



INTER-OFFICE TRANSMITTAL

U. S. Fish & Wildlife Service - Colorado Field Office

30930

 Director, _____ Regional Director, _____ Project Leader, _____ Dr Behrke, CSU Regular Mail Air Mail Action Information

From

Bruce D Rosenthal

Subject

Office

USFWS

Date

1/8/85

Dr Behrke:

Attached is a copy of our 1984 Annual report that gives a summary of our greenback work thru 1984. Received a letter from Trout Mag. requesting photos of greenbacks for an article that I assume you wrote.

3-1908

(Rev. 6/63)

(Attach securely to material to be transmitted & mail through regular channels)

At that time, the best photo's I had were on the
Greenback Recovery Plan cover. Since then I had the
attached photo developed, and thought you would like a
copy. The photo is a spawning greenback from Bear
Lake ^{RMAP}, 11 July 1984.

IF things go as planned, we would like to
open Outel lake in RMAP to catch-and-release
Fishing for greenbacks on 1 August 1985.

Sincerely,

Bruce Schwalbe



INTER-OFFICE TRANSMITTAL

U. S. Fish & Wildlife Service - Colorado Field Office

30930

 Director, _____ Regional Director, _____ Project Leader, _____ Dr. Behnke, Colorado State Univ Regular Mail Air Mail Action Information

From

Bruce D Rosenlund

Office

Date

Subject

I would appreciate any thoughts you have on sources of Colorado River cutthroats for Bench Lake.

*Sincerely*Bruce D Rosenlund

3-1908

(Attach securely to material to be transmitted & mail through regular channels)

(Rev. 6/63)

PROPOSAL FOR THE INTRODUCTION OF
COLORADO RIVER CUTTHROAT TROUT INTO
BENCH LAKE AND PTARMIGAN CREEK ABOVE
WAR DANCE FALLS, ROCKY MOUNTAIN NATIONAL
PARK, COLORADO

INTRODUCTION AND SUMMARY

The Colorado River cutthroat trout (*Salmo clarki pleuriticus*) was the only species of trout native to the Colorado River drainage within Rocky Mountain National Park in the early 1900's. The Colorado River cutthroat trout has been almost totally displaced by yellowstone cutthroat trout and brook trout.

PROPOSAL FOR THE INTRODUCTION OF
COLORADO RIVER CUTTHROAT TROUT INTO
BENCH LAKE AND PTARMIGAN CREEK ABOVE
WAR DANCE FALLS, ROCKY MOUNTAIN NATIONAL
PARK, COLORADO

Through 1984, two populations of pure Colorado River cutthroat trout are known to still exist within the Colorado River drainage of RMNP. These include Paradise Creek and Timber Lake and Creek. Timber Lake and Creek is a restoration project that was stocked with pure Colorado River cutthroat trout in 1980 and 1981.

In an attempt to expand the numbers of native Colorado River cutthroat trout within the Colorado River drainage of RMNP, a second restoration project is proposed for 1985. Non-native yellowstone cutthroat trout are proposed to be removed from the 1.6 hectare (6.4 acre) Bench Lake and 1.5 kilometers (1.9 miles) of Ptarmigan Creek above Bench Lake in September 1985 with antineoplasin. Following the successful removal of non-native fish from Bench Lake and Ptarmigan Creek above War Dance Falls, this habitat will be stocked with pure Colorado River cutthroat trout, probably from the Paradise Creek, RMNP population by July 1986.

U.S. Fish and Wildlife Service
Colorado Fish and Wildlife Assistance Office
730 Simms Street, Suite 292
Golden, Colorado 80401
3 June 1985

PROPOSAL FOR THE INTRODUCTION OF
COLORADO RIVER CUTTHROAT TROUT INTO
BENCH LAKE AND PTARMIGAN CREEK ABOVE
WAR DANCE FALLS, ROCKY MOUNTAIN NATIONAL
PARK, COLORADO

INTRODUCTION AND SUMMARY

The Colorado River cutthroat trout (Salmo clarki pleuriticus) was the only species of trout native to the Colorado River drainage within Rocky Mountain National Park (RMNP). By the early 1900's, the Colorado River cutthroat trout within RMNP had been almost totally displaced by hybridization with non-native cutthroat trout, and rainbow trout; or competition from brown trout and brook trout.

Through 1984, two populations of pure Colorado River cutthroat trout are known to still exist within the Colorado River drainage of RMNP. These include Paradise Creek and Timber Lake and Creek. Timber Lake and Creek is a restoration project that was stocked with pure Colorado River cutthroat trout in 1980 and 1981.

In an attempt to expand the numbers of native Colorado River cutthroat trout within the Colorado River drainage of RMNP, a second restoration project is proposed for 1985. Non-native Yellowstone cutthroat trout are proposed to be removed from the 2.6 hectare (6.4 acre) Bench Lake and 1.5 kilometers (1.0 mile) of Ptarmigan Creek above Bench Lake in September 1985 with antimycin. Following the successful removal of non-native fish from Bench Lake and Ptarmigan Creek above War Dance Falls, this habitat will be stocked with pure Colorado River cutthroat trout, probably from the Paradise Creek, RMNP population by July 1986.

Frequency of Yellowstone cutthroat trout:

		Total length mm			
<150	150-199	200-249	250-299	300-349	≥350
	10%	5%	26%	7%	

The condition factor (K) of the average length and weight of the fish captured was 1.75. On 13 July 1981, cutthroats were spawning. On 24 July 1984, cutthroats were spawning. The delay in spawning in 1984 was due to the cold and wet summer of 1984 that slowed the warming of the water in July and delayed the onset of spawning throughout RMNP.

STATUS OF FISH LIFE

Background

Above War Dance Falls on Ptarmigan Creek, four lakes are located; Bench Lake, Snowdrift, unnamed, and Ptarmigan. A fisheries survey conducted on 13 July 1981 found a population of Yellowstone cutthroat trout in Bench Lake that extended upstream over several fish barriers to an elevation of 3,170m (10,400 ft).

One Yellowstone cutthroat trout was found at an elevation of 3,353m (11,000 ft), 200m downstream from Snowdrift Lake in a meadow isolated by upstream and downstream fish barriers.

On 24 July 1984, Snowdrift Lake, Ptarmigan Lake, the pond downstream from Ptarmigan Lake, and the unnamed Lake between Snowdrift and Ptarmigan Lakes were gill netted. No fish were captured in any of the four waters gill netted. No fish could be found below Snowdrift Lake as in 1981.

The presence of Yellowstone cutthroats below Snowdrift Lake, and upstream from Bench Lake, indicates that some of the lakes upstream from War Dance Falls were stocked at one time, allowing fish access to the meadow near 3,170m (10,400 ft); but habitat upstream from 3,170m apparently does not support reproducing fish life, Figure 1.

Ptarmigan Creek

From the meadow at 3,170m (10,400 ft) which receives the outflow of Snowdrift, unnamed, and Ptarmigan Lakes, a population of Yellowstone cutthroat trout exists that extends downstream for 1.5km (1 mile) to Bench Lake.

Angling in Ptarmigan Creek on 13 July 1981, and 24 July 1984, captured 23 Yellowstone cutthroat trout. Percent length frequency of Yellowstone cutthroat trout:

Total length mm					
<150	150-199	200-249	250-299	300-349	>350
	10%	57%	26%	7%	

The condition factor (K) of the average length and weight of the fish captured was 0.75. On 13 July 1981, cutthroats were spawning. On 24 July 1984, cutthroats were spawning. The delay in spawning in 1984 was due to the cold and wet summer of 1984 that slowed the warming of the water in July and delayed the onset of spawning throughout RMNP.

Bench Lake

A Swedish monofilament experimental gill net was set from 1250 to 0900 14 July 1981. All fish captured were Yellowstone cutthroat trout. Percent length frequency of the Yellowstone cutthroat trout:

Total length mm					
<150	150-199	200-249	250-299	300-349	>350
	5%	40%	10%	45%	

A total of 20 Yellowstone cutthroat trout were captured for a capture rate of 1.29 Yellowstone cutthroat trout per net hour. The average length was 269mm and the average weight 214g. Condition (K) of the average length and weight for Bench lake Yellowstone cutthroat trout was 1.09.

When gill netted on 13-14 July 1981, the Yellowstone cutthroats had completed spawning. Spawning habitat is abundant in the inlet. Bench Lake was not gill netted in 1984.

PHYSICAL.

Bench lake above War Dance Falls is well suited as a restoration project for Colorado River cutthroat trout due to the fish barrier made by 256m (840 ft) of vertical drop (including War Dance Falls) that separates the hanging valley containing Bench Lake and the North Inlet. Once non-native cutthroat trout are removed, non-native fish will not be able to ascend Ptarmigan Creek. No trail services Bench Lake, limiting angler use and possible non-native fish introductions. Flows and temperatures of aquatic habitats above War Dance Falls, Tables 1 and 2. 1984 was a cold and wet summer, with water flows almost twice that of most years. On 24 July 1984, stream flows exceeded normal bank levels.

Snowdrift, Ptarmigan and the unnamed Lake between these two lakes appear to be too cold to support fish reproduction for the quality of outlet spawning habitat present. However, some Yellowstone cutthroats did exist below Snowdrift Lake up to 1981.

In addition to the fish barrier at War Dance Falls, another exists at an elevation of 3,139m (10,300 ft). Barriers exist on the two side streams to the east of Ptarmigan Creek within 200m of Ptarmigan Creek, Figure 1.

Beaver ponds existed in the meadows at an elevation of 3,188m (10,260 ft) in 1981. By July 1984, these beaver ponds had been washed out.

PROPOSAL FOR REMOVING NON-NATIVE FISH FROM ABOVE WAR DANCE FALLS
AND INTRODUCING COLORADO RIVER CUTTHROAT TROUT.

Removal of non-native fish with antimycin.

It is proposed that non-native cutthroat trout be removed from Bench Lake and the 1.5km of Ptarmigan Creek above Bench Lake on 4 September 1985.

Fish eggs are more resistant to fish poisons. Cutthroat trout in Bench Lake appear to spawn prior to 15 July and cutthroat trout upstream from Bench Lake spawn from 13 July to 24 July, depending upon the year. Considering the temperatures of Ptarmigan Creek, all July eggs should be hatched by early September. An early September treatment date should allow for all eggs to be hatched, with minimum water flows, and hopefully minimum amounts of snow.

Using water flows from 24 July 1984, it appears that a maximum of seven units of antimycin will be needed to treat Ptarmigan Creek and Bench Lake, Table 2. Based upon July 1984 flows, it will require 32.4kg (72lbs) of potassium permanganate to neutralize the antimycin, Table 2. The exact amount of chemical needed in September 1985 will depend upon the measured water flows. Hopefully, September 1985 water flows should be about 30% to 50% of those observed in July 1984.

Personnel Required. It appears that the project will require 10 personnel to complete the antimycin project. Seven personnel to treat stations 1 through 6, Table 2 and Figure 1. Two personnel to treat Bench Lake. One person to run the potassium permanganate (neutralization) station. The FWS can provide up to three personnel for the project.

Equipment. The FWS can provide all equipment needed for applying the antimycin and recovering the dead fish: boats, pumps, treating stations, marking dye, dip nets and block nets. The NPS will and to provide the antimycin, potassium permanganate, and two backpack fire pumps.

Safety. Antimycin (Fintrol) is an antibiotic that is EPA registered as a chemical for the eradication of fish. All handling precautions should be followed, Table 3.

It is very important that no soft contact lens be worn by anyone handling or applying antimycin. It appears that these lens absorb antimycin fumes and hold them against the eyes causing extreme eye irritation.

To prevent adverse public relations due to the planned fish kill in Bench Lake, the area above War Dance Falls and the Ptarmigan Creek campsites should be closed to camping from 3 September to 5 September 1985. Trails should be signed to prevent day users from drinking the water in Ptarmigan Creek.

Impacts Outside the Target Area. If everything goes as planned, the fish kill should not extend into the North Inlet for the following reasons:

1. Antimycin to be neutralized with potassium permanganate.
2. The 256m (840 ft) of drop from Bench Lake to the North Inlet should help oxidize any antimycin not removed by the potassium permanganate.
3. There is a 1:3 dilution of Ptarmigan Creek by the North Inlet.

Some purple water (potassium permanganate) may be visible at the Ptarmigan Creek Camp Sites. These camp sites should be closed from 3 September to 5 September 1985.

PROPOSED SCHEDULE OF EVENTS

July 1985. Obtain Colorado River Cutthroat trout eggs from Paradise Creek, RMNP. Hold eggs at Saratoga NFH until July 1986.

Mid-August 1985. Fly equipment and chemicals into Bench Lake.

3 September 1985. Pack into Bench Lake.

4 September 1985. Treat Ptarmigan Creek and Bench Lake.

5 September 1985. Pickup fish, check treatment effectiveness.

6 September 1985. Pack out.

July 1986. Restock with pure Colorado River cutthroat trout fry.

July 1987. Stock with pure Colorado River cutthroat trout.

July 1990. Open to catch-and-release fishing.

SOURCE OF PURE COLORADO RIVER CUTTHROAT TROUT FOR PTARMIGAN CREEK AND BENCH LAKE.

Two pure populations of Colorado River cutthroat trout are known to remain within the Colorado River drainage, RMNP, Timber Lake and Paradise Creek.

Timber Lake is a 1979 restoration project that used Clinton Gulch (Amax Inc. Summit Co) Colorado River cutthroat trout. The population in Timber Lake is still small due to the small number of fry available for stocking in 1980 and 1981. The original Clinton Gulch stock is now hybridized with non-native fish.

A pure population of RMNP Colorado River cutthroat trout was discovered in 1981 within Paradise Creek above an elevation of 3,048m (10,000 ft). Analysis of Paradise Creek cutthroat trout by Dr. Behnke and Eric Wagner concluded that Paradise Creek cutthroat trout are pure Colorado River cutthroat trout, Attachment 1. Dr. Behnke also added in another letter that the "Paradise Creek fish strongly resemble Trappers Lake fish. There are differences in the number of gill rakers and scales to indicate that they represent a native pleuriticus that has been influenced by Trappers Lake fish (Colorado River cutthroats) stocked in Boundary Lake over the years."

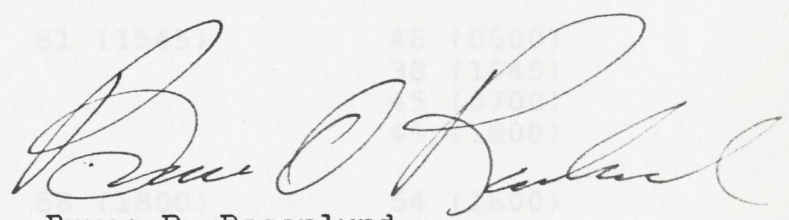
After the work of Dr. Behnke and Mr. Wagner, stocking records were found that indicated that 50,000 cutthroat fry were stocked into Paradise Creek in 1931-1934. And a total of 126,000 eyed cutthroat trout eggs were stocked into Paradise Creek, 1936 to 1947. These "cutthroat trout" were probably Trappers Lake Colorado River cutthroats, as used upstream in Boundary Lake by the CDOW. These stocking records should not change the previous conclusions, but indicates that native cutthroat trout were stocked into Paradise Creek in the past.

The Trappers Lake Colorado River cutthroat trout used for stocking by the CDOW, recently has been reported to show signs of hybridization with rainbow trout, and is apparently no longer suitable for establishing new populations of Colorado River cutthroat trout.

Unless another source of Colorado River cutthroat trout can be located, it is proposed that Paradise Creek Colorado River cutthroat trout be used. Eggs and disease samples could be collected early in July 1985, with the eggs and fish held at the Saratoga NFH until July 1986. A broodstock could be maintained at the Saratoga NFH for future RMNP and CDOW projects, if requested.

Another source of pure Colorado River cutthroat trout suggested by Dr. Behnke is Trappers Lake Colorado River cutthroat trout shipped to California in the early 1900's. Other populations of Colorado River cutthroat within Colorado that may be known about by the CDOW could also be considered.

Location	DATE	
	Temp(F) Time	Temp(F) Time
Outlet Snowdrift Lake @ 11,180'	61 (11:00)	48 (10:00)
Outlet Ptarmigan Lake @ 11,450'		38 (11:00)
Outlet unnamed Lake @ 11,060'		48 (11:00)
Pond below Ptarmigan @ 11,180'		48 (11:00)
Outlet unnamed Lake @ 10,380'		48 (11:00)
Outlet Ptarmigan Lake @ 10,380'		46 (15:00)
Outlet Snowdrift Lake @ 10,380'		
Ptarmigan Creek @ 10,260'		
Stream off Ptarmigan Pass @ 10,280'		46 (15:00)
Stream off Peak 11,245 @ 10,200'	44 (11:00)	
Inlet Bench Lake	35 (11:00)	
	61 (16:30)	



Bruce D. Rosenlund
 Project Leader, USFWS
 Colorado Fish and Wildlife
 730 Simms, Suite 292
 Golden, CO 80401

CC: Jerry Bennett, CDOW
 Jim Bennett, CDOW
 USFWS, FR
 Dr. Behnke
 FDCC
 Saratoga NFH

Table 1. Location, Date, Time and Temperature (F), Ptarmigan Creek Drainage, RMNP 1981 and 1984.

Station #	Desc	Elevation (Feet)	Date	DATE		Flow	Total ml
				7/13/81	7/24/84		
Location				Temp(F)	Time	Temp(F)	Time
1	Flow of	10400	7/24/84	61	(1545)	5.3cfs	333
	Outlet Snowdrift Lake @ 11,180'			48	(0600)		
	Outlet Ptarmigan Lake @ 11,460'			38	(1645)		
	Outlet unnamed Lake @ 11,060'		7/24/84	45	(0700)	5.3cfs	333
	Pond below Ptarmigan @ 11,180'			44	(1800)		
	Outlet unnamed Lake @10380'		7/24/84	58	(1800)	8.0cfs	333
	Outlet Ptarmigan Lake @10380'			56	(1800)		
	Outlet Snowdrift Lake @10380'			51	(1600)		
	Ptarmigan Creek @10260'		7/24/84	58	(1300)	9.0cfs	333
	Stream off Ptarmigan Pass @ 10280'		7/24/84	46	(1530)	3.1cfs	333
	Stream off Peak 11248 @10200'		7/24/84	44	(1100)	3.1cfs	333
	Inlet Bench Lake			55	(1100)		
	Outlet Bench Lake			61	(1630)		
6	Spring	9940	7/24/84			0.5cfs	50
9	Spring	9940	7/24/84			0.1cfs	10
10	Spring	9940	7/24/84			0.1cfs	10
11	Bench Lake	9940	7/24/84			32 ACF	1934
						TOTAL	3333ml*
12	Outlet Bench	9940	7/24/84			26.5cfs	32.4kg**
13	Ptarmigan Cr	9300	7/24/84			25.0cfs	
14	North Inlet	9300	7/24/84			82.5cfs	
17	Inlet Bench L	9300	7/31/81			14.5cfs	

* Antimycin: 3333 ml = 6.9 units

** Potassium permanganate for neutralizing antimycin. 32.4 kg (72lbs)

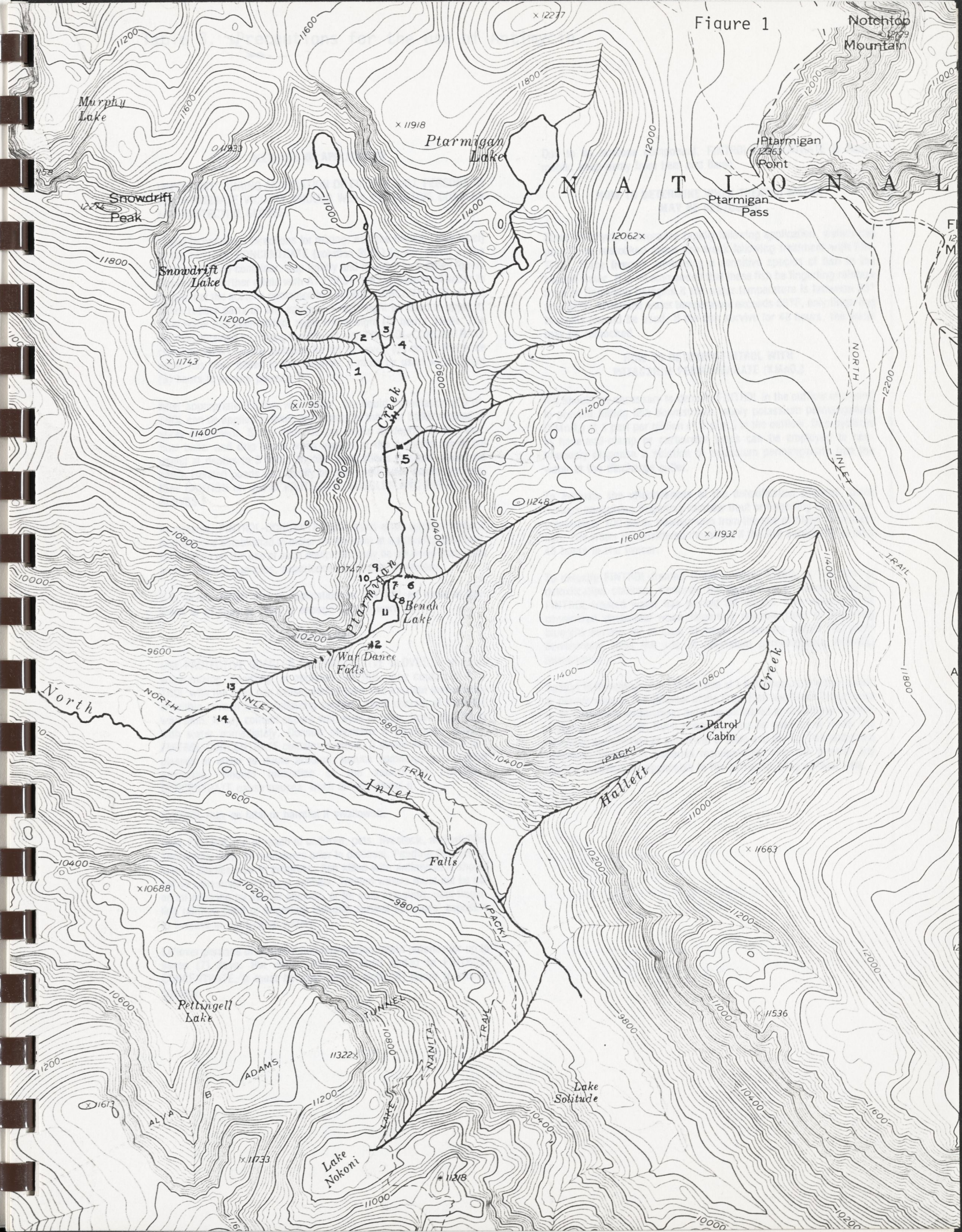
Table 2. Antimycin Stations, Flows (CFS), Volume (ACF) Concentration/Duration Antimycin and KMnO4, Bench Lake Restoration Project, RMNP, 1985.

Station #	Desc	Elevation (Feet)	Date	Flow ACF	Conc Ant Hours	Total mls Antimycin
1	Flow of Peak 11743	10400	7/24/84	1.0cfs	8ug/1/8H	65
2	Outlet Snowdrift	10400	7/24/84	5.3cfs	8ug/1/8H	345
3	Outlet No-Name Lake	10400	7/24/84	1.6cfs	8ug/1/8H	104
4	Outlet Ptarmigan	10400	7/24/84	9.0cfs	8ug/1/8H	585
5	Flow off Ptarmigan Pass	10280	7/24/84	3.1cfs	8ug/1/8H	200
6	Flow off Peak 11248	10000	7/24/84	6.0cfs	8ug/1/8H	390
7	Inlet Bench Lake	9940	7/21/84			
8	Spring	9940	7/24/84	0.5cfs	8ug/1/8H	50
9	Spring	9940	7/24/84	0.1cfs	8ug/1/8H	10
10	Spring	9940	7/24/84	0.1cfs	8ug/1/8H	10
11	Bench Lake	9940	7/24/84	32 ACF	4ug/1/12H	1534
					TOTAL	3333mls*
12	Outlet Bench	9940	7/24/84	26.5cfs	1mg/1 KMnO4/12H	32.4kg**
13	Ptarmigan Cr	9300	7/24/84	25.0cfs		
14	North Inlet	9300	7/24/84	82.5cfs		
7	Inlet Bench L	9300	7/31/81	14.5cfs		

* Antimycin: 3333 mls = 6.9 units

** Potassium permanganate for neutralizing antimycin. 32.4 kg (72lbs)

Figure 1



Notchtop Mountain

Ptarmigan Point
Ptarmigan Pass

NATIONAL

Murphy Lake

Snowdrift Peak

Snowdrift Lake

Ptarmigan Lake

Creek

Ptarmigan

Bendish Lake

Wap Dance Falls

North Inlet

Patrol Cabin

Hallett Inlet

Falls

Pettingell Lake

Lake Solitude

Lake Nokoni

ADAMS

ALY

B

x 11733

x 11218

x 11322

x 10688

x 10400

x 9600

x 10200

x 10747

x 11400

x 11743

x 11800

x 1274

x 11918

x 12277

12062x

x 12361

x 12062

x 11932

x 11663

x 11536

NORTH INLET

NORTH INLET

TRAIL

TRAIL

TRAIL

TRAIL

TRAIL

TRAIL

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F 12 M

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V

Table 3. Precautions for the use of Antimycin.

METHODS OF APPLICATION

IMPORTANT: DURING APPLICATION OF FINROL, ALL PERSONS IN THE IMMEDIATE VICINITY SHOULD WEAR PROTECTIVE GOGGLES AND PROTECTIVE GLOVES.

Liquid formulation: Directions for mixing: Add the Diluent [blue label] to the FINROL-CONCENTRATE (solution 20%) [green label] in the oversize mixing container. Cap tightly and invert 2 to 3 times to mix thoroughly. Further dilute with AT LEAST five (5) gallons of water to insure that the acetone contained in FINROL-CONCENTRATE will not affect rubber parts on any equipment that might be used to apply it. After water has been added, apply within eight (8) hours. [Note: The solution obtained by mixing the Diluent with FINROL-CONCENTRATE (solution 20%) retains potency for up to seven (7) days. But once water has been added to this solution, it must be used within eight (8) hours to ensure potency.]

After appropriate dilution with water, the liquid formulation of FINROL can be applied to lakes and ponds by the boat bailer method or spray equipment. Spray methods are useful at depths to one foot. Boat bailer and drip tubes when applied at the propeller wash are useful at depths to 3 feet. Pinpoint applications to shoal areas and small, isolated ponds can readily be made with back-pack sprayers. (See CAUTION on use of PROTECTIVE GOGGLES AND PROTECTIVE GLOVES.)

In streams, FINROL-CONCENTRATE is most often applied through drip stations established to meter the toxicant at a precalculated rate. Information on the use of such equipment may be obtained from state and/or federal agencies, experienced in stream treatment.

It is recommended that all applications of FINROL be made at day-break or as soon as there is enough light to work by.

PRECAUTIONS

USE PROTECTIVE GOGGLES AND PROTECTIVE GLOVES at all times when mixing, handling, or applying FINROL. Any contact of FINROL with the eyes can cause *intense pain and irritation* immediately or within several hours following contact. Avoid contact of FINROL with skin. If any contact occurs with eyes or skin, flush repeatedly with water immediately. Consult physician if discomfort occurs. FINROL-CONCENTRATE contains acetone. If swallowed, give 2 to 4 glasses of water to dilute acetone, induce vomiting, and consult physician. Should inhalation of the vapors of FINROL-CONCENTRATE cause nausea, fresh air will dispel it.

FINROL may be fatal or harmful if swallowed.

Keep FINROL out of reach of children, pets, livestock, and wildlife. Thoroughly rinse all containers prior to disposal. Pending the conclusion of studies now in progress, fish killed with antimycin A should not be consumed by man or animals. Treated waters must not be used for drinking by man or animals, or for crop irrigation, until fingerling rainbow trout or fingerling bluegills survive 48 hours' exposure in livecars in the treated waters.

Leftover portions of diluted liquid formulation retain potency for up to seven (7) days. But once water has been added to FINROL-CONCENTRATE, it must be used within eight (8) hours to ensure potency.

Due to its acetone component, FINROL-CONCENTRATE is flammable: keep away from heat and flame.

HOW TO DETERMINE WHEN TREATED WATER MAY BE RESTOCKED

Since antimycin A degrades rapidly following application, waters can usually be restocked about one week following treatment with FINROL. Place livecars containing a sensitive species of fish in the treated water. It is recommended that these fish be fingerling rainbow trout or fingerling bluegills if the water temperature is between 35° and 68°F. When the water temperature exceeds 68°F, only fingerling bluegills should be used. If the fish survive for 48 hours, the water may be restocked.

HOW TO DETOXYIFY FINROL WITH POTASSIUM PERMANGANATE (KMnO₄)

If it should be necessary to detoxify FINROL in the outflow of a pond to prevent killing fish downstream, apply potassium permanganate (KMnO₄) at 1 part per million (1 p.p.m.) to the outflow. Drip systems of hose-and-clamp or carburetor types can be employed to continuously dispense a solution of potassium permanganate into the water at the discharge outlet.

To evaluate the effectiveness of the detoxification process, place livecars containing fingerling rainbow trout or fingerling bluegills approximately 100 yards downstream from the site of KMnO₄ introduction. The water is considered detoxified if the fish survive for at least 48 hours in the livecar.

To detoxify FINROL-treated streams, apply KMnO₄ at 1 p.p.m. at detoxification stations. Continue the application of KMnO₄ until all FINROL-treated water has passed the station. The water may be considered detoxified when fingerling rainbow trout or fingerling bluegills survive for at least 48 hours in livecars placed 100 yards downstream from the site of potassium permanganate (KMnO₄) introduction.

Special instructions: Prior to the use of a fish toxicant in either public or private waters, the Director of the State Fish and Game Department or Conservation Department must be contacted to determine whether a permit is required. Such products must be used by or under the technical supervision of personnel of state and federal fish and game agencies, trained in fisheries management, who will provide any special instructions applicable to the particular geographical area.

APPLICATION FOR FISH CONTROL

NAME Bruce D. Rosenlund, USFWS DATE 5/20/85

ADDRESS USFWS, 730 Simms, Suite 292, Golden Co 80401

LEGAL AND PHYSICAL DESCRIPTION OF WATER AND NEAREST TOWN Ptarmigan Creek above War Dance Falls (Bench Lake), Rocky Mountain National Park

Please see attached project proposal.

TYPE AND AMOUNT OF TOXICANT TO BE USED Antimycin at 8 ug/l for 8 hours. Total of 7 units of antimycin

LEVEL OF TOXICANT APPLICATION 8 ug/l

DETOXIFICATION PROCEDURES Potassium permanganate at 1 mg/l

REASON FOR TREATMENT make habitat available for a pure strain of Colorado River cutthroat trout

ANTICIPATED DATE OF TREATMENT September 4, 1985

DISPOSAL METHODS OF FISH KILLED burial

- Approved
- Disapproved

Comments: _____

Eddie Kochman, Fish Program Mgr.

cc: State Health Department
Colorado Water Quality Control
Commission
Regional Manager
Fish Research Chief
Regional Fish Biologist
Wildlife Law Enforcement Chief

INTRODUCTION

TAXONOMIC ANALYSIS OF CUTTHROAT TROUT FROM
ROCKY MOUNTAIN NATIONAL PARK

Due to habitat degradation and hybridization with non-native trout, Colorado's native cutthroat trout now occupy only a small fraction of their former range. The greenback cutthroat trout, *Salmo clarki stonias*, native to the Arkansas and South Platte River drainages, and the Colorado River cutthroat, native to the Colorado River drainage, are presently being managed. Efforts by a wide variety of government and private organizations have initiated the recovery of cutthroat trout with the ultimate goal of establishing several stable cutthroat trout populations within their former range.

prepared for the U.S. Fish and Wildlife
Service, Lakewood, Colorado

Vernsman(1973) and Benke(1973) describe the status of cutthroat trout. These were updated later by Benke(1976,1979), Benke and Zaro(1978), Wesner and Chapel(1982), and the Greenback Cutthroat Trout Recovery Team(1982).

by Eric J. Wagner

December 1982

The purpose of this study is to determine the purity and taxonomy of cutthroat trout sampled from Rocky Mountain National Park (RMNP), Colorado. Bruce Rosenlund, of the U.S. Fish and Wildlife Service, collected cutthroat trout from Paradise Creek, downstream from Adams Lake (R74W,T3N,S31 Grand Co., CO) and from Boundary Lake (R74W,T2N,S5 Grand Co.) at the head of Paradise Creek. From the South Platte River drainage he sampled at four different points along the Big Thompson River in Forest Canyon. Specimens were taken from Strawberry Park (R74W,T2N,S28 Larimer Co., CO), 500 feet below the Gorge Creek-Big Thompson River junction, at the Gorge Creek junction, and at 10,500 feet.

INTRODUCTION

Due to habitat degradation and hybridization with non-native trout, Colorado's native cutthroat trout now occupy only a small fraction of their former range. The greenback cutthroat trout, Salmo clarki stomias, native to the Arkansas and South Platte River drainages, and the Colorado River cutthroat, native to the Colorado River drainage, are presently being managed. Efforts by a wide variety of government and private organizations have initiated the recovery of the native cutthroat, with the ultimate goal of establishing several stable cutthroat trout populations within their former range.

Wernsman(1973) and Behnke(1973) describe the status of cutthroat trout. These were updated later by Behnke(1976,1979), Behnke and Zarn(1976), Wagner and Chapal(1982), and the Green-back Cutthroat Trout Recovery Team(1982).

The purpose of this study is to determine the purity and taxonomy of cutthroat trout sampled from Rocky Mountain National Park (RMNP), Colorado. Bruce Rosenlund, of the U.S. Fish and Wildlife Service, collected cutthroat trout from Paradise Creek, downstream from Adams Lake (R74W,T3N,S31 Grand Co., CO) and from Boundary Lake (R74W,T2N,S5 Grand Co.) at the head of Paradise Creek. From the South Platte River drainage he sampled at four different points along the Big Thompson River in Forest Canyon. ^(Fig. 1) Specimens were taken from Raspberry Park (R74W,T5N,s28 Larimer Co., CO), 500 feet below the Gorge Creek-Big Thompson River junction, at the Gorge Creek junction, and at 10,500 feet.

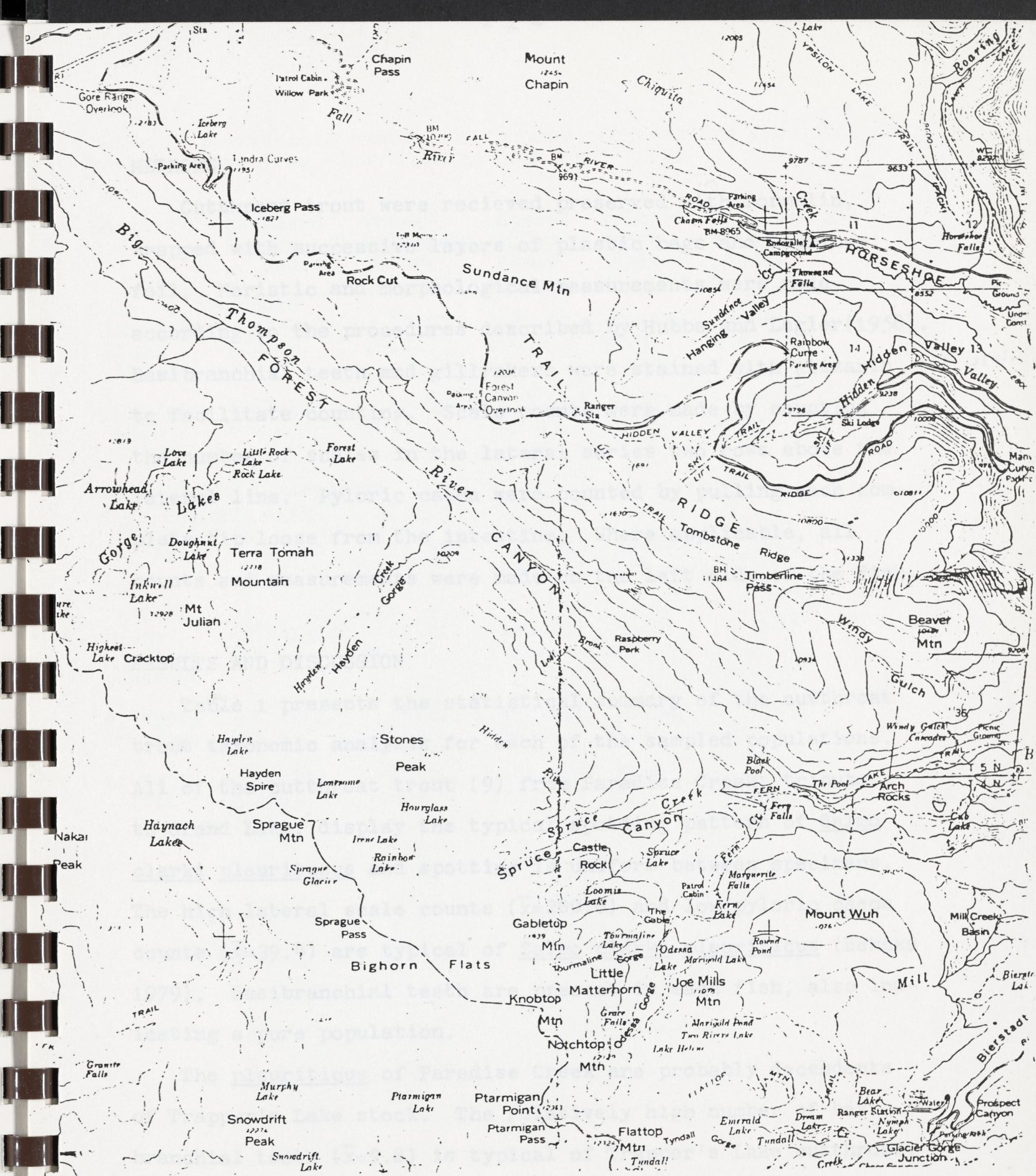


Figure 1. Sample sites on the Big Thompson River, Rocky Mountain National Park, CO.

Table 1. Statistical summary of taxonomic characters from cutthroat trout from Rocky Mountain National Park.

METHODS

Cutthroat trout were recieved preserved with formalin, wrapped with successive layers of plastic bags and aluminum foil. Meristic and morphological measurements were made according to the procedures described by Hubbs and Lagler(1958). Basibranchial teeth and gillrakers were stained with Alizarin² - red stain to facilitate counting. Scale counts were made by counting the number of scales in the lateral series two rows above the lateral line. Pyloric caeca were counted by pulling each complete tip loose from the intestine. Where applicable, all counts and measurements were made on the left side of the fish.

RESULTS AND DISCUSSION

Table 1 presents the statistical summary of the cutthroat trout taxonomic analysis for each of the sampled populations. All of the cutthroat trout (9) from Paradise Creek, tributary to Grand Lake, display the typical spotting pattern of Salmo clarki pleuritucus and spotting is uniform between specimens. The high lateral scale counts (\bar{x} =200.6) and low pyloric caeca counts (\bar{x} =39.4) are typical of Salmo clarki pleuriticus (Behnke 1979). Basibranchial teeth are present in each fish, also indicating a pure population.

The pleuriticus of Paradise Creek are probably decedents of Trapper's Lake stock. The relatively high number of basibranchial teeth (\bar{x} =9.8) is typical of Trapper's Lake cutthroat,

Table 1. Statistical summary of taxonomic characters from cutthroat trout sampled from Rocky Mountain National Park.

Locality	Standard	Total	Lateral	Pyloric	Basibranchial
	Length(mm)	Gillrakers	Scales	Caeca	Teeth
	Range	Range	Range	Range	Range
	\bar{x}	\bar{x}	\bar{x}	\bar{x}	\bar{x}
Colo. R. drainage					
<u>Paradise</u>	147-218	17-20	182-212	31-47	4-20
<u>Creek</u>	172.6	19.0	200.6	39.4	9.8
N=9					
<u>Boundary</u>	163-254	19-22	176-203	32-51	7-14
<u>Lake</u>	186.2	20.5	183.8	39.2	11.0
N=4					
South Flatte R. drainage					
<u>Big Thompson River</u>					
at Raspberry					
Park	101-210	17-22	178-209	29-45	0-15
	161.4	19.9	192.9	31.8	7.1
500 ft					
below	165-180	19-21	180-211	31-47	0-15
Gorge Cr	170.3	20.2	192.8	37.0	7.0
junction					
at Gorge	116-172	17-22	183-208	28-52	0-14
Cr. jct.	150.4	19.4	194.0	38.1	8.1
at 10,500	100-203	17-20	181-205	29-43	2-12
feet	152.9	18.4	192.6	32.0	7.1

although the total gillraker count ($\bar{x}=19.0$) is slightly lower than that reported for Trapper's Lake (Wernsman 1973). The higher number and greater development of the posterior gillrakers on the first arch is also indicative of Trappers Lake origin (Behnke pers. comm.). Based on the taxonomic characters, it appears that the trout of Paradise Creek are decedents of Trapper's Lake-endemic native crosses. Thus being of pure lineage (Behnke 1979), the pleuriticus of Paradise Creek are pure and should be managed as an "A" population as described by the alphabetic grading system developed by Binns (1977).

we can only speculate on this, but it may be an event are pleuriticus

At the headwaters of Paradise Creek lies Boundary Lake. Once again, the higher number of gillrakers ($\bar{x}=20.5$) and basibranchial teeth ($\bar{x}=11.0$) indicate Trapper's Lake genotypes. Although one specimen had 51 pyloric caeca, the spotting and meristic characters all indicate pure pleuriticus and constitute an "A" population.

this, no doubt, is Trapper's Lake trout

In the South Flatte River drainage, cutthroat trout from the Big Thompson River were examined to determine if any non-native genes had infiltrated the greenback population. Samples from Raspberry Park, the sample site furthest downstream, show only a very slight non-native trout influence upon the taxonomic characters. Only one specimen (SL=117mm) of 14 lacks basibranchial teeth. There is some slight variability in spotting, but spotting is typical of S. c. stomias. The high scale counts ($\bar{x}=192.9$) and caeca counts are indicative of pure stomias (Behnke 1979).

Further upstream, 500 feet below the Gorge Creek Junction, six more greenbacks were sampled. Examination of these specimens proved them to be relatively pure stomias as well. One specimen (SL=180mm) lacked basibranchial teeth, but spotting and meristic characters are all typical of greenback trout.

Nine trout from the Gorge Creek-Big Thompson River junction were analyzed. One trout (SL=172mm) lacked basibranchial teeth, yet all other characters are typical of stomias.

At the 10,500 foot mark, the sample site furthest upstream in these 1980 collections, 14 greenback trout were collected. All of the specimens have uniform spotting that is typical of stomias and all have basibranchial teeth. Scale counts, gillrakers, and caeca are all typical stomias.

Overall, there appears to be little or no difference between the greenback trout in the upper and lower portions of Forest Canyon. The only evidence of greater purity further upstream is the fact that at the 10,500 foot elevation site, all fish had basibranchial teeth, slightly fewer gillrakers ($\bar{x}=18.4$), and greater uniformity in spotting between specimens. The difference, however, is insignificant.

The data presented here differs little from the results reported by Behnke(1976). He reported three of 40 specimens ^{from} without basibranchial teeth, and there are three of 43 without teeth in ^{the present} ~~this~~ sample? The average lateral scale and pyloric caeca counts are nearly identical with gillraker totals also being comparable. In Behnke's (1976) analysis, he determined

the Forest Canyon trout to be 'good representative' stomias, despite the 1922 and 1923 stocking of 'spotted native' trout into Forest Canyon. Since the data from this study shows that nothing has changed since 1976, Forest Canyon greenback trout can still be considered 'good representative' stomias.⁽ⁱ⁾

SUMMARY

Cutthroat trout sampled from Paradise Creek, tributary to Grand Lake, are pure Salmo clarki pleuriticus and probably are decedents of Trapper's Lake-endemic native cutthroat crosses. Boundary Lake also contains pure S. c. pleuriticus of Trappers Lake origin. In the Big Thompson River, evaluation of samples from four points within Forest Canyon showed little or no taxonomic differences between sites. No significant difference was found between the 1982 and 1976 taxonomic evaluations of Forest Canyon greenback trout.

① The Forest Canyon fish can be considered as 'essentially' or 'virtually' pure stomias. Over the years of collections (1963-67 --- to 82) there is no indication of change -- they have >90% occurrence of basibranchial teeth and typical stomias characters. Only that the large scale stockings of 1922-23 and long term stocking of Gorge L. tributary, certainly exposed the native population to hybridization.

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