2005 ANNUAL MEETING

Managing Fisheries in the 21st Century: "Meeting New Challenges with New Ideas".

Agenda and Abstracts

February 24 -26, 2005

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Annual Meeting

Thursday, February 24- Saturday, February 26

Wednesday, February 24, 2005

6:00 PM – 8:00 PM	Registration
7:00 PM – 9:00 PM	ExCom Meeting

Thursday, February 25, 2005

7:00 AM – 10:00 AM	Registration
8:00 AM – 8:10 AM	Introduction and housekeeping
8:10 AM – 8:25 AM	President's Address - Introduction to the Plenary Session

Plenary Session — *Matt Powell, Moderator*

8:25 AM – 9:05 AM	"A new perspective on conservation in the 21st century"NPT settlement agreement and groundwater legislation, Clive Strong

Session 1: Managing Non-Natives — *Vaughn Paragamian, Moderator*

9:05 AM – 9:10 AM	Introduction
9:10 AM – 9:30 AM	Walleye – overcoming a 30 year old paradigm, Vaughn L. Paragamian
9:30 AM – 9:50 AM	Testing direct competition between juvenile Yellowstone cutthroat trout, rainbow trout, and their hybrids. S.M. Seiler and E.R. Keeley
9:50 AM – 10:10 AM	The use of probable pheromones to attract brook trout into hoop nets. James A. Lamansky Jr, Ernest R. Keeley, Michael K. Young, Kevin A. Meyer

10:10 AM – 10:30 AM Break

10:30 AM – 10:50 AM	Hydrologic regime as a factor in displacement of Yellowstone cutthroat by rainbow trout in the Teton River and other upper Snake River basin streams. Rob Van Kirk, Amy Jenkins

10:50 AM – 11:10 AM	New Zealand mudsnails (*Potamopyrgus antipodarum*) in Silver Creek drainage. Chris James, Christine Moffitt
11:10 AM – 11:30 AM	Why a brook trout removal project in a Boise River tributary was unsuccessful. K. A. Meyer, D. J. Schill
11:30 AM – 11:50 AM	Evaluating the functional roles of native and non-native fishes using analysis of gut contents and stable isotopes. Claire C. McGrath, William M. Lewis, Jr.

11:50 AM – 1:00 PM Lunch: Committee Breakouts

Session 2: Anadromous Fish ***Jay Hesse, Moderator***

1:00 PM – 1:05 PM	Introduction to session
1:05 PM – 1:25 PM	What do your PIT tags represent? Use of the separation by code (SbyC) system for unbiased smolt to adult return rates and adult run predictions. J.L. Vogel, R.W. Orme, D.D. Nelson
1:25 PM – 1:45 PM	Monitoring the migrations of wild Snake River spring/summer Chinook salmon juveniles. Stephen Achord, Eric E. Hockersmith, Benjamin P. Sandford, Richard W. Zabel, and John G. Williams
1:45 PM – 2:05 PM	Survival, growth, and physiology of Snake River fall Chinook salmon following chronic temperature stress and application of passive integrated transponder (PIT)-tags. Jeff Yanke, Christine M. Moffitt, James L. Congleton
2:05 PM – 2:25 PM	Use of acoustic imaging technology to determine adult Chinook salmon Abundance in the Secesh River, Idaho. Paul Kucera and Dave Faurot
2:25 PM – 2:45 PM	Effects of juvenile migration and ocean/climate conditions on smolt-to-adult return rates and recruitment for Snake River Chinook Salmon. Howard Schaller and Charlie Petrosky
2:45 PM – 3:05 PM	In Search of the Lost Legions: Attempting to account for hatchery-origin adult steelhead returns to the Snake River Basin. Herb Pollard and Chris Starr
3:05 PM – 3:25 PM	**Break**

Session 3: Fish Health ***Keith Johnson, Moderator***

3:25 PM – 3:30 PM	Introduction to session
3:30 PM – 3:50 PM	The ecology of *Myxobolus Cerebralis* in the Pahsimeroi River drainage, Idaho: factors affecting the distribution and iIntensity. Michael Colvin, Kara Anlauf, Christine M. Moffitt, Keith Johnson
3:50 PM – 4:10 PM	Characterization of the Idaho *Neurotropic Myxobolus*, and distribution in Idaho waters. Carla Hogge and Keith Johnson
4:10 PM – 4:30 PM	Fish vaccines: Past, present and future. B.R. LaFrentz

4:30 PM – 4:50 PM	The influence of landscape, stream, and microhabitat parameters on tubificid habitat and population abundances. Kara J. Anlauf, Christine M. Moffitt, Michael E. Colvin
4:50 PM – 5:10 PM	Whirling disease, the whirling disease initiative, and whirling disease outreach. Amy Rose
6:30 PM –?	Student/Professional Mixer.

Friday, February 25, 2005

Session 4: Bull Trout — *Bart Gamett, Moderator*

8:00 AM – 8:10 AM	Housekeeping and Introduction
8:10 AM – 8:30 AM	Taking the "bull" by the horns: A collaborative approach to bull trout recovery in the Little Lost River Basin. Jason Pyron, Jim Fredericks, Bart Gamett, Jim Gregory, Pat Koelsch, Deb Mignogno, Scott Yates
8:30 AM – 8:50 AM	Studying bull trout movement and habitat use with radio telemetry in Idaho and beyond: A summary of the bull trout radio telemetry database. Matthew R. Dare
8:50 AM – 9:10 AM	Monitoring movement and mortality patterns of adult adfluvial bull trout during the Arrowrock dam construction project in southwestern Idaho. Tammy Salow, Lauri Hostettler
9:10 AM – 9:30 AM	Influences of Fish Size and Environmental Factors on the Extent and Rate of Autumn Downstream Migration by Bull Trout in the Boise River basin, Idaho. Lauri Hostettler, Jason Dunham, Tammy Salow, Pete Koetsier
9:30 AM – 9:50 AM	Estimated abundance, trend, and viability of bull trout populations in Idaho. Brett High, Kevin A. Meyer, Dan J. Schill, and Elizabeth R. J. Mamer
9:50 AM – 10:10 AM	**Break**

Session 5: Watershed — *Jody Brostrum, Moderator*

10:10 AM – 10:15 AM	Introduction to session
10:15 AM – 10:35 AM	USDA Forest Service fish and watershed program review - Rise to the future 2003. Dave Cross, Fred Harris and Virgil Moore
10:35 AM – 10:55 AM	Entrainment losses prior to and after fish screen installation at Skalkaho creek, Montana. Steve Gale, Al Zale, Tom McMahon, Chris Clancy
10:55 AM – 11:15 AM	Restoring Lightning Creek: Developing a watershed scale plan to guide restoration actions in a northern Idaho watershed. Chris Downs, Joe DosSantos
11:15 AM – 11:35 AM	Prioritizing restoration opportunities for bull trout habitat at the watershed scale: Lightning Creek, northern Idaho. S.R. Clayton, C. Huntington
11:35 AM – 1:40 PM	**Lunch – ICAFS Annual Business Meeting, Western Division AFS Update**

Session 6: Population Censusing ***Sam Sharr, Moderator***

1:45 PM – 1:50 PM	Introduction to session
1:50 PM – 2:10 PM	Influence of habitat attributes and spatial variability of capture efficiency of salmonids in small cold-water streams. Darek S. Elverud
2:10 PM – 2:30 PM	Use of radio telemetry data for management of fluvial trout populations in the upper Salmon River Basin, Idaho. Greg Schoby, Dr. Ernest Keeley, Tom Curet
2:30 PM – 2:50 PM	Was Edgar Winter correct? Utility of snorkeling for censusing salmonids. Russ F. Thurow and John W. Guzevich, James T. Peterson
2:50 PM – 3:10 PM	Factors influencing presence/absence of brook trout in the Panther Creek drainage. Joseph R., Benjamin, Matthew R. Dare and Jason B. Dunham
3:10 PM – 3:30 PM	**Break**

Session 7: Genetics ***Matt Powell, Moderator***

3:30 PM – 3:35 PM	Introduction to session
3:35 PM – 3:55 PM	Genetic variation in steelhead trout of the Grande Ronde River, Oregon. Shawn R. Narum, Steve Boe, Melanie Paquin, Paul Moran, Matt Powell
3:55 PM – 4:15 PM	Testing phenotype-based identifications of westslope cutthroat trout, rainbow trout, and hybrids in the Coeur d' Alene River basin, ID. Matthew Campbell, Christine Cegelski, Joe Dupont
4:15 PM – 4:35 PM	Large-scale and fine-scale genetic structuring of Yellowstone cutthroat trout *Oncorhynchus clarkia bouvier*i in Idaho. C.C. Cegelski, M.R. Campbell, K.A. Meyer, M.S. Powell

4:35 PM – 5:30 PM POSTER SESSION

- Mitochondrial DNA analysis of redband trout *Oncorhynchus mykiss gairdneri* from tributaries to the Salmon and Snake Rivers, ID. Matthew Campbell, Christine Cegelski, Ed Schriever, Craig Johnson
- Mitochondrial DNA analysis of Wood River *sculpin Cottus leiopomus* from the Big Wood, Little Wood, and Camas River drainages, ID. Matthew Campbell, Christine Cegelski, John Chatel, Dan Mahoney, Don Zaroban, Matt Powell
- Genetic assessment of Bonneville cutthroat trout Oncorhynchus mykiss Utah reintroduction efforts in S.F. Johnson Creek, UT. Matthew Campbell, Christine Cegelski, Warren Coyler, Amy Harig
- Conservation implications of spatial and temporal synchrony among Chinook salmon populations. Daniel J. Isaak, Russell F. Thurow, Bruce E. Rieman , Jason B. Dunham
- Bull trout population characteristics of two South Fork Boise River tributaries. Dan Kenney
- Conservation husbandry techniques for production of wild-like fish. Thomas A. Flagg, William T. Fairgrieve, Barry A. Berejikian, and Desmond J. Maynard

POSTER SESSION Continued

- Enhancement of ESA – listed endangered Redfish Lake sockeye salmon via a captive broodstock program. Thomas A. Flagg, W. Carlin McAuley, Paul A. Kline, Madison S. Powell, Doug Taki, and Jeffrey C. Gislason
- Spring Chinook captive broodstock, Grande Ronde Basin of eastern Oregon. Carlin McAuley
- Spring Chinook captive broodstock of the Salmon River Basin of Central Idaho. Carlin McAuley
- Manchester seawater supply system. Michael Waste
- East Fork ditch company fish habitat rehabilitation project: Step-pool complex, fish screen, and bypass channel. David M. Hogen
- Aquatic organism passage at culvert crossings on the Sawtooth National Forest: Challenges and opportunities. John Chatel

6:30 PM – 11:00 PM **Raffle and auction**

Saturday, February 26, 2005

Session 8: Lakes and Reservoirs ***Rob Van Kirk, Moderator***

8:00 AM – 8:10 AM	Housekeeping and Introduction
8:10 AM – 8:30 AM	Determining the feasibility of measuring rainbow trout abundance using hydroacoustics in a large oligiotrophic Lake. Thomas P. Bassista and Melo A. Maiolie
8:30 AM – 8:50 AM	Production of triploid lake trout (*Salvelinus namycush*) at Grace Fish Hatchery. Jeffrey D. Seggerman, Dwight Aplanalp, Tom Kent, Joe Kozfkay, Eric Wagner
8:50 AM – 9:10 AM	Habitat use of lake trout in Lake McDonald, Glacier National Park from ultrasonic telemetry. Andrew M. Dux and Christopher S. Guy, Wade A. Fredenberg, Leo Marnell
9:10 AM – 9:30 AM	Social implications of managing lake trout in Lake Pend Oreille, Idaho. Ned Horner
9:30 AM – 9:50 AM	Autumn to spring energetic and diet changes among kokanee from north Idaho lakes with and without *Mysis relicta*. Lance R. Clarke and David H. Bennett
9:50 AM – 10:10 AM	Evaluation of large trap nets to reduce lake trout abundance in Lake Pend Oreille, Idaho. Michael P. Peterson and Melo A. Maiolie
10:10 AM – 10:30 AM	**Break**

Session 9: Cutthroat Trout ***Michael Colvin, Moderator***

10:30 AM – 10:40 AM	Housekeeping and Introduction
10:40 AM – 11:00 AM	Movement and mortality of westslope cutthroat trout in the Coeur d'Alene River basin, Idaho, 2003-2004. Joe DuPont, Matthew Davis, Edward Lider and Brett Roper
11:00 AM – 11:20 AM	Habitat use and availability by westslope cutthroat trout in the north fork Coeur d'Alene River drainage, Idaho. Matthew Davis, Edward Lider, Joe DuPont and Brett Roper
11:20 AM – 11:40 AM	Thermal regimes and summer thermal refugia for westslope cutthroat trout within the Coeur d'Alene basin, Idaho, 2003-2004. Edward Lider, Joe DuPont, Matt Davis and Brett Roper
11:40 AM – 12:00 AM	Factors affecting cutthroat trout recruitment in the Teton Valley. M.K. Koenig , J. Fredericks, J. Kershner
12:00 AM – 12:20 PM	Prey size and abundance as predictors of growth efficiency for stream-dwelling cutthroat trout (*Oncorhynchus clarki*). Christopher A. Leeseberg and Ernest R. Keeley

12:20 PM Adjourn and Executive Committee Meeting

Contributed Papers - alphabetized by presenter

Achord (session 2 – 1:25 pm – 1:45 pm)

Monitoring the migrations of wild Snake River spring/summer Chinook salmon juveniles

Stephen Achord, Eric E. Hockersmith, Benjamin P. Sandford, Richard W. Zabel, and John G. Williams; Northwest Fisheries Science Center, National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service, 2725 Montlake Blvd. E., Seattle, WA. 98112-2097.

ABSTRACT: Monitoring the survival and migrational characteristics of wild Snake River spring-summer Chinook salmon *Oncorhynchus tshawytscha* juveniles have been identified in several regional fisheries documents as important for protection and recovery of these ESA-listed fish. During summers 1988 through 2003, wild Chinook salmon parr were collected and PIT tagged in their natal streams in Idaho. Each subsequent spring and summer, tagged smolts were detected at juvenile bypass systems at dams on the lower Snake and Columbia Rivers. At Lower Granite Dam, annual migration timing distributions were consistently protracted and highly variable among streams and years. Timing trends were observed for some populations and ranged from early to late spring. In addition, for combined wild populations, we observed 2- to 3-week migrational timing shifts between relatively warm and cold years. Yearly, overall parr-to-smolt survival estimates for these combined (Idaho) populations from 1993 to 2004 at the dam ranged from 8.0 to 25.4% (average 15.7%) and standard errors (se) ranged from 0.3 to 1.8% (average 0.8%). Estimated survival for individual populations has ranged from 2.8 to 48.4% (se from 1 to 8%). We successfully developed in-stream monitoring of PIT-tagged fish in Valley Creek, Idaho from 2002 to 2004. Overall, estimated survival of the 2003 summer-tagged Chinook parr, from tagging, to leaving this stream in 2003 and 2004 was 27.3%. These fish moved out of this stream in the following proportions: 58.7% in late summer/fall, 32.8% in winter, and 8.5% in spring. We have collected water quality environmental data at several sites in the Salmon River basin since 1994. As additional water quality environmental monitors, in-stream PIT-tag monitors, and traps are installed in study streams, we can more accurately monitor fry, parr, and smolt movements out of rearing areas and examine the relationships between these movements and environmental conditions within the streams. Mapped over time, this information, along with weather and climate data, may provide tools for the prediction of movement and survival in different wild populations. Such tools are vital to recovery planning for threatened or (ESA) endangered species of Pacific salmon.

Anlauf (session 3 – 4:30 pm – 4:50 pm)

The influence of landscape, stream, and microhabitat parameters on Tubificid habitat and population abundances

Kara J. Anlauf, Christine M. Moffitt, Michael E. Colvin, Idaho Cooperative Fish and Wildlife Research Unit, Department of Fish and Wildlife, University of Idaho, Moscow, Idaho 83844 Phone (208) 885-7139. Fax (208) 885-9080.

ABSTRACT: We used stream habitat metrics at multiple scales to build predictive habitat models of *Tubifex tubifex*, the alternate host in the life history of *Myxobolus cerebralis* the causative parasite of whirling disease. The objectives of this study were to 1) Use multi-scale geospatial landscape variables and measurable reach scale variables to identify the best predictive model of fine stream sediments, a favorable tubificid worm habitat feature, 2) Identify relationships among tubificid populations and sediment core properties, and 3) Quantify the link between stream-scale habitat attributes and microhabitat aiding in the quantification of suitable *T. tubifex* habitat. This study was conducted within the Pahsimeroi River drainage, a tributary of the Salmon River located in East-Central Idaho. We included four reach scale parameters, measured in the field, and quantified for 100-m reaches, and six landscape scale parameters extracted using a GIS at three different scales. Each scale included the stream reach and three distances upstream (500-m, 2000-m, and the total length upstream). We used linear mixed models to predict fine sediments and to assess the relationship between *Tubifex sp.* and physical and biological microhabitat variables. The best approximating models predicting fine sediments at a reach scale included the proportion of slow habitat. Multi-scale models with the

best fit included the proportion of slow habitat at the reach scale and conifer cover and agriculture at the landscape scale. The most plausible model predicting *Tubifex sp.* included silt-clay, fine sand, and the total number of another prevalent tubificid oligochaete found within core samples. We found silt-clay to be positively correlated with the proportion of fine sediments estimated within a study reach. Our results suggest that the prediction of fine sediments was best-determined using variables operating at different spatial scales, while *Tubifex sp.* abundance was influenced by factors functioning at the microhabitat scale.

Bassista (session 8 – 8:20 am – 8:40 am)

Determining the feasibility of measuring rainbow trout abundance using hydroacoustics in a Large oligiotrophic lake

Thomas P. Bassista and Melo A. Maiolie, Idaho Department of Fish and Game, Lake Pend Oreille Research Station, P.O. Box 806, Bayview, Idaho 83803-0806, Phone: (208) 683-3054, tbassista@idfg.state.id.us, mmaiolie@idfg.state.id.us.

ABSTRACT: We attempted to develop a hydroacoustic technique to estimate the abundance of rainbow trout *Oncorhynchus mykiss* > 415 mm from the limnetic zone of Lake Pend Oreille, Idaho (38,000 ha, mean depth = 164 m). Having the ability to estimate rainbow trout abundance could be essential in managing the lake for balanced populations of predator and prey, and maintaining good fisheries. One drawback of hydroacoustics is that fish species cannot be directly determined from the echograms. During the summers of 2003 and 2004, we utilized sonic tracking to regularly locate 8 rainbow trout, 11 lake trout *Salvelinus namaycush* and 10 bull trout *S. confluentus* that were internally implanted with depth-sensing sonic transmitters. From this we identified the nighttime habitat used by the three species. During August we conducted mobile hydroacoustic surveys using a towed split-beam 120 kHz transducer to estimate the abundance of pelagic fish > 415 mm. We then compared the nighttime location of acoustic targets to the distributions of sonic tracked fish. Bull trout and lake trout were mainly found along near-shore benthic areas and used mean depths of 23 and 27 m, respectively. Both species were occasionally located in the limnetic zone. Rainbow trout were exclusively located in the limnetic zone between the lake's surface and 25 m (mean depth = 8 m). On the echograms, fish > 415 mm in the limnetic region were located between the 12 m and 35 m depths (mean = 23 m), and so overlapped the habitat used by all three predatory species. No fish > 415 mm were detected with hydroacoustics in water < 12 m. We found that our current down-looking hydroacoustic technique would miss many of the shallow rainbow trout and include some lake trout and bull trout in the abundance estimates. Therefore, we are currently investigating methods to improve detection of shallow rainbow trout.

Benjamin (session 6 – 2:50 pm – 3:10 pm)

Factors influencing presence/absence of brook trout in the Panther Creek drainage

Joseph R. Benjamin[1] (jbenjamin@fs.fed.us, Phone: 373-4392), Matthew R. Dare[1] (mdare@boisestate.edu), and Jason B. Dunham[2] (jbdunham@fs.fed.us) 1) Department of Biology, Boise State University, 1910 University Drive, Boise, ID 83705; 2) U. S. Forest Service, Rocky Mountain Research Station, 316 E. Myrtle Street, Boise, ID 83702.

ABSTRACT: Numerous studies have been done on the introduction of nonnative fish in freshwater systems. In western North America, the introduction of brook trout (*Salvelinus fontinalis*) has recently become a topic of concern for fishery managers. The majority of research dealing with brook trout invasions has been as a side note to investigating native species; however, this research has suggested that brook trout could potentially displace or replace native species. There are few studies that have evaluated the habitat preferences of brook trout outside their native range. We took a step back from the current trend in research to evaluate the environmental variables brook trout prefer. It is our thought that a better understanding of these variables will provide managers with useful tools in dealing with current and potential invasions by brook trout. This study was conducted in the headwaters of Panther Creek, a tributary to the Salmon River, near Challis, Idaho. We used electrofishing and habitat sampling to 1) document basic habitat characteristics influencing the presence

of juvenile and adult brook trout, 2) determine if rainbow trout (*Oncorhynchus mykiss*) act as a biotic barrier to juvenile and adult brook trout, 3) investigate the potential of greater species diversity limiting juvenile and adult brook trout presence, and 4) determine if there is a correlation between the presence of beaver ponds and the presence of brook trout populations in nearby tributary streams.

Campbell (session 7 – 3:55 pm – 4:15 pm)

Testing phenotype-based identifications of westslope cutthroat trout, rainbow trout, and hybrids in the Coeur d' Alene River basin, ID

Matthew Campbell, Idaho Department of Fish and Game, Eagle, Idaho 83616; Christine Cegelski, Idaho Department of Fish and Game, Eagle, ID 83616; Joe Dupont, Idaho Department of Fish and Game, Coeur d'Alene, ID 83815.

ABSTRACT: Hybridization issues concerning westslope cutthroat trout and rainbow trout remained primary concerns for Idaho Department of Fish and Game managers during the past year, and the Department has continued to develop management strategies for reducing or eliminating hybrids and non-native populations of rainbow trout. Many of these strategies rely on the ability of biologists and managers to use phenotype-based characters to accurately distinguish cutthroat trout from hybrids and rainbow trout. In this study, 106 *Oncorhynchus sp.* were randomly collected from four sites within the Coeur d'Alene River basin, ID. Every fish collected was photographed, recorded as cutthroat trout, rainbow trout, or hybrid, and sampled for genetic analysis (non-lethal fin clip). A diagnostic mitochondrial DNA marker and six diagnostic nuclear DNA markers were used to assign individual fish a genetic identification and test phenotypic calls. In total, 13 samples had genotypes indicative of rainbow trout, 11 had genotypes indicative of hybrids (10 >F_1s, 1 F_1), and 82 had genotypes indicative of cutthroat trout. Results indicated that phenotype-based identifications largely agreed with genetic identifications. Of the 106 samples, 97 had matching genetic identifications (91.5%). However, four samples phenotypically identified as a westslope cutthroat trout were genetically detected as >F_1 hybrids. This demonstrates that current phenotype-based procedures will be unable to remove all hybrids from streams within the Coeur d'Alene River basin, ID. Additionally, we failed to detect rainbow trout alleles in four samples phenotypically identified as "hybrid". Despite these limitations, results from this study still suggest that phenotype-based identifications and subsequent rainbow trout and hybrid removal efforts could be of benefit in reducing the threat of hybridization and introgression within these streams.

Cegelski (session 7 – 4:15pm – 4:35pm)

Large-scale and fine-scale genetic structuring of Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri* in Idaho.

C.C.Cegelski[1], M.R. Campbell[1], K.A. Meyer[2], M.S. Powell[3]
[1]Idaho Department of Fish and Game, 1800 Trout Rd., Eagle ID 83616
[2]Idaho Department of Fish and Game, 1414 E. Locust Lane, Nampa ID 83686
[3]University of Idaho, Center for Freshwater and Salmonid Species at Risk, 3059-F National Fish Hatchery Road, Hagerman, Idaho 83332.

ABSTRACT: Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri* populations have declined throughout their native range due to habitat degradation, over-harvest, and introductions of non-native trout that have hybridized with or displaced native populations. The degree to which these factors have impacted current genetic population structure of Yellowstone cutthroat trout populations is of primary interest for their conservation. In this study, we examined genetic diversity and genetic population structure of Yellowstone cutthroat trout using data from six polymorphic microsatellite loci. A total of 1330 samples were analyzed from 45 populations throughout 11 major drainages in Idaho. We found that levels of genetic diversity and genetic differentiation varied extensively. The Salt River drainage, which is representative of the least impacted habitat in Idaho, had the highest levels of genetic diversity and lowest levels of genetic differentiation. High levels of genetic differentiation were observed at similar or smaller geographic scales in

the Portneuf River, Raft River and Teton River drainages, which are more altered by anthropogenic disturbances. Results indicated that Yellowstone cutthroat trout are naturally structured at the drainage level, but that habitat fragmentation has significantly altered this structuring and has led to reduced gene flow among populations. Nevertheless, our data support the finding that Yellowstone cutthroat trout appear to be functioning at a metapopulation level within some areas. Management and conservation should be focused at the drainage level in areas of connected habitat and at the stream level in areas of degraded habitat to ensure genetic variation is maintained. Connectivity (through translocations or habitat restoration) should also be restored whenever possible to minimize losses in genetic diversity, preserve historical processes of gene flow, life-history variation, and meta-population dynamics.

Clarke (session 8 – 9:40 am – 10:00 am)

Autumn to spring energetic and diet changes among kokanee from north Idaho lakes with and without *Mysis relicta*

Lance R. Clarke[1] and David H. Bennett; Department of Fish and Wildlife Resources
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[1]Presenter. Current address: U. S. Fish and Wildlife Service, UCA-1207, 1917 Marsh Road, Yakima, WA 98901-2058.

ABSTRACT: In prior net-pen experiments with age-0 kokanee Oncorhynchus nerka, we concluded that zooplankton community changes at Pend Oreille Lake, Idaho, attributed to Mysis relicta planktivory, might be affecting kokanee growth in autumn, but not in spring. To support or refute our experimental results, we conducted field studies to compare autumn and spring body lipids and feeding patterns from ages-0 and 1 kokanee in Pend Oreille Lake to those in nearby Coeur d'Alene and Spirit lakes. We also compared our feeding analysis of Pend Oreille Lake kokanee with a similar study conducted before the Mysis introduction. Age-0 Pend Oreille Lake kokanee showed no evidence of malnutrition, as total lengths, overwinter (November-May) growth, and autumn body lipid contents were similar for age-0 Pend Oreille and Coeur d'Alene lake kokanee. However, Pend Oreille Lake age-1 kokanee were smaller and had lower lipid levels in autumn and spring, as compared to those from Coeur d'Alene and Spirit lakes. There was no evidence of direct starvation mortality in either Pend Oreille Lake year-class, since body lipids were higher than prior studies have reported for starving individuals. Seasonal kokanee feeding patterns differed among the three lakes, with Pend Oreille Lake individuals having lower stomach biomass in November compared to those from Coeur d'Alene Lake, and a lower proportion of the cladoceran zooplankter Daphnia in the autumn diet compared to Coeur d'Alene and Spirit lake fish. Kokanee fed upon small copepod species during spring in all three lakes. Before Mysis establishment in Pend Oreille Lake, kokanee in autumn apparently fed upon a higher proportion of cladoceran zooplankton, had a greater amount of stomach biomass, and had fewer empty stomachs, although spring feeding patterns were more similar to those we observed. Our results show that seasonal changes in zooplankton availability at Pend Oreille Lake may have changed age-1 kokanee foraging, growth, and energy accumulation patterns, although we cannot exclude the possibility that recent changes in predation intensity might also explain our results.

Clayton (session 5 – 11:15 am – 11:35 am)

Prioritizing restoration opportunities for bull trout habitat at the watershed scale: Lightning Creek, northern Idaho

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ABSTRACT: Lightning Creek, a tributary to Lake Pend Oreille in northern Idaho, drains a 316-km2 watershed characterized by frequent rain-on-snow events, steep slopes, and an abundant supply of glacial till. The drainage provides important habitat for bull trout, and large portions of the watershed were intensively

roaded and harvested from the 1950s-1970s. In coordination with a technical committee composed of representatives from state and federal agencies and Avista Corporation, the PWA team assessed how physical processes and past land management have influenced slope and channel stability and aquatic habitat complexity. Our work included analysis of historic and current aerial photos and GIS coverages to identify and characterize sediment source, transport, and response reaches; field surveying of stream channels and abandoned roads; and assessment of changes in cross sections at a USGS cableway near the mouth. We developed a prioritized, long-term plan with recommendations at the subwatershed and geomorphic reach scales for addressing problems currently impacting bull trout habitat. Findings from the assessment will be used to coordinate, implement, and monitor restoration activities throughout the watershed (following the NEPA process) and leverage future opportunities for restoration funding in the watershed.

Colvin (session 3 – 3:30 pm-3:50 pm)

The ecology of *Myxobolus Cerebralis* in the Phasimeroi River drainage, Idaho: Factors affecting the distribution and intensity

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ABSTRACT: Aquatic habitat fragmentation on the mainstem Pahsimeroi River and its tributaries limits the recovery of threatened salmonids in the Pahsimeroi River drainage. Fragmentation occurs due to a combination of natural seepage and reduced surface flow from irrigation withdrawal. Restoration of aquatic habitat for anadromous salmonids and bull trout has focused on the reconnection of tributaries and increasing aquatic habitat connectivity. Restoration efforts have the potential to alter the current distribution and intensity of *Myxobolus cerebralis* in the Pahsimeroi River Drainage. We surveyed streams to identify the distribution and quantify the intensity of *M. cerebralis* infections in sentinel exposure rainbow trout in the Pahsimeroi River drainage. Sentinel exposures were conducted over the years of 2001-2003 in cooperation with Idaho Department of Fish and Game to identify the distribution and intensity of *M. cerebralis*. Factors affecting the distribution and intensity of *M. cerebralis* in this fragmented system were hypothesized and derived in a Geographic Information System and used to construct candidate models of distribution and intensity. We used an information theoretic approach to model selection and inference of data. Analysis of the detectable presence of *M. cerebralis* identified relationships of the amount of aquatic habitat and distance to connection. Sites with increasing upstream aquatic habitat had a higher probability of being positive for *M. cerebralis*. The degree of connectivity had a positive relationship in the probability of detection of *M. cerebralis*. Analysis of the intensity of pathology of the parasite over the six exposure periods revealed weak or no relationships to landscape variables. Consistent patterns across time in intensity were weak or indeterminable in the dataset suggesting small-scale environmental heterogeneities may be contributing more to intensity of infection.

Dare (session 4 – 8:30 am – 8:50 AM)

Studying bull trout movement and habitat use with radio telemetry in Idaho and beyond: a summary of the bull trout radio telemetry database

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ABSTRACT: In 2004, the U. S. Fish and Wildlife Service funded a project to collect and synthesize existing information regarding studies that have examined the movement and habitat use of bull trout *Salvelinus confluentus* with radio telemetry. The result of the study was a database containing information on 68 completed or ongoing studies in the United States and Canada. Since 1989, over 3,000 bull trout have been tagged as part of a radio telemetry study. In Idaho, 16 projects have used radio telemetry to study this threatened species. The database contains a wide array of information including the location, cooperators,

funding sources, objectives, and field methods for each study. The majority of studies were initiated to examine the upstream movement patterns of adult bull trout associated with spawning; however, several studies had unique objectives. I have gleaned a number of interesting patterns pertaining to the design and execution of radio telemetry studies including international trends in surgical techniques, sample size, observations, and mortalities. The completion of the database is the first phase of the synthesis project: I am currently moving forward with a species-level analysis of migratory bull trout distribution.

Davis (session 9 – 11:00 am – 11:20 am)

Habitat use and availability by westslope cutthroat trout in the north fork Coeur d'Alene River drainage, Idaho

Matthew Davis, Zone Fisheries Biologist, USDA Forest Service, Coeur d'Alene River Ranger District, Coeur d'Alene, Idaho. Edward Lider, Joe DuPont and Brett Roper.

ABSTRACT: Through a cooperative research project we conducted a telemetry study on westslope cutthroat trout *Oncorhynchus clarki lewisi* in the Coeur d'Alene River watershed in northern Idaho from May 2003 to June 2004. One objective of this study was to evaluate the habitat use and availability for westslope cutthroat trout. In each 5th Hydrological Unit Code watershed, stream habitat data was used from years: 1995, 1998, 2001, and 2003. These surveys were conducted from mid-August to mid-September, using a modified R1/R4 survey methodology. The survey measured habitat along 155.9 kilometers of river, consisting of 1,502 individual habitat units identified. Based on area surveyed (m^2), pools constituted the overall primary habitat type in the project area (31.9 %), followed by riffles (29.1 %), glides (20.2 %), and runs (18.6 %), respectively. For each of the 75-radio tagged fish in the study, similar habitat was collected during telemetry tracking efforts, which consisted of 671 habitat use observations. In our telemetry efforts, westslope cutthroat trout primarily occupied pool habitat (65.3 %), followed by run habitat (25.2 %). Seasonal occupancy of pool and run habitat by biologic season varied little throughout the study, however the selection of glide habitat (20.7 %) was significantly higher in winter than in any other season. Cover was an important criteria within habitat selected, where over 76.1 % of the time fish were tracked, they were associated with some form of cover. Fish in most basins were selecting woody debris in greater proportion than what was available.

Downs (session 5 - 10:55 am – 11:15 am)

Restoring Lightning Creek: Developing a watershed scale plan to guide restoration actions in a northern Idaho watershed

Chris Downs, Senior Fishery Research Biologist, Idaho Department of Fish and Game. Joe DosSantos, Aquatic Program Leader, Avista Corporation.

ABSTRACT: Restoring and enhancing populations of native salmonids in Lake Pend Oreille is a focus of the Clark Fork Settlement Agreement signed in 1999. Lightning Creek, the third largest tributary to Lake Pend Oreille, is important historical habitat for bull trout. Recent genetic analysis indicates at least five distinct bull trout populations inhabit the Lightning Creek drainage, comprising a significant proportion of the total number of populations inhabiting the lake. Redd counts indicate Lightning Creek bull trout populations have undergone substantial reductions in abundance due in large part to habitat degradation. Due to its' size, current condition, and number of distinct bull trout populations, Lightning Creek and its tributaries offer some of the greatest potential to enhance local bull trout populations. Habitat problems are large in scale, complex, and will require a carefully developed plan to address them successfully. We assembled a multi-agency technical team to develop a framework for a watershed assessment to provide an analysis of historic conditions and current trends at the sub-watershed scale in Lightning Creek to ultimately develop a top to bottom restoration plan for the drainage. The technical group worked collaboratively with the consultant selected to develop the plan. Initial implementation efforts of plan recommendations are anticipated to begin in 2006, following NEPA analysis in 2005.

DuPont (session 9 – 10:40 am – 11:00 am)

Movement and mortality of westslope cutthroat trout in the Coeur d'Alene River basin, Idaho, 2003-2004

Joe DuPont, Regional Fisheries Biologist, Idaho Department of Fish and Game, Region 1, Coeur d'Alene, Idaho, Matthew Davis, Edward Lider and Brett Roper.

ABSTRACT: Through a cooperative research project we conducted a telemetry study on westslope cutthroat trout *Oncorhynchus clarki lewisi* in the Coeur d'Alene River watershed in northern Idaho from May 2003 to June 2004. One objective of this study was to evaluate movement and mortality of the radio tagged cutthroat trout. We found that the 75 cutthroat trout that we tagged display localized movements where they tended to stay in one of eight subbasin for the entire summer, fall and winter period. Very little mixing of fish occurred between the subbasins except during the spawning season. We tracked 29 different fish throughout the spawning season. We documented a spawning migration for 22 of these fish with most spawning between mid-April and early-May. Of the 22 different fish that made spawning migrations, 14 survived long enough or were tracked long enough for us to document their return migration. Of these 14 fish, 13 returned to within 200 m of where they spend the previous summer with 11 of them returning to the exact same pool often locating under or behind the same log or boulder. Two factors ANOVA testing showed that movement of these radio tagged cutthroat trout differed significantly between subbasins (p value = 0.0007) and months (p value < .0001). Of the 75 cutthroat trout we put transmitters in, 51 died or expelled their tags before the study was complete or before the transmitter batteries expired. Thirteen of these fish died from fishermen with nine of these being killed illegally. Fishing mortality was higher in two of the basins than the other six. Fish using these two subbasins lived on average < 200 days (all other subbasins > 700 days) during the open fishing season before they were killed by a fisherman. Fish from these two subbasins also displayed the longest migrations and most mixing with fish from other subbasins. The high exploitation rates in these two subbasins may be selecting against fish with longer migrations and that have more genetic interchange with fish from other subbasins. Concerted efforts to minimize illegal harvest should reduce exploitation rates of cutthroat trout in both of these basins. Because of the localized movement of cutthroat trout within the Coeur d'Alene River watershed, we believe fishing regulations should consider each of these eight basins versus blanket regulations for the entire watershed.

Dux (sessions 8 – 9:00 am – 9:20 am)

Habitat use of lake trout in Lake McDonald, Glacier National Park from ultrasonic telemetry

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ABSTRACT: Bull trout *Salvelinus confluentus* have suffered a dramatic population decline since the establishment of nonnative lake trout *Salvelinus namaycush* in Lake McDonald, Glacier National Park (GNP). In an attempt to prevent further decline of this population, GNP is considering implementing a lake trout suppression program. We used ultrasonic telemetry to examine the spatial and temporal distribution of lake trout, thus providing information critical to developing a successful suppression program. We relocated 36 lake trout 1,137 times from June through November 2003 and March through November 2004. Tracking was conducted at all times during a 24-h period. Lake trout total length varied from 508-859 mm and averaged 629 mm (SE = 13.1). Mean depth of lake trout was shallowest (14.0 m, SE = 2.2) in May and deepest (25.2 m, SE = 1.03) in September. Mean depth increased from May through September as thermal stratification became more pronounced. During stratification, lake trout occupied depths in the thermocline and upper hypolimnion where temperatures varied from 6-12˚ C and dissolved oxygen levels were approximately 9-12 mg/L. Additionally, lake trout were found in the pelagic zone more frequently during stratification than in spring and

autumn. Spawning commenced in late-October (water temperature <11˚ C), and lake trout aggregated in shoreline habitats with clean cobble and rubble substrates. Mean fish depth during spawning was 16.1 m (SE = 1.4). These data illustrate patterns in the spatial and temporal distribution of lake trout and will be useful for developing methods to reduce lake trout abundance in Lake McDonald

Elverud (session 6 – 1:50 pm – 2:10 pm)

Influence of habitat attributes and spatial variability of capture efficiency of salmonids in small cold-water streams

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ABSTRACT*:* Fish abundance estimates are commonly used to evaluate and monitor populations of salmonid species throughout the western United States. Capture efficiency is central in producing reliable population estimates, and varies relative to physical and chemical stream attributes. Knowing the relationship between stream attributes and capture efficiency is vital to producing reliable estimates of fish abundance. The relationship between seven stream attributes and capture efficiency was determined for seven geographically distinct sub-basins in the upper Columbia River Basin. Population estimates were compared from single pass electrofishing to population estimates from multiple pass electrofishing and related to seven stream attributes (conductivity, percent pools, residual pool depth, bankfull width, bank angle, percent undercut banks, and large woody debris) from seven sub-basins in Idaho, Montana, Oregon, and Washington. Capture efficiencies were found to vary by region and by stream habitat characteristics. Universal capture probabilities should not be assumed. Comparisons of fish abundance should only be completed after capture probabilities have been considered.

Gale (session 5 – 10:35 am – 10:55 am)

Entrainment losses prior to and after fish screen installation at Skalkaho Creek, Montana

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ABSTRACT: Post-spawn adult and downstream migrant juvenile westslope cutthroat trout (*Oncorhynchus clarki lewisi*) are entrained, become trapped, and die in the seven irrigation canals on Skalkaho Creek, a tributary of the Bitterroot River. We quantified entrainment rates into the canals using telemetry and trapping before (2003) and after (2004) installation of fish screens at three of the canals (Highline, Ward, and Hughes). No telemetered adults were entrained in 2003, because most were residents and did not migrate past the canals. Fifteen telemetered adults were entrained in 2004; three were entrained, bypassed, and entrained again further downstream. Nine telemetered adults were entrained at screened canals and all nine were successfully bypassed. Five telemetered age-1 juveniles were entrained at the Highline ditch in 2003; three were entrained there in 2004, but only one was bypassed. We estimated that 33,722 age-0 westslope cutthroat trout (95 % CI, 12,044-161,799) moved downstream from 16 July to 20 September in 2003; 8,964 (95 % CI, 2,840-72,141) or about 27 % were entrained at the Highline ditch. In 2004, 7,939 fish were bypassed by all three screens, and of those 6,137 were westslope cutthroat trout. The fish screens effectively precluded entrainment and effectively bypassed adult, age-1 juvenile and age-0 westslope cutthroat trout. Fish screens were an effective management tool to eliminate entrainment of westslope cutthroat trout at Skalkaho Creek.

High (session 4 – 9:30 am – 9:50 am)

Estimated abundance, trend, and viability of bull trout populations in Idaho

Brett High, Kevin A. Meyer, Dan J. Schill, and Elizabeth R. J. Mamer. Idaho Department of Fish and Game, Nampa Research, 1414 East Locust Lane, Nampa, ID 83686.

ABSTRACT: Broad-scale declines in bull trout *Salvelinus confluentus* distribution and abundance over the past century or more led to statewide no-harvest regulations in the state of Idaho in 1994, and ultimately to a threatened listing under the Endangered Species Act in 1998. Despite this listing, quantitative evaluations of trends in abundance and estimates of existing population sizes over most of its historical range have not been made. We evaluated long-term trends in bull trout abundance, estimated population sizes, and conducted population viability analysis (PVA) for bull trout in Idaho based on stratified sampling extrapolations of fish surveys (snorkel and electrofishing). Long-term trend estimates from bull trout redd counts, spawning weirs, and snorkel and electrofishing population surveys indicate that many bull trout populations declined through the mid-1990s, but in general have increased over the last 10 years. We estimated there was approximately 1.24 million bull trout divided within the seven recovery units included in our analyses. Persistence probabilities for bull trout in 11 core areas throughout 4 recovery units ranged from 0.55 to >0.95 with the majority >0.95. When conservative estimates of the instantaneous rate of population change (_) and the variance in rate of change ($_^2$) were used at the recovery unit scale, and risks of recovery unit-wide bull trout extirpation due to environmental stochasticity were spread over the number of local populations for each recovery unit identified in the bull trout draft recovery plan, PVA results indicated extirpation risks for bull trout in 5 of the 7 recovery units included in our analysis was low. Conclusions pertaining to the Kootenai River and Coeur d'Alene River recovery units based on PVA results are limited due to the lack of quantitative sampling data from those areas and the lack of identification of local populations in the Coeur d'Alene River Recovery Unit in the bull trout draft recovery plan. Our results suggest that bull trout remain abundant in large stream networks throughout Idaho, that their abundance for most core areas in most recovery units has been increasing over the past decade, and that their risk of extirpation in Idaho over the next 100 years appears to be low.

Hogge (session 3 - 3:50 pm – 4:10 pm)

Characterization of the Idaho *Neurotropic Myxobolus*, and its distribution in Idaho waters

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ABSTRACT: While screening salmonids for *M. cerebralis*, the causative agent of whirling disease, we detected another *Myxobolus* sp., morphologically similar to *M. cerebralis*, in brain tissue. Our initial objective was to develop a PCR-based technique to discriminate between *M. cerebralis* and the neurotropic *Myxobolus*. The resulting diagnostic tool has resolved cases in which the pepsin-trypsin digest (PTD) screening test indicated *Myxobolus* spores but histological examination or PCR was negative for *M. cerebralis*. We then looked at the relatedness of this neurotropic *Myxobolus* to other known *Myxobolus* species. Our phylogenetic analysis based on 683 bp of the 18S ribosomal DNA reveals a large genetic divergence between the Idaho neurotropic *Myxobolus* and *M. cerebralis* suggesting this neurotropic *Myxobolus* is a new, previously undescribed species. Continuing to study this neurotropic Myxobolus we now have 1) characterized the species in preparation for naming it, and 2) using our PCR-based diagnostic technique, mapped it's distribution in Idaho. The neurotropic *Myxobolus* spore, as viewed in PTD wet mount, is on average slightly larger than those of *Myxobolus cerebralis* with no distinctive morphological differences. In contrast to *Myxobolus cerebralis,* histological examination reveals spores located in distinct pockets within nervous tissues with no detectable host inflammatory response. Scanning electron microscopy (SEM) demonstrates bivalved spores with a distinct suture line and well-developed sutural ridge. Sutural grooves and a polar filament discharge pore were observed. Host species infected with the neurotropic *Myxobolus* include rainbow trout *Oncorhynchus mykiss*, cutthroat trout *O. clarki*, Chinook salmon O. *tshawytscha*, and kokanee *O. nerka*. The

intensity of infection based on histological examination varies from few spores in one pocket to many spores in many pockets within the nervous tissue. The current geographic range in Idaho encompasses eight river drainages, the Spokane R., Snake R., Clearwater R., Salmon R., Payette R., Boise R., Wood R., and Lost River Sinks. These include watersheds shown to be positive for *M. cerebralis*. Many tributaries of the Clearwater River are positive for the neurotropic *Myxobolus* although only one, the American River, is positive for *M. cerebralis*. In the Middle Fork Salmon River we have shown many tributaries positive for one or the other species with three locations positive for both the neurotropic *Myxobolus* and *M. cerebralis*. We have confirmed the presence of this neurotropic species in Utah in Bear Lake cutthroat trout. Documentation of *Myxobolus* species from Oregon and California appear to be this neurotropic species, further indicating a widespread distribution. Since the fish health community is committed to screening large numbers of salmonids for *M. cerebralis,* the possibility of a widespread distribution is significant. The importance of the neurotropic *Myxobolus* remains in its similarity to *M. cerebralis* morphologically and it's overlapping geographic distribution.

Horner (session 8 – 9:20 am – 9:40 am)

Social implications of managing lake trout in Lake Pend Oreille, Idaho

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ABSTRACT: Non-native lake trout have had significant negative impacts on native bull trout and other popular sport fisheries in Pacific northwest lakes. Lake trout now dominate Priest and Flathead lakes and fishing effort is about 50% of what native cutthroat, bull trout and kokanee populations supported. Evidence of a rapidly expanding lake trout population in Lake Pend Oreille prompted significant fishing regulation changes. Two years of predator reduction efforts and no improvement in the kokanee population prompted an intensive angler involvement program to define and implement socially acceptable means of predator reduction. A Citizens Advisory Committee recommended establishment of a commercial rod-and-reel fishery for lake trout. The CAC also approved the experimental use of deep water trap nets similar to those used on Lake Michigan to commercially harvest lake whitefish. Funding was obtained to build nine trap nets and hire two boats and a crew for two 6-month assessments in Lake Pend Oreille. Opposition to the trap net fishery surfaced in a petition with 1,820 signatures to the Governors office just prior to the fishery commencing in the fall of 2003. The trap net fishery was implemented, but commercial harvest of lake trout did not occur. The second season of the trap net contract was delayed until the fall of 2005 to address both biological and social issues. Angler education efforts continue in an effort to gain acceptance for needed management actions.

Hostettler (session 4 – 9:10 am – 9:30 am)

Influences of fish size and environmental factors on the extent and rate of autumn downstream migration by bull trout in the Boise River basin, Idaho

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ABSTRACT: An understanding of habitat use and migratory behavior is important for managing bull trout in highly manipulated reservoir systems. Little is known about the relative importance of migratory corridor conditions and seasonal feeding habitats in relation to life stage of bull trout. We used radio telemetry to determine size related patterns of autumn migration during 2001-2003 in the Boise River and Arrowrock Reservoir in southwestern Idaho. Downstream migrating bull trout (n = 158, 21-73 cm TL) captured in the autumn at a picket weir on the North Fork Boise River were implanted with radio transmitters. Tagged fish were located weekly throughout their autumn migration. Probability of migration to the reservoir increased

with fish body length. Rate of migration (km/day) was compared to fish size, stream temperature and stream flow for 93 bull trout that traveled to the reservoir. Bull trout captured later in the season had a lower probability of migrating to Arrowrock reservoir. Migration rate increased with fish length. Stream temperature was not significantly related to migration rate. Higher stream flow during the first week after tagging resulted in slower migration rates. The results of this study indicate that fish size and migratory corridor conditions play an important role in determining whether bull trout use reservoir habitats for overwintering.

James (session 1 – 10:50 am – 11:10 am)

New Zealand mudsnails (*Potamopyrgus antipodarum*) in Silver Creek drainage

Chris James and Christine Moffitt Idaho Cooperative Fish and Wildlife College of Natural Resources, University of Idaho Moscow, Idaho 83844-1136.

ABSTRACT: New Zealand mudsnails *Potamopyrgus antipodarum*, have been observed in some reaches of Silver Creek, Blaine County, Idaho. This invasive species has been reported to dominate and alter the trophic dynamics of some aquatic communities within the intermountain west, and managers are worried that its potential spread could threaten important fishery resources. In June-August 2004, we conducted a systematic sampling at 1 km intervals throughout the drainage with a kick net and a standard sampling protocol. Sampling sites were determined using digital orthophoto maps of the drainage. We identified New Zealand mudsnails at 5 of the 56 sites visited, and the relative abundance of snails from a 30 sec kick net sampling effort ranged from 2 to 2,220 snails. Using a modified Hess sampler, we estimated the density of snails at two positive sites in the drainage to range from 12 to 25,640 snails/m^2. Based on our sampling, we conclude that New Zealand mudsnails are found only in lower Loving Creek, Butte Creek, and in Silver Creek near the Nature Conservancy's Silver Creek Visitor Center. We suspect that seasonal changes in the drainage are limiting the ability of New Zealand mudsnails to spread rapidly throughout the system. Average monthly water temperatures recorded for December 2004 in the drainage, ranging from 1.4°C to 6.2°C. These averages are a decrease of more than 10°C from average summer temperatures that ranged between 14.6 and 19.6°C during July 2004. We suspect that colder winter temperatures may be limiting the range expansion of this invasive species in the Silver Creek drainage.

Koenig (session 9 – 11:40 am – 12:00pm)

Factors affecting cutthroat trout recruitment in the Teton Valley

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ABSTRACT: The Teton River drainage is considered one of the most important strongholds of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) in Idaho. Yellowstone cutthroat trout in the Teton River have been in decline over the past 100 years, but have declined dramatically since 1987. The Quality Stock Index for Yellowstone cutthroat trout in the Teton River has increased since 1987, accompanied by a shift in the length/frequency distribution towards fewer but larger fish. Smaller size classes of Yellowstone cutthroat trout have become increasingly rare, indicating a decline in recruitment. Although declines have occurred across all trout species in the Teton River, cutthroat trout have declined disproportionately compared to Eastern brook trout (*Salvelinus fontinalis*) and rainbow trout (*Oncorhynchus mykiss*). We used a multifaceted approach to investigate potential factors limiting cutthroat trout recruitment to the Teton River. We quantified the relative abundance and distribution of juvenile Yellowstone cutthroat trout using multiple-pass electrofishing surveys. Redd surveys were used to assess the location, timing and number of adult spawning cutthroat trout. The

prevalence and intensity of whirling disease in both mainstem and tributary sites was investigated using sentinel test fish. Results show Teton Creek and Fox Creek held the greatest percentage of juvenile Yellowstone cutthroat trout, while juvenile Eastern brook trout were abundant throughout the Teton Valley. Rainbow trout spawned almost exclusively in Fox Creek, while cutthroat trout used both Teton Creek and Fox Creek. Whirling disease is present in the Teton Valley but its intensity is often both spatially and temporally variable. Possible hypotheses explaining the recruitment decline in cutthroat trout focus on the compounding effects of introduced species, habitat loss, and disease.

Kucera (session 2 – 2:05 pm – 2:25pm)

Use of acoustic imaging technology to determine adult Chinook salmon abundance in the Secesh River, Idaho

Paul Kucera and Dave Faurot. Nez Perce Tribe Department of Fisheries Resources Management, 28761 Salmon Lane, Lapwai, ID. (208) 843-7145.

ABSTRACT: Acoustic imaging camera technology (DIDSON) was experimentally tested in the Secesh River in 2004 to quantify adult spring and summer chinook salmon abundance. Artificial substrate and bank standoff structures were installed, to force salmon away from undercut banks and off of the stream bottom, for clear target image acquisition. The DIDSON unit was installed on May 28 and the first adult salmon was observed on June 16. The acoustic imaging system was operated throughout the entire salmon spawning migration. Underwater optical cameras provided the independent methodology to validate DIDSON counts at the monitoring site. Preliminary independent validation indicated that DIDSON identified 100% of all salmon targets.

LaFrentz (session 3 – 4:10 pm – 4:30 pm)

Fish vaccines: Past, present and future

B.R. LaFrentz Department of Fish and Wildlife Resources and the Aquaculture Research Institute, University of Idaho, Moscow, ID 83844-1136.

ABSTRACT: The health status of cultured fish is influenced by a number of factors including environmental conditions, biological factors, and management practices. Therefore, effective disease control relies on an integrated fish health program that optimizes these factors for the production of healthy fish. One tool that can be used in a fish health program is vaccination. The first studies on fish vaccines began in the 1940's, and since that time, significant advances have been made. The composition, methods of delivery and future of vaccines are reviewed in respect to commercial and stock enhancement aquaculture in Idaho.

Lamansky Jr. (session 1 – 9:50 am – 10:10 am)

The use of probable pheromones to attract brook trout into hoop nets

James A. Lamansky Jr., Idaho Department of Fish and Game / Idaho State University, Ernest R. Keeley, Idaho State University, Michael K. Young, U.S. Forest Service, Kevin A. Meyer, Idaho Department of Fish and Game.

ABSTRACT: The introduction of non-native species across the west has placed many native populations at risk, but methods for controlling non-native species are usually time-consuming, expensive per unit of treatment, harmful to non-target species, and often unsuccessful. An alternative method to reduce non-native brook trout populations that may avoid some of those concerns is to selectively remove them by exploiting pheromonal attraction. To test this approach, we conducted a study to evaluate the effects of probable pheromones to attract brook trout into hoop nets for removal. We placed different combinations of mature brook trout into pvc tubes to prevent escape and placed them as attractants into the closed ends of hoop nets.

The combinations of brook trout were a single male, three males, a male/female pair, a single female, and no fish. A significant difference in the number of mature brook trout captured across treatments was detected (***P*** = 0.002 (sex model) or 0.02 (treatment model)). The male/female pair captured the highest number of brook trout > 100mm (284), however, nets with no fish caught the second most (188). No difference was detected in the capture of brook trout < 100mm between treatments (***P*** = 0.219). Our results suggest that brook trout are attracted to mature conspecifics, and can be used effectively to attract them into hoop nets.

Leeseberg (session 9 – 12:00 pm – 12:20 pm)

Prey size and abundance as predictors of growth efficiency for stream-dwelling cutthroat trout (*Oncorhynchus clarki*)

Christopher A. Leeseberg and Ernest R. Keeley, Department of Biological Sciences, Box 8007, Idaho State University, Pocatello, Idaho 83209, (leeschri@isu.edu).

ABSTRACT: Stream-dwelling salmonids often exhibit dramatic differences in maximum body size and growth rate across populations. In particular, headwater populations isolated above waterfalls often have smaller body sizes at sexual maturity and slower growth rates than salmonids from larger rivers. Two hypotheses have been proposed to explain how salmonids reach larger body sizes and faster growth rates in larger rivers: (1) A difference in mean prey size available and/or (2) a difference in levels of prey abundance. To investigate the effects of prey size and abundance on salmonid body size and growth rates, I compared three headwater populations of cutthroat trout (*Oncorhynchus clarki*) isolated above a waterfall, and three populations of similar size in headwater stream, but with access to larger mainstem rivers, with three mainstem river populations. I collected stomach content and drift samples to test my prediction that larger mean size and/or higher prey abundance in mainstem river would lead to a more growth efficient environment. As predicted, cutthroat trout found in mainstem rivers were larger and had a higher growth rate. Consistent with previous studies on salmonid diets, I found that as cutthroat trout grow in size, they selectively consume larger prey. Contrary to the prey-size hypothesis, I found no significant difference in prey size between stream types. However, I did find higher invertebrate drift abundance in mainstem river sites. The higher drift abundance found in mainstem rivers suggest that cutthroat trout are able to be more selective in their prey consumption, choosing larger invertebrate prey to optimize their food intake.

Lider (session 9 – 11:20 am – 11:40 am)

Thermal regimes and summer thermal refugia for westslope cutthroat trout within the Coeur d'Alene basin, Idaho, 2003-2004

Edward Lider, Zone Fisheries Biologist, USDA Forest Service, Coeur d'Alene River Ranger District, Coeur d'Alene, Idaho. Joe DuPont, Matt Davis and Brett Roper.

ABSTRACT: Through a cooperative research project we conducted a telemetry study on westslope cutthroat trout *Oncorhynchus clarki lewisi* in the Coeur d'Alene River watershed in northern Idaho from May 2003 to June 2004. One objective of this study was to evaluate how water temperature influenced movement and habitat use of cutthroat trout in the Coeur d'Alene River system. We collected water temperature using tidbit thermographs that took readings every hour. In 2003 we set out 27 thermographs throughout the basin to evaluate water temperatures in the upper and lower reaches of each 5th Hydrologic Unit code (HUC). In addition, we evaluated temperature data at 194 sites within the Coeur d'Alene basin collected from 1999 to 2004. Surface water temperatures were also collected each time we located a fish utilizing a hand held thermometer. During this study, we found thermal regimes within the basin that exceeded temperatures that have been reported lethal to cutthroat trout and other salmonids. In the main river system, we found that temperatures peaked near the end of July. These temperatures ranged from 27°C in the lower reaches of the basin to 22°C in the upper basin. Tributary streams < 16,000 hectares entering the river never exceeded 20°C, whereas tributary streams < 6,000 hectares never exceeded 15°C. Where these tributary streams entered the main river they created pockets of cooler waters. During peak summer temperature, we tracked some fish near

tributary mouths that provided thermal refugia from potentially lethal temperatures. We also found that subsurface flows within selected areas in the basin, created areas of thermal refugia. During our tracking we found large concentration of fish associated with side channels and off channel habitat that had mean temperatures that were 2-4°C cooler than main river temperatures. We found that a number of factors were present that affected water temperatures within the basin and that tagged fish used a number of techniques to select these areas and/or adjusted activity to survive these potentially lethal temperatures. Because of the localized movement of cutthroat trout within the Coeur d'Alene River watershed and the extreme summer temperatures that occur their, we feel that protecting all sources of cool water inputs into the main river are necessary. This needs to be done by maintaining the cooler thermal regimes in tributary streams and protecting or restoring the wide flood plain sections of the river through out the basin.

McGrath (session 1 – 11:30 am – 11:50 am)

Evaluating the functional roles of native and non-native fishes using analysis of gut contents and stable isotopes

Claire C. McGrath, Idaho Department of Fish and Game, Nampa, ID; William M. Lewis, Jr., Center for Limnology, CIRES, University of Colorado, Boulder, CO.

ABSTRACT: Direct effects of invasive species on native species have been demonstrated largely at the population level. For example, non-native brook trout displace native cutthroat trout in Montana streams, and population models suggest that this displacement occurs through loss of juvenile cutthroat trout. Less well described are the effects of non-native species at the community and ecosystem levels. Gut content and stable isotope analyses provide complementary methods for describing the functional roles of native and non-native fishes in aquatic food webs, and for evaluating community and ecosystem level effects of species invasions. The trophic roles of native greenback cutthroat trout and non-native brook trout at 10 stream sites in Colorado were described using analysis of gut contents and stable isotopes of C and N. Greenback cutthroat trout had a broader trophic niche than brook trout, and differences in diet and population density suggest that the two species might have different effects on invertebrate communities. Low interspecific variability in isotopes of C and N suggests that greenback cutthroat trout and brook trout do not differ in their general functional roles at the ecosystem level, even though their diets differ at the community level. This seeming discrepancy can be reconciled by acknowledging that the two methods provide different, albeit complementary, descriptions of the functional roles of consumers. The relative utility of the two methods depends on the objectives of research and management. If the objective is to maintain natural diversity of the aquatic community, the diets of native and non-native trout should be evaluated with stomach content analysis. If the objective is to maintain natural flowpaths of energy at the ecosystem level, results of stable isotope analysis may be most relevant.

Meyer (session 1 – 11:10 am – 11:30 am)

Why a brook trout removal project in a Boise River tributary was unsuccessful

K. A. Meyer (kmeyer@idfg.state.id.us), and D. J. Schill. Idaho Department of Fish and Game, 1414 East Locust Lane, Nampa, Idaho 83686.

ABSTRACT: In the western United States, the presence of brook trout *Salvelinus fontinalis* often has deleterious effects on native salmonids, and biologists often attempt to suppress brook trout from streams using multiple-pass electrofishing removals. Although the success of such electrofishing removal projects is typically low, few studies have assessed the underlying mechanisms of the failure, especially in terms of compensatory responses. We evaluated the effectiveness of a three-year removal project initiated by a multi-agency watershed advisory group to eradicate or reduce brook trout and enhance native salmonids in 7.8 km of a southwestern Idaho stream that was protected by a man-made barrier. Due to inaccurate knowledge of the distribution of brook trout in the first year, and manpower shortages in the third year, the stream was fully treated (i.e., multi-pass removals in the entire study area) in only one year. Nevertheless, a total of 1,401, 1,241, and 890 brook trout were removed from 1998 to 2000, respectively. In 1999 and 2000, such removals

constituted an estimated 88 and 79% of the total number of brook trout present, respectively. Despite substantial removal pressure, brook trout total annual survival rate actually increased during the removal treatments, from 0.06 in 1998 to 0.18 in 1999 and 0.26 in 2000. Age-0 brook trout growth in 2000 (the year after their abundance was lowest) was significantly higher than in other years, and age-1 and age-2 brook trout growth was significantly lower following the initial removal years, but recovered after the two rest years. Few other demographic parameters, such as sex ratio, length-weight relations, fecundity, or length- or age-at-maturity, changed appreciably over the course of the project. Manpower expenditure for the electrofishing removals alone totaled 180 days. Our results indicate that, despite experiencing a slight decrease in abundance and short-term changes in growth and survival, brook trout in Pike's Fork appeared little affected by three years of relatively intense removal efforts, most likely because mortality within the population was extremely high prior to initiation of the project, such that the removal efforts merely replaced natural mortality with exploitation.

Moore (session 5 – 10:15 – 10:35 pm)

USDA Forest Service fish and watershed program review - Rise to the Future 2003

Virgil Moore Dave Cross, and Fred Harris Idaho Department of Fish and Game PO Box 25, Boise ID 83707-0025; 208-334-3790.

ABSTRACT: In 1987 the Forest Service launched the *Rise to the Future* initiative that resulted in more effectively managed fisheries and aquatic resources. Peak staffing and funding occurred in the mid- to late-1990s. Since then, emphasis on fisheries and aquatic programs has weakened with declines in staffing and funding. Forest Service Chief Dale Bosworth created a task force in 2002 to make recommendations to address this decline. The *Rise to the Future Task Force 2003: Fish and Watershed Program* makes five major findings and recommendations: Finding 1: The priority given fisheries and aquatic resources has weakened within the Forest service since the mid- 1990s. *Recommendation: Create a USDA Forest Service Sportfishing and Aquatic Resource Advisory Council to provide advice concerning fisheries and aquatic resource management, and sportfishing on national forests.* Finding 2: Current core staffing and professional development programs are inadequate to meet responsibilities of work associated with fisheries conservation, endangered species recovery, and sportfishing. *Recommendation: Conduct a national assessment/review of fisheries and watershed program staffing needs and professional training by October 2005.* Finding 3: The Forest Service can do better in promoting the exceptional sportfishing opportunities on national forests. *Recommendation: Develop and initiate a coordinated a strong partner-endorsed marketing strategy to promote sportfishing opportunities by October 2005.* Finding 4: Funding for priorities within the fisheries and aquatic resource programs have not been established or articulated nationally. Field programs are inconsistent and uncoordinated and not effectively accounted for under the budget system. *Recommendation: Ensure coordination of fisheries and watershed programs at the national and regional level in budget formulation. Provide increased accountability for budget allocations and reporting of accomplishments. Combine the fisheries and watershed program budgets into a single budget line item.* Finding 5: The Forest Service has widespread inconsistencies and inadequate resources to develop and sustain partnerships that today's successful fisheries and aquatic resource management programs depend on. *Recommendation: Simplifies the process for establishing partner agreements and improve the understanding of authorities and opportunities for the Forest Service and partners*. *Produce and distribute a partnership guide that clarifies roles and responsibilities of existing and potential partners.* The task force further suggests that an annual review of the Forest Service's response to the Task Force recommendations by the American Fisheries Society would creating a adaptive management feedback mechanism to identifying successes and challenges to implementation Chief Bosworth has appointed an implementation team comprised of state, NGO and Forest Service is currently working on implementation of these top five finding in 2005.

Narum (session 4 – 8:10 am – 8:30 am)

Genetic variation in steelhead trout of the Grande Ronde River, Oregon

Shawn R. Narum Columbia River Inter-Tribal Fish Commission, 3059F National Fish Hatchery Road; Hagerman, ID 83301; Steve Boe, Confederated Tribes of the Umatilla Indian Reservation, P. O. Box 638, Pendleton, OR 97801; Melanie Paquin and Paul Moran, Northwest Fisheries Science Center, NOAA Fisheries; Matt Powell University of Idaho, 3059F National Fish Hatchery Road, Hagerman, ID 83301.

ABSTRACT: Genetic diversity and structure were examined among four populations of summer run steelhead trout (*Oncorhynchus mykiss*) from the Grande Ronde River, OR, U.S.A. with 20 microsatellite loci. Included were temporal collections of three wild (Lookingglass Creek, Catherine Creek, and upper Grande Ronde River) and one hatchery (Wallowa Hatchery) population. Average gene diversity was moderate to high in all collections. Genetic variance among sites was greater than temporal collections as pairwise tests within populations were not significant with the exception of Lookingglass Creek. Evidence from this study suggests gene flow between steelhead from Catherine Creek and Wallowa Hatchery, but there was no evidence for low diversity or recent bottleneck events detected in any of the four populations. Further, we compare our results to genetic information from other steelhead in the Snake River Basin.

Paragamian (session 1 – 9:10 am – 9:30 am)

Walleye – overcoming a 30 year old paradigm

Vaughn L. Paragamian, Idaho Department of Fish and Game, 2750 Kathleen Avenue, Coeur d'Alene Idaho 83815; vparagam@idfg.state.id.us. Gregory Gelwicks Iowa Department of Natural Resources Manchester, Iowa.

ABSTRACT: Ranking third in angler importance, walleye *Sander vitreum* is one of the most important sportfish in Iowa. Yet, this species was rare in Iowa rivers despite 30 years of stockings of millions of early larval walleye (yolk sac fry herein called fry). A project proposal in 1978 to compare fry stockings of Big Spirit Lake strain fish to releases of walleye at a larger pre-juvenile (herein called fingerlings) was denied, falling victim to the paradigm "the more fry we stock the more walleye – we don't stock enough fry". Persistence to what was believed by some researchers led to genetic analysis of river walleye stocks using starch gel electrophoresis. Analysis suggested after many years of stocking fry walleye of Big Spirit Lake strain had contributed only about 19% to the river populations. Eight years after the proposal was presented a study of fry and fingerling walleye stockings was approved. From 1986 through 1989 fry and fingerling walleye, two river strains and one lake strain, were marked with coded wire tags (cwt) and freeze brands, stocked into three rivers, sampled by seining and electrophoretically analyzed to evaluate their survival 2-3 weeks later. Fall electrofishing provided annual survival and population estimates. No significant contribution resulted from the fry stockings; however, despite a high loss of cwts stocked fingerlings averaged 76% of the young of the year for each study reach and averaged 50% of the total populations. Fingerling walleye growth was excellent; presumably, they took advantage of the high densities of cyprinids (minnows) as forage. Standing stocks of walleye increased from <1 to 17kg/ha. Fingerling walleye stockings improved all river populations substantially, but fry stockings were inconsequential and were discontinued. Continued studies assed the contribution and performance of Spirit Lake vs. Mississippi River strain walleye and stocking rates. These investigations suggested superior performance of river strain fish and stocking density guidelines. Rivers once barren of walleye fisherman became destinations with increased angler use and success. The question was raised by administrators "why didn't we do this study sooner"?

Peterson (session 8 – 10:00 am – 10:20 am)

Evaluation of large trap nets to reduce lake trout abundance in Lake Pend Oreille, Idaho

Michael P. Peterson (Fishery Research Biologist) and Melo A. Maiolie (Principal Fishery Biologist) Idaho Department of Fish and Game, Bayview, ID 83803.

ABSTRACT: We evaluated the use of large trap nets to suppress the introduced population of lake trout *Salvelinus namaycush* in Lake Pend Oreille (38,300 ha), Idaho. Lake trout were chosen for removal because their expansion poses a threat to the lake's bull trout and kokanee populations. We caught 1,183 lake trout (marked and unmarked) during the six-month study. Using the Schnabel multiple-census population estimator, we estimated that Lake Pend Oreille contained 6,376 lake trout >52 cm (+ 27%, -18%, 95%CI). Catch rates ranged from a high of 3.0 lake trout/net/day (during spawning season) to a low of 0.13 lake trout/net/day (during the winter season). The nets varied in lead heights and mesh size as part of the assessment to identify the most effective gear. However, net location seemed to be the overriding variable and no nets captured many lake trout < 52 cm regardless of mesh size. Catch and mortality of nine species of non-target fish was generally low. Based on the population estimate, we caught 16% of the lake trout population >52 cm in length. This indicated that a netting program on the scale of the current study would not be a suitable way to suppress the lake trout population in a short period of time.

Petrosky (session 2 – 2:25 pm – 2:45 pm)

Effects of juvenile migration and ocean/climate conditions on smolt-to-adult return rates and recruitment for Snake River Chinook salmon

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ABSTRACT: Snake River salmon and steelhead *Oncorhynchus* spp. have substantially declined since the completion of the Columbia River hydrosystem. Currently, the species are listed under the Endangered Species Act. These species evolved in systems without dams and were dependent on the river current to aid in their migration to the ocean. We evaluated the impact of flow, spill, ocean and estuary conditions common to Snake River populations and populations in the mid Columbia over life stages that include survival through the hydrosystem and survival following this migration. (Mid Columbia, populations migrate past fewer dams). Through previous large-scale assessment processes, analytical approaches were used to identify management options for halting the decline of these populations. The benefits these actions are predicted to have on salmon recovery hinge on whether the source of mortality that takes place in the estuary and early ocean is related to earlier hydrosystem experience during downstream migration (delayed mortality). Despite recent improvements in climate/ocean conditions, the overall mortality of Snake River stocks remains much higher than John Day stocks (Mid Columbia) for these brood years. Our analyses indicate that the delayed mortality for Snake River spring/summer Chinook populations remained high in recent brood years.

Pollard (session 2 – 2:45 PM – 3:05 PM)

In search of the Lost Legions: Attempting to account for hatchery-origin adult steelhead returns to the Snake River Basin

Herb Pollard, National Marine Fisheries Service, Chris Starr, USFWS, Lower Snake River Compensation Plan.

ABSTRACT: Concern for the "significant potential negative impacts from interaction with hatchery stocks" is one of several reasons that the Snake River Basin steelhead Evolutionarily Significant Unit (ESU) was listed as threatened, under the Endangered Species Act (ESA) on August 18, 1997 (FR 62, 159 43937). This same concern has been expressed in a number of scientific reviews of the affects of artificial propagation (NPPC 1999), and in the status reviews leading to the listing of the ESU (Busby et al 1996, BRT 2003). In the 1999 Biological Opinion on Artificial Propagation of Anadromous Salmonids in the Columbia River Basin, NMFS found that the impacts of ecological and genetic interactions between hatchery-origin and natural-origin steelhead and the uncertainty regarding the distribution of the hatchery-origin fish was sufficient risk to conclude that operation of steelhead hatcheries jeopardize the survival and recovery of the ESU (NMFS 1999). Although managers reduced steelhead production and curtailed some outplanting programs after the listing of

the native fish, the large number of hatchery-origin steelhead that migrate into the Snake River and potentially interact with listed natural-origin steelhead has remained a concern (Williams et al 2003). In response to the continuing uncertainty, NMFS requested that the USFWS, Lower Snake River Compensation Plan office, and their cooperators in the Snake River Basin steelhead hatchery programs provide an accounting for hatchery-origin steelhead at upstream hatcheries, weirs and traps, in harvest, and in natural spawning areas. Managers accounted for an average of 92.5% of the adult steelhead returns in harvest, hatchery racks, natural mortality, and returns to direct-stream releases. Homing fidelity within basins is very high. Detection of hatchery strays at weirs and in spawning surveys is very small. Genetic surveys do not indicate hatchery influence in natural populations. On the other hand, there are still large numbers of unaccounted hatchery-origin steelhead. Straying into some out-of-basin areas is high, and some release strategies may tend to increase straying.

Pyron (session 4 8:10 am – 8:30 am)

Taking the "bull" by the horns: A collaborative approach to bull trout recovery in the Little Lost River Basin

Jason Pyron, Jim Fredericks, Bart Gamett, Jim Gregory, Pat Koelsch, Deb Mignogno, Scott Yates. USDA Forest Service, Salmon-Challis National Forest, P.O. Box 507, Mackay, Idaho 83251, 208-588-2224, pyrojaso@hotmail.com.

ABSTRACT: Since the listing of bull trout, *Salvelinus confluentus,* under the Endangered Species Act, managers in the Little Lost recovery unit have utilized an informal collaborative approach to management. Through this collaborative process, numerous individuals representing state and federal agencies, conservation organizations, and local stakeholders have come together to protect and restore bull trout populations. Working together has resulted in the completion of numerous research, evaluation, protection, and restoration projects. Although these projects have proved to be very successful, there are many challenges yet to be faced. We believe that the informal-collaborative nature of this process will continue to be successful in the recovery and long-term persistence of bull trout in the Little Lost basin.

Rose (session 3 – 4:50 pm – 5:10 pm)

Whirling disease, the whirling disease initiative, and whirling disease outreach

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ABSTRACT: Whirling disease is caused by *Myxobolus cerebralis*. *Myxobolus cerebralis* is a parasite that infiltrates the head and spinal cartilage of fingerling trout where it multiplies rapidly, causing the fish to swim erratically and, in severe cases, die. When an infected fish dies, millions of tiny indestructible Myxobolus cerebralis spores (each about the size of a red blood cell) are released into the water. The spores can survive in a somewhat "dormant" form for up to 30 years. When the spores are ingested by *Tubifex tubifex* worms, the spore changes inside the worm and are released in a highly infective form, the *Triactinomyxon* (TAM). TAMs free-float in the water until they infect trout, causing spinal deformities and decreased abilities for feeding. Whirling disease is most infective to rainbow and cutthroat trout, but can infect all salmonid species. The National Partnership for the Management of Wild and Native Coldwater Fisheries is a consortium of public agencies and non-governmental organizations with an interest in sustaining the health of coldwater fisheries in the U.S. The Partnership exercises oversight over the Whirling Disease Research Initiative and evaluates other fisheries-health problems as potential subjects for integrated national research initiatives. Detailed scientific direction of the Whirling Disease Initiative is provided by the Whirling Disease Steering Committee. The Montana Water Center manages the Initiative, and funding comes from the US Fish & Wildlife Service. Conducting outreach activities has been an ongoing, yet somewhat limited, effort since the inception of the Whirling Disease Initiative in 1997. Now, as we enter the final phase of the Initiative, a concerted effort to increase accessibility and availability of whirling disease information is warranted. The primary audience to be served through the outreach program is technical professionals—fishery managers and administrators,

hatchery operators and fish health professionals, researchers and agency land managers. The secondary audience comprises fishery I&E professionals, both within the agencies and in private organizations such as the Whirling Disease Foundation, Trout Unlimited and the Federation of Fly Fishermen.

Salow (session 4 – 8:50am – 9:10am)

Monitoring movement and mortality patterns of Adult adfluvial bull trout during the Arrowrock dam construction project in southwestern Idaho

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ABSTRACT: Bull trout (*Salvelinus confluentus)* were tagged with radio transmitters and tracked as part of the monitoring program for work that required the near complete drafting of water from Arrowrock Reservoir in southwestern Idaho. Trapping and tagging occurred prior to the reservoir draw down between the months of August and October in 2002 and during the drawdown in 2003. One hundred three bull trout 327 mm to 730 mm total length were tagged with digitally encoded radio transmitters and tracked weekly throughout both years. Mortality rates were 22.0 % during the 2002 fall migration downstream to Arrowrock Reservoir and 49.0 % during the 2003 fall migration period for adult fish tagged in each year. In 2003, larger fish were selected over smaller fish by predators. Two fish (4.0 %) did not leave the South Fork Boise River or Arrowrock Reservoir throughout the spring and summer of 2003. Twenty-four fish began moving upstream into the Middle and North Fork Boise Rivers during spring and early summer and nine fish entered spawning habitat. Six fish were killed or expelled tags post-spawning. Seventeen (34.0%) fish overwintered in Arrowrock Reservoir or the South Fork arm of Arrowrock Reservoir and 11 (22.0%) overwintered in the mainstem river of South Fork Boise River downstream from Anderson Ranch Dam. Entrainment through Arrowrock Dam was 4.0 % in 2002 and 11.3 % in 2003 for this group of fish. We developed recommendations for reservoir pool elevations and discharge volumes that will help reduce mortality and entrainment for bull trout using Arrowrock Reservoir.

Schoby (session 6 – 2:10 pm – 2:30 pm)

Use of radio telemetry data for management of fluvial trout populations in the upper Salmon River Basin, Idaho

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ABSTRACT: Information on the movements, behavior, and critical habitats of native resident salmonids in the Salmon River basin, Idaho is lacking. Additionally, concerns have been raised by the public regarding the lack of angling opportunities in the mainstem of the Salmon River. In an effort to identify migration patterns, corridors, and timing, as well as identify critical spawning and wintering habitats, fluvial populations of bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and rainbow trout (*O. mykiss*) were monitored using radio telemetry. During 2003 and 2004, 75 bull trout, 55 westslope cutthroat, and 56 rainbow trout were implanted with radio transmitters. Movements were monitored by ground relocations and fixed telemetry stations located at major tributaries. Fish were relocated on a weekly basis, allowing for the spatial and temporal identification of spawning areas, migration timing, movement corridors, and over wintering habitats. During this study, 13 previously undocumented spawning tributaries were identified. Information from this study also identified Redfish Lake and Little Redfish Lake as wintering

habitat for bull trout populations that generally demonstrated fluvial life-history characteristics. This information will be used in future management decisions by agencies working in the upper Salmon River basin and help guide habitat conservation and improvement projects.

Seggerman (session 8 – 8:40 am – 9:00 am)

Production of triploid lake trout *(Salvelinus namycush)* at Grace Fish Hatchery

Jeffrey D. Seggerman, Dwight Aplanalp, Tom Kent, Idaho Department of Fish and Game, Grace Fish Hatchery, 390 Fish Hatchery Road, Grace, Idaho 83241. Joe Kozfkay, Idaho Department of Fish and Game, Nampa Fisheries Research, 1414 E. Locust Lane, Nampa, ID 83686-8451. Eric Wagner, Utah Department of Wildlife Resources, Utah Fish Experimental Research Station, 1465 W. 200 N., Logan, Utah 84321.

ABSTRACT: In 2001, a cooperative agreement between Idaho Department of Fish and Game (IDFG) and Utah Department of Wildlife Resources (UTDWR) was reached requiring IDFG to stock 50,000 triploid lake trout *(Salvelinus namycush)* every three years into Bear Lake. Joe Kozfkay (IDFG) and Eric Wagner (UTDWR) conducted experiments to develop techniques for producing triploid lake trout. Personnel from IDFG's Grace Fish Hatchery (GFH) assisted researchers by rearing experimental groups and enumerating survival of fish in different treatments. Over three years, research and hatchery personnel set out to answer a number of questions aimed at improving survival of triploid lake trout. The first questions asked were which hatchery broodstock to use and which method of inducing triploidy would show the best survival of fish to stocking. Second, research and hatchery personnel looked into how to increase survival from eyed-egg to hatch by comparing incubation in chilled water versus ambient water and by comparing incubation of eggs in upwelling incubators versus tray type incubators. Third, hatchery personnel compared fish survival and growth of triploid lake trout reared at GFH in 2003 to diploid lake trout reared the previous year at GFH. Fourth, hatchery personnel would like to examine if the use of AquaMats® and soft moist feed will increase growth of triploid lake trout during final rearing in outdoor raceways. As the program moved from the experimental phase to the hatchery production phase, an overview of spawning, rearing, and stocking of triploid lake trout at the GFH will be presented. The development, rearing, and stocking of triploid lake trout shows a successful example of how research and hatcheries worked together to solve a fisheries management problem.

Seiler (session 1 – 9:30 am – 9:50 am)

Testing direct competition between juvenile Yellowstone cutthroat trout, rainbow trout, and their hybrids

S.M. Seiler and E.R. Keeley, Department of Biological Sciences, Idaho State Univ., Pocatello, ID 83209.

ABSTRACT: Introduced rainbow trout and rainbow/cutthroat hybrids have established wild populations in many Idaho waterways often with a corresponding decline in native cutthroat trout. Although several studies have attempted to find patterns between stream habitats and the success of nonnative trout, relatively few studies have investigated whether direct competition for food and feeding territories can explain the displacement of native trout. This study used commonly reared trout to test whether juvenile rainbow and hybrid trout can out compete cutthroat trout for profitable feeding territories. Yellowstone cutthroat trout, rainbow trout, maternal cutthroat hybrid, and maternal rainbow hybrid crosses were created, incubated, and reared in a common environment. After fish reached 40mm fork length, pair wise competition trials were conducted between equal length fish in an artificial stream arena. Intra-genotype trials were analyzed to assess levels of aggression. Although levels of aggression tended to be highest in rainbow trout and maternal cutthroat hybrid trials, differences in rates of aggression between genotypes were not significant. Inter-genotype trials were analyzed to assess the relative competitive ability of each genotype to defend the feeding territory and capture food. Against all other competitors, Yellowstone cutthroat trout tended to spend less time defending a feeding territory and captured proportionately less food. Competitive differences between

Yellowstone cutthroat trout, rainbow trout, and first generation hybrids may be related to differences in body shape and relative mass.

Thurow (session 6 - 2:30 pm – 2:50 pm)

Was Edgar Winter correct? Utility of snorkeling for censusing salmonids

Russ F. Thurow and John W. Guzevich, U.S. Department of Agriculture- Forest Service, Rocky Mountain Research Station, 316 East Myrtle Boise, Idaho 83702. James T. Peterson, U.S. Geological Survey, Georgia Cooperative Fish and Wildlife Research Unit, Warnell School of Forest Resources, University of Georgia, Athens, GA 30602.

ABSTRACT: Despite widespread use of underwater observation to census stream-dwelling fishes, the accuracy of snorkeling methods has rarely been rigorously assessed. We evaluated the efficiency of day and night snorkel counts for estimating the abundance of stream-dwelling bull trout (Salvelinus confluentus), cutthroat trout (Oncorhynchus clarki spp.), and rainbow trout (O. mykiss) in 1st – 3rd order streams. We used a dual-gear approach that applied multiple-pass electrofishing catch data, adjusted for capture efficiency, to estimate baseline fish abundance. Snorkeling efficiency was estimated by comparing day and night snorkel counts to the baseline. Further, we evaluated the influence of fish species, size, and stream habitat variables on snorkeling efficiencies. Snorkeling efficiency was, on average, higher at night compared to the day. Day and night snorkeling efficiencies for bull trout were positively related to fish body size and negatively related to stream width and habitat characteristics. Day snorkeling efficiency also was positively influenced by water temperature and non-linearly related to underwater visibility. Night snorkeling efficiency was non-linearly related to water temperature and the abundance of pools. Our results suggest that the ability to observe and accurately count salmonids underwater in small streams is influenced by fish species, size, time of day, and stream habitat characteristics. Although snorkeling is versatile and has numerous advantages over other sampling methods, use of raw snorkel counts, unadjusted for the effects of these biases, may result in erroneous conclusions. To minimize the effect of these biases, we illustrate how to apply sampling efficiency models to adjust snorkel count data.

Van Kirk (session 1 – 10:30 am – 10:50 am)

Hydrologic regime as a factor in displacement of Yellowstone cutthroat by rainbow trout in the Teton River and other upper Snake River basin streams: Time for a regime change?

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ABSTRACT: Yellowstone cutthroat trout (YCT) abundance in the upper Teton River declined 95% between 1999 and 2003, while nonnative rainbow trout increased substantially. We investigated relationships between hydrologic regime and YCT populations there. Hydrologic regimes in the Teton watershed are altered by withdrawal of irrigation water from tributary streams and by return via ground water pathways of a portion of this water, resulting in transformation of the hydrologic regime of the upper Teton River from one dominated by surface runoff to one dominated by ground water. Decreased peak flows and increased winter flows have significantly decreased maximum/minimum discharge ratio in the upper Teton River relative to natural. Trout populations have responded to annual hydrologic variability, with YCT increasing in abundance relative to rainbow trout following years in which maximum/minimum ratios were high and the hydrologic regime was dominated by surface runoff rather than by ground water. These observations prompted us to investigate the relationship between maximum/minimum discharge ratio and YCT persistence in 24 stream reaches in the Snake River watershed upstream of the Henry's Fork-South Fork confluence. Rainbow trout have not successfully invaded any stream reaches in which mean maximum/minimum discharge ratio exceeds 15. Of the 10 reaches in this category, YCT are the dominant trout species in all but the lower South Fork Snake, where brown trout make up 70% of the trout population. Of the 10 reaches with mean maximum/minimum ratio less than 10, YCT are present only in the lower Salt River, where brown trout make up 70% of the trout

population. The four remaining reaches—two on the South Fork Snake and two on the Teton River—are the only ones in the watershed in which YCT persist, if somewhat tenuously, in the presence of rainbow trout. Previous work recommended increasing maximum/minimum discharge ratios at Palisades Dam to restore YCT in the South Fork. Based on this work, we recommend reducing the influence of irrigation-induced ground water flow to restore YCT in the Teton River.

Vogel (session 2 – 1:05 pm – 1:25 pm)

What do your PIT tags represent? Use of the separation by code (SbyC) system for unbiased smolt to adult return rates and adult run predictions

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ABSTRACT: Passive Integrated Transponder (PIT) tags are generally used to obtain juvenile survival estimates and emigration timing (hatchery/natural, salmon/steelhead) to the four lower river dams (Lower Granite, Little Goose, Lower Monumental, and McNary Dams). The current use of adult PIT tag returns to estimate smolt to adult returns (SAR) will likely result in biased and inaccurate estimates, due to the different migration routes the juvenile fish encounter. Fish migrate through the hydro-system in one of three ways; 1- enter juvenile bypass and directed back into the river, 2- enter juvenile bypass and directed to the transport system, 3- go undetected through spill or turbines. Default operation on all PIT tags that enter the bypass facilities, they are sent back into the river, while all unmarked fish entering bypass are sent to the transport system. The results of these actions are PIT tagged fish no longer represent the unmarked fish at large. A comparison of brood year 1998 Johnson Creek hatchery and natural PIT tagged fish versus untagged fish resulted in a SAR of 0.37% for PIT tagged hatchery fish and 1.00% for untagged hatchery fish and a SAR of 0.81% for PIT tagged natural and 1.72% for untagged natural fish. We have implemented a system where PIT tagged fish mimic whatever management action is currently in place (transport is default for unmarked fish). Thus when these PIT tagged fish return as adults, SAR's should represent the general population of fish. Having an unbiased representative SAR will enable us to complete accurate comparisons (i.e. supplementation vs. natural fish) and perform accurate in-season adult predictions. Utilizing this approach gives managers a valuable tool to calculate salmon and steelhead SAR's at the dam or the stream (if remote detectors or weirs are installed) level and also gives a more accurate means of forecasting the number returning adults.

Yanke (session 2 – 1:45 pm – 2:05pm)

Survival, growth, and physiology of Snake River fall Chinook salmon following chronic temperature stress and application of passive integrated transponder (PIT)-tags

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ABSTRACT: Snake River fall Chinook juveniles migrate during mid-summer, when river flows are low and water temperatures are high. To prevent temperatures at the tailrace of Lower Granite dam from exceeding 20°C, river managers augment flows by releasing water from upstream reservoirs. Management decisions to improve fish survival are often based on research and monitoring of passive integrated transponder (PIT)–tagged fish, yet the differential effects of PIT-tagging have never been evaluated in water temperatures above 14.5°C. During the summers of 2003 and 2004, we conducted laboratory studies to assess the relationship between water temperature and survival in fresh and seawater, and to quantify the differential mortality that

may be caused by PIT tagging. Replicated groups of control (i.e., not tagged) and PIT-tagged fish were acclimated from 14°C over 30 days to achieve average daily temperatures of 16, 20, 24 and 28°C. In both years, we observed high survival and growth rates in fish held at 16 and 20°C. Detrimental effects on growth and survival were observed in groups of fish that were acclimated and maintained at 24°C for more than 4 weeks. We observed 100% mortality in groups of control and PIT-tagged fish when temperatures during acclimation exceeded 26°C. Blood plasma profiles from fish in the 24 and 28°C treatment groups were indicative of likely tissue damage, reduced energy conversion, and impaired regulatory abilities. We observed elevated plasma electrolytes in fish from all temperature treatments following a 24 h acute seawater challenge, indicating that osmoregulation was impaired regardless of temperature exposure. The overall physiological effects of PIT-tagging on fish performance appeared negligible, indicating that PIT-tagging does not exacerbate temperature related stress. We conclude that prolonged exposure to temperatures at or above 24°C can have detrimental effects on the growth and survival of Snake River fall Chinook, and our data support flow augmentation objectives in the Snake River.

POSTERS (Friday 4:35 PM -5:30 PM)

Campbell

Mitochondrial DNA analysis of redband trout *Oncorhynchus mykiss gairdneri* from tributaries to the Salmon and Snake Rivers, ID

Matthew Campbell, Idaho Department of Fish and Game, Eagle, Idaho 83616; Christine Cegelski, Idaho Department of Fish and Game, Eagle, ID 83616; Ed Schriever, Idaho Department of Fish and Game, Lewiston, ID 83501; Craig Johnson, Idaho Bureau of Land Management, Cottonwood, ID 83522.

ABSTRACT: The identification and conservation of pure, native redband trout populations are goals of both the Bureau of Land Management and the Idaho Department of Fish and Game. Of particular conservation interest are redband trout populations found above natural barriers. In many cases, these populations are protected from upstream invasion of exotic introduced trout. Additionally, previous studies have suggested that many of these allopatric populations exhibit substantial genetic and life-history divergence from their downstream counterparts thus making them potentially unique and important components of the overall genetic diversity of O. mykiss. In this study, 10 populations of O. mykiss isolated above migration barriers in the Snake and Salmon River drainages were sampled and compared to one downstream, native anadromous O. mykiss population, and to six non-native hatchery rainbow trout populations. Mitochondrial DNA analyses were used to examine genetic relationships between populations and to assess intraspecific hybridization. Results provide evidence that these populations are pure native interior redband trout. No mtDNA haplotypes observed in the reference hatchery rainbow trout populations/strains were observed in any of these populations. Mitochondrial haplotypes were shared between the ten allopatric redband trout populations, as well as one steelhead population. These preliminary findings suggest that these populations should be prioritized for conservation and likely managed independently from O. mykiss populations downstream of these barriers.

Campbell

Mitochondrial DNA analysis of Wood River sculpin *Cottus leiopomus* from the Big Wood, Little Wood, and Camas River drainages, ID

Matthew Campbell, Idaho Department of Fish and Game, Eagle, ID 83616; Christine Cegelski, Idaho Department of Fish and Game, Eagle, ID 83616; John Chatel, U.S. Forest Service, Twin Falls, ID 83301; Dan Mahoney, U.S. Forest Service, Twin Falls, ID 83301; Don Zaroban, Idaho Division of Environmental Quality; Boise, ID 83706; Matt Powell, University of Idaho, Hagerman, ID 88332.

ABSTRACT: The Wood River sculpin, an endemic species to Idaho, is considered a "sensitive species" by both the Idaho Department of Fish and Game and the U.S. Forest Service, due to its' historic restricted distribution and recent significant losses in habitat from anthropogenic and natural causes. Recently, both agencies have prioritized resources for research projects aimed at better understanding the distribution, life history and genetic population structure of the species. The primary objective of this study was to determine whether drainage level mitochondrial DNA differences exist between Wood River sculpin populations found in the Big Wood, Little Wood, and Camas River drainages. To accomplish this objective, non-lethal fin clips from C. leiopomus were collected from three sample locations within each of the three major drainages and genetically examined using mitochondrial DNA sequencing analyses. Results indicate significant haplotype frequency differences both between and within the three major river drainages supporting Wood River sculpin populations. The most striking difference was observed between the Camas Creek drainage and the other two drainages, in which no haplotypes were shared. While additional research is needed before comprehensive management recommendations can be made, an initial conservative management strategy would be, to at minimum, prioritize the protection of Wood River sculpin populations in the Camas River drainage, since they

contain mtDNA diversity not found in the sample locations analyzed thus far in the Big and Little Wood drainages.

Campbell

Genetic assessment of Bonneville cutthroat trout *Oncorhynchus mykiss utah* reintroduction efforts in S.F. Johnson Creek, UT

Matthew Campbell, Idaho Department of Fish and Game, Eagle, Idaho 83616; Christine Cegelski, Idaho Department of Fish and Game, Eagle, ID 83616; Warren Coyler, Trout Unlimited, Providence, UT 84332; Amy Harig, Trout Unlimited, Eagle, ID 83616.

ABSTRACT: Numerous Bonneville cutthroat trout *Oncorhynchus clarki utah* populations have been extirpated throughout their historic range due to a variety of natural and anthropogenic factors including drought, over-fishing, habitat degradation, and the stocking of non-native trout, which have hybridized with or replaced populations in many areas. In response, numerous State and Federal agencies are working together to reintroduce pure Bonneville cutthroat trout in several areas throughout their historic range. One such area is the South Fork of Johnson Creek, headwaters of Deep Creek in west central Utah. Historically, S.F. Johnson Creek supported a pure Bonneville cutthroat trout population. However, genetic analyses conducted in 1996 indicated that the population was extensively hybridized with stocked, non-native rainbow trout. In an attempt to restore genetically pure Bonneville cutthroat trout, the creek was chemically renovated in the fall of 2001 to remove non-native rainbow trout and hybrids. In 2002, sixty adult Bonneville cutthroat trout were translocated into S.F. Johnson Creek from a genetically pure population in N.F. Birch Creek. The purpose of this preliminary study was to determine whether hybrids and/or rainbow trout were missed during the renovation and are currently contributing to reproduction. To accomplish this objective, 37 juvenile fish were non-lethally sampled from S.F. Johnson Creek in August 2004 and genetically analyzed with diagnostic mitochondrial DNA (mtDNA) and nuclear DNA (nDNA) markers to assess rainbow trout hybridization and introgression. Results indicate that hybrids were missed during the 2001 renovation. Eight of the 37 juvenile samples were identified as $>F_1$ hybrids. However, 27 of the juveniles collected had genotypes indicative of pure cutthroat and exhibited a mtDNA haplotype matching that found in Birch Cr. adults. This strongly suggests that at least a portion of the transplanted adults have been reproductively successful. These results will have to be considered carefully by managers focused on restoring genetically pure Bonneville cutthroat trout throughout their historic range.

Chatel

Aquatic organism passage at culvert crossings on the Sawtooth National Forest: Challenges and opportunities

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ABSTRACT: The Sawtooth National Forest recently completed a road/stream fish passage assessment in 2003 and 2004. The purpose of this assessment was to better describe the extent of culvert barriers across the forest to fish species and threats to water quality from undersized culverts or poorly designed crossings. A national inventory and assessment developed by the San Dimas Technology and Development Center was used (Welcome to the FishXing Website). This field-based assessment examined a range of stream (channel gradient, bank full width, fish presence etc.) and road crossing (crossing type, dimensions, slope, perch height, general condition) attributes. All road-stream crossings on anadromous and resident trout streams were inventoried and their condition documented. Validated data was entered into the national "Fishpass" database. Approximately 200 culverts on fish bearing streams were inventoried. Of the evaluated culverts, about 66% are a barrier to adults and 81% a barrier to juvenile salmonids. Culverts block an estimated 150 miles of fish habitat across the forest. Reduced access increases risks to fish populations by blocking valuable spawning and rearing habitat, and restricting passage to refuge areas during disturbances (e.g. fire, floods, etc.). Culverts

accounted for 98% of the crossings that impair upstream passage to salmonids. Greater than 60% of the crossings were found to have a high potential for diverting stream flows if their capacity was exceeded. This poses a high risk to degrading water beneficial uses such as aquatic life (e.g. cold water, salmonids spawning, etc.) during storm and high runoffs events. Assessment information has helped to fully describe the extent and geographic distribution of these issues on the forest. Assessment results are being used with the forest's "Watershed Restoration and Recovery Strategy" to prioritize culverts restoration across the forest. However, estimated costs of replacing all barrier culverts will be steep and could exceed $20,000,000. Still, addressing barrier and undersized culverts will be a critical part in any restoration approach. Replacement of poorly designed stream crossings will reduce sediment sources that impair beneficial uses and will aid in the recovery of fish species protected under the Endangered Species Act by expanding access to former habitat.

Flagg

Conservation husbandry techniques for production of wild-like fish

Thomas A. Flagg, William T. Fairgrieve, Barry A. Berejikian, and Desmond J. Maynard [1] NOAA Fisheries, Northwest Fisheries Science Center Resource Enhancement and Utilization Technologies Division, Manchester Research Station, PO Box 130 Manchester, Washington, 98353 tom.flagg@noaa.gov.

ABSTRACT: Captive broodstocks and hatchery propagation are being used for rapid demographic amplification of depleted or endangered fish species. However, past attempts to rebuild naturally reproducing populations with hatchery-produced fish have often yielded poor results, especially for Pacific salmon. Research indicates that morphological and behavioral linked fitness traits are often poorly developed in hatchery fish compared to wild fish, and may be a factor limiting post-release survival. The success of conservation programs may be improved through development of innovative culture techniques based on a wild-fish life history template. A framework of conservation hatchery strategies to reduce potential impacts of artificial propagation on the biology and behavior of fish is presented. Research results to help mitigate the unnatural conditioning provided by hatchery rearing are discussed and contrasted to those for production hatchery operation. These include simulation of natural rearing conditions through incubation and rearing techniques that approximate natural profiles, increasing habitat complexity (e.g. cover, structure, and substrate) in rearing vessels, and behavioral fitness conditioning techniques such as anti-predator conditioning.

Flagg

Enhancement of ESA – listed endangered Redfish Lake sockeye salmon via a captive broodstock program

Thomas A. Flagg[1]*, W. Carlin McAuley, Paul A. Kline, Madison S. Powell, Doug Taki, and Jeffrey C. Gislason[2]*[1]NOAA Fisheries, Northwest Fisheries Science Center Resource Enhancement and Utilization Technologies Division, Manchester Research Station PO Box 130, Manchester Washington, 98353 tom.flagg@noaa.gov; [2]Bonneville Power Administration Fish and Wildlife Division - KEWU4 P.O. Box 3621 Portland, Oregon 97208 jcgislason@bpa.gov.

ABSTRACT: In December 1991, the National Marine Fisheries Service listed Snake River sockeye salmon (*Oncorhynchus nerka*) as endangered under the U.S. Endangered Species Act (ESA). Snake River sockeye salmon are a prime example of a species on the threshold of extinction, with the last known remnants of this stock returning to Redfish Lake, Idaho. On the basis of critically low population numbers and coincident with the listing, a captive broodstock project was implemented by federal, state, and tribal partners as an emergency measure to save Redfish Lake sockeye salmon. During the decade of the 1990s, a total of 16 wild fish returned to Redfish Lake (0-8 per year); all were captured for the broodstock program. Amplification of the population through captive broodstocking resulted in hundreds of thousands of progeny (prespawning adults, eyed eggs, presmolts, and smolts) replanted to habitats. Between 1999-2004, about 340 adults returned from the ocean from captive broodstock releases – an amplification of over 20 times the number of wild fish that returned in the 1990s. Important lineages of Redfish Lake sockeye salmon continue to be maintained in culture as

preserves for genetic variability and for numerical and demographic amplification of releases to the habitat. It is virtually certain that the broodstock program has, at least for the short-term, prevented extinction of Redfish Lake sockeye salmon. Over the course of the program, operational issues included development of successful captive husbandry procedures, maintenance of genetic diversity, assessment/enhancement of habitat carrying capacity, and intensive evaluation of restocking efforts. These issues are presented as a model approach for fisheries enhancement of severely depleted stocks of fish.

Hoffman

Kootenai River White Sturgeon recovery activities update poster

Greg Hoffman Fishery Biologist Kootenai River ~ Libby Dam US Army Corps of Engineers (406) 293-7751 x 255 gregory.c.hoffman@usace.army.mil.

ABSTRACT: The Kootenai River white sturgeon *Acipenser transmontanus* population was listed as endangered under the ESA during 1994. The population has been declining for at least four decades; the last successful year-class recruitment of over 20 fish is believed to have occurred in 1974. At the current mortality rate of 9% per year, fewer than 500 adults will remain by year 2005, and fewer than 50 adults will remain by year 2030. Without intervention or natural recruitment, population extinction is all but certain during the next 20-40 years. Failure to re-establish natural recruitment during the 1990's with altered hydrograph experiments has prompted pursuit of further adaptive management alternatives. Recent USGS studies indicate an absence of suitable substrate for fertilized egg adhesion in the reach of river where sturgeon currently spawns. Additional USGS modeling demonstrated that attempts to substantially increase channel velocity in this reach through increased flow from Libby Dam is not possible under existing system constraints. Biologists and water managers are pursuing adaptive management activities including: 1) development of a "normative" ecosystem rehabilitation hydrograph in conjunction with experiments designed to test hypotheses that substrates and velocity are limiting factors in sturgeon recruitment; 2) development of habitat and placement strategies in the Kootenai River that may allow adhesion and development of fertilized eggs; 3) restoration and rehabilitation of tributary and Kootenay Lake ecosystem functions; and 4) continuation of a rigorous conservation aquaculture program that was initiated in 1990 to protect and ultimately help recover this endangered population.

Hogen

East fork ditch company fish habitat rehabilitation project: Step-pool complex, fish screen, and bypass channel.

David M. Hogen, Fisheries Biologist Council Ranger District, Payette National Forest.

ABSTRACT: Over the last two years, the East Fork Ditch Company and other cooperators rehabilitated an irrigation ditch point of diversion on the Payette National Forest. The project was designed to reduce potential impacts to bull trout and other native fish. Fish entrainment into the existing ditch was addressed by constructing an overshot horizontal flat plate fish screen. This screen is the first fish screen installed on any irrigation diversion in the Weiser River basin. In addition, the screen type is the first of its kind in Idaho. The year-round fish passage portion of the project was addressed by constructing a step pool structure below an existing dam, maintaining a summer flow over the newly constructed fish screen, and creating a fish return channel. Approximately 20 miles of fish bearing stream habitat were reconnected because of the project. Challenges related to implementing this project included funding, permitting, design, and material costs.

Isaak

Conservation implications of spatial and temporal synchrony among chinook salmon populations

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ABSTRACT: Metapopulation dynamics have emerged as an important consideration in conservation planning for salmonid fishes; yet key uncertainties remain regarding the spatial and temporal scales at which these processes operate. We addressed these uncertainties by examing patterns of synchrony in Chinook salmon (*Oncorhynchus tshawytscha*) redd counts from a wilderness area in central Idaho. Our results suggest that, over the last 50 years, these populations have become strongly temporally synchronous as they decreased to one-sixth of their former abundance. Additionally, the range, or diversity of correlations, exhibited among populations decreased, suggesting that variation in life histories may now be constrained. These changes indicate that the likelihood of simultaneous extirpations has increased, which may have long-term detrimental impacts on the regional persistence of this species. Within year analysis of spatial synchrony in redd distributions revealed domains of spatial covariation at stream distances of 5 – 12 km. If these domains represent typical dispersal distances, as has been suggested, then this amount of habitat may provide a conservative estimate of the area occupied by a local population. These estimates are critical because local populations serve as fundamental building blocks for metapopulations and knowledge of the spatial requirements for these key demographic units is necessary for efficient reserve design. Implications for management are that the resilience of many metapopulations to large-scale disturbance and anthropogenic suppression may not depend solely on attempts to maintain large and productive component populations, but also on efforts to desynchronize populations that have become temporally correlated. Such efforts could entail promoting the existence of a broad distribution and diversity of habitats that support a wide array of life history forms and ensuring that some habitat enclaves are sufficiently spatially disjunct so that risks from catastrophic stochastic events are minimized. Protected areas should be as large as possible until more is known about habitat area requirements and possible interactions with landscape geometry, habitat productivity, and population turnover rates, all of which bear on the amount of habitat this species needs to persist.

Kenney

Bull Trout Population Characteristics of Two South Fork Boise River Tributaries

Dan Kenney, North Zone Fisheries Biologist, Sawtooth National Forest dkenney@fs.fed.us.

ABSTRACT: We sampled bull trout with backpack electrofishing equipment and weirs in the Boardman and Skeleton Creek drainages in 2002, 2003, and 2004. These streams enter the South Fork Boise River less than 10 stream miles apart, but differ in important physical characteristics. Both systems support migratory bull trout populations (adfluvial and, likely, fluvial) and one or both may also support resident life history forms. Although we took scale samples and fin clips and PIT-tagged many fish, this presentation will focus on bull trout population characteristics than can be gleaned from fish size and abundance statistics and sampling location and timing data. Specifically discussed will be population abundance and density estimates and trends; juvenile length-at-age and growth rates; juvenile outmigration size, age, and timing; and variability among years for these characteristics. Some data related to adult migratory bull trout would also be presented, as will speculation regarding causes of the observed similarities and differences between bull trout populations in the two drainages and the potential existence of the resident life history form.

McAuley

Spring Chinook captive broodstock of the Salmon River Basin of central Idaho

Carlin McAuley, Northwest Fisheries Science Center, Manchester Research Station, 7305 Beach Drive East, Port Orchard, WA 98366, 360-871-8314, carlin.mcauley@noaa.gov.

ABSTRACT: Captive rearing is a form of artificial propagation in which fish are cultured in captivity for their entire life cycle. Increased survival in protective culture rapidly increases breeding population size, accelerating recovery efforts by producing large numbers of prespawning adults that can be returned to the wild. Three stocks of Salmon River Basin spring chinook were listed as threatened under the Endangered Species Act in 1992. As a consequence of this listing, the Idaho Department of Fish and Game, in cooperation with NMFS, USFWS, the Shoshone-Bannock Tribe, and BPA established a captive rearing program in 1994 in an effort to aid recovery of these listed stocks. This poster reviews the history of this program, and follows the rearing process beginning with fry (BY94 – 98) and egg (BY99 – 04) collection and ending with release of captively reared mature adults for natural spawning in their natal streams.

McAuley

Spring Chinook captive broodstock, Grande Ronde Basin of Eastern Oregon

Carlin McAuley, Northwest Fisheries Science Center, Manchester Research Station, 7305 Beach Drive East, Port Orchard, WA 98366, 360-871-8314, carlin.mcauley@noaa.gov.

Captive broodstocks are a form of artificial propagation in which fish are cultured in captivity for their entire life cycle. Increased survival in protective culture rapidly increases breeding population size, accelerating recovery efforts by producing large numbers of offspring that can be returned to the wild.
Three stocks of Grande Ronde Basin spring chinook were listed as threatened under the Endangered Species Act in 1992. As a consequence of this listing, the Oregon Department of Fish and Wildlife, in cooperation with NMFS, USFWS, Confederated Tribes of the Umatilla, the Nez Perce tribe, and BPA established a captive broodstock program in 1994 in an effort to aid recovery of these listed stocks. This poster reviews the history of this program, and follows the rearing process beginning with parr collection (BY94 – 04) through the spawning of captively reared mature adults and release of their progeny in the natal stream.

Wastel

Manchester seawater supply system

Michael Wastel Presenter, Northwest Fisheries Science Center, Manchester Research Station, 7305 Beach Drive East, Port Orchard, WA 98366, 360-871-8323, mike.wastel@noaa.gov; James Hackett, Northwest Fisheries Science Center, Manchester Research Station, 7305 Beach Drive East, Port Orchard, WA 98366, 360-871-8325, james.hackett@noaa.gov.

ABSTRACT: Located on Clam Bay in Puget Sound, the Manchester Research Station has access to excellent quality seawater. Seawater temperatures range from 7 - 13°C and the average salinity is 29ppt. Both conditions are ideal for salmonid and marine fish culture. However, due to naturally occurring pathogens and toxic algae blooms, all seawater utilized at the station is pumped, filtered, and treated with ultraviolet (UV) lights. This process minimizes the risk of water-borne pathogens in Puget Sound reaching the fish rearing tanks onshore. Total treated seawater capacity is currently 4542 liters per minute (1200 gallons per minute).

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