ILLEGAL FISH INTRODUCTIONS

By Jim Vashro

Early fish distribution efforts depended in part on "sportsmen troughs" at state fish hatcheries and railroad whistle stops across the state. Enterprising anglers could load up a cream can of fish to take to their favorite fishing hole. The "Johnny Appleseed" approach to fish plants created a lot of fishing for which Montana is famous—and also a lot of headaches. By the 1930s, the Department had developed its own fish distribution system and controlled all the fish plants but the pioneer spirit lives on with some people.

The Montana Fish and Game Commission Biennial Report of 1941-42 makes note of the disastrous consequences of many poorly planned introductions such as a loss of recreational fishing, stunted rough fish populations, and a loss of native trout fisheries. A Fish and Game Commission report in 1953 repeated the warning and included a cartoon of a character dumping a bucket full of fish—hence, the term "bucket biologist" for anglers that take matters into their own hands.

In the 1980s fisheries professionals and knowledgeable anglers began to fully recognize the seriousness of the problem as recreational fisheries began to fall behind anglers' demands and native fish stocks slipped toward listing under "Species of Special Concern" lists or under the federal Endangered Species Act. Chemical rehabilitation was used to remove some unwanted fish but it is impractical in larger waters, expensive, sometimes controversial, and not always effective. Northern pike and yellow perch have been the fish most commonly moved around but the list includes about any fish species you can think of—and a few you probably didn't think about such as pacu—a fruit-eating Amazon fish found in two locations. Basically, every drainage in the state has been affected. Yellow perch in Lake Mary Ronan and walleye in Canyon Ferry Reservoir are two of the more visible illegal introduction that threaten very popular fisheries.

The 1990s saw increased educational efforts to head off the problem, stiffened statutes and penalties, prosecution of some bucket biologists, and development of a database to track and document the illegal introduction problem. But the problem continues. Through 1999 FWP had documented 345 introductions into 211 waters statewide including 6 illegal introductions into 5 waters in 1999. Illegal introductions may prove to be one of the defining issues for fisheries management in Montana and the nation in the next century.

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Fluvial Arctic Grayling Restoration (1984 - 1999)

By Patrick A. Byorth

1980's - The Decline

Arctic grayling were native to the Missouri River drainage upstream of the Great Falls, but by the mid 1980's, the sole remaining population of river dwelling, or fluvial, Arctic grayling inhabited the Big Hole River. An intense spring runoff in 1984 began a serious decline in abundance of grayling in the Big Hole River. A second blow to the grayling population was persistent drought. Dick Oswald, regional fisheries management biologist, and Brad Shepard, a fisheries biologist working in cooperation between MFWP and the Beaverhead National Forest, were monitoring the grayling population and studying their spawning ecology. Oswald and Shepard's data enabled them to raise awareness of the crisis facing grayling of the Big Hole River. Rising concern in the fisheries community led to a cooperative effort between MFWP, Montana State University, and the U.S. Forest Service to fund a series of short-term research projects aimed at understanding the ecology, origins, and natural history of the grayling in the Big Hole River drainage. Researchers Harold Stevenson, Don Skaar, Geoff McMichael, and Jon Streu investigated grayling distribution, movements, habitat selection, and interactions with brook trout from 1987 through 1990.

1990's - The Recovery Program

Studies in the 1980's emphasized the urgency to prevent the extinction of the Big Hole River Arctic grayling population. An apparent need to establish a full time recovery program led to an expansion of the recovery group to include MFWP, the Bureau of Land Management, Montana Chapter of the American Fisheries Society, Montana State University and the University of Montana, The Nature Conservancy, Trout Unlimited, the U. S. Fish and Wildlife Service, and the U.S. Forest Service. The Fluvial Arctic Grayling Workgroup, chaired by Chris Hunter, Special Projects Bureau Chief, was formed to develop a cooperative funding mechanism and a plan to recover fluvial Arctic grayling throughout its native range. A non-profit organization, The Arctic Grayling Recovery Program, was developed as a fund-raising and - managing group with the purpose of providing for a long-term recovery effort. Through a memorandum of understanding between state, federal, and private organizations, a five-year project was initiated in September, 1991, when Patrick Byorth was hired as project biologist. The Recovery Program was designed to closely monitor the population, determine which environmental factors were limiting the population and work to mitigate those factors, and develop a brood reserve stock to hedge against extinction while providing a representative source of fluvial grayling for reintroductions. A Fluvial Arctic Grayling Recovery Plan was drafted in 1992 to guide the project and was officially adopted by cooperators in 1993. In October of 1991, private organizations submitted a petition to list the fluvial Arctic grayling as "Endangered" under the Endangered Species Act.

The project focused on researching limiting factors such as impacts of angling, winter habitat and seasonal movements, habitat limitations, water quality and quantity, and competition with non-native species. This research demonstrated that while grayling are easily caught by anglers, they sustain very low mortality under catch-and-release only regulations. Research on

life history complimented earlier data, demonstrating that grayling in the Big Hole basin moved great distances to seasonal habitats, and were highly faithful to those habitats. A series of studies were conducted from 1993 to 1996 to determine the impacts of non-native trout on grayling,. These studies revealed that brook trout and grayling spatially segregated and intraspecific interactions were strong among grayling. Further studies demonstrated grayling to be fierce competitors, to their own detriment. During daylight hours, grayling fed voraciously, vigorously defending their feeding territories against rainbow trout and other grayling. While rainbow trout rarely dominated a confrontation with a grayling, they created "interference competition" by sheer numbers, reducing graylings' ability to feed successfully.

The bottom line for grayling came down to water quality and quantity. During severe drought years, the Big Hole River was severely dewatered, even ceasing to flow during 1988. Drought-induced loss of habitat, increased susceptibility to predation, and lethal water temperatures likely drove the decline through the mid 1980's. Ranchers in the upper Big Hole valley relied on the river to provide irrigation for a single cutting of grass hay, and for stock water through the fall and winter. Dry years pitted the survival of ranching against grayling. In 1994, snowpack was miserably low, mid-summer rain was scarce, and the Big Hole River was going dry. Irrigation was over by mid-July, but water was still withdrawn for stock. To maintain live flow in the river, ranchers were offered an alternative source of water: FWP would buy stock tanks and rent a water truck to provide stock water in exchange for closing diversions. While hauling stock water was a temporary solution, it demonstrated that the Big Hole could run through and the grayling could survive severe drought. Drought also provided impetus for discussions between anglers, ranchers, conservationists and agencies. From these discussions, The Big Hole Watershed Committee formed. This group spearheaded protecting minimum flows by securing grants to drill stockwater wells and studied characteristics of the watershed.

By 1995, the Big Hole grayling population had returned to pre-decline levels and the Restoration Program began to turn its sights on expanding the range. Earlier preparations for reintroductions included Dr. Cal Kaya's (Montana State University) review of streams throughout the grayling's native range that identified suitable reintroduction sites. From 1988 to 1992, gametes were collected from spawning, wild Big Hole grayling to build a genetically representative brood stock. These grayling were raised at the USFWS Bozeman Fish Technology Center by Pat Dwyer. The individual year classes were crossed and backcrossed with others to develop a broad founding population. A second brood reserve was established at the Axolotl Lakes. From these broods, young grayling were gathered for experimental introductions in the West Gallatin River in 1992 -1995, the East Gallatin River in 1993 -1995, and Cougar Creek in Yellowstone National Park in 1993. These experimental plants demonstrated that young grayling could survive and grow, and that they made long-range movements as expected. However, it became apparent that long unimpeded reaches of streams with low densities of potential competitors was necessary to establish self-sustaining populations.

In 1996, reintroduction efforts began in earnest when the Ruby River above Ruby Dam was selected as a reintroduction site. After working extensively with the public, the reintroduction was approved and scheduled for 1997. In 1997, Pat Byorth resigned as project biologist, and was replaced by Jim Magee, who had been project technician since 1993. Jim oversaw planting of grayling in the Ruby River and spearheaded the organization of similar

efforts in the North and South Forks of the Sun River, and the Beaverhead River. Future reintroductions are planned at the Missouri Headwaters and in the upper Madison River.

Over time, understanding of fluvial Arctic grayling has increased, along with numbers of grayling. While the future of Montana's unique fluvial Arctic grayling is not quite certain, the actions and dedication of biologists in cooperation with anglers, ranchers and conservationists have ensured there will be a future for grayling.

The History of Fish Health Management in Montana

Jim Peterson
Fish Health Coordinator
Montana Fish, Wildlife and Parks

Montana Fish, Wildlife and Parks maintains a fish health program in order to protect Montana's wild and hatchery fish stocks from disease and to insure that Montana has healthy viable fish populations. The program consists of a coordinated effort of state, federal and university laboratories, which is headed by FWP's fish health project located in Great Falls. Montana's Fish Health Coordinator and a Fish Health Specialist lead the project, which is based at a laboratory at Giant Springs Trout Hatchery. Fish health management for the entire state of Montana is coordinated from the Giant Springs laboratory. Through contracts with the U. S. Fish and Wildlife Service's Bozeman Fish Health Center and various university laboratory support, FWP manages fish health concerns from fish kill investigations and health concerns in wild fish populations to trouble shooting and routine annual inspections at all state and private fish hatcheries in Montana.

The fish health management program in Montana today is based on disease prevention. A strong emphasis is placed on preventing the introduction and spread of fish pathogens in order to control disease. Once a disease-causing organism is introduced into a fish population, it is difficult or impossible to eradicate. This is especially true in wild fish populations. The concept of prevention vs. control of fish pathogens got its start at the very beginning of Montana's fish health management program in the mid-1950's. But it wasn't until 40 years later, when whirling disease was discovered in the Madison River, that most Montanan's would realize the importance of fish health management to Montana's fisheries and the impact a disease-causing organism can have on a wild fish population.

1950's

The roots of fish health management in Montana go back to 1955 when the American Fisheries Society (AFS) took up the issue. Several papers at the 1955 AFS annual meeting discussed the potential disease risks associated with importing fish and moving them between states. A special committee established by AFS identified specific threats and made specific recommendations that states which do not have import rules to protect against the importation of disease should develop the necessary rules. This committee conducted a survey of states and found that 24 states did have some limited regulations dealing with the importation of fish and fish eggs. Twenty -one states did not have such regulations, including Montana. However, in the survey, Montana and Maryland were singled out as the two states responding they were most concerned about the danger of introducing diseases and parasites with foreign imports. This was an especially timely concern since we would learn later that the whirling disease parasite was most likely imported to the United States in 1956.

The recommendations of the 1955 AFS committee would be the foundation of current fish import and transport regulations throughout the United States. The committee's report included recommendations that all states adopt importation rules to protect against the importation of disease. Montana's hatchery biologist, Jack Bailey, began working on Montana's first import policy right away. The first policies were fairly limited, but resources were limited. There were few fish health specialists anywhere in the United States that could even conduct an inspection, and even fewer laboratories to conduct the necessary lab work. Biologists were not even sure what diseases to look for. There was very little understanding of fish

diseases at that time, and the names of the diseases of concern in 1955 do not much resemble the pathogen lists we have today.

The importance of the AFS efforts in 1955 can not be overemphasized. The AFS committee, which wrote the report dealing with fish imports, was just the beginning for AFS. In later years, AFS established the Fish Health Section, which developed standards for fish disease testing and certification programs for fish pathologists and inspectors, which is used as the standard for fish health management throughout the United States and other countries around the world.

1960's

Montana's first fish import statute was adopted in 1969 when Montana's 41st legislature enacted a law that required that salmonid fish or eggs shipped into Montana be certified free of whirling disease and other diseases as identified by the Fish and Game Commission. This law gave the Commission the authority to add pathogens and diseases it felt were necessary to protect Montana's fisheries from introduction of disease. Once this law passed the legislature, Montana's fish health program really began to develop.

1970's

In 1971 IPN virus was added to Montana's list of pathogens of concern. During the next few years, two other viral pathogens and three bacterial pathogens were added to the list, and, in 1974, the Fish and Game Commission adopted the revised Administrative Rules of Montana (ARM) which included the list of pathogens of concern and other guidelines under which fish may be imported into Montana. The pathogen list adopted in 1974, which includes seven pathogens, including the whirling disease parasite, represents the primary list of pathogens of concern which we still use today.

As Montana's fish health program was growing, so were programs across the country and more people became trained in fish pathology. Montana developed a list of pathologists who could conduct fish health inspections for fish shipped into Montana. In 1972, FWP and the U.S. Fish and Wildlife Service (USFWS) entered into an agreement for fish health laboratory services. Under this agreement FWP would hire a fish health specialist to collect fish tissue samples and deliver them to the Bozeman Fish Cultural Development Center. Laboratory analysis of the samples was conducted at the center by USFWS biologists. This was the beginning of a successful partnership, which is still in place today.

During the 1970's annual inspection programs were initiated for all state and federal brood hatcheries and wild broodstock sources. Annual inspection programs and on-going fish health inspections at all state hatcheries became the primary focus of FWP's fish health program. Inspections at private hatcheries were also initiated. Initially, these inspections were the responsibility of the USFWS, but as Montana's fish health program developed, the state picked up most of the responsibility for inspecting private facilities.

The fish health program grew during the 1970's from one Fish Health Specialist conducting fish health work for about 10% of his time to a project requiring full time attention. Montana's first Fish Health Specialist, Thurston Dotson, was located at Washoe Park Trout Hatchery. He was later relocated to Bluewater Springs Trout Hatchery, where the fish health laboratory was located until 1985. Montana's current Fish Health Coordinator, Jim Peterson, took over the fish health job in 1977, when Thurston was promoted to a Fish Hatchery Manager position.

As knowledge of fish diseases grew during the 1970's, so did knowledge of disease treatments. Drugs and chemicals that had been used to treat other animals or as disinfectants were used to treat fish disease. And along with the use of these new drugs on fish came government regulation through the Food and Drug Administration. Montana got its first exposure to the drug approval process when it used erythromycin, an antibiotic used in human medicine, to treat bacterial kidney disease at the Yellowstone River Trout Hatchery. The drug was obtained and administered under an investigational new animal drug permit

(INAD). This was FWP's first exposure to the INAD process, but over the next two decades INADs would become a major part of doing business in fish health management. The use of erythromycin to fight kidney disease at the Yellowstone River hatchery was successful, and the disease was eradicated from the stock. The technique used at the Yellowstone River hatchery was experimental at the time and has since been used as an example for other kidney disease treatment plans across the country.

1980's

Fish health management became an integral part of fisheries management in the 1980's. Regional Fisheries Managers and biologists consulted the fish health project for a variety of fisheries management projects which required fish health consideration. It was also during the 1980's that Montana's fish health project began coordinating with other states and agencies, and fish health professionals realized the importance of sharing information on fish pathogens, treatments and disease testing techniques. FWP became affiliated with the Pacific Northwest Fish Health Protection Committee (PNFHPC), which was a newly formed organization of agencies in the Pacific Northwest states. Membership included fish health professionals and fisheries administrators from state and federal agencies as well as private representation. PNFHPC developed a "Model Program" for fish health management, which included minimum requirements to be incorporated into state programs. Shortly after formation of PNFHPC, another group organized which Montana also joined. This organization, The Rocky Plains Fish Health Committee, included states in the Rocky Mountain and plains states from Montana to New Mexico. Through membership in these organizations, fish health management became a regional issue and an effective network of fish health information exchange and contacts was developed. FWP's participation in these organizations has been a tremendous boost to fish health protection and disease prevention and control in Montana.

The American Fisheries Society was also actively pursuing development of fish health programs during this time. The AFS Fish Health Section had developed a certification program for fish health professionals and developed standardized techniques in the AFS Fish Health Section "Bluebook". The Bluebook standards were adopted by Montana FWP and incorporated into state law.

The FWP fish health laboratory was relocated to Giant Springs Trout Hatchery in 1985. This allowed the Fish Health Coordinator to operate from a more central location and meet state-wide commitments.

In 1989, the Montana legislature passed Senate Bill 260, which revised Montana's fish disease laws and added much needed fish health protection requirements. The new law required an import permit for all species of live fish or fish eggs imported into Montana. The only exception was aquarium fish for use in home or office aquariums. The law also gave FWP more authority to deal with intrastate fish transports and authority to quarantine infected facilities. Shortly after the new law was enacted, the Administrative Rules of Montana dealing with fish disease were revised, which further defined FWPs authority to protect Montana's fisheries from introduction of disease. The enactment of the new statutes and rules was the single most important disease protection development of the 1980's.

1990's

The discovery of whirling disease in the Madison River in December 1994 greatly increased awareness of fish disease. With the announcement of the presence of the whirling disease parasite in the Madison River and a 90% decline in rainbow trout in the Madison, whirling disease made headlines across the country. The response was overwhelming and fish health was immediately moved to one of the top priorities of the FWP Fisheries Division. A state-wide survey was initiated to determine the presence of the parasite in Montana waters, an effort that found over 80 waters infected by 1999. A major emphasis was placed on whirling disease research and an unprecedented effort was made to understand whirling disease and how to fight it. The governor appointed a task force to deal with the disease and the Whirling Disease Foundation was formed. A fish disease with its own foundation emphasized the new public awareness of fish disease.

For the first time, many people in the public, as well as fisheries managers, realized the impact fish disease can have on wild fish populations and that fish disease is not just a hatchery problem.

By 1998, FWP's fish health lab had relocated from a 7' X 14' room to a remodeled facility developed in a house at Giant Springs Trout Hatchery. Also by that time, a Fish Health Specialist, Ken Staigmiller, was added to the staff, which doubled FWP's fish health staff to two full-time employees.

Since the late 1970's the USFWS had provided laboratory service to FWP from their Fish Disease Control Center in Fort Morgan, Colorado. In 1996, the Fort Morgan lab relocated to Bozeman, and FWP and the USFWS entered into a cooperative agreement for laboratory services. This agreement resulted in a very successful partnership, which currently provides excellent fish health protection for Montana fisheries. The Bozeman lab provides laboratory support services for all hatchery and wild broodstock inspections in Montana as well as trouble shooting diagnostic support. The two agencies are also working together to collect information on wild fish populations through the USFWS Wild Fish Survey, which was initiated in the late 1990's.

Since the beginning of Montana's fish health management efforts, Montana has been fortunate to have the Bozeman Fish Technology Center and its staff available to help with fish health issues. In particular, the support and expertise of histologists Charlie Smith, John Morrison and Beth MacConnell have been essential components of fish health diagnostics. Beth MacConnell has been especially valuable in recent years with a variety of fish health projects, including whirling disease detection and research. Even though Beth is a USFWS employee, she is currently working for FWP under a special agreement.

Another asset to Montana's fish health management program is a contract between FWP and Washington State University (WSU). Through this contract, WSU provides laboratory diagnostic support for state-wide whirling disease research and survey efforts. Montana's fish health project also utilizes WSU for diagnostic trouble-shooting support.

As fish health management became more and more integrated into all aspects of fisheries management in Montana, it became important to involve other fisheries personnel in the fish health decision-making process. The FWP Fish Health Committee was established, which included fisheries administrators, a hatchery manager and a fisheries manager. A commercial fish hatchery operator and representatives from the Bozeman Fish Health Center were also placed on the committee. This committee discusses a variety of fish health issues and makes recommendations to the FWP Fisheries Division. The committee deals with such things as wild fish transfers, import issues, commercial hatchery licensing and other appropriate fish health concerns.

During the 1990's fish disease diagnostics and treatments became more efficient, but at the same time more complicated. Diagnostic techniques include new methodologies that are many times more sensitive than previously used techniques. Some techniques are so sensitive that interpretation of results is sometimes difficult and determination of which technique to use is an important consideration. As knowledge of the distribution and impact of disease is gained we will have a better understanding of how to apply new technologies. Use of new disease treatments is equally complicated. INADs and special requirements for drug and chemical treatments have required very close coordination with FDA and other agencies. In 1998, the USFWS agreed to allow states to access INADs they have approved by FDA. This allows FWP to use non-registered drugs to treat fish disease. In order to handle the paperwork associated with these INADs, FWP entered into a contract with retired USFWS Bozeman Fish Technology Center Director, Bob Piper. Bob coordinates INAD paperwork between FWP, USFWS and FDA. This is a time consuming requirement, but it is necessary in today's operating environment.

Since the 1950's, the Montana Fish, Wildlife and Parks fish health project has developed into an effective and efficient disease control and health management program. Montana now has a comprehensive program, which is capable of dealing with fish disease issues in hatchery and wild stocks. Fish import and

transport issues are managed to reduce risk of disease introduction, and through the Montana FWP lab in Great Falls and the contracts with other agencies and partnerships which have been developed, the Montana fish health project is ready to deal with any fish health issue.

Hydropower Relicensing

By Chris Hunter

1970s – Kerr Dam

The original license to operate the Kerr Dam project was granted to Rocky Mountain Power in May, 1930. The license was scheduled to expire in May, 1980. The long and painful history of the Kerr Dam relicensing actually began in 1976 when the Montana Power Company (MPC) filed an application with the Federal Energy Regulatory Commission (FERC) for a new license to operate the Kerr Project. One month later, the Confederated Salish and Kootenai Tribes (CSKT) of the Flathead Indian Reservation filed a competing application.

1980s- Kerr Dam

MPC operated the Kerr Project from 1980-1985 under successive annual licenses pending the resolution of a number of environmental issues and studies. In July of 1985 the FERC issued a joint 50-year operating license for the Kerr project to the MPC and CSKT. As stipulated by the joint license, MPC is to operate the project for the first 30 years and the CSKT would have the option of operating the project for the remaining 20 years of the license.

The joint operating license included Articles 45, 46 and 47 requiring MPC to conduct fish and wildlife studies and to propose specific remedial measures to reduce the operation impacts of the Kerr Project. Specifically, operating impacts to fish and wildlife resources in Flathead Lake and the lower Flathead River as well as habitat loss due to erosion along the northern shoreline of Flathead Lake were to be studied.

1980s - Madison-Missouri

During the late 1980s the MPC initiated studies that would become an integral part of the license renewal application for the nine dams on the Madison-Missouri. Hebgen Dam is included in this license renewal application even though it does not generate any power itself. The remaining eight dams in downstream order are Ennis, Hauser, Holter, Black Eagle, Rainbow, Cochrane, Ryan and Morony. The most obvious issues as the process began were Madison River thermal problems believed to be associated with Ennis Dam, the possibility of peaking at Holter and the effect of peaking at Morony on Missouri River fish populations.

1990s – Kerr Dam

Following the issuance of the joint operating license, MPC conducted additional studies and utilized the studies of others to prepare a Mitigation and Management Plan (Plan) that was submitted in June of 1990. The Plan was the result of an extensive negotiation among MPC, CSKT, US Fish and Wildlife Service and Montana Fish, Wildlife and Parks. The Plan contained very little in the way of changes in the operation of the dam although the resource agencies all agreed that wide fluctuations in flow due to power peaking and load following had a huge impact on lower Flathead River fisheries resources. MPC maintained that they had to have the flexibility to operate the dam as they always had and thus would not negotiate on operations. One of the elements included in the Plan was the stocking of 131,000 pounds of salmonids to Flathead Lake to mitigate primarily for the loss of the kokanee fishery. The fluctuations were believed to have caused the dewatering of kokanee redds around the lake margin.

Subsequent to the Plan being submitted to the FERC, the Department of Interior, Bureau of Indian Affairs (BIA) became actively involved in the process for the first time. They determined to use their 4e (Section 4e of the Federal Power Act) conditioning authority to impose operational changes on the dam. These changes would greatly limit the ability of MPC to produce peaking and load following power. These

changes would likely benefit the downstream fishery and would greatly impact the economic value of the project. The 4e conditions also directed the management of lake levels to reduce erosion at the U.S. Fish and Wildlife Service lands at the north end of the lake.

The issuance of the Draft EIS, which included the 4e conditions, unleashed a firestorm of controversy. The MPC was very unhappy with the 4e conditions not only because they limited the operational flexibility and the economic vitality of the project but because FERC chose to make them additive to the mitigation outlined in the Plan. The recommendations for the management of lake levels resulted in the creation by a local politician of the National Organization to Save Flathead Lake. This organization intervened in the proceeding and generated a great deal of heat on FERC. The Final EIS was published in July, 1996 and looked very similar to the Draft EIS.

The greatest concern from the State's perspective was that the final 4e conditions did not recognize or acknowledge the State as co-manager of Flathead Lake with the CSKT. Virtually all of the responsibility for mitigation planning and implementation was given to the CSKT. The issues surrounding the license were still not resolved in late 1999. The MPC and CSKT continued to battle in court over mitigation dollars that the Tribes felt MPC should have to pay from 1985. The amount in question was roughly $15 million dollars.

The Kerr Dam relicensing was intimately interwoven with Hungry Horse mitigation, the development of a management plan for Flathead Lake, the listing of bull trout and the U.S. Fish and Wildlife Services's insistence that the lake trout fishery be decimated so that kokanee could be successfully reintroduced to Flathead Lake for the benefit of bull trout. This somewhat murky line of reasoning ignored the real problem in the lake, the introduction of Mysis, which severely altered the food web, as well as the likely competition of kokanee with westslope cutthroat trout, which, along with bull trout, were also being considered for listing under the ESA. All of these issues, combined, made for a potent witches brew of controversy in the always volatile Flathead drainage. Fortunately, the good working relationship between the department and CSKT was helping to make the management issues work out.

1990s - Madison-Missouri

MPC hoped to learn from the protracted Kerr Dam fiasco as they began the Madison-Missouri relicensing in earnest in the early 1990s. They hoped to achieve consensus among the agencies on the mitigation included in the relicensing application. If consensus could be achieve by the MPC and state and federal agencies, they believed they could submit a settlement agreement to FERC that would be adopted in total. **To this add?** several technical advisory committees were established to work on the specific issues of recreation, fisheries and wildlife.

This approach seemed to work well and, over the course of several years during the mid-1990s, a mitigation package was hammered out and submitted to FERC. There were several contentious issues that were resolved during this process, the most volatile of which was the Madison River thermal issue. Since at least the early 1970s, there had been discussions among MPC, FWP and anglers about the role of Ennis dam in creating the thermal problem downstream of Ennis dam. MPC had retained a MSU professor to model the thermal situation and his analysis seemed to indicate that the dam had little effect on the thermal regime downstream. FWP and local anglers never believed this analysis. The issue simmered for at least 20 years until it boiled over as the MPC 'consensus' package was being submitted to FERC.

Trout Unlimited, both the Madison-Gallatin Chapter and the national organization, intervened in the process with the intent to resolve this issue once and for all. They were very unhappy that they had not been party to the negotiations up to that point. They hired their own consultants and began to chip away at the technical analysis prepared by MPC. In an attempt to hold the mitigation package together, MPC retained several thermal modeling experts to meet with the agencies and TU to look closely just at the

thermal issue. Unfortunately their attempt was too little, too late, because the battle lines with TU had been drawn. TU refused to participate in the series of meetings.

The agencies found the meetings to be useful and informative. A new piece of the relicensing application package was prepared to deal specifically with the lower Madison thermal issue. It included mitigation primarily for acute thermal events, but not much for chronic thermal impacts. This was due to the fact that all of the modeling and data analysis showed little chronic thermal impact from the dam. This conclusion seemed to defy logic, but the scientific analysis seemed to bear it out.

The Madison thermal issue controversy made it clear that although there was consensus among the agencies and MPC on the mitigation package, there certainly was not with TU. Consequently FERC essentially threw out the funding portion of the mitigation package and many of the mitigation tasks as well in their draft EIS on the application. The FWP comments to the draft EIS were designed with the help of a FERC consultant, Fred Ayer, to get most or all of the mitigation tasks back into the license. Without a consensus package, FERC will not tell the applicant how much they must spend on mitigation, only the tasks they must complete. The comments were largely successful.

In December of 1999, the resource agencies were in the process of negotiating a memorandum with MPC to implement the license conditions. Because of the nature of the FERC decision, MPC is not committed to the dollar amount they had agreed to in the 'consensus' mitigation package submitted to FERC. MPC has greatly reduced the amount they say they are willing to spend, particularly in the Helena to Fort Benton reach of the river. However, Steve Leathe, the Region 4 fisheries manager, who has been involved in this process since its beginning, is pushing hard to see that the MPC lives up to its mitigation responsibilities.

Toward the end of this process, MPC sold all of its hydropower resources, with the exception of Milltown Dam on the Clark Fork, to **Pacific Power?**, a Pennsylvania-based energy company. This caused great consternation in Montana and in this process.

As the millenium wound down, everyone involved in the process was waiting to see if TU would sue the FERC for their decision on the Madison/Missouri, which largely supported the Madison River thermal mitigation package negotiated by MPC and the resource agencies. This story was far from over, although everyone hoped it was not destined to go as long as the Kerr relicensing process.

1990s - Noxon and Cabinet Gorge

Washington Water and Power (WWP) began their relicensing efforts on Noxon and Cabinet Gorge reservoirs in the mid 1990s. WWP, to their eternal credit, looked at the relicensing landscape and decided it was too dysfunctional. They did not want to become involved in a protracted Kerr or Madison-Missouri process. FERC at this time was interested in seeing a more collaborative approach taken toward the relicensing approach. WWP was willing to take a chance and try to make a collaborative approach work. WWP basically invited everyone with an interest in the relicensing to participate. They retained a facilitation consultant and let the process role. WWP created a Relicensing Team with representatives of virtually any entity with an interest in the process. The actual team had as many as 40 people at the table at any one time. The Team was supported by several technical committees that again had open membership. Over the span of 3 years, the Relicensing Team was able to develop a true consensus settlement agreement that FERC incorporated in total into the new license for these two projects. The settlement agreement included not only the tasks for which WWP would be responsible, but also laid out the dollars they would spend to achieve the mitigation goals. Four years after the process began, mitigation dollars were being spent on the ground.

A very large component of the Noxon/Cabinet mitigation package is an effort to restore bull trout as well as westlsope cutthroat trout to the lower Clark Fork.

Dams and Mitigation

By Brian Marotz

Hungry Horse and Libby Dams were constructed on the Flathead and Kootenai Rivers in the northwestern corner of the state. The huge reservoirs (Libby Reservoir was named Lake Koocanusa) are operated by the federal government for hydroelectric generation and flood control. These two headwater reservoirs provide 40 percent of the US water storage for the colossal Columbia River hydropower system. Dams radically affected Montana's fisheries resources by blocking migrations, inundating river channels and changing river flows and water temperatures. Then in 1980, Congress passed the Northwest Power Planning and Conservation Act that directed a portion of the revenues created by the dams into fish and wildlife mitigation and conservation. The Northwest Power Planning Council (Council) was formed, consisting of two representatives from each of the northwestern states, Montana, Idaho, Washington and Oregon. The Council crafted the Columbia Basin Fish and Wildlife Program (Program) that includes specific actions required to mitigate damages to fish and wildlife resources attributable to the construction and operation of Columbia River dams. Scientists throughout the basin submitted specific corrective measures to the Council for inclusion in the Program. In Montana, Pat Graham, now the Director of Fish, Wildlife & Parks, submitted the first program measures. Later, amendments were submitted by John Fraley and Brian Marotz of FWP, and Joe DosSantos of the Confederated Salish and Kootenai Tribes. Once approved by the Power Planning Council, the Program directed the state and tribes to implement the Program through funding by the Bonneville Power Administration. Fisheries mitigation began in 1982.

Dams influence several Fish Species of Special Concern in Montana, including the endangered Kootenai River white sturgeon and threatened bull trout. Westslope cutthroat and interior redband trout have also been petitioned for listing under the Endangered Species Act (ESA). The South Fork of the Flathead River contains an intact native species assemblage, including one of the strongest remaining populations of westslope cutthroat and bull trout. Libby Reservoir and the Kootenai River headwaters in British Columbia contain what may be the most viable metapopulations of bull trout in existence.

Federal funding enabled FWP to launch aggressive programs to repair the fisheries impacts caused by Hungry Horse and Libby dams. Fisheries mitigation includes habitat enhancement, fish passage improvements into blocked areas, rehabilitation of lakes, hatchery technology and monitoring to assess progress. First, researchers determined the extent of fisheries losses and causal factors in each subbasin. Computer models were constructed, using measurements and samples collected from the project sites. Model simulations enabled researchers to assess various strategies for operating the dams that would benefit fish in the reservoirs and rivers downstream. Operational guidelines called "Integrated Rule Curves" (IRCs) were developed to balance the needs of fish and wildlife with power generation and flood control. The Power Planning Council included the IRCs in their Fish and Wildlife Program in 1994, and Governor Marc Racicot adopted the IRCs as Montana's preferred operation shortly thereafter. State agents continue to struggle with downstream states and federal agencies to fully implement the IRCs, although many of the desired features have been implemented.

Through Hungry Horse mitigation, a device was installed on Hungry Horse Dam to restore natural water temperatures in the Flathead River downstream. Called "selective withdrawal", the structure was the result of five years of field research, computer modeling, huge public support and political support leading to a Congressional appropriation for construction. Since 1952, Hungry Horse Dam released frigid water year round from the bottom of the reservoir, causing unnaturally cool summer river temperatures and sudden thermal fluctuations that harmed fish growth and trout food availability. Then, in 1996, selective withdrawal became operational and warm water came through

the turbines for the first time since the dam was constructed, vastly improving trout growth potential in 44 river miles downstream. Fish passage improvements reopened 16 percent more tributary habitat for spawning westslope cutthroat from Hungry Horse Reservoir. Lake rehabilitation made Lion Lake the most intensively utilized small lake for anglers in Region One. Rogers Lake became a genetic reserve for the rare Red Lake stock of arctic grayling and a popular fishery for pure westslope cutthroat. Non-native and illegally introduced fish species were also removed from Murray Lake, Hubbart Reservoir, Bootjack Lake near Tally Lake, Dollar Lake and Devine Lake to create genetic reserves or important recreational fisheries. An innovative fish ladder using mainly native materials and stream reconstruction techniques reconnected Tayor's Outflow to the Flathead River, creating a wild spawning run.

Libby Mitigation reestablished naturalized spring flow conditions in the Kootenai River to aid in the recovery of the endangered white sturgeon, balanced with other native species in the reservoir and river. Lake rehabilitation restored the fisheries in Carpenter Lake, Bootjack Lake near Happy's Inn, and Little McGregor Lake. Stream reconstruction reopened fish passage and restored degraded habitat in Young Creek, Sinclair Creek and Terriault Creek near Eureka. Stream reconstruction on Pipe Creek has decreased bank erosion and restored fisheries habitat. A coordinated effort with the national program "Project Impact" has begun to restore Parmenter and Flower Creeks near Libby. Plans are underway to create youth fishing opportunities in a local gravel pit, which will be converted into a fishing pond. Libby Creek is the site of several mitigation projects, including an effort to reduce juvenile bull trout lost through an irrigation ditch while improving stream stability and fisheries habitat, stabilization of a very large slough, and another project which will insure bedload transport through a bridge site. Work at the mouth of O'Brien Creek will insure bull trout passage and eliminate the stream's access to an erosional bank. Additional work on O'Brien Creek will insure continued secondary water supply to the city of Troy while insuring bull trout passage and stabilizing stream banks.

Research continues on the status of burbot in the Kootenai River in Montana, as well as the Kootenai River white sturgeon. Libby Mitigation is funding a graduate project through the University of Idaho to document habitat use of juvenile white sturgeon in the Kootenai River in Idaho and Canada. Additional research will provide valuable information concerning the food habits of bull trout in the reservoir and river, as well as habitat preferences. A long-term study of habitat requirements and preferences for rainbow trout and mountain whitefish is nearing completion, and will be valuable in determining optimum flows for these species. Data from the white sturgeon study may also prove useful in these regards.

Several bull trout have been captured and radio-tagged to monitor fish migrations, movements, and the timing of spawning in river tributaries. Personnel recently cooperated with the Idaho Department of Fish and Game in capturing and tagging 8 bull trout in O'Brien Creek; Idaho personnel will track the fish. Libby Mitigation personnel also cooperate with B.C. Ministry of Environment – Fisheries personnel in their bull trout research and monitoring efforts, including redd counts and fish tracking.

Fisheries Program History – Bull Trout

By Ken McDonald

1950s-1970s

As large predators that feed on other fish, bull trout were considered an undesirable species by many in the angling community. Anglers were allowed to haul out bull trout and throw them onto the bank as a trash fish. Government sponsored suppression and eradication programs were carried out against bull trout through the 1930's in an effort to rid certain lakes and streams of this fish-eating predator. In addition, but trout habitat was degraded in many areas, resulting in further declines. Bull trout have very specific habitat requirements that are generally classified as the four C's – clean, cold, complex, and connected – referring to cold, clean, high quality water, complex in-stream and riparian habitat, and connectivity between spawning and rearing areas. Bull trout are very sensitive to changes in their habitat, and have declined in many areas where habitat conditions have been degraded.

1980s

By the 1980s, attitudes towards bull trout began to shift as bull trout ecology became better understood and concerns about declining numbers and distribution became more apparent. By 1986 bull trout were listed as a Species of Special Concern by FWP, and regulations resulting in protections to bull trout were gradually being implemented

1990s

By 1992, all waters were closed to the harvest of bull trout except Swan Lake and Hungry Horse Reservoir. Hungry Horse was later closed. In late 1993, in response to growing concern about the status of bull trout in Montana, Governor Marc Racicot convened the Governor's Roundtable to discuss issues and threats facing bull trout. As a result of the Roundtable, the Governor chartered a nine-person restoration team consisting of members from Montana Fish, Wildlife and Parks, Montana Department of Natural Resources and Conservation, U.S. Fish and Wildlife Service, U.S. Forest Service, Confederated Salish and Kootenai Tribes, National Wildlife Federation, Plum Creek Timber Company, Bonneville Power Administration and Montana Chapter of the American Fisheries Society. The Restoration Team was directed to develop a plan that maintains, protects, and increases bull trout populations:

1. which includes a process and timetable for recovery;
2. that uses shared research, appropriate information, and resources;
3. that sets specific restoration goals, resource management criteria and methods to monitor results;
4. complies with MEPA and other applicable state, federal, and tribal statutes and regulations; and

5. that is based upon the best available current information, and that identifies the biological habitat and needs of bull trout.

The Restoration Team appointed a Scientific Group that developed status reports for the 12 major drainages (or portions thereof) where bull trout occur in western Montana, referred to in the plan as Restoration Conservation Areas. These status reports described the current status and distribution, as well as summarized threats to bull trout within each drainage. They also identified core areas, which are watersheds containing the best remaining spawning and early rearing habitat in each major drainage. Over 120 core area watersheds have been identified. These status reports became the foundation around which the restoration plan was written. Additionally, the Scientific Group prepared three technical reports addressing specific issues related to bull trout: use of hatcheries to supplement bull trout, suppression or eradication, and the relationship between bull trout habitat requirements and land management activities.

The focus of Montana's bull trout restoration plan is protection of core areas, which comprise the majority of spawning habitat in Montana. Towards that end, the plan has the following objectives:

1. Protect existing populations within all core areas and maintain the genetic diversity represented by those remaining populations.
2. Maintain enlarged populations in historically connected core areas
3. Restore and maintain connectivity between historically connected RCAs.
4. Develop and implement a statistically valid population monitoring program.

A draft plan was completed in 1999, and the final is expected to be completed in early 2000. In addition to the goals, the state restoration plan contains guidelines and recommendations for local watershed groups and resource management agencies to meet the above objectives.

On June 10, 1998, bull trout throughout the Columbia River basin, including Montana, were listed as threatened under the Endangered Species Act. With listing comes federal oversight of bull trout management, as well as the requirement to develop a federal recovery plan for the species. Recovery planning began in January, 1999, and a final recovery plan is expected in late 2000. The Montana portion of the federal recovery plan will incorporate information already developed for the state's plan, especially the emphasis on protection of core areas. Delisting of bull trout will require achieving criteria set forth in the federal recovery plan for the entire Columbia River basin, including populations in Idaho, Oregon, Washington, and Montana.

+HISTORY OF THE BIGHORN RIVER FISHERY

By Ken Fraser

The history of the current Bighorn River fishery started in the early 1960s when plans were finalized to construct a 525 foot high concrete dam across the Bighorn River at the lower end of the spectacular Bighorn Canyon. Closing of Yellowtail Dam in October 1965 changed this silty warmwater stream into a world renowned tailwater trout fishery. The final report on the proposed "Yellowtail Unit", completed in 1962, predicted that Yellowtail Dam would improve the fishery in the river below the proposed dam. Little did anyone realize how big this change would be.

FWP began planting rainbow trout into the Bighorn River in 1966. Rainbow plants continued on an annual basis until 1973, then intermittently until 1983 in the upper river, and 1989 in the river near Hardin. Brown trout were never planted, but began to develop a wild population on their own shortly after the dam was closed. The trout grew rapidly in the Bighorn and the river gained a reputation for producing trophy fish. A 1965 FWP survey estimated less than 500 angler days of fishing were spent on the entire 84 miles of river downstream of Yellowtail Dam. By 1973, fishing pressure on the upper 12 miles of river above Bighorn Fishing Access Site (FAS) had grown to 13,000 angler days, roughly the same intensity of angler use being experienced on the Madison River.

Angling on the Bighorn River came to an end in 1975 when the crow tribe passed a resolution closing the entire reservation to hunting, fishing and trapping to all but tribal members. This started a long series of legal battles in which numerous sportsman organizations joined together to fight for the Bighorn. The fate of the Bighorn River fishery was finally decided in March 1981 when the Supreme Court ruled that the Bighorn River was a navigable stream, and that the bed and banks of the river belonged to the state of Montana.

The Bighorn River was finally reopened to anglers on August 20, 1981, but not without some conflicts. Most angers who were excited about trying their luck on the Bighorn on this "opening day" were turned around by a large group of Crow Indians who had set up barricades to block angler access. At least three separate incidents were reported where shots were fire near angler on the river during the first few weeks the river was open. Once these conflicts settled down, angling pressure on the Bighorn picked up where it had left off in 1975. Angler success was excellent on this previously lightly fished population, and many trophy sized fish were caught. Through the early to mid-1980s fishing regulations on the Bighorn were changed several time while FWP tried to develop proper management practices for this new fishery.

With the reopening of the river, FWP began annual electrofishing to monitor fish populations. A mark/recapture estimate in the fall of 1981, on the upper river, found 2,218 age 1 and older brown trout per mile. Rainbow numbers were low and no estimate was obtained this first year. Good flow conditions in the early 1980s in this new coldwater stream really helped the Bighorn trout populations expand. The trout population in the upper river reached a peak in 1987 of around 9,900 brown trout and 1,000 rainbow trout per mile. Poor flow conditions in the late

1980s and early 1990s resulted in a significant drop in Bighorn River trout numbers. The trout population in the upper river reached a low of around 3,900 trout per mile in 1995 before the effects of better flows took over. With the improved flow conditions experienced through the remainder of the decade, trout populations in the Bighorn fluctuated between about 4,000 and 7,500 trout per mile, with a growing part of this population being made up of rainbow trout.

As the fish populations increased, the Bighorn's reputation as one of the best trout streams in the world also increased. The Bighorn River began to draw nonresident anglers from around the world to compete with the many resident anglers who were already using the river. The big increase in interest in fly fishing in the early 1990s added to this influx of new anglers. As angler use continued to increase, many resident anglers quit going to the Bighorn because they did not want to fight the crowds. A creel census conducted on the Bighorn in 1982 - 1983 found that nonresident anglers accounted for 34% of the anglers using the river. Forty nine percent of these anglers fished strictly with flies. A similar creel study in 1992 - 1993 found that 74% of the anglers on the Bighorn were nonresidents, and 88% of Bighorn anglers fished exclusively with flies. Despite a feeling by many of the anglers contacted in 1992 - 1993 that the Bighorn was becoming too crowded, the number of anglers using the river continued to grow. The latest statewide angling pressure estimate for the Bighorn River estimated there were 91,909 angler days of use on the upper 12 miles of river between March 1997 and February 1998! An additional 21,514 angler days of use were reported for the river downstream of Bighorn FAS.

The future of the Bighorn fishery is not at all certain as we head into the next millennium. So far whirling disease has not been discovered in the Bighorn River, but whirling disease has the potential to devastate this fishery if it becomes established. Ongoing efforts to develop use regulations for the Big Hole Drainage will probably be carried over to the Bighorn River in coming years. And negotiations are currently going on to finalize a water compact with the Crow Tribe which would include the water in the Bighorn Drainage. Flow conditions seem to be the single most important factor that controls the Bighorn River fishery. The amount of water these compact negotiations provide for fisheries flows will be critical to the Bighorn River fishery well into the next century.

The History of FWP's Conservation and Management of Cutthroat Trout in Montana

Compiled by Brad Shepard – FWP
January 2000

Meriwether Lewis first described cutthroat trout on June 13, 1805 in his journal based on six fish ranging in length from 16 to 23 inches caught by Private Silas Goodrich at the Great Falls of the Missouri River (Moring 1996). The cutthroat trout described by Lewis are today recognized as the subspecies westslope cutthroat trout (abbreviated as WCT in the rest of this report). In 1836 Richardson formally described a cutthroat trout from a lower Columbia River tributary as *Salmo clarki* (Behnke 1992). All native species of North American trout were originally classified as belonging to the genus *Salmo.* This genus also included the Atlantic salmon and Eurasian trout. However, more recent information has led taxonomists to conclude that North American trout are more closely related to Pacific salmon, classified in the genus *Oncorhynchus,* consequently all North American trout species have been moved to the genus *Oncorhynchus* (Stearly and Smith 1989).

Fisheries biologists from Montana played a significant role in understanding the taxonomy and evolution of cutthroat trout. Montana biologists long recognized that cutthroat trout from the Clark Fork River basin appeared different from cutthroat trout inhabiting the Yellowstone River basin. They used the common name "westslope cutthroat trout" to describe those cutthroat trout inhabiting waters west of the Continental Divide and "Yellowstone cutthroat trout" (abbreviated as YCT in the rest of this report) to describe those cutthroat trout inhabiting the Yellowstone River drainage. Montana biologists also referred to those native cutthroat trout that inhabited the Missouri River basin as "Upper Missouri cutthroat trout", though they appeared to be more similar to "westslope cutthroat trout" than to "Yellowstone cutthroat trout". J.G. Cooper (1870) described and discussed catching WCT from the Missouri River near Fort Benton and reported catching cutthroat trout from mountain streams in the Missouri River basin and taking them across the Continental Divide "... to compare with those on the western slope, and am very doubtful whether these can be considered a distinct species,...."

George Holton of Montana Fish, Wildlife and Parks (FWP) was interested in the distribution and status of cutthroat trout in Montana and this led to a Master's thesis by Delano "Laney" Hanzel completed at Montana State University, Bozeman in 1959. In his thesis Hanzel (1959) provided photographs showing the differences between "westslope" and "Yellowstone" forms of the cutthroat trout, but he did not make specific taxonomic recommendations based on the different forms. It wasn't until much later that WCT (*Oncorhynchus clarki lewisi*) and YCT (*O. c. bouvieri*) were formally recognized as subspecies of cutthroat trout (Behnke 1979, 1988, 1992).

The historical distribution of both WCT and YCT in Montana can never be known with certainty. Hanzel (1959) reported that WCT were distributed in the Missouri River basin

down to the mouth of the Musselshell River and throughout the state west of the Continental Divide. George Liknes (1984) conducted a status review of WCT in Montana for FWP and reported that the known distribution of WCT included the entire portion of Montana west of the Continental Divide and the upper Missouri River and its tributaries downstream to Fort Benton, as well as the headwaters of the Judith, Milk, and Marias rivers. Behnke (1992) concurred with Liknes's assessment of the historical range. WCT are also native to waters in Idaho, Oregon, Washington, and southern British Columbia and Alberta in Canada. Leading to the confusion were early transplants of native (including WCT) and introduced trout to waters surrounding forts in Montana used by U.S. Army troops for use as a food source in the late 1800's. The historical range of YCT in Montana included only the upper Yellowstone River basin and extended from the Wyoming border at Yellowstone National Park down to about the Tongue River according to a status review conducted by Kathleen Hadley (1984) who was contracted by FWP to conduct this review. May (1996) documents that YCT did not occupy the lower Tongue River or Yellowstone River near the Tongue during the earliest documented fish surveys in the region, but speculates that YCT may have occupied these areas much earlier when climatic conditions were cooler.

Since all cutthroat trout subspecies were identified and managed as a single species until the 1970's, YCT were often stocked into drainages that supported WCT prior to 1980. YCT eggs were first taken from the West Thumb of Yellowstone Lake (Yellowstone National Park) in 1899, and from then to 1957 over 818 million eggs were gathered from Yellowstone Lake cutthroat trout (Gresswell and Varley (1988). Fish from some these eggs were distributed to Montana for stocking and records show that 400,000 of these YCT were planted out in 1903 and 600,000 were planted in 1904 (Alvord 1991). In 1908 Montana Fish and Game constructed the Washoe Park Hatchery and by 1912 this hatchery was raising over 2 million YCT for release throughout the state. Most of these fish were distributed to individuals and groups at railroad stops by a rail car called the "Thymallus" specially designed to transport fish.

In 1956 YCT egg-taking operations at Yellowstone Lake ended. Montana wanted a cutthroat trout to stock in high mountain lakes, so in 1969 gametes from 15 spawning pairs of YCT from McBride Lake in Yellowstone National Park were brought into the state's hatchery system (McMullin and Dotson 1988). Thus began the Department's brood of McBride strain YCT. These cutthroat trout can survive, spawn successfully, and grow well in mountain lakes and remain one of the primary sources of fish for stocking mountain lakes today.

The abundance and distribution of WCT have been on a long-term decline and WCT are now estimated to occupy less than 20% of their historical habitats in Montana. Their status is even worse in the Missouri River basin where they occupy less than 10% of their historical range. YCT have declined in a similar fashion in Montana and are now believed to occupy less than 650 miles of stream habitat and about 32% of main river habitats of the approximately 2,000 miles of river and stream habitats they were believed to historically occupy in the Yellowstone River basin from Yellowstone National Park down to about the Big Horn River (May 1996). Factors that have led to declines in

distribution and abundance of cutthroat trout include over-harvest, habitat loss, and introduction of nonnative fish into waters historically occupied by cutthroat trout. Over-harvest was probably a major impact in the late 1800's and early 1900's, but fish regulations presently restrict harvest for cutthroat trout to "catch-and-release" in streams and rivers where populations need protection. Habitat loss has occurred due to poor land management practices, de-watering of streams to divert water for human or agricultural use, construction of dams and diversions, and human development of flood plains. Nonnative fish introductions, especially brown, rainbow and brook trout, have led to serious consequences for cutthroat trout. Rainbow trout can interbreed with cutthroat trout and their progeny can reproduce. These hybrid crosses change the genetic make-up of the original cutthroat population; thus they are no longer pure WCT or YCT. YCT can hybridize with WCT and since YCT were stocked into many waters within the historic range of WCT this type of hybridization is common. In addition, nonnative trout can compete with and prey on both subspecies of cutthroat, and eventually nonnative trout will replace native cutthroat trout in most waters where they occur together.

George Holton and Joe Huston of FWP began collaborating with Dr. Fred Allendorf of the University of Montana to determine the genetic status of cutthroat trout in Montana using allozyme electrophoresis around 1978. This collaboration continues and has made Montana the leader in using genetic information for the management and conservation of native fishes. This information also led to the recognition that those native cutthroat trout inhabiting the Missouri River basin referred to as "Upper Missouri cutthroat trout" were indistinguishable from WCT and thus were the same subspecies.

FWP biologists and fish culturists have been actively conserving cutthroat trout throughout the Department's history. Unfortunately, the lack of scientific and management distinction between the two cutthroat trout subspecies prior to the 1970's led to a mixing of the two subspecies. A 1971 article in Montana Outdoors by Vern Campbell (Vol.2, Number 3:7-9) cites Hanzel's (1959) study and concludes that the greatest need is for the "immediate preservation and restoration of as much natural habitat as possible". FWP designated the WCT as a "Species of Special Concern" within Montana in 1972 based on a recommendation from the Montana Chapter of the American Fisheries Society. The cutthroat trout was designated as the "state fish" of Montana in 1977. This designation did not differentiate between the two subspecies, westslope and Yellowstone, native to the state. The USDA Forest Service designated the WCT as a "Sensitive Species" in 1988. These designations recognized the unique stature of WCT as a native fish species that requires clean, cold waters to survive. These designations also recognized that special management emphasis was needed to slow their decline. In June of 1998 the USDI Fish and Wildlife Service (FWS) was petitioned, under the Endangered Species Act, to list WCT and "threatened" throughout its range. The FWS has determined [SHOULD BE DONE BY PUBLICATION]?????

Westslope Cutthroat Trout

Joe Huston, a retired FWP Fisheries Biologist who was instrumental in initiating numerous conservation actions for WCT, and the Conservation Genetics Committee

(Leary et al. 1991) provided the following synopsis of Montana's effort to culture WCT. There is no evidence that WCT were raised in FWP or federal fish hatcheries prior to 1952. The first attempt to bring WCT into a hatchery occurred when Bob Mitchell, Jim Lucas, and an unidentified game warden from Great Falls flew horses into Big Praire within the South Fork of Flathead River basin in 1952 and collected 32 live WCT from Big Salmon Lake by angling. These WCT were flown out and kept in FWP's Jocko River (Arlee) Hatchery. Eggs were taken from these fish in 1953 and 1954, but only spawning success was low. Fish raised from these eggs were transferred to the FWP Hamilton Fish Hatchery in May of 1955 to start a WCT brood. There is a question whether this brood maintained its genetic integrity because either rainbow trout were present in Big Salmon Lake or were also held at this hatchery. Genetic testing of WCT in North Bigelow Lake that originated from this hatchery found the fish population was 97% WCT and 3% rainbow. In 1961 the Hamilton Hatchery was closed and its WCT brood was moved to the FWP Libby Hatchery. Both westslope and Yellowstone cutthroat were raised at the Libby Hatchery and it is likely that the WCT became even more introgressed during its use at Libby. All WCT brood were planted out from the Libby Hatchery in 1969.

In 1954 personnel from FWP, the U.S. Fish and Wildlife Service (FWS), and several anglers from Kalispell captured 135 adult WCT from Hungry Horse Reservoir tributaries (Felix, Hungry Horse, Murray, Quintonkon, and Sullivan creeks) during the spawning season. These fish were taken to the federal FWS Creston Hatchery. It is likely that this brood became contaminated with YCT because male WCT ripened much later than female WCT and YCT males were sometimes used to fertilize eggs from WCT females. This WCT brood and all WCT were moved to FWP's Anaconda Hatchery in the spring of 1957 and subsequently all fish were planted out sometime in late 1957. However, eggs from two or three pairs from the Creston Hatchery were transferred to FWP's Somers Hatchery. These eggs were used to found a Laurie Lake WCT brood in 1958 after it had been chemically treated to eliminate all fish. The Somers Hatchery started taking WCT eggs from Lauri Lake in 1960. This brood was also released into Spoon Lake (Ninemile) in 1965. From 1960 to 1970 WCT eggs were taken by the Somers Hatchery crew from Laurie or Spoon lakes for rearing and planting. In 1964 some WCT from Laurie Lake were moved back to the FWS's Creston Hatchery where they were maintained until 1971 when they had to be destroyed due to a furunculosis disease outbreak.

The first documented genetically pure WCT brood stock was collected by Joe Huston and Bob Mitchell. They collected about 23,000 eggs from Hungry Horse Creek and 2,000 from Emery Creek in 1965 and another 4,000 in 1967. Fertilized eggs from these two creeks were taken to FWP's Arlee Hatchery. Vern Campbell was the Hatchery Manager of Arlee at the time. Ironically, the first 23,000 eggs taken in 1965 were destined for the Anaconda Hatchery, but Bob Mitchell stopped at the Arlee Hatchery and he and Vern Campbell decided to keep the WCT brood stock at Arlee. This brood remained in Arlee until 1980. It was then moved to the Murray Springs Hatchery, after its construction by the U.S. Army Corps of Engineers as partial mitigation for impacts of Libby Dam on the Kootenai River fishery.

This original WCT brood was found to have had a significant reduction in its genetic variation compared to the wild source WCT in Hungry Horse Creek after 14 years in the hatchery (Allendorf and Phelps 1980). The hatchery stock had (1) a 57% reduction in the proportion of polymorphic loci, (2) a 29% reduction in the average number of alleles per locus, (3) a 21% reduction in the average heterozygosity per individual, and (4) significant changes in allelic frequencies between age-classes. The loss of variation was attributed to both a limited number of founders of the hatchery stock and the effects of genetic drift in the maintenance of the hatchery stock because of non-random matings. By 1983 this lack of genetic variation was adversely affecting hatching success and developmental problems including morphological deformities were prevalent (Leary et al. 1985). Because of these problems it was decided that this broodstock would be terminated and all these fish were stocked out in 1986.

Based on the genetic problems that occurred with this brood FWP worked with the Salmon and Trout Genetics Laboratory at the University of Montana to develop a new "wild" brood that was designed to preserve as much genetic diversity from the wild as possible. The present WCT brood stock was founded in 1983-84 from 6,445 fish collected from 12 South Fork Flathead River tributaries and two Clark Fork tributaries. Prior to collecting these fish, genetic electrophoretic analyses were conducted on individuals from all donor populations and all donor populations were found to be 100% pure WCT. In addition, disease testing was conducted on all populations and no detectable fish pathogens were found. This new brood was housed at FWP's Murray Springs Hatchery. Part of the genetic breeding program for this wild brood was that the source of fish for this brood were obtained from many different WCT populations that exhibited different life history strategies - lake stocks, river stocks, and stream stocks. There was no and continues to be no intentional selection at the hatchery for domesticate characteristics, such as fast growth or early spawning. In addition, matings between fish are done randomly and wild fish are to be brought into the hatchery at periodic intervals to ensure domestication is kept to a minimum. In addition, the plan calls for the infusion of enough wild fish from aboriginal populations to contribute at least 5-10% contribution to the brood stock for three successive years every 10 years. This infusion has not yet been done, even though it was scheduled for 1995.

It was soon discovered that the water source at the Murray Springs Hatchery was not ideal for spawning and raising the wild WCT brought into that hatchery because it was too warm, so this brood was moved to the Washoe Park Hatchery in Anaconda in 198

where it resides today.

FWP has formed strong collaborative partnerships with Forest Service and Bureau of Land Management Fisheries Biologists to survey WCT populations and collect fish for genetic testing. Genetic testing of WCT populations that began around 1978, primarily by Joe Huston out of the Kalispell Regional Office, have intensified through time resulting in some genetic testing being done for a majority of know WCT populations.

Forest Service Fisheries biologists that have been leaders in this effort include Bruce May of the Gallatin National Forest, Len Walch and Archie Harper of the Helena National Forest, Mike Enk of the Flathead and Lewis and Clark National Forests, Pat VanEimeren of the Flathead National Forest, Dick Kramer of the Lolo National Forest, Doug Perkinson of the Kootenai National Forest, David Browning Kathy Thompson, Denise Vore, and Bruce Roberts of the Beaverhead National Forest, Brian Sanborn of the Deerlodge National Forest, Rick Stowell of the Forest Service's Region One Office, and David Kampwerth of the Dillon Resource Area of the BLM. FWP biologists that have contributed significantly to this effort include Joe Huston, Bob Domerose, Bruce May, Scot Rumsey, Ladd Knotek, Steve Leathe, John Fraley, Tom Weaver, Mike Hensler, Scott Snelson, Ron Pierce, Don Peters, Dennis Workman, Chris Clancy, Rod Berg, David Schmetterling, Wayne Hadley, Jim Vashro, Pat Byorth, Jim Brammer, Dick Oswald, Ian Chisholm, Mark Delray, Wade Fredenberg, Les Everts, and Brad Shepard.

In addition to survey work and genetic testing, FWP has completed rehabilitation projects to remove nonnative trout from several streams and lakes in the state that were then populated by WCT, either from WCT remaining in the stream drainage or from WCT brought in from another stream. The two earliest projects were completed in the early 1970's. Joe Huston, a leader in WCT conservation for FWP, rehabilitated Young Creek, a tributary stream to the Kootenai River following the creation of Libby Reservoir (Lake Koocanusa), to create a spawning run of WCT from the reservoir into Young Creek. Young Creek was treated with rotenone to remove nonnative brook trout and then WCT that had been collected from Young Creek and held in FWP's Somers Hatchery were stocked back into Young Creek.

FWP formed a WCT Conservation Genetics Committee in the late 1980's to develop a plan for conserving and restoring WCT in the state. This committee consisted of Dr. Robb Leary (chairperson), Kathy Knudsen, and Kevin Sage from the Wild Salmon and Trout Genetics Laboratory at the University of Montana, Thurston Dotson, Bill Hill, George Holton, Joe Huston, and Scott Rumsey from FWP, and Dave Genter from the Montana Natural Heritage Program. This committee developed recommendations for a rating system for conservation and management of WCT that relied on genetic status and threats from introgression or competition, and recommended brood stock development, maintenance, and stocking policies. While these recommendations were incorporated into FWP's database system and as policy for managing the WCT brood, no further actions were taken by FWP to implement these recommendations into a conservation/ restoration strategy until 1994.

In 1994 FWP formed another Technical Committee to recommend strategies for conserving WCT in Montana that were strictly based on biological criteria. The initial emphasis of this committee was to conserve WCT in the Missouri River basin. The Technical Committee was made up of fish professionals from throughout Montana and included representatives from FWP (Dick Oswald, Jim Brammer, Anne Tews, Ladd Knotek, Mark Delray, Brad Shepard [chairperson]), the Forest Service (Mike Enk and Brian Sanborn), the Bureau of Land Management (David Kampwerth), the FWS (Lynn Kaeding, Pat Dwyer, and Robon Wagner), and the Wild Salmon and Trout Genetics

Laboratory at the University of Montana (Dr. Robb Leary). In 1998 this technical committee published their recommendations for genetic conservation of WCT in the Upper Missouri River basin (Leary et al. 1998). In 1997 a Steering Committee was formed by FWP to develop formal recommendations to conserve WCT throughout the state using biological strategies developed by the Technical Committee. The Steering Committee was open to all interested parties and letters soliciting members for this committee were sent to a wide group of interests. The Steering Committee included representatives from the agriculture (Montana Stockgrowers and Farm Bureau), timber (Intermountain Forest Industry Association), land and fish conservation (American Wildlands, Montana Chapter of the American Fisheries Society), and angling (Trout Unlimited and Montana Wildlife Federation) communities, as well as federal (FWS, Forest Service, BLM) and state (FWP, DNRC, DEQ, and NRCS) agencies in the state.

This Steering Committee agreed upon an overall conservation goal for conserving WCT in Montana (Montana Department of Fish, Wildlife and Parks 1999). **The management goal for westslope cutthroat trout in Montana is to ensure the long-term, self-sustaining persistence of the subspecies within each of the five major river drainages they historically inhabited in Montana (Clark Fork, Kootenai, Flathead, Missouri, and Saskatchewan), and to maintain the genetic diversity and life history strategies represented by the remaining local populations.** The Steering Committee also developed five objectives to reach the goal:

1. Protect all genetically pure WCT populations.
2. Protect slightly hybridized populations (<10% hybrid) until a basin-wide conservation plan has been developed. Basin planning will occur by river basin (ie. Big Hole, Smith, Blackfoot, Stillwater, Yaak).
3. Ensure the long-term persistence of westslope cutthroat trout within their native range.
4. Provide technical information, administrative assistance, and financial resources to assure compliance with these listed objectives and to encourage conservation of WCT.
5. Design and implement an effective monitoring program by the year 2002 to document persistence and demonstrate progress towards the goal.

Several strategies to conserve and restore WCT will be implemented. Existing populations will be conserved by 1) protecting and, in some cases, enhancing habitats they now occupy; 2) ensuring that nonnative salmonids cannot invade them by constructing barriers to prevent upstream movement of these nonnative fish; and 3) where nonnative fish are presently threatening existing populations, remove nonnative fishes. WCT populations will also be restored to some areas they do not now occupy. In most cases, wild WCT from a nearby stream will be used to "re-found" these new WCT populations. Using an existing wild stock to "re-found" a new population will help preserve the genetic variability now present in existing wild populations. In addition FWP's Washoe Park Hatchery WCT will also be used to "re-found" some new populations and will continue to be used for stocking mountain lakes. An effort will be made to preserve and restore groups of WCT populations within interconnected habitats

in an attempt to preserve the migratory life history form of this subspecies. These strategies are presently being implemented and evaluated.

Yellowstone Cutthroat Trout

Since YCT historically inhabited only the Yellowstone River drainge from Yellowstone National Park down to about the Big Horn River, conservation and management efforts have focused on this drainage. A number of FWP and Forest Service fisheries biologists have been involved with this effort including Al Wipperman, Larry Peterman, Dennis Workman, Rich Stevenson, Chris Clancy, Brad Shepard, and Joel Tohtz who all were fisheries biologists working on the upper Yellowstone River out of Livingston, Montana for FWP; Rod Berg who did a special inventory of the Yellowstone River basin for FWP; Mike Poore, Jim Darling, Ken Frazier, Steve McMullin, Pat Marcuson, and Clint Bishop of Region 5 FWP; and Bruce May, Jim Lloyd, and Scot Shuler of the Gallatin National Forest. In 1991 a group initiated by the Montana Chapter of the American Fisheries Society formed to make conservation management recommendations for conserving YCT. This group consisted of Bruce May and Ray Zubick of the Forest Service, Brad Shepard and Jim Darling of FWP, Dave Genter of the Nature Conservancy, Lynn Kaeding of the Fish and Wildlife Service, and Robb Leary of the University of Montana's Wild Salmon and Trout Genetics Laboratory. Mike Stone of Wyoming Fish and Game was added to this group in 1994. This group developed a draft conservation management guide by 1994 and presented this guide to FWP. Unfortunately, priorities in FWP at the time prevented the adoption and implementation of this management guide. In 1998 [CHECK WITH JOEL TOHTZ AND KEN MCDONALD] a second effort to develop a conservation strategy for YCT in Montana was initiated. [GET PARTICULARS OF THIS EFFORT FROM KEN MCDONALD, JOEL TOHTZ, BRUCE RICH AND JIM DARLING].

Several conservation efforts to enhance recruitment of YCT to the Yellowstone River have been accomplished. Barriers to stream spawning YCT near the mouths of several spawning tributaries were made passable by the installation of culvert fish ladders. A ladder was initially installed and evaluated in Cedar Creek (Clancy and Reichmuth 1990), similar ladders were subsequently placed in a railroad stream crossing in Mol Heron Creek with assistance from the Yellowstone Fly Fishers out of Gardiner and in a culvert near the mouth of Cinnabar Creek. The Cinnabar Creek ladder was later removed during a flood and debris torrent event in Cinnabar Creek. Instream flow leases to enhance recruitment of YCT to the Yellowstone River have been obtained in Cedar and Mill creeks and leases are pending in Mol Heron and Big creeks. A barrier to upstream fish migration was installed in upper Mill Creek to preseve the genetic integrity of YCT inhabiting the upper basin. [GET OTHER PROJECTS – INCLUDING SHIELDS RIVER FROM JOEL TOHTZ AND SCOT SHULER]. [GET PROJECTS FOR MID-YELLOWSTONE FROM MIKE POORE AND JIM DARLING].

References

Allendorf, F. W. and S. R. Phelps. 1980. Loss of genetic variation in a hatchery stock of cutthroat trout. Transactions of the American Fisheries Society 109:537-543.

Alvord, B. 1991. A history of the Montana's Fisheries Division from 1890 to 1958. Montana Department of Fish, Wildlife and Parks, Helena, Montana.

Behnke, R.J. 1979. Monograph of the native trouts of the genus *Salmo* of western North American. Unpublished report.

Behnke, R.J. 1988. Phylogeny and classification of cutthroat trout. American Fisheries Society Syposium 4:1-7.

Behnke, R.J. 1992. Native trout of Western North America. American Fisheries Society Monograph 6, Bethesda, Maryland.

Clancy, C. G. and D. R. Reichmuth. 1990. A detachable fishway for steep culverts. North American Journal of Fisheries Management 10:244-246.

Cooper, J.G. 1870. The fauna of Montana territory. The American Naturalist 3:124-128.

Gresswell, R.E. and J.D. Varley. 1988. Effects of a century of human influence on the cutthroat trout of Yellowstone Lake. American Fisheries Society Symposium 4:93-106.

Hadley, K. 1984. Status report on the Yellowstone cutthroat trout (*Salmo clarki bouvieri*) in Montana. Final Report submitted to Montana, Department of Fish, Wildlife and Parks, Fisheries Division, Helena, Montana.

Hanzel, D.A. 1959. The distribution of the cutthroat trout (Salmo clarki) in Montana. Proceedings of the Montana Academy of Sciences 19:32-71.

Leary, R.F., T. Dotson, D. Genter, B. Hill, G. Holton, J. Huston, K.L. Knudsen, S. Runsey, and G.K. Sage. 1991. Westslope cutthroat trout restoration program: past and present distribution, brood stock program, and conservation genetics committee report. Montana Department of Fish, Wildlife and Parks, Helena, Montana.

Leary, R.F., F.W. Allendorf, and N. Kanda. 1997. Lack of genetic divergence between westslope cutthroat trout from the Columbia and Missouri river drainages. Wild Trout and Salmon Genetics Laboratory Report 97/1, Division of Biological Sciences, University of Montana, Missoula, Montana.

Leary, R.F., B.B. Shepard, B.W. Sanborn, W.P. Dwyer, J.A. Brammer, R.A. Oswald, A. Tewes, D. Kampwerth, M. Enk, R. Wagner, and L. Kaeding. 1998. Recommendations from the Westslope Cutthroat Trout Technical Committee for

the genetic conservation of the westslope cutthroat trout in the Upper Missouri River drainage. Montana Department of Fish, Wildlife and Parks, Helena, Montana.

Liknes, G. A. 1984. The present status and distribution of the westslope cutthroat trout (*Salmo clarki lewisi*) east and west of the Continental Divide in Montana. Final Report to the Montana Department of Fish, Wildlife and Parks, Fisheries Division, Helena.

May, B. 1996. Yellowstone cutthroat trout, *Oncorhynchus clarki bouvieri*. Pages 11-34 in D.A. Duff, Technical editor. Conservation assessment for inland cutthroat trout status and distribution. U.S.D.A. Forest Service, Intermountain Region, Ogden, Utah.

McMullin, S.L. and T. Dotson. 1988. Use of McBride Lake strain Yellowstone cutthroat trout for lake and reservoir management in Montana. American Fisheries Society Symposium 4:42-44.

Montana Department of Fish, Wildlife and Parks. 1999. Memorandum of understanding and conservation agreement for westslope cutthroat trout (Oncorhynchus clarki lewisi) in Montana. Helena, Montana.

Moring, J. R. 1996. Fish discoveries by the Lewis and Clark and Red River Expeditions. Fisheries 21:6-12.