X	X	X	X	X	
Invert. Sampling	X	X	X	X	X	X	X	X	X	
Water Quality	X	X	X	X	X	X	X	X	X	
Tidbit Placement	X	X	X	X	X	X	X	X	X	
Annual Report	X	X	X	X	X	X	X	X	X	X
Conservation Aid	X	X	X	X	X	X	X	X	X	X
Warden	X	X	X	X	X	X	X	X	X	
Additional Biologist	X	X	X	X	X	X	X	X	X	
Evaluation and Final Report										X