

STATE OF NEVADA

DIVISION OF WILDLIFE



LAHONTAN CUTTHROAT TROUT

SPECIES MANAGEMENT PLAN

FOR THE QUINN RIVER/BLACK ROCK BASINS

AND NORTH FORK LITTLE HUMBOLDT RIVER

SUB-BASIN

Prepared by

Mike Sevon  
Jim French  
Jim Curran  
Ralph Phenix

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SPECIES MANAGEMENT PLAN

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LAHONTAN CUTTHROAT TROUT SPECIES MANAGEMENT PLAN

For Region I including:

The Quinn River/Black Rock Basins

The North Fork of the Little Humboldt River Sub-basin

SUBMITTED BY:

Mike Sevon  
Mike Sevon

Supervising Fisheries Biologist  
Nevada Division of Wildlife

April 23, 1999  
Date

APPROVED BY:

Gene Weller  
Gene Weller, Fisheries Bureau Chief  
Nevada Division of Wildlife

23 April 99  
Date

Robert D. Williams  
Robert D. Williams, Field Supervisor  
U.S. Fish and Wildlife Service

June 1, 1999  
Date

Terry A Reed  
Terry Reed, Field Manager  
Bureau of Land Management - Nevada

4/26/99  
Date

Gloria Flora  
for Gloria Flora, Forest Supervisor  
Humboldt-Toiyabe National Forest

4/26/99  
Date

CONCURRENCE BY:

Jim Greer  
Jim Greer, Director  
Oregon Department of Fish and Wildlife

4/21/99  
Date

Steve Eglin  
Steve Eglin  
Acting District Manager  
Vale District Office  
Bureau of Land Management - Oregon

8/26/99  
Date

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Black Rock Desert Basin

Quinn River Basin

North Fork of the Little Humboldt River Sub-basin

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Black Rock Desert Basin

Quinn River Basin

North Fork of the Little Humboldt River Sub-basin

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Black Rock Desert Basin

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Black Rock Desert Basin

Quinn River Basin

North Fork of the Little Humboldt River Sub-basin

Map of Lahontan Cutthroat Trout Stream Distribution  
....Inside back cover

## EXECUTIVE SUMMARY

### QUINN RIVER LAHONTAN CUTTHROAT MANAGEMENT PLAN

This management plan is an interagency plan which supplements the U.S. Fish and Wildlife Service (USFWS) Recovery Plan for Lahontan Cutthroat Trout (LCT) (*Oncorhynchus clarki henshawi*), published in January of 1995, and the USFWS Cooperative Management Agreements to outline the objectives for LCT recovery for the Northwestern Lahontan basin located within the boundaries of Region I of the Nevada Division of Wildlife (NDOW). The USFWS Recovery Plan calls for the management of LCT to be on a basin level. This plan will include those basins in Nevada which make up the northwest population segment of the LCT and a sub-basin of the Humboldt River basin population segment. Basins within the northwest population segment include: the Quinn River basin and the Black Rock Desert basin. Within the Humboldt River population segment in Region 1, only the North Fork of the Little Humboldt River sub-basin is considered. The LCT was listed as an endangered species in 1970. (Federal Register Vol. 35, p. 16047) and subsequently reclassified as threatened in 1975 to facilitate management and allow regulated angling (Federal Register Vol. 40, p. 29864.)

In the northwest basins and the Humboldt River basin, many man-caused impacts have severely reduced the number of populations that still exist. The degradation of riparian habitat and introductions of non-native trout (rainbow, brook and brown trout) are the two primary causes of the population decline.

Forty-six streams have been identified as potential habitat for LCT within their historical range in the northwestern Lahontan basin and North Fork Little Humboldt sub-basin. Only fifteen streams contained remnant populations of cutthroat through the 1998 surveys.

Mahogany and Summer Camp Creeks are the only streams in the Black Rock basin that sustain LCT throughout all of its reaches. Streams containing LCT within the Quinn River basin have small populations in isolated headwater regions only. Recent mitochondrial DNA (mtDNA) analysis indicates that Quinn River LCT are not genetically similar to Summit Lake/Mahogany Creek LCT and should be managed separately.

The primary objective of this management plan is to set parameters and strategies which will recover LCT in the northwest population segment and to provide for recovery planning in the North Fork of the Little Humboldt sub-basin. Long-term declines caused by natural and man-related changes in habitat condition must be reversed before recovery efforts will be successful. Although not required as a recovery objective the importance of establishing metapopulations in the Quinn/Black Rock Basin remains a high priority.

Twenty-two different management activities needed to achieve recovery of LCT populations are identified and discussed. Implementation of activities are separated into three different priorities.

# I

Priority I identifies the need to immediately undertake actions to protect and enhance all remaining populations of LCT in the Quinn River and Black Rock Desert basins.

Protection from excessive ungulate grazing within the riparian zone is required in order to improve stream habitat conditions.

Priorities II and III involve the reestablishment and maintenance of cutthroat in the Quinn River/Black Rock basins, and actions needed to plan for the recovery of LCT populations in the North Fork of the Little Humboldt sub-basin pending the development of the fisheries management plan for the Humboldt River basin.

To be considered established, a population must be at least five years old and consist of at least three year classes. Streams identified for reintroduction all have potential, either now or in the future, to sustain trout populations. Some streams will require elimination of competing non-native trout populations, and all will require maintaining grazing utilization levels that will result in riparian restoration at near "natural rates". Readers are reminded that the streams need not be listed in the appendix to be considered a potential recovery water. The basic requirement for a recovery water is that it is within the geographic basin of the original range of the cutthroat trout and has suitable habitat.



Fish pictograph - six feet long - on the Sheldon N.W.R.

Photo by: Ruth Tipton Danner

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INTRODUCTION

In the early part of the twentieth century, Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) (LCT) populations throughout Nevada were reduced by a number of man-caused impacts. Destruction of habitat from the combined effects of excessive ungulate concentration in riparian habitat, mining disturbances, irrigation diversion, road construction, and beaver use contributed to the loss of suitable habitat available to this species. Further, it has been shown that indiscriminate introductions of rainbow trout into historic habitat has, in many cases, contributed to the elimination of populations through hybridization. In other cases, cutthroat were displaced completely from entire drainage systems by hatchery stocks of non-native trout (brown and brook trout). In general, the only genetically pure Quinn River cutthroat remaining in this basin are found above natural barriers, or in some cases, streams so small and obscure that they were somehow overlooked in the early fish planting process. Of the 73 historic stream habitats identified in this basin, only 15 were found to possess populations of genetically pure cutthroat trout during the 1990s, with only two of these populations occupying the majority of its available habitat (Mahogany and Summer Camp Creeks).

In the late 1980s, Quinn River cutthroat inhabited less than two percent of their historic habitat, with less than 16 miles of occupied habitat. Stream habitat conditions declined in many areas following the heavy runoff experienced during 1983-84. A drought which continued from 1987 through 1994 further reduced trout populations. In 1989, it was believed that nearly 50 percent of the confirmed populations known to exist in 1980 had been lost. Five consecutive good water years beginning in 1993-1994 have improved habitat with resultant improvements in fish populations in the occupied streams.

The LCT was listed as an endangered species in 1970, (Federal Register Vol. 35, p. 16047) and subsequently reclassified as threatened in 1975, to facilitate management and allow regulated angling (Federal Register Vol. 40, p. 29864.) Quinn River LCT were included with all other races of LCT as the Nevada State Fish by the 1981 Nevada Legislature.

To insure that this fish survives in its remaining habitat and to affect its recovery, all existing populations should be maintained and secured, and new populations reestablished in their available native habitat as soon as possible.

This species management plan is an interagency plan which supplements U.S. Fish and Wildlife Service (USFWS) Recovery Plan for LCT published in January of 1995, and the Interagency Memorandum of Agreement signed on July 3, 1996, to provide specific direction for LCT recovery for the northwestern Lahontan basin, located within the boundaries of Region I of the Nevada Division of Wildlife (NDOW). The USFWS Recovery Plan calls for the management of LCT on a basin level. This plan will include the Quinn River basin, the Black Rock Desert basin (of the northwest population segment), and the North Fork of the Little Humboldt River sub-basin located in Humboldt County (Humboldt population segment). **To provide for coordination of this plan with the federal plan,**

**this management plan will have direct quotations from the USFWS Recovery Plan. These direct quotations will be in bold print.**

## ORIGINS, DESCRIPTION AND TAXONOMIC STATUS

The origin of cutthroat trout in the northwest population segment is obscure. At present all cutthroat trout in the basins that historically drained to Lake Lahontan are considered to be LCT trout, but there is evidence that supports a distinction between cutthroat trout in the upper Humboldt River streams and the lower Lake Lahontan drainages of western Nevada.

In 1964, Robert Behnke differentiated Humboldt cutthroat from LCT. Humboldt cutthroat had fewer gill rakers and fewer scales in the lateral line and above the lateral line. Morphological data and zoogeography suggest that the cutthroat trout from the Quinn River drainage basin should be more closely related to the Humboldt cutthroat than the LCT from the western population segment. Recent geological studies suggest that this drainage basin was part of a northern meander of the main trunk of the Humboldt River as recently as 5,000 years ago (Johnson and Hicks, 1987). It appears that a geologic event may have diverted the course of the Humboldt River away from the Quinn River drainage (Silver State Valley) and the Black Rock Desert basin during the last 4,000 to 5,000 years, thereby isolating these populations and allowing divergent evolution to progress. Analysis of a small sample of Quinn River drainage trout by Behnke indicate that the fish had 20-21 gill rakers typical of Humboldt cutthroat trout (Behnke, 1992).

Other information supports that the Quinn River race of the LCT is more related to the Lahontan form than the Humboldt form. Mitochondrial DNA analysis of Quinn River drainage cutthroat trout suggest a closer relationship to the Lahontan form (Williams, 1989). Further analysis by Williams (1998) samples indicate that Quinn River cutthroat trout are genetically distinct from other cutthroat trout in the lower Lahontan basin, the Humboldt basin, Willow/Whitehorse basin and Summit Lake.

NDOW stocking records indicate that between 1905 and 1925, in Humboldt County, 190,000 black-spotted cutthroat trout were stocked. These fish originated from the Pyramid Lake stock obtained from the Truckee River. The effect of these introductions on the present cutthroat trout population is unknown. Genetic analysis of Quinn River LCT to date has failed to indicate that the Pyramid Lake stock have contributed to the gene pool of the fish remaining.

There are minor differences in the morphological characteristics of cutthroat trout in the Lahontan basin. A description of morphological and meristic characteristics of LCT in the Quinn River system is as follows:

"Body elongate, not greatly compressed; head comparatively slender and long acuminate, its upper surface very slightly carinated; muzzle somewhat pointed, but bluntish at the tip; head not convex above in either direction; maxillary rather short, about as in *S. clarki*; not reaching much beyond the eye; teeth on vomer usual, a



rather small, narrow but distinct patch of teeth on the hyoid bone, the patch narrower and teeth smaller and more closely set than in *S. clarki*; these teeth appear to be sometimes deciduous. Dorsal fin small, its last rays two-thirds the height of the first, the outer margin even, as in *S. irideus*. Caudal fin short, moderately forked; scales medium, 27-160-27. Color rather dark, the sides silvery; back about equally spotted before and behind; sides with rather distinct spots. In some cases the belly is also spotted; in others, the spots are quite sparse and very round. Top and sides of head spotted, even to the end of the snout. Dorsal and caudal spotted. From *S. clarki* it differs in the form of the head, in the forked tail, and in the smaller patch of hyoid teeth and somewhat in color." (La Rivers, 1962).

Observations made over the years from populations of cutthroat in the Quinn River system show a close similarity to the description offered for the LCT. The coloration observed is dull and very similar to the Yellowstone cutthroat (Coffin, 1983). Variations often exist in spotting patterns and coloration from one population to the next. In general, larger deep water streams produce fish which have olive colored dorsal fins tending to exhibit rose color along the sides from the opercle extending into the caudal region. The orange slash found under the mandible in the interopercle region is nearly always found to some degree. Smaller, shallower streams tend to produce fish with the distinct olive coloring in the dorsal region with less of the rose coloring present. In both cases, spotting pattern will vary within populations. Spots are usually oval and dark, found on the anterior, usually above the lateral line. However, many examples have been noted with small oval spots beginning in the humeral area and extending along and below the lateral line to the caudal region. In the South Fork of Flat Creek this cutthroat trout exhibits color variations which tend toward the yellow and away from the characteristic olive coloration noted in other regions of the Quinn River system.

## BIOCHEMICAL AND GENETIC FINDINGS

Table I, on page five, summarizes the results of genetic analysis from 1979 through 1997 for waters covered in this plan. Studies at the University of California at Davis pertaining to biochemical and genetic systematics of western cutthroat, suggest that differences in genotype exist in many populations of cutthroat/rainbow hybrids with little or no external morphological or meristic changes. Many populations of cutthroat which appear "pure" have proven to be influenced by rainbow. The intent of the genetics analysis initiated in the late 1970s was to differentiate pure LCT populations from those that may be hybridized. Electrophoresis was the technique used. Population identification based on this technique generally used nuclear markers (those inherited from both parents). Later genetics analysis used mitochondrial DNA which is maternally inherited only. Techniques utilizing mtDNA tend to underestimate hybridization because a hybrid will only have the mtDNA of its mother. However, these techniques can be very valuable identifying within species differences. The use of different techniques explains some of the variation in results shown in Table 1. The USFWS is in the process of developing a genetics management plan which will synthesize and review the available genetics information and

recommend genetics management strategies.

### 1978-1993 U.C. Davis analysis (electrophoresis)

A contract was maintained from 1978 through 1993 to determine the genetic purity of populations of trout which exhibited external characteristics consistent with LCT. Contracts with Dr. Graham Gall, at the University of California at Davis, were maintained throughout the ongoing stream survey effort in Humboldt and Pershing Counties. A total of 18 populations of "potential" LCT were sampled between 1980 and 1989, from the Black Rock Desert basin, Quinn River basin, and the North Fork of the Little Humboldt River sub-basin.

Twelve of the populations sampled were identified as genetically pure LCT, while the remaining six were rainbow/cutthroat hybrids. Since the initial identification, three of the genetically pure cutthroat populations may have been lost due to stream habitat changes associated with the recent drought.

### 1990 Boise State University analysis (mitochondrial DNA)

In 1990 a contract was initiated with Dr. Richard Williams of Boise State University to look at mitochondrial DNA relationships in LCT populations. During this survey Dr. Williams evaluated two Quinn River basin trout populations, six Humboldt cutthroat populations, plus cutthroat from Willow and Whitehorse Creeks in Oregon. Dr. Williams concluded from these studies, "The analysis were concordant in revealing very low levels of differentiation (i.e. divergence) among Lahontan, Humboldt, Willow Creek and Whitehorse cutthroat trout.

In most instances, Willow and Whitehorse Creek cutthroat trout were genetically indistinguishable from LCT. Within this group of closely related trout, the Humboldt cutthroat trout appears to be the most genetically divergent." Dr. Williams recommends that the unclassified Willow Creek and Whitehorse Creek cutthroat trout be considered LCT, rather than a unique subspecies. Mitochondrial DNA analysis also indicated that Washburn Creek and Mahogany Creek cutthroat trout were identical in restriction enzymes (Williams, 1998).

**LAHONTAN CUTTHROAT TROUT**  
Collections for Genetic Analysis

Water	Collection Year	No. in Sample	Species Classification	Primary Researcher	University	Analysis Technique
Abel Creek	1989	8	Cutthroat	Bartley	U.C. Davis	Biochem/gen
Andorno Creek	1981	10	Lah. cutthroat	Bartlev	U.C. Davis	Biochem/gen
Corral Creek	1988	6	Lah. cutthroat	Bartlev	U.C. Davis	Biochem/gen
Crowley Creek	1996	30	Pure Quinn LCT	Williams	Clear Creek	mtDNA
Crowley Creek	1986	10	98 percent LCT	Bartlev	U.C. Davis	Biochem/gen
Deep Creek	1989	6	Hvbrid	Bartlev	U.C. Davis	Biochem/gen
Eight Mile Creek	1985	10	Lah. cutthroat	Bartlev	U.C. Davis	Biochem/gen
S.F. Flat Creek	1987	8	Lah. cutthroat	Bartlev	U.C. Davis	Biochem/gen
Kings River	1988	14	Hvbrid LCT	Bartlev	U.C. Davis	Biochem/gen
Line Cyn. Creek	1990	10	Lah. cutthroat	Bartlev	U.C. Davis	Biochem/gen
Line Cyn. Creek	1989	5	Cutthroat	Bartlev	U.C. Davis	Biochem/gen
Mahogany Creek	1996	32	LCT	Williams	Clear Creek	mtDNA
Mahogany Creek	1992	5/1	Lah. 1/2	Williams	Williams	mMit. DNA
Mahogany Creek	1986	10	Lah. cutthroat	Bartlev	U.C. Davis	Biochem/gen
N.F.L. Humboldt	1980	21	F1 hybrid	Gall	U.C. Davis	Biochem/gen
N.F.L. Humboldt	1979	6	Lah. cutthroat	Gall	U.C. Davis	Biochem/gen
Pole Creek	1988	10	Hvbrid LCT	Bartlev	U.C. Davis	Biochem/gen
Raster Creek	1988	12	Hvbrid LCT	Bartlev	U.C. Davis	Biochem/gen
Riser Creek	1996	34	Quinn LCT/Hyb.	Williams	Clear Creek	mtDNA
Riser Creek	1985	9	Lah. cutthroat	Bartlev	U.C. Davis	Biochem/gen
Rodeo Creek	1988	10	Hvbrid LCT	Bartlev	U.C. Davis	Biochem/gen
Round Corral Ck.	1989	7	Hvbrid	Bartlev	U.C. Davis	Biochem/gen
Sage Creek	1996	30	Quinn LCT	Williams	Clear Creek	mtDNA
Sage Creek	1992	9	Lah-1	Williams	Boise S.U.	mtDNA
Sage Creek	1990	7	Lah. cutthroat	Bartlev	U.C. Davis	Biochem/gen
Summit Lake	1976	42	Lah. cutthroat	Gall	U.C. Davis	Biochem/gen
Summit Lake	1996	16	Lah. cutthroat	Williams	Clear Creek	mtDNA
Tenmile Creek	1992	8	Lah-1 (hybrids)	Williams	Boise S.U.	mtDNA
Three Mile Creek	1996	31	Lah. cutthroat	Williams	Clear Creek	mtDNA
Three Mile Creek	1992	10	Lah-1	Williams	Boise S.U.	mtDNA
Three Mile Creek	1989	12	Cutthroat	Bartlev	U.C. Davis	Biochem/gen
Three Mile Creek	1985	10	Yellowstone cutt	Bartlev	U.C. Davis	Biochem/gen
Washburn Creek	1996	27	LCT	Williams	Clear Creek	mtDNA
Washburn Creek	1992	7	Lah-1	Williams	Boise S.U.	mtDNA
Washburn Creek	1985	10	LCT	Bartlev	U.C. Davis	Biochem/gen

In total in Nevada, seven different populations were sampled. Two factors suggest that the Lahontan basin complex of cutthroat trout may have experienced an extended

historical bottleneck. These include: the uniformity of mtDNA haplotypes observed in Lahontan and Humboldt populations and the small amount of divergence observed between the two groups. The general lack of variation within populations suggest a historic bottleneck coupled with recent isolation between populations and historically accepted taxa (Williams, 1992). Populations from western Nevada were divided into three different groupings and listed separately from the upper Humboldt River populations. A small but consistent divergence was noted between the Humboldt cutthroat and the LCT populations.

Of note were the results of samples from Three Mile Creek, in the Santa Rosa Range. The samples from this water, analyzed by U.C. Davis in 1985, were labeled as Yellowstone cutthroat. In 1992, a sample of 10 fish from Three Mile Creek, analyzed by Boise State University, were labeled as Lah-1 cutthroat.

### 1996 Clear Creek Genetics/BYU analysis (mitochondrial DNA)

Additional contract work was done by Williams for NDOW with samples collected in 1996. Thirteen samples from eleven northern Nevada cutthroat trout populations revealed little overall diversity, no within-population diversity and extremely low levels of divergence among the few mitochondrial DNA haplotypes observed. Due to this diagnostic technique, it is uncertain whether cutthroat samples in Three Mile Creek were influenced by Yellowstone cutthroat trout which were identified there in 1985.

This most recent analysis showed no evidence of introgression from non-indigenous cutthroat trout or from hatchery rainbow trout with the exception of Riser Creek. Quinn River populations were genetically distinct from Lahontan, Humboldt, and Willow/Whitehorse cutthroat trout. Within the Quinn River system, cutthroat trout from Washburn Creek, exhibited a unique haplotype compared to cutthroat trout from Sage, Riser, Crowley and Three Mile Creeks, which shared a common haplotype. The two haplotypes differed from one another by 0.32 sequence divergence, the result of a single restriction site difference.

The relationship of Summit Lake cutthroat trout to cutthroat trout in Mahogany and Summer Camp Creeks were analyzed. There was no difference between fluvial and lacustrine populations. All three populations shared a common mitochondrial haplotype, which was distinct from Quinn River and Willow Creek cutthroat trout. It was recommended that Summit Lake populations not be considered as a reserve source for rebuilding Quinn River populations. (Williams, Evans, and Shiozawa. 1998)

The apparent inability of introduced hatchery rainbow trout to adapt to harsh summer and winter conditions in these streams may partially explain the low incidence of hybridization found in the Quinn River/Black Rock basin. It would appear that introductions of other trout throughout the Quinn River/Black Rock basin offer a more serious competitive challenge for available habitat than the threat of species hybridization. In general, most pure populations of LCT are associated with stream reaches which, for one reason or

another, have been isolated from hybrid influences or inter-specific competition from other trout species, therefore, most existing LCT found in the Quinn River/Black Rock basin have been confined to limited habitat found in the more remote headwater regions. This, in combination with habitat degradation and drought, has reduced available habitat to this race drastically.

In the North Fork of the Little Humboldt River sub-basin, in 16 streams considered for recovery of LCT, seven currently have documented populations of hybrid cutthroat. Accessibility to the streams by vehicles and a long history of fish stocking have eliminated pure LCT in all but the most remote reaches of this drainage. With the exception of Long Canyon Creek, pure LCT have not been observed in the North Fork of the Little Humboldt.

### LIFE HISTORY

Few studies have been completed on the life history of the Quinn River LCT. Much of the specific biology of this race has been learned from observations made through the years during the ongoing stream survey program. The life history and habitat requirements for this trout appear to be quite similar to that of other salmonids found throughout the west.

Basic habitat requirements for LCT as well as other western species of trout include: cool waters, silt free spawning gravels, and deep narrow stream profiles. Cutthroat trout in the Lahontan basin have adapted to tolerate high water temperatures for short periods of time (less than four hours) during late summer months. The ability of LCT to survive diel water temperature fluctuations of over 40°F has been an important survival mechanism. In the Quinn River basin these fish have survived where maximum daytime water temperatures exceed 82°F.

Access to clean, well oxygenated gravel is basic to consistent spawning success. In most cases these fish reach sexual maturity at age two. Females found in high desert streams will usually reach a mature size of less than eight inches in their third year, and will yield less than 200 eggs. Peak spawning activity occurs in late May and early June when water temperatures reach and exceed 45°F. Depending upon weather conditions, the spawning can start as early as March and can be delayed as late as July. Average egg incubation time is dependent on stream water temperatures. During the late June spawning period, egg hatch can be expected from six to eight weeks after spawning occurs depending on water temperature variations. Fry are evident within two weeks of egg hatch.

Swim-up fry will usually occupy suitable nursery reaches of stream and stream tributaries for approximately 16 weeks. Preferred habitat for these fry are found in riffles, glides and small pools. The absence of this habitat during the warmest part of the summer and the coldest period of winter is a major factor contributing to inconsistent recruitment of the species in many small degraded stream habitats.

As with many stream-born salmonids, acquisition of food is "feast or famine" and very opportunistic in nature. In many streams with well represented age classes, dominance hierarchies appear. In most cases, the largest fish occupy pools, while the younger age classes are relegated to occupy glides, runs and riffles. Many times marginal habitat must be occupied by the young-of-the-year (YOY) age class. In years of marginal precipitation

or exceptionally cold winter and heavy ice accumulations extensive mortalities of YOY fish have occurred.

Growth rates of yearling age classes of fish can vary drastically, depending upon availability of food and average water temperatures. In most occupied habitat, growth of yearling fish can be expected to average between .01 and .25 inches per month during the productive summer and fall months. Similar growth rates can be expected until sexual maturity. Post spawning stress can have substantial impacts on the survival of adult fish. Under marginal conditions this species may die of stress after the first attempt at reproduction. Often average life expectancy does not exceed three to four years.

### DISTRIBUTION - HISTORIC

The historic range of the Quinn River cutthroat is unclear due to undocumented plants of cutthroat throughout the historic Quinn River drainage. Based on remnant populations of pure, as well as hybrid fish, and the geographic locations of tributaries to the Quinn River/Black Rock Desert drainage, it is estimated that over 90 percent of available stream habitat was occupied at least some of the time. Based on stream bank profiles and the lack of remnant riparian habitat, it appears that Quinn River below "Quinn River Crossing" was not an important part of the total habitat available to this species.

As early as 1873, transplants of "black-spotted" trout were occurring throughout Humboldt County. The source of these fish is unclear, although it was common practice during this period to transplant fish from Pyramid Lake and in some cases, Summit Lake (La Rivers, 1962).

### DISTRIBUTION - MODERN

The USFWS recovery plan identifies 386 miles of probable historic LCT habitat in the Quinn River/Black Rock Desert basins with 15 percent of the stream habitats (15 streams) occupied today. In the Little Humboldt River sub-basin, including the South Fork drainage, the recovery plan identifies 58 miles of occupied habitat. NDOW stream surveys have identified 411.8 miles of potential habitat in 40 streams found within the historic Quinn River/Black Rock basin. Twenty-one of the identified habitats have been rated as fishable. Most of these streams have been subjected to sparse and sporadic fishing pressure with insignificant harvest. As of 1998, all of the identified habitats have been surveyed and sampled for the presence of pure LCT. As of 1995, it appears that 10 waters may contain populations of pure Quinn River cutthroat, while several others may have small populations in the headwater reaches.

Table 2

CUTTHROAT POPULATIONS IN QUINN/BLACK ROCK DRAINAGE STREAMS  
1995

Stream	Estimated Population*
Washburn Creek	Approximately 50
Riser Creek	Approximately 20
Crowley Creek	Approximately 200
Line Canyon Creek	Approximately 50
Sage Creek, NV	Approximately 50
Eight Mile Creek	Approximately 50
South Fork Flat Creek	Unknown
East Fork Quinn River	Unknown
Mahogany Creek	Approximately 500
Summer Camp	Unknown
Three Mile Creek	Unknown

\* The estimated population includes all age classes from fry through mature specimens.

Table 2 displays 1995 LCT population estimates for several streams in the Quinn River/Black Rock basin following the last major drought. In 1996, there were major increases in LCT numbers in streams in the Montana, the Trout Creek and the Black Rock Ranges. On Washburn Creek the average LCT sampled in 1995 was 10 trout per mile. In 1996, the average LCT increased to 443 trout per mile. Fish densities increased by a factor of more than 40 from 1995 to 1996 for Washburn Creek. In 1998, Washburn Creek LCT populations increased to an average of 1,255 per mile with a total population estimate of 3,675. On Crowley Creek, from 1995 to 1996, the average fish per mile increased from eight to 48 trout per mile.

Current evidence suggests that pure populations of Quinn River cutthroat are limited in range to the northeast corner of the historic Quinn River system. The present range includes the headwaters on the South Fork of Flat Creek, Three Mile Creek, Andorno Creek and Eight Mile Creek, located on the west side of the north Santa Rosa Range. (Note: On the South Fork of Flat Creek, the last two population surveys have not identified LCT) Genetically pure fish have also been documented on the north end of the Montana Mountains and the south end of the Trout Creek Mountains. Essentially all historic populations found in the southern Santa Rosa Range, western Montana Mountains, Jackson Mountains, Calico Mountains and Granite Range have been lost.

Most of the populations of Quinn River cutthroat are found in the uppermost reaches of the watersheds. Riser Creek presently contains only rainbow trout and hybrids. Crowley Creek has populations of rainbow and rainbow/cutthroat hybrids in the drainage below Sentinal Rock.

The population of cutthroat found in Eight Mile Creek is considered to be low and in danger of being lost. High water conditions in 1983 severely affected the stream channel condition, eliminating critical summer, winter and spawning/nursery habitats. During August 1990, adult and sub-adult cutthroat were observed in isolated pools. Recurring fires in this drainage are retarding recovery of riparian habitat.

The South Fork of Flat Creek, in the Santa Rosa Range, once possessed a small population of cutthroat trout. Brook trout are found throughout the main reach of the stream, with the cutthroat historically confined to the South Fork. During the last two population surveys, LCT were not found in this stream.

The only remaining cutthroat in Washburn Creek after the drought appeared to be located in the steeper portions of the stream where riparian utilization by livestock has only been moderate. Distribution of LCT moved downstream with improved flows following the drought.

Mahogany Creek, in the Black Rock Desert basin, and its tributaries make up the streams that run into Summit Lake. Annual spring spawning migrations from Summit Lake ascend Mahogany Creek. In addition to the migrating cutthroat trout, the stream possesses a population of stream dwelling cutthroat that appear to spend their entire life in the stream (Weller, 1980).

Cutthroat trout in Line Canyon and Sage Creeks are found in both Oregon and Nevada. Responsibility for management of the public land habitat on these streams is delegated to the Vale, Oregon District of the Bureau of Land Management (BLM).

Table 3 displays 1995 LCT population estimates for several streams in the North Fork of the Little Humboldt sub-basin following the last major drought.



Table 3

CUTTHROAT POPULATIONS IN N. F. LITTLE HUMBOLDT STREAMS  
1995

Stream	Estimated Population*
Abel Creek	1200-fish/mile
Long Canyon Creek	Less than 500
Indian Creek	Less than 500
South Fork Indian Creek	Less than 500

\* 1989 estimate of all age classes from fry through mature specimens.

In 1996, in the North Fork of the Little Humboldt drainage, seven out of 16 streams identified in the USFWS recovery plan as having pure populations of cutthroat trout have been diagnosed as containing hybrid LCT (See Table 4).

Table 4

HABITATS PREVIOUSLY OCCUPIED BY LCT IN THE NFLH  
(since 1985)

Water	Present Status
Lye Creek	Introgressed
Road Creek	Introgressed
Mullinix Creek	Introgressed
Dutch-John Creek	Introgressed
North Fork Little Humboldt	Introgressed
Martin Creek	Extinct
North Fork of Cabin Creek	Introgressed

Appendix A lists streams with potential to support LCT. The appendix also lists all fish species currently existing in each stream.

## REASONS FOR DECLINE

Quinn River LCT populations face threats to their survival from a number of factors. A long term decline in quality habitat has reduced summer and winter survival. Specifically, the following list identifies factors which are considered a threat to the long-term survival of the native trout in the Black Rock basin.

1. Hybridization of this species with rainbow: The earliest known stocking of rainbow trout into a cutthroat stream in Humboldt County was July 1, 1896 when 35,000 trout (rainbow and brook) were stocked into the Quinn River. Early records of stocking are not available. However, it would be safe to assume that all perennial streams with road access were repeatedly stocked with rainbow trout. As indicated in Appendix A, hybridized LCT have been documented in the Black Rock basin in the Mary Sloan Creek; in the Quinn River basin in Crowley Creek, Raster Creek, Rodeo Creek, Cold Springs Creek, Rebel Creek, Sage Creek, Washburn Creek and all perennial tributaries of McDermitt Creek including Line Canyon Creek, Riser Creek, Sage Creek, Indian Creek.

The Crowley Creek population showed light introgression with rainbow trout (Bartley, 1987). Specific electrophoresis for this population indicated that the sampled population was contaminated with less than two percent identified rainbow genomes, which were thought to have occurred many generations ago. Based on NDOW surveys, the population found from the headwaters downstream approximately 1.5 miles are genetically pure cutthroat.

2. Habitat loss associated with past ungulate grazing practices: Over the past century livestock operations have dominated the use of most rangelands. It has been demonstrated that solutions to the past and on-going grazing problems are not easily found. To compound today's problems land managers not only must administer their own grazing management program properly, but they must correct damages produced by the heavy grazing of the past.

There are many case histories documenting the impacts of improper grazing. These impacts can affect all four components of the river-riparian system: the channel, the stream banks, the water column and the instream and bordering vegetation.

In most cases damage from livestock is concentrated on stream side vegetation, as riparian areas are usually grazed more heavily than the adjacent uplands. Improper grazing can reduce vigor and alter, reduce, or eliminate stream side vegetation (Platts, 1990). This in turn can change plant species composition, lower water tables, change the timing and amount of organic energy entering and leaving the stream, decrease canopy cover, and change a stream from a perennial to an ephemeral condition. Livestock directly alter stream side vegetation by trampling, rubbing and grazing on herbaceous plants and browsing of shrubs. Usually the narrower the riparian zone, the

more easily it is altered by grazing animals. Livestock grazing impacts stream banks by removal of bank vegetation and by the trampling and shearing of banks themselves.

The effects of heavy ungulate use of riparian vegetation on fish habitat are the alteration of stream bank, reduction of shade, decrease in cover, and subsequent changes in stream temperatures. Generally, streams in improperly grazed areas contain more fine sediment, stream banks are more unstable, banks are less undercut and channels have widened. ( Platts, 1990)

3. The occurrence of active beaver colonies together with ungulate grazing in streams currently supporting cutthroat trout has degraded riparian habitat. Streams impacted by the synergistic effects of beaver and livestock include: Washburn, Crowley, Riser, Line Canyon and Sage Creeks. Damage occurs when woody reproduction is removed by ungulates grazing the riparian zone during hot season use.

Beaver have become a threat to Quinn River cutthroat due to the loss of woody stream bank vegetation. Losses of key woody species de-stabilize stream banks, embed spawning substrates and degrades water quality. Willow and aspen growth found along most of the historic habitat cannot sustain beaver colonies along with the presence of livestock grazing. Rapid willow/aspen depletion causes growing beaver colonies to expand their range in an attempt to secure food supplies, leaving many drainages devoid of woody vegetation. Abandoned beaver structures are susceptible to washing out and creating a "domino effect" of habitat loss. Washed out beaver dams deposit large quantities of silts and clays into important spawning and nursery areas for the cutthroat. The construction of beaver dams also may act as barriers to upstream spawning migration; however, during severe drought conditions, beaver dams and ponds provide refugia for trout to survive low water conditions.

4. Displacement of existing populations by other nonnative trout species which include rainbow, brown and brook trout. Plants of competing species of trout drastically increase the risk of displacement. Even in streams with well defined barriers, the risk of mixing populations still exists during extreme high water years and with the unauthorized transport of fish by sportsmen.
5. Extended drought, as occurred from 1987 through 1994, decreased flows in most waters in Nevada. LCT populations decreased through this period in all streams and were eliminated in some waters. During February of 1989, low stream flows combined with record low temperatures caused mortality of cutthroat trout in Humboldt County streams.
6. Angling pressure can, in some instances, exert pressure on cutthroat trout numbers. During drought cycles, many stream populations are extremely confined due to limited habitat. In this situation, sportfishing has the potential to deplete a stream population.

For this reason, fishing seasons were closed on several of the Quinn River populations in 1990. Streams presently closed to fishing include: Crowley, Eight Mile, Riser, Sage, Andorno, Line Canyon and Washburn Creeks, and the tributaries of Summit Lake. However, there is no documentation that sport angling has been a significant contributing factor to the decline of LCT.

Based on the NDOW 10 Percent Angler Questionnaire, average angler use from 1980 through 1994 on streams considered in this plan varied from 0 to 348 angler days per year. (See Appendix A for a summary of average angler use from 1980 through 1994). With the exception of Indian Creek in the North Fork of the Little Humboldt drainage, all streams with angler use have mixed species.

Behnke (1979) estimated that with Westslope cutthroat, fishing pressure of 125 hours per hectare per year would result in an over exploitation of the population. On an average stream in Nevada that is three feet in width, angling pressure of 31.25 four hour angler days per stream mile would be the equivalent of 125 hours per hectare per year. In a stream, typical of the Santa Rosa Range, with five miles of fishable habitat, one could expect that LCT populations would be impacted if angler use reached or exceeded 140 angler days. The only stream listed in Appendix A with over 140 angler days per year is the North Fork of Cabin Creek. No rare or endangered trout has ever become so through over fishing. (Behnke and Zarn, 1976)

Historical and present Quinn River cutthroat habitats have been deteriorated far below the optimum in most streams in the Quinn River drainage. Habitat requirements identified for the Humboldt River cutthroat are essentially the same as those of the Quinn River basin. Moderately hard calcium carbonate streams dominate the habitat type. Stable watersheds provide the cohesive influence to many streams with suitable aquatic and riparian habitats. Many of the watersheds found within the historic Quinn River cutthroat range are below optimum and produce large amounts of fine sediments during peak water flows. Spawning habitat, in many cases, has been altered to the point of low or no spawning potential. Fine sediments are cementing spawning gravels so that intra-gravel oxygen levels are below levels suitable for egg incubation.

## LAND OWNERSHIP STATUS

Appendix B lists land ownership status for potential LCT streams. In the Black Rock Desert basin there is a total of 208.2 stream miles considered on 22 different waters. Of these, 99.4 miles or 47.7 percent of stream miles listed have potential for LCT. In this basin, 5.2 miles of stream are on tribal land, 151.2 miles of stream are on BLM land, and 51.8 miles of stream are on private land.

In the Quinn River basin there is a total of 203.6 stream miles considered on 18 different streams. Of these, 112.3 miles or 55.1 percent of stream miles listed have

potential for LCT. The BLM administers 120.0 miles of the available stream miles. The United States Forest Service (USFS) administers 23.7 miles of the available stream miles and 59.9 miles of available stream habitat are on private land. A total of 411.8 miles of historic stream habitat occur within the Black Rock Desert/Quinn River basin. Of those habitats, a total of 71.6 percent (294.9 miles) are on public lands, however, many of the most desirable habitats are found on private lands.

In the North Fork of the Little Humboldt sub-basin, Appendix B lists eight different streams with a total of 59.0 miles. Of these, 50.3 miles or 85.2 percent of the total listed miles have the potential to support LCT. The USFS administers 34.5 miles of stream, the BLM administers 6.1 miles of the listed streams, and private lands are located along 18.4 miles of the available stream. For the North Fork of the Little Humboldt River basin, all streams included in the Species Management Plan have some private land except for: Deep Creek and South Fork Indian Creek. Many of the most difficult management decisions facing land management agencies, involving the long-term improvement of habitats suitable for LCT, are found on those systems containing both public and private holdings. Opportunities for cooperative planning between private land owners, land management agencies, the USFWS and NDOW exist, and many solutions to long-range improvement of stream habitat will lie with the cooperative efforts of all interested parties. As outlined in the LCT Recovery Plan, the USFWS is taking the lead in developing Habitat Management Plans (HMP's) with private landowners. Cooperative agreements/Safe Harbor agreements should be pursued for private lands where LCT have the potential to drift if populations expand. The Black Rock Desert basin streams listed in the Species Management Plan with private landowners include: Mahogany Creek, Snow Creek, Leonard Creek, Summer Camp Creek, Bartlett Creek, Cottonwood Creek (Granites), Big Creek, Donnelly Creek, Granite Creek (Granites), Chicken Creek, Happy Creek, Jackson Creek, Mary Sloan Creek, Paiute Creek, Red Mountain Creek, and Coleman Creek. The Quinn River basin streams listed for Nevada in the Species Management Plan with private land include: Crowley Creek, Flat Creek, Rebel Creek, Riser Creek, Washburn Creek, Sage Creek, Line Canyon Creek, Andorno Creek, Eight Mile Creek, Rodeo Creek, House Creek, Log Cabin, Falls Canyon Creek, Three Mile and McDermitt Creek.

## RECOVERY OBJECTIVES

The primary objective of this management plan is to set parameters and strategies, which when implemented, will improve the status of LCT in Quinn River/Black Rock basin and North Fork Little Humboldt sub-basin to a point where these populations will no longer require protection under Endangered Species Act (ESA). Long-term declines caused by natural and man-related changes in habitat must be reversed before the recovery effort can be considered successful. **LCT will be considered for delisting by population segment when management has been instituted to enhance and protect habitat required to sustain appropriate numbers of viable self-sustaining populations.** The USFWS Recovery plan sets objectives for the number of populations in each basin that need to be maintained or established. Appendix A lists the recovery waters by basin and the recovery

objectives as stated in the USFWS Recovery Plan. The northwestern Lahontan basin population segment in Nevada encompasses portions of Humboldt and Washoe Counties and is comprised of the Quinn River basin and Black Rock basin. This plan also includes the portion of the Little Humboldt sub-basin occurring in Humboldt County which is part of the Humboldt population segment.

The Executive Summary of the LCT Recovery Plan identifies “target densities” as a recovery criteria. **Lahontan cutthroat trout population numbers fluctuate widely in response to a variety of stimuli including living space, food, cover, age class structure, predation, habitat conditions, and annual and long term weather patterns.** Target densities will not be a single determining factor in meeting recovery objectives. The DPS team will identify on a stream by stream basis, numbers needed for a viable population.

For the Black Rock Desert basin, recovery criteria calls for maintaining four existing streams and reintroducing LCT to an additional 11 streams. The Quinn River basin recovery objectives call for maintaining 11 existing streams and reintroducing LCT to one additional stream. The Little Humboldt sub-basin recovery objectives call for maintaining 11 streams in the North Fork of the Little Humboldt drainage **A viable population is considered to be one that has been established for five or more years and has three or more age classes of self-sustaining trout as determined through monitoring.** For Humboldt and Washoe Counties, recovery objectives call for maintaining a total of 38 stream populations of LCT and one lacustrine (lake) population on Summit Lake.

## MANAGEMENT STRATEGIES AND OBJECTIVES

Appendix C lists all streams currently containing LCT populations and streams considered in the USFWS Recovery Plan as possibilities for meeting recovery objectives. This list details the management actions needed for each water. The following section details actions identified to meet recovery objectives. The numbers listed for each recovery activity corresponds to the list developed by the USFWS during 1995, with all cooperating agencies. (i.e. 1 is the first activity and is listed as: Livestock grazing management improvements). With the exception of 1, the activities are not listed in order of importance in recovery activities.

### Habitat Management Actions

Habitat improvement is listed in the USFWS Recovery Plan as the most immediate need in improving the status of LCT. **Habitat proposed for LCT management should be selected by state wildlife and federal land management agencies, dependent on the suitability or potential to maintain viable LCT populations over the long-term.**

The following riverine habitat optimum parameters are provided as a guideline for future evaluations and stream survey (habitat suitability index model) (Hickman and Raleigh, 1982). Optimal riverine cutthroat trout habitat is characterized by:

- Clear, cold water with an average maximum summer temperature of less than 22°C (72°F).
- An approximate 1:1 pool/riffle ratio.
- Well vegetated, stable stream banks.
- Sixty percent or more of stream area providing cover.
- Relatively stable water flow regime, less than 50 percent fluctuation from average annual daily flow.
- Relatively stable summer temperature regime, averaging 13°C (55°F) with variations of about 4°C (9°F).
- A relatively silt-free (less than 12 percent silt) rocky substrate in riffle-run areas.

Actions which fall in the category of habitat management include:

1. Livestock Grazing Management, Watershed Improvement, Stream Side Management Zone (SMZ), Riparian areas.

**Stream side management zones should be in a good to excellent condition. This includes management to assure that: 1) Desired key riparian plant community types of species (woody and herbaceous) are present, reproducing, and have high vigor; 2) cover of key species is 90 percent or greater of estimated potential; 3) soil productivity should not be significantly reduced by compaction from estimated condition. Grazing practices on federal lands within watersheds and the SMZ should be managed to achieve desired LCT habitat conditions. Watersheds should be managed to achieve desired future condition objectives and prevent degradation of SMZ, riparian areas, stream banks, and stream water quality. Strategies to achieve desired habitat conditions should be identified in land-use plans.**

**All land management agency activity plans involving LCT habitat should be monitored, evaluated, and updated on an as needed basis. Land use activity plans should be evaluated and revised if water-shed, SMZ and riparian objectives are not being achieved. Best management practices should be initiated to reduce non-point source pollution problems on LCT streams.**

The BLM and the USFS should adhere to the requirements of the Interagency Memorandums of Agreement (MOA's) developed for potential recovery streams to improve habitats. Appendix C lists the latest year in which livestock management planning was completed by the USFS and/or BLM.

## 2. Forestry Management

Management of available forest resources should be predicated on maintaining healthy watersheds and stream riparian systems. It is recommended that public land management agencies develop best management practices (BMP's) that address specific standards for large woody debris removal, stream side buffer zone, and low impact harvesting.

## 3. Fire Management

Streams selected for recovery of LCT should be protected as much as possible against the deleterious effects of hot or recurring fires. Protocols for fire management activities around LCT streams should be developed to minimize impacts to the stream channel, water chemistry and surrounding riparian areas. Eight Mile Creek is an example of a stream that has suffered from repeated burns. Following a fire, it would be desirable for the responsible land management agency to evaluate the damage and provide measures to enhance upland and riparian areas.

It is recommended that grazing be restricted for a period of two years or until land management agency condition guidelines are met (example: Aspen and willow regeneration attains a minimum height of five feet). Management recommendations should be developed on a case by case basis after an evaluation of the effects of a fire on each recovery water.

## 4. Instream Habitat Improvement Projects

Some instream habitat improvement projects have been implemented on streams such as the East Fork of Quinn River and Eight Mile Creek. There are no further proposals at this time. Future projects may be proposed on a site specific basis by land management agencies if determined to be beneficial to LCT recovery. Potential for these projects is limited by accessibility, funding and work force constraints.

## 5. Acquisition of Private Inholdings or Water Rights

As an activity, there have been no suggestions on specific waters to purchase property or to obtain water rights. This may be necessary in the future to meet recovery objectives on key waters. Purchase of private property by government entities would only be done with willing sellers.



## 6. Road Management

Objectives for road management should focus on minimizing stream bank disturbances and reducing potential for silt loading to the stream. It is recommended that the federal land management agencies develop best management practices for road construction and maintenance on streams proposed for LCT recovery. The majority of the potential and occupied streams have some degree of road management problems.

## 7. Wild Horse Management

Wild horse distribution in the Winnemucca BLM district is localized in the Black Rock, Jackson and the Granite Ranges, where management is ongoing. All existing and potential LCT streams have multiple use decisions (MUD's) and appropriate management levels (AML) for horses established. Streams listed in Appendix C needing wild horse management include: Bartlett Creek, Battle Creek, Coleman Creek, Cottonwood Creek, Donnelly Creek, Granite Creek, Happy Creek, Mahogany Creek, Summer Camp Creek, Snow Creek, Paiute Creek and Red Mountain Creek.

Horses and burros will be removed from public lands in accordance with policies outlined in the Strategic Plan for Management of Wild Horse and Burros on Public Lands. If adverse impacts to stream channels, water chemistry and/or riparian areas from wild horses and or burros are occurring on recovery streams, and populations cannot be reduced, other stream and riparian protections, such as fencing of impacted areas, will be initiated.

## 8. Monitoring of Habitat Condition

The preferred method for monitoring habitat by NDOW is through the present GAWS (General Aquatic Wildlife System) stream survey technique (USFS Region 4 - FSH 2609.23, 1989). Priorities for waters to be monitored during the upcoming field season should be determined through interagency meetings in the spring of the year. As population monitoring needs increase with the implementation of the fisheries management plan, it will become more difficult to maintain a full time stream survey crew. Interagency funding is needed to maintain crews at more than baseline levels. Riparian condition will be monitored by land management agencies in accordance with their guidelines, to insure that recovery streams are in proper functioning condition. If specific management objectives are set for a stream, riparian area, or watershed, direct monitoring of those attributes are more efficient than trying to interpret GAWS data.

## 9. Mine Rehabilitation

Streams impacted by previous mining activity, which could benefit from rehabilitation, are Three Mile Creek, Eight Mile Creek and the North Fork of the Little Humboldt River. In 1995, on the North Fork of the Little Humboldt River, remediation was initiated to minimize problems

associated with acid drainage and heavy metal toxicity. Stream survey conducted during the summer of 1998 identified pH levels of 3.0 just below the mine tailings. The stream pH returned to neutral two miles below the tailings.

### Fish Population Management Actions

**Many LCT populations are found in restricted portions of streams not protected from invasion of non-native salmonids. These LCT populations are subject to displacement and/or hybridization.** Habitat proposed for LCT management should be protected from non-native salmonids. Streams proposed for recovery will be prioritized by the quality of habitat potential and in order of diminishing conflicts, which includes: streams with private landownership and streams which are popular sport fisheries. On streams identified for recovery where there is private land on that portion of stream with potential habitat for LCT, the USFWS and NDOW will work toward private landowner agreements.

Remote waters with minimal angler use will receive priority in selecting recovery waters. To meet recovery objectives it will be necessary to utilize some streams currently supporting a sport fishery. Appendix A provides average angler use from 1980 through 1994 for proposed recovery waters. In specific stream systems within the Quinn River basin and the Little Humboldt sub-basin, non-native trout should be removed and streams restocked with LCT. Whenever practical, resident LCT should be returned to their original habitat if treated to remove non-native trout. It is the desire of NDOW to work with all government agencies and sportsmen to determine those waters which will be selected as recovery sites, treated to remove competing salmonids and subsequently used for LCT reintroduction.

#### 1. Fish Barriers

Fish barriers will be needed on some waters to prevent the movement of potentially competing salmonids upstream. Barriers are economically limited to areas where streams run through solid bedrock. Streams identified in Appendix C as needing barriers include: Crowley Creek, Cold Springs Creek, Chicken Creek, South Fork Flat Creek, House Creek, Log Cabin Creek, McDermitt Creek, Rodeo Creek, Raster Creek, Riser Creek, Sage Creek and the North Fork Cabin Creek. Field investigation to determine the location of existing barriers and potential barrier sites will occur prior to considering streams for recovery. On isolated streams, in most cases, it is more cost effective to treat the entire stream than build a barrier.

In streams which have metapopulation potential it is recommended that barriers be used only as a last resort. (i.e.: The metapopulation population potential should be explored and receive priority over development of barriers.) Barrier sites will be fully documented on streams proposed for recovery prior to treatment and described in the treatment proposal. Physical parameters to be identified will include a GPS location, height of the barrier, what constitutes the barrier, stability of the barrier, vertical drop and a complete description of the pool below the barrier. When possible, photos of the barrier site will be included.

## 2. Fish Screens

Fish screens should be considered on streams where diversions could significantly impact survival of LCT. In many streams in the Quinn River/Black Rock Desert basin most diversions occur below the preferred habitat of LCT. Fish screens have been proposed by the Oregon Department of Fish and Wildlife (ODFW) for McDermitt Creek and Sage Creek to prevent losses into irrigation ditches.

## 3. Private Landowner Agreement/Habitat Management Plan

On streams identified for recovery, where there is private land on that portion of the stream which has potential habitat for LCT, the USFWS and NDOW will work toward establishing private landowner agreements. Appendix B lists waters containing private lands. The elevational range of potential habitat is listed as a part of Appendix B. Landowners wishing to determine whether their lands are within projected LCT habitat can use the elevational range listed in Appendix B and a topographic map.

In many cases private lands are located on the streams below the potential habitat and will not require a private landowner agreement. Streams in the Black Rock basin where private landowner agreements should be pursued include: Leonard Creek, Coleman Creek, Bartlett Creek, Mahogany Creek, Battle Creek, North Fork Battle Creek, South Fork Battle Creek, Chicken Creek, Donnelly Creek, Happy Creek, Jackson Creek, North Fork Jackson Creek, Paiute Creek, Big Creek (Jackson Mt.), Granite Creek (Granite Range), Rock Creek (Granite Range), Mary Sloan Creek and Red Mountain Creek.

Streams in the Quinn River basin where private landowner agreements could be necessary include: Crowley Creek, Eight Mile Creek, Flat Creek, Line Canyon Creek, Sage Creek, Andorno Creek, Riser Creek, Three Mile Creek, Falls Canyon Creek, Washburn Creek and McDermitt Creek. In the North Fork of the Little Humboldt sub-basin, streams where private landowner agreements could be necessary include, Abel Creek, Indian Creek, Long Canyon Creek, Mullinix Creek, Round Corral Creek, and North Fork of Cabin Creek.

It is recommended that the USFWS and NDOW work on private landowner agreements on those streams identified in Appendix A as high priority for recovery. Attempts during 1997 to obtain private landowner agreements failed due to the reluctance of landowners to sign any agreement with federal and state agencies. NDOW will not proceed on fish population management actions in suitable habitat on private lands without the owners verbal approval. Lack of a written agreement may preclude a water from being counted towards delisting or providing protection under the ESA. Safe Harbor agreements should be pursued for private lands. Development of Safe Harbor agreements will be tailored to each landowners situation. The key thought is that NDOW will have the landowners support. Without landowners support NDOW will select another priority stream on which to concentrate its efforts. In the event that a verbal or written agreement cannot be negotiated with a private landowner who has property located within that section of the stream identified as potential habitat, recovery activity (treatment, population monitoring and

subsequent reintroduction) will not proceed on the water.

#### 4. Fish Eradication Projects

Fish eradication projects involve the use of rotenone to eliminate competing salmonids or other undesirable fish. In 1996, the LCT interagency team selected two streams for fish eradication during the fall of 1997. These two streams were Rodeo and Raster Creeks in the Bilk Creek Range with only Rodeo Creek being treated. It was later determined that neither stream was feasible due to a lack of barriers, nonnative salmonids in connecting waters and lack of private land owner support. Annually the Distinct Population Segment (DPS) Team will select four streams to be considered for eradication. Of these four streams, two streams will be scheduled for treatment the following year, with the other two streams being alternates. Streams selected for eradication will be prioritized by the following factors:

- A. Stream reaches which provide suitable habitat and have management practices in place to maintain or improve habitat conditions.
- B. Eradication must be cost effective.
- C. Quinn River/Black Rock Desert basin streams will have priority unless funding becomes available to hire additional crews to work in the North Fork of the Little Humboldt River sub-basin.
- D. Private landowner approval must be obtained prior to treatment of streams with private lands on proposed introduction habitat. Appendix B contains the elevational range of the proposed habitat of LCT for all potential recovery streams. If private lands are located within that elevational range, private landowner agreements will be pursued. At a minimum, NDOW will obtain the verbal support of the landowner before initiating treatment.
- E. Streams should have minimal conflicts with existing sport fisheries to reduce the potential of reintroduction of non-native trout by anglers. With the concurrence of the appropriate County Wildlife Management Board a stream supporting a sport fishery could be considered for treatment.
- F. Other native fish species in this area may include: Lahontan redbside shiner, speckled dace, Tahoe sucker, Tui chub and Lahontan sucker. Appendix A lists the occurrence of these fish in the proposed streams, as determined by fish population inventories. If any of these species is located in the recovery waters they will be salvaged and returned to the stream. Before treatment population inventories will be conducted to determine the presence of nongame native fish. An attempt will be made to collect sufficient numbers representative of the population structure of these native fish to restock the stream following the treatment.

Waters selected for eradication would be treated only after a complete habitat

evaluation. Cutthroat trout reintroductions would be considered on treated waters only after an evaluation of habitat and eradication integrity is complete, a minimum of one year following the completion of treatment.

## 5. Introduction, Augmentation and Reintroduction of LCT

Introduction of threatened and endangered fishes often is an integral feature of recovery programs. (American Fisheries Society, 1988) Reintroduction of LCT will be proposed in streams with reaches of suitable habitat and are either barren or have been treated to remove competing salmonids. Due to the drought of 1987-1994, there are a number of streams in Humboldt County which are barren or have cutthroat trout populations with a reduced range. Establishing LCT populations in these waters is the most expedient way of increasing the number of LCT populations. It is proposed that existing Quinn River LCT populations be used as a temporary source for reintroduction into suitable habitat. **Annual year class production is highly variable, and the species has the capability of responding to improved environmental conditions with rapid increases in population abundance. The recent drought from 1987 to 1994 has decreased abundance of many LCT populations, and possibly caused extinctions of some isolated stream population in degraded habitats. Reintroductions may be appropriate for some of these recent extinctions if they cannot be naturally recolonized.**

Appendix A and C lists those waters which are presently considered barren and have potential for LCT reintroduction. A recent summary of habitat parameters monitored on stream surveys indicate improving trends on most streams which have supported LCT (NDOW, 1996). Prior to reintroduction, an adequate source of LCT need to be identified, a population inventory of potential sources should be completed to insure adequate numbers of fish are available and any necessary National Environmental Policy Act (NEPA) documentation and ESA compliance should be completed. The following section explains criteria to be used in determining reintroduction waters.

### Quinn River/Black Rock Desert LCT Reintroduction Criteria

The stream selection process will use the following criteria:

- A. All streams selected are from the historical Quinn River/Black Rock basin.
- B. The stream is currently under management direction which is adequate to maintain and/or improve the habitat conditions that will sustain reintroduced LCT.
- C. Interspecific conflicts between introduced trout populations and fish found within identified recovery waters can be resolved prior to introduction.
- D. Streams selected would allow for an even distribution of cutthroat throughout the basin.
- E. Historic angler use on selected streams should be low to minimize possible conflicts

with sport fisheries. (Popular sport fisheries could be used with the concurrence of local Wildlife Advisory Boards.)

- F. Each stream selected for LCT reintroduction would be in a location that minimizes the possibility of hybridization, predation, or competition with other salmonids.

Guidelines for the introduction of fish will also be based on the Guidelines of the American Fisheries Society. A synopsis of these guidelines is:

#### I. Selecting The Site

- A. Restrict the introductions to within the historic habitat.
- B. Restrict introductions to a protected site.
- C. Restrict introductions to sites where the potential of dispersal has been determined and is acceptable.
- D. Sites must fulfill the life history requirements of the species.
- E. Sites must contain sufficient habitat to support a viable population.
- F. Prohibit introductions into areas where hybridization could occur.
- G. Prohibit introductions into areas where other rare or endemic native species could be adversely affected as determined by the DPS team. The need for and level of surveys of rare aquatic species will be determined by the DPS team.

#### II. Conducting The Introduction

- A. Choose stock from appropriate source.
- B. Examine taxonomic status of introduction stock.
- C. Examine stock for undesirable pathogens. The number of adult fish sacrificed to determine pathogens should not affect the breeding population of the donor stream. Selected donor streams will be evaluated the first year of use for stocking and after that only if conditions warrant. Pathology investigation will be done by an accredited fish pathology lab.
- D. Obtain stock of sufficient number and character. No more than 10 % of an age class will be removed from potential donor streams.
- E. Carefully and quickly transport stock.
- F. Introduce stock under most favorable conditions.

- G. Document the translocation.

### III. Post Introduction Activities

- A. Conduct systematic monitoring of the introduced population.
- B. Restock or augment if warranted.
- C. Determine cause of failures.
- D. Document findings and conclusions of post-introductions activities.

### 6. Augmenting/Supplementing LCT Populations

Lahontan cutthroat populations in northwestern Nevada suffered reductions in range and number during the recent extended drought. Numbers of native LCT in some streams, may be enhanced by the judicious augmentation of fry taken from the same stream and moved to areas that are currently vacant, but have suitable habitat. In most streams annual recruitment during good water years is sufficient to distribute LCT.

Population inventory of selected waters can determine whether or not recruitment within a stream would allow for the removal of some fish to other areas of the stream. Waters identified as candidates for population augmentation in the Quinn basin include: Crowley Creek, Andorno Creek, Eight Mile Creek, South Fork of Flat Creek, Three Mile Creek and Washburn Creek. Stream inventories were conducted on Crowley, Riser and Washburn Creeks in 1996. These surveys determined an increase in fish per mile that range from four times to 40 times the population numbers seen the previous year. An additional survey was conducted on Crowley, and Washburn Creeks in 1998. Survey crews determined that natural movement of trout in the streams adequately dispersed recent production. In those streams surveyed there were no areas identified that would benefit from augmentation. Therefore, no fish were moved.

### 7. Angler Use and Harvest Monitoring

Angler use and harvest monitoring is conducted through field contacts by NDOW biologists and wardens. Annual angler effort and harvest is also obtained by issuing a 10 percent angler questionnaire to all licensed anglers. On small waters that receive little angler use, the questionnaire results vary widely from year to year due to sampling bias. Averaged angler use does however provide information to compare one small stream to another. The results of this effort, ongoing since 1980, are averaged in Appendix A.

In the Quinn River/Black Rock basin all streams that contain LCT and/ or hybrid LCT are closed to angling. In the Quinn River basin, seven waters (Crowley Creek, Andorno Creek, Eight Mile Creek, Line Canyon Creek, Riser Creek, Sage Creek, and Washburn Creek) containing LCT were closed to protect declining populations. Three tributaries of

Summit Lake (Mahogany Creek, Summer Camp Creek and Snow Creek) are closed to angling. In the North Fork of the Little Humboldt sub-basin, 12 streams containing LCT or hybrid LCT are presently open to angling.

Establishing special regulation fisheries for western cutthroat trout waters has been suggested in Utah with Bonneville cutthroat trout (Duff and Hickman, 1986) and proven effective with Yellowstone cutthroat trout (Moore, Corsi and Thurow, 1986) and Westslope cutthroat trout. Westslope cutthroat trout have responded to special regulations that restrict harvest to allow for angling. Five years after implementing catch and release angling on Kelly Creek, 13 times more cutthroat were counted on snorkeling transects. (Johnson and Bjornn ,1978) In the Selway River, special angling regulations resulted in a three-fold abundance of cutthroat from 1975 to 1984. (Lindland 1985)

Some streams currently used by anglers will have to be treated to eliminate competing trout and restocked with LCT to meet recovery objectives. There is a growing number of anglers who have expressed a desire to have opportunities to catch a native trout in its natural environment. To provide the angling public with this type of fishing experience, NDOW will pursue an aggressive strategy to create angling opportunities on recovery waters with the following proposal.

Following the successful removal of competing salmonids, three successive years of annual fingerling stocking and one successful year of reproduction, recovery streams will be proposed to be opened to catch and release angling. Following the documentation of a viable population being established for five years, with three or more age classes established, a limited harvest of trout will be recommended (Example - two fish per day).

The procedure for establishing fishing regulations involves public input on a biennial basis. Seasons are set on odd numbered years with the public involvement process beginning in August. The area biologist proposes needed regulation changes. These proposals are reviewed internally by the fisheries division and presented at meetings with the respective county Wildlife Advisory Boards. Following the recommendations of all Wildlife Advisory Boards, the Nevada Board of Wildlife Commissioners will meet, receive any additional public input and recommend changes in fishing seasons and regulations for the next two year period. Fishing regulations are printed and are distributed to the public, becoming effective in March of each even-numbered year.

The existing Wildlife Commission Policy, P-31, on LCT management guidelines allows for the closure of waters or specific areas of certain waters to protect LCT and states that sport fishing in most cases has no negative impact on the recovery program. Minor changes in fishing regulations can be handled by the Wildlife Commissioners each year due to the fact that the regulation booklets are printed every year. Under the proposed schedule for introduction of LCT, the first year that regulations to open a recovery stream to angling would need to be addressed would be 2000.

## 8. Fish Stocking Evaluation



In recent years this evaluation has been conducted annually by NDOW and the USFWS. This activity will continue through and beyond the recovery effort. The only streams considered as recovery waters in this plan, that are currently stocked by NDOW, are waters in the North Fork of the Little Humboldt sub-basin.

## 9. Genetic Evaluation

As diagnostic technology increases, with respect to subspecies differentiation, the need for separation of sub-basin populations becomes increasingly evident. The present policy of the USFWS and the NDOW is to maintain separate interior populations of cutthroat and to maintain sub-basin integrity.

Recent genetic analysis (Williams, Evans, and Shiozawa, 1998) occurred on Summit Lake, Mahogany Creek, Summer Camp Creek, Crowley Creek, Sage Creek, Riser Creek, Three Mile Creek, and Washburn Creek. This most recent analysis, with one exception, showed no evidence of introgression from non-indigenous cutthroat trout or from hatchery rainbow trout. Quinn River populations were genetically distinct from Lahontan, Humboldt, and Willow/Whitehorse cutthroat trout. Within the Quinn River system, cutthroat trout from Washburn Creek, exhibited a unique haplotype compared to cutthroat trout from Sage, Riser, Crowley and Three Mile Creeks, which shared a common haplotype. The two haplotypes differed from one another by 0.32 sequence divergence, the result of a single restriction site difference. The exception occurred in Riser Creek where 20 fish from a sample of 34 LCT were monomorphic for cutthroat trout haplotype #1, with the remaining 14 specimens containing rainbow trout mtDNA. Because mtDNA only analyzes genetic material contributed by the female parent, hybridization may be underestimated by this process.

The relationship of Summit Lake cutthroat trout to cutthroat trout in Mahogany and Summer Camp Creeks was analyzed. All three populations shared a common mitochondrial haplotype, which was distinct from Quinn River and Willow Creek cutthroat trout. It was recommended that Summit Lake populations not be considered as a reserve source for rebuilding Quinn River populations (Williams Evans, and Shiozawa. 1998).

Duplicate samples of the populations analyzed by R. Williams have been archived with Stanford University. Analysis of these samples using DNA microsatellite techniques may or may not agree with the mitochondrial analysis. Funding to complete this analysis is needed.

Streams presently acceptable for use as donor stock for Quinn River/Black Rock basin stocking include Washburn Creek, Crowley Creek upstream of the barrier, Sage Creek and Eight Mile Creek. Three Mile Creek in the Santa Rosas potentially could be used as a donor stock if it is determined that the LCT population is pure.

Selection of donor stock for reintroductions or the development of blood stock will continue by consulting the DPS team. Donor stock selection will occur following a review of the latest findings on genetics by the DPS team.

On waters in the North Fork of the Little Humboldt River sub-basin, where hybridization has occurred, additional testing may be needed to determine what sections of the streams still maintain pure populations of LCT.

#### 10. Monitoring and Evaluation of Fish Populations

This work will continue, based on the need to quantify fish populations and identify stream reaches needing augmentation. Following fish introductions, stream populations should be evaluated annually for presence or absence. Population sampling can include ocular surveys, snorkeling surveys and spot checking with an electro shocker. Intensive electro shocking surveys should occur no more than every third year. The implementation schedule in Appendix C lists the schedule for population monitoring. On most waters the dates for implementation have not been established pending selection of the order in which streams will be recovered. Donor populations will be monitored to determine a population estimate and age structure. Statistical reliable data will be needed in meeting recovery objectives, and determining numbers of available LCT from donor streams. Methodology necessary to meet this objective will be evaluated by the DPS team as new information becomes available.

#### 11. Beaver Control

Control of beaver may be necessary in some waters with limited riparian vegetation. Beaver have the capability of eliminating traditional aspen riparian areas within a short time. Recovery of these aspen areas can take decades. If there is concurrent livestock use, recovery may be delayed further or may not occur at all. Streams in the Quinn River/Black Rock basin with a history of beaver problems include: Crowley Creek, Sage Creek, Line Canyon Creek, Washburn Creek and Cottonwood Creek (Oregon). If areas are identified as being adversely affected by beaver activity it is recommended that the respective wildlife agency contract for the control of the offending beaver population.

#### 12. Fish Salvage Prior To Eradication

Due to the low numbers of LCT in the Quinn/Black Rock drainages, it is recommended that LCT be salvaged in those streams scheduled for treatments. Prior to any salvage operations it will be necessary to determine stream sections that contain pure LCT and the locations of barriers that are separating pure and introgressed populations. If possible, salvaged pure LCT should be transported to upper reaches of the stream being considered for eradication. If a clear boundary between pure and hybrid LCT cannot be located, it is recommended that the whole stream be treated to eliminate the possibility of contaminating donor streams which would be recipients of the salvaged fish. It is also recommended that salvaged fish be placed in the closest water in need of donor stock. A further discussion on how to deal with LCT and rainbow hybrids is needed by the DPS team.

### 13. Brood Stock Development (NDOW, USFWS, SLPT and ODFW)

Hatchery propagation of Quinn River cutthroat for future introduction into barren habitat was not considered in the USFWS Recovery Plan. Today there exists some good reasons to include the possibility of using cultural facilities to facilitate recovery efforts. The primary reason to pursue this alternative is the loss of viable populations in the Quinn River basin for recovery. In the Fisheries Management Plan for LCT in California and western Nevada (Gerstung, 1986), guidelines for using natural populations as donor stock indicate that the donor population be no less than 500 individuals. Although overall population numbers have increased since 1995, in 1995 there was only one population (Mahogany Creek) in the Quinn River basin that met those requirements. In order to obtain sufficient stock for recovery efforts, it would be advantageous to use cultural techniques to obtain additional pure LCT.

Two government entities have offered assistance in culturing LCT fry for transplant stock. These include the Summit Lake Indian Tribe and the Lahontan National Fish Hatchery (LNFH). At present, the LNFH is involved in producing LCT for Pyramid Lake and Walker Lake and assists in the annual spawning run of cui-ui on the Truckee River. During 1996 the LNFH initiated a program to develop a brood stock of LCT from Morrison Creek, Utah for use at Pyramid Lake. The USFWS is exploring the feasibility of using the LNFH to rear LCT for use in the recovery of Quinn River/Black Rock basins.

The Summit Lake Paiute Tribe (SLPT) recently has hired a fisheries biologist to coordinate LCT recovery efforts on the tribal lands, which include the lower reaches of Mahogany Creek, Snow Creek and all of Summit Lake. Egg taking operations of LCT from Summit Lake historically were an important activity on the reservation. A modern facility for spawning is available on Mahogany Creek. A hatchery facility, the One-Mile Spring Hatchery, is located nearby and was used in 1995 to produce approximately 10,000 LCT fingerling. Unfortunately, mtDNA analysis of these fish has determined that Summit Lake populations are not genetically distinct from the western Lahontan basin populations. Summit Lake populations should not be considered as a reserve source for rebuilding Quinn River populations.

If a hatchery facility is used, precautions need to be taken to reduce the domestication of LCT produced. All brood stock should be wild fish. Rearing should be limited to raising fish to the fingerling stage. Stocking rate would vary by stream. Stocking rates will be determined depending on suitable habitat and historic population estimates for streams in the area established from previous surveys.

Attempts to raise wild stocks of trout have been made in many hatcheries with varying degrees of success. Artificial propagation projects should only be considered after wild donor stocks are secure. As would be expected with a job of this magnitude, interdisciplinary and interagency cooperation will be essential for long-term success. Beginning in 1998, NDOW and the USFWS will coordinate the development of potential brood stock sites on private waters.

## AGENCY RESPONSIBILITIES

Recovery of the Quinn River LCT will involve a wide variety of agencies. Quinn River LCT are found in habitat located on BLM administered lands within two districts; the USFS, Humboldt-Toiyabe National Forest, Santa Rosa District and SLPT lands. The ODFW, the NDOW, the SLPT and the USFWS have responsibility for the management of LCT. All agencies listed above participate in a LCT Interagency Management Team and DPS team.

Each year members of these teams meet to review the accomplishments of the previous year and schedule recovery activities for the current year. These teams are the focal point for decision making on all critical activities concerning the management of LCT. Team participation by agency management personnel with decision making authority is essential to the continuing success of the process.

### Legislative Authority

This race of LCT is included under protection offered by the ESA for all races of LCT found within its historic range in Nevada, California and Oregon (50 CFR 17.11 and 17.12, April 15, 1990). The following breakdown is offered in an attempt to designate specific legal management responsibility, with respect to recovery of this subspecies. The habitat included in this breakdown either presently contains LCT, or is identified as historical habitat with the potential for reintroductions.

### All Land Management Agencies (USFS and BLM)

As outlined in the Interagency MOAs, Federal agencies are required by the ESA to consult with USFWS if they determine their proposed action may affect LCT. Consultation is limited to discretionary actions. As a part of the DPS team, the BLM and USFS will participate with other responsible habitat and species management agencies in evaluating any additional streams to be managed for LCT recovery.

The following guidelines from the MOA are recommended for use in modifying applicable MUDs/allotment management plans/annual operating plans/project decision documents to provide a high degree of assurance that objectives for conservation and restoration of LCT habitat will be met.

1. Maintain or improve conditions, where the criteria for "late seral" ecological status are met or exceeded, or conditions are meet or exceed desired future condition (i.e., it is easier to protect healthy riparian systems than to restore a degraded one).
2. Adjust management practices, where the criteria for "mid-seral" ecological status are met but the trend is static or downward, and conditions do not meet desired future condition criteria. This is especially important, where vegetative factors are primarily responsible for the mid-seral rating (i.e., making

adjustments at this stage is likely to prevent stream bank/channel damage to a lasting nature).

3. Adjustments in management practices, where the criteria for "early seral" ecological status are met, and are primarily tied to deteriorated stream bank/channel conditions (especially in cases of severe channel down cutting where channel evolution has not re-created a floodplain), may contribute little to the recovery of the system in the near future.

Recommended livestock grazing guidelines for use within the range of LCT call for a near natural rate of restoration. This rate of restoration limits the adverse effect of grazing to those effects which do not carry through to the next year, avoiding cumulative negative effects. Additional guidelines for achieving the objective of near natural recovery are detailed in Appendix A of the MOAs for each agency.

1. The U.S. Forest Service, Santa Rosa District

Following the interagency stream survey of the Santa Rosa District, seven streams were identified as historical habitat in the Quinn River basin. Five of those streams are considered to have potential for habitat recovery and cutthroat introductions. Under current federal law, as outlined in the Humboldt National Forest Land and Resource Management Plan, management responsibility for the riparian and aquatic habitats must be considered as a priority when species listed under the ESA are involved. The following streams currently contain LCT: Eight Mile Creek, Three Mile Creek and Andorno Creek.

The following streams do not presently contain LCT, but have potential as future recipients of LCT: South Fork Flat Creek and Falls Canyon Creek.

2. The Bureau of Land Management, Winnemucca District

In accordance with the Winnemucca District Grazing EIS, the Management Framework Plan Decisions and the interagency MOA on LCT: the BLM will improve, manage and secure habitat for existing and proposed populations of LCT. Specific planning efforts on each grazing allotment with LCT recovery streams will provide direction for habitat monitoring and if necessary improvement to protect existing and proposed LCT populations.

To meet the objectives of the MOA, the BLM shall implement activities to recover and maintain proper functioning riparian condition and desired future condition of riparian habitat to enhance the opportunity for LCT recovery. Recommended programmatic livestock grazing guidelines are included in Appendix A of the MOA. The BLM will conduct implementation, effectiveness, and validation monitoring to determine achievement of objectives. BLM will provide reports at the

annual Interagency Coordination meeting summarizing their activities and results for the previous year, and plans for the forthcoming year.

Those streams which have riparian habitat in early seral or mid seral ecological status will need to have adjustments made in current livestock grazing practices. All effective means of improving riparian and instream habitats should be considered (i.e. fencing of riparian areas, herding, change season of use, and complete rest). Those streams with riparian habitat in late seral ecological status should be maintained. The BLM will continue to implement long-term management on all identified recovery waters to bring riparian habitats within required condition levels for trout survival.

### 3. The Bureau of Land Management, Vale District

The Vale District of the Bureau of Land Management administers three streams in the McDermitt Creek drainage that contain Quinn River LCT. These streams include Line Canyon Creek, Indian Creek and Sage Creek. Line Canyon Creek and Sage Creek were observed to have pure LCT in 1989. Since 1996, Indian Creek was identified as containing hybrid LCT at lower elevations.

Specific concerns in the Winnemucca District also apply to the Vale District. Implementation of management to facilitate habitat recovery is essential for the survival of these populations. Change in season of use on public lands has proven to be an effective means of improving riparian restoration and the long-term stabilization of critical habitats.

### 4. The U.S. Fish and Wildlife Service

The USFWS is responsible for administering the ESA, including the recovery of species and subspecies listed as threatened or endangered. Section 7 of the ESA requires Federal agencies to consult with USFWS on "any action authorized, funded, or carried out by the agency which may affect listed species."

### 5. The Nevada Division of Wildlife

This agency has been directed through legislative mandate to preserve, protect and to manage for the long-term restoration and maintenance of wildlife for the people of the State of Nevada. This includes activities such as fish stocking, transplanting and eradicating competitive species. For the management of LCT, the 4(d) rule [50 CFR 17.44(a)] allows the State management authority of the species within applicable state law.

### 6. Summit Lake Paiute Tribe

The SLPT will take the leading role in coordinating management of LCT within the Summit Lake Indian Reservation and an active role with the LCT interagency

management team in population and habitat monitoring and restoration on adjacent lands in the Summit Lake basin. The SLPT will administer all fish cultural activities on the Summit Lake Indian Reservation.

## 7. All Agencies

Select all recovery habitats available within the historical range by 1999. Implement management to bring all identified habitats to management optimum. Implementation of recovery activities will be dependent on adequate funding to accomplish recovery activities. Secure any available funding which can be used for timely recovery activities within the basins described in this plan.

### Priority I

## PLANNING AND IMPLEMENTATION

Priority I identifies the need to immediately undertake actions to protect and enhance all remaining populations of genetically pure LCT in the Quinn River and Black Rock Desert basins. Protection from excessive ungulate grazing within the riparian zone is required to improve stream habitat conditions.

### Interagency and Public Coordination

Following the review of the third Draft Management Plan dated January 15, 1997 by state and federal agencies, public meetings were scheduled in communities which will be affected by recovery efforts. The procedure for establishing public meetings was to send a copy of the draft plan to all concerned public groups. The first series of public meetings involved the respective County Wildlife Advisory Boards in those counties affected by the management plan. In Humboldt County public meetings were held in Paradise Valley with the Paradise Conservation District on February 19, 1997, and with the Humboldt County Wildlife Advisory board on April 17, 1997. Support for the Species Management Plan was received at both meetings. The plan was submitted to the Washoe County Wildlife Advisory Board on May 1, 1997. Here again approval was gained for the conceptual plan. The Humboldt County Commissioners requested a public meeting to discuss the Species Management Plan and a meeting was held on July 8, 1997. This meeting resulting in an approval from the Humboldt County Commissioners.

Following the public meetings of 1997, NDOW has moved forward on the goals of the draft plan. Goals for each year toward meeting the objectives of recovery will be presented at the LCT interagency annual meeting, at each respective county Wildlife Advisory Board meeting and at the Humboldt County Commissioners public meetings.

1. Management efforts that affect the angling public will be addressed each year through the County Wildlife Advisory Boards. For example, the selection of a popular stream fishery for treatment will be discussed with the appropriate County Wildlife Advisory Board.

2. Coordination of the implementation schedule will have to occur before the management plan is signed and may need to be adjusted annually to reflect the available funding.

3. Coordination of stream treatments and LCT introductions will occur each year through the DPS Team to facilitate the necessary NEPA documentation and Section 7 consultation.

At this time there is no established protocol for the final approval of the Species Management Plan. An annual statement of the proposed work program will insure that NDOW will continue to work towards the objectives of this Species Management Plan, and insure that recovery objectives as outlined in the draft plan are met. This process will continue after the final plan is approved to inform cooperating agencies and the public of work that is being proposed and objectives accomplished. The implementation of Priority 1, 2, and 3 activities may take place in the same year.

### Priority I Management Activities

Priority I streams for the Quinn River basin include: Washburn Creek, Crowley Creek, Riser Creek, Sage Creek, Line Canyon Creek, Andorno Creek, Eight Mile Creek and the South Fork of Flat Creek. Priority I NDOW management activities are the improvement of the existing populations in the Quinn River/Black Rock basin and preparing for reestablishment in new waters within these basins. Due to the limited populations of LCT in the Quinn River/Black Rock basins, it is imperative that actions be taken as soon as possible to increase the numbers and distribution of LCT in the habitat that is presently available. A key activity will be monitoring the remaining cutthroat populations and their habitats in Mahogany, Summer Camp, Riser, Washburn, Crowley, Eight Mile, South Fork of Flat, Andorno, Sage and Line Canyon Creeks.

Depending on winter precipitation and runoff conditions, annual recruitment of LCT can vary by a factor of greater than 40. Augmentation of existing populations should continue for three consecutive years. With average to above average flows, production of LCT could provide adequate stocks to supplement LCT in existing streams, and providing fry for developing new populations. No more than 10 % of the year 0 and year 1 age class will be removed from potential donor streams. In years of poor spawning conditions, naturally produced LCT fry will not be used. Potential sources of donor stock include Washburn Creek, upper Crowley Creek, Eight Mile Creek, Three Mile Creek, Sage Creek, or the LNFH. Three Mile Creek in the Santa Rosas potentially could be used as a donor stock if it is determined that the LCT population is pure. Evaluation of potential donor stocks within the Quinn River/Black Rock basins will be made by the NDOW stream survey crews to determine population structure. Genetic evaluation of potential donor stock will be a priority activity before mixing of fish from any separate waters within a basin. The latest findings in conservation genetics will be reviewed to determine if the mixing of populations from within the basin are desirable.

Streams that may benefit from supplemental stocking of Quinn River basin LCT include Washburn, Crowley, Eight Mile, South Fork of Flat, Sage and Line Canyon Creeks. Barren streams that are available for stocking will be rated by reach using GAWS habitat survey parameters and prioritized.



Stream surveys will be scheduled to evaluate the potential for supplementing existing pure populations, and sites that could benefit from supplemental stocking will be documented. In 1996, stream survey data (GAWS) from the Quinn River basin was analyzed to determine common habitat factors that maintained LCT through the drought period. Those reaches, that continued to support LCT were located in aspen communities, contained significant amounts of large woody debris, had higher riffle to pool ratios, and had low stream bottom embeddedness.

Coordination to meet the guidelines of all cooperating agencies will occur to insure that donor streams have received the necessary clearance prior to fish collection. All agencies involved in LCT recovery, recognize the concept and importance of metapopulations in the eventual recovery and delisting of LCT. NDOW will be diligent in striving to establish metapopulations. The ODFW has expressed an interest in the feasibility of adding McDermitt Creek as a recovery water. This stream currently does not meet the Species Management Plan criteria for recovery waters, due to its historic use as a sport fishery. The feasibility of reclaiming the stream solely as a LCT water has merit in providing a metapopulation. Field analysis will be conducted on the potential treatment and public meetings will be scheduled in Humboldt County to receive comment on treating this water as a Priority II activity. Due to a historic sport fishery, Kings River and its tributaries fall under the same category as McDermitt Creek, and before any recovery efforts can take place, public support would need to be established. Obtaining concurrence from the private land owners will be a critical step in achieving the broader goal of metapopulation establishment.

Significant opportunity exists for intensive species management throughout the Black Rock Desert basin. Current populations should be enhanced with the long-term goal of increased species distribution throughout its original range. Management recommendations for this species will depend on intensive habitat management by land management agencies and eventual reintroduction by the NDOW.

### Priority II and III

## PLANNING AND IMPLEMENTATION

Priorities II and III involve the reestablishment and maintenance of LCT in the Quinn River/Black Rock basins, and actions needed to plan for the recovery of cutthroat populations in the North Fork of the Little Humboldt sub-basin pending the development of the fisheries management plan for the Humboldt River basin.

In addition to Priority I activities, to achieve objectives for delisting within the Quinn River/Black Rock basin, recovery activities include securing an additional eleven populations in the Black Rock basin and one in the Quinn River basin.

**A viable population is considered to be one that has been established for five or more years and has three or more age classes of self-sustaining trout as determined through monitoring.**

The following list of streams will receive attention during Priority II reintroduction efforts.

Table 5

PRIORITY II  
QUINN RIVER/BLACK ROCK LCT REINTRODUCTION STREAMS

Stream	Mountain Range
Bartlett Creek	Black Rock Range
Coleman Creek	Black Rock Range
Paiute Creek	Black Rock Range
Donnelly Creek	Calico Range
Happy Creek	Jackson Mountains
Mary Sloan Creek	Jackson Mountains
Cold Springs Creek	Trout Creek
Raster Creek	Bilk Creek Mountains
Rodeo Creek	Bilk Creek Mountains

Those streams that have competing salmonids will be treated. With the existing fisheries staff of the NDOW stream survey crew, initiating treatment of two streams per year will be the maximum possible. When available, additional barren streams will be stocked with LCT for three consecutive years provided these streams have habitat suitable for reintroduction. If recovery efforts are to be accelerated from this rate, additional funding will be needed. Stream habitat and fish population monitoring will continue on key streams in Priority I and II. Priority III streams will be moved up in priority when found suitable for reintroduction and treated if necessary.

A number of other streams are found within the drainage basin, which will also serve as recovery sites for reintroduction efforts. These streams were selected based on potentials for successful transplants, but were considered to possess some problems which could hinder immediate transplant efforts (See Management Options and Stream Priorities, p. 38). Long-term management should include plans for improving habitat conditions, with long-term goals for conflict resolution and eventual reintroduction of LCT. In addition, all recovery streams should be placed in accelerated management programs to improve habitat as soon as possible.

Table 6

Priority III  
QUINN RIVER/BLACK ROCK LCT REINTRODUCTION STREAMS

Stream	Mountain Range
Cottonwood Creek	Granite Range
Big Creek	Jackson Creek
Indian Creek	Trout Creek Mountains
McDermitt Creek	Trout Creek Mountains
Rock Creek	Montana Mountains
Three Mile Creek	Santa Rosa Range
Flat Creek	Santa Rosa Range
House Creek	Bilk Creek Mountains
Granite Creek	Granite Mountain
Rock Creek	Granite Mountain

Priority II and III Management Actions for the North Fork of the Little Humboldt River

During the implementation of Priority II activities in the North Fork Little Humboldt River sub-basin, plans will be coordinated to monitor those streams within the basin that contain genetically pure LCT populations, and to select streams to meet recovery objectives of maintaining LCT populations. Streams tentatively selected for reintroduction are listed in Table 7.

Table 7

NORTH FORK OF THE LITTLE HUMBOLDT RIVER  
LAHONTAN CUTTHROAT REINTRODUCTION STREAMS

Stream	Proposed Action
Abel Creek	Monitor LCT population
Indian Creek	Monitor LCT population
Indian Creek, SF	Monitor LCT population
Long Canyon	Monitor LCT population
Round Corral	Introgressed: eradicate/reintro
Mullinix Creek	Introgressed: eradicate/reintro
Deep Creek	Introgressed: eradicate/reintro
Cabin Creek, NF	Introgressed: eradicate/reintro

This work could be initiated prior to the completion of the Management Plan for the Humboldt River LCT Population Segment. Stream survey data will be compiled to document trends on the North Fork Little Humboldt River sub-basin and select those reaches best suited for recovery.

### Augmenting LCT populations in the NF of the Little Humboldt River Subbasin

During years of average or above average LCT reproduction, harvest of pure fish from known populations found within the Little Humboldt basin will be used for augmentation of small known populations of fish identified previously in the basin. Exact locations of donor populations of fish or populations to be augmented will depend on habitat conditions documented during the life of the recovery effort. Augmentation of streams containing hybrid populations will not occur until it can be demonstrated that pure LCT are physically isolated from hybridized populations.

## GLOSSARY

**Augmentation:** Is defined as the act of supplementing existing wild populations where it is determined that a population is below habitat carrying capacity. Augmentations also apply to subsequent release onto a previously approved site. (NDOW Fish Stocking Guidelines)

**Basin:** A hydrologic area with a common drainage system.

**DNA:** Deoxyribonucleic acid, the hereditary material of genes. Most DNA is organized into chromosomes within cell nuclei, but about 1 percent of a cell's DNA resides in mitochondria. Modern analytic techniques allow DNA fragments to be compared between individuals and species, providing a powerful taxonomic and systematic tool. (Benhke 1992).

**Ecological Status:** The present state vegetation and soil protection of an ecological site in relation to the potential natural community for the site. Vegetation status is the expression of the relative degree to which the kinds, proportions, and amounts of plants in a community resemble that of the potential natural community. The four ecological status classes are generally called early seral, mid seral, late seral, and potential natural community (PNC) respectively.

**Endemic species:** Are those species presently or historically occurring naturally within the 48 contiguous states and Alaska, and normally found in a wild state.

**Estimated Population:** The total population of fish of all size classes including fry through mature specimens.

**Hybridization:** Interbreeding between different species, lines or varieties.

**Reestablishment (Reintroduction):** Is the act of releasing native species into habitats formerly occupied by that species for the purpose or intent of creating self-sustaining populations in a wild environment.

**Release:** Is the act of releasing any species for the purpose or intent of creating self-sustaining populations in a wild environment.

**Transplant:** The act of releasing endemic wildlife species into habitat not previously occupied by the species for the purpose or intent of creation self-sustaining populations in the wild state. Stocking the act of releasing any wildlife for "put and take" purposes.

**Mitochondrial DNA (mtDNA):** DNA housed within the mitochondria. All mtDNA molecules are inherited from the mother and they are identical within an individual, though they may vary among individuals. Mitochondrial DNA molecules are smaller than nuclear DNA molecules and hence easier to analyze; they also mutate more readily, facilitating diagnosis of individuals and species (Benhke 1992).

**Metapopulation:** A population comprised of a set of populations that are linked by migration, allowing for the recolonization of unoccupied habitat patches after local extinction events. **(FWS Recovery Plan)**

**Proper Functioning Condition:** The functioning condition of riparian/wetlands is a result of interactions among geology, soil, water, and vegetation. Riparian-wetland areas are functioning properly when they exhibit healthy characteristics such as 1) purifying water by removing sediments and other contaminants; 2) reducing the risk of flooding and associated damage; 3) reducing stream channel and stream bank erosion; 4) increasing available water and stream flow duration by holding water in stream banks and aquifers; 5) supporting a diversity of plant and wildlife species; 6) maintaining habitat for healthy fish populations; 7) providing water, forage, and shade for wildlife and livestock; and 8) creating opportunities for recreationists to fish, camp, picnic and enjoy other activities.

**Sub-basin:** A hydrologic subunit of a river basin, e. g. the north fork of the Little Humboldt is a subunit of the Humboldt River basin. **(FWS Recovery Plan)**

**Threatened species:** Threatened species as defined by the Endangered Species Act of 1973 as amended in 1988, is any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. **(FWS Recovery Plan)**

**MOA's:** Interagency Memorandums of Agreement

## REFERENCES

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**POTENTIAL LIST OF STREAMS FOR LCT RECOVERY  
BLACK ROCK DESERT BASIN**

**Recovery Objectives: Maintain four existing streams**  
Current or Recently existing Populations

Stream	Mountain Range	Survey Year	Average Angler Days	Trout Spp. Estab.	Nongame Fish	Needs Treatment	Needs Intro. Aug.	Needs Genetic Eval.	Needs HMP	Priority I - III
Leonard	Pine Forest	1992	58	RB, BK, BRN, LCT	None	Yes	Yes	No	Yes	III
Mahogany	Black Rock	1997	Closed	LCT	SD, RSS	No	No	No	No	I
Snow	Black Rock	1997	Closed	LCT	None	No	No	Yes	No	I
Summer Camp	Black Rock	1997	Closed	LCT	None	No	No	Yes	Yes	I

**Recovery Objectives: Reintroduce LCT to 11 streams**  
Potential Sites

Stream	Mountain Range	Survey Year	Average Angler Days	Trout Spp. Estab.	Nongame Fish	Needs Treatment	Needs Intro. Aug.	Needs Genetic Eval.	Needs HMP	Priority I - III
Bartlett	Black Rock	1998	9	RB	TC	Yes	Yes	No	No	High
Battle	Black Rock	1992	0	Barren	None	No	Yes	No	No	II
Battle, SF	Black Rock	1992	0	Barren	None	No	Yes	No	No	I/II
Battle, NF	Black Rock	1997	0	Barren	None	No	Yes	No	No	I/II
Big	Jacksons	1990	0	Barren	None	No	No	No		III
Chicken	Pine Forest	1992	0	Barren	None	No	Yes	No	Yes	I/II
Coleman	Black Rock	1997	0	Barren	None	No	Yes	No	Yes	II
Cottonwood	Granites	1997	0	Barren	None	No	Yes	No	No	III
Donnelly	Calico Hills	1995	9	Barren	None	No	Yes	No	No	II
Granite	Granites	1993	0	BK	None			No		III

**POTENTIAL LIST OF STREAMS FOR LCT RECOVERY  
BLACK ROCK DESERT BASIN (CONTINUED)**

Stream	Mountain Range	Survey Year	Average Angler Days	Trout Spp. Estab.	Nongame Fish	Needs Treatment	Needs Intro. Aug.	Needs Genetic Eval.	Needs HMP	Priority I - III
Rock	Granites	1993	0	Barren	None			No		III
Happy	Jacksons	1997	1	RB	None	Yes	Yes	No	No	II
Jackson	Jacksons	1997	3	Barren	None	No	Yes	No	Yes	I/II
Mary Sloan	Jacksons	1996	0	RB, HYB	None	Yes	Yes	No	Yes	II
Paiute	Black Rock	1994	0	Barren	None	No	Yes	No	No	III
Red Mountain	Granites	1998	43	BK	None	Yes	Yes	No	Yes	III

Angler days are based on the average of the NDOW angler questionnaire data from 1980-1994.

Private land on Snow, Mahogany and Summer Camp refer to the Summit Lake Indian Reservation.

Fish Species Codes BK - brook trout, BRN - brown trout, RB - rainbow trout, LCT - Lahontan cutthroat trout, HYB - hybrid rainbow with cutthroat.

Nongame Fish Species Codes: RSS - red-sided shiner, TC - tul chub, SD - speckled dace, TS - tahoe sucker, LS - Lahontan sucker, PS - Paiute sculpin.

**POTENTIAL LIST OF STREAMS FOR LCT RECOVERY**  
**QUINN RIVER BASIN**

**Recovery Objectives: Maintain 11 existing streams**  
Current or Recently existing Populations

Stream	Mountain Range	Survey Year	Average Angler Days	Trout Spp. Estab.	Nongame Fish	Needs Treatment	Needs Intro. Aug.	Needs Genetic Eval.	Needs HMP	Priority I - III
Crowley	Montana's	1996	Closed	98% LCT	TS, RSS, SD	?/Low	Yes	1997	Yes	I
Eight Mile	Santa Rosa	1997	Closed	LCT	SD	No	Yes	1997	No	I
Flat, SF	Santa Rosa	1997	0	BK, LCT	None	Possible	Yes	1997	Yes	I
Line Canyon	Trout Creek	1989	Closed	LCT	None	Yes		Yes	No	I
Riser	Montana's	1996	Closed	LCT, HYB	SD, RSS, LS	Yes	Yes	1997	Yes	I
Rock	Montana's	1995	5	Barren	None	No	Yes	No	No	III
Sage	Trout Creek	1989	Closed	LCT, HYB	SD, RSS, LS	Yes	Yes	1997	No	I
Washburn	Montana's	1996	Closed	LCT, HYB	SD	No	No	1997	Yes	I

**Recovery Objectives: Introduce LCT to one additional stream.**  
Potential Sites

Stream	Mountain Range	Survey Year	Average Angler Days	Trout Spp. Estab.	Nongame Fish	Needs Treatment	Needs Intro. Aug.	Needs Genetic Eval.	Needs HMP	Priority I - III
Andorno	Santa Rosa	1996	0	LCT	None	No	Yes	No	No	High II
Flat	Santa Rosa	1986	56	BK	None	Yes		No	No	II
McDermitt *	Trout Creek	1998	169	RB, BN, BK	LS, S, RSS	Yes		No	Yes	III
Cold Springs	Trout Creeks	1998	0	RB, HYB	SD	No	Yes	No	No	II
House	Bilk Creeks	1998	0	RB	SD	Yes	Yes	No	Yes	II

**POTENTIAL LIST OF STREAMS FOR LCT RECOVERY  
QUINN RIVER BASIN (CONTINUED)**

**Recovery Objectives: Maintain 11 existing streams  
Current or Recently existing Populations**

Stream	Mountain Range	Survey Year	Average Angler Days	Trout Spp. Estab.	Nongame Fish	Needs Treatment	Needs Intro. Aug.	Needs Genetic Eval.	Needs HMP	Priority I - III
Log Cabin	Bilk Creeks	1997	0	BK, RB	SD	Yes	Yes	No	Yes	III
Raster	Bilk Creeks	1997	0	RB, HYB	None	Yes	Yes	No	Yes	II
Rodeo	Bilk Creeks	1997	0	HYB	SD	Yes	Yes	No	Yes	II
Three Mile	Santa Rosa	1997	0	Yellowstone cutts?	SD	Yes?	No	Yes	No	III
Falls Canyon **	Santa Rosa	1998	0	RB, BK	None	No	Yes	No	No	III

**Angler days are based on the average of the NDOW angler questionnaire data from 1980-1994.**

**Pure LCT are located in the headwaters of Crowley Creek.**

**\* Winnemucca District Portion Only in 1998.**

**\*\* Falls Canyon Creek has rainbow trout and brook trout below water fall.**

**Fish Species Codes BK - brook trout, BRN - brown trout, RB - rainbow trout, LCT - Lahontan cutthroat trout, HYB - hybrid rainbow with cutthroat.**

**Nongame Fish Species Codes: RSS - red-sided shiner, TC - tul chub, SD - speckled dace, TS - tahoe sucker, LS - Lahontan sucker, PS - Palute sculpin.**

**POTENTIAL LIST OF STREAMS FOR LCT RECOVERY  
NORTH FORK LITTLE HUMBOLDT RIVER SUB-BASIN**

**Recover Objectives: Maintain 11 streams in the North Fork Of the Little Humboldt Drainage  
Current or Recently Existing Populations**

Stream	Mountain Range	Survey Year	Average Angler Days	Trout Spp. Estab.	Nongame Fish	Needs Treatment	Needs Intro. Aug.	Needs Genetic Eval.	Needs HMP	Priority I - III
Abel	Santa Rosa	1997	66	LCT, BK	None			Yes	No	III
Deep	Santa Rosa	1995	0	LCT, HYB	None	Yes	No	Yes	No	III
Indian	Santa Rosa	1995	66	LCT	None	No		Yes	No	III
Indian, SF	Santa Rosa	1995	0	LCT	None	No		Yes	No	III
Long Canyon	Santa Rosa	1998	0	LCT, BRN	SD	No		Yes	No	III
Mullinix	Santa Rosa	1995	12	RB, HYB	SD	Yes	No	No	No	III
Round Corral	Santa Rosa	1995	0	LCT, HYB	None	Yes	No	No	No	III

**Recover Objectives: Introduce LCT to one additional stream  
Potential Sites**

Stream	Mountain Range	Survey Year	Average Angler Days	Trout Spp. Estab.	Nongame Fish	Needs Treatment	Needs Intro. Aug.	Needs Genetic Eval.	Needs HMP	Priority I - III
Cabin, NF	Santa Rosa	1997	145	HYB	None	Yes	No	Yes	No	II

**Angler days are based on the average of the NDOW angler questionnaire data from 1980-1994.**

**Fish Species Codes** BK - brook trout, BRN - brown trout, RB - rainbow trout, LCT - Lahontan cutthroat trout, HYB - hybrid rainbow with cutthroat.

**Nongame Fish Species Codes:** RSS - red-sided shiner, TC - tul chub, SD - speckled dace, TS - tahoe sucker, LS - Lahontan sucker, PS - Palute sculpin.

**LAND STATUS OF RECOVERY STREAMS  
BLACK ROCK DESERT BASIN**

STREAM	MTN RANGE	LAST SURVEY	TOTAL MILES	STREAM MILES OF				POTENTIAL MILES	ELEVATION RANGE *	PRIORITY
				BIA	BLM	FS	PRIV.			
LEONARD	PINE FOREST	1992	27.8	0.0	18.8	0.0	9.0	9.4	5000' - 7200'	III
MAHOGANY	BLACK ROCK	1997	9.7	4.5	3.6	0.0	1.6	9.7	5840' - 8000'	I
SNOW	BLACK ROCK	1997	3.6	0.7	1.7	0.0	1.2	3.6	5840' - 8000'	I
SUMMER CAMP	BLACK ROCK	1997	3.5	0.0	1.9	0.0	1.6	3.5	6420' - 7300'	I
BARTLETT	BLACK ROCK	1998	16.0	0.0	10.0	0.0	6.0	7.5	4600' - 7000'	II
BATTLE	BLACK ROCK	1992	32.0	0.0	26.5	0.0	5.5	0.7	4600' - 5000'	I
BATTLE, NF	BLACK ROCK	1997	5.0	0.0	0.3	0.0	4.7	4.5	5000' - 6950'	I
BATTLE, SF	BLACK ROCK	1992	3.7	0.0	1.9	0.0	1.8	3.5	5000' - 6600'	I
CHICKEN	PINE FOREST	1992	2.5	0.0	2.4	0.0	0.1	2.5	5600' - 7200'	I
COLEMAN	BLACK ROCK	1997	7.8	0.0	6.9	0.0	0.9	7.0	5200' - 7800'	II
COTTONWOOD	GRANITES	1997	12.1	0.0	7.9	0.0	4.2	4.5	4200' - 7000'	III
DONNELLY	CALICO HILLS	1995	7.1	0.0	6.8	0.0	0.3	6.0	4100' - 7500'	II
JACKSON	JACKSONS	1995	8.2	0.0	6.2	0.0	2.0	6.5	4200' - 6200'	I
JACKSON, NF	JACKSONS	1997	3.3	0.0	2.9	0.0	0.4	2.0	6000' - 6800'	I
MARY SLOAN	JACKSONS	1996	5.0	0.0	3.8	0.0	1.2	1.5	4600' - 5900'	II
DONNELLY, NF	CALICO HILLS	1995	3.4	0.0	3.4	0.0	0.0	2.0	5000' - 7000'	II
HAPPY	JACKSONS	1997	11.5	0.0	8.4	0.0	3.1	4.0	4600' - 6200'	II
PAIUTE	BLACK ROCK	1994	15.3	0.0	12.2	0.0	3.1	4.0	4500' - 5300'	II
RED MOUNTAIN	GRANITES	1998	13.0	0.0	12.0	0.0	1.0	8.5	4200' - 5600'	III
BIG	JACKSONS	1990	6.2	0.0	4.8	0.0	1.4	3.0	6000' - 8000'	III

\* Elevational Range For Potential Miles Of Stream

**LAND STATUS OF RECOVERY STREAMS  
BLACK ROCK DESERT BASIN (CONTINUED)**

STREAM	MTN RANGE	LAST SURVEY	TOTAL MILES	STREAM MILES OF				POTENTIAL MILES	ELEVATION RANGE *	PRIORITY
				BIA	BLM	FS	PRIV.			
GRANITE	GRANITES	1993	4.0	0.0	3.4	0.0	0.6	2.5	4100' - 6000'	III
ROCK	GRANITES	1993	7.5	0.0	5.4	0.0	2.1	3.0	4100' - 5600'	III
TOTALS:			208.2	5.2	151.2	0.0	51.8	99.4		

\* Elevational Range For Potential Miles Of Stream



# LAND STATUS OF RECOVERY STREAMS QUINN RIVER BASIN

STREAM	MTN RANGE	LAST SURVEY	TOTAL MILES	STREAM MILES OF				POTENTIAL MILES	ELEVATION RANGE *	PRIORITY
				BIA	BLM	FS	PRIV.			
CROWLEY	MONTANA'S	1996	18.5	0.0	13.5	0.0	5.0	18.0	4600' - 6200'	I
EIGHT MILE	SANTA ROSA	1997	14.5	0.0	2.7	7.8	4.0	4.5	5000' - 5600'	I
FLAT	SANTA ROSA	1996	11.0	0.0	0.0	3.8	7.2	8.0	5200' - 7800'	III
FLAT, SF	SANTA ROSA	1997	3.0	0.0	0.0	3.0	0.0	2.5	5200' - 6200'	I
RISER	MONTANA'S	1996	17.5	0.0	15.0	0.0	2.5	15.0	4900' - 6200'	I
ROCK	MONTANA'S	1995	11.5	0.0	11.5	0.0	0.0	5.0	5200' - 6200'	III
LINE CANYON	TROUT CREEK	1989	3.0	0.0	2.4	0.0	0.6	2.5	5400' - 6400'	I
SAGE	TROUT CREEK	1989	11.5	0.0	9.2	0.0	2.3	8.0	5200' - 6800'	I
WASHBURN	MONTANA'S	1996	23.0	0.0	16.0	0.0	7.0	6.6	5200' - 6000'	I
ANDORNO	SANTA ROSA	1996	5.7	0.0	1.2	2.8	1.7	2.7	5500' - 7200'	I
McDERMITT **	TROUT CREEK	1998	33.0	0.0	20.0	0.0	13.0	9.0	5200' - 6800'	III
THREE MILE	SANTA ROSA	1997	11.8	0.0	3.3	2.4	6.1	4.0	5100' - 6800'	III
FALLS CANYON	SANTA ROSA	1998	6.9	0.0	2.0	3.9	1.0	2.5	5400' - 6600'	III
COLD SPRINGS	TROUT CREEK	1998	3.2	0.0	3.2	0.0	0.0	2.7	5400' - 7800'	II
LOG CABIN	BILK CREEK	1997	8.0	0.0	3.1	0.0	4.9	6.8	4600' - 6200'	III
HOUSE	BILK CREEK	1998	7.5	0.0	4.9	0.0	2.6	6.0	4850' - 6600'	III
RASTER	BILK CREEK	1997	8.0	0.0	8.0	0.0	0.0	5.0	4800' - 6200'	II
RODEO	BILK CREEK	1997	6.0	0.0	4.0	0.0	2.0	3.5	4600' - 6400'	II
TOTALS:			203.6	0.0	120.0	23.7	59.9	112.3		

\* Elevational Range For Potential Miles Of Stream

\*\* Only the Winnemucca District Portion of McDermitt Creek was Surveyed During 1998.

**LAND STATUS OF RECOVERY STREAMS  
LITTLE HUMBOLDT RIVER SUB-BASIN**

STREAM	MTN RANGE	LAST SURVEY	TOTAL MILES	STREAM MILES OF				POTENTIAL MILES	ELEVATION RANGE *	PRIORITY
				BIA	BLM	FS	PRIV.			
ABEL	SANTA ROSA	1997	8.0	0.0	2.0	4.5	1.5	5.0	4700' - 6800'	III
DEEP	SANTA ROSA	1995	5.2	0.0	0.0	5.2	0.0	5.2	5600' - 7500'	II
INDIAN	SANTA ROSA	1995	15.0	0.0	1.9	1.7	11.4	15.0	4900' - 7400'	III
INDIAN, SF	SANTA ROSA	1995	6.5	0.0	0.0	6.5	0.0	6.5	6200' - 7200'	III
LONG CANYON	SANTA ROSA	1998	5.2	0.0	0.0	5.0	0.2	4.7	6200' - 7000'	III
MULLINIX	SANTA ROSA	1995	10.0	0.0	2.2	3.1	4.7	5.3	5200' - 6600'	III
ROUND CORRAL	SANTA ROSA	1995	5.5	0.0	0.0	4.9	0.6	5.5	5600' - 7000'	III
CABIN. NF	SANTA ROSA	1997	3.6	0.0	0.0	3.6	0.0	3.1	6300' - 6800'	II
TOTALS:			59.0	0.0	6.1	34.5	18.4	50.3		

\* Elevational Range For Potential Miles Of Stream

# **LAHONTAN CUTTHROAT TROUT FISHERIES MANAGEMENT PLAN IMPLEMENTATION SCHEDULE**

## **BLACK ROCK DESERT BASIN**

Streams	Leonard	Mahogany	Snow	Summer Camp	Bartlett	Battle, NF	Big	Chicken	Coleman
Interagency Stream Survey(BLM/FS/NDOW)	1992	1997	1997	1997	1998	1992	1990	1992	1997
Open to Angling	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes
Allotment Evaluation/MUD	1996	1994	1994	1994	1993	1993	1994	1996	1998
Fire Management Control (BLM/FS)	As Needed	As Needed	As Needed	As Needed	As Needed	As Needed	As Needed	As Needed	As Needed
Genetic Evaluation (USFWS)	X	1996-1997	NA	1996-97	NA	NA	NA	NA	NA
Stream Improvement Project ID (BLM/FS)	None	None	None	None	None	None	None	None	None
Stream Temperature Monitoring (BLM/FS)	X	X	1998	NA	NA	X	X	X	1998
Develop Implementation Schedule (NDOW)	1999	1999	1999	1999	1999	1999	1999	1999	1999
Private Land Agreements (USFWS)	X	NA	NA	NA	X	X	X	NA	X
Wildhorse Management (BLM)	NA	1997	NA	1997	1997	1997	NA	NA	1997
Evaluate Beaver Control (NDOW/ODFW)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Evaluate Fish Screens/Barriers	NA	NA	NA	NA	NA	NA	NA	1996	NA
Supplemental Marginal LCT Pop. (NDOW)	No	No	1997	NA	NA	NA	NA	NA	NA
Survey for Donor Potential (NDOW/ODFW)	NA	1996	1996	1996	NA	NA	NA	NA	NA
Intro. LCT w/o Eradication (NDOW)	NA	No	No	No	NA	1998	X	1997	1998
Stream Eradication (NDOW)	X	No	No	No	1998	Barren	Barren	Barren	Barren
Stream Erad. Plan. (NDOW/BLM/FS)	X	No	No	No	X	NA	NA	NA	NA
Cutthroat Trout Intro. (NDOW)	X	No	No	No	X	1999	X	X	1999
Monitor Intro. LCT (NDOW)	X	NA	No	NA	X	2000	NA	X	2000

**X - Denotes where dates need to be coordinated with cooperating agencies.**  
**NA - Not Applicable**

**LAHONTAN CUTTHROAT TROUT FISHERIES MANAGEMENT PLAN  
IMPLEMENTATION SCHEDULE**

**BLACK ROCK DESERT BASIN (CONTINUED)**

Streams	Cottonwood	Donnelly	Granite	Happy	Jackson NF	Mary Sloan	Paiute	Red Mtn.
Interagency Stream Survey (BLM/FS/NDOW)	1993	1995	1993 *	1997	1997	1996	1999	1998
Open to Angling	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Allotment Evaluation/MUD	1993-A	1994-A	1993	1999	1994	1994	1993	1999
Fire Management Control (BLM/FS)	As Needed	As needed	As Needed	As Needed	As Needed	As Needed	As Needed	As Needed
Genetic Evaluation (USFWS)	NA	NA	NA	NA	NA	NA	NA	NA
Stream Improvement Project ID (BLM/FS)	None	NA	NA	No	No	No	No	No
Stream Temperature Monitoring (BLM/FS)	1998	1998	X	X	1998	1998	1998	X
Develop Implementation Schedule (NDOW)	1999	1999	1999	1999	1999	1999	1999	1999
Private Land Agreements (USFWS)	NA	NA	NA	X	X	NA	X	X
Wildhorse Management (BLM)	NA	Needed	Needed	NA	Needed	Needed	Needed	Needed
Evaluate Beaver Control (NDOW/ODFW)	NA	No	No	NA	No	No	No	No
Evaluate Fish Screens/Barriers	NA	NA	NA	X	NA	NA	NA	NA
Supplemental Marginal LCT Pop. (NDOW)	NA	NA	NA	NA	NA	NA	NA	NA
Survey for Donor Potential (NDOW/ODFW)	NA	NA	NA	NA	NA	NA	NA	NA
Intro. LCT w/o Eradication (NDOW)	X	X	NA	X	NA	NA	NA	NA
Stream Eradication (NDOW)	Barren	Barren	X	1999	NA	X	X	X
Stream Erad. Plan. (NDOW/BLM/FS)	NA	No	2001	1999	NA	X	X	X
Cutthroat Trout Intro. (NDOW)	X	2000	2004	2001	1999	X	X	X
Monitor Intro. LCT (NDOW)	X	2001	2005	2002	2000	X	X	X

**X - Denotes where dates need to be coordinated with cooperating agencies.**  
**NA - Not Applicable**

**LAHONTAN CUTTHROAT TROUT FISHERIES MANAGEMENT PLAN  
IMPLEMENTATION SCHEDULE**

**QUINN RIVER BASIN**

<b>Streams</b>	<b>Crowley</b>	<b>Eight Mile</b>	<b>Flat, SF</b>	<b>Line Canyon</b>	<b>Riser</b>	<b>Andorno</b>
Interagency Stream Survey(BLM/FS/NDOW)	1995	1997	1997	1999	1995	1996
Open to Angling	No	No	Yes	No	No	Yes
Allotment Evaluation/MUD	1995	NA	1995	1994	1994	X
Fire Management Control (BLM/FS)	As Needed	As Needed	As Needed	As Needed	As Needed	As Needed
Genetic Evaluation (USFWS)	1996-97	1998	X	1996-97	1996-97	1981
Stream Improvement Project ID (BLM/FS)	None	None	None	None	None	None
Stream Temperature Monitoring (BLM/FS)	1999 (BLM)	1998 (NDOW)	1999 (FS)	1999 (NDOW)	1997 (BLM)	X
Develop Implementation Schedule (NDOW)	1999	1999	1999	1999	1999	1999
Private Land Agreements (USFWS)	X	No	X	Yes	X	No
Wildhorse Management (BLM)	Not Needed	Not Needed	Not Needed	Not Needed	Not Needed	No
Evaluate Beaver Control (NDOW/ODFW)	Evaluate	NA	Evaluate	Evaluate	X	No
Evaluate Fish Screens/Barriers	Needed	NA	Needed	Evaluate	X	NA
Supplemental Marginal LCT Pop. (NDOW)	X	X	X	X	X	NA
Survey for Donor Potential (NDOW/ODFW)	1998	1998	NA	1996-97	NA	NA
Intro. LCT w/o Eradication (NDOW)	X	X	NA	X	NA	NA
Stream Eradication (NDOW)	NA	No	X	X	X	X
Stream Erad. Plan. (NDOW/BLM/FS)	X	NA	X	X	X	X
Cutthroat Trout Intro. (NDOW)	X	No	No	X	X	1997
Monitor Intro. LCT (NDOW)	X	X	X	X	X	1998 - 2000

**X - Denotes where dates need to be coordinated with cooperating agencies.**  
**NA - Not Applicable**

**LAHONTAN CUTTHROAT TROUT FISHERIES MANAGEMENT PLAN  
IMPLEMENTATION SCHEDULE**

**QUINN RIVER BASIN (CONTINUED)**

Streams	Rock	Sage	Washburn	Falls Canyon	McDermitt	Cold Springs	Three Mile
Interagency Stream Survey(BLM/FS/NDOW)	1995	1999	1995	1998	1998	1998	1997
Open to Angling	Yes	No	No	Yes	Yes	Yes	Yes
Allotment Evaluation/MUD	1994	1994	1994	X	X	1998	X
Fire Management Control (BLM/FS)	As Needed	As Needed	As Needed	X	X	As Needed	X
Genetic Evaluation (USFWS)	No	1996-97	1996-97	NA	1996-97	NA	1996-97
Stream Improvement Project ID (BLM/FS)	None	None	None	None	None	None	None
Stream Temperature Monitoring (BLM/FS)	1999 (BLM)	1997(ODFW)	1997 (BLM)	X	X	1998 (NDOW)	X
Develop Implementation Schedule (NDOW)	1999	1999	1999	1999	1999	1999	1999
Private Land Agreements (USFWS)	No	Yes	Yes	Yes	Yes	NA	Yes
Wildhorse Management (BLM)	Not Needed	Not Needed	Not Needed	No	No	NA	No
Evaluate Beaver Control (NDOW/ODFW)	X	Evaluate	Evaluate	X	X	Evaluate	X
Evaluate Fish Screens/Barriers	X	Evaluate	NA	X	Evaluate	1996	X
Supplemental Marginal LCT Pop. (NDOW)	NA	No	X	NA	NA	NA	NA
Survey for Donor Potential (NDOW/ODFW)	NA	1996-97	1998	NA	NA	NA	NA
Intro. LCT w/o Eradication (NDOW)	X	NA	NA	NA	NA	NA	NA
Stream Eradication (NDOW)	Barren	X	X	X	X	X	X
Stream Erad. Plan. (NDOW/BLM/FS)	NA	X	X	1999	X	X	X
Cutthroat Trout Intro. (NDOW)	X	X	X	X	X	X	X
Monitor Intro. LCT (NDOW)	X	X	X	X	X	X	X

X - Denotes where dates need to be coordinated with cooperating agencies.  
NA - Not Applicable

# **LAHONTAN CUTTHROAT TROUT FISHERIES MANAGEMENT PLAN IMPLEMENTATION SCHEDULE**

## **QUINN RIVER BASIN (CONTINUED)**

Streams	House	Log Cabin	Raster	Flat	Rodeo
Interagency Stream Survey(BLM/FS/NDOW)	1998	1997	1997	1999	1997
Open to Angling	Yes	Yes	Yes	Yes	Yes
Allotment Evaluation/MUD	1999	1999	1998-99	Yes	1999
Fire Management Control (BLM/FS)	As Needed	As Needed	Needed	As Needed	Needed
Genetic Evaluation (USFWS)	NA	NA	NA	NA	NA
Stream Improvement Project ID (BLM/FS)	None	None	None	None	None
Stream Temperature Monitoring (BLM/FS)	1998	1998	1998	X	1998
Develop Implementation Schedule (NDOW)	1999	1999	1999	1999	1999
Private Land Agreements (USFWS)	NA	NA	NA	X	X
Wildhorse Management (BLM)	NA	NA	NA	NA	NA
Evaluate Beaver Control (NDOW/ODFW)	No	Yes	Evaluate	X	Evaluate
Evaluate Fish Screens/Barriers	X	X	Yes	NA	Yes
Supplemental Marginal LCT Pop. (NDOW)	NA	NA	NA	NA	NA
Survey for Donor Potential (NDOW/ODFW)	NA	NA	NA	NA	NA
Intro. LCT w/o Eradication (NDOW)	NA	NA	NA	NA	NA
Stream Eradication (NDOW)	X	X	X	X	1997
Stream Erad. Plan. (NDOW/BLM/FS)	X	X	2000-01	X	2000-01
Cutthroat Trout Intro. (NDOW)	X	X	X	X	X
Monitor Intro. LCT (NDOW)	X	X	X	X	X

**X - Denotes where dates need to be coordinated with cooperating agencies.**  
**NA - Not Applicable**

# LAHONTAN CUTTHROAT TROUT FISHERIES MANAGEMENT PLAN IMPLEMENTATION SCHEDULE

## NORTH FORK LITTLE HUMBOLDT RIVER SUB-BASIN

Streams	Abel	Deep	Indian	Indian, SF	Round Corral	Mullinix	Long Canyon	Cabin, NF
Interagency Stream Survey (BLM/FS/NDOW)	1998	1995	1995	1995	1994	1995	1998	1997
Open to Angling	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Allotment Evaluation/MUD	NA	NA	NA	NA	2000	2000	1994	2000
Fire Management Control (BLM/FS)	As Needed	As Needed	As Needed	As Needed	As Needed	As Needed	As Needed	As Needed
Genetic Evaluation (USFWS)	1989	1998	1987-88	X	X	X	1998	1997
Stream Improvement Project ID (BLM/FS)	None	None	None	None	None	None	None	None
Stream Temperature Monitoring (BLM/FS)	None	None	1998 (FS)	None	None	None	None	No
Develop Implementation Schedule (NDOW)	1998	1998	1998	1998	1999	1999	1998	1998
Private Land Agreements (USFWS)	NA	NA	NA	NA	Yes	Yes	NA	Yes
Wildhorse Management (BLM)	No	No	No	No	No	No	No	No
Evaluate Beaver Control (NDOW/ODFW)	As Needed	As Needed	As Needed	As Needed	X	X	Yes	X
Evaluate Fish Screens/Barriers	Evaluate	Evaluate	Evaluate	Evaluate	Evaluate	Evaluate	No	Yes
Supplemental Marginal LCT Pop. (NDOW)	X	X	No	No	NA	NA	No	NA
Survey for Donor Potential (NDOW/ODFW)	X	NA	X	X	NA	NA	X	NA
Intro. LCT w/o Eradication (NDOW)	NA	NA	No	No	NA	NA	NA	NA
Stream Eradication (NDOW)	No	X	No	No	X	X	No	Yes
Stream Erad. Plan. (NDOW/BLM/FS)	NA	X	No	No	X	X	No	X
Cutthroat Trout Intro. (NDOW)	NA	X	NA	NA	X	X	No	X
Monitor Intro. LCT (NDOW)	NA	X	NA	NA	X	X	No	X

X - Denotes where dates need to be coordinated with cooperating agencies.  
NA - Not Applicable



# HABITAT PARAMETERS OF RECOVERY STREAMS BLACK ROCK DESERT BASIN

## Current or Recently Existing Populations

Stream	Water Code	Mountain Range	Year Surveyed	Percent PM	Percent PS	Percent SB	Percent BC	Percent BSS	Percent BVS	Percent HCI	Average WW	Average WD
Leonard Creek	1228	PFR	1992	44.6	10.4	19.8	56.8	45.6	51.8	37.2	4.6'	2.7"
Mahogany Creek	1774	BRR	1997	68.6	48.8	77.8	56.9	76.4	92.1	70.5	5.9	3.2
Mahogany Creek	1774	BRR	1992	21.9	1.6	37.5	56.0	76.4	86.9	46.7	4.6	2.0
Mahogany Creek	1774	BRR	1990	68.7	8.7	39.8	76.0	81.4	79.1	58.9	4.9	2.2
Mahogany Creek	1774	BRR	1989	67.2	24.6	68.7	77.6	90.0	93.3	70.4	5.6	2.7
Snow Creek	1851	BRR	1997	78.6	50.0	72.9	58.1	85.0	90.0	72.4	5.2	2.9
Snow Creek	1851	BRR	1992	59.2	2.0	49.6	59.2	77.8	80.3	55.0	3.3	1.9
Summer Camp	1873	BRR	1997	76.2	60.6	84.1	51.5	77.5	92.0	74.5	6.5	3.2
Summer Camp	1873	BRR	1992	82.7	20.1	71.1	50.0	77.0	85.0	64.3	3.8	1.6
Summer Camp	1873	BRR	1990	26.5	0.0	78.6	68.0	72.5	75.0	53.4	4.0	1.9
Summer Camp	1873	BRR	1989	74.3	24.5	92.0	69.1	96.4	92.7	74.8	4.4	2.4

## Potential Sites

Bartlett Creek	1016	BRR	1998	60.8	33.6	82.3	88.6	78.6	78.7	70.4	5.5'	3.7"
Bartlett Creek	1016	BRR	1994	59.4	49.7	65.0	72.0	68.4	67.5	64.5	4.2	2.4
Bartlett Creek	1016	BRR	1989	69.3	5.7	73.7	54.3	48.8	51.3	56.9	4.1	2.5
Battle Creek, NF	1781	BRR	1997	62.3	53.6	47.8	82.0	68.0	75.3	64.8	6.6	4.8
Battle Creek, NF	1781	BRR	1992	47.2	5.6	42.0	70.0	50.9	57.8	45.2	4.3	2.4
Battle Creek, NF	1781	BRR	1989	51.0	19.9	69.0	54.0	67.8	59.3	54.4	4.4	2.6
Big Creek	1842	JM	1990	61.5	18.1	64.8	76.3	77.5	82.9	63.5	3.1	1.7

# **HABITAT PARAMETERS OF RECOVERY STREAMS BLACK ROCK DESERT BASIN (Continued)**

## **Potential Sites**

Stream	Water Code	Mountain Range	Year Surveyed	Percent PM	Percent PS	Percent SB	Percent BC	Percent BSS	Percent BVS	Percent HCI	Average WW	Average WD
Chicken Creek	1852	PFR	1992	54.1	11.7	39.8	70.1	66.6	67.7	50.8	4.2'	1.6"
Coleman Creek	1853	BRR	1997	66.3	47.9	68.2	63.1	70.2	75.9	65.9	5.2	3.3
Coleman Creek	1853	BRR	1992	65.5	34.0	53.3	55.2	56.8	57.7	54.2	4.2	2.9
Cottonwood	1874	GR	1997	68.3	26.0	62.8	77.5	58.2	57.8	58.4	4.9	2.7
Cottonwood	1874	GR	1993	81.6	20.7	58.8	60.9	64.2	69.5	59.3	4.9	2.4
Donnelly Creek	1777	CH	1995	74.3	54.0	55.2	70.0	72.0	73.0	66.4	5.2	2.8
Donnelly Creek	1777	CH	1989	74.2	33.3	41.9	61.1	58.8	44.3	52.4	3.7	3.6
Donnelly, NF	1907	CH	1995	79.9	29.2	37.2	68.3	70.0	71.7	59.4	3.4	1.7
Donnelly, NF	1907	CH	1989	86.9	22.2	28.3	45.0	43.8	42.5	44.8	3.8	1.7
Granite Creek *	1169	GR	1993									
Happy Creek	1638	JM	1997	69.4	20.7	79.5	76.0	53.5	64.5	60.6	8.3	3.9
Happy, Trib. 664	1638	JM	1997	69.9	66.9	81.3	70.8	77.1	67.8	72.3	5.9	4.3
Happy Creek	1638	JM	1989	60.9	29.2	85.1	42.9	57.5	47.0	55.5	3.6	2.6
Jackson Creek	1204	JM	1997	33.7	27.2	74.1	85.2	65.4	66.2	58.6	8.1	6.0
Jackson Creek	1204	JM	1989	58.0	28.9	80.2	62.4	63.1	60.0	60.4	5.8	3.4
Jackson, NF	1204	JM	1997	60.0	36.4	74.3	76.5	73.8	73.2	65.7	5.0	3.3
Jackson, NF	1204	JM	1989	48.8	42.7	91.6	54.5	76.0	50.5	60.7	5.1	2.5
Mary Sloan		JM	1996	34.5	42.7	68.7	71.7	97.5	98.3	68.9	4.4	3.4
Mary Sloan		JM	1991	18.6	79.7	55.0	100.0	71.3	78.8	67.2	2.5	3.1
Paiute Creek	1841	BRR	1994	36.9	85.1	34.1	72.5	68.7	70.0	63.6	4.0	2.6
Paiute Creek	1841	BRR	1990	67.1	3.4	41.0	81.2	78.2	79.2	67.0	3.7	2.4

# HABITAT PARAMETERS OF RECOVERY STREAMS BLACK ROCK DESERT BASIN (Continued)

## Potential Site

Stream	Water Code	Mountain Range	Year Surveyed	Percent PM	Percent PS	Percent SB	Percent BC	Percent BSS	Percent BVS	Percent HCI	Average WW	Average WD
Red Mountain	1312	GR	1998	74.0	75.5	63.2	97.1	87.1	87	80.7	7.8'	5.5"
Red Mountain	1312	GR	1993	36.2	45.0	50.9	75.4	72.6	75.6	59.3	7.5	4.3
Rock *	1885	GR	1993									

# HABITAT PARAMETERS OF RECOVERY STREAMS

## LEGEND

PM = Pool Measure (pool/riffle ratio)  
 PS = Pool Structure (quality pools)  
 SB = Stream Bottom (rubble/gravel)  
 BC = Bank Cover  
 BSS = Bank Soil Stability  
 BVS = Bank Vegetation Stability  
 HCI = Habitat Condition Index  
 WW = Water Width (feet)  
 WD = Water Depth (inches)  
 PFR = Pine Forest Range  
 BRR = Black Rock Range

TCM = Trout Creek Range  
 GR = Granite Range  
 CH = Calico Hills  
 JM = Jackson Mountains  
 BCM = Bilk Creek Mountains  
 MM = Montana Mountains  
 SRR = Santa Rosa Range  
 NA = Not Available  
 \* = Fish Population Survey Only  
 \*\* = Winnemucca District BLM Only

# HABITAT PARAMETERS OF RECOVERY STREAMS QUINN RIVER BASIN

## Current or Recently Existing Populations

Stream	Water Code	Mountain Range	Year Surveyed	Percent PM	Percent PS	Percent SB	Percent BC	Percent BSS	Percent BVS	Percent HCI	Average WW	Average WD
Crowley Creek *	1743	MM	1996	/	/	/	/	/	/	/	5.7	3.4"
Crowley Creek	1743	MM	1995	77.5	30.0	54.0	66.0	77.9	77.3	63.8	10.3	4.5
Crowley Creek	1743	MM	1991	40.1	47.2	60.3	57.7	59.3	68.6	53.5	7.6	3.6
Crowley Creek	1743	MM	1987	27.1	46.8	62.1	58.8	62.5	64.5	53.6	6.6	2.8
Eight Mile Creek	1142	SRR	1997	39.9	32.6	68.2	77.2	79.0	66.2	60.5	5.2	2.3
Eight Mile Creek	1142	SRR	1992	22.8	4.3	73.2	73.3	78.2	80.6	56.0	5.8	2.9
Eight Mile Creek	1142	SRR	1987	00.0	12.6	11.7	75.9	77.1	77.1	42.4	0.6	0.4
Flat Creek, SF	1149	SRR	1997	59.2	27.4	88.5	83.2	61.3	63.2	63.8	3.9	1.8
Flat Creek, SF	1149	SRR	1992	89.2	00.0	63.4	50.0	59.1	58.7	53.5	2.6	1.0
Flat Creek, SF	1149	SRR	1986	60.1	42.6	71.7	32.5	46.4	51.1	52.1	4.1	2.3
Line Canyon	1801	TCM	1989	79.4	17.1	75.5	51.5	56.5	63.0	59.1	5.1	2.3
Riser Creek *	1643	MM	1996	/	/	/	/	/	/	/	3.4	4.6
Riser Creek	1643	MM	1995	46.5	11.1	71.3	89.6	79.1	78.5	62.7	12.0	3.0
Riser Creek	1643	MM	1991	37.7	15.9	85.3	45.0	53.3	59.2	49.4	9.6	2.5
Riser Creek	1643	MM	1987	34.9	27.9	65.1	58.9	61.1	62.1	51.7	9.0	2.0
Rock Creek	1775	MM	1995	10.9	5.2	NA	51.2	56.2	59.3	34.1	1.6	0.8
Rock Creek	1775	MM	1989	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sage Creek	1804	TCM	1989	69.8	41.3	73.9	56.4	58.7	69.8	58.3	7.0	3.6

# **HABITAT PARAMETERS OF RECOVERY STREAMS QUINN RIVER BASIN (CONTINUED)**

## **Current or Recently Existing Populations**

Stream	Water Code	Mountain Range	Year Surveyed	Percent PM	Percent PS	Percent SB	Percent BC	Percent BSS	Percent BVS	Percent HCI	Average WW	Average WD
Washburn C. *	1741	MM	1996	/	/	/	/	/	/	/	6.0'	4.1'
Washburn C.	1741	MM	1995	61.8	41.0	58.8	64.3	61.7	67.6	59.2	8.9	5.3
Washburn C.	1741	MM	1991	47.1	48.2	65.9	60.0	62.3	67.7	59.6	5.8	3.0
Washburn C.	1741	MM	1987	45.4	16.7	54.8	58.1	50.6	58.6	50.1	6.7	2.4
Three Mile	1422	SRR	1997	45.8	28.3	83.1	79.6	55.7	56.4	58.1	4.5	2.1
Three Mile	1422	SRR	1987	53.8	28.7	71.3	41.5	47.8	51.8	51.7	4.3	1.7

# **HABITAT PARAMETERS OF RECOVERY STREAMS QUINN RIVER BASIN (Continued)**

## **Potential Sites**

Stream	Water Code	Mountain Range	Year Surveyed	Percent PM	Percent PS	Percent SB	Percent BC	Percent BSS	Percent BVS	Percent HCI	Average WW	Average WD
Andorno Creek	1006	SRR	1996	65.2	7.6	47.9	83.5	65.5	79.5	58.2	5.2'	2.8"
Andorno Creek	1006	SRR	1992	59.6	00.0	75.3	79.0	78.5	80.5	62.1	5.8	1.9
Andorno Creek	1006	SRR	1986	53.4	13.1	65.4	52.0	52.1	52.3	48.2	5.6	2.8
Flat Creek	1149	SRR	1986	69.6	38.8	72.8	32.5	53.0	54.2	53.7	5.9	2.4
McDermitt **	1252	TCM	1998	46.0	90.6	67.9	63.7	80.7	81.2	71.7	22.0	9.8
McDermitt	1252	TCM	1988	46.3	50.0	67.1	57.7	63.5	68.3	56.4	11.0	6.2

# HABITAT PARAMETERS OF RECOVERY STREAMS QUINN RIVER BASIN (CONTINUED)

## Potential Sites

Stream	Water Code	Mountain Range	Year Surveyed	Percent PM	Percent PS	Percent SB	Percent BC	Percent BSS	Percent BVS	Percent HCI	Average WW	Average WD
Cold Springs	1792	TCM	1998	62.9	66.7	74.0	66.5	72.3	88.3	71.8	7.0	3.7"
Cold Springs	1792	TCM	1994	55.1	25.5	68.3	64.3	69.6	70.6	60.8	5.1	2.1
Cold Springs	1792	TCM	1989	67.3	28.4	72.1	57.0	68.5	69.0	62.8	5.0	2.4
House Creek	1704	BCM	1998	45.9	40.2	65.1	74.5	69.5	79.3	62.4	5.8	5.3
House Creek	1704	BCM	1989	73.6	16.6	57.8	50.0	58.0	67.0	55.0	3.6	2.6
House Trib. 584	1704	BCM	1998	93.0	69.1	60.8	50.0	62.5	77.5	68.8	3.2	3.9
House Trib. 750	1704	BCM	1998	44.0	21.7	57.5	73.3	54.2	57.5	51.4	3.7	3.1
Log Cabin	1780	BCM	1997	77.4	60.0	60.3	66.8	70.5	80.5	64.7	4.9	3.7
Log Cabin	1780	BCM	1989	70.1	26.8	56.6	54.1	46.1	58.6	52.5	5.3	3.0
Raster Creek	1779	BCM	1997	78.5	39.2	65.6	66.1	65.4	71.8	64.4	6.5	3.8
Raster Creek	1779	BCM	1989	83.3	10.0	67.7	53.0	63.7	65.9	57.2	4.4	2.4
Rodeo Creek	1778	BCM	1997	61.0	24.5	51.9	55.5	42.7	70.9	51.1	3.0	2.7
Rodeo Creek	1778	BCM	1989	89.0	29.3	37.8	49.1	57.0	62.5	52.5	3.0	2.4
Falls Canyon	1507	SRR	1998	50.2	33.9	49.7	76.7	81.2	79.8	61.9	8.3	5.1
Falls Canyon	1507	SRR	1986	65.8	25.2	44.0	10.0	49.2	54.0	45.2	6.6	2.9

**HABITAT PARAMETERS OF RECOVERY STREAMS  
HUMBOLDT RIVER BASIN  
NORTH FORK, LITTLE HUMBOLDT RIVER SUB-BASIN**

**Current or Recently Existing populations**

Stream	Water Code	Mountain Range	Year Surveyed	Percent PM	Percent PS	Percent SB	Percent BC	Percent BSS	Percent BVS	Percent HCI	Average WW	Average WD
Abel Creek	1508	SRR	1997	85.9	50.2	65.7	89.0	62.9	65.3	71.9	4.8'	2.8"
Abel Creek	1508	SRR	1988	57.7	49.5	65.5	60.8	51.3	54.7	58.2	5.4	2.2
Deep Creek	1756	SRR	1995	62.8	38.4	57.2	69.1	79.9	79.8	58.2	5.4	2.2
Deep Creek	1756	SRR	1988	8.4	22.9	69.4	80.0	76.6	74.5	57.2	3.2	2.1
Indian Creek	1499	SRR	1995	64.5	39.4	62.8	91.0	89.2	89.9	72.8	7.7	3.2
Indian Creek	1499	SRR	1988	6.8	12.5	69.0	87.5	80.0	72.7	56.4	3.6	2.1
Indian Creek, SF	1908	SRR	1995	63.5	35.8	52.2	86.6	90.2	91.3	70.0	5.0	2.4
Indian Creek, SF	1908	SRR	1988	7.4	34.8	61.3	81.2	84.6	79.6	58.6	8.3	1.6
Long Canyon	1767	SRR	1998	51.9	10.7	91.1	61.4	65.4	73.2	58.9	5.2	2.6
Long Canyon	1767	SRR	1993	74.3	53.8	70.1	53.9	63.6	63.2	63.1	5.0	2.4
Long Canyon	1767	SRR	1988	18.7	18.2	70.8	65.0	55.0	58.9	47.8	3.1	1.2
Mullinix Creek	1488	SRR	1995	56.1	14.0	47.2	84.1	67.9	70.3	56.6	3.9	1.7
Mullinix Creek	1488	SRR	1988	43.1	34.0	55.9	53.4	55.6	53.1	48.8	3.8	1.3
Round Corral	1772	SRR	1995	23.3	15.0	32.2	74.3	87.0	87.2	56.7	4.1	1.7
Round Corral	1772	SRR	1988	13.4	62.8	35.5	82.6	83.7	85.0	64.0	3.9	2.4
Cabin, NF	1051	SRR	1997	39.2	15.5	74.1	76.1	49.8	55.7	51.7	3.3	2.0
Cabin, NF	1051	SRR	1993	32.7	49.1	69.4	67.8	75.3	79.6	56.8	3.6	2.1
Cabin, NF	1051	SRR	1987	44.7	11.6	57.4	55.0	63.8	78.1	51.8	2.5	1.0

## HABITAT PARAMETERS OF RECOVERY STREAMS

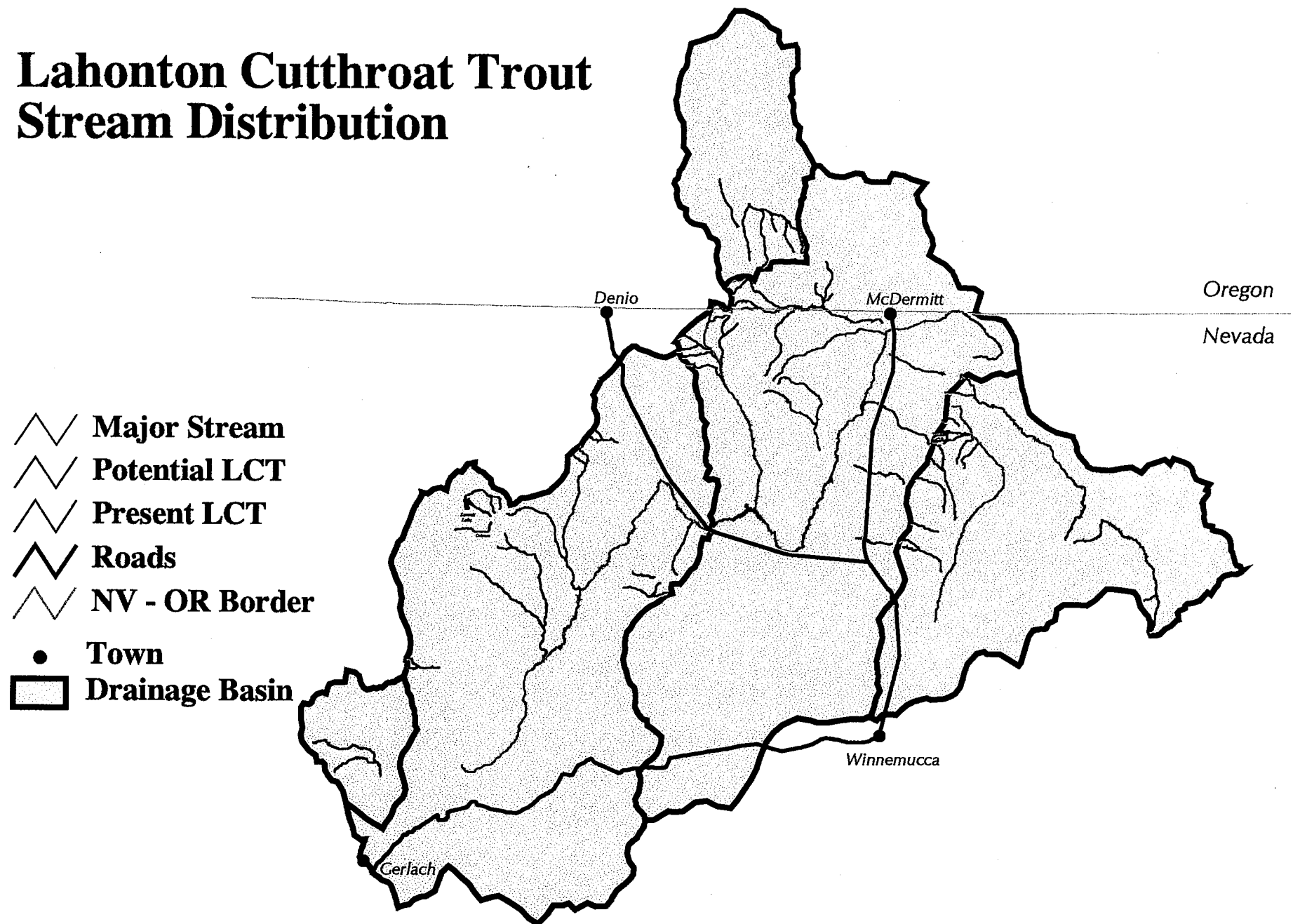
### LEGEND

PM = Pool Measure (pool/riffle ratio)  
PS = Pool Structure (quality pools)  
SB = Stream Bottom (rubble/gravel)  
BC = Bank Cover  
BSS = Bank Soil Stability  
BVS = Bank Vegetation Stability  
HCI = Habitat Condition Index  
WW = Water Width (feet)  
WD = Water Depth (inches)  
PFR = Pine Forest Range  
BRR = Black Rock Range

TCM = Trout Creek Range  
GR = Granite Range  
CH = Calic Hills  
JM = Jackson Mountains  
BCM = Bilk Creek Mountains  
MM = Montana Mountains  
SRR = Santa Rosa Range  
NA = Not Available  
\* = Fish Population Survey Only  
\*\* = Winnemucca District BLM Only



# Lahonton Cutthroat Trout Stream Distribution



Revised 02/07/00 to reflect updated LCT status

