Idaho Cooperative Fish and Wildlife Research Unit

Annual Report

Fiscal Year 2007

Cover Photo: Jordan Nielson collecting samples from hydrocyclone, Hagerman National Fish Hatchery, Idaho. Photo by Christine Moffitt. See page

ANNUAL REPORT

1 October 2006 — 30 September 2007

IDAHO COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT

6TH AND LINE STREETS
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U.S. GEOLOGICAL SURVEY
IDAHO DEPARTMENT OF FISH AND GAME
UNIVERSITY OF IDAHO
WILDLIFE MANAGEMENT INSTITUTE
U.S. FISH AND WILDLIFE SERVICE

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Introduction

Idaho Cooperative Fish and Wildlife Research Unit
A cooperative research and educational program of
U.S. GEOLOGICAL SURVEY
IDAHO DEPARTMENT OF FISH AND GAME
UNIVERSITY OF IDAHO
WILDLIFE MANAGEMENT INSTITUTE
U.S. FISH AND WILDLIFE SERVICE

The Cooperative Fish and Wildlife Research Unit Program was established in 1937. The program was established in the U.S. Fish and Wildlife Service in response to a recognized need for trained biologists and increased scientific analysis and skills in fish and wildlife management. The resulting partnership that developed among federal and state resource agencies, the Land Grant Universities and private entities evolved into a well-respected nationwide program. Beginning in 1984, wildlife and fishery units were combined into cooperative fish and wildlife research units. The Unit Program operated as part of the U.S. Fish and Wildlife Service until November 1993, when the program was moved into the National Biological Survey established by a Secretarial Order under the FY 1994 Interior Appropriations Act. In October 1996, the Units Program was moved into the U.S. Geological Survey, where it now resides in the Biological Resources Division (BRD). Today, there are 44 BRD Cooperative Research Units in 40 States, from pre-existing research programs of the Fish and Wildlife Service. These units contain more than 160 Ph.D. scientists who oversee as many as 600 graduate students per year. Staff in the Cooperative Research Units conduct research on renewable natural resource questions; participate in the education of graduate students destined to become natural resource scientists; provide technical assistance and consultation to parties who have legitimate interests in natural resource issues; and provide various forms of continuing education for natural resource professionals

Idaho Unit History
The Idaho Cooperative Wildlife Research Unit was established at the University of Idaho September 20, 1947 and the Idaho Cooperative Fishery Research Unit was established in 1963. The two units were combined into the Idaho Cooperative Fish and Wildlife Research Unit in 1985. The unit is housed in the Department of Fish and Wildlife Resources in the College of Natural Resources at the University of Idaho. The unit is staffed, supported, and coordinated by the United States Geological Survey-Biological Resources Division, the Idaho Department of Fish and Game, the University of Idaho, the Wildlife Management Institute, and the U.S. Fish and Wildlife Service.

Program Direction
The unit works toward conducting research on fish and wildlife problems of state, regional, and national interest, training graduate students for careers in the fish and wildlife professions, and providing technical assistance to state and federal managers and researchers.

The unit emphasizes research to help find solutions to problems affecting the fish and wildlife resources of Idaho, the Pacific Northwest, and the nation. Special areas of focus include studies

of anadromous fish passage in the Snake River basin, evaluation of methods to enhance fish health of hatchery reared fish, methods of establishing new animal populations or augment existing populations, improved estimators of animal abundance, determining the effectiveness of existing reserve and management areas, methods to assess and control the effects of introduced or invasive aquatic species, study the basic biology of aquatic and terrestrial animals, evaluate effectiveness of efforts to recover populations of endangered species, develop methods to prevent species from becoming threatened or endangered, and evaluate factors that regulate carrying capacity in fresh water and terrestrial habitats.

Unit Scientists, Research, Expertise, and Interests

Unit personnel maintain close working and professional relationships with the University of Idaho faculty, Idaho Department of Fish and Game and U.S. Fish and Wildlife Service personnel. Research studies are conducted primarily within Idaho, though research is conducted in Montana, Oregon, Washington, California, Colorado, North Carolina, Alberta, Federated States of Micronesia, Hawaii, Costa Rica, and Eastern Europe.

Unit research is supported by state contributions and by contracts from the U.S.G.S.-Biological Resources Division, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, U.S. Forest Service, Bonneville Power Administration, Northwest Power Planning Council, and other federal, state, and private agencies. In addition to research activities, unit personnel teach graduate-level courses, serve as advisers for graduate students, and participate in a variety of professional activities.

J. Michael Scott, Ph.D. – Unit Leader and Professor of Wildlife Resources. Recent research activities include studies on: reserve identification, selection, and design in North America; the use of translocation as a tool for establishing or augmenting animal populations; predicting species occurrences; recovery of endangered species; and development of tools to facilitate the transfer of information at the science policy interface. Areas of interest include animal ecology and conservation biology. Specialty course: WLF 515 – Advanced Topics in Conservation Biology.

Christine M. Moffitt, Ph.D. – Assistant Unit Leader and Professor of Fishery Resources. Recent research activities include: host-parasite relationships in an ecological settings; methods to evaluate sustainable aquaculture; interactions between cultured and wild fish; monitoring and control of invasive species; temperature effects on fish physiology and health; efficacy, risks, and regulatory approvals for aquaculture chemicals; and fisheries history. Specialty Courses: FISH 510, Advanced Fisheries Management; FISH/WLF 501, Graduate Seminar, and guest lectures in several classes.

SPECIAL RECOGNITION OF JIM CONGLETON

Assistant Leader Fall 1980 – Summer 2007

James L. Congleton, Ph.D. – Assistant Unit Leader and Professor of Fishery Resources retired from USGS in June 2007. He continues as part of the faculty in emeritus status, working part time on analysis and publication of completed research. In FY 2007, Dr. Congleton provided guest lectures in several classes and workshops, participated in graduate student committees, and published manuscripts on the physiology and energetics of smolt migrations in the Snake-Columbia River hydropower system. We congratulate Jim on his retirement and wish him happiness in his travels with wife Susan, and their family!

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Department of Fish and Wildlife Faculty & Emeriti and Other Faculty Cooperators with Unit Projects in FY 2007

** Indicates Unit Project in 2007*

Ernest Ables, Emeritus Professor
*Cort Anderson, Research Assistant Professor
David H. Bennett, Emeritus Professor
Ernest Brannon, Emeritus Professor
*Kenneth Cain, Assistant Professor
Brian Dennis, Professor
Michael Falter, Emeritus Professor
*E. O. (Oz) Garton, Professor
*Dale Goble, Professor of Law
*Brian Kennedy, Assistant Professor
George LaBar, Emeritus Professor
*Kirk Lohman, Affiliate Associate Professor
James Peek, Emeritus Professor
*Christopher Peery, Research Assistant Professor
*Madison "Matt" Powell, Adjunct Assistant Professor
*Wayne Melquist, Ph.D. – Wildlife Resources
*Janet Rachlow, Assistant Professor
*John Ratti, Emeritus Professor
*Kerry Paul Reese, Professor and Department Head
Dennis Scarnecchia, Professor
Kerri Vierling, Assistant Professor
Lee Vierling, Assistant Professor
*Lisette P.Waits, Associate Professor
Frank Wilhelm, Assistant Professor
*R. Gerald Wright, Emeritus Professor

Post-Doctoral Associates on Unit Projects

Aaron Haines, Ph.D., Wildlife Resources
Jon Horne, Ph.D., Wildlife Resources

Graduate Students of Unit Staff

Student	Discipline	Adviser
Peter Bloom	Ph.D. Wildlife Resources	J.M. Scott
John Cassinelli	M.S. Fishery Resources	C.M. Moffitt
Lubia Cajas Cano	Ph. D. Environmental Science	C.M. Moffitt
Derek Fryer	M.S. Fishery Resources	J.L. Congleton
Christopher James	M.S. Fishery Resources	C. M. Moffitt
Adam Kautza	M.S. Fishery Resources	C. M. Moffitt
Jordan Nielson	M.S. Fishery Resources	C.M. Moffitt
Anna Pidgorna	Ph.D. Environmental Science	J.M. Scott
David Rupp	M.S. Environmental Science	J.M. Scott
Leona Svancara	Ph.D. Wildlife Res/Geography	J. M. Scott
Don Zaroban	Ph.D. Fishery Resources	J. M. Scott/G.W. LaBar

Graduate Students on Unit Affiliated Projects

Student	Discipline	Adviser
Jen Adams	Ph.D. Wildlife Resources	L.P. Waits
Chris Anderson	M.S. Fishery Resources	C.A. Peery
Jocelyn Aycrigg	Ph.D. Wildlife Resources	E.O. Garton
James Barron	M.S. Fishery Resources	K. Cain
Nathan Burkepile	Ph.D. Wildlife Resources	K.P. Reese
Dustene Cummings	M.S. Fishery Resources	C.A. Peery
Rita Dixon	Ph.D. Wildlife Resources	E.O. Garton
Trevor Fox	M.S. Wildlife Resources	J. Ratti
David Griffith	M.S. Fishery Resources	C.A. Peery
Darlene Kilpatrick	M.S. Wildlife Resources	K. P. Reese
Tim Kiser	M.S. Fishery Resources	B. Kennedy
Jesse Lewis	M.S. Wildlife Resources	J.L. Rachlow
Ryan Mann	M.S. Fishery Resources	C.A. Peery
Daniel Schill	Ph.D. Fishery Resources	G.W. LaBar
Timothy Smyser	M.S. Wildlife Resources	E.O. Garton
Katherine Strickler	Ph.D. Wildlife Resources	L.K. Lohman
John Stevenson	M.S. Wildlife Resources	K.P. Reese

Research Staff on Unit Affiliated Projects

Charles Boggs
Lisa Garrett
Nathan Jensen
Katherine Strickler
Boling Sun
Gina Wilson

Fish and Wildlife Departmental Administrative Staff

Carrie Barron
Linda Kisha
Cheryl Chambers

Current Projects – Fisheries and Aquatic Resources

DEVELOPMENT AND EVALUATION OF EXTENSIVE LARVAL AND JUVENILE REARING TECHNIQUES AND SYSTEMS FOR BURBOT (LOTA LOTA MACULOSA) TO MEET CONSERVATION AQUACULTURE NEEDS

Principal Investigator:	Kenneth D. Cain, Ph.D.
Student Investigator:	James Barron
Research Technician:	Nathan Jensen
Funding Agency:	U.S. Fish and Wildlife Service
Completion Date:	30 September 2010

Objectives:

- Determine growth, condition, and survival of burbot reared from larval to juvenile life stages in replicated extensive (outdoor pond/tank) rearing systems.
- Evaluate existing natural ponds and potential pond sites at the Kootenai National Wildlife Refuge and other sites in Boundary County (or elsewhere) for further developing and testing extensive rearing requirements for burbot.
- Determine optimum hatchery rearing temperature and density for maximum growth of burbot fed commercial diets.
- Test various commercial diet formulations for use in burbot culture.
- In conjunction with our ongoing production program, compile data from this project for incorporation into a draft "Burbot Hatchery Manual".

Progress:
This project is just being initiated and the graduate student arrived in June 2008. The overall project goal is to improve survival of burbot from larval to juvenile life stages and investigate "natural" rearing options that may better meet conservation aquaculture needs for this species. Demographic analysis in 2004 of the Lower Kootenai River burbot (*Lota lota maculosa*) population indicated that approximately 50 fish currently remain. A series of factors appear responsible for the collapse of riverine burbot populations in the Kootenai/y Basin, including: habitat alteration and loss (increased winter discharge and winter water temperatures, reduced primary and secondary productivity, hydro impoundment and operations, and Kootenay Lake flood control), harvest, reduction in mysid availability, and resulting ecological community composition shifts. Rather than listing burbot as threatened or endangered under the Endangered Species Act (ESA), the Kootenai Valley Resource Initiative (KVRI) Burbot Committee, along with the US Fish and Wildlife Service and additional committed stakeholders, contributed to a Conservation Strategy. The committee proposed the Kootenai River drainage as a "pilot project" to develop, implement, and evaluate this Conservation Strategy for Lower Kootenai River Burbot, in lieu of formal ESA listing. It is this multi-faceted international focus and commitment, and consistency with the proposed federal "Policy for Evaluating Conservation Efforts" (PECE Policy; U.S. Vol. 65 No. 114, June 13, 2000) that empowers

this Conservation Strategy. The goal of this Conservation Strategy is to restore and maintain a viable and ultimately harvestable burbot population in the Kootenai River and in the South Arm of Kootenay Lake through habitat restoration and conservation aquaculture efforts. The need to investigate the potential of rearing burbot larvae under "natural" conditions has been identified as essential. This rearing method may simplify and/or improve our ability to rear this species for conservation aquaculture efforts. This study is being conducted as a graduate student (MS) project and builds on current burbot culture research at the University of Idaho's Aquaculture Research Institute (UI-ARI). A detailed proposal will be developed during the student's first semester. Research on intensive burbot culture has been ongoing since 2004 at the UI-ARI and this project addresses important questions for future development of a conservation aquaculture facility. If extensive pond rearing of burbot is feasible and cost-effective, then facility design plans must incorporate pond construction. Temperature, growth, and feed requirements will also be important when considering water and tank needs.

EFFECTS OF ARSENIC FROM MINE WASTES ON BULL TROUT

Principal Investigator: Brian Kennedy, Ph.D.
Graduate Research Assistant: Tim Kiser
Funding Agency: U.S. Fish & Wildlife Service
Completion Date: 30 September 2008

Objectives:

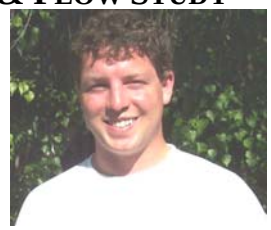
- Determine the extent and spatial variability of Arsenic (As) contamination in sediments below the Lakeview Mine and throughout Gold Creek drainage.
- Determine the bioaccumulation factors that relate the concentration of As in sediment to As in benthic macro invertebrates and resident salmonids.
- Determine benthic macro invertebrate diversity and abundance relative to spatial variability of sediment As concentrations.
- Determine the seasonal use patterns of juvenile bull trout in Gold Creek and West Gold Creek and relate to sediment As loads and habitat variables (e.g. productivity).
- Determine the extent of As-related toxicity in juvenile bull trout residing in Gold Creek and West Gold Creek by analyzing tissue residues and conducting histological investigations.

Background:
Arsenic (As) is a contaminant of concern in the Inland Northwest. Arsenic can be found at relatively high concentrations in soils and sediment at mine sites in Washington and Idaho. Lakeview Mine is located on the southeast end of Lake Pend Oreille in northern Idaho. The mine and mine wastes are located in Chloride Gulch that flows into Gold creek, then into the lake. The Gold Creek drainage is the second most productive bull trout spawning and rearing area in the lake basin. This stream contains high numbers of juvenile bull trout

with relatively low numbers of other salmonid species. Mine-related toxicity may be the cause, or a contributing factor, to the lack of use of Gold Creek above the confluence with West Gold Creek by juvenile bull trout. Furthermore, As may be adversely-affecting those juvenile bull trout that are present in the system, potentially reducing their long-term survival.

Progress: Funding began in Summer 2006 at which time a graduate student was brought on for fieldwork. An intensive field effort in 2006 resulted in the collection of sediment, macroinvertebrate, and fish samples as well as extensive habitat measurements throughout the drainage. Efforts focused on five sites throughout the drainage that varied with respect to their distance to mine effects and presumed sediment As concentrations. In 2007, Tim Kiser, has been working hard to process fish samples for histological analysis and analyzing metals data and macroinvertebrate samples. Tim will be working with the US Fish and Wildlife Service while he completes the data analysis and thesis writing.

LEWISTON ORCHARDS PROJECT: SWEETWATER BASIN FISH & FLOW STUDY



Principal Investigator: Brian Kennedy, Ph.D.
Graduate Research Assistant: Richard Hartson
Funding Agency: Bureau of Reclamation
Completion Date: 30 September 2008

Objectives:

- Quantify temperature and primary stream and riparian habitat features relative to flow levels in Lapwai, Webb, and Sweetwater creeks.
- Evaluate juvenile and adult movement behavior in Sweetwater, Lapwai and Webb creeks relative to flow operations.
- Evaluate indices of system productivity (macroinvertebrate abundance and diversity) relative to stream flow and temperature in Lapwai, Webb, and Sweetwater creeks.
- Evaluate indices of fish (targeting juvenile steelhead) population productivity (abundance, growth, bioenergetics and smolt production) relative to flow regime in Lapwai, Webb, and Sweetwater creeks.
- Evaluate effects of interspecific interactions on juvenile steelhead productivity.

Background:
The Bureau of Reclamation owns a series of water storage reservoirs, diversion dams and canals that provide irrigation water to the Lewiston Orchards area of Lewiston, Idaho. The Lewiston Orchards Project (LOP) is operated by the Lewiston Orchards Irrigation District (LOID), which distributes the water to agricultural, urban and suburban users. Lapwai watershed provides spawning and rearing habitat for a distinct population segment (DPS) of a federally endangered salmonid, *Oncorhynchus mykiss*, or steelhead, of the Snake River Basin. The LOP withdraws water from these creeks that are designated as critical habitat for this species. Importantly, the major temporal impact that water withdrawals

have are during the summer months when juvenile fish are trying to gain mass before smolting (migrating to the ocean) and diversion operations can potentially leave the streams dry. Decreased flows during spring may also impact spawning of adult A-run *O. mykiss* in the basin (NMFS 2006).

Understanding the effects of hydrologic changes on fish populations requires an integrative approach that addresses 1) how the growth potential of individual fish is affected, 2) how changes in growth and growth potential influence survival of individuals and, ultimately, how processes for the individual scale up to population level dynamics, and 3) how population dynamics are influenced by altered connections among subpopulations. These changes can be a direct result of hydrologic change (Lopes et al. 2004) or an indirect effect through altered temperatures, productivity or trophic relationships (Almodovar and Nicola 1999, Horne et al. 2004). Our study will address how flow alterations in the Lapwai system influence growth and survival of juvenile *O. mykiss* and develop integrated models for flow-foraging relationships, bioenergetics (i.e., energy gains and losses), productivity relationships, and fish movements, which collectively are designed to identify mechanistic relationships between fish performance and habitat. Student began course work in the Fall and the field work will begin in Summer 2008.

EFFECTS OF WATER TEMPERATURE ON GROWTH OF PHYSIOLOGY OF REDBAND TROUT

Principal Investigator: Christine M. Moffitt, Ph.D.
Student Investigator: John Cassinelli
Technical Staff: Boling Sun
Agency Collaborator- Kevin Meyer
Funding Agency: Idaho Department of Fish and Game
Completion Date: 31 December 2007

Objectives:

- Do redband trout from a desert population have higher survival in a warm water environment than redband trout from a montane population?
- Do redband trout from a desert population have faster growth in a warm water environment than redband trout from a montane population?
- Do particular physiological characteristics measured within desert and montane populations of redband trout enable desert populations to withstand a warmer environment?

Progress:
Within the Snake River Basin, redband trout occupy a range of habitat from high elevation mountain streams with high flows and cool temperatures to low elevation desert streams with little flow and warm temperatures. In FY 2007 we completed two years of laboratory studies to evaluate the physiology and growth of selected wild populations exposed to

simulated diel desert or montane water temperatures. Gametes were collected from wild stocks of redband trout from desert and montane habitat and fertilized in single-parent crosses. To serve as a control, gametes from a hatchery stock were also reared. Stocks were tested under simulated desert and montane stream water temperature cycles for various time intervals and at different life stages. The fish were monitored daily, and samples of fish were collected at different time intervals to evaluate various parameters. Response variables evaluated included growth rates and survival, feed efficiency, plasma cortisol, heat shock proteins, and body proximate analysis. The hatchery fish showed faster growth rates and higher feed efficiency in both the desert and montane treatments but also showed the earliest mortality at high temperatures. In wild populations, growth rates and feed, protein, and lipid efficiencies were variable among stocks, treatments and years. Mortalities at high temperatures varied among wild stocks but there were no differences between desert and montane source stocks. Heat shock protein 70 (hsp 70) levels were consistently higher in fish tested in a desert temperature treatments but levels varied among source populations These stocks showed a high level of variability in test variables measuring their responses. The high levels of versatility and variation of these fish expressed their ability to withstand a high range of environmental conditions with regards to water temperature. We conclude that desert- and montane-adapted populations of redband trout from the middle Snake River Basin of southwest Idaho seem to be equally dynamic and adaptive in various diel water temperature treatments but desert stocks may be more at risk from increasing temperatures and reduced stream flows likely with global climate change.

INFRASTRUCTURE TO COMPLETE FDA REGISTRATION OF ERYTHROMYCIN

Principal Investigator: Christine M. Moffitt, Ph.D.
Funding Agency: DOE – BPA (LSRCP)
Completion Date: 30 December 2007

Objectives:

- Keep an active dialog with Food and Drug Administration (FDA) to resolve any outstanding issues during their review of submission, and assure that all components of the public master file and drug claim for erythromycin to control bacterial kidney disease are completed.
- Interact with Ms. Roz Schnick, National Aquaculture NADA Coordinator, to assist in information needs for potential drug manufacturing sponsors as they prepare the manufacturing claim.
- Maintain an adequate infrastructure to assure a source of experimental premix is in place during completion of the drug approval submission
- Submit for publications manuscripts from studies and data collections previously submitted to FDA. Serve as a resource for others working with erythromycin to control bacterial kidney disease

Progress:
This project has been a major effort form more than 10 years to approve erythromycin for treatment of bacterial kidney disease in salmon. The requirements of the Food and Drug Administration's, Center for Veterinary Medicine (CVM) for technical data submissions regarding product Efficacy, Target Animal Safety, Human Food Residues, Human Safety from Antibiotic Resistance, and Human Safety from Resistant Microorganisms have been completed, reviewed and accepted by the CVM as adequate to support the label claim. Progress has been slow over the years due to regulatory concern about aquaculture drugs. Outstanding issues of environmental safety were addressed with submission of a risk assessment document following the CVM guidance as an Environmental Impact Assessment, Phase 1 and Phase 2, using Guidance Document 89. This document was reviewed and the CVM determined that further studies need to be completed. Dr. Moffitt is working with a contractor, and with the USGS Upper Mississippi Science Center at La Crosse, WI to complete the studies necessary. Bimeda Animal Health is preparing to submitting the manufacturing claim for this drug. The passage of the MUMS legislation for Minor Use Minor Species drug approval requirements led to this decision by Bimeda, as this legislative act allows a longer exclusivity arrangement and other advantages for drug companies to sponsor products with minor use. We anticipate completion of these requirements soon after the funding cycle of this grant.

ASSESSING THE POTENTIAL FOR ENVIRONMENTALLY FRIENDLY AQUACULTURE THAT IS SOCIALLY AND ECONOMICALLY SUSTAINABLE

Major Professor:	Christine M. Moffitt, Ph.D.
Funding Agency:	Ford Foundation, and NSF EPSCoR
Student Investigator	Lubia Cajas Cano
Completion Date:	30 August 2009

Objectives:

- Identify potential social opportunities and obstacles that may affect aquaculture development.
- Identify the likely habitats and determine a suite of suitable species for aquaculture development.
- Provide a set of guidelines and management practices that will help regulators and decision makers to consider and minimize the negative footprints of aquaculture production so as to protect the environment for future generations.

Progress: This project is part of the PhD dissertation of Lubia Cajas Cano. She was provided initial funding through the Ford Foundation, and we are seeking additional support from a variety of sources such as the World Wildlife Fund, and Department of Agriculture, and parties interested in developing environmentally and socially responsible and sustainable aquaculture production. The project goal is to develop a set of guidelines

and model approaches that can be used to evaluate the marine and freshwater resources of developed and developing countries for suitability and sustainability for different types of aquaculture. The tools used will be universally applicable and will consider social and economic factors as well as environmental factors.

GROWTH, AGE DISTRIBUTION, AND POPULATION DYNAMICS OF BLACK CRAPPIES FROM IDAHO

Principal Investigator:	Christine M. Moffitt, Ph.D.
Collaborating Investigator	Kevin Meyer, IDFG
Student Investigator:	Adam Kautza
Funding Agency:	IDFG
Completion Date:	30 May 2008

Objectives:

- Evaluate age, growth and stock differences for populations of Black Crappie from selected reservoir and lake systems in Idaho.
- Pose plausible models for further testing of these populations

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Progress: Black crappies (*Pomoxis nigromaculatus*) are becoming increasingly popular warm-water game fish in Idaho. This study will compare size-structure, growth, body condition and recruitment variability of black crappies from five sites in Idaho. Collections of crappie were from two large reservoirs on the Snake River system, two small water storage reservoirs and one natural lake. CJ Strike Reservoir in southwestern Idaho is a relatively large (~3,000 ha) impoundment on the Snake and Bruneau Rivers and is noted for having extremely stable water levels throughout the year. It is the southern-most of the five black crappie populations sampled for this study. Brownlee Reservoir is located along Idaho's western border with Oregon. It is north and west of CJ Strike Reservoir. Brownlee is a large (~6,000 ha) impoundment used mainly for hydropower. It is the uppermost reservoir of the Hell's Canyon Complex of reservoirs on the Snake River. Brownlee is long, narrow, steep-sided and deep, with highly fluctuating water levels. Winchester and Mann Lakes are two relatively small (~40 ha and ~60 ha) water storage impoundments in north-central Idaho's Clearwater region. Hayden Lake is located in northern Idaho and is the only natural lake among the study sites. Hayden Lake has a highly dendritic shape and is relatively large at approximately 1600 ha. It is also the only site that has special regulations for black crappie (15 fish limit none <10 inches or 254 mm). Samples from the five sites were collected using several types of gear by Idaho Department of Fish and Game staff. Fish were measured for total length and weight and selected fish were killed and otoliths removed and stored. We are evaluating the growth using the otoliths, and will evaluate the body condition, population size-structure, and recruitment using data from samples collected. The growth, body condition, population size-structure, and recruitment appear varied among all the populations sampled. Recruitment appears highly variable for all populations, with weaker year classes generally followed by stronger year classes. Several potential factors may contribute to the

differences in growth, body condition and recruitment among the black crappie populations. We will evaluate these populations to consider environmental factors such as water temperature and length of growing season, competition and food resources within the lake or reservoir. Future research directions and areas of uncertainty will be identified as the result of this study.

FILTRATION STRATEGIES TO REMOVE NEW ZEALAND MUD SNAILS AT FISH HATCHERIES

Principal Investigator:	Christine M. Moffitt, Ph.D.
Collaborating Investigators:	Barnaby J. Watten, Ph.D. USGS Bryan Kenworthy, USFWS Paul Heimowith, Ph.D. USFWS
Student Investigators:	Jordan Nielson
Undergraduate Interns	Katie Teater, Shawn Howard Kala Hamilton;
Funding Agency:	U.S. Fish and Wildlife Service
Completion Date:	30 September 2008

Objectives:

- Evaluate the efficacy of hydrocyclonic filtration to remove invasive New Zealand mudsnails from a hatchery inflow.
- Determine effectiveness of CO_2 as a lethal treatment for snails in fish culture operations.

Progress: This project began as collaboration with USGS Leetown Science Center, and the Fish and Wildlife Service. Jordan Nielson joined the project in May 2006 as a master's student, and will be completing his program in 2008. Infestations of NZMS at fish hatcheries limit or restrict the options for stocking hatchery-reared fish because of the risks of spreading snails to uninfested locations. Development of reliable and environmentally friendly methods that remove NZMS from source waters will be helpful to hatchery managers by creating an environment for snail–free fish production and/or transportation. During the summer and fall of 2007, we tested the efficacy of hydrocyclonic separation of NZMS, followed by carbonation of the hydrocyclone waste (snail) stream. We found the system 100% effective in removing NZMS from inflow waters at Hagerman National Fish Hatchery. We are preparing and characterizing models to describe the transit for snail and water particles through in the hydrocyclone system. Three different sizes of NZMS based on life history characteristics were exposed to CO_2 under 100 kPa pressure at several time intervals and three different temperatures to determine survival based on temperature units. Probit models were used to compare the different sizes of NZMS ability to survive pressurized CO_2 treatment. Adult and juvenile NZMS did not differ in their response to CO_2 treatment, but both of those sizes differed from the smallest size neonate. Probit models predicted an estimated 50% lethal time of exposure (LT50) at 59.4 °C-hours for the adult and juvenile combined model and 5.4 °C-hours for the neonate size. These results suggest that pressurized CO2 treatment may be effective at treating and killing NZMS collected in a hatchery and aid in eliminating the potential for further spread. We will

complete these studies and convene a workshop to explain the findings to fish hatchery managers and researchers.

EVALUATION OF PINNIPEDS EXCLUSION GATES ON PASSAGE OF ADULT ANADROMOUS SALMONIDS AT BONNEVILLE DAM (2)

Principal Investigator: Christopher Peery, Ph.D.
Funding Agency: U.S. Army Corps of Engineers
Completion Date: 31 December 2007

Objectives:

- Deploy a set of two acoustic transmitting devices and hydrophones in the base of the Washington (north)-shore fishway entrance at Bonneville Dam. The south-Shore entrance area will be left without acoustic deterrents. Hourly counts of sea lions in and near the two fishway entrances will be made daily. Total and median numbers of sea lions at the two locations will be compared using time-0series repeated measure ANOVA and paired t-tests(alpha=0.05).
- Make systematic observations of the number and locations of pinnipeds in the vicinity of Bonneville Dam.
- Use a randomized block design with and without modified entrance dates in place to evaluate for potential effects of the gates on fish passage.

Progress: Placement of sea lion exclusion devices (SLEDS) and acoustic deterrents effectively prevented adult sea lions from entering fishways at Bonneville Dam. However, SLEDS appeared to delay salmon passage. Additional testing is currently being conducted.

EVALUATE FACTORS LIMITING MIGRATION SUCCESS AND SPAWNING DISTRIBUTION OF ADULT PACIFIC LAMPREY IN THE SNAKE RIVER

Project Investigator: Dr. Chris Peery
Student Investigator: Brian McIlraith
Funding Agency: USFWS
Closing Date: 31 October 2008

Objectives:

- Evaluate passage of adult lamprey at McNary and four lower Snake River dams and identify areas and factors affecting passage success using radio telemetry.

- Determine final fates, distribution and preferred spawning habitat of adult lamprey migrating in the Snake River upstream from Lower Granite Dam.

Progress: Fifty adult lamprey were collected at two dams on the lower Snake River, outfitted with radio transmitters and released upstream of Lower Granite Dam, the last dam fish must pass prior to reaching historical spawning areas in the upper Snake River. There fish were monitored through the winter and early spring using combination of fixed-receiver sites and mobile tracking by boat and truck. To date (about end of battery life of transmitters) 30 fish had been documented in areas that represent potential spawning habitat in the Clearwater and Salmon rivers. Future efforts include tracking transplanted adult lamprey, released into headwater streams, to evaluate this method to boost spawning populations, monitor fir juveniles in these same streams, and tagging a second batch of migrant fish in the coming fall.

LOWER METHOD FISHERIES POPULATION GENETIC ANALYSIS

Principal Investigator:	Madison Powell, PhD
Student Investigator:	Dana Weigel
Key Technical Staff:	Joyce Faler
Funding Agency:	U. S. Bureau of Reclamation Pacific Northwest Region
Completion Date:	31 December 2008

Project Objectives: The purpose of this investigation is to provide fisheries population genetic data to: 1) assess the effects of parentage and hatchery fish on naturally spawned endangered fish in the Methow basin; and 2) compare population genetics and life history information across steelhead and Chinook salmon populations in Beaver, Libby and Gold creeks. These data will be analyzed to quantify the effects of passage barrier removal on salmon and steelhead population parameters (such as growth, survival, etc), life history strategies, and the effects of hatchery fish on naturally spawned populations in the basin.

Results Report:
Tissue samples were collected by project cooperators from juvenile steelhead rearing in Beaver, Libby and Gold creeks during 2004, 2005, 2006 and 2007. In addition, tissue samples from migrating adult and juvenile steelhead were collected in upstream-downstream weir during 2005, 2006 and 2007. These samples were delivered to the University of Idaho, Aquaculture Research Institute. DNA was extracted from samples and they are currently being analyzed with 13 standardized microsatellite markers for steelhead. Microsatellite data for 2005 and 2006 samples have been completed. Remaining laboratory analyses are underway.

Photo 1. Upstream-downstream weir located on Beaver Creek, tributary to the Methow River near Twisp, WA. Migrating steelhead and other non-target fish for a barrier removal study are collected at the weir.

Completed Projects – Fisheries and Aquatic Resources

EXPLORING FEASIBILITY OF PROPOSED CONTROL STRATEGIES FOR NEW ZEALAND MUD SNAILS AT FISH HATCHERIES

Principal Investigator: Christine M. Moffitt, Ph.D.
Student Investigators: Rolita Louise Bruce
Jordan Nielson
Funding Agency: U.S. Geological Survey, Special Scientific Support Project
Completion Date: 30 September 2007

Objectives:

- Pursue water system treatments or barriers that can successfully filter out invading snails.
- Determine if there are chemical treatments that would be lethal to New Zealand mudnsnails, and harm fish, that would be given to fish prior to stocking to eliminate survival of snails in the fish gut.
- Identify potential chemical treatment candidates including copper sulfate, or other compounds that may have the ability to kill snails that may be resident in the GI tract of fish.
- Determine if chemical biocides would be effective applied to ponds, springs, or areas lacking fish to kill existing NZMS and yet not violate water quality requirements of harm listed fish.

Abstract:

Fish stocking and fish transfers may accelerate the spread of New Zealand mud snails to other locations. Fish movements (via natural migrations or by stocking) have been documented as likely vectors of snail range expansion as the snails can survive transit through the gut of trout. Fish reared in state and federal hatcheries in the Hagerman Valley that are positive for NZMS are used in supplementation and stocking programs throughout Idaho run by Idaho Department of Fish and Game, the Shoshone-Bannock and Nez Perce tribes, and the U. S. Fish and Wildlife Service. Private fish growers sell trout for stocking in private ponds, and to some public agencies. In 2004, the U.S. Fish and Wildlife Service identified New Zealand mud snails as harmful non-target invertebrates that could be transported to fish release sites during an agency Hazard Analysis and Critical Control Point Planning (HACCP) process. As a result the FWS determined that they could not safely stock trout reared at their National Fish Hatchery into waters of the Clearwater River, Idaho. With increased concerns regarding the potential consequences of invasive

New Zealand mud snails in waterways, there is a serious need to develop control strategies for New Zealand mud snails in fish farms and their effluents. The University of Idaho has been working with Hagerman NFH and the FWS to determine ways to remove all live snails from the gut, depurating fish, before planting so that fish could be safely stocked.

R. Louise Bruce completed her master's thesis in 2006. She conducted studies that found that a portion of NZMS could survive transit in the intestinal track of rainbow trout. Studies conducted with several sizes of fish and snails found 8 - 12% of the snails in the fish fecal material were alive. Snail survival decreased with time in the trout gastrointestinal tract. The second student supported by this project Jordan Neilson continued research at the Hagerman National Fish Hatchery with a separate project supported through funds from the invasive species programs.

EVALUATION OF PINNIPEDS EXCLUSION GATES ON PASSAGE OF ADULT ANADROMOUS SALMONIDS AT BONNEVILLE DAM

Principal Investigator: Christopher Peery, Ph.D.
Funding Agency: U.S. Army Corps of Engineers
Completion Date: 30 September 2007

Objectives:

- Deploy a set of two acoustic transmitting devices and hydrophones in the base of the Washington (north)-shore fishway entrance at Bonneville Dam. The south-Shore entrance area will be left without acoustic deterrents. Hourly counts of sea lions in and near the two fishway entrances will be made daily. Total and median numbers of sea lions at the two locations will be compared using time-0series repeated measure ANOVA and paired t-tests(alpha=0.05).
- Make systematic observations of the number and locations of pinnipeds in the vicinity of Bonneville Dam.
- Use a randomized block design with and without modified entrance dates in place to evaluate for potential effects of the gates on fish passage.

Progress: Placement of sea lion exclusion devices (SLEDS) and acoustic deterrents effectively prevented adult sea lions from entering fishways at Bonneville Dam. However, SLEDS appeared to delay salmon passage. It was determined that delay of salmon, several minutes to about an hour at the most, was not sufficient to cause harm or increased predation risk to salmon from pinnipeds. Results were presented to USACE in November of 2007 as oral presentation and progress report. Final report is pending.

AN EVALUATION OF TEMPORARY STRAYING OF ADULT FALL CHINOOK SALMON ON MARK/RECAPTURE ESTIMATES IN THE DESCHUTES RIVER, COLUMBIA RIVER BASIN

Principal Investigator: Christopher Peery, Ph.D.
Funding Agency: U.S. Army Corps of Engineers
Completion Date: 30 June 2007

Objectives:

- Use radio telemetry to estimate proportion of adult fall Chinook salmon used in the whole river mark-recapture escapement estimate in the Deschutes River that exit the river prior to spawning, within ± 15% of the true value 95% of the time.
- Evaluate effectiveness of instream PIT tag interrogators to determine tributary exit rates for adult fall Chinook salmon marked in the Deschutes River for escapement estimation program.

Progress:
Approximately 25, 23, and 33% of radio-tagged fall Chinook salmon monitored in the Deschutes River were last located in spawning areas outside the Deschutes River in 2005, 2006, and 2007 respectively. These stray rates have produced an overestimate of escapement to the Deschutes River of approximately 23% over the three years. This information is being used to develop new and more accurate escapement estimators for area managers. Final report is near to being completed.

RADIO TELEMETRY OF ADULT SALMON AND ADULT LAMPREY THROUGHOUT THE WATERSHEDS OF THE WALLA WALLA DISTRICT

Principal Investigator: Christopher Peery, Ph.D.
Student Investigator: Ryan Mann
Funding Agency: U.S. Army Corps of Engineers
Completion Date: 30 September 2006

Objectives:
Determine effects of water temperature exposures for migrating adult salmon and steelhead on gamete quality and reproductive success for migrating adult salmon and steelhead.

Progress: We found evidence that temperatures adult Chinook salmon are exposed to during a portion of their migration (lower Snake River) is related to proportion of fish that reach spawning areas. There was also evidence that gamete quality and survival may be lower in individual female Chinook salmon exposed to warm water temperatures. Ryan

Mann successfully defended his thesis for this project. The final report has been completed and a manuscript is being developed.

RESEARCH AND MONITORING INVOLVING RADIO TELEMETRY OF ADULT STEELHEAD KELTS IN THE SNAKE RIVER

Principal Investigator: Christopher Peery, Ph.D.
Research Associate: Charles Boggs
Funding Agency: U.S. Army Corps of Engineers
Completion Date: June 2007

Objectives:

- Evaluate fallback of adult salmon and Steelhead at Columbia and Snake River dams.
- Evaluate delay of adult salmon and Steelhead at Columbia and Snake River dams.
- Evaluate homing and the incidence of straying of adult salmon and Steelhead migrating to natal streams in the Columbia River basin.
- Assess the effects of passage through the Columbia and Snake rivers hydrosystem on the survival and reproductive fitness of adult salmon and Steelhead.

Progress:
This project has been completed. We partnered with researchers from the US Army corps of Engineers and Columbia River Intertribal Fisheries Commission to develop a comprehensive summary of a multi-year data set. This final report has been completed. A manuscript has been accepted and the information was recently presented at a professional meeting.

EVALUATION OF ADULT PACIFIC LAMPREY PASSAGE SUCCESS AT MCNARY AND LOWER SNAKE RIVER DAMS

Principal Investigator: Christopher Peery, Ph.D.
Student Investigator: Dustene Cummings
Funding Agency: U.S. Army Corps of Engineers
Closing Date: 1 June 2007

Objectives:

- Develop adult lamprey collection, tagging and release operations at McNary and Ice Harbor dams.
- Monitor movements and behavior of adult lamprey migrants at McNary and four lower Snake River dams.

Progress:
Over a three year period, more than 300 adult Pacific lamprey were collected at McNary Dam, tagged and released to the Columbia and Snake rivers. Information was gathered on passage success, timing, and potential bottleneck to migration this summer. Passage success at McNary Dam average about 50% over the three years. For fish that were able to successfully continue their migration, passage times were reasonable, 1-2 d per dam or reservoir. We are working with areas managers to identify where modifications to the system can be made to improve migration and survival. We are also working to improve detection equipment and expand coverage upstream to additional projects. Final reports for this phase of the project have been developed and are currently in review by USACE. Dustene Cummings successfully defended her thesis project.

AN INTEGRATED APPROACH TO RESTORATION OF ANADROMOUS SALMONIDS AND THEIR HABITAT IN THE ELWHA RIVER FOLLOWING DAM REMOVAL

Principal Investigator:	Christopher Peery, Ph.D.
Student Investigator:	Nancy Wright
Funding Agency:	NOAA
Completion Date:	28 February 2007

Objectives:

- Train the Tribe's staff in methods to acquire, compile, and evaluate physical, ecological and socioeconomic datasets primarily through remote sensing and telemetry technology that is appropriately scaled for the lower Elwha River, estuary and shallow nearshore areas.
- Develop Geographical Information Systems tools that will organize the Tribe's current and expanding spatial data (GIS) collection into appropriate themes, scales, and applications for multiple management purposes.
- Develop and apply a characterization of the lower Elwha River, estuary, nearshore physical, biological and socioeconomic parameters for long-term resource management by the Tribe.

Progress:
This project has been completed and the website (www.elwhainfo.org) has been turned over to the Lower Elwha Klalam Tribe and Peninsula College.

DISTRIBUTION, HABITAT ASSOCIATIONS, DISCUSSION OF POTENTIAL CONSERVATION ACTIONS AND FEASIBILITY OF PIT-TAGGING WOOD RIVER SCULPIN (*COTTUS LEIOPOMUS*)

Principal Investigator: J. Michael Scott, Ph.D.
Student Investigator: Don Zaroban
Funding Agency: ID Dept Environmental Quality
Office of Species Conservation
Completion Date: 30 September 2007

Objectives:

- Inventory Wood River sculpin occurrence across its range, with single-pass electrofishing at randomly selected stream reaches
- Develop a multivariate habitat association model to predict species occurrence using logistic regression
- Assess feasibility of using PIT tags to track individual Wood River sculpins using PIT tags implanted in shorthead sculpins, observe survival, tag retention, net avoidance behavior and detectability.
- Integrate findings through a modified aquatic Gap Analysis, classify valley segments of the Wood River basin, document species distribution and develop predictive model of Wood River sculpin occurrence, compile land stewardship digital data layers.

Results:

I monitored 166 stream reaches in the Wood River basin. Graphic comparisons of habitat parameters with sculpin presence and relative abundance are being made as first step of model development. An initial model is anticipated by July 2007. Feasibility assessment for PIT tagging sculpins is completed and a manuscript drafted, and in review. Spatial data layers are compiled for Wood River basin. A GIS comparison of Wood River sculpin occurrence, physical habitat and land use will be initiated upon development of predictive model.

Current Projects – Wildlife and Terrestrial Resources

A METAPOPULATION APPROACH TO THE CONSERVATION OF THE WHITE-HEADED WOODPECKER IN THE INTERIOR WEST

Principal Investigator: Oz Garton
Student Investigator: Rita D. Dixon
Completion Data: 31 December 2008

Objectives:

- Estimate the population size, survival rates, and stability of White-headed Woodpeckers in the Interior West,
- Investigate metapopulation structure and dynamics,
- Examine the effects of landscape heterogeneity on populations.

Progress**:**
The White-headed Woodpecker (*Picoides albolarvatus*) is considered an at-risk species throughout its northern range. This species relies on large-diameter ponderosa pine for all aspects of its life history, including nesting, roosting, and foraging. However, the continued fragmentation of ponderosa pine, low snag densities, and conversion to fir-dominated stands pose threats to the long-term viability of White-headed Woodpecker populations. Currently, there is an inadequate understanding of the effects of landscape heterogeneity on the dynamics of White-headed Woodpecker populations. Likewise, we have lacked the demographic data needed to evaluate the stability of these populations. Sensitivity analyses will be completed this summer to evaluate relative contributions of each population making up the metapopulation in order to prioritize conservation efforts.

SURVIVAL ESTIMATION AND SENSITIVITY ANALYSIS OF THE WHITE-HEADED WOODPECKER (PICOIDES ALBOLARVATUS)

Principal Investigators: Oz Garton
Student Investigator: Rita D. Dixon
Completion Date: 31 December 2008

Abstract. I estimated the survival rates of White-headed Woodpecker (*Picoides albolarvatus*) eggs, nestlings, fledglings, and adults to identify key stages that influence the long-term population dynamics of this rare bird associated with large-diameter ponderosa pine (*Pinus ponderosa*) forests of the Interior West. I calculated the elasticity associated

with each age-specific vital rate based on 500 replicates of a stochastic Leslie matrix model (Leslie 1945, 1948). Age 0 survival was associated with highest elasticity for 69% of the replicates and age 1 reproduction was associated with highest elasticity in the remaining 31%. The mean finite rate of increase (λ) associated with these elasticities was 1.083 ± 0.008 95% C.I., which implies a stable population.

Progress:
These results indicate that management of White-headed Woodpeckers should focus on obtaining more precise estimates of age-specific survival as well as providing suitable nest-sites and habitat for these early life stages. Improved estimates using program MARK will be incorporated into final dissertation and ms. for publication this summer.

AN ASSESSMENT OF THE DISTRIBUTION AND ABUNDANCE OF THE WHITE-HEADED WOODPECKER (PICOIDES ALBOLARVATUS) IN THE INTERIOR COLUMBIA BASIN

Principal Investigators: Oz Garton
Student Investigator: Rita D. Dixon
Completion Date: 31 December 2008

Objectives:
Abstract. I assessed the distribution, density, and habitat characteristics for the White-headed Woodpecker (*Picoides albolarvatus*) and associated forest bird species at point transects in the Interior Columbia Basin (ICB) in spring, 1998. Point transects were primarily conducted along road transects, with all points ultimately classified into one of 16 habitat types. The 1998 field effort spanned three states (Oregon, Idaho, Washington), 12 National Forests, three tribal lands, as well as state and private lands within the ICB region.

Progress:
A total of 545 points were surveyed between 10 April 1998 and 19 May 1998 on 54 transects with an average of 10 points per transect. A total of 104 bird species were detected during point transects and included 11 woodpecker species. The total density for all species ranged from 4.33 birds/40 ha in young ponderosa pine (*Pinus ponderosa*)/Douglas-fir (*Pseudotsuga menziesii*) to 480.34 birds/40 ha in understory reinitiations. There was no significant difference in the density of birds among habitat types (ANOVA, $F_{11, 1272} = 1.482$, $P = 0.132$). A total of 76 White-headed Woodpeckers were observed on 29 transects (59 points). Density estimates for White-headed Woodpeckers ranged from 0.13 birds/40 ha to 5.36 birds/40 ha with the highest densities in ponderosa pine dominated forest types. Improved estimates of abundance will be obtained by application of the newest version of DISTANCE which includes corrections for birds near the observation point later detected from responses to playbacks of White-headed Woodpecker call.

USING THE METAPOPULATION CONCEPT TO UNDERSTAND THE SPATIAL AND TEMPORAL POPULATION DYNAMICS OF ELK IN IDAHO

Principal Investigators: Oz Garton
Student Investigator: Jocelyn L. Aycrigg
Funding Agency: Idaho Department of Fish and Game
Completion Data: 30 June 2008

Objectives:
Large mammals, such as Rocky Mountain elk (*Cervus elaphus nelsoni*), exemplify the challenge of managing wildlife populations over large spatial areas because they have seasonal and annual ranges that often cover areas the size of watersheds or sub-basins, respectively (Wisdom & Cook 2000). To address the challenge of managing elk, our research emphasizes spatial analysis of populations at the landscape level. We can meet this challenge by focusing on the metapopulation concept, which encompasses the dynamics, interactions, and processes of multiple populations over large areas. This directs our research to look at the 'big picture'.

Our goal is to bring the ecological concept of metapopulations into reality where it can be applied to management questions and emphasize the dynamics of management practices at landscape scales. Our objectives are to (1) use demographic and genetic characteristics to delineate elk metapopulations; and (2) model the influence of extrinsic factors (i.e., harvest levels, predator impacts, habitat change, weather, essential mineral levels, and road patterns) on each metapopulation. We will apply a hierarchical approach using both local and large spatial extents to ensure the most appropriate scale is analyzed.

Results:
For our first objective, we have used genetic analysis to delineate elk populations in Idaho. Elk tissue samples were collected from across the state. Using microsatellites at multiple loci, we examined genetic population substructure with 4 approaches. Individuals were clustered into local populations based on their relative similarity or dissimilarity to each local population using genotypes and geographical location. Our results indicated a moderate level of genetic differentiation between specific regions of the state; however, clustering algorithms results indicate a single large population of elk. Based on these preliminary results we would like to further examine the genetic data association with geographical location. Incorporating geographical locations of the samples into our genetic analysis may improve our ability to determine genetic differentiation between elk populations in Idaho.

We will concentrate on our second objective once our results of our first objective are finalized.

IDAHO'S IMPORTANT BIRD AREAS PROGRAM

Principal Investigator:	Wayne Melquist, Ph.D.
Cooperating Investigators:	Rex Sallabanks, Ph.D. and Colleen Moulton
Funding Agency:	Idaho Department of Fish and Game
Completion Date:	30 June 2008

Objectives:

- To accept nominations for Important Bird Areas (IBAs) statewide; review and recognize nominated IBAs; initiate bird monitoring activities at wetland IBAs; and gather information on the distribution and abundance of nongame birds at Idaho's IBAs.

Background:

Idaho's Important Bird Areas (IBA) Program was launched in 1996 as a partnership between Idaho Partners in Flight and the Idaho Audubon Council. An IBA Technical Committee was formed to encourage nominations and review materials for candidate IBAs. To date 57 sites have been identified by the committee as IBAs in Idaho.

Phase two of the IBA process has begun and proponents were sought to work toward conservation and management of IBAs. These individuals and organizations are champions for bird conservation at particular sites and work cooperatively with each site's land manager or landowner. To some degree, additional site nominations are still being sought and missing information for accepted sites is being sequestered.

Another important part of the phase two process that has been initiated is monitoring of birds at some of Idaho's IBAs, which is conducted by either biologists or volunteers. These efforts, intended to collect basic information about the IBAs, created an inventory of bird species present at each site, which will lead to further investigations.

Waterbirds at Silver Creek Preserve have been monitored monthly, year-round, by volunteers, and year-round monitoring by volunteers at several more IBAs has been initiated. In addition, Colleen Moulton, the project's Wildlife Research Biologist is building an "Adopt-an-IBA" Program, which seeks to encourage more community participation in the IBA Program, particularly from local Audubon chapters.

Project has been extended through June of 2008.

FURTHER UNDERSTANDING AND KNOWLEDGE OF WILDLIFE IN IDAHO

Principal Investigator: Wayne Melquist, Ph.D.
Cooperating Investigators: Chuck Harris, Ph.D., Dan Davis, USFS
Funding Agency Idaho Department of Fish and Game
Completion Date: 30 June 2008

Objectives:

- Focus on forest carnivore surveys and research in the Clearwater and adjacent National Forests.

Progress:
This project is a coordination program that involves several individual projects identified and reported elsewhere and has been continued through June 2008.

BLACK BEAR HABITAT SELECTION AND HIGHWAY CROSSING PATTERNS

Principal Investigator: Janet Rachlow, Ph.D.
Student Investigator: Jesse Lewis
Funding Agency: Idaho Department of Fish and Game
Completion Date: 30 June 2008

Objectives:

- Evaluate habitat selection and movement patterns by black bears (*Ursus americanus*) within the corridor of Highway 95 in northern Idaho.
- Develop predictive models of habitat association for crossing locations along Highway 95.
- Compare results of habitat selection across a range of GPS telemetry acquisition intervals.
- Quantify how habitat variables affect Global Positioning System collar performance across the range of variation within the study area.

Progress:
During 2005, 11 black bears (9 males, 2 females) and 1 female grizzly bear were fitted with Lotek GPS collars that store data on board. We downloaded location data sets for 7 black bears during the summer of 2005 from collars that were dropped (n=5), from one animal that was recaptured, and from one bear that was harvested.

During January - March, 2006, we visited winter dens of 6 black bears to retrieve GPS data and to replace GPS collar batteries. During the summer, we trapped an additional 13 black bears and 1 grizzly bear, and fitted each with GPS collars. We also recaptured a grizzly

bear previously collared in Canada and fitted a yearling black bear with a VHF collar. I also surveyed relative shrub abundance, presence of fence, and presence of cut-banks along Highway 95.

We completed an assessment of how habitat variables affect GPS collar performance. Results of this work are currently in press in the *Journal of Applied Ecology* (Lewis et al. 2007). The M.S. student, Jesse Lewis, will be completing the project and his thesis during August 2007. We anticipate 3 additional publications addressing: 1) Habitat characteristics associated with highway crossings by black bears; 2) Habitat selection by black bears and the influence of highways and human development; and 3) Influence of location fix rate on evaluations of habitat selection: GPS and VHF technology.

USE OF ADVOCACY IN PEER REVIEWED ARTICLES IN THE NATURAL RESOURCE SCIENCES

Principal Investigators:	Janet Rachlow Ph.D., J. Michael Scott, Ph.D.
Funding Agency:	U.S. Geological Survey, Idaho Department of Fish and Game
Completion Date:	June 2008

Objectives:

- Determine the frequency with which value laden language is used and preferred policy outcomes are stipulated in peer reviewed journals in the Natural resource sciences.

Progress:
We concluded a graduate seminar on Advocacy in Science in three semesters. Fifty articles from each of six natural resource journals; Ecological Applications, Journal of Wildlife Management, North American, Journal of Fisheries, Management, Forestry Science, Conservation Biology and Journal of Range Management were reviewed for use of value laden language and stipulation of preferred policy outcomes. The use of value laden language was found in all journals most frequently in Conservation Biology and Journal of Range Management. The stipulation of preferred policy outcomes was also found in each of the journal again most frequently in Conservation Biology and Journal of Wildlife Management.

We co-hosted a symposium on advocacy in Natural Resource Sciences at the 2006 meeting of the Society for Conservation Biology. Presentations by prominent conservation biologists and senior administrators of natural resource agencies as well as a roundtable discussion by editors of Conservation Biology and Bioscience were featured at the symposium. An overview of our results was presented.

WINTER ECOLOGY OF VANCOUVER CANADA GEESE IN SOUTHEAST ALASKA

Principal Investigator: John Ratti, Ph.D.
Student Investigators: Trevor Fox
Funding Agency: U.S.G.S. Alaska Science Center
Completion Date: 01 July 2008

Objectives:

- Compare characteristics of shorelines that are used by Canada geese to intertidal areas that are not used. Use GIS coverages to develop a predictive model of the distribution of potential wintering areas in Southeast Alaska
- Evaluate how habitat area, snow cover, intertidal substrate, and plant community composition affect numbers of geese that use a wintering site.
- Determine how Canada geese are distributed among available habitats within a wintering site, and whether patterns of habitat use change with tide, weather, or date

Progress:
Thesis is in process. Project will be completed by 30 June 2008. Canada goose use of shoreline characteristics in Southeast Alaska was modeled using logistic regression. Shoreline characteristics were sampled within 500-m and 1000-m circular buffers placed around used and available locations. These buffers were used to develop 2 separate sets of models (small- and large-buffer model). Because geese are gregarious animals, spatial dependency was a concern in the analyses. To account for this, I included the number of geese within additional buffers up to 3000 m from location and used these as potential explanatory variables. At least one of these dependency variables appeared in 81.8% and 77.4% of candidate models of small-buffer and large-buffer models; respectively.

A portion of sampling data was withheld for model validation. This data was scored using the Score option in PROC LOGISTIC (SAS version 9.1). The discriminatory capacity of models was evaluated by looking at the area under the curve (AUC) of relative operating characteristic (ROC) curves . All AUC values were above 0.7, which indicates reasonable discriminatory capacity. Work is completed, final report due June 2008. Student is defending on June 4, 2008.

MOUNTAIN QUAIL TRANSLOCATIONS

Principal Investigator: Kerry Reese, Ph.D.
Student Investigator: John Stephenson
Funding Agency: Idaho Department of Fish and Game
Completion Date: 31 December 2007

Objectives:

- Reintroduce mountain quail into Asotin Creek Wildlife Management Area in Washington and Craig Mountain Wildlife Management Areas in Idaho.

Progress:
On 17 March 2006, we translocated 177 mountain quail (*Oreortyx pictus*) into Asotin Creek Wildlife Area (AC) in eastern Washington and into Craig Mountain Wildlife Management Area (CM) in northern Idaho. Fifty and 49 birds were radioed at CM and AC, respectively, and monitored throughout the season. Translocated mountain quail moved up to 24.4 km from release sites at AC and up to 33.6 km at CM. Nests (n = 12) were located a mean distance of 1.2 km (range 0.3 – 2.2 km) from release sites at AC and 8.4 km (range 3.3 to 15.8 km) at CM. At AC, 40 of 49 (82%) radioed mountain quail died during the season and 8 (16%) radioed birds were still alive at the end of the 5 month study period (17 Mar – 12 Aug). At CM, 42 of 50 (84%) radioed mountain quail died and 5 birds (10%) were still alive at the end of the study period. Mean clutch size for 12 nests was 7.8 eggs. Five of 8 nests at AC hatched from 15 June to 13 July (mean 30 June). Two of 4 nests at CM hatched on 3 July and 5 July (mean 4 July).

Nest success was 63% (5/8) for AC, 50% (2/4) for CM, and 58% (7/12) for areas combined. Six nests were incubated by males, 4 by females, 1 was started by a female and finished by a male, and 1 nest was not incubated. Brood success was 57% (4/7) with an average of 4.0 chicks per brood at 28 days after hatching. Of the 12 nests located, 6 (50%) were located in Douglas fir, 4 (33%) in ponderosa pine, 1 (8%) in talus/garland, and 1 (8%) in a rose/snowberry plant association. All nests were in or near edge habitat. The data collected in 2005 and 2006 will be analyzed further and incorporated into a Master's thesis which is expected to be completed in December 2007.

TRANSLOCATION OF TRUMPETER SWANS

Principal Investigator: Kerry Reese, Ph.D.
Student Investigator: Darlene Kilpatrick
Funding Agency: Idaho Department of Fish and Game
Completion Date: 30 December 2007

Objectives:

- The primary objective is to determine whether winter translocation of trumpeter swan cygnets is effective at increasing the distribution of the species.

Results:
Trumpeter swan cygnets have been trapped each of the past several winters in the Island Park area of Idaho. Control birds were radio-marked and released at point of capture and translocated cygnets were radio-marked and moved to release sites along the Bear River, Idaho. In the winter of 2002-2003, 78 cygnets were captured and 39 were translocated. In 2003-2004, 100 cygnets were captured and 51 were translocated. In 2004-2005, 103 cygnets were captured and 51 were translocated. Birds were monitored over each winter until migration moved them north. Darlene Kilpatrick will complete her thesis in December.

SOCIAL, LEGAL, AND ECONOMIC DIMENSIONS OF INVASIVE SPECIES AND THREATENED/ENDANGERED SPECIES

Principal Investigator: Cort Anderson, Ph.D./Mike Scott, Ph.D.
Funding Agency: Center for Research on Invasive Species & Small Populations (CRISSP)
Post doctoral Scientist Aaron Haines
Date of Completion: 31 May 2008

Objectives:

- Work with an interdisciplinary team to research questions on the social, legal, and economic dynamics of invasive species and threatened/endangered species management.
- Research the listing policy for threatened/endangered species and develop landscape management frameworks to effectively evaluate the conservation planning process.

Progress:
Developed a database for all threatened/endangered species with recovery plans (i.e., 1,075 species) to evaluate the recovery process used in the implementation of the Endangered

Species Act. Developed the dynamic human footprint concept to measure conservation success at the landscape level.

ESTABLISHING NEW PATHWAYS TO RECOVERY OF THREATENED AND ENDANGERED SPECIES

Principal Investigator:	J. Michael Scott Ph.D., U.S.G.S.
Cooperating Investigators:	Donald Pitts, U.S. Army Corp. of Engineers; Dr. Barry Noon, Colorado State University
Student Investigator:	Gina Wilson
Agency Funding:	U.S. Department of Defense (DoD)
Completion Date:	31 Mar 2008

Objectives:

- Assess the recovery status of threatened and endangered species on military lands
- Compare their status with that of populations and endangered species not found on military lands
- Identify those species that could be future success stories in relatively short time periods
- Develop realistic time frames for evaluating the recovery status of a listed species
- Apply the insights derived from the modeling exercises to real existing data sets that occupy a wide range of ecological conditions.

Progress:

The work to be conducted will estimate meaningful time frames to evaluate a species recovery status based on the unique ecological and life history attributes of each listed species and recovery actions taken. We have assembled a multidisciplinary team of researchers who together have more than a hundred years of experience with threatened and endangered species these investigators will compile a database of recovery status for T and E species on military lands and those found elsewhere. Successful management of threatened and endangered species on Army installations will be identified with a literature survey, and through polling endangered species and natural resource managers on the installations. Management systems both planned and those innate to the unique situation of Army installations will be compared to those directly off the installations and within the region, thereby gaining insight into management priorities region-wide. The rate of recovery of a listed species, even under the most optimal conditions for its population growth, will ultimately be limited by the demographic characteristics of its life history. That is, a species' maximum rate of population growth will be constrained by its demographic potential that is a function of its age-specific rates of survival and reproduction. Demographic attributes such as age at first reproduction, average number of young produced, and survival of young to reproductive age will determine the maximum possible time period over which a listed species can possibly experience "recovery."

Recovery status of U.S. DoD installations has been assessed. Initial findings suggest threatened and endangered species on DoD lands have no conservation advantage over threatened and endangered species on other U.S. lands. DoD success stories have been identified; low hanging fruit - species that could be moved along the recovery gradient in a very short amount of time have been also identified. Initial modeling efforts have identified factors that have influenced time to recovery for delisted and downlisted species. Initial answers for recovery time have been identified and further analysis is being done. A sampling framework for recovery plans and Integrated Natural Resource Management Plans (INRMPs) is being created. Databases that include management actions in recovery plans and INRMPs, conservation status, and recovery status of threatened and endangered species have been assembled. Literature on demographic and life history information for selected threatened and endangered species on DoD lands, e.g. brown pelican, least tern, peregrine falcon, bald eagle has been gathered. Initial work has analyzed time frames for recovery of species on DoD lands that are downlisted and delisted. We have developed algorithms for determining factors that influence time to recovery. Final report to be completed by March 31, 2008

A RISK ASSESSMENT FRAMEWORK FOR DEFINING SCIENTIFICALLY-DEFENSIBLE RECOVERY GOALS FOR LISTED SPECIES

Principal Investigators:	J. Michael Scott, Oz Garton Scott Mills, University of Montana
Post Doctoral Researcher:	Jon Horne
Student Investigator:	Katherine Strickler
Funding Agency:	Department of Defense
Completion Date:	31 Mar 2009

Objectives:

- Develop and test tools that can be used to better manage listed species on Department of Defense (DoD) installations by estimating management effects and extinction risk under a range of life history attributes, available data, and training, testing, and management actions.

Progress:

Military land managers increasingly are faced with the challenge of balancing threatened and endangered species (TES) conservation with military testing and training activities, which must not impede species' recovery. This challenge is often complicated by incomplete information on species' populations and demography that precludes conducting quantitative, complex viability analyses to assess the effects of military and conservation activities on the health of these populations. Military land managers are uniquely situated to enhance local populations of TES and, if provided the tools to conduct thorough viability analyses, can facilitate more robust TES populations and alleviate current training restrictions.

We have compiled demographic data for 219 species (18 amphibians, 26 birds, 20 mammals, 5 reptiles and 150 plants) for the parameterization of our Life History Typology matrix models. Calculated vital rate elasticities concurrently with construction of matrix models. Developed a new analytical technique that combines meta-analysis with a model selection approach to determine which variables (e.g. ecological or life history variables) best explain variation in effect size (the increase in survival or reproductive rates of a particular species as a result of management) across species. We have finalized a spatially-explicit simulation model for assessing metapopulation viability. This model is a stage-matrix based population projection model that incorporates the effects of species-specific parameters such as mean vital rates (i.e., fecundity and survival), variation in vital rates, and density dependence as well as effects due to metapopulation dynamics (i.e., number of populations, dispersal among populations, and correlations in vital rates among populations. We have developed beta versions of software programs including: PopGrowth for analysis of exponential population growth using time-series abundance estimates, and MetaPVA for global sensitivity analysis of metapopulation models. Developed R programs to 1) fit a stochastic density dependent population model to time series observations of population abundances and 2) calculate maximum likelihood or restricted maximum likelihood estimates of unknown parameters in the Gompertz state space model of stochastic population growth. To apply modeling approaches and software to threatened and endangered species on DoD lands, we have formed collaborations with Fort Hood (Texas), Texas A&M University, The Nature Conservancy-Texas, and Eglin Air Force Base (Florida). Two graduate seminars were conducted during spring semester 2007: 1) spatially explicit modeling of meta populations at UI and 2) life history typologies at University of Montana.

NATAL DISPERSAL AND PHILOPATRY IN TWO SPECIES OF SYMPATRIC BUTEOS IN SOUTHERN CALIFORNIA

Principal Investigator: J. Michael Scott, Ph.D.
Student Investigator: Peter Bloom
Completion Date: December 2007

Objectives:
Evaluate the long-term conservation implications of philopatry in heavily modified Coastal sagebrush and chaparral and associated environments to determine several questions:

- Where do they go?
- Are the two species philopatric? Why or why not?
- What proportions of each sex of the two species are philopatric?
- What proportions of the fledgling red-tailed hawks migrate outside the natal region and what proportion remain?
- What proportion of the fledgling red-shouldered hawks disperse outside the natal region and what proportion remains.

- Do the two species exhibit sex-biased dispersal?
- Is there any evidence that breeding dispersal moves of red-shouldered hawks are closer to the natal territory?
- What proportion of young move > 100 km?
- Is there a latitude or other factor that predicts northward vs. southward movement of Red-tailed Hawks across North America?
- Do the data on natal dispersal distances provide any support for Wright's "isolation by distance" hypothesis?

Progress:
During the springs of 1970-2002, we banded 3,860 nestling red-tailed hawks and of 2,112 nestling red-shouldered hawks (Figure 3) resulting in 73 (1.89%), breeding age red-tailed hawk recaptures, and 99 (4.69%) breeding age red-shouldered hawk recaptures of known sex respectively. Another in as yet unanalyzed, nearly equal number of pre-breeding aged red-tailed hawks and pre-breeding aged red-shouldered hawks were also recaptured of presumed known sex. The BBL provided 121 (3.13%) breeding aged red-tailed hawk recoveries and an unanalyzed number of pre-breeding aged red-tailed hawks, as well as 82 (3.88%) breeding aged and an unanalyzed number of pre-breeding aged red-shouldered hawk recoveries, all of mostly unknown gender from the above total bandings during this study.

Migratory movements of juvenile red-tailed hawks banded in southwestern California are atypical for avian species. First year juvenile red-tailed hawks were recovered, and sometimes recaptured in Idaho, Montana, Utah, Nevada and northern California as much as 1,000+ km away from their natal territory. However, no live or fresh mortalities were found in any state other than California after approximately 24 months age. Mean post migration red-tailed hawk natal dispersal distances for 45 recaptured males was 5.61 km +/- 0.63 SE with a median of 4.45 (range 0 - 26.25 km). The mean for 28 recaptured female red-tailed hawks was 5.41 km +/- 0.67 SE with a median of 4.48. Interestingly, female red-tailed hawks did not disperse significantly further than males (P=0.90). Distances moved between the natal territory and breeding area were relatively short for a bird with the demonstrated flight capabilities of a large hawk. Preliminary analysis of recapture data indicates that sex-biased dispersal does not exist in red-tailed hawks of this population.

Fifty-four recaptured male red-shouldered hawks moved a mean of 8.73 km +/- 1.07 SE with a median of 5.76 (range 0 – 31.0), while 45 females moved a mean of 13.49 km +/- 1.66 SE with a median of 9.00 (range 0 -49.0). Female red-shouldered hawks dispersed significantly further than their mates on the study area (P=0.0189).

In contrast to red-tailed hawks, only four red-shouldered hawks moved more than 100 km and none undertook predictable large scale north bound juvenile migrations, although the majority of short distance movements were north bound. However, two radioed hawks did exhibit what could be referred to as vagrancy to the east into Nevada and to the south into Baja California del Sur, or what Mayr (2001) described on a larger scale as "… the spread

of individuals of a species beyond the current species range," essentially potential founders.

Preliminary analysis of recapture and recovery data from both species suggests that the red-tailed hawk is highly philopatric and that the red-shouldered hawk is less so. The fact that the red-tailed hawk is strongly philopatric is of particular interest because many juveniles make a large >500 km north-northeast movement and could nest anywhere between the natal area and their summering range but usually return to within 10 km of where they fledged.

HOW IS RECOVERY DEFINED BY THE NUMBERS?

Principal Investigator:	J. Michael Scott Ph.D., U.S.G.S.
Cooperating Investigators:	Dr. Dale Goble, College of Law Dr. Maile Neel, University of Maryland
Post Doctoral Researcher:	Dr. Aaron Haines
Agency Funding:	Center for Research on Invasive Species and Small Populations (CRISSP) & U.S. Geological Survey
Completion Date:	January 2009

Objectives:

- To determine if there has been an increase in the proportion of species listed under the Endangered Species Act (ESA) that can be considered for recovery.
- Has the proportion of species with sufficient information to develop measurable recovery criteria increased over time?
- Have the levels of abundance at listing, at recovery plan writing, and required for delisting changed through time?

Progress:

A database of all listed species with completed recovery plans has been developed. The database includes information on species population size and number of populations at time of listing, at time recovery plan was written, and what has been stipulated for recovery goals. In addition, a database has been developed that outlines the listing and recovery record for species that have been delisted from the ESA. Initial efforts have been made to analyze data and begin writing of a manuscript.

CONSERVATION RELIANT SPECIES

Principal Investigators: J. Michael Scott and Dale Goble
Funding Agency: Idaho Department of Fish and Game
U.S. Geological Survey
Completion Date: June 2008

Objectives:
Test the assumption that imperiled and endangered species will no longer require specific management intervention after down listing or delisting.

Results: Study of delisted and down listed threatened and endangered species found that several require continuing species specific management intervention if recovered status is to be sustained. Traditional concept of once a species is delisted that existing statutes would be sufficient to protect it may not be true for fifty percent of listed species.
Three papers were published in peer reviewed journals

ASSESSING AVIAN DIVERSITY AND IDENTIFYING CONSERVATION TARGETS IN THE NATIONAL WILDLIFE REFUGE SYSTEM

Principal Investigator: J. Michael Scott, Ph.D.
Student Investigator: David Rupp
Funding Agencies: U.S. Geological Survey
Environmental Science
Completion Date: 30 June 2008

Objectives:

- Create a list of bird species ranked by conservation priority to present to the National Wildlife Refuge System (NWRS) for use in strategic growth at the national level and for habitat management strategies at the refuge level.
- Assess the representation and redundancy of America's bird diversity on the NWRS.
- Identify bird species that could serve as conservation targets for strategic growth and habitat management in the NWRS.

Progress:
In the spring, a committee was formed for the support and guidance of this project. The student investigator presented a proposal to both the committee in a private meeting and to the Department of Fish and Wildlife Resources at a weekly seminar. In the summer the student made contact with many refuges via personal visits or phone calls to gain a greater understanding of the diversity of the NWRS and the various bird checklists that are available to the public. The 25 refuges contacted or visited represent 13 states and 5 FWS regions. Other FWS staff were contacted to receive guidance or support in developing the project. Staff included members of the Division of Realty, Planning, Partners in Flight, and

refuge managers and biologists. Further contacts will be needed in the future. The database for this project was developed in Microsoft Access. It is designed to include data on variables involving bird species, the refuges, and the bird checklists. Key variables in this project are the distribution of refuges by Bird Conservation Region and the categorization of bird species on the Green List by the American Bird Conservancy. Collection of the bird checklists and other important data is moving along well.

A THEORETICAL APPROACH TO USING HUMAN FOOTPRINT DATA TO ASSESS LANDSCAPE LEVEL CONSERVATION EFFORTS

Principal Investigator:	J. Michael Scott Ph.D.
Cooperating Investigators:	Dr. Matthias Leu, USGS Forest and Rangeland Science Center, Boise. Leona K. Svancara Kerry Reese PhD
Post Doctoral Researcher:	Aaron Haines PhD
Agency Funding:	Center for Research on Invasive Species and Small Populations, (CRISSP) & U.S. Geological Survey
Completion Date:	30 April 2008

Objectives:

- Develop a theoretical approach to measure conservation success.
- Outline how the use of human footprint spatial data layers can be used to evaluate if conservation strategies are being effective on the ground.

Results:

Conservation organizations are increasingly being held accountable for identifying and documenting measures of conservation success. We propose the use of human footprint data to aid in the assessment of conservation efforts by monitoring qualitative change in the human footprint (i.e., spatial land use measures of negative anthropogenic activity) within a hypothesis driven framework to assess the effects of conservation efforts (i.e., positive anthropogenic activity). If human footprint data shows that implemented conservation strategies mitigated or reduced negative anthropogenic influences, then a potential conservation approach is working. In contrast, if the implementation of conservation strategies did not mitigate or reduce the human footprint, then new conservation approaches may need to be developed or old ones refined. Human footprint data may offer great potential for assessing conservation efforts when used as part of a larger conservation monitoring strategy.

EVALUATING AND CURBING HYBRIDIZATION FOR THE RED WOLF POPULATION

Principal Investigator: Lisette Waits, Ph.D.
Post Doctoral researcher: Jen Adams
Funding Agency: US Fish and Wildlife Service
Completion Date: September 2009

Objectives:

- Reconstruct the pedigree of the wild red wolf population and evaluate hybridization events
- Determine the genetic identity of puppies, captured animals and fecal samples
- Evaluate the genetic consequences of red wolves dispersing from the recovery zone using computer modeling
- Optimize and evaluate fecal DNA sampling and analysis methods

Methods:

Objectives one and two are being accomplished by extracting DNA, amplifying 8-18 microsatellite loci and analyzing the data on an ABI fluorescent detection system. To determine parentage, program CERVUS, exclusion and likelihood based models are being used. To determine the genetic identity of the samples, log-likelihood assignment test analysis methods and program described in Miller et al 2003 is being used. A computer model is being constructed to evaluate the long-tem genetic impacts of two management options: a) active removal of red wolves that disperse from the recovery zone vs b) no active removal of red wolves dispersing from the recovery area. We are collecting fresh fecal samples and storing them using 5 different preservation methods (freezing, Ethanol, lysis buffer, DETs buffer and a Guadinine buffer. Samples will be stored for 1 year but extracted a 4 different time points to evaluate which preservation method works best for long-term and short-term storage. The usefulness of new PCR preamplification methods for improving the success rates for DNA amplification from fecal samples is also being tested.

This project supports a PhD student and partial funding for a post doc.

VASCULAR PLANT INVENTORY OF EXPANDED CRATERS OF THE MOON NM AND PRESERVE

Principal Investigator: R. Gerald Wright, Ph.D.
Government Technical Rep.: John Apel
Funding Agency: National Park Service
Completion Date: 30 January 2008

Objectives:

- Complete the documentation of a target of 90 percent of all vascular plant taxa known or believed to occur on the expanded unit of Craters of the Moon NM and Preserve via vouchered plant specimens.
- Field work to collect taxa not previously collected which are believed to occur in the expanded section of the monument, determinations of resulting collected specimens, and database completion tasks are needed to accomplish this initiative.

Progress:
Completed initial field survey study conducted and database design of location extent and documentation voucher specimens estimated.

PHASE III MONITORING REPORT AND VITAL SIGNS PROTOCOL DEVELOPMENT

Principal Investigator: R. Gerald Wright, Ph.D.
Government Technical Rep.: Lisa Garrett
Funding Agency: National Park Service
Completion Date: 1 November 2009

Objectives:

- Based on the results of the Phase I study of the nine park units in the Upper Columbia Basin Network, Phase II of the study will develop a set of conceptual models that show the pathways and interactions between the various resources in the parks, and identify, via these models and interactive workshops a list of key resources or vital signs to be considered in a long-term monitoring plan.
- Phase III of the study will be the development of a long-term monitoring plan that incorporates specific vital signs and the protocols and responsibilities for monitoring each.

Progress:
Objective 1 has been completed. Based on the conceptual models, workshops with resource experts held at the University of Idaho, and workshops held with the staff of each of the park units, 18 vital signs were selected for monitoring in at least one of the nine parks. Vital signs selected included those where the network will develop the monitoring

plans and protocols and those were the vital signs are monitored by a given park or another federal or state agency and form which the data will be compiled by the network. The details of the entire process are contained in the Phase II report cited below. This report is now being used by network staff to develop a specific long-term monitoring plan under Phase III.

The work accomplished under this task agreement will assist in completion of the Upper Columbia Basin Network monitoring plan. The goal of this project is to provide technical assistance in all phases of the development of the Phase III report and vital signs protocol development for the Upper Columbia Basin Network.

The Phase III report has been peer reviewed and final edits are in progress as of April, 2007. Final product will be complete in 2007.

ESTABLISHMENT OF THE UPPER COLUMBIA BASIN NETWORK INVENTORY AND MONITORING PROGRAM SUPPORT OFFICE

Principal Investigator:	R. Gerald Wright, Ph.D.
Government Technical Rep.:	Lisa Garrett
Funding Agency:	National Park Service
Completion Date:	1 January 2009

Objectives:

- To establish a NPS support office for the Upper Columbia Basin Network and staff with appropriate NPS employees.

Progress:

A program support office for the NPS Upper Columbia Basin Inventory & Monitoring Network was established in Moscow in 2003. The program was initially staffed by one NPS employee, Lisa K. Garrett, who serves as Network Coordinator and reports to the Pacific West Region coordinator in Seattle. Subsequently, a second position as network program/data manager was established and filled by Leona Svancara in 2004. A network statistician was hired in 2006 through the University of Idaho. Currently, the network is advertising for a network ecologist who will be an NPS employee. Funds in this subagreement support the administrative costs and functions of the network office and will be renewed annually

Completed Projects – Wildlife and Terrestrial Resources

THE NATIONAL WILDLIFE REFUGE SYSTEM: PROVIDING A CONSERVATION ADVANTAGE TO THREATENED AND ENDANGERED SPECIES IN THE UNITED STATES

Principal Investigator:	J. Michael Scott, Ph.D.
Student Investigator:	Emmi Blades
Funding Agencies:	U.S.G. S. /Environmental Science
Completion Date:	May 2007

Objectives:

- Define and compare the conservation advantage of listed species for which refuges have been established, listed species found on the refuge system but for which refuges have not been established, and listed species not found on the refuge system.
- Assess the levels of population viability that can be maintained on refuges established for listed species by examining habitats and home range sizes of listed species for which refuges have been established.

Progress:

Conservation advantage has been defined and compared. Sixty-one national wildlife refuges have been identified as established to protect threatened and endangered species. One-hundred and twenty-seven species for which refuge have been established have been identified and refuge sizes established for listed species determined. Home-range sizes for listed species for which refuges have been established have been identified and were used to determine the levels of population viability that could be maintained. Dispersal abilities were assessed and refuge habitats analyzed to assess the ability of species for which refuges have been established to evade effects of climate change and human development.

REPRESENTATION, REDUNDANCY, AND RESILIENCE: WATERFOWL AND THE NATIONAL WILDLIFE REFUGE SYSTEM.

Principal Investigator:	J. Michael Scott, Ph.D.
Student Investigator:	Anna Pidgorna
Funding Agency:	Environmental Science Program
Completion Date:	26 April 2007

Objectives:

- To assess the occurrences of waterfowl species on each of the 545 National Wildlife Refuges during all-seasons and during breeding in order to measure representation and redundancy.
- To assess the occurrences of waterfowl species on each of the 545 National Wildlife Refuges within the four North American migratory bird flyways during all-seasons and during breeding in order to measure representation and redundancy.
- To assess the occurrences of waterfowl species on each of the 545 National Wildlife Refuges within the 20 climatic zones during all-seasons and during breeding in order to measure representation and redundancy.
- To assess the resilience of waterfowl species on National Wildlife Refuge lands.

Progress:

By combining and editing several GIS data sources we produced a digital dataset of 538 National Wildlife Refuges. We completed the search for bird checklists for National Wildlife Refuges. We managed to acquire some form of bird list for 82% of refuges. We finalized the methods for assessing the resilience of waterfowl species on the National Wildlife Refuge System. Resilience includes three assessments: the range of the waterfowl species in the U.S. captured by the National Wildlife Refuge System; the number of cities and interstate highways in the vicinity of refuges; the projected changes to the breeding ranges of waterfowl in the National Wildlife Refuge System as a result of Global Climate Change. Initial results showed that waterfowl species occurred on at least 45% of refuges in their respective ranges. In the all-season part of the analysis waterfowl species had representation in all the National Wildlife Refuges.

ECOLOGICAL CONTENT AND CONTEXT OF NATIONAL PARKS

Principal Investigator: J. Michael Scott, Ph.D.
Student Investigator: Leona K. Svancara
Funding Agency: National Park Service
Completion Date: July 2007

What will the National Park Service (NPS) system look like 100 and 200 years after founding? What species and ecological processes will be maintained within park boundaries? The answers depend, at least in part, on the current level of representation of natural resources within park boundaries, the spatial distribution of the parks and the integrity of the surrounding landscape. An ever-increasing human population has resulted in ours being one of the most economically and technologically advanced nations in the world. It has also resulted in numerous ecological impacts including habitat loss and fragmentation, pollution, invasions of exotic species, and species extinctions.

Our objective was to assess the ecological content and context of the national park system at multiple spatial scales by quantifying the level of representation, redundancy and resiliency of natural resources. We quantified the level of representation of biological and geophysical features as well as the spatial and temporal patterns of broad-scale external threats influencing matrix permeability for the 243 park units in the coterminous US with "significant natural resources." These parks represent 1.47% of the coterminous US, average 48,100 ha in area (median 2,400ha) and range from 4ha to over 1.3 million ha. Although the majority of parks consist of only 1 subunit, 49% represent 2 or more subunits with the greatest number in Appalachian Trail (405 subunits) and National Capitol Parks-East (347 subunits). In general, NPS units protect areas of high elevations, steep slopes, low soil productivity. In addition, they are not distributed equally through ecological space. Eight ecoregions lack even one park with significant natural resources and eight more ecoregions are only represented once. These ecoregions are predominately in the Midwest. Based on estimated minimum park sizes put forth by Gurd et al. (2001) and Wiersma et al. (2004), only 12 parks are large enough to preserve the historic number of mammals.

We assessed the resiliency of these parks based on the size and context of surrounding lands, a crucial factor in the effectiveness of parks as conservation areas and the ability of the NPS to manage for their "unimpaired" mission. We defined multiple layers of context based on 10km and 50km buffers, adjacent counties, and hydrologic units and assessed representation of landcover, nighttime stable lights, road density, and human population density. At the national level, the proportion of converted (urban or agriculture) to natural land cover within 10km of park boundaries is significantly different than the proportion within the parks themselves. In addition, although 51% of parks are less than 1 km from other protected areas, the proportion of protected to converted lands within 10km is quite

small, with the exception of the southwest where the amount of protected lands equal or surpass the amount converted. These results, along with the fact that the average human population size in counties adjacent to NPS units has increased faster than the national average, indicate that, at the national level, park units occur in a fairly unfriendly matrix. One manuscript has been submitted and two are in preparation.

USING A WEIGHTED APPROACH TO IDENTIFY BIODIVERSITY HOTSPOTS FOR SENSITIVE IDAHO BIRD SPECIES IN THE UNITED STATES

Principal Investigator:	J. Michael Scott Ph.D.
Cooperating Investigators:	Matthias Leu, PhD, USGS, Boise Leona K. Svancara Gina Wilson
Post Doctoral Researcher:	Aaron Haines, PhD
Agency Funding:	Idaho Department of Fish & Game Center for Research on Invasive Species and Small Populations (CRISSP) & USGS
Completion Date:	September 2007

Objectives:

- Identify biodiversity hotspot areas for Idaho avian species of greatest conservation need (SGCN) based on species richness, species range size (based on models of preferred habitat), and species endangerment, using a weighted approach.
- Compare each hotspot approach to identify which one overlapped with a greater number of species and was most congruent with all hotspot approaches.
- Group Idaho avian SGCN into human threat groups.
- Identify hotspot areas for each human threat group to identify areas within Idaho that may need specific management or conservation actions.

Results:

Identification of biodiversity hotspots has become a common strategy to delineate important areas for wildlife conservation. However, the use of biodiversity hotspots has not incorporated important habitat types, ecosystem services, anthropogenic activity, or consistency in identifying important conservation areas. The purpose of this study was to identify biodiversity hotspots to improve conservation efforts for avian species of greatest conservation need in the state of Idaho, United States. We evaluated the use of multiple approaches to define biodiversity hotspots and we identified a new approach based on weighting species by their range (based on models of preferred habitat) and endangerment status to identify biodiversity hotspot areas. In addition, we grouped species based on their sensitivity to specific human threats (i.e., development, agriculture, fire suppression, grazing, roads, and logging) and identified ecological sections within the state of Idaho that may require specific conservation actions to address these human threats. All biodiversity

hotspot approaches identified bodies of water (Bear Lake, Grays Lake, and American Falls Reservoir) as important biodiversity hotspots for Idaho avian species of conservation need. The Snake River Basalts and Overthrust Mountains ecological sections of Idaho were important areas for potential implementation of 'on the ground' conservation actions such as reducing human disturbance, controlling chemical run-off, lowering livestock density, and implementing controlled burns. Our approach to identifying biodiversity hotspots may be useful for land managers or local governments as a way to effectively apply theoretical conservation biology to 'on the ground' conservation actions or planning efforts.

VEGETATION MAPPING FOR THE UPPER COLUMBIA BASIN NETWORK

Principal Investigator:	R. Gerald Wright, Ph.D.
Government Technical Rep.:	Leona Svancara, Gina Wilson
Funding Agency:	National Park Service
Completion Date:	1 Dec 2007

Objectives:

- To determine the current (~2000) spatial distribution and size of land cover types within and surrounding these parks at a thematic resolution, based on the National Vegetation Classification System, most appropriate for long-term monitoring and management.
- To provide a cost-effective and timely product with resolution and accuracy standards similar to the NPS Vegetation Mapping Program, 0.05 ha MMU, >80% accuracy/class.
- The results of this project will allow UCBN staff to identify, map, and monitor changes in the patterns of land cover on lands within and adjacent to the parks and will provide base-level support for various vital sign monitoring (e.g., sampling design, view shed analysis, focal species occurrences).
- This project will enable Network staff and resource managers to assess land use impacts and make better-informed resource management decisions.

Progress:

The work accomplished under this task agreement will complete vegetation mapping in two Upper Columbia Basin Network (UCBN) parks, Big Hole National Battlefield and Whitman Mission NHS, using ASTER satellite data. Research Technician Gina Wilson has the lead on this project. To date, draft vegetation maps for Whitman Mission NHS, Nez Perce NHS, and John Day Fossil Beds National Monument have been produced and are being evaluated by park personnel. Maps for Lake Roosevelt are in progress and are to be completed in summer of 2007. The remaining parks in the network will be mapped throughout 2007.

LAKE ROOSEVELT NATIONAL RECREATION AREA VEGETATION MAPPING PROJECT USING ASTER SATELLITE DATA

Principal Investigator: R. Gerald Wright, Ph.D.
Government Technical Rep.: Jerald Weaver
Funding Agency: National Park Service
Completion Date: 1 May 2007

Objectives:

- To determine the location and size of plant communities as defined in the Standardized National Vegetation Classification System at Lake Roosevelt National Recreation Area.
- To enable the Lake Roosevelt Chief of Compliance and Natural Resources and others to monitor plant communities over time, and assess land use impacts in regards to plant communities.

Progress:
The cooperator will provide a computer-generated vegetation classification key based on ASTER imagery. These notes will include, at a minimum, the following: plant association(s)/alliances - as defined by the Washington State Gap Analysis program - encountered in the project area; a list of dominant species found in each community type (include scientific and common names); or invasive species with appropriate maps and forms. Because ASTER does not acquire images on a regular basis, the thematic resolution of the final classification is dependent on the imagery dates. Given the late date of the imagery currently available (September 27, 2000) a detailed classification of plant associations/alliances may not be easily determined for all vegetation types (e.g., grasslands).

Classification schemes will be site truthed. Field notes will include the dates the area was surveyed, inspector's name, and identification of the dominant plant associations encountered using vegetation classification key. When the plant association is not defined in the guide, as with unique habitats, the habitat will be identified using the dominant species present in each life form. Such as *Populus tremuloides/Symphoricarpos albus/Calamagrostis rubescens* to describe an aspen grove with a dominant snowberry shrub and pinegrass understory.

In describing the community, common species will make up at least 1% of the total vegetative cover. To be considered abundant, a species needs to make up at least 25% of the total vegetative cover. A draft vegetation layer and technical report has been prepared. The final report will be submitted to the NPS Research Coordinator and the RM-CESU host university by July 1, 2007.

Awards, Publications, Service and Other Activities FY 2007

HONORS AND AWARDS

J. Michael Scott

- Department of Interior Distinguished Service Award
- American Ornithologists Union Conservation Award

C. M. Moffitt

- University of Idaho Alumni Award for Excellence as Mentor –2007 for Outstanding Graduate Student John Cassinelli
- USGS, Star Award, 2006. For maintaining active research and outreach programs.

Lubia Cajas Cano, PhD Student

- Dissertation Support, Regional Program of Graduate Fellowships for Latin American Students. Ford Foundation, New York. 2006 -2008.
- Research Excellence Award. Grad. Expo. Graduate and Professional Students Association. University of Idaho. April, 2007.

John Cassinelli, MS Student

- Trout Unlimited Graduate Scholarship.
- Bob Burnham Memorial Scholarship, Kelly Creek Fly Casters
- Alumni Graduate Student Award of Excellence.

R.J. Neilson, MS Student

- Idaho Chapter of American Fisheries Society Scholarship, 2006-07 ($500).
- Idaho Chapter University of Idaho Ted Bjornn Memorial Scholarship, 2006-2007 ($500).

PEER REVIEWED PUBLICATIONS

Adams, J. R., C. Lucash, L. Schutte, and L. P. Waits (in press) Locating hybrid individuals in the red wolf (*Canis rufus*) experimental population area using a spatially targeted sampling strategy and faecal DNA genotyping. Molecular Ecology

Adams, J. R. and L. P. Waits. 2007. An efficient method for screening faecal DNA genotypes and detecting new individuals and hybrids in the red wolf (*Canis rufus*) experimental population area. Conservation Genetics 8:123-131

Anlauf, K. and C. Moffitt. 2008. Models of stream habitat characteristics associated with tubificid populations in an intermountain watershed. Hydrobiologia. 603:147–158.

Cajas Cano, L., and C. M. Moffitt. (in press). Comparing Footprints of Trout and Beef Production. World Aquaculture Magazine Feature Article.

Colvin, M. E., and C. M. Moffitt. (in press) Evaluation of irrigation canal networks to assess stream connectivity in a watershed. River Research and Applications.

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Davison, R.P., A. Falucci, L. Maiorano, and J.M. Scott. 2006. The National Wildlife Refuge System pages 90-100 *in* Goble, D. D., J.M. Scott and F.W. Davis (Editors).The Endangered Species Act at Thirty: renewing the conservation promise. Island Press. Covelo CA

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Scott, J.M. D.D. Goble L. Svancara and A. Pidgorna. 2006. By the Numbers. pages 16-35 *in* Goble, D.D. J.M. Scott and F.W. Davis 200.The Endangered Species Act at Thirty: renewing the conservation promise. Island Press Covelo CA

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TECHNICAL AND SEMI-TECHNICAL REPORTS

Cassinelli, J., C. Moffitt, and K. Meyer. 2007. Laboratory studies of growth and physiology of redband trout from desert and montane streams. FY 2006 Progress Report March. Idaho Fish and Game Report 07-18. March.

Moffitt, C. M. 2007. Continuation of Testing of Control Strategies to Reduce New Zealand Mudsnail Infestation at Fish Propagation Faculties. Annual Report to FWS. Requisition Number 11332-4-2006, Amendment Modification 3. Idaho Cooperative Fish and Wildlife Research Unit. September 2007.

Rosenblum, E, and C. M. Moffitt. 2007. Environmental Impact Assessment, Phase II. Erythromycin thiocyanate to control bacterial kidney disease in salmonids. Submittal, May 2007.

Scott, J. M., B. Griffith, B. Adamicik, D. Ashe, B. Czech, R. Fishmann, P. Gonzalez, and A. Pidgorna. In review. Impact of Climate Change on National Wildlife Refuges. EPA SAP4.4 Program.

THESES AND DISSERTATIONS

Adams, J. R. 2006. A multi-faceted molecular approach to Red Wolf (*Canis rufus*) conservation and management. PhD Thesis, College of Natural Resources.

Blades, Emmi. 2007. The National Wildlife Refuge System: providing a conservation advantage to threatened and endangered species in the United States. Master's Thesis, Environmental Sciences.

Bruce, R. L. 2006. Examination of a Fish Depuration Strategy to Control New Zealand Mudsnails (*Potamopygrus antipodarum*) at Fish Hatcheries. Master's Thesis. Fishery Resources.

Cajas Cano, Lubia. 2006. Environmental and social footprints of beef and trout production for human consumption: using Idaho as an example. Masters Thesis. Environmental Science.

Cummings, Dustene. 2007. Direct and indirect effects of barriers to migration of Pacific lamprey at Mc Nary and Ice Harbor Dams in the Columbia River Basin.

Griffith, David W. 2007. Behavior of adult fall Chinook salmon in the Lower Columbia River estuary.

James, Christopher. 2007. Investigations of the invasive New Zealand mudsnail *Potamopyrgus antipodarum* in Idaho: implications for temperature limitations.

Mann, Ryan. 2007. The effects of high temperature exposures on migration success and embryo quality of Snake River Chinook salmon and steelhead.

Pidgorna. Anna. 2007. Representation, redundancy, and resilience: waterfowl and the National Wildlife Refuge System.

Stanish, D. 2006. Defining recovery: an analysis of endangered species recovery criteria through 2004. Master's Thesis. Wildlife Resources.

Yanke, J. A. 2006. Effects of passive integrated transponder (PIT) tags and elevated water temperatures on survival, growth, and physiology of Snake River fall Chinook salmon subyearlings (*Oncorhynchus tshawytscha*). Masters Thesis. Fishery Resources.

POSTERS AND PAPERS PRESENTED AT PROFESSIONAL MEETINGS

Blades, E. and J. M. Scott. 2007 The Wildlife Society Annual Meeting, Pocatello, ID National wildlife refuges: maintaining threatened and endangered species in the United States. The Wildlife Society Annual Meeting, Pocatello, ID

Cajas Cano, L. 2007. Environmental and social footprints of beef and trout in Southern Idaho. World Aquaculture Meeting, San Antonio, Texas. February 2007.

Cassinelli, J. and C. M. Moffitt 2007. (oral) Effects of water temperature on growth and physiology of different populations of redband trout (*Oncorhynchus mykiss gairdneri*). Idaho Chapter of American Fisheries Society, Boise, ID. 21-24 February, 2007.

Garton, E.O., J.S. Horne. 2006. Analysis of Home Range, Resource Selection, and Space Use. The Wildlife Society, Anchorage, Alaska.

Haines, A., J. Fay, O. Garton, D. Goble, N. Neel, J.M. Scott, D. Stanish, and D. Wilcove. 2007. What is a recovered species? The Wildlife Society Annual Meeting, Pocatello, ID

Haines, A. 2007. Dynamic human footprint: a measure of conservation success. Ecological Society of America Annual Meeting 2007, San Jose, California

Haines, A. 2007. Recovery defined for listed avian species? Cooper Annual Ornithological Meeting 2007, Moscow, Idaho.

Haines, A. 2006. The science policy interface. Frontiers in Forest and Rangeland Ecosystems 2006, Moscow, Idaho .

Hamilton, K. 2007, C. M. Moffitt, and R. J Nielson. (poster) Using Hydrocyclone Filtration to remove the invasive New Zealand mudsnail from fish hatchery inflow REU2 Inter Program Poster Presentation. August 2007.

Lewis, J.S., J.L. Rachlow, E.O. Garton, L.A. Vierling. 2006. Effects of habitat on GPS collar performance: addressing location error. The Wildlife Society. Anchorage, Alaska.

Moffitt, C. M. Dealing with changing environments: xenobiotics and emerging diseases. Challenges for Diadromous Fishes in a Dynamic Global Environment. Halifax, NS. June 18-21 2007.

Moffitt, C. M. C. James, L. Bruce, J. Nielson, and B. Watten.(poster).Invasive New Zealand Mudsnails (Potamopyrgus antipodarum) in Idaho: assessment of risks and opportunity for control. Poster for USGS headquarters highlights of research on invasive species. November 2006.

Moffitt. C. M. 2006. (oral). Presentation of studies of small populations and invasive species. New Zealand mudsnails in Idaho. Presentation to CRISSP advisory board 13 October 2006.

Moffitt, C. M. 2007. Drug approval of erythromycin to treat bacterial kidney disease. 13th 13th Annual Aquaculture Drug Approval Coordination Workshop. July 31- August 1, 2007. Bozeman, MT.

Moffitt, C. M. 2007. Vectors, Vehicles and Invasive Species in Stream Watersheds. Landscapes to riverscapes: bridging the gaps between research and management of stream taxa and their ecosystems. University of Idaho. Moscow 15-16 May 2007.

Moffitt, C. M. 2007. Fish Health Management of cultured fish: parasites, pathogens, and physiology. Presentation to University of Arkansas, Pine Bluff, and University of Maryland, Easter Shore 19 April 2007 for graduate class in use of cultured fish in supplementing marine and inland fisheries. Organized by Paul Port and Alf Haukenes.

Moffitt, C. M. 2007. Definition of Environmental Footprints and Applications to Animal Protein Production and Aquaculture. Sustainable aquaculture. World Aquaculture San Antonio, TX 26-29 February 2007.

Moffitt, C.M. 2007. Use of Antibiotics in Production: myths, reality and comparisons. Sustainable aquaculture. World Aquaculture San Antonio, TX 26-29 February 2007.

Moffitt, C. M. 2007. Erythromycin to Control Bacterial Kidney Disease in Salmonids. Producers Session, World Aquaculture, San Antonio, TX. 26-28 February 2007.

Nielson, R. J. , Moffitt, C.M., and B. J. Watten, 2007. (poster) Toxicity of CO2 to New Zealand Mudsnails (Potamopyrgus antipodarum): Implications for Control. 15th International Conference on Aquatic Invasive Species, September. Nijmegen, The Netherlands.

Nielson, R.J., Moffitt, C.M., and B. J. Watten, 2007.(Oral) Feasibility of two step system for removing New Zealand mudsnails from infested hatchery inflow waters. 137th Annual Meeting American Fisheries Society, San Francisco, CA. 3-7 September, 2007.

Nielson, J. 2007. Moffitt, C.M., and B. J. (oral) A two-step approach for controlling New Zealand mudsnails (*Potamopyrgus antipodarum*) in fish hatcheries. 5th New Zealand Mudsnail in the Western USA Conference, Putah Creek Lodge, 27-28 June 27, 2007.

Nielson, J. Moffitt, C.M., and B. J. Watten, 2007. (oral) Toxicity of New Zealand Mudsnails (*Potamopyrgus antipodarum*) to CO_2: Implications for Control. Idaho Chapter of American Fisheries Society, Boise, ID. 21-24 February, 2007.

Nielson, J., C. M. Moffitt, and B. J. Watten. 2006. (oral) Progress on Methods of Controlling New Zealand Mudsnails (Potamopyrgus antipodarum) in Fish Hatcheries. December 4 – 6, 2006, Portland OR.

Pidgorna, A., J. M. Scott, and J. J. Lawler. 2007. Representation, redundancy and resiliency: waterfowl and the National Wildlife Refuge System. The Wildlife Society Annual Meeting, Pocatello, ID

Scott, J. M., and D. D. Goble. 2007. Humanities new relationship with nature: Conservation reliant species. The Wildlife Society Annual Meeting, Pocatello, ID

Scott, J. M. and D. Goble. 2006. National Marine Fisheries Service: "Conservation Reliant Species; Novel Occurrence or the future of endangered species". Seattle Washington

Scott, J.M. and D. Goble. January 2007. ESA and recovery: When is a Species Recovered? Is it the same for all species? 14th Annual Endangered Species Act Conference, Seattle, Wa.

Scott, J.M. February 2007. Changes in Landscape and Conservation Changes. USFWS Project Leader Meeting. Indianapolis, In.

Scott, J.M. February 2007. New Directions in Conservation for the National Wildlife Refuge System. USFWS Project Leader Meeting. Indianapolis, IN.

Scott, J.M. February 2007. Climate Change: The Biological Perspective. Washington State University Environmental Issues Community Group, Moscow, ID.

Scott, J.M. February 2007. A Risk Assessment Framework for Defining Scientifically Defensible Recovery Goals for Listed Species. SERDP and ESTCP Joint Annual Meeting. Arlington, VA

Scott, J.M. February 2007. Determination of Recovery of Threatened and Endangered Species under the Endangered Species Act. USFWS Region 1 Meeting, Portland, OR.

Scott, J.M. March 2007. America's Conservation Landscape 2076. Plenary Presentation. The Wildlife Society, Idaho Chapter. Pocatello, ID.

Scott, J.M. March 2007. Conservation Reliant Species: Our New Relationship with Nature. The Wildlife Society, Idaho Chapter. Pocatello, ID.

Scott, J.M. April 2007. America's Conservation Landscape 2076. The George Wright Society Annual Meeting. Minneapolis, MN.

Scott, J.M. April 2007. America's Conservation Landscape 2076. University of Idaho Physics Department Annual Banquet. Moscow, ID

Scott, J.M. June 2007. America's Conservation Landscape 2076: Managing avian diversity in the face of global climate change: the case of the National Wildlife Refuge System. Plenary Presentation. Cooper Ornithological Society Annual Meeting. Moscow, ID.

Scott, J.M. July 2007. Conservation Reliant Species: Our new relationship with nature. Society for Conservation Biology. Port Elizabeth, South Africa.

Scott, J.M. et al. July 2007. Manage for Change: Climate Change and the National Wildlife Refuge. USFWS and USGS Joint Directors Meeting. Anchorage, AK.

Scott, J.M. July 2007. Hawaii's Conservation Landscape: A window to the future. Plenary Presentation, Hawaiian Conservation Alliance, Honolulu, HI.

Scott, J.M. August 2007. Establishing New Pathways to the Recovery of Species Listed Under the Endangered Species Act. Department of Defense Readiness Conference. Orlando, FL.

Scott, J.M. September 2007. Managing for Change: Climate Change and the National Wildlife Refuge System. The Wildlife Society, Climate Change Symposium. Tucson, AZ.

Scott, J.M. September 2007. Conservation Reliant Species: Our New Relationship with Nature. The Wildlife Society Annual Meeting, Tucson, AZ.

Scott, J.M. September 2007. Managing for Change: Climate Change and the National Wildlife Refuge System. Defenders of Wildlife Symposium. Washington, D.C.

Svancara, L. K., J. M. Scott, J. J. Lawler. 2007. Ecological Content and Context of the National Park System. George Wright Society, Minneapolis, MN.

Svancara, L. K. 2007. The Palouse in Context. US Fish and Wildlife Service, Spokane, WA. May, 2007.

Svancara, L. K 2007. Mapping Remnant Vegetation. US Fish and Wildlife Service, Spokane, WA. May, 2007.

Svancara, L. K. 2007. Planning for Change: A Change for Planning? Idaho Department of Fish and Game, ISTS, Boise, Idaho. May, 2007.

Svancara, L. K. 2007. BLM, VISTA, and Healthy Lands. Bureau of Land Management, Boise, ID. August, 2007

Svancara, L. K. 2007. Land Use Planning and Decision Support Systems. Idaho Department of Fish and Game, Nongame Biologists Retreat, Island Park, ID. September, 2007

TECHNICAL ASSISTANCE, OUTREACH AND PROFESSIONAL SOCIETY ACTIVITIES

Lubia Cajas Cano

REU Coordinator, University of Idaho. Water Resources. May – August 2007.

Asociation of Latinamerican and Iberoamerica Students of the University of Idaho, member and Treasurer of the Committee. Aug 2005 to present.

Graduate and Professional Student Association (GPSA), University of Idaho. Senator for Environmental Science. Aug. 2006 to present

John Cassinelli

Palouse Unit, Kids fishing day and wild game feed organizer.

J. L. Congleton

Initiated and maintain the Environmental News Bulletin Board in the College of Natural Resources.

Aaron Haines

2007- Workplace Focus Team for developing the Strategic Plan for the College of Natural Resources at the University of Idaho

2007. Member of the organizational committee for the 77th Annual Cooper Ornithological Society Meeting (June 2007).

2007. Consultant to Region 1 of the Fish & Wildlife Service on defining 'risk' and 'foreseeable future' in the Endangered Species Act (January 2007).

2007. Member of the assessment committee and project evaluator fo the College of Ecology and Conservation Biology .

Journal Referee for Ecography (2007); Journal of Tropical Ecology (2007)

Acta Theriologica (2007); BioScience (2006, 2007); ORYX (2006); Acta Zoologica Sinica (2006)

Adam Kautza

Palouse Unit Graduate Student Representative

Christine M. Moffitt

Associate Editor, Transactions of the American Fisheries Society

Faculty Advisor to the Palouse Unit of the Idaho Chapter of the American Fisheries Society

Member at large, University of Idaho Athena Board 2006-2007.

Member Steering Committee "Challenges for Diadromous Fishes in a Dynamic Global Environment." 2005 to 2008

Chair, Transition Committee for moving headquarters, American Fisheries Society

President Fisheries History Section, 2006-2008.

Chair, Equal Opportunity Section's J. Frances Allen Scholarship Award. 2007-08.
Multimedia Plenary and Business Meeting Awards Ceremonies for Annual Meeting of the American Fisheries Society, San Francisco, CA. 2-6 September 2007.
2005-2007 Co-Leader, Task Force on Resistant Microbial Populations. Joint Subcommittee for Aquaculture.
2005-2006. CREES Department of Agriculture SBIR Aquaculture Program Panel Leader, Phase I and Phase II Proposals.
SBIR Phase II reviewer
Journal Outreach Co-Editor, Journal of Aquatic Animal Health
Potlatch Corporation Community Advisory Board. 2004-2008.
2005-8. United States - Israel Bi-national Agricultural Research and Development Fund Review Board. Proposal reviewer.
2005-2008- Renewal of CNR Laboratory Infrastructure- Wrote proposal that led to securing university funds for $300,000 renovations of the CNR wetlab.
2006-7. Chair, Limnology Search Committee, Dept Fish and Wildlife Resources.

R. J. Neilson

Idaho Chapter –Palouse Student Unit Co-organizer ice fishing derby
2006-2007 Fundraising committee
2007 - Co-leader of a free kid's fishing day Kiwanis & Idaho Department of Fish and Game with Palouse AFS.
2007-2008 – Webmaster, Palouse Unit website (www.cnr.uidaho.edu/afs)

J. Michael Scott

Member Environmental Protections Agency Task Force on Climate Change and Public Lands
Appointed to the Secretary of the Interior's Committee on Climate Change. 2007
Consultant Government of Canada on Critical Habitat for Caribou
Consultant Nature Conservancy on the Santa Cruz Island Scrub Jay
Member Publications Committee Society for Conservation Biology
Chair LaRoe Award Committee for Society for Conservation Biology
Member Honorary Member ship Committee of the Cooper Ornithological Society
Committee Member Annual Meeting of the Society for Conservation Biology, San Jose, California; May 2006
Co-chair of Invited Symposium on Advocacy at the Society for Conservation Biology; San Jose CA June 2006
Member, Weiser, Idaho Sheep Council Joe Hinson Invited discussant
Senior Member of the Science Council of the Nature Conservancy; Attended both meetings of the Council in 2006.
Chair of 2006 Awards Committee, Natural Areas Association
American Institute of Biological Sciences: Served on Publications Committee; Served on Finance Committee; Member of the Board of Directors;
Attended Diversity Opportunities Luncheon in Washington DC
Co-chair, Frank Church Wilderness Area, Symposium Committee, University of Idaho, College of Natural Resources

Member, Policy Committee, American Institute of Biological Sciences
Member Editorial Board, BioSciences Journal
Member Diversity Committee, AIBS.
2007 Member, Ivory Billed Woodpecker Recovery Team
Member, Hawaii Forest Bird Recovery Team
Member, The Nature Conservancy Senior Science Council
Member, Doris Duke Charitable Foundation, Science Advisory Board
Member, National Wildlife Foundation Wildlife Scholarship Advisory Board, Biosciences and Biological Conservation

Leona Svancara

Latah County 4-H Natural Resource Judging Contest, April 2007
Latah County 4-H Potlatch Summer Camp Animal Identification, June 2007