Creating Resilient Habitats:

Native Fish Recovery in a Time of Climate Change

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by Mike Bader and Jack Tuholske

Executive Summary

Global warming will have profound effects on the northern Rocky Mountains of the U.S. The impact of global warming on cold water fisheries, which are already stressed by degraded habitat, disease, and hybridization, will be profound. Global warming will increase water temperature and decrease stream flow. Native fisheries have evolved with, and depend upon, cold water and interconnected habitat for survival. Native trout like bull trout and westslope cutthroat are already imperiled from the cumulative impacts of a century of logging, dams, mining and urbanization in the northern Rockies. Global warming may constitute the proverbial straw that breaks the camel's back and leads to the extinction of numerous populations and perhaps entire species.

This paper touches upon the challenges presented by climate change in the face of habitat impacts that have already compromised native fish. Bull trout, one of the nation's largest freshwater salmonids, require the coldest water of all native fish. They can provide an excellent yardstick to measure aquatic health and protect other native fish throughout their home range in the northern Rockies and Pacific Northwest. Their protection under the Endangered Species Act will help spur conservation and recovery efforts, which can dovetail with a strategy to protect the species from climate change.

Timely and effective pro-active measures are needed to ensure the survival of native fish. Cooperative habitat improvement projects can improve current populations and buffer habitat from some of the effects of global warming. We suggest a coordinated combination of ecosystem based habitat protection and restoration, education and outreach focused on bull trout and westslope cutthroat to address the effects of global warming before those effects overtake already imperiled populations.

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Introduction

A variety of strategies – legal, political and educational – have significantly advanced the protection of native fisheries in the northern Rockies over the past 20 years. Conservation groups across the West have been at the forefront of these efforts, which have led to a sea-change in attitudes towards protecting our native fish and the habitat they require. However, climate change poses problems that have not been addressed by previous efforts. The habitat impacts posed by climate change in the northern Rockies threaten the future of native trout and cold freshwater ecosystems.

The Intergovernmental Panel on Climate Change report, issued by 2,500 of the world's leading experts in climate change research, ended the debate over whether global climate change is real. Significant increases in mean annual temperatures have been documented. These changes are now apparent in the heart of the northern Rocky Mountains. Montana has seen a 2.1°F increase in annual temperature above 20th century averages (Kinsella, et al. 2008). Glaciers are in rapid retreat in Glacier National Park, extended droughts have led to large-scale wildfires, and Missoula, Montana saw 11 days in July 2007 exceed 100°F including an all-time record 107°. The monthly average high for that period was a record-breaking 96.5°F, perhaps a harbinger of future summers in the Rockies.

For native cold water species like bull trout *(Salvelinus confluentus)* and cutthroat trout *(Oncorynchus clarki lewisi),* global warming spells trouble. These species are already threatened and sensitive due to a host of human-caused impacts to their habitat and distribution. The additional impacts posed by increased stream temperatures compound existing problems and threaten to undo the great progress that has been made in protecting and restoring native fisheries.

Bull trout waters in the northern Rocky Mountains include some of the crown jewels of the U.S. National Park and Wilderness system. Flowing from 10,000 foot peaks, snowfields and glaciers, bull trout strongholds include Glacier National Park, the Bob Marshall, Cabinet, Selway-Bitterroot, Frank Church-River of No Return, and Sawtooth Wilderness Areas and some of America's most famous rivers including the Clark Fork of the Columbia, Flathead, Blackfoot and the Bitterroot in Montana and the Snake, Clearwater, Pend'Oreille and the Salmon in Idaho. Bull trout are the leading indicator species for aquatic ecosystem health within these riverine ecosystems.

"Global warming is the single greatest threat to the survival of trout in America's interior West."

— The Impacts of Global Warming on Trout in the Interior West, Natural Resources Defense Council & Montana Trout Unlimited, July 2008

Bull Trout in the Northern Rockies and Northwest

The focus of this paper is on bull trout, the most habitat-sensitive of all fish species native to the northern Rockies and Northwest. Thus, protecting bull trout benefits cutthroat and other species that depend on clean, cold freshwater habitat.

Following several years of effort and litigation by conservationists, fishing organizations and others, the bull trout was listed as a Threatened Species pursuant to the federal Endangered Species Act (ESA) in June 1998. Native to the Pacific Northwest and northern Rockies, bull trout were historically widely distributed and abundant in both major river systems and smaller mountain streams. Most mountain streams in Montana west of the Continental Divide contained healthy bull trout populations.

Over the last one hundred years bull trout have declined precipitously, both in number and range. Compared to other salmonids, bull trout have more specific habitat requirements that influence their distribution and abundance. These habitat components include very cold water temperature, cover, channel form and stability, valley form, stream elevation, spawning and rearing substrates, and migratory corridors. Human activities over the last century such as logging, road construction, dams, mining, grazing, and urban development have impacted bull trout habitat, causing widespread and significant population declines and local extirpations. In addition, over-fishing and the introduction of exotic (non-native) species has contributed to the ongoing demise of the species. *See generally Friends of the Wild Swan v. USFWS, (FOWS I)* 945 F. Supp 1388, 1391-2 (D. Or. 1996).

Based on the overwhelming scientific evidence, the Fish and Wildlife Service found that persistence of migratory bull trout and maintenance or re-establishment of stream migration corridors is essential to the survival and recovery of bull trout. (FOWS I, 945 F. Supp. at 1391)

Bull trout have been extirpated from more than half of their former range. They are extinct in California, extinct from numerous historically-occupied streams and lakes, and imperiled in their remaining habitat. In 1994 the U.S. Fish & Wildlife Service summarized the decline of the species:

> Bull trout distribution has been significantly reduced since pre-settlement times. River basins once supported larger, migratory forms and numerous local populations distributed throughout tributary streams. Highly migratory fluvial populations have been eliminated from the largest, most productive river systems across the range. Most river systems now contain only isolated, remnant populations of resident fish restricted to the headwater areas of a few remaining suitable tributaries. These remnant populations have lost their migratory life-history forms, exist in isolation, and are likely to be at extreme risk of extinction. (*FOWS I,* 945 F. Supp. at 1392.)

Bull trout exhibit one of four different life history forms: resident, fluvial, adfluvial, and anadromous. Resident bull trout are non-migratory and spend their entire life cycle in the same or nearby streams. They do not distribute themselves through a basin as do migratory forms and so they do not re-colonize vacant habitats, and as such, are more prone to extinction. Fluvial, adfluvial and anadromous bull trout are migratory. Like salmon, they spawn in tributary streams and as juveniles migrate to either a lake (adfluvial), large river (fluvial), or salt water (anadromous) to mature, and return to small streams to reproduce. Migratory bull trout facilitate genetic interchange among local and regional populations and ensure sufficient variability within populations. They also serve to recolonize local populations extirpated by natural or human-caused events.

Throughout the period of official reviews, the U.S. Fish & Wildlife Service has persistently emphasized the importance of migratory corridors for bull trout throughout their range.

In addition, the construction of dams on main stem rivers like the Columbia and Snake has accelerated the loss of migratory bull trout and the consequent fragmentation of habitat. In the 1998 Final Listing Rule, the Service again concluded that loss of migratory corridors and adverse modifications of habitat have imperiled bull trout. "Within the Columbia River population segment, 66 percent of bull trout subpopulations are isolated by dams or indirectly by dam or water diversion operations that alter habitat conditions." 63 F.R. 31658.

The 1998 Final Listing Rule speaks at length to the essential role of migratory corridors for both survival and recovery of bull trout. "Many remaining subpopulations in both the Klamath River and Columbia River population segments are at risk from the combined effects of habitat loss and fragmentation, loss of migration corridors, and inability to reestablish extirpated subpopulations through emigration, and recovery actions are required to slow the rate of habitat loss and continued reductions in range. 63 FR 31655. "Relative to bull trout, maintenance of migratory corridors is essential to provide connectivity among subpopulations thought to be sources and sinks, and enables the reestablishment of extirpated subpopulations. 63 FR 31670.

…the Bush Administration retreated from its original designation of critical habitat and promulgated a Final Critical Habitat Rule that designated only 10% of the original proposal.

In the northern Rockies, migratory corridors like the Clark Fork, Flathead and Blackfoot Rivers are critical to the continued recovery of the species. Yet the crucial cold-water habitat in these larger streams is at risk due to global warming. Increased temperature coupled with persistent late summer lower flows, both predicted impacts from global warming, will diminish the ability of these rivers to provide habitat for bull trout.

In the 2002 Draft Critical Habitat Rule, the Service found: "[S]cientific evidence also supports the position that maintaining multiple bull trout populations distributed and interconnected throughout their current range will provide a mechanism for reducing the risk of extinction from stochastic events." Thus, migratory corridors, and maintenance of cold water fisheries habitat, go to the heart of the recovery strategy for bull trout.

Recognizing the inter-relationship between critical habitat and the Recovery Plan, the 2002 Draft Rule explained that "The draft recovery strategy focuses primarily on the maintenance (and, where needed, expansion) of existing local populations by .... sustaining (and in some cases reestablishing) movement corridors to maintain migratory routes and the potential for gene flow between local populations by maintaining habitat conditions that allow for fish passage." 67 FR 71243.

Unfortunately, the Bush Administration retreated from its original broad designation of critical habitat, and in 2005 promulgated a Final Critical Habitat Rule that designated only 10% of the original proposal. The Rule is currently under challenge in federal district court in Oregon.

The protection of bull trout under the ESA was initially driven by litigation, as state governments and the U.S. Fish and Wildlife Service resisted mandatory measures to assure their survival. However, the listing of bull trout has prompted state and federal land managers to focus on protecting bull trout. For example, the state of Montana convened a Bull Trout Study Group that developed excellent watershed-based recovery goals. The U.S. Forest Service implemented an Inland Native Fish Strategy (INFISH) with habitat standards to limit future impacts of habitat degrading activities. Public-private partnerships, like the recent purchases of thousands of acres of Plum Creek timberlands and their eventual protection as public lands, will compliment habitat protection already in place on federal lands. More recently, partnerships between state agencies, private organizations and the Forest Service have taken the protection of native fisheries out of the courtroom and into the realm of public education. These efforts offer great promise to combine public awareness of the value of ESA protection for native fisheries with new ideas to promote public education and awareness.

While these efforts have resulted in a profound and beneficial appreciation for bull trout and other native fisheries by government agencies, new strategies are needed to move beyond the litigation arena. Moreover, the critical habitat designation, INFISH or state recovery plans do not address the problems posed by climate change in the northern Rockies. As discussed below, bull trout and other native fisheries are especially sensitive to changes in water temperature. New approaches are needed to compliment existing strategies to ensure that climate change does not undo all of the combined efforts to protect and restore bull trout and other native fish.

What Climate Change Could Do to Native Fisheries

Bull trout came from the North with the advance of the glaciers during the Ice Ages. As a member of the Char family, bull trout have evolved with very cold water conditions. In fact, their requirements for cold water are greater than for other salmonids. For example, average summer stream temperatures should ideally be less than 58º F. while spawning and rearing habitats should be 48º F. or less. Biologists report that ideal temperatures for incubation range from 36° F. to 39º F. (Rieman and McIntyre 1993). Thus, bull trout are the quintessential indicator species for monitoring the effects of climate change in the northern Rocky Mountains and the Northwest.

Bull trout distribution has also been tied to air temperatures. Rieman, et al. (1997) found that bull trout were four times as likely to be present and six times as likely to be classified as strong in subwatersheds with a mean annual air temperature less than 5.1°C (< 41°F) than in warmer areas.

Several models have projected severe decreases in the range of trout and salmon species as a result of increased air and water temperatures, and altered flow regimes. For example, O'Neal (2002) projects the percent of locations losing all trout in Montana, Idaho, Wyoming, Oregon and Washington ranges from 3%-26% by the year 2060, and by 2090 rises to 5%-42%. This analysis did not include bull trout; recent estimates for the amount of migratory bull trout loss range as high as 90% (Kinsella, et al. 2008). Moreover, Bisson (2008) reports that bull trout in the Columbia River Basin will be particularly vulnerable to the effects of climate change, including increased risk of flood and scour events during winter, raising mortality.

…recent estimates for the amount of migratory bull trout loss range as high as 90%.

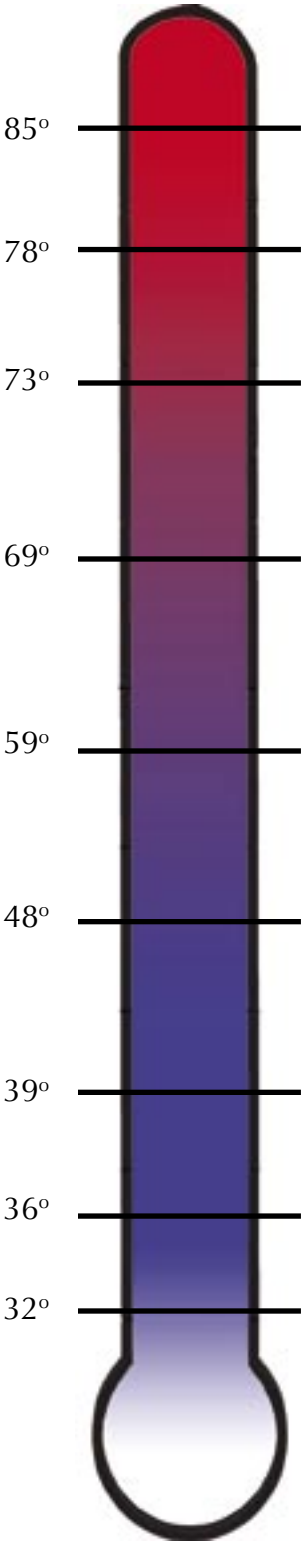
— Kinsella, et al. 2008

A warming climate is predicted to change freshwater flows, particularly in snow-dominated regions such as the northern Rockies, where up to 80% of annual precipitation has traditionally fallen as snow. Spring runoff is predicted to begin a month earlier resulting in low water flows during the summer and fall months (Brick, et al. 2008). This could have severe effects on bull trout, which begin their spawning journeys in August and continue through September.

The difficulty addressing the effects of climate change on endangered species must not be underestimated. As Professor J.B. Ruhl explains, we are entering a "no analog future" – one for which we have no biological roadmap to guide us. The future is changing in ways we cannot envision – at a pace much faster than we predict. The Endangered Species Act and other environmental laws, which have traditionally provided an effective means to protect and conserve species, are not well-suited to address the causes and problems posed by climate change.

Just as the IPCC report ended the debate over the reality of climate change, an increasing amount of scientific data point to serious threats to our native trout and salmon populations, even as we continue to invest significant efforts in recovery. If we do nothing, the days of fishing for large, migratory trout in the famous rivers of the northern Rockies will be over. Not only will the loss to recreational opportunities and the associated contribution to the regional economy be substantially diminished, a vital portion of the native biodiversity on our national public lands will be lost forever — portending a host of others to follow.

Keeping it Cool — A Matter of Survival



85° Let's go to the beach!

78° Trout mortality increases

73° Montana streams may be closed to fishing if stream temperatures reach 73° for three consecutive days

69° Above 69 degrees, west-slope cutthroat and other trout are under stress

59° Temperatures above 59° are detrimental to bull trout and act as thermal barriers

48° 48° or less is ideal for bull trout spawning and rearing habitats

39° Stream temperatures between 36° and 39° are ideal for bull trout incubation

36°

32° Brrr!

Building Resilient Habitats to Lessen the Impact of Climate Change – Opportunities & Solutions

If the dire scenario described above is to be avoided, we must take immediate and effective action. The Sierra Club and other leading conservation organizations including Trout Unlimited have outlined four keys to creating resilient habitats on a nationwide basis:

1) Cut global warming emissions by 80% by 2050.
2) Protect large core areas, buffer zones and migration corridors.
3) Reduce or eliminate habitat fragmentation, overharvest, invasive species, disruptive human activities and pollution.
4) Where necessary, apply adaptive management strategies including reintroduction of native species, assist in migration, prescribed burning and control of invasive species.

The most pressing need for native trout in the northern Rockies is direct, hands-on restoration and habitat improvement work in the field, designed to keep stream temperatures cool. At the heart of this strategy are projects designed to improve habitat conditions in both spawning tributaries and main stem migratory river corridors.

The recovery process for species such as bull trout and cutthroat trout provide many opportunities. In Montana alone, there are some 3,000 miles of bull trout habitat eligible for critical habitat protection under the Endangered Species Act, providing a framework for prioritizing needs, while providing a funding mechanism for on-the-ground projects. However, while critical habitat designation under the ESA might stop new harmful actions, it won't necessarily protect these areas from the impacts of climate change. Thus, Montana and the northern Rockies can be a national example for creating resilient habitats for species vulnerable to global climate change by initiating restoration work to compliment legal protection.

To save migratory bull trout, recovery will mean improving habitat in the main stem river corridors, the lower elevation streams that are most susceptible to the impacts of global warming. This will require a three-tiered approach that has been described by Trout Unlimited and others as **Protect, Restore & Reconnect** (see figure on next page). This approach means ***Protecting*** the roadless character of high and mid-elevation lands. Approximately 78% of bull trout strongholds are located within roadless areas (Bader 2000). Other lands within the mid-elevations are in need of ***Restoration***, where excessive roads are decommissioned, faulty culverts and other blockages are removed or repaired, and active stream restoration takes place. Rieman, et al. (1997) found that bull trout populations were seven times more likely to be strong in lower road density watersheds. Main stem river bottoms are ***Reconnected*** to the entire system through riparian restoration, dam removal or fish passage installation, streamside setbacks, in-stream flow reservations, and urban greenways.

Montana and the northern Rockies can be a national example for creating resilient habitats for species vulnerable to global climate change.

Protect

Protect the roadless character of high and mid-elevation lands.

Restore

Restore mid-elevation lands by decommissioning excessive roads, removing or repairing faulty culverts and other blockages, and actively restoring streams.

Reconnect

Reconnect main stem river bottoms to the entire system through riparian restoration, dam removal or fish passage installation, streamside setbacks, in-stream flow reservations, and urban greenways.

Partnerships for Direct Habitat Restoration Work

Bull trout recovery and watershed restoration are ideal for the formation of partnerships between state and federal agencies, NGOs, high schools and the public university system. For example, the Sierra Club is a partner with the Clark Fork Watershed Education Program, the Montana Department of Fish, Wildlife & Parks, and the University of Montana for a program that distributes Trout Identification booklets to anglers, schools and others. More than 50 fishing and sporting good stores are partners in this effort. The guides directly aid in the protection and conservation of bull trout and westslope cutthroat trout by informing anglers how to identify and release these fish, reducing mistaken identity killings.

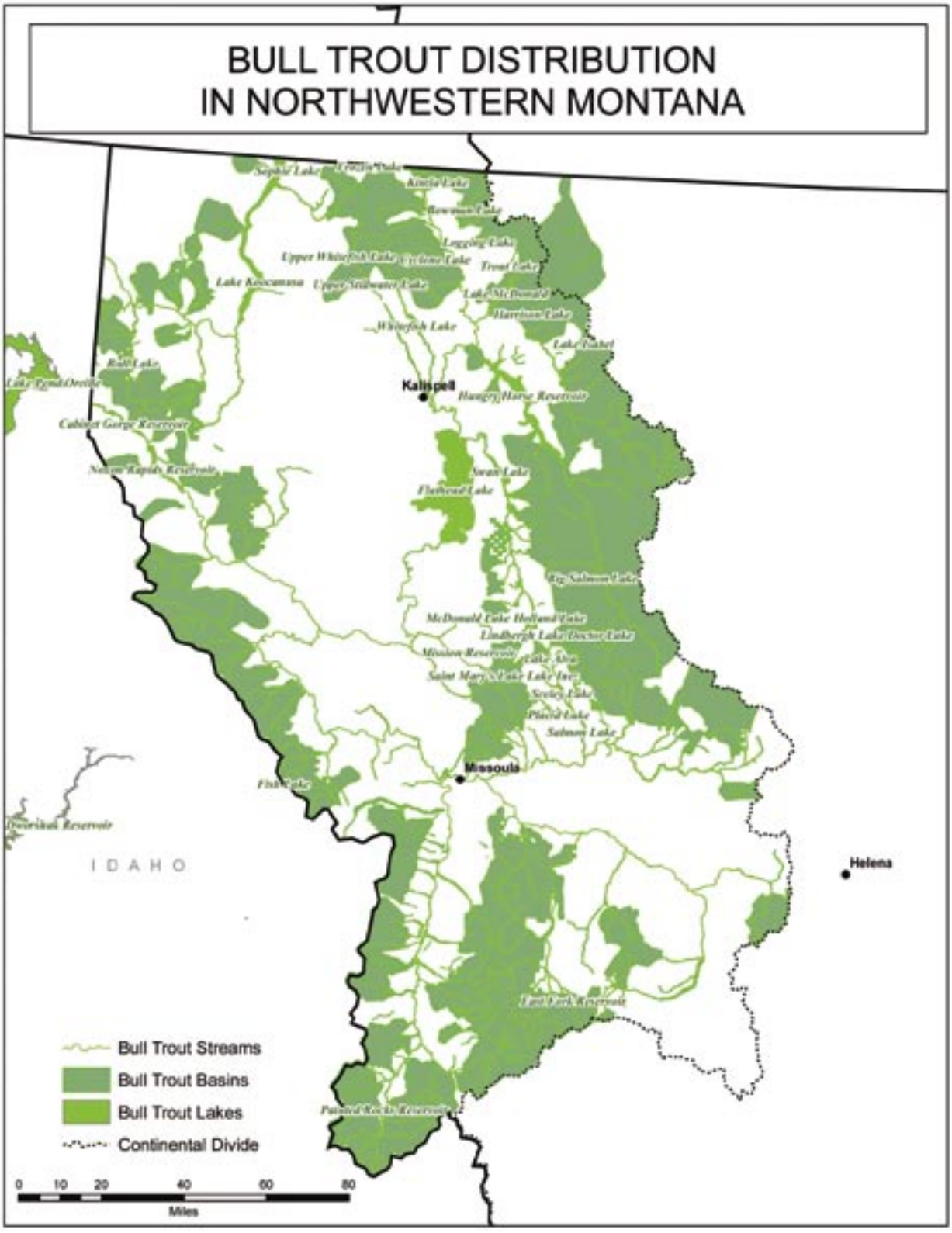
Teaming up with professional fisheries biologists and engineers from the public agencies, partners from the school systems and the NGOs can provide people to assist in field projects. These include road decommissioning, culvert repair, planting of native vegetation in riparian areas and in-stream work including installation of boulders, logs and root wads to create pool habitat and increase diversity and complexity.

Protection of Critical Habitat

The first step in the recovery process is the identification and designation of the ***critical habitat*** necessary for the survival and recovery of the bull trout. This should proceed in tandem with a comprehensive Recovery Plan that describes detailed actions and coordinates across a broad spectrum of efforts. A critical habitat designation and active Recovery Plan creates the legal framework for coordination at the basin level. This also creates funding opportunities for active partnerships.

The basis for this effort in Montana should be the core areas and migratory corridors as described and mapped by the Montana Bull Trout Scientific Group (see map on next page). These represent areas where viable metapopulations of bull trout will be maintained and restored. An important aspect of critical habitat and recovery is reestablishment of bull trout within some areas of historically occupied habitat.

The next step is identification of problem areas in the watersheds. These can come in many forms including point and non-point pollution sources, blockages to migration, degraded habitat, improper culverts and so on. These problems are then prioritized for active restoration actions, which are implemented on the ground by the partnership as described above.


BULL TROUT DISTRIBUTION
IN NORTHWESTERN MONTANA
Kalispell
Missoula
Helena
IDAHO
Bull Trout Streams
Bull Trout Basins
Bull Trout Lakes
Continental Divide
0 10 20 40 60 80
Miles

Increasing Connectivity

Since dams and associated habitat fragmentation and genetic isolation are a leading threat to survival and recovery of migratory bull trout, fish passage is a key element of recovery and watershed restoration. Benefits include reestablishing habitat connectivity and gene flow. This process can be accomplished through installation of fish passage structures, culvert removal as part of rehabilitating forest landscapes from the adverse effects of commercial timber harvest, or through complete removal of the dams themselves.

A highly successful fish passage was constructed at Rattlesnake Dam in Missoula, Montana (see photo below). Even this relatively small dam has blocked spawning migrations for bull trout and cutthroat trout. Some fish are captured by biologists and implanted with transmitters, so the fish can be tracked and monitored. The number of bull trout redds (spawning nests) counted above the dam has increased significantly since the fish ladder was installed.

The area from Butte, Montana to the Milltown Dam above Missoula was designated as a Superfund Site by the U.S. Environmental Protection Agency and is the largest Superfund site in the nation. Central to the restoration plan has been the historic $100 million removal of Milltown Dam at the confluence of the Clark Fork and Blackfoot Rivers, along with thousands of tons of heavy metals deposits that were trapped behind the dam.

The listing of the bull trout as a threatened species was a key factor in the decision to remove the dam, as the U.S. Fish & Wildlife Service concluded the dam was an ongoing, "illegal taking of bull trout," by blocking their spawning migrations. For the first time in 100 years, bull trout will again migrate freely upstream.

Improperly designed and/or placed culverts can be major blockages to migration. Common problems include culverts that are undersized for the amount of water that flows through them at high water. Others are placed too high so that at low water fish cannot jump high enough to migrate. During high water there is too much velocity. Replacing and/or fixing these culverts is a major recovery action.

A necessary action is to complete a comprehensive drainage by drainage inventory, identifying blockages to migration (such as dams and culverts) and prioritizing these problems for correction.

Montana and the northern Rockies are part of an emerging "restoration economy"

Restoring Riparian Areas

A major threat to bull trout survival and recovery is the damage and loss of riparian areas in the streamside zone. It is the streamside vegetation that shades and cools the water and provides a steady source of woody material needed for pool formation. If this vegetation is removed, stream temperatures can dramatically increase. Moreover, if cattle have direct access to streams, they will often trample the banks and widen the streams, which leads to further warming and degradation of water quality.

Two primary methods for restoring riparian areas include the planting of native vegetation, including willows and cottonwoods, and fencing cattle out of the riparian area. For example, the U.S. Fish & Wildlife Service has provided funding to ranchers so they can install fences. With healthy riparian areas restored, the streams can once again support populations of native fish. Riparian habitat is central to the complex habitat requirements of bull trout, which include overhanging vegetation and shade. These help keep stream temperatures cooler. The partnerships should develop teams of field volunteers to assist with riparian restoration. This will include the purchase and planting of hundreds of thousands of native plants and trees.

An additional action is the establishment of streamside setbacks at the county government level. These would limit construction in floodplains and encourage maintenance of native vegetation and restoration of riparian habitat. Another would be improved forest practices laws to increase streamside buffer zones.

In-Stream Projects

The Montana Department of Fish, Wildlife & Parks and other state agencies and conservation organizations have carried out numerous Habitat Improvement Projects, which often focus on improving in-stream habitat by placing large woody debris such as logs and root wads within streams to create deeper pool habitats. Large boulders are also placed in streams for this purpose. These projects create thermal refugia for trout as well as hiding cover and resting areas.

Negotiate In-Stream Water Flows for Native Trout

Agriculture in our dry climate requires irrigation and water diversions. Dewatering of streams has been cited by the U.S. Fish & Wildlife Service as a threat to bull trout populations. Lower flows result in higher stream temperatures and can render some streams impassable for spawning trout. A primary method that is used to reduce impacts on native fish is negotiating in-stream flows with water users to guarantee an adequate amount of water will remain to support native fish. The Montana Department of Fish, Wildlife & Parks and private organizations have been negotiating agreements with ranchers to protect adequate flows. Many more agreements are needed.

Trout Rescue Parties

Fish screening can prevent bull trout from entering the irrigation ditches, where they become entrapped in inhospitable habitat. These ditches become dry in the fall when the head gates are closed, often claiming native fish. Irrigation districts have partnered with Montana Fish, Wildlife and Parks to install screens in critical watersheds. More cooperative efforts are needed to keep native fish in waterways. Another action for the partnerships is to recruit volunteer "fish rescue" parties to save stranded fish in large irrigation diversions that lack screening.

Endow Chairs in Resilient Habitats Within the State University System

Montana and the northern Rockies are part of an emerging "restoration economy" where new jobs and economic activity are being created restoring our damaged landscapes and watersheds. In order to facilitate partnerships and increase expertise in the region, endowed professorships in Resilient Habitats will more deeply formalize the university system and the state's involvement in this basin-wide effort. An official program will also provide graduate students a myriad of field projects to design and supervise.

Implement Region-wide Education Effort

Concurrent with these efforts, a region-wide education effort that targets all levels of citizenry as well as the visiting public is required. Many people are relocating to this area from other regions of the country and millions more visit each year. Existing education efforts have been sporadic and uncoordinated. An educational partnership can provide a more consistent, effective effort targeted at all levels from grade school through college and to the general public. Its chief purpose is to educate about ecosystem function, its value to society, and the need to protect these irreplaceable resources.

Federal Land and Rivers Protection

Federal legislation to protect the wild landscapes that bull trout depend upon is an important step. For example, many bull trout streams are eligible for protection under the National Wild & Scenic Rivers Act, which would protect migratory corridors by prohibiting new dams and limiting streamside development.

Roadless watersheds are also eligible for protection under the Wilderness Act and need to be formally analyzed and recommended for protection under a comprehensive citizen-based review. At a minimum, the Clinton Roadless Rule must be restored to ensure that another round of resource extraction in roadless lands does not undo the protections achieved by INFISH and the ESA. Proposed legislation such as NREPA, H.R. 1975, would also provide effective protection for these areas.

Other actions are necessary at the state and county level to create effective limits on housing density in bull trout watersheds. The proliferation of septic systems and deep ground wells are an increasing threat to groundwater and overall water quality as well as quantity.

Conclusion

The scope of the work ahead is broad, and the work will not be easy. A multi-million dollar effort will be required in every region and ecosystem. Yet the costs of inaction would be several-fold higher, and could undo the years of collective efforts by conservation groups, the private sector and state and federal agencies. Montana and the northern Rockies can be a highly effective international showcase for the process of native fish recovery and watershed restoration — creating resilient habitats in the face of global climate change.

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Biographies

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Mike Bader has been involved in conservation issues, wildlife and fish management and research for 25 years. He is a consultant on conservation issues and environmental education based in Missoula, Montana, where he is sole proprietor of Bader Consulting. Over that time he has been a National Park Ranger at Yellowstone including work in grizzly bear research and management, a volunteer on a northern Rockies wolf study, and the main author of the successful petition to list the bull trout under the Endangered Species Act. He has authored numerous professional papers and popular literature articles on grizzly bear and bull trout recovery, ecosystem protection, proposed legislation and wildland fire policy.

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Since graduating cum laude from the University of Montana School of Law in 1985, Jack Tuholske has served as lead counsel in over 50 published decisions in state and and federal courts involving a wide array of environmental, land use and natural resource laws. His work includes the bull trout listing cases (5 of them) under the ESA, the Montana TMDL litigation (5 separate published decisions) and more recently, a number of cases under NEPA, the CWA and state water law addressing energy development in the Powder River Basin. His academic pursuits include teaching at the Vermont Law School, University of Montana School of Law. In January 2009 he will begin a teaching stint at the University of Ljubljana in Slovenia as a Fulbright Scholar.

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Page 14: river courtesy BLM, fish courtesy U.S. FWS
Page 15: river scene by Mark Alan Wilson, others Montana FWP

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