

RESEARCH AND MANAGEMENT ON AN UNDESCRIBED CUTTHROAT TROUT IN EASTERN NEVADA

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Abstract: A cutthroat trout population in Pine Creek, White Pine County, Nevada, which historically has been thought of as a remnant population of the Bonneville Cutthroat trout, Salmo clarki utah, is in all probability a new undescribed subspecies of cutthroat trout. Besides an unusual morphology, the Pine Creek trout have fewer scales, more gillrakers, many more basibrachial teeth and a more uniform distribution of spots on the body. Subsequent investigations of other streams with Bonneville Basin drainage have revealed cutthroat trout populations with similar distinctive traits and that the Pine Creek form of trout was once the native trout of the whole Snake Valley and probably co-existed in Lake Bonneville with S. c. utah. Cutthroat trout populations of Pine Creek stock have been started in several previously barren streams in order to insure the subspecies survival. Stream improvement and land protective measures have been initiated to insure success of these transplants.

INTRODUCTION

Pluvial Lake Bonneville was once a very large body of water, reaching a reported maximum size of 346 miles by 145 miles with a surface area of 19,750 square miles. The western extremities of the lake extended into eastern Nevada covering the present Snake Valley. The streams draining the eastern half of the Snake Range once drained directly into Lake Bonneville (Figure 1).

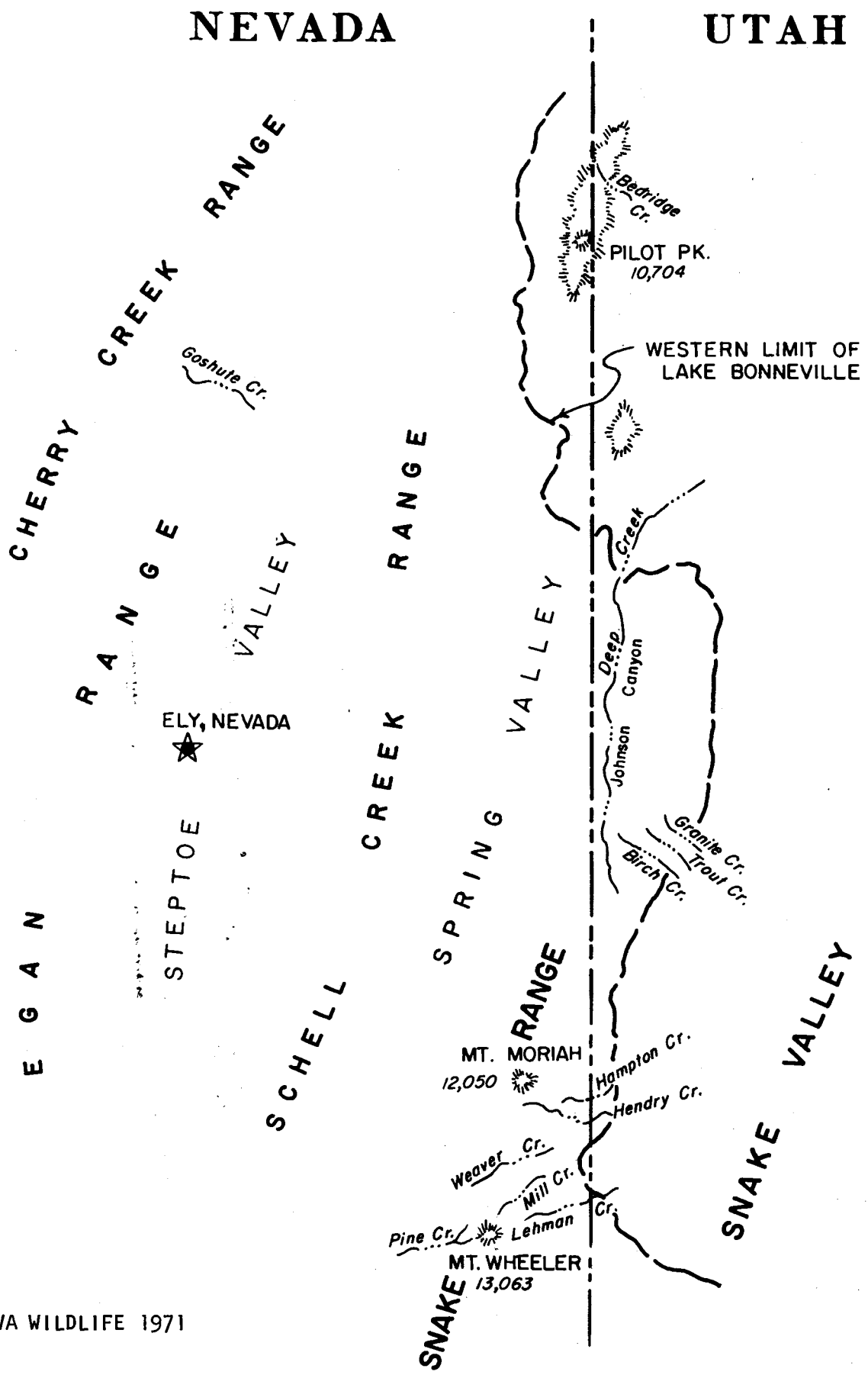
The Lake had a native cutthroat trout called Bonneville cutthroat trout, Salmo clarki utah, which is virtually indistinguishable from the widespread Salmo clarki lewisi of the upper Missouri and Columbia river basins. It can be assumed that the cutthroat trout of Lake Bonneville had access to the streams of the Snake Range and there was a natural exchange of trout between the lake and some of the streams. Cutthroat trout in recent times have been known to exist in some of these streams but their status has never been clear. Pine Creek on the western slope of Mount Wheeler in the Snake Range, was found by Ted Frantz, Nevada Department of Fish and Game, to contain cutthroat trout. Trout were not native to the streams on the western slopes of the Snake Range but the fish were thought to be a remnant population of S. c. utah that had been transplanted from one of the streams on the east side of the range.

Population research on Pine Creek and other streams in eastern Nevada and western Utah has revealed that the trout they contain is probably a new unclassified subspecies of cutthroat trout and that Lake Bonneville once contained not one but two separate and distinct subspecies of cutthroat trout. Experimental stocking of the Snake Valley variety into other streams has shown that the fish can adjust to other stream environments.

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Figure 1. - Map Showing Streams in Study Area



DISCUSSION

HISTORICAL REVIEW

Pine Creek on the Western slope of Mt. Wheeler in White Pine County, Nevada, was found by Ted Frantz in a 1952 stream survey to contain cutthroat trout (Frantz and King 1958). Cutthroat trout were not native to the streams on the west side of the Snake Range but the trout were thought to be a remnant population of S. c. utah. Such belief stemmed from a statement given to Carl L. Hubbs on August 22, 1938 by "old timer" John Yelland of Ely, Nevada. Miller and Alcorn (1948:177) report Mr. Yelland as saying the trout were introduced to the streams on the west side of the Snake Range prior to 1881 by pioneer settlers. The fish reportedly came from Trout Creek in the Deep Creek Range, Juab County, Utah.

Behnke (1970:7) found the Pine Creek cutthroat to be identical with cutthroat trout collected in 1938 from Lehman Creek, on the east side of the Snake Range.

According to the testimony of an "old timer" cited in a letter from Ted Frantz to Dr. R. R. Miller, University of Michigan, dated October 19, 1953, only Hendry's Creek originally contained the native trout and several creeks, including Lehman Creek, were stocked with trout from Hendry's Creek.

The origin of the Pine Creek trout may never be known and it seems unlikely from testimony given, that most of the streams on the east side of the Snake Range had native trout populations. Historical evidence indicates that there were only one or two streams on the east side of the Snake Range and one or two in the Deep Creek Range which had populations of native cutthroat trout. The remaining streams were evidently barren of trout even though several of them must have offered favorable habitat. If they did contain trout in the days of Lake Bonneville they have since lost them, possibly due to natural causes. For example, violent thunder storms can eliminate a stream's trout population.

Since the first discovery of cutthroat trout in Pine Creek it was assumed that they were S. c. utah, and they have been protected from fishing. S. c. utah is listed as a rare fish in the International Union for the Conservation of Nature's Red Data Book, Vol. 4, 1969. In the United States Department of Interior's Red Book of Rare and Endangered Wildlife Species (Bureau Sport Fisheries and Wildlife 1968) S. c. utah is listed as "status undetermined". The Nevada Department of Fish and Game has considered the Pine Creek cutthroat as possibly the last remaining population of a pure strain of S. c. utah.

Lockard (1967) attempted unsuccessfully to determine whether the Pine Creek trout were a pure strain of S. c. utah. Specimens were sent to the Bureau of Commercial Fisheries biological laboratory in Seattle, Washington for blood serological tests and the eye lenses were tested for protein analysis of homogenous genetics. Unfortunately, the results were not clear cut and a definite statement on pureness of strain could not be made.

CURRENT RESEARCH

In May of 1970, ten specimens of the Pine Creek trout were collected and sent to Behnke for taxonomic interpretation to see if they were in fact S. c. utah. Behnke found that the Pine Creek trout were consistently differentiated from the typical S. c. utah and he felt they probably represented a pure strain of an unclassified subspecies. In August, 1958, Behnke, himself collected 31 specimens from Pine Creek. Behnke (1970:5) states that "expecting to find a population of S. c. utah in Pine Creek, I was surprised and baffled to encounter a cutthroat trout quite unlike any other I had ever seen. The long head and jaw positioned on a deep body with a short caudal peduncle presents an odd 'chunky' appearance. The spotting pattern is more uniformly distributed over the body and not so concentrated posteriorly as in S. c. utah. The Pine Creek trout have higher gillraker numbers and a profuse development of basibranchial teeth - up to 50 or more can be detected after alizarin staining, whereas S. c. utah and other cutthroat trout typically have 1-15 such teeth. There is no doubt that the cutthroat trout in Pine Creek are genetically differentiated from S. c. utah and other cutthroat trout. The level of differentiation would warrant recognition as a new subspecies of Salmo clarki."

There is a strong probability that the phenotypic characters of the Pine Creek trout may be influenced a great deal by environment. According to Behnke (1970:5) the spotting pattern and particularly the gillraker number and basibranchial teeth development can be considered as being under genetic control. Goshute Creek, a small stream about 80 miles northwest of Pine Creek was planted with Pine Creek stock on July 17, 1960. Cutthroat trout found in Goshute Creek today exhibit a much thinner body conformation and are much lighter in color. They have, however, retained the same spotting pattern and generally the same meristic characters as their Pine Creek ancestors (Table 1). Cutthroat trout of Pine Creek origin planted in Hampton Creek (a small stream about 20 miles northeast of Pine Creek) have, with the exception of a less "chunky" body, retained to a large degree the characteristics of their Pine Creek ancestors (Table 1).

After receiving Behnke's report on the Pine Creek trout the question arose about whether or not there may be other streams which had either identical or closely related cutthroat trout. A thorough search of other streams which drain into the western Bonneville Basin was initiated in May, 1970. Cutthroat trout were known to occur in the upper reaches of Hendry's Creek, thus, collections were started there. Hendry's Creek, being no different from most fishable Nevada streams, has been planted with voluminous amounts of rainbow trout, *Salmo gairdneri*. Cutthroat trout collected from the upper reaches of Hendry's Creek appear to be essentially identical to the Pine Creek trout but the absence of basibranchial teeth in most of the specimens suggest that they have hybridized with rainbow trout. There is, however, a definite relationship between the fish in the two streams which leads one to think that before hybridization they were identical. This assumption is supported by comparison of the meristic variation between the Hendry's Creek and Pine Creek cutthroat trout in Table 1.

Various other streams with Lake Bonneville drainage from the Snake Range were sampled without finding cutthroat trout. Among the streams sampled were Big Wash Creek, upper Lehman Creek, Weaver Creek and lower Smith Creek. In addition, Birch, Trout and Granite Creeks in the Deep Creek Range of Utah were sampled, as well as Bedridge Creek on the east side of Pilot Peak in Nevada and Utah. Specimens from known cutthroat trout streams such as Hampton Creek, Goshute Creek, and Hendry's Creek were collected and sent to Behnke for systematic interpretation.

On July 30, 1970, cutthroat trout were found in Mill Creek, another small stream on the east side of Mt. Wheeler. Mill Creek had not been included in the Nevada stream surveys of the early 1950's and there are no records that the stream had ever been stocked. The cutthroat trout in Mill Creek are phenotypically similar to the cutthroat trout in Pine Creek and Hendry's Creek, with the exception that they lack the compressed, "chunky" body form. This form in all probability is of non-genetic influence and is a function of environment.

The Mill Creek trout when first discovered were thought to be a pure strain of the Snake Valley cutthroat trout indigenous to the stream. When one examines the meristic variation (Table 1) between the Mill Creek trout and the Pine Creek trout, some differences are noted, particularly higher vertebral counts and lower gillraker number which suggests that the Mill Creek population has hybridized with non-native trout. The counts on the Mill Creek trout, however, may be influenced by sampling error induced by the small number of specimens examined. Before a more definitive statement can be made, more Mill Creek trout will have to be collected and examined.

As it stands today, the only pure population of this unique cutthroat trout known to exist occurs in Pine Creek and the transplant streams, Hampton and Goshute Creeks. With such a limited base population it is very difficult to determine the range of variability of the diagnostic characters which determine the pureness of strain of the Snake Valley cutthroat trout. Hopefully, more streams will be found that contain a pure strain; but the chances are slight. The most likely area where such a population may be found is in Johnson Creek, near Ibapah, Utah, on the Goshute Indian Reservation. As of this writing, the Goshute Indians have not given authorization to collect specimens.

MANAGEMENT

As pointed out previously, there have been several opportunities to transplant Pine Creek stock into other streams. These plants were made initially to establish secondary populations in the event the Pine Creek population would come to an untimely end. Due to the

TABLE 1. Meristic variation in Pine Creek, Snake Valley and Bonneville cutthroat trout *

Locality	Vertebrae			Gillrakers			Scales above lateral line			Scales, lateral series			Basibranchial teeth			Caeca		
	N	Range	\bar{X}	N	Range	\bar{X}	N	Range	\bar{X}	N	Range	\bar{X}	N	Range	\bar{X}	N	Range	\bar{X}
Salt Lake-Utah Lake drainages coll. 1872-1915	19	61-65	63.0	19	17-22	19.7	19	32-43	37.8	10	150-186	165.0	14	3-13	7.9			
Pine Cr., Nev., 1959, 1970	37	60-64	62.3	41	19-23	21.4	29	37-44	39.1	35	133-156	142.1	40	13-55	30.1	10	30-47	39.7
Hampton Cr., (Pine Cr. stock), 1970	10	20-21	20.5	10	39-43	41.0	10	141-157	149.8	10	17-27	22	10	29-36	33.1			
Goshute Cr., (Pine Cr. stock), 1970	10	19-21	20.1	10	38-52	40.2	10	135-160	143.1	10	11-30	19	10	31-37	34.6			
Hendrys Cr., extreme head-waters, 1970	7	20-22	20.9	7	41-44	42.1	7	146-175	155.3	7	4 no teeth 3 with 13, 15, 16		7	33-46	39.0			
Hendrys Cr., downstream, 1970	9	61-63	61.9	10	18-22	20.5	7	36-42	39.7	8	7 no teeth 3 with 1, 1, 6		10	35-47	41.0			
N. Mill Cr., 1970	6	63-64	63.5	9	18-21	19.7	5	39-45	42.0	5	150-169	161.0	5	3-30	20	10	39-51	43.2
Lehman Cr., 1938	2	62, 62		2	20, 21		2	42, 42		1	148		2	17, 20				

* Adapted from original tables. (Behmke: 1970)

rarity of this trout it has been advisable to try experimental plantings only in areas where it is certain they will not hybridize with other trout already in the stream. Ideally, it would be best to try plantings in streams barren of other trout species. Streams of this type, however, which offer suitable habitat are practically nonexistent in Nevada. Historically, almost all streams in Nevada, even the most marginal, have been planted with several trout species. Consequently there has been no choice but to make experimental plants into streams which offer at best only poor to fair habitat. To date, there have been three streams which have received experimental plantings of the Pine Creek trout. The first, in 1953, was Hampton Creek, a small stream devoid of fish life on the east side of Mt. Moriah. Since then the fish have been planted into Goshute Creek in 1960 and Weaver Creek in 1970. Goshute Creek once had a population of S. gairdneri but they were entirely eliminated in a catastrophic cloudburst in 1955 that left the streambed in a badly scoured condition. Weaver Creek is a small stream also with a history of widely fluctuating water levels, but with good habitat created by small recently constructed beaver dams. The cutthroat trout have not been in Weaver Creek long enough to evaluate the success of the transplant. The Goshute Creek trout, however, have done moderately well considering the condition of the habitat. A cooperative habitat management plan (Cain 1971) was developed identifying needed stream improvement projects. Under this plan the "Goshute Creek Natural Area" and the "Weaver Creek Scenic Area" were designated and the lands segregated from nearly all forms of disposal. Techniques to improve pool-riffle ratios were documented with recommended techniques. Also reference to needed livestock and watershed management practices were identified.

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