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UNITED STATES DISTRICT COURT
DISTRICT OF OREGON

NATIONAL WILDLIFE FEDERATION, *et al.*,

Plaintiffs,

v.

NATIONAL MARINE FISHERIES SERVICE, *et al.*,

Defendants.

Case No. 3:01-cv-00640-SI

DECLARATION OF CASEY M. BALDWIN

I, CASEY M. BALDWIN, hereby declare as follows:

1. I am a Senior Research Scientist with the Confederated Tribes of the Colville Reservation ("Colville" or "Tribes") in the Fish and Wildlife Department. I have been employed by the Tribes in this position since November 2011. I am the Department's lead regional scientific authority on fish ecology, physiology and behavior with an emphasis on Columbia River anadromous fisheries. In this capacity, I oversee tribal resident and anadromous fisheries research conducted in waters on- and off-Reservation and in production-scale hatcheries. Our

research and reporting emphasis includes population limiting factors and population dynamics, determining the success of habitat restoration and recovery programs, and addressing the guidelines and requirements of the Endangered Species Act and other legal mandates. As Senior Research Scientist, I coordinate and collaborate with multiple interagency committees and processes within the Upper Columbia and throughout the Pacific Northwest. I am responsible for preparing hatchery and genetic management plans (HGMP), and portions of the Colville Tribal Resource Management Plan (TRMP). I guide, edit, and co-author project reports for Fish and Wildlife Department monitoring and evaluation projects and represent the Tribes on technical committees related to anadromous fish and habitat research, management and restoration, including the Regional Technical Team, Transboundary Sockeye Harvest Sharing Technical Workgroup, Integrated Recovery Technical Advisory Group and the Fish Barrier Removal Board.

2. Prior to my employment by Colville, I served for over 14 years as a research scientist with the Washington Department of Fish and Wildlife. From 2003 to 2011 my focus was on salmon and steelhead recovery planning, including species status evaluations, planning and prioritizing the implementation of habitat restoration and protection projects, and modeling potential habitat and species response to implementing habitat restoration actions. I earned an M.S. in Fisheries at Utah State University in 1998 and a B.S. in Biology from Adams State College in Alamosa, Colorado in 1995. I have authored or co-authored 10 peer-reviewed scientific articles related to fisheries research and management. A copy of my curriculum vitae is attached hereto as Exhibit A.

3. I was asked to review Appendix C, prepared by Rich Zabel and Tom Cooney, to the 2014 Supplemental Biological Opinion for Operation of the Federal Columbia River Power

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System issued by NOAA Fisheries on January 17, 2014 ("2014 BiOp"), the discussion of Appendix C in the 2014 BiOp at pages 109-119, and the Declaration of Dr. Brendan M. Connors (Dkt. 1981). I was asked to provide a response to the discussion in the Connors Declaration regarding the BiOp's explanation of the influence of density dependence as a factor in recently observed declines in the recruits per spawner (R/S) productivity metric. I was also asked to comment on Dr. Connors' statement that "many of [the salmon and steelhead populations addressed in the 2014 BiOp] occupy near pristine wilderness tributary habitat which has not been degraded or otherwise reduced in its carrying capacity . . .," Connors Decl. ¶ 16, in the context of Colville's work in the Upper Columbia River, particularly the Okanogan River sub-basin.

4. It is important to note at the outset that the observations of reduced R/S in recent years may have limited value in determining the efficacy of implementing the 2008 BiOp's RPA. This is because data for adult recruits only go through 2010, 2011 or 2012 for most populations, 2014 BiOp at 111, and many, if not most, RPA actions, particularly those involving habitat restoration, were not undertaken until after 2008. With adult recruit data from 2012 or earlier, there is at most one full lifecycle – for some populations – that falls entirely within the 10-year term of the BiOp, i.e. brood year 2008. As a result, the available R/S metric data does not yet reflect the bulk of RPA actions implemented under the 2008 BiOp. However, many habitat actions have shown an immediate response (utilization) by one or multiple life stages of salmon and steelhead (Weigel et al. 2013; Martens and Connolly 2014). Unfortunately, in addition to more data from fish spawned during the BiOp term, it will take several salmon generations experiencing the improved survival conditions in the tributary and estuary habitat and hydro system to enable detection of a response attributable to these RPAs. I agree that NOAA's analysis in Appendix C demonstrates a plausible density dependent effect explaining the lower

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R/S in recent years where higher spawner abundance has been observed; however the abundance-productivity relationship reflected in the data does not include the full effects of the RPA implementation.

5. Dr. Connors describes an alternative explanation to the density dependent effect on productivity observed in recent years. His theory is that at low abundance, returning spawners concentrate in a subset of the available "habitat patches"[1] to reproduce successfully, resulting in a lower "apparent carrying capacity" for the population. If this theory were correct it would essentially be a false positive for density dependent response. Connors Decl. ¶¶ 10-12. Thus, the apparent carrying capacity may be reduced at low population abundance, and true carrying capacity of the population may only be realized when more spawners return and spread out to all available spawning and rearing habitat. *Id.* ¶ 13. While his theory appears plausible, there are several problems with Dr. Connors' alternative explanation.

6. Dr. Connors lacks supporting data for the Snake River and Upper Columbia River Chinook and steelhead populations he contends are likely to be experiencing the density dependent effects of spatial contraction of tributary habitat.[2] Therefore, it is nothing more than a hypothesis until data are collected (if they do not currently exist) and tested against the hypothesis. Isaak and Thurow (2006) did evaluate the expansion of habitat utilization in five Snake River tributary streams and they found that returns per spawner was 2-3 times higher

[1] Connors never identifies the size of the relevant "habitat patches." It is unclear whether they are on the scale of river reaches or smaller.

[2] I am aware the Independent Scientific Advisory Board (ISAB) recently reviewed density dependence and its implications for salmonid habitat restoration in the Columbia River basin, but did not consider it given the time available for preparing my declaration. *See* ISAB, *Density Dependence and its Implications for Fish Management and Restoration Programs in the Columbia River Basin*. Feb. 25, 2015, *available at* http://www.nwcouncil.org/media/7148891/isab2015-1.pdf.

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when abundance (and distribution) were at their lowest (Table 1, Figure 3a.).[3] Although Isaak and Thurow (2006) did not address the issue of density dependence or report the changes in density in the subset of reaches that were occupied at all abundance levels, these general results appear counter to Dr. Connors' premise that density dependence (reduced R/S) would be observed even at low abundance due to high density in a subset of occupied spawning patches. Dr. Connors describes "three lines of evidence," but he cites only one peer-reviewed paper for evidence that "many of these same populations, despite their low abundance, have clear evidence of density dependent juvenile survival in tributary habitat." *Id.* ¶ 16 (citing Walters et al. (2013)). However the Walters study does not support Dr. Connors' broad assertions. Walters et al. studied the degree of density dependence in juvenile production in 9 populations of spring/summer Chinook in the Snake River basin, only a small subset of the ESA-listed populations in the Interior Columbia Basin. Additionally, Walters et al. did not empirically evaluate the "apparent" carrying capacity theory. They did explore theories to explain the observed density dependence at relatively low abundances in the discussion, but no data were presented or analyzed related to spawner or juvenile distribution and the quality of habitat that different escapement (abundance) levels experienced. At several points, Walters et al. mention that many of the studied populations occurred in relatively undisturbed areas. This observation is never rigorously analyzed, appears to ignore the effects of limited marine-derived nutrients as a form of habitat degradation even while discussing the literature on this issue, and is undermined by their conclusion that the three populations which experienced the greatest degree of density dependence (Lemhi River, East Fork, and Crooked Fork) also experience more human-caused degradation, which justifies the approach of habitat restoration as an important

[3] Connors cites to Isaak and Thurow (2006) once in his declaration, as support for various explanations why a salmon "metapopulation may see spawning and rearing subpopulations within individual habitats blink in and out." Connors Decl. ¶ 10.

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component of recovery. Finally, in their conclusion, Walters et al. call for further research in spatial clustering, the same theory Dr. Connors describes in his declaration.

7. Dr. Connors states that "where spatial contraction of occupied habitat patches occurs because of low spawner abundance, driven in part by sources of mortality outside tributary habitat, a focus on restoration of additional tributary habitat is unlikely to be sufficient to allow the overall metapopulation to increase its productivity, expand the number of habitat patches occupied and ultimately grow to the point where population viability and conservation status is improved." Connors Decl. ¶ 17. He then suggests that to break out of this situation, *i.e.* seed more habitat patches, '[m]anagement actions that increase survival after emigration from rearing habitat would be necessary." *Id.* He focuses on one management action in particular, increasing spill over dams during outmigration, which, in his view, has the possibility of significantly increasing smolt survival. *Id.* ¶ 18. Again, Dr. Connors' comparison of habitat improvement versus Columbia River hydrosystem management actions (e.g. spill) lacks data or modeling to demonstrate the ineffectiveness of habitat restoration or the survival gains from mainstem management actions. He also fails to consider the significant questions raised by the Independent Scientific Advisory Board (ISAB) and NOAA in the past year in response to Oregon's proposed spill experiment. *See* 2014 BiOp at 381 - 383; Review of Proposed Spill Experiment, ISAB 2014-2 (Feb. 20, 2014) (BOR 2014 AR at BR00072093). If Dr. Connors' hypothesis is correct and mainstem management actions increase returning spawners, the ability to achieve higher productivity may be limited by failing to restore degraded habitat throughout the basin.

8. As noted above, Dr. Connors describes three lines of evidence supporting his view that Snake River and Upper Columbia River Chinook and steelhead populations are

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experiencing density dependence as a result of spatial contraction of tributary habitat. Connors Decl. ¶ 16. The first line of evidence is that "many of these populations occupy near pristine wilderness tributary habitat which has not been degraded or otherwise reduced in its carrying capacity." *Id.* I respond to this line of evidence in greater detail below. The second line of evidence is that many populations are, despite low abundance, experience density dependent effects in this "pristine" tributary habitat. As discussed above, Walters et al. do not supply any data on which Dr. Connors relied for his spatial contraction density dependence theory. Dr. Connors' third line of evidence involves low and variable SARs, but he fails to make a logical link to his theory of spatial contraction. Certainly, higher and less variable SARs would increase adult returns and those adult returns should expand their range and occupy more habitat, as was determined by Isaak and Thurow (2006). However, Dr. Connors fails to make the connection between the observed expansion of adult spawning distribution from Isaak and Thurow (2006) and the density dependence observed by Walters et al. (2013) at the higher abundance levels.

9. Returning to Dr. Connors' first line of evidence – that "pristine wilderness" habitat is available to many Snake and Upper Columbia River salmonid populations - this represents an extremely broad generalization, and it is incorrect with respect to the majority of watersheds in the Interior Columbia Basin As I explain in further detail below, the Okanogan River basin was severely degraded from over a century of water diversions, logging, road infrastructure, and livestock grazing, and steelhead productivity in this habitat was and still is likely affected by density dependent processes. In addition, even those tributaries that lie in the wilderness of Idaho have experienced a century of depressed salmon returns and the associated marine derived nutrients, which have been shown to benefit the riparian zone and multiple

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trophic levels including salmon parr and smolts (Bilby et al. 1998; Stockner 2003; Martin et al. 2010).

10. The Okanogan sub-basin, which has the most severely degraded summer steelhead habitat in the upper Columbia River region, is far from "pristine wilderness." (RTT 2014). Initial results from the Ecosystem Diagnosis & Treatment (EDT) model[4] estimate that habitats in the U.S. portion of the Okanogan River are operating far below historic potential. The current status of habitat capable of supporting all life history diversity has been severely reduced. Historic habitat productivity provided for a self-sustaining steelhead population, whereas recent status assessments and the EDT model estimate population productivity that is not capable of returning more than 1 return per spawner, which is a critical threshold for achieving population viability (UCSRB 2007; Ford et al. 2011; 2014 BiOp, Appendix C).

11. Dr. Connors' contends that "a focus on restoration of additional tributary habitat is unlikely to be sufficient to allow the overall metapopulation to increase its productivity, expand the number of habitat patches occupied and ultimately grow to the point where population viability and conservation status is improved." Connors Decl. ¶ 17. Dr. Connors overlooks the vital role of habitat restoration in the survival and recovery of salmonids in the Columbia River basin. An approach that does not include a heavy reliance on habitat restoration in many of the populations will not achieve species viability. The Okanogan River basin and its threatened summer steelhead population are a good example of why past and future habitat restoration and protection are critical to recovery of the species. UCR steelhead cannot be delisted without each of the four populations (Wenatchee, Entiat, Methow and Okanogan) achieving their viability criteria (UCSRB 2007; ICTRT 2007). Therefore, addressing the habitat

[4] EDT and its use by Colville in designing and implementing habitat restoration projects in the Okanogan River basin is described in detail in the Second Declaration of William Towey.

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limiting factors for the Okanogan population is essential to recovering (and delisting) UCR steelhead as a whole, notwithstanding gains made in the other sub-basin populations.

12. The degraded state of the Okanogan watershed adds to already harsh natural conditions which limit the production potential of stream-type salmonids in this basin. In several sub-watersheds, low stream flows in the summer and winter, and high ambient summer temperatures restrict or limit access to otherwise suitable habitat. Extreme winter conditions naturally limit fish growth and activity during this period. Dewatered reaches naturally occur in some areas of the Okanogan watershed during hot summer months. Collectively, these conditions can restrict salmonid access to habitat, dewater redds, and sometimes strand juveniles, resulting in direct mortality to salmonids. Although habitat impairment in the Okanogan watershed is widespread, much of the mainstem habitat and several tributaries are sufficiently intact to support and increase populations of anadromous salmonids, particularly if the human-caused degradation is addressed – as Colville has been doing for over a decade.

13. In my opinion, restoration of the Okanogan watershed for steelhead recovery is at one end of the spectrum regarding species status and the condition of the habitat. The Okanogan Basin and its steelhead population were so severely degraded with respect to habitat conditions that recovery could not be achieved by focusing solely in improvements in non-tributary habitat limiting factors such as the hydrosystem. Despite the substantial habitat challenges for UCR steelhead that persist today in the Okanogan River basin, opportunities for restoration abound.

14. Colville efforts to restore Omak Creek, which the Upper Columbia River Recovery Plan identifies as an essential "major spawning area" for achieving viability criteria for abundance, productivity and spatial structure, began in the mid to late 1990s.[5] As the Colville

[5] *See* Upper Columbia River Spring Chinook and Steelhead Recovery Plan at 122 (Upper Columbia River Salmon Recovery Board 2007) (NMFS 2014 AR at B.413) *available at*

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habitat restoration program expanded, improvements to Omak Creek and other tributaries began to make the Okanogan River basin a place where adult steelhead could find spawning habitat and juveniles could rear and migrate to the Columbia. A long-term water lease agreement in Salmon Creek, secured in 2006 and 2009, provided adequate flows to allow adult and juvenile passage through a previously dewatered reach, thereby providing access for UCR steelhead to the second major spawning area in the U.S. portion of the basin. Utilizing funding under the Colville Fish Accord MOA since 2008, as well as other sources such as the Salmon Recovery Funding Board, Colville and our restoration partners have restored many other smaller tributaries and minor spawning areas to enable some production and survival of juveniles. These include Loup Loup, Bonaparte, Antoine, Ninemile and Aeneas Creeks. Colville monitoring has shown adult spawners and juvenile production in these areas.

15. Actions that provide access to habitat and additional instream flows directly address the severely degraded state of the Okanogan watershed. Creating more accessible habitat for adults and juveniles, often with immediate benefits for fish, alleviates density dependent effects typical in degraded habitat. Other actions, such as riparian restoration, sediment reduction, and physical habitat manipulation (adding wood or rock) also improve the quality of the Okanogan's degraded habitat by enhancing survival and productivity within the confines of available space. Although these restoration efforts do not change stream length or area, they also reduce density dependence because more fish can occupy the same volume of water if it offers more or better food and shelter.

16. In order for a watershed to support a viable population of salmonids it must provide sufficient quality spawning and rearing habitat to produce enough juveniles to replace

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http://www.ucsrb.org/Assets/Documents/Library/Plans/UCSRP/UCSRP%20Final%209-13-2007.pdf

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the parent spawners. In severely degraded systems, such as the Okanogan, that are undergoing restoration we should expect to see an expansion of carrying capacity (reduction in density dependence) and an increase in juvenile survival over time. The timeframe for observing detectable results is uncertain, but increased abundance of natural origin returns have already been documented (OBMEP 2014).

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 5th day of March, 2015.

Casey M. Baldwin

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CERTIFICATE OF SERVICE

I hereby certify that on March 6, 2015, I electronically filed the foregoing document with the Clerk of the Court using the CM/ECF system which will send notification of such filing to all parties in this matter who are registered with the Court's CM/ECF filing system.

s/ Brian C. Gruber
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EXHIBIT A

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CURRICULUM VITAE

EDUCATION

Utah State University, Logan, UT 84322. 1998. M.S. Fisheries.
Adams State College, Alamosa, CO 81140. 1995. B.S. Biology, minors-Chemistry and Geology
Columbia Central High School, Brooklyn, MI 49230. 1991.

WORK EXPERIENCE

Colville Confederated Tribes
Fish and Wildlife Department
470 9th St. NE, Suite 4
East Wenatchee, WA 98802

Title: Sr. Research Scientist
Supervisor: Randy Friedlander
Starting-Ending Dates: Nov 2011-Present
Hours per week: 40

Duties and Responsibilities

CCT F&W department's lead regional scientific authority on fish ecology, physiology and behavior with an emphasis on Columbia River Anadromous fisheries. Oversees tribal resident and anadromous fisheries research conducted on and off reservation waters and in production-scale hatcheries. Areas of research and reporting emphasis include population limiting factors and population dynamics, monitoring and evaluation of hatchery effectiveness and hatchery/wild natural fish interactions, determining the success of habitat restoration and recovery programs, evaluating selective harvest techniques and addressing the guidelines and requirements of the Endangered Species Act and other legal mandates. Technical expert in the application of experimental design in laboratory, field (rivers and streams) and production-scale hatchery environments. Develops and implements innovative, applied research programs and modeling exercises in fish physiology, behavior, ecology, and population dynamics. Coordinate and collaborate with multiple interagency committees and processes within the Upper Columbia and throughout the Pacific Northwest. Serve as CCT technical lead for interagency harvest negotiations, prepare Hatchery and Genetic Management Plans (HGMP), and Tribal Resource Management Plan (TRMP). Guide, edit, and co-author project reports for CCT Fish and Wildlife Department monitoring and evaluation projects. Represent the CCT on technical committees related to anadromous fish and habitat research, management, and restoration including the Regional Technical Team, Transboundary Sockeye Harvest Sharing Technical Workgroup, Integrated Recovery Technical Advisory Group and the Fish Barrier Removal Board. Prepare manuscripts for publication in scientific journals and present research and management plans and results at technical conferences and in public forums.

Washington State Department of Fish and Wildlife
Science Division / Conservation Biology Unit
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Wenatchee, WA 98801

Title: Research Scientist I
Supervisor: John Kerwin
Starting-Ending Dates: March, 1998-Oct2011
Hours per week: 40

Duties and Responsibilities:

March 2003-Oct 2011: Provide central contact point for WDFW science activities in Eastern Washington; assist the Chief Scientist and Regional Directors in prioritizing research needs, develop funding proposals (including study design) for the SRFB, NPPC, and other funding sources. Write and edit, revise, and evaluate draft reports, proposals and manuscripts prepared by WDFW staff and cooperators in research studies. Participate on multi-disciplinary teams and workgroups related to various salmon recovery implementation and monitoring activities such as the Upper Columbia Regional Technical Team, the Interior Columbia Technical Recovery Team, the reintroduction workgroup and life-cycle modeling workgroup for the FCRPS BiOp, White River technical workgroup, the summer Chinook Summit, the HCP and PRCC habitat committees, among others.

March 2007-Oct2011: Lead (as the chairperson) the Upper Columbia Regional Technical Team (UCRTT), an interdisciplinary team of scientists, biologists, and natural resource professionals that provide three functions to the Upper Columbia salmon recovery region: 1) recommend region-wide approaches to protect and restore salmonid habitat, 2) develop and evaluate salmonid recovery projects within the Upper Columbia Region and 3) develop and guide salmonid recovery monitoring plans. Facilitate monthly UCRTT meetings, coordination between the UCRTT and the Upper Columbia Salmon Recovery Board (UCSRB), and provide advice on technical issues related to salmon and steelhead science, management, monitoring, and habitat. Participate on the Upper Columbia Implementation Team, the Monitoring and Data Management Committee, and attend Watershed Action Team meetings as appropriate. Recent activities include completing a revision of the UCRTT *Biological Strategy,* updating and finalizing the UCRTT project scoring criteria, barrier prioritization framework, Nason Creek Biological Benefits assessment, data gaps prioritization, evaluate and present the results of the RTT's evaluation of Salmon Recovery Funding Board (SRFB) and PUD Tributary Fund projects.

October 2010-Nov2011: Principle Investigator of radio tracking study of summer Chinook in the Upper Columbia. Develop study design, manage contracts and hire staff to implement a 2 year radio tracking study of adult summer Chinook from Wells Dam to the spawning grounds to evaluate pre-spawn mortality, movement, distribution, and population structure.

January 2005-2010: Direct and guide studies to determine steelhead spawning abundance and distribution in a subset of areas of the Wenatchee and Entiat population boundaries. Negotiate, develop, plan, and implement the contract and budget for the studies and supervise field staff in the

execution of studies including redd counts, carcass recoveries, stream temperature monitoring, and discharge measurements.

August 2004-2008: Participate on the Interior Columbia Technical Recovery Team (ICTRT). The ICTRT is a NOAA Fisheries lead interdisciplinary team that established the viability criteria for ESA listed Interior Columbia River Basin anadromous salmonids. Attended meetings and contributed to ICTRT analysis and work products including the viability report, gaps report, current status reports, and a primary literature publication regarding risks of hatchery strategies at different spatial scales.

March 2003-2005: Lead complex and potentially controversial technical analyses of habitat-salmonid productivity relationships (EDT) that are a key component of multi-jurisdictional efforts to complete watershed, subbasin, and ESA recovery plans in Eastern Washington. Assisted with analysis, strategic planning, and writing sections of the Upper Columbia Salmon and Steelhead Recovery Plan and the NPPC Subbasin Plans for the Methow, Okanogan, Upper Middle Mainstem, Asotin, Tucannon, Walla Walla, and Lower Snake watersheds.

Salmonid Habitat-Productivity Analysis: Develop, refine, and apply quantitative models that relate aquatic habitat characteristics to the productivity of salmonid populations. Organize and conduct workshops with stakeholders and biologists from tribal, federal, state and local governments to collect and collate information on the aquatic habitat of rivers. Evaluate the effectiveness of proposed management actions on aquatic habitat and fish populations using sophisticated simulation models, analyze the data using stock-recruit analysis, EDT and other tools to identify escapement objectives consistent with current, historical and Properly Functioning Conditions for habitat and water quality. Objectively present the results of potentially controversial and sensitive analyses in reports and in oral presentations to agency staff, watershed planning groups and scientific conferences.

March 1998-2007: Project leader for Lake Roosevelt Limnetic Fish Project/Creel Study. Development, implementation, and administration of various monitoring and evaluation projects designed to identify limiting factors for resident fish populations and evaluate hatchery/stocking strategies. Write experimental design, collect data, conduct statistical analysis and report results for management decisions related to natural origin and artificially propagated resident fish. Budget and out-year planning for research team; handle accounts receivable and accounts payable contracts, supervise and train 1 biologist and 1-3 technicians doing various fieldwork, lab work, and data analysis (see research activities). Present results at various intra- and interagency meetings and fisheries conferences and prepare primary literature manuscripts for publication. Coordinate and participate in interagency research activities with State, Federal, Tribal, partners and local stakeholder groups.

Research Activities: Develop bioenergetically-based food web models to compare temporally and spatially-explicit estimates of consumption demand to prey supply for salmonids, percids, centrarchids, cyprinids and burbot. Determine carrying capacity estimates based on fish consumption and zooplankton biomass. Conduct bioenergetics modeling of piscivore consumption to evaluate seasonal and stocking losses of salmonids (rainbow trout and kokanee) to piscivores (walleye, burbot, smallmouth bass and northern pikeminnow). Determine relative impacts of each piscivore species and size class on stocked salmonids by defining spatial, temporal, and size relationships between predator and prey. Provide seasonal pelagic fish abundance estimates by performing hydroacoustic, gill net, and

mid-water trawl surveys. Evaluate vertical, horizontal, and diel distribution in relation to habitat, water chemistry, available forage, and entrainment (through Grand Coulee Dam).

Developed the Banks Lake Fishery Evaluation Project that received funding from BPA (began FY 2001) to evaluate limiting factors for stocked salmonids and panfish. Limiting factors analysis included assessments of predation, competition, entrainment, limnology, and habitat quality and quantity.

Utah Cooperative Fish and Wildlife Research Unit
Utah State University, Logan, UT 84322

Title: Graduate Research Assistant **Supervisor:** Dr. David Beauchamp (206) 543-6475
Starting-Ending Dates: October 1995-May 1998
Hours per week: 20

Duties and Responsibilities: Plan, conduct, analyze and report a food web study of Strawberry Reservoir, Utah in cooperation with the Utah Division of Wildlife Resources (see research activities). Trained and lead a group of 1-5 technicians for fieldwork, lab work, and data analysis.

Research Activities: Monitor adfluvial Bear Lake cutthroat trout movements in Strawberry Reservoir using ultrasonic tracking with depth sensing transmitters, differentially corrected GPS, and an acoustically generated bathymetric map. Develop a bioenergetically based food web model to compare temporally and spatially-explicit estimates of consumption demand to prey supply for cutthroat trout, rainbow trout, and kokanee in Strawberry Reservoir. Conduct seasonal gill net, hydroacoustics and zooplankton surveys. Assess acute stocking loss to predation and application of the Wisconsin bioenergetics model to quantify food web interactions. Present results at various academic meetings and fisheries conferences and prepare primary literature manuscripts for publication.

FISHERIES RELATED EXPERIENCE

- Dozens of fisheries related presentations at conferences, workshops, and public/policy meetings
- Conducted risk assessments of hatchery programs throughout the Interior Columbia Basin, including Upper Columbia spring Chinook and steelhead.
- Participated in co-manager meetings related to HSRG recommendations.
- Transboundary Sockeye Harvest Sharing Technical Workgroup
- Lead author to:
    - Hatchery and Genetic Management Plan: Okanogan Basin Spring Chinook Salmon (2013)
    - Hatchery and Genetic Management Plan: Okanogan Basin Summer Steelhead Conservation Program (2014)
- Contributing author to:
    - Tribal Resource Management Plan (CCT 2014)
    - Upper Columbia summer Chinook Summit (2010)
    - NPPC Subbasin Plans (Methow and Okanogan)
    - Upper Columbia Salmon and Steelhead Recovery Plan (2007)
    - Interior Columbia Technical Recovery Team Viability Criteria (2007)
    - The Regional Technical Team's Biological Strategy to Protect and Restore Salmonid Habitat in the Upper Columbia Region (2008)
- Conducted life cycle modeling for anadromous salmonids in the Upper Columbia
- Evaluated and developed RM&E inventories and gaps identification for Upper Columbia salmon and steelhead through CSMEP, the RTT monitoring committee, and as part of the WDFW-BPA fish accord preparation
- Participated in co-manager coordination meetings related to the planning and implementation of tribal and state Fish Accord agreements with BPA
- Review and input on the WDFW Statewide Steelhead Management Plan
- Review and input on the draft Wenatchee Spring Chinook Management Plan
- Chairperson of the Upper Columbia Regional Technical Team
- WDFW alternate on the HCP and PRCC Tributary Committees

OTHER FISHERIES RELATED FIELD WORK

- Installation, operation and monitoring of a fish weir in the Okanogan River
- Coded wire tag insertion, extraction, reading and database queries and analysis
- Extensive use of and analysis of multiplexing hydroacoustic echosounder
- Salmon and steelhead spawning ground surveys
- Boat, bank, and backpack electro shocking
- Zooplankton collection and identification
- Fish diet analysis
- Seasonal monitoring of stream and lake water quality

- Spawning of cutthroat trout and kokanee salmon
- Surgical implantation of ultrasonic transmitters
- Creel surveys and tag return study
- Use of net pens for growth experiments and as holding structures
- Spray mark and floy tag fingerling cutthroat trout
- Mid-water trawling
- Ground and aerial creel survey
- Beach seining
- Sturgeon egg mat and set line surveys

AWARDS

- WDFW Steve Phelps Leadership in Science Award (2011)
- WDFW Merit award (2006)
- WDFW Director's award (2005)
- Utah State University M.S. Graduate Student of the Year award (1998)
- CRC Freshman Chemistry Award (1992)
- CSHS Biology Student of the Year (1991)

TRAINING

- Contracts, federal procurement, sexual harassment, and other Tribal administrative training (2011-2014)
- MS-Access database training (2012)
- Motorboat Operator Certification Course (2010)
- Facilitation Skills for Scientists and Natural Resource Managers (2010)
- American Fisheries Society member (1996-Present)
- First Aid and CPR (2008, 2012)
- Personal Service Contracts Training (2006)
- Principles of Electrofishing (2002)
- Technical Writing, editing, and proofreading (2002)
- Level 1 and 2 Excel macros and Access training (1999, 2000)
- USDOI motor boat operator's certification (1997)
- ATV certified (Colorado 1995)
- SCUBA open water certification (1996)

JOURNAL PUBLICATIONS

Anderson, J. H., G. R. Pess, R. W. Carmichael, M. J. Ford, T. D. Cooney, C. M. Baldwin, and M. M. McClure. 2014. Planning Pacific salmon and steelhead reintroductions aimed at long-term viability and recovery. North American Journal of Fisheries Management 34: 72-93.

Hansen, A. G., D. A. Beauchamp, and C. M. Baldwin. 2013. Environmental constraints on Piscivory: Insights from linking ultrasonic telemetry to a visual foraging model for cutthroat trout. Transactions of the American Fisheries Society 142: 300-316.

Baldwin, C. M. and M. Polacek. 2011. Abundance and seasonal shifts in vertical and horizontal distribution of lake whitefish (*Coregonus clupeaformis*) in a western United States Reservoir. Journal of Freshwater Ecology. 26(2):171-183.

Baldwin, C. M. and J. G. McLellan. 2008. Use of Gill Nets for Target Verification of a Hydroacoustic Fisheries Survey and Comparison with Kokanee Spawner Escapement Estimates from a Tributary Trap. North American Journal of Fisheries Management 28: 1744-1757.

McClure, M. M., F. M. Utter, C. Baldwin, R. W. Carmichael, P. F. Hassemer,P. J. Howell, P. Spruell, T. D. Cooney, H. A. Schaller, and C. E. Petrosky. 2008. Evolutionary effects of alternative artificial propagation programs: implications for viability of endangered anadromous salmonids. Evolutionary Applications 1: 356-375.

Polacek, M. C., C. M. Baldwin, and K. Knuttgen. 2006. Status, distribution, diet, and growth of burbot in Lake Roosevelt, Washington. Northwest Science 30:153-164.

Baldwin, C.M., J. G. McLellan, M. C. Polacek, and K. Underwood. 2003. Walleye predation on hatchery releases of kokanees and rainbow trout in Lake Roosevelt, Washington. North American Journal of Fisheries Management 23: 660-676.

Baldwin, C. M., D.A. Beauchamp, and C. P. Gubala. 2002. Seasonal and diel distribution and movement of cutthroat trout from ultrasonic telemetry. Transactions of the American Fisheries Society.

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Beauchamp, D.A., C. M. Baldwin, and J. L. Vogel. 1999. Estimating diel, depth-specific foraging opportunities with a visual encounter rate model for pelagic piscivores. Canadian Journal of Fisheries and Aquatic Sciences. Supplement 1. 56:128-139.

REPORTS AND DOCUMENTS AUTHOR/CO-AUTHORSHIP

Baldwin, C. and J. Miller. 2014. Draft Technical Memorandum: Acoustic evaluation of sockeye passage at the lower Okanogan River weir, 2014. Prepared for Colville Confederated Tribes, Columbia River Intertribal Fish Commission, and Okanogan Nation Alliance fisheries management staff. 16 October 2014. Nespelem, Washington.

CCT (Colville Confederated Tribes) 2014. Hatchery and genetic management plan for the Okanogan River summer steelhead conservation program. Submitted to the National Marine Fisheries Service on 4 February 2014. Colville Confederated Tribes, Nespelem, Washington.

CCT (Colville Confederated Tribes) 2014. Tribal Resource Management Plan for the Confederated Tribes of the Colville Reservation. Submitted to the National Marine Fisheries Service on 7 July 2014. Colville Confederated Tribes, Nespelem, Washington.

Baldwin, C. 2013. Technical Memorandum: Summer Chinook jack assessment. Submitted to Colville Confederated Tribes fisheries management staff 25 January 2013. Nespelem, Washington.

CCT (Colville Confederated Tribes) 2012. Hatchery and genetic management plan for the Chief Joseph Hatchery Program, non-essential experimental Okanogan River Spring Chinook Salmon. Submitted to the National Marine Fisheries Service on 19 December 2012. Colville Confederated Tribes, Nespelem, Washington.

Mann, R., C. Snow, and C. Baldwin. 2012. Population structure, movement patterns, and pre-spawn mortality for natural origin summer/fall Chinook Salmon above Wells Dam. Technical Report prepared for NOAA Fisheries and the Pacific States Marine Fisheries Commission. PSMFC Job Number 936A.11.10. 44 pages.

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Ward, M.B., J. Morgan, and C. Baldwin (editors). 2010. Upper Columbia Regional Technical Team 2010 analysis workshop synthesis report. Prepared for the Upper Columbia Salmon Recovery Board by the Upper Columbia Regional Technical Team and Terraqua, Inc. Wenatchee, WA: UCSRB, 63 pages.

Peven, C. and 18 co-authors. 2010. Proceedings and findings of the summer/Fall Chinook salmon summits. 2009 Status Report. Wenatchee, WA.

UCRTT 2008. (lead author). A biological strategy to protect and restore salmonid habitat in the Upper Columbia Region. A Report to the Upper Columbia Salmon Recovery Board from the Upper Columbia Regional Technical Team. http://www.ucsrb.com/resources.asp

Archibald, P., E. Johnson, and C. Baldwin. 2008. Mad River rainbow/steelhead trout spawning surveys. USFS Entiat Ranger District.

Baldwin, C. M. 2007. Steelhead spawning ground surveys, temperature and discharge monitoring in small tributaries of the Columbia River Upper Middle Mainstem Subbasin, 2005-2007. Washington State Department of Fish and Wildlife Report FPT 07-10. Olympia, Washington.

ICTRT 2007. (Contributing author). Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs. Review Draft March 2007. http://www.nwfsc.noaa.gov/trt/col/trt_viability.cfm

Lead or co-author on 21 other WDFW or BPA fisheries related annual or technical reports (available upon request).

REFERENCES

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