

**LOCHSA RIVER BASIN TEMPERATURE GUIDANCE
PILOT PROJECT
CLEARWATER SUBBASIN**

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**Compiled by
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Introduction

In April 2003 the Environmental Protection Agency (EPA) Region 10 issued new temperature guidance criteria for the protection of sensitive fish species in (EPA) Region 10. The criteria apply to chinook, coho, sockeye, chum and pink salmon, steelhead, coastal cutthroat and bull trout.

EPA stresses that the temperature guidance criteria are not requirements; however the potential impact of the new temperature guidance and potential litigation to protect threatened or endangered salmonids cannot be ignored. Idaho may be at risk of legal action if it does not consider the new EPA temperature guidance with respect to existing temperature water quality standards. In some instances the existing state water quality criteria for temperature may need modification.

In an effort to be proactive in implementing the temperature guidance, the Idaho Department of Environmental Quality (IDEQ) in conjunction with Environmental Science and Public Policy Research Institute (ESPRI) at Boise State University and other state and federal agencies conducted a pilot project on the Lochsa River Basin based on a process used in Oregon to address these issues.

Oregon developed a process of using local scientists and stream temperature data to apply beneficial fish designations according to the EPA Region 10 temperature guidance criteria. This project attempted to replicate that effort but on a smaller scale. The Lochsa River Basin Pilot Project convened biologists and hydrologists from IDEQ, USDA, Clearwater National Forest (CNF), Idaho Department of Lands, Idaho Department of Fish and Game, the Soil Conservation Commission and Potlatch Corporation.

EPA's Recommended Temperature Criteria to Protect Sensitive Salmon and Trout Species¹

- Applies to the summer maximum temperature
 - 12°C (55°F) for Bull Trout rearing - *generally in the upper portion of river basins*
 - 16°C (61°F) for salmon and trout “core” juvenile rearing - *generally in the mid to upper part of river basins*
 - 18°C (64°F) for salmon and trout migration plus non-core juvenile rearing - *generally in the lower part of river basins*
 - 20°C (68°F) plus cold water refugia protection for salmon and trout migration - *generally in the lower part of a few river basins that likely reach this temperature naturally*

- Applies where and when fish use a river (generally during the fall-winter-spring period)
 - 9°C (48°F) for Bull Trout spawning
 - 13°C (55°F) for salmon and trout spawning, egg incubation, and fry emergence
 - 14°C (57°F) for steelhead smoltification
- Note: the above criteria are based on the 7 day average of the daily maximum values

Temperature Guidance Background^{2, 3,4,5,6}

In 1996, Oregon submitted to the EPA a revised set of water quality standards for temperature and other water quality measures. The revised standards were intended to protect salmonids.

Due to the complexity of the issues, EPA consulted with NOAA Fisheries and the U.S. Fish and Wildlife Service. Oregon's revised water quality standards were finally approved in July 1999. The approval of the standards was subject to additional conservation measures by Oregon. One of these measures was Oregon's participation in an interagency temperature guidance project protecting valuable salmonids in EPA's Region 10. Oregon and EPA collaborated and pursued two parallel tracks toward developing water quality criteria for Oregon and the second to establish a regional guidance for temperature. The guidance went through two rounds of public comment and EPA published the final guidance in April 2003.

Meanwhile, in April 2001, the Northwest Environmental Advocates (NWEA) filed suit against the EPA and NOAA Fisheries in Portland's federal district court. The suit challenged EPA's 1999 approval of Oregon's revised water quality standards and sought an injunction to force EPA to promulgate Oregon's water quality standards. The suit alleged EPA's approval of Oregon's revised water quality standards were not protective of salmonids spawning and rearing.

On March 31, 2003, Judge Haggerty ruled in favor of NWEA on several temperature criteria issues. The court held that the water quality standards failed to specify where and when the temperature criterion applied. The court ordered EPA to promulgate a revised temperature criterion for bull trout and salmon rearing that included where and when the temperatures are applied. The court upheld the temperature requirements for salmonids in Oregon's EPA approved water quality standards.

The results are (1) new temperature guidance criteria protective of sensitive fish species issued by EPA (Environmental Protection Agency 2003) and (2) new use designations for the State of Oregon (Oregon 2003).

The intent of EPA's new temperature guidance is to enable states and tribes to develop water quality standards which can be approved by EPA in compliance with the Clean

Water Act and the Endangered Species Act. It sets the expectations for any revision or review of Idaho water quality standards for temperature.

Oregon's process for implementing the EPA temperature criteria for beneficial fish use consisted of 1) using biologists and hydrologists to develop decision rules for when and where EPA temperature guidance criteria should be applied and 2) compiling GIS information on locations and life stages of the various salmonid species.

The watershed maps developed through the process are an important part of Oregon's current water quality standards. The maps help officials identify temperature requirements for each of Oregon's water bodies.

Pilot Project

Study Area

The Lochsa River Basin in the Clearwater Subbasin was selected as a test case for several reasons. The Clearwater drainage is important for anadromous and resident fish that the new guidance specifically seeks to protect. Three threatened and endangered fish inhabit the Clearwater Basin at different stages in their lifecycles and different times of the year. These species are fall chinook, steelhead, and bull trout. There is a range of human impact in the watershed. While this area has a history of wildfires and timber harvesting, there is an absence of dams and diversions that would complicate use designations. In addition, Clearwater National Forest and Idaho Department of Fish and Game have collected fish life stage data and a great deal of temperature data necessary to this effort. Also, the river basin covers a wide range of temperatures and all uses addressed by the temperature guidance.

Objectives

The intent of the pilot project was: 1) to determine the effect the 2003 EPA Temperature Guidance criteria has on beneficial fish use designation in the Lochsa River Basin of the Clearwater Subbasin in northern Idaho using best available data, 2) to use and if necessary modify Oregon's process of implementing the EPA Temperature Guidance criteria, 3) document the use designations in the pilot area, and 4) document the process for possible use in other Idaho watersheds.

The success of this project depended on the cooperation of agency participants in contributing time and data to the effort.

Background

Lacking time and manpower, IDEQ entered into a cost-sharing arrangement with ESPRI to facilitate this project. ESPRI funds contributed to this project originated from the

USDA Boise National Forest. The project spanned a year and a half from December 2003 through June 2005.

ESPRI's responsibilities were: 1) Facilitate meetings of relevant agency hydrologists and biologists to reach consensus on core fish lifecycle habitat for steelhead and bull trout, 2) Build a GIS-based database of water temperature data, core habitat, and fish use designations for the Lochsa River Basin, 3) Create maps of fish use designations, and 4) Write a brief report to document the decision basis for the new use designations.

The agencies contributing data and participants for the project are as follows:

Clearwater National Forest contributed: 1) Participants; Dave Schoen (hydrologist), Richard Jones (forest hydrologist), and Pat Murphy (fish biologist) 2) Temperature log data for 1999 – 2003 from temperature gauges in the Lochsa River Basin and 3) GIS data.

IDEQ provided: 1) Participants; Don Essig and John Cardwell, 2) the meeting room, equipment and support staff at the Lewiston office and 3) GIS data.

The Idaho Department of Fish and Game provided: 1) Participant; Danielle Schiff (fish biologist) from the Lewiston office and 2) GIS data on bull trout presence.

The Idaho Department of Lands provided: 1) Participant; Chris Tretter (biologist).

Potlatch Corporation provided: 1) Participant; Terry Cundy, hydrologist.

Soil Conservation Commission: 1) Participant; Janet Hohle; and 2) Background documents on the Clearwater Subbasin Management Plan and Inventory.

Initial meetings and contacts were made from January through March 2003 with potential participants in the local Lewiston area to explain the objectives of the project and to elicit participation for a technical working group. Meetings and contacts were made with the Nez Perce Tribe, Potlatch Corporation, the USDA Forest Service, Clearwater National Forest and Nez Perce National Forest, Idaho Department of Fish and Game, Idaho Department of Lands, Bureau of Land Management, and NOAA Fisheries. Additional contacts were made at the Clearwater PAC meeting and a Basin Advisory Group meeting. The data sources and participants were identified in these meetings.

Once the participants were identified, additional meetings were held throughout the project's span to determine decision rules for temperature and bull trout and steelhead presence in the study region.

Project Data

Data Used

Temperature Data

Five years of stream temperature data for one hundred ten gauges in the Lochsa river basin were obtained from Ed Lozer of the Clearwater National Forest. The data included the CN (Control Number), Location, Date, Daily Maximum temperature, Daily Minimum temperature, Daily Mean temperature and the Seven Day Average temperature.

Spatial Data

The shapefiles' metadata are [in the included CD](#).

Clearwater National Forest:

- Stream layer downloaded from their website
- Fish survey points and accompanying attribute data
- Point data for temperature gauges and barriers

IDEQ:

- 305b stream layer

ESPRI:

- Created the temperature logger location (Forest Service gauge layer) based on the location description in the temperature spreadsheets and Clearwater National Forest personnel input

ICBEMP (Interior Columbia Basin Ecosystem Management Project):

- HUC layer

IDFG:

- IDFG bull trout layer (available January 2005)
- Barrier layer - the barrier layer identifies water falls, dams, culverts and other known structures, natural or man made that may impede fish passage (available January 2005)

Data Processing

Temperature logs (115 log files for five years):

Five years of data was used whenever possible. Some of the temperature loggers did not have five years worth of data because they were new or had been discontinued, so the project used the best available data. The original files were in

.txt and .csv format, one file per site gauge per year for a total of eight hundred and two files.

Using the .csv files, new spreadsheets were created by temperature gauge and each year's data appended into the respective gauge's spreadsheet. A new field was added named 'Reach' to use as the foreign key for a join to the spatial data. The Reach number was obtained from the metadata supplied by the Clearwater National Forest. Finally a new worksheet was added and the summer temperature data was extracted and sorted to obtain the maximum weekly mean temperature (MWMT) for the five years worth of data. Additional data processing included converting Fahrenheit temperatures to Celsius where needed.

Stream layer: DEQ 305b streams:

A 'Select by Attribute' query was used to select the stream segments within the Lochsa HUC and with a stream order greater than one. The selected stream segments were exported as a new shapefile for use in this project.

The following fields were added to the exported stream layer: BT_Pres (Bull Trout Presence); BT_Doc (How the Bull Trout presence was determined for the project); BTLifeStage (Present Bull Trout life stage activity); BTLifeSDoc (How the Bull Trout life stage was documented for the project); Comments (Additional comments about the stream reaches and fish presence); FS_Gauge (Clearwater National Forest Reach description for the gauge and used as a foreign key); MWMT (the Maximum Weekly Mean Temperature for the summer).

The FS_Gauge field in the stream layer was calculated for the stream segments using a spatial query. The query used the FS_Gauge layer, the stream layer and the 'intersect' and 'are within a distance of' methods to select the stream segments. After the stream segments were selected the reach value from the gauge layer was calculated for the selected stream segments. The 'MWMT' field was then calculated using the 'Select by Attribute' query method. The FS_Gauge 'MWMT' field values entered for the selected stream segments. This process was repeated for the one hundred fourteen gauges in the Lochsa River Basin.

The process was time intensive because 'Reach' information was not comparable between the temperature logs and the DEQ stream data. The information was necessary to produce the maps for use in the working group discussions and the reports.

Temperature gauge layer: FS_Gauge:

The temperature gauge location layer was developed by ESPRI from the description in the 'Location' field in the temperature logs. The shapefile was created using ArcGIS 9.0 software. The points were snapped to the IDEQ and Clearwater National Forest stream layers.

Three fields were added to the shapefile attribute table and values calculated for each gauge. The additional fields are 'Location', 'Reach', and 'MWMT'.

ICBEMP HUC layer:

The HUC layer was used as a background layer and to clip the Clearwater National Forest stream layer

IDFG Bull trout layer:

The IDFG's bull trout layer was mapped and used for documentation of Bull Trout in the Lochsa river basin. No processing was necessary.

IDFG Barrier layer:

The barrier layer is the current layer used on the temperature maps. No processing was necessary.

Project Decision Rules

The project decision rules were developed by group consensus in the first six meetings with the hydrologists and biologists of the working group. The rules were then applied to the data. The maps produced for this project are based on the information using the following decision rules.

Scale: 1:100000

Streams:

- Use stream order greater than one
- Use the DEQ stream layer

Temperature Decision Rules

- Use the Summer Temperature criteria for Bull trout in the EPA Temperature Guidance. Bull trout require the coolest temperatures and if their temperature needs are met then criteria for the other fish use will be met as well.
- Use the MWMT for the warmest summer season per temperature gauge.
- Summer season: June 8 – September 30

- Initially the season was June 15 – August 15 by group consensus
 - This change was implemented when one gauge showed a high MWMT after September 15th
 - The June 8th date encompasses the Clearwater Subbasin Management plan summer season dates.
- The MWMT summer stream temperature is applied to all stream segments upstream of the temperature gauge.

Project Summary

The project found bull trout living in the Lochsa River Basin where the MWMT maximum summer temperatures exceeded the EPA temperature guidance criteria for bull trout. There were no streams in the basin with the MWMT of 12°C or less during the time frame of the project. Summer MWMT for the upper reaches of the Lochsa basin ranges from 14°C to 21°C, yet these reaches have documented spawning and rearing of bull trout.

The high temperatures in the upper reaches cannot be discounted due to the lack of ten years of data on all of the temperature gauges in the study area. EPA allows an extreme temperature to be dropped if there is ten years worth of data. The biologists noted that these stream temperatures do fall dramatically the second and third week in September when spawning occurs in the upper reaches of the Lochsa River Basin. (Map 1, page 15)

The remainder of the river basin is used by Bull Trout for migration and rearing. The biologists believe Bull Trout move into the tributaries when temperatures in the Lochsa River increase in the late summer. Some populations of Bull Trout are found behind the barriers and the biologists consider them resident populations. (Map 2; page 16)

The project fish biologists commented that some streams were designated with no Bull Trout because they were too steep. Stream slope was not a part of this project. However, Clearwater National Forest uses the Rosgen A and Aa classification in this area.

Steelheads are found in the entire river basin. This fish use classification is used on the stream segments with the 'No Bull Trout' classification. Per the EPA guidance the use classification is either core or non-core rearing for trout.

The hydrologists and biologists both want to emphasize that the use of fish surveys and temperature information is a snapshot in time.

Observations and Recommendations

Overall I was very pleased with the process and cooperation of the participating agencies in this project. It took more time than I expected to develop the decision rules. Part of this was due to the fluctuation in group members during the initial meetings. The scientists were forth coming with data and their time once we were settled into the process.

Pessimism was expressed on occasion as to whether EPA is really interested in their findings that bull trout in Idaho are found in waters with temperatures greater than the recommended temperatures in the guidance.

Compiling the temperature log data was a manually intensive process. I ended up with more information than I needed. I had asked for this data before the decision rules were finalized. Next time, I would request the maximum temperature for the season rather than the entire year's temperature log.

The cooperation between participants was extraordinary. Overall, the scientists liked the process and the use of an outside participant to gather and process the data.

Below is a summary of my observations and recommendations.

ESPRI Facilitator's Observations

- Cooperation and coordination with federal, state and other agencies was crucial to this project
 - Cooperation was excellent on this project.
 - Data was readily shared, but took time and personal attention to obtain.
 - In January, 2005, IDFG published a study on bull trout. This study included
 - GIS data,
 - Databases, and
 - A report of findings.
 - Participants had positive comments toward IDEQ for pursuing input from a variety of agencies in this process
 - Participants liked the process and
 - Liked having an objective party process the data and present the findings for discussion at the meetings
 - The temperature data may be more difficult to obtain in other subbasins

ESPRI Facilitator's Recommendations

- First conduct a background and literature search for fish studies and temperature studies in the study area.

- Send an all-call invitation from IDEQ to participate in defining temperature based fish use to local scientists and researchers in the study area.
- For the study to move quickly the facilitator needs to obtain data commitments early in the process.
 - Gathering data at designated meetings or by picking it up at the contributing agency
 - Once the data is gathered standardize the data formats
 - A lot of time was spent waiting for data – no one’s fault, very busy and understaffed agencies
 - See data processing section for data to request
- Set regular meeting dates
 - Send preliminary findings and maps to participants to review before meetings
 - Meet-with hydrologists to develop decision rules for stream temperatures and the application of the rules to the spatial data.
 - Then meet with biologists to develop decision rules, based on their knowledge of the study area, for the presence and life stage of threatened and endangered fish species. Apply the rules to the spatial data.
 - Set combined meetings with hydrologists and biologists to review the combined findings of the biologists and hydrologists
 - Hold a wrap-up meeting to go over proposed use delineation maps

Recommended Process

- Conduct a literature search for temperature and fish data in the subbasin study area
- Send out an e-mail and or letter requesting participants for a working group on temperature based fish use designations
 - Include
 - Purpose
 - Background of project
- Initial meeting
 - Data request
 - Who has data to share
 - What format
 - Who can participate
 - Review project objective
- Gather data
 - Set up a meetings to gather data from researchers
 - Or set a meeting to bring in the data

- Process data
 - Preliminary maps/reports of temperature data
 - Preliminary maps/reports of fish presence data

- Set up a meeting(s) with hydrologists
 - Review preliminary findings
 - Input on issues regarding stream temperatures
 - Update maps and reports

- Set up a meeting(s) with fish biologists
 - Review preliminary findings
 - Input on issues regarding fish use designations
 - Update maps and reports based on the meeting(s)

- Combine temperature and fish presence information

- Send out the draft findings for review








- Set up meeting(s) to go over updated findings

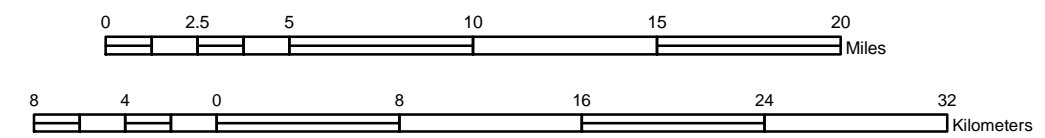
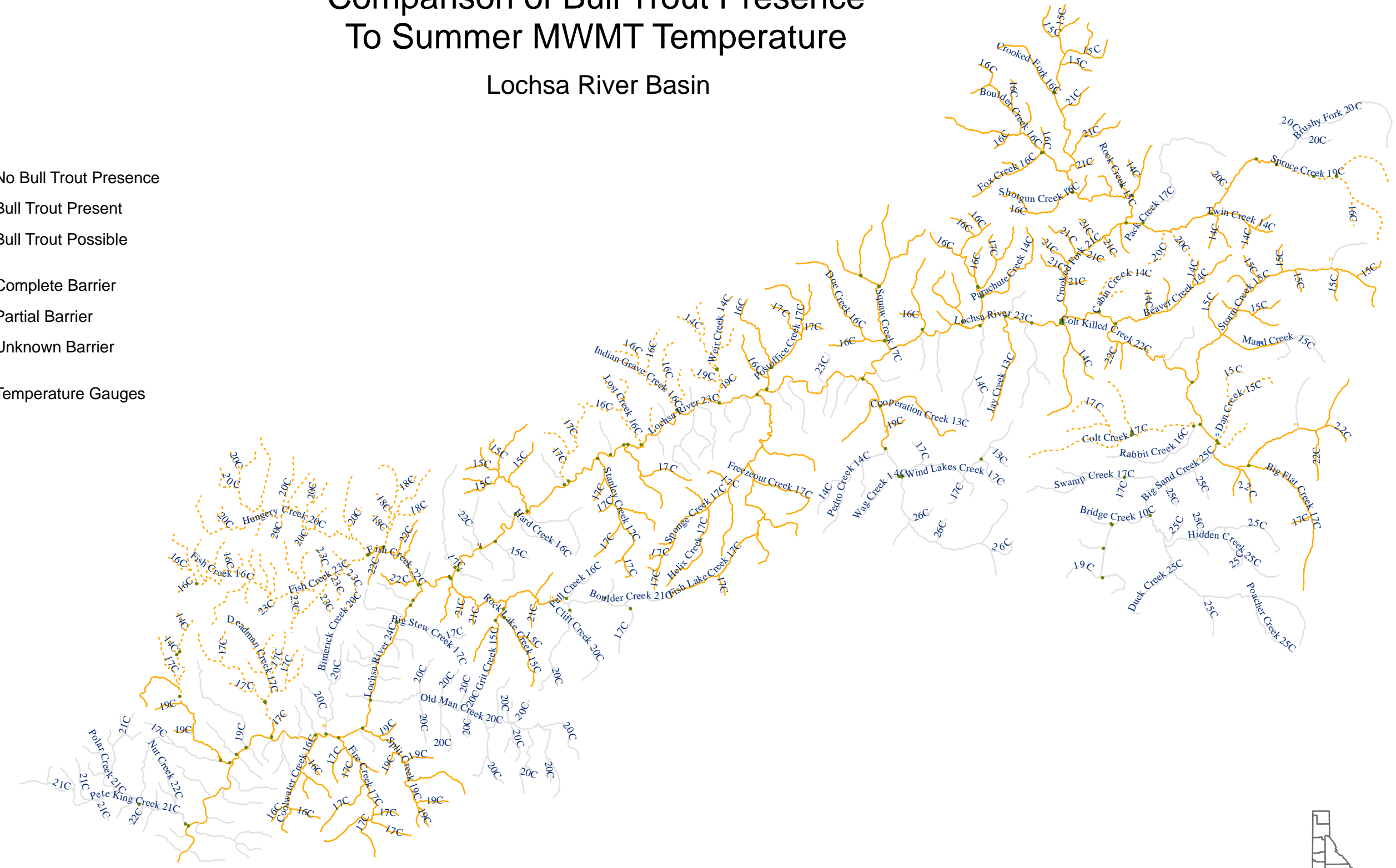
- Final report to IDEQ

MAPS

Comparison of Bull Trout Presence To Summer MWMT Temperature

Lochsa River Basin

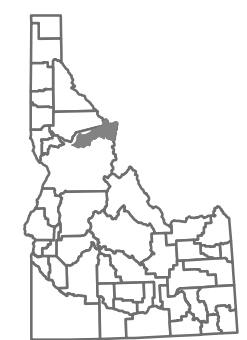
-  No Bull Trout Presence
-  Bull Trout Present
-  Bull Trout Possible
-  Complete Barrier
-  Partial Barrier
-  Unknown Barrier
-  Temperature Gauges



The purpose of the map is to compare Bull Trout presence in relation to the maximum summer MWMT. The temperatures are expressed in degrees of centigrade. The data for this map was obtained from Idaho state and federal agencies. The projection is UTM, NAD27, Zone 11N.

The map was produced at Boise State University's GRF facility, using ESRI ArcGIS ArcMap 9.0 software, for a project in conjunction with ESPRI and IDEQ.

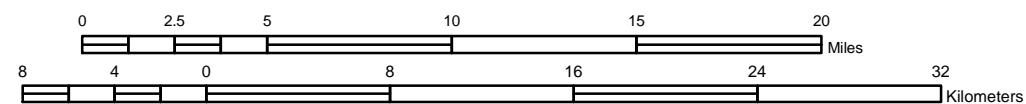
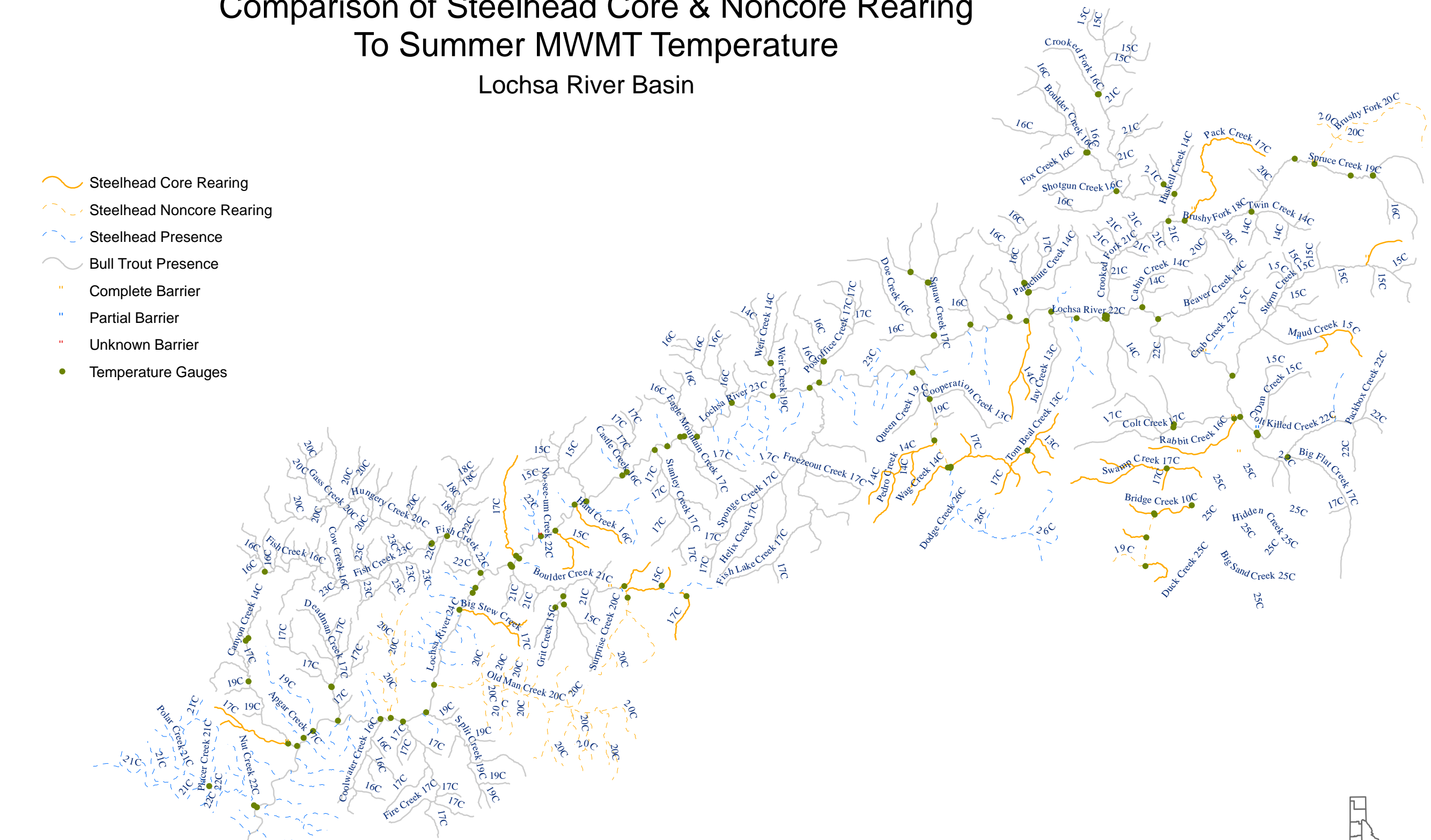
The plots were made on an HP Business Inkjet 2600 PLC 5C printer.



Comparison of Steelhead Core & Noncore Rearing To Summer MWT Temperature

Lochsa River Basin

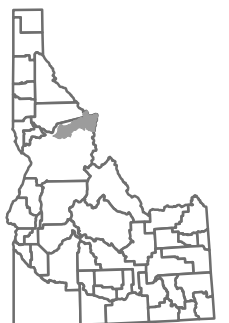
- Steelhead Core Rearing
- Steelhead Noncore Rearing
- Steelhead Presence
- Bull Trout Presence
- Complete Barrier
- Partial Barrier
- Unknown Barrier
- Temperature Gauges



The purpose of the map is to compare Steelhead fish use designations to the maximum summer MWT for trout core and noncore rearing. The temperatures are expressed in degrees of centigrade. The data for this map was obtained from Idaho state and federal agencies. The projection is UTM, NAD27, Zone 11N.

The map was produced at Boise State University's GRF facility, using ESRI ArcGIS ArcMap 9.0 software, for a project in conjunction with ESPRI and IDEQ.

The plots were made on an HP Business Inkjet 2600 PLC 5C printer.



Acknowledgements

A special thanks to the participants and organizations they represent. Their contributions to this project are greatly appreciated.

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