Yellowstone Cutthroat Trout

Current Status and Conservation Recommendations Within the State of Montana

Executive Summary

August, 1998

up Dated January, 1999

Completed by:

Fishery Managers and Field Biologists

Representing

Gallatin/Custer National Forests

Regions 3/5 Montana Fish, Wildlife and Parks

USFWS Montana Technical Assistance Office

Current Status

Abstract

At the time of early white settlement of Montana, Yellowstone cutthroat trout were the only native trout within the Yellowstone River drainage. It has been estimated that there were 4260 miles of occupied habitat and as many as six lakes which historically supported Yellowstone cutthroat trout. At present, it has been estimated that 428 miles of stream (about 10%) support 38 genetically pure Yellowstone cutthroat populations. Lake populations currently occur in 133 lakes under self sustaining or hatchery supplemented conditions. Most current stream populations are at risk from either hybridization or demographic or stochastic influences. Land use influences are of concern to about 22 populations. Conservation action , on a limited scale, has been on going for the last decade.

Introduction

During July, 1998 a working group of fisheries personnel of the Gallatin and Custer National Forests, Regions 3 and 5 of Montana Fish, Wildlife and Parks and USFWS Montana Technical Assistance Program completed an updated assessment of the current status and distribution of genetically pure populations of Yellowstone cutthroat trout throughout their historic range in the State of Montana. Public concern has grown over native fish species population viability and management, and the recent filing of a petition to list under the Endangered Species Act. Therefore, area biologists felt this assessment was needed to identify the current extent of existing populations and to identify factors (e.g. hybridization, habitat degradation, competitive species interaction, land use influences and harvest impacts) which may lead to a risk of accelerated local extinctions. This effort will provide the needed information from which to develop a comprehensive conservation package which is urgently needed.

This information will be used to provide added focus on Yellowstone cutthroat conservation and will assist in the continued refinement of pro-active cooperative working relationships between the responsible agencies. Conservation and restoration of Yellowstone cutthroat populations within the Montana portion of the Yellowstone River basin was the over riding goal of this assessment.

Methods

The assessment was composed of five (5) tasks each of which provided significant information on current status and well-being of each population of Yellowstone cutthroat. Each task will be discussed separately. The analysis area was partitioned into fifth order hydrologic units (5th order HUC's) to facilitate tracking of the assessment information. GIS capabilities of the Gallatin NF were used to store and display the assessment information. The primary focus was on information associated with genetically pure populations. A minor amount of information from hybridized populations was also obtained.

Distribution--Current and Historic (Task 1)

Current and historic distribution of Yellowstone cutthroat trout within the Yellowstone River Basin in Montana was delineated with the aid of the MRIS hydrography layer (at the 1:24000 scale on 7.5 minute USGS topographic maps) applied to the 5th order HUC's.

Historic distributions of Yellowstone cutthroat trout were based on best professional judgement and a minor amount of supporting historical information taken from a variety of sources. (e.g. early field notes, personal journals, early newspaper articles and releases, etc.). Every effort was made to be realistic in developing this information. In all probability, the estimated amount of stream habitat historically occupied represents a conservative amount. Historic distributional area (pre-white settlement) was based on a modification of the Behnke (1992) prehistoric description which included the Tongue River. For the purposes of this assessment, the downstream extent of the historic distributional area was considered to be the mainstem Yellowstone River at the confluence with the Bighorn River. For the Bighorn River only some of the tributaries were considered as historic habitat. All areas within the Yellowstone River Drainage above the confluence of the Bighorn River were considered historically occupied, unless local area biologists were aware of barriers or other naturally existing environmental conditions that would have prevented occupation by Yellowstone cutthroat trout.

Current distribution and extent of genetically pure Yellowstone cutthroat was anchored to electrophoretic validations completed over the last 15 years. Again, every effort was made to be realistic in development of this information. Stream reaches upstream of sample sites are considered inhabited by that population unless a physical barrier to upstream migration is known to exist. In all probability, estimates of current occupancy also reflect a conservative approximation.

Probability of Persistence (Tasks 2 and 3)

Following the concepts disclosed in Rieman et al. (1993), the likely persistence of each Yellowstone cutthroat population was evaluated by identifying the deterministic, stochastic, and genetic processes that could lead to an accelerated extinction rate. Risks associated with genetic concerns (Task 2) were of two types: 1. Hybridization and 2. Genetic "bottlenecks". Risks associated with hybridization were ranked from low to extremely high. Assessment of the risk of genetic "bottlenecks" was not undertaken and should be addressed at a future time.

Risks associated with deterministic and stochastic considerations (Task 3) were dealt with by addressing four factors (i.e. temporal variability in recruitment and survival, population size, growth and survival characteristics and isolation). These four factors were weighted based on input from the Forest Service Rocky Mountain Research Station in Boise, Idaho. Based on that advice a risk score was developed for each population.

Evaluation of Land Use Impacts (Task 4)

Land uses that have or maybe adversely affecting Yellowstone cutthroat habitat were identified. The same approach which was applied to westslope cutthroat evaluation was applied to Yellowstone cutthroat. Uses evaluated included timber, range, mining, recreation, roads, irrigation diversions, and others. Affected fish habitat components included: water quality, water quantity, fish migration and passage, quality and quantity of spawning and/or rearing habitat, riparian zone condition, redd disturbance, and harassment of fish. Risks to the viability of a population and magnitude of those risks were determined.

Existing Conservation Actions (Task 5)

Population and habitat oriented conservation actions that have been implemented to date were identified for each population. These included population and/or species conservation actions such as: generalized goals and objectives, hybridizing species removal, specific goals and objectives, stocking adjustments, genetic testing, private pond permit requirements, population density estimates, special fishing regulation, special studies, barrier placement, competing species removal, and barrier enhancement.

Habitat oriented actions included; generalized goals and objectives, specific objectives, land use coordination, habitat surveys, habitat restoration and/or enhancement, watershed restoration, stream channel and fish habitat restoration and/or enhancement, water leasing, and monitoring.

Results

Current distribution

Based on current information, there were a total of 38 distinct genetically pure, stream-dwelling populations (Table 1) of Yellowstone cutthroat trout identified and these populations currently occupy approximately 433 miles of stream within the Yellowstone River Basin within the State of Montana. This represents about ten percent of the estimated 4260 miles estimated to be historic stream habitat The majority of these populations occupy streams or stream reaches of less than ten miles in length. Only four populations occurred in situations where occupied mileages exceeded 30 miles. All populations were isolated from each other. A few populations had intraconnections between tributaries within the boundary of the population.

Table 1. Summary Information Associated with Currently Existing Stream Populations of Yellowstone Cutthroat Trout in Montana.

Name	Legal	Forest/Other	Miles	Hybridization Risk	Other Risk	Land Use Influence	Conservation Actions
Bad Canyon Cr.	T4S,R15E,Sec 1	Custer	3.5	Low	Extreme	Moderate	Major
Big Bull Elk Cr.		Crow Res	5.9	High	Moderate	None	Minor
Bracket Cr.	T1N,R7E,Sec 5	Gallatin	15.0	High	Moderate	Moderate	Minor
Crooked Cr.	T8S,R25E, Sec 35	Custer	5.2	High	Moderate	Low	Minor
Darrock Cr.	T8S,R9E,Sec 27	Gallatin	1.9	High	Moderate	None	Minor
Dryhead Cr.	T7S,R28E, Sec 7	Custer/Crow Res	0.3	Moderate	Extreme	High	Minor
East Boulder R.	T4S,R13E, Sec 23	Gallatin	10.7	Low	Moderate	None	Minor
Boulder R.	T6S,R12E,Sec 28	Gallatin	4.7	Moderate	High	None	Minor
Bridge Cr.	T6S,R12E,Sec 21	Gallatin	6.7	Low	Moderate	None	Minor
Hawley Cr.	T6S,R12E,Sec 1	Gallatin	3.0	Low	High	None	Minor
Hay Cr.	T5S, R27E, Sec 33	Crow Res	6.0	High	High	None	Minor
Flathead Cr.	T3N,R7E, Sec 26	Gallatin/Pvt	84.4	High	Moderate	Moderate	Minor
SF Big Timber Cr.	T3N,R6E, Sec 20	Gallatin/Pvt	8.5	High	Low	None	Minor
SF Little Timber Cr.	T2N,R12E, Sec 11	Gallatin/Pvt	4.6	Moderate	Moderate	None	Minor
Piney Cr.	T8S,R25E, Sec 35	Custer/State/Pvt	1.5	Low	Extreme	High	Minor
Mill Cr.	T6S,R10E, Sec 32	Gallatin	43.4	Moderate	Moderate	Moderate	Major
Brushy Fork	T7S,R20E, Sec 17	Pvt.	2.4	Moderate	Extreme	High	Minor
Donahue Cr.	T7S,R7E, Sec 6	Gallatin	7.3	Low	Extreme	High	Minor
Fridley Cr.	T5S,R7E, Sec 26	Gallatin	4.8	Low	Moderate	None	Minor
Rock Cr.	T7S,R7E, Sec 19	Gallatin	9.6	Low	Moderate	Moderate	Minor

Sixmile Cr.	T7S,R8E, Sec 9	Gallatin	17.7	High	High	Moderate	Major
Rotten Grass Cr.	T7S,R32E, Sec 23	Crow Res	3.8	Low	Moderate	None	Minor
Pebble Cr.	T9S,R13E, Sec 25	Gallatin/YNP	8.0	Moderate	Low	Non e	Minor
Slough Cr.	T9S,R12E, Sec 24	Gallatin/YNP	35.3	Low	Moderate	Moderate	Minor
Soda Butte Cr.	T9S,R14E, Sec 33	Gallatin/YNP	7.9	Moderate	High	High	Major
Mulherin Cr.	T9S,R7E, Sec 9	Gallatin	13,2	Extreme	Low	None	Minor
Tom Miner Cr.	T8S,R6E, Sec 9	Gallatin/Pvt	5.0	Extreme	Moderate	High	Minor
Suce Cr.	T3S,R10E,Sec 16	Gallatin	2.2	High	Moderate	None	Minor
Lower Deer Cr.	T2S,R15E,Sec 29	Gallatin	14.2	Moderate	High	High	Major
Upper Deer Cr.	T3S,R14E,Sec 15	Gallatin	6.8	High	High	None	Minor
Smith Cr.	T6N,R10E,Sec 6	Gallatin	9.7	High	High	High	Minor
Shields R.	T5N,R11E, Sec 18	Gallatin	52.1	High	High	High	Minor
Bangtail Cr.	T1N,R9E, Sec 29	Gallatin/Pvt	8.3	High	High	High	Minor
Rock Cr.	T2N,R11E, Sec 8	Gallatin	6.3	Moderate	Moderate	None	Minor
NF Willow Cr.	T1S,R8E, Sec 4	Gallatin/Pvt	2.4	High	Extreme	High	Major
Miner Cr.	T2S,R8E, Sec 27	Pvt	2.6	Moderate	Moderate	Low	Minor
Billman Cr.	T2S,R8E, Sec 13	Pvt	5.2	High	High	High	Minor
Mill Fork Mission Cr.	T3S,R11E, Sec 4	Gallatin	2.9	Extreme	Extreme	High	Minor

According to Montana fish stocking records, 31 of the 38 streams and/or watersheds which support current populations have been stocked with at least one of the following fish species; rainbow trout, brook trout, brown trout, Yellowstone cutthroat trout, or other trout of unidentified speciation. Currently 23 of the existing 38 populations support other fish species either sympatrically or directly downstream of an isolating barrier.

Information collected to date on hybridized populations indicates that populations that were 90 to 99.9 genetically pure currently occupy about 71 stream miles. Hybridized populations of less than 90 percent genetic purity currently occupy approximately 56 stream miles (based upon very limited information).

Probability of Persistence linked to Hybridization and Other Factors

Hybridization -- Loss of current populations due to potential hybridization is a significant concern. At present, 18 populations were viewed as being at high (15) or extreme (3) risk. Ten populations were viewed has having a moderate risk and 10 had a low risk associated with hybridization.

Other Factors -- For factors associated with deterministic and stochastic influences, a substantial number of populations were viewed as being at high (11) or extreme (7) risk. A substantial number of populations were viewed as having a moderate (17) risk and only three populations were viewed as having a low risk of extinction due to the combined factors.

Land Use Influences

For most populations, land use influences were identified as having a negative influences on individual fish. This was not unexpected given the defined relationships between most land uses and influences on

the aquatic environment and subsequently on aquatic organisms, including fish. It was estimated that population viability of 22 of the 38 populations was at risk due to past and present land management activities. The relative ranking of viability risk for these 22 populations was as follows; High 13, Moderate 7, and Low 2.

Status of Lake Populations

Only a few lakes were believed to have been historically occupied by Yellowstone cutthroat (e.g. possibly as few as two or as many as six). Through an extensive stocking program, 46 lakes (942 surface acres) within the Absaroka and Beartooth mountain ranges currently support self-sustaining Yellowstone cutthroat populations . An additional 72 lakes (1,541 surface acres) within that same area support Yellowstone cutthroat trout populations that are maintained through stocking of genetically pure fish. Additionally, another 61 lakes that are within the Yellowstone River Drainage in Park and Gallatin counties likely support either self-sustaining or hatchery maintained Yellowstone cutthroat populations.

Summary and Recommendations

The results of this most recent assessment further define the precarious conditions which surround stream populations of Yellowstone cutthroat trout. All stream populations are isolated and most have limited numbers and/or occupy somewhat marginal, remnant portions of the historic range. These same characteristics and symptoms have led to recent petitions and listing of all cutthroat subspecies, including Yellowstone cutthroat. A unique situation relative to Yellowstone cutthroat trout conservation is the extensive high mountain lake stocking program which has greatly increased the number of potential populations that have conservation benefits.

It is our recommendation that our respective agencies quickly elevate the priority of management of Yellowstone cutthroat trout populations and habitat to a level that will result in increased distribution and reduced risk of extinction of existing stream dwelling Yellowstone cutthroat trout populations within the State of Montana. This should be accomplished through a pro-active and coordinated program of work which is chartered by a cooperative agreement and directed by a cooperative conservation strategy adopted by the three agencies. The conservation strategy would be designed and implemented by a local steering committee, composed of area biologists and agency leadership. It is felt that the highest probability of success in securing the existing populations and in increasing the current distribution of Yellowstone cutthroat trout would be to put our efforts into project level accomplishments rather than extensive meetings and program documentation.

Literature Cited

Rieman B., D. Lee. J. McIntyre, K. Overton, and R Thurow. 1993. Consideration of extinction risk for salmonids. Fish Habitat Relationships Technical Bulletin. Number 14. USDA Forest Service, Intermountain Research Station, Boise, Idaho.

Yellowstone Cutthroat Conservation

This section contains a set of conservation recommendations developed by the working group of fishery managers and field biologists which currently oversee management of Yellowstone cutthroat populations and associated habitats in Montana. It is important to understand that the conservation recommendations presented in this report are in many instances extensions of conservation actions that have been ongoing for the past several years. The working group recognizes that conservation and restoration of Yellowstone cutthroat trout depends upon protection, restoration and enhancement of populations and their respective habitats. The working group also stresses that an active program of informing and educating the public about native trout conservation is critical to the success of the conservation effort. The working group recommends that planning and effects assessment be conducted at broader scales (e.g. ecosystem, watershed, landscape, etc.). We do, however, realize that, indicators such as Yellowstone cutthroat trout, can fairly represent conditions in general and provide a reasonable indication of conditions in a broader context.

It is believed that cutthroat entered the Yellowstone River Drainage via passage from the Snake River (Columbia River Drainage) to the Yellowstone River (Missouri River Drainage) at Two Ocean Pass in Wyoming (Behnke, 1992). This access point is still in existence today. Genetic analysis, using electrophoretic and other techniques, has indicated that minimal genetic divergence has taken place within Yellowstone populations. It is likely that all currently existing populations of Yellowstone cutthroat within Montana represent a single evolutionary significant unit (ESU) given the probability that a considerable amount of gene flow occurred between a substantially large number of populations (Personal communication with Dr. Robb Leary, UM).

The working group strongly recommends that future conservation of Yellowstone cutthroat trout be anchored to a clearly stated goal and well defined objectives which provide the needed specificity upon which to gauge success. The working group suggests that the planning and implementation period associated with these recommendations be ten years. Revision and extension of the conservation program would take place at the end of the initial conservation period.

Yellowstone Cutthroat Conservation Goal: Ensure the persistence of the Yellowstone cutthroat trout subspecies within Montana at levels and under conditions that provide for protection and maintenance of both intrinsic and recreational values associated with this fish.

Objectives 1. Secure and enhance all known stream populations (i.e. 38 known stream populations at present) through the development and implementation of population specific conservation plans. The target date for completion of the plans is 2005. Additional conservation plans will be completed as new populations are found and/or created.

Objective 2. Complete the effort to identify all currently existing stream populations by 2005.

Objective 3. Expand the distribution of stream populations through a doubling (i.e. target of 76 populations) of the number of populations within the planning period.

Objective 4. Include lake populations as a valued component of the conservation effort by development and implementation of a management protocol that protects genetic integrity and population health. Time frame for completion of the protocol would be 2000.

Objective 5. Provide an increased effort to inform and educate the public on the various aspects of native fish conservation, including an increased effort to provide technical assistance to private land

owners, resource users and public land managers. This effort would be on going throughout the planning period.

Conservation and Restoration Considerations

The working group recommends protecting all existing populations of Yellowstone cutthroat trout to maintain as much genetic diversity as possible and to provide for a reasonable starting point for long term preservation. Current populations will serve as the nucleus upon which future conservation action will be anchored.

Conservation of Current Populations

1. Secure and protect all current populations through development and implementation of population specific conservation plans which address habitat condition, population health, land use coordination and recreational use. These plans will describe conservation actions and time frames necessary to move from the current situation to a desired, long term condition.

2. Isolate populations to prevent invasion by hybridizing and/or competing nonnative fish species. Initiation of passage barriers should be proceeded by an analysis which provides information on best location, proper design, seasonal movements and other components of life histories.

3. Enhance and/or restore habitat to the highest potential quality condition based on in-depth survey and channel attribute characteristics.

4. Modify land uses to provide the greatest degree of habitat and population protection possible. The working group highly recommends adoption of the approach identified in the Short-term Conservation Strategy developed for westslope cutthroat.

5. Expand current populations within the context of their streams and watersheds by increasing the amount of occupied habitat and through increasing the quality of that habitat.

Population Restoration

1. Increase the number of Yellowstone cutthroat trout stream populations substantially, by restoring Yellowstone cutthroat into historic habitat and/or into certain waters that are currently fishless within the boundary of the historic range. Introductions into fishless waters should be preceded by an analysis of impact on current biota.

2. Where necessary, remove existing populations of trout (e.g. introduced/stocked species and/or a hybridized populations of cutthroat). Population removals will in many cases require the use of fish toxicants to facilitate removal of the unwanted fish. The target level of population restoration is 38 new populations distributed throughout the historic range. Suggested new population accomplishment is: CU1 = 7 populations; CU2 = 10 populations; CU3 = 14 populations; CU4 = 7 populations (CU = Conservation Unit which will be discussed later).

3. The restoration protocol direction developed for westslope cutthroat (e.g. genetic protection, introduction techniques, use of captive brood, etc.) should be adopted.

Genetic Purity

The working group recognizes that genetic purity is a major conservation criteria and recommends that 100% pure Yellowstone cutthroat populations be given the highest priority of conservation. These populations are the only ones that can serve as donor sources for restoration, by translocation or by incorporation into a captive brood. Validation of genetic purity should be monitored periodically and is a prerequisite (using current suggested protocol) for reintroduction.

For those populations that are slightly hybridized (e.g. up to 10 to 15% hybridization), the working group recommends that they be viewed as high priority candidates for Yellowstone cutthroat restoration. Habitats supporting these populations should be given the same level of protection as habitats supporting pure populations until a final decision on restoration is made. Prior to replacement of any hybridized population, an extensive genetic sampling effort must be completed to confirm that no genetically pure fish exist within the drainage.

General Fishery Management

Yellowstone cutthroat trout are an important fish within Montana, and fishery management will play an important role from both conservation and recreational perspectives. The present "catch and release" regulation should be applied to all current stream populations which are genetically pure until such time as a greater degree of recovery is attained. At this time, the working group does not suggest or recommend that lake populations, as a general rule, be covered by a "catch and release" regulation. For some lakes there maybe the need for more restrictive harvest but this should be determined on a case by case basis. The ultimate goal of conservation includes provision for populations, both stream and lake, to be healthy enough to support some level of angler harvest.

It is also understood that at the present time, most recreational stream fisheries for Yellowstone cutthroat trout will be based primarily upon management of hybridized populations. The goal associated with conservation of Yellowstone cutthroat trout includes the intention of making pure Yellowstone cutthroat trout a greater portion of the recreational cutthroat fishery in the future.

Improper stocking of mountain lakes and streams and the permitting of private fish ponds may place pure Yellowstone cutthroat populations at risk. The working group recommends that FWP review the lake and stream stocking policy and the following suggestions are recommended:

1. Within drainages that are not connected to habitats which support pure Yellowstone cutthroat trout any suitable species can be used, however, the potential risk to Yellowstone cutthroat populations should be assessed on a case by case basis.

2. Within drainages that are connected to habitats supporting pure Yellowstone cutthroat, the working group recommends stocking of only genetically pure Yellowstone cutthroat trout.

3. The working group further recommends that within drainages that support or that are connected to habitats which support pure Yellowstone cutthroat, FWP should restrict private fish pond licenses to permit releases of only pure Yellowstone cutthroat and no other trout species which would have the potential to hybridize (e.g. rainbow or golden trout) and/or compete (e.g. brown or brook trout) with Yellowstone cutthroat. In addition, the working group recommends that "state of the art" barriers be required on all pond inlets and outlets to prevent movement of fish.

Administrative Considerations

There is a need to significantly increase the amount of conservation attention and action. But at the same time there needs to be recognition that elevation of conservation to the purely political level will only serve to hinder conservation action. The following are recommended as a means of providing the stimulus to conservation action.

1. Development of agreement(s) that provide the contractual foundation for the actions and efforts associated with Yellowstone cutthroat conservation. Several prototype agreements are available to build from. At a minimum the agreement should reaffirm the conservation goal/objectives, identify roles and responsibilities, and define conservation action. They should include signatures from the lowest agency leadership level as possible.

2. Development of a generalized conservation strategy which also reaffirms the conservation goal/objectives, discusses current status, provides identification of generalized conservation actions, reconfirms goals/objectives, states roles and responsibilities, sets time frames for accomplishment, and identifies budgetary needs.

3. Subdivision of the conservation effort into discrete geographical areas (Conservation Units). The working group recommends that the historic range in Montana be partitioned into four conservation units (i.e. CU1 -- upper Yellowstone River above Livingston, CU2 -- the Shields River and Yellowstone River to below Big Timber (Sweetgrass Creek), CU3 -- the Stillwater and Clarks Fork and Yellowstone River to confluence of Clarks Fork and CU4 -- the tributaries to the Bighorn River). This subdivision of effort will allow for the greatest degree of flexibility, will encourage healthy competition and will provide for focused public involvement.

Organizational Considerations

The various conservation efforts for other trout have included a number of different organizational formats and levels. The working group recommends that organizational considerations be met at the lowest level possible . We suggest that a steering committee (Yellowstone Cutthroat Conservation Council) be established and that Council be primarily composed of field biologists and fishery managers along with agency leadership representatives. The Council should be staffed to meet technical as well as organizational and administrative needs.

The working group also recommends the creation of Implementation Teams (each composed of 2-5 persons) assigned to implement conservation action at the Conservation Unit level. These Teams would be composed of field biologists having management authority and others, and would provide for direct implementation of conservation action within each Conservation Unit.

Other subteams could be created to address specific situations and conditions. These would be under the direction of the Council or specific Implementation Teams, as appropriate.

It is expected that the Conservation Council and Implementation Teams would come together annually to discuss accomplishment and to set future effort. An annual implementation report could be developed and used to inform those interested in YCT conservation.

References

Behnke, R.J. 1992. Native trout of western North America. Am. Fish Soc., Monograph 6. 275pp.

Leary, R.F., B.B. Shepard, B.W. Sanborn, W.P. Dwyer, J.A. Brammer, R.A. Oswald, A. Tews, D.Kampwerth, M. Enk, R. Wagner, and L. Kaeding. 1998. Final Draft - Genetic conservation of the westslope cutthroat trout in the upper Missouri River drainage. Memo Rept. 10pp.

May, B. 1998. Yellowstone cutthroat trout conservation in Montana. Memo Rept. 4pp.