
2008 ANNUAL REPORT
USGS Biological Resources Division
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Utah State University, Logan UT 84322-5290



2009 Coordinating Meeting
College of Natural Resources
Utah State University
1 April 2009



UtahState
University



Cooperators:
USGS Biological Resources
Utah Division of Wildlife Resources
CNR Utah State University
Wildlife Management Institute
U. S. Fish & Wildlife Service

2009 AGENDA
Annual Coordinating Committee Meeting
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Dean's Conference Room
Utah State University, Logan, UT

Rotating Chair: 1992:USU, 1993:NBS, 1994:UDWR, 1995:WMI, 1996:USU, 1997:USGS, 1998:UDWR, 1999:WMI, 2000:USU, 2001:USGS, 2002:UDWR, 2003:WMI, 2004:USU, 2005:USGS, 2006:UDWR, 2007:WMI, 2008:USU, 2009:USGS, 2010:UDWR

Tuesday Evening Social: T. Edwards @ 6:30 P.M. 798 Juniper Dr., Logan UT (Map to follow)

Wednesday, 1 April 2009

Theme: *Improving future communication to implement research needs in a fiscally challenging environment.*

8:00-9:00	Continental Breakfast
9:15-9:30	Introductions & Awards
9:30-10:00	Unit Fiscal Health & Awards – J. A. Bissonette
10:00-10:15	CRU Status - Bern Shanks -- CRU Program
10:15-12:00	Discussion: Meeting Cooperator Needs in a Tight Budget Time Darren McAvoy, Facilitator
12:00-1:30	Catered Lunch <i>CNR Dean's Conference Room</i>
1:30-2:45	Discussion Continued... .
2:45-3:00	Wrap Up
3:00-4:00	Cooperators Closed Meeting: <u>USGS, UDWR, USU</u>
~4:30	Departure

ALL BREAKS ARE OPEN. THERE WILL BE REFRESHMENTS THROUGHOUT THE DAY.

Discussion

To guide the discussion, we are asking you to think about how we can improve our communication and our service to you. Do the current economic situation and the future outlook impact what we can do for you? If so, how? Is there something we can do to alleviate any perceived problems? What are the institutional or fiscal constraints to accomplishing what you would like to see done? Are there other problems we should know about? How can we better help DWR and partners realize some of the issues discussed at previous CCMs? Do available funds drive priorities or do resource issues drive priorities?

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bunnies, birds, & fish

2008 Research Activities of the Unit Staff

John A. Bissonette
Thomas C. Edwards, Jr.
Phaedra E. Budy

Personnel

Cooperators – Coordinating Committee

United States Geological Survey

Bern Shanks
Western Supervisor
U.S.D.I. Cooperative Research Units
909 First Avenue-Eighth Floor
Seattle, Washington 98104
bernard_shanks@usgs.gov
206-220-4610
Fax: 206-220-4624

Utah Division of Wildlife Resources

James Karpowitz, Director
Utah Division of Wildlife Resources
1594 West North Temple
Salt Lake City, UT 84114-6301
robinthomas@utah.gov
801-538-4705
Fax 801-538-4709

Utah State University

Nat Frazer
Dean
College of Natural Resources
Utah State University
Logan, UT 84322-5200
nat.frazer@usu.edu
435-797-2452
Fax:435-797-2443

Wildlife Management Institute

Steve Williams
President
1440 Upper Bermudian Road
Gardners, PA 17324
swilliams@wildlifemgt.org
717-677-4480

Utah Cooperative Fish and Wildlife Unit Staff

John A. Bissonette
Leader & Professor
Wildland Resources Department
john.bissonette@usu.edu

Thomas C. Edwards, Jr.
Assistant Leader Wildlife & Professor
Wildland Resources Department
t.edwards@nr.usu.edu

Phaedra E. Budy
Assistant Leader Fisheries & Associate Professor
Watershed Sciences Department
phaedra.budy@usu.edu

Shauna Leavitt
Staff Assistant
Utah Cooperative Fish and Wildlife Research Unit
sleavitt@cc.usu.edu

Cecelia Melder and Esther Biesinger
Financial Administrators
College of Natural Resources
busctr@cc.usu.edu

Unit Research Staff and Students

Research Associates:

	
Patricia Cramer, Ph.D.	Gary Thiede, M.S.

Graduate Students by Degree Program:

	
Justin Bingham Wildlife Biology – M.S.	Jared Bottcher Fisheries Biology – M.S.
	
Tracy Bowerman Fisheries Biology – M.S.	Andy Dean Fish Ecology – M.S.



Jacob Gibson
Landscape Ecology – M.S.



Randy Larsen
Wildlife Biology – Ph.D.



Andy Leidolf
Wildlife Biology – Ph.D.



Christy Meredith,
Aquatic Ecology – Ph.D.



Russell Norvell
Ecology – Ph.D.



Carrie O'Brien
Range Ecology – M.S.



Daniel Olson,
Wildlife Biology - Ph.D.



Julie Ripplinger
Historical Ecology – M.S.



Sara Seidel
Fisheries Biology – M.S.



Hillary White
Riparian Ecology – M.S.



Tammy Wilson
Landscape Ecology – Ph.D.

Mission Statement
Utah Cooperative Fish and Wildlife Research Unit
2008

The major limiting influences upon fishery and wildlife resources in the Intermountain West are terrestrial habitat degradation and loss, and watershed and water issues. Fragmentation of winter range for big game, degradation and impacts on riparian areas by agricultural practices, invasion of wildlife rangeland invasive plants, as well as change of reservoir and riverine habitat through activities associated with hydroelectric and water delivery systems are the major factors that have and will continue to affect natural resource management in Utah in years to come. Rapid population growth in the state has exacerbated the pressures on both the terrestrial and aquatic resource. Given these trends and the expertise of Unit personnel, the primary mission of the Unit is to address food web and habitat-related applied research questions relating to the fishery and wildlife resources of Utah and the Intermountain West and beyond.

Cooperating Faculty in the Department, College, and University are, and will continue to be, integrated into Unit research to apply diverse expertise to all facets of a research problem. In addition to the more traditional fields of biological endeavor, expertise in geographical information systems, sociological science, survey and population assessment methodology, new statistical techniques, chemical and contaminant analysis, and computer modeling and methodology, as well as other pertinent fields, can be brought to bear on resource problems. The primary motivation of the Unit is to solve pressing resource problems.

Technical expertise of the Unit staff includes: larger scale dynamics, GIS and habitat analysis, population management and assessment, road ecology, aquatic habitat ecology, fish population dynamics, aquatic food web dynamics, and quantitative study design. Our research activities focus on landscape-level habitat studies, ecological modeling of lake, reservoir, and riverine systems, and avian and terrestrial ecology. Future research directions of the Unit will continue to involve endangered and high interest species, sustainable game and sport fish management, terrestrial and aquatic riparian studies, migratory non-game bird research, and landscape-level studies involving modeling for future scenarios.

Graduate level courses being taught by unit personnel at Utah State University include Design and Analysis of Ecological Research (emphasizes the research process), Topics in Spatial Ecology (emphasizes space from an ecological as well as statistical perspective), Fish Diversity and Conservation (seeks to expose student to the evolution and the biodiversity of fishes, and their conservation, through lecture and practical formats), and Landscape Ecology (emphasizes the conceptual background of large scale ecology). Unit personnel are involved in continuing education/professional advancement short courses for agency personnel. The Unit is committed to academic pursuit of cooperator interests, and in particular, the needs of the Utah Division of Wildlife Resources. Yet, the strength of the Unit is directly related to its ability to attract outside funds. Research done in the state and region with non-cooperator funds provides added benefits to cooperators. This Unit has and will continue to address resource issues associated with its expertise to the benefit of Utah and the resource management community. Our primary objective is quality science.

**USGS
UTAH COOPERATIVE FISH AND WILDLIFE RESEARCH
UNIT
2008
PRODUCTIVITY SUMMARY**

PUBLISHED

**1 BOOK
1 BOOK CHAPTER
21 PEER-REVIEWED PAPERS
6 PAPERS IN REVIEW
6 TECHNICAL REPORTS
1 BOOK REVIEW
4 PUBLIC RELATIONS PUBLICATIONS**

STUDENTS

**5 THESES AND DISSERTATION COMPLETED
6 Ph.D. & 9 M.S. CANDIDATES IN-PROGRESS**

PRESENTATIONS, COURSES, WORKSHOPS, AND OUTREACH

**5 INVITED
14 CONTRIBUTED
4 UNIVERSITY COURSES
4 WORKSHOPS
4 OUTREACH ACTIVITIES**

RESEARCH

**15 ACTIVE GRADUATE UNIT RESEARCH PROJECTS
17 ACTIVE COOPERATING FACULTY UNIT RESEARCH PROJECTS
\$3,011,722 TOTAL CY 2008 FUNDING**

USGS Utah Cooperative Fish and Wildlife Research Unit
Productivity FY 2008
1 January 2008 to 31 December 2008

PUBLICATIONS

Books, and Chapters in Books

- Edwards, T. C., Jr., and D.R. Cutler. 2009. The analysis of ecological data using R. In press, Chapman/CRC Press, Boca Raton, Florida, USA.
- Budy, P., G.P. Thiede, C. Luecke, and R. Schneidervin. *In press*. Chapter 10, Sampling in two-story fisheries in S. Bonar, A. Iles, and S. Contreras-Balderas (*editors*) Standard Sampling Methods for North American Freshwater Fishes. *Invited submission* for AFS Book special publication. *Accepted March 15, 2008*.

Peer- Reviewed Papers

- Al-Chokhachy, R., P. Budy, and M. Conner. *In press*. Detecting changes in bull trout population abundance: understanding the accuracy, precision, and costs of our efforts. Canadian Journal of Fisheries and Aquatic Sciences. *Accepted December 15, 2008*.
- Al-Chokhachy, R. and P. Budy. 2008. Demographic characteristics, population structure, and vital rates of a fluvial population of bull trout in Oregon. Transactions of the American Fisheries Society 137:262-277.
- Bissonette J.A. and S. Rosa. *In press*. Road zone effects in small mammal communities. Ecology and Society, *Accepted 27 January 2009*.
- Bissonette J.A., and C. Kassar. 2008. Locations of deer-vehicle collisions are unrelated to traffic volume or posted speed limits. Human Wildlife Conflicts 2(1):122-130.
- Bissonette, J.A, C. Kassar, and L.J. Cook. 2008. Assessment of costs associated with deer-vehicle collisions: human death and injury, vehicle damage, and deer loss. Human Wildlife Conflicts 2(1):17-27.
- Bissonette, J. A., and W. A. Adair. 2008. Restoring habitat permeability to roaded landscapes with isometrically-scaled wildlife crossings. Biological Conservation 141(2):482-488. Online DOI: <http://dx.doi.org/10.1016/j.biocon.2007.10.019>.
- Budy, P., G.P. Thiede, P. McHugh, E.S. Hansen, and J. Wood. 2008. Exploring the relative influence of biotic interactions and environmental conditions on the abundance and distribution of exotic brown trout (*Salmo trutta*) in a high mountain stream. Ecology of Freshwater Fish, OnlineEarly Articles: 11-Jun-2008 doi: 10.1111/j.1600-0633.2008.00306.x.
- Edwards, T.C., Jr., D. R. Cutler, and K. H. Beard. *In Press*. Using statistical models to predict the risk of occurrence of invasive plants in national parks. Pages XX in B. Welch, editor. Tools for prioritizing, predicting and managing invasive plants on public lands.
- Grilo, C., J.A. Bissonette, and M. Santos-Reis. 2008. Response of carnivores to existing highway culverts and underpasses: Implications for road planning and mitigation. Biodiversity and Conservation 17:1685-1699. On-line DOI 10.1007/s10531-008-9374-8.
- Grilo, C., J. A. Bissonette & M. Santos-Reis *In press*. Spatial-temporal patterns in Mediterranean carnivore road casualties: Consequences for mitigation. Biological Conservation 142:301-313. On-line DOI: <http://dx.doi.org/10.1016/j.biocon.2008.10.026>.

- Gunson, K. E., A. P. Clevenger, J. A. Bissonette. *In press*. Limited applications of wildlife-vehicle collision analyses for mitigation planning due to spatial inaccuracy. Submitted Environmental Management, *Accepted 27 January 2009*.
- Homel, K. and P. Budy. 2008. Temporal and spatial variability in the migration patterns of juvenile and subadult bull trout (*Salvelinus confluentus*) in Northeast Oregon. Transactions of the American Fisheries Society 137:869-880.
- Homel, K., P. Budy, M.E. Pfrender, T.A. Whitesel, and K. Mock. 2008. Evaluating genetic structure among resident and migratory forms of bull trout (*Salvelinus confluentus*) in Northeast Oregon. Ecology of Freshwater Fish On-line Early Articles: DOI:1-.1111/j.160-0633.2008.00299.x
- Johnson, J.A., B.A. Andres, and J.A. Bissonette. 2008. Birds of the major mainland rivers of southeast Alaska. Gen. Tech. Rep. PNW-GTR-739. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 88 pages.
- Leidolf, A., and J. A. Bissonette. *In press*. The effects of fire on avian communities: spatio-temporal attributes of the literature 1912-2003. International Journal of Wildland Fire *Accepted 27 May 2008*.
- Loureiro, F., J. A. Bissonette, D. W. Macdonald, and M. Santos-Reis. 2008. Temporal variation in availability of Mediterranean food resources: Do badgers track them? Submitted to Wildlife Biology *Accepted 6 October 2008*.
- McHugh, P., P. Budy, G.P. Thiede, and E. VanDyke. 2008. Trophic relationships of nonnative brown trout, *Salmo trutta*, and native Bonneville cutthroat trout, *Oncorhynchus clarkii utah*, in a northern Utah, U.S.A. river. Environmental Biology of Fishes 81(1):63-75.
- Vatland, S., P. Budy, and G.P. Thiede. 2008. An approach to modeling striped bass and threadfin shad predator-prey dynamics in Lake Powell, Utah-Arizona. Special Section: Bioenergetics Modeling. Transactions of the American Fisheries Society 137:262-277.
- Wilson, T. L., E. J. Johnson, and J. A. Bissonette. 2008. Relative importance of habitat area and isolation for bird occurrence patterns in a naturally patchy landscape. Landscape Ecology On-line DOI 10.1007/s10980-008-9309-5.
- Wood, J. R. and P. Budy. 2007. The role of environmental factors in determining the spawning density and distribution of brown trout along an elevational gradient, pp. 251-257. *In*: Carline, and C. LoSapio, eds., 2007. Sustaining wild trout in a changing world; proceedings of Wild Trout IX symposium; 2007 October 9-12; West Yellowstone, Montana. 308 pages.
- Wood, J. and P. Budy. *In press*. An investigation of the early life-history and potential influences on invasion success of exotic of brown trout (*Salmo trutta*). Transactions of the American Fisheries Society, *Accepted 12 September 2008*.

In Review

- Hansen, E. S., and P. Budy. *In review*. The potential of passive stream habitat restoration to improve ecosystem health with consideration of the impacts of disease? Restoration Ecology, *Re-submitted March 2009*.
- Johnson, E. J., T. L. Wilson, and J. A. Bissonette. *In review*. High-elevation sagebrush meadows: substitute for or supplement to low-elevation sagebrush habitat? to Western North American Naturalist, *Re-submitted 2009*.

- Larsen, R. T., J. A. Bissonette, J. T. Flinders, M. B. Hooten. *In review*. Summer Spatial Patterning of Chukars in Relation to Free Water in Western Utah. *Landscape Ecology*, *Submitted July 2008*.
- Larsen, R. T., J. A. Bissonette, J. T. Flinders, and A. C. Robinson. *In USGS review*. Does small-perimeter fencing inhibit antelope and mule deer use of free water? Intended for *JWM*.
- Larsen, R. T., J. A. Bissonette, J. T. Flinders, and A. C. Robinson. (in USGS review) Chukar (*Alectoris chukar*) Response to Free Water. Intended for *Journal of Wildlife Management*.
- Miller, S., P. Budy, and J.C. Schmidt. *In review*. Testing the field of dreams hypothesis: Applications of meta-analysis to river restoration. *Restoration Ecology*. *Submitted November 2008*.

Technical Reports

- Budy, P., G.P. Thiede, J. Wood, S. Seidel, and S. Bennett. 2008. Logan River whirling disease study: factors affecting trout population dynamics, abundance, and distribution in the Logan River, Utah. Grant Number XIII. Project F-47-R. 2007 Annual Report to Utah Division of Wildlife Resources. *UCFWRU 2008(2)*: 66 pages.
- Budy, P. J. Botcher, and G.P. Thiede. 2008. Habitat needs, movement patterns, and vital rates of endemic Utah fishes in a tributary to the Green River, Utah. 2007 Annual Progress Report to the Beureau of Reclamation. *UTCFWRU 2008(3)*: 32 pages.
- Budy, P., P. MacKinnon, T. Bowerman, and G.P. Thiede. 2008. Bull trout population assessment in northeastern Oregon: a template for recovery planning. 2007 Annual Progress Report to the US Fish and Wildlife Service. *UTCFWRU 2007(4)*: 73 pages.
- Budy, P., E.S. Hansen, and G.P. Thiede. 2008. Spawn Creek whirling disease study: evaluating the effectiveness of passive stream restoration for improving native fish health and minimizing the impacts of whirling disease. 2007 Annual Report to Utah Division of Water Quality (Non-point Source 319[h] Project, Environmental Protection Agency 310[h], Grant Number 061139) and to Utah Division of Wildlife Resources (Sport Fish Restoration. Grant number XIII. Project F-47-R). *UTCFWRU 2008(5)*: 21 pages.
- Johnson, J.A., B.A. Andres, and J.A. Bissonette. 2008. Birds of the major mainland rivers of southeast Alaska. Gen. Tech. Rep. PNW-GTR-739. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 88 pages..
- Sales-Louis, T., J. A. Bissonette, and M. Santos-Reis. 2008. Importance of pre-classifying river stretches for otter abundance sampling. Tenth International Otter Colloquium Proceedings. <http://www.otterspecialistgroup.org/Bulletin/IUCNOSGBull.html>.

Book Reviews

- Bissonette, J. A. 2008. Book Review of *Habitat Fragmentation and Landscape Change: An Ecological and Conservation Synthesis* by D. B. Lindenmayer and J. Fischer, 2006. *Ecological Restoration* 26(2):162-164.

PUBLIC RELATIONS PUBLICATIONS

- Leavitt, Shauna L. 2008. Rejuvenate Spawn Creek, a Critical Home Ground of the Rare Bonneville Cutthroat Trout. Logan Herald Journal. July 11, 2008 C:1.
- Leavitt, Shauna L. 2008. Highway Mortality: Making Road Systems More Permeable for Wildlife. People, Land & Water. Fall 2008.
- Leavitt, Shauna L. 2008. Testing the waters: Scientists continue study of the Logan River The Herald Journal. Newspaper article about Phaedra Budy's Long Term Logan River Project. Friday August 15, 2008.
- Leavitt, Shauna, L. 2009. A 'Win, Win, Win' Future: With the U.S. Geological Survey Fish and Wildlife Coop Unit, Utah State is helping to define Wildlife management. Utah State Magazine. Winter 2009.

GRADUATE STUDENTS DIRECTED

Theses and Dissertation Completed

- Gross, Donovan, H. 2008. Mountain pine beetle fecundity and offspring size differ among lodgepole pine and whitebark pine hosts. M. S. Thesis, Utah State University, 38 pages
- Nadolski, Benjamin. 2008. Movement patterns and multi-scale factors that influence exotic brook trout distribution and abundance. M.S. Thesis, Utah State University, 79 pages
- Norvell, Russel E. 2008. Disturbance as restoration in the intermountain sagebrush-steppe: Effects on non-target bird species. Ph.D. Dissertation, Utah State University, 144 pages
- Wood, Jeremiah. 2008. An investigation of the early life-history of exotic brown trout (*Salmo trutta*) and potential influences on invasion success. M.S. Thesis, Utah State University, 48 pages
- Larsen, Randy. 2008. A conceptual framework for understanding effects of wildlife water developments in the American southwest. Ph.D. Dissertation, Utah State University, 148 pages

Active Graduate Research Projects

J. A. Bissonette

- Andreas Leidolf, Ph.D. Candidate. Modeling habitat selection behavior in territorial birds: towards a behavioral ecology of landscapes.
- Dan Olson, Ph.D. Candidate. Modeling population effects of deer vehicle collisions.
- Carrie O'Brien, M.S. Candidate. Terrestrial small mammals from the Gamba Complex in Gabon: Sampling techniques, distribution patterns, and landscape factors.
- Hillary White, M.S. Candidate. Developing Riparian Bird Habitat Association Models and Management Guidelines.
- Justin Bingham, M.S. Candidate. Lead Pellet Ingestion by Chukars in the West Desert of Utah: Investigating soil, search images, and toxicology.

T. C. Edwards

- Jacob Gibson. M.S. Candidate. Landscape-level stressors in the Upper Colorado River ecosystem.

Julie Ripplinger. M.S. Candidate. Legacy effects in sagebrush steppe : the key to understanding the future.

Amy Croft. Ph.D Candidate, Co-Chair. Modelling effects of urban disturbance fronts on endangered plant species in the Las Vegas metropolitan area.

Tammy L. Wilson. Ph.D Candidate. Effects of anthropogenic disturbance on habitat use of pygmy rabbits: the role of legacy effects.

P. Budy

Botcher, Jared. M.S Candidate. Habitat needs, movement patterns, and vital rates of endemic fishes in the tributaries to the Green River, UT.

Bowerman, Tracy. Ph.D Candidate. Understanding the effects of land use and natural variation in habitat on early life-history of threatened bull trout.

Dahle, Kirk S. M.S Candidate. Understanding the abiotic and biotic factors that determine fish abundance and diversity along the gradient of a highly altered stream ecosystem.

Andy, Dean. M.S Candidate. Comparative survival of triploid brook trout and food web interactions in high Uintah lakes.

Seidel, Sara. M.S Candidate. Spawning ecology and early-life history of imperiled, endemic cutthroat trout.

Christy Meredith. Ph.D degree in progress. Geomorphic controls of exotic fish expansion.

PRESENTATIONS

Invited

Bissonette, J.A. 2008. Invited Seminar. Restoring landscape permeability to the roaded landscape: Finding the distance. Idaho State University, 5/8/08.

Budy, P. 2008. *Efecto de peces introducidos sobre las redes tróficas en embalses de Norteamérica*. (Food web interactions and the role of a new invader in a large reservoir in USA). Department Seminar, University of Leon, Dept. of Ecology, Spain. 3/31/08.

Edwards, T.C., Jr. Time and species distribution modelling: a conceptual process for moving beyond static prediction maps. Invited paper, Third Workshop on Species Distribution Modelling, Riederalp, Switzerland, 8/11/08.

Edwards, T.C., Jr. Validating forecast models under global change scenarios: the key to utility and application. Invited paper, Annual Meeting on Biodiversity and Ecosystem Changes in Europe (ECOCHANGE), Cluj-Napoca, Romania, 5/12/08.

Edwards, T.C., Jr. Assessing the usefulness of future landscape projections: some simple solutions to a complex issue. Invited paper, University of Edinburgh, Edinburgh, Scotland, 1/29/08.

Contributed

Al-Chokhachy, R., N. Bouwes, and M. Conner and P. Budy. 2008. Bias in salmonid survival rate?: capture-recapture models where multiple life-history forms coexist within a single population. American Fisheries Society, Western Chapter, Portland, Oregon Utah, 5/4/08.

Ascensao, F., C. Grilo, J. A. Bissonette, and M. Santos-Reis. 2008. The role of landscape permeability for stone marten conservation: Patch occupancy and road mortality risk.

Presented at the 23rd Annual Landscape Ecology Symposium, Madison Wisconsin, 4/6-10/08.

- Botcher, J. P. Budy, and J. Botcher. 2008. Habitat requirements, vital rates, and movement patterns of three endemic fishes in the San Rafael River, Utah. Utah American Fisheries Society, Moab, UT, 2/25/08. Best Student Poster Presentation Award (\$250).
- Botcher, J., P. Budy, and G.P. Thiede. 2008. Maintaining population persistence in the face of an extremely altered hydrograph. Desert Fishes Council 2008 Annual Meeting, Mexico, 11/14/08.
- Bowerman, T.B., P.E. Budy, H.A. Schaller. 2008. Use of predictive models to assess the importance of riverscape connectivity on the distribution of an imperiled fish species. American Fisheries Society Utah Chapter Annual Meeting, Moab, Utah, 2/27/08.
- Bowerman, T.B., P.E. Budy, H.A. Schaller. 2008. Use of predictive models to assess the importance of riverscape connectivity on the distribution of an imperiled fish species. American Fisheries Society Western Division Annual Meeting, Portland, Oregon, 5/5/08.
- Budy, P., J. Lobón-Cerviá, G. Ganzalez, L. A. Vøllestad, G. P. Thiede, and E. Becares. A cross-continental, bioenergetic comparison of factors limiting the endemic and exotic distribution of brown trout under current and future environmental conditions. American Fisheries Society, National , Ottawa, Canada. 8/08.
- Grilo, C., M. Cruz, J. A. Bissonette, and M. Santos-Reis. 2008. Sensitivity of carnivores to habitat fragmentation from a multi-scale perspective. Poster presented at the 23rd Annual Landscape Ecology Symposium, Madison Wisconsin, 5/6-10/08.
- Miller, S.W., P.E. Budy, and J. C. Schmidt. 2008. Testing the field of dreams hypothesis: Applications of meta-analysis to river restoration. North American Benthological Society, Salt Lake City, Utah, 5/25/08.
- Seidel, S.S., P.E. Budy, S. Bennett, and B. Roper. 2008. The spawning ecology and early life history of Bonneville cutthroat trout in northern Utah. Utah American Fisheries Society, Moab, UT, 2/25/08.
- Seidel, S., P. Budy, and B. Roper. 2008. Spawning ecology and early life-history of Bonneville cutthroat trout (BCT) in northern Utah. American Fisheries Society, National , Ottawa, Canada. 8/08.
- Wilson, T. L., M. B. Hooten, and T. C. Edwards, Jr. Improving habitat models for rare and inconspicuous species: A multi-part conditional approach. Poster presented at the 93rd Annual Meeting of the Ecological Society of America, Milwaukee, Wisconsin, 8/6/06.
- Wood, J.R., and P. Budy. 2008. Spawning ecology and early life-stage survival influence the distribution of brown trout in a native cutthroat trout stream. American Fisheries Society, Idaho Chapter Annual Meeting, Post Falls, Idaho, 2/6/08.
- Wood, J.R., and P. Budy. 2008. Spawning ecology and early life-stage survival influence the distribution of brown trout in a native cutthroat trout stream. American Fisheries Society, Utah Chapter Annual Meeting, Moab, Utah, February, 2008. Best Student Oral Presentation Award (\$250).

UNIVERSITY COURSES

Classes

J. A. Bissonette

WILD 6710-7710, Wildlife Ecology (Spring 2008, 21 students)

T. C. Edwards

WILD 6500, Biometry: Design and Analysis of Ecological Research (Fall 2008, 19 Students)

P. Budy

WATS 3100/5100, Fish Diversity and Conservation (Fall 2008, 27 students)

WATS 3100/5100, Fish Diversity and Conservation Laboratory Practicum (Fall 2008, 9 students)

WORKSHOPS

T. C. Edwards

Co-organized and led the Third Triennial Workshop on Species Distribution Models, held in Riederalp, Switzerland, 8/9-17/08.

Species distribution models in conservation #1 - the statistics that underlie them. Online presentation to U.S. Fish and Wildlife Service, National Conservation Training Center, Shepherdstown, West Virginia, 2/7/08.

Species distribution models in conservation #2 – validation as the key to proper application. Online presentation to U.S. Fish and Wildlife Service, National Conservation Training Center, Shepherdstown, West Virginia, 3/20/08.

P. Budy

Principles of Stream Restoration – Part I, Utah State University, Department of Watershed Sciences. Co-taught with J. Schmidt, M. Kondolf, and P. Wilcox. 5-day short course. 7/08.

OUTREACH AND DISTANCE EDUCATION

P. Budy

Lead a field trip and presented field stream-side presentation to the Spawn Creek Passive Restoration and Research Study Site located in Logan Canyon, UT for the Trout Unlimited (TU) national convention, held at Snowbird, UT (September 11-14, 2008).

Earth Day Environmental Explorations. On the Watershed Sciences Department at Utah State University conducted an Earth Day activity involving environmental explorations for two Cache Valley high schools. As part of the Earth Day event, the Fish Ecology Lab of the Utah Cooperative Fish and Wildlife Unit, demonstrated fish sampling techniques including electrofishing, stomach pumping for stomach content analysis and fish tagging. We then discussed the information we gained from sampling, answered questions, and discussed a few bigger picture issues about the environment in general. We interacted with seven groups of between 5-8 students (April 22, 2008).

Evaluating the effectiveness of stream bank and riparian protection in restoring the water quality, stream habitat, and fish community of an important trout, spawning stream: Spawn Creek, Utah'. *Presentation to:* Public as invited and coordinated by the Utah Watershed Coordinating Council. Phaedra Budy, Eriek Hansen, and Gary Thiede, (March 19, 2008).

State Volunteers and Education.

Each year, we work with the Utah Division of Wildlife Resources Dedicated Hunter program. Volunteers provide about 130 - 180 volunteer hours, and we educate them about our projects and the goals of the project. They also receive information about my fish

ecology lab and on-going research , and basics of fish biology, ecology and conservation (via actions, demonstrations, and a handout). Annual.

RECOGNITION AND AWARDS

Leaders:

J. A. Bissonette

Received USGS Star Award, 2008

Students and Faculty Collaborators:

Botcher, J. and P. Budy. 2008. American Fisheries Society, Utah Chapter Annual Meeting, Moab, UT, February 25, 2008. Best Student Poster Presentation Award (\$250).

Bowerman, T. 2008. College of Natural Resources, Teaching Assistant of the Year. Submitted for USU Robbins Award for USU Teaching Assistant of the Year.

Wood, J.R., and P. Budy. 2008. American Fisheries Society, Utah Chapter Annual Meeting, Moab, Utah, February, 2008. Best Student Oral Presentation Award (\$250).

PROFESSIONAL SERVICE

J. A. Bissonette:

Reviewed for: Acta Theriologica, American Midland Naturalist, Biological Conservation, Cooperative Grants Program-US Civilian Research and Development Foundation, Conservation Biology, Environmental Management, Journal of Mammalogy, Landscape and Urban Planning, National Science Foundation, Chapter on wolf recovery for edited book, Journal of Wildlife Management, Journal of Applied Ecology, Landscape Ecology

Editorial Board: European Journal of Wildlife Research, 2003-present

Coordinating Editor: Landscape Ecology, 2008-present

Host: 2009 Annual Meeting, International Association of Landscape Ecologists, Snowbird, Utah.

T. C. Edwards

Reviewed for: Reviewer for: Conservation Biology, Ecology, Ecological Applications, Landscape Ecology, Ecological Modelling, Biological Conservation, Trends in Ecology and Evolution, Diversity and Distributions, Ecography

Member: Utah Partners in Conservation and Development Science Committee (Appointed 2004)
Member, Utah Partners in Flight (2002-current)

Associate Editor: Journal of Applied Vegetation Science (2006-current) (6)

Assistant Treasurer: Cooper Ornithological Society (2003-current)

Program Chair: 2009 Annual Meeting, International Association of Landscape Ecologists, Snowbird, Utah.

P. Budy:

Assistant Director: Intermountain Center for River Rehabilitation and Restoration, Utah State University (2006 – present).

Scientific Expert: Lake trout Suppression Workshop,:

Goal: examine (a) information concerning the effects of lake trout predation on the native Yellowstone cutthroat trout in Yellowstone Lake and (b) the effectiveness of the suppression program. Chico Hot Spring Resort, Montana, (August 25-29, 2008).

Reviewed for: Canadian Journal of Fisheries and Aquatic Sciences, Transactions of the American Fisheries Society, Ecology of Freshwater Fish, Fish Biology.

Member: USU, Watershed Sciences, Spatial Analyst and Ecologist Faculty Search Committee (2008).

Member: USU, Watershed Sciences, USU/ BLM Bug Lab Director Search Committee (2008)

Member: USFWS Bull Trout Research, Monitoring, and Evaluation Technical Team, 2003-present.

RESEARCH

Ongoing, Completed, and New Starts

J. A. Bissonette

- 2007-2009 Lead Pellet Ingestion by Chukars in the West Desert-(\$ sources same as below). ONGOING.
- 2006-2008 Water Ecology of Chukars (*Alectoris chukar*): Implications for Species Management in Arid Environments.- Utah Division of Wildlife Resources, Utah Habitat Council, Utah Chukar Foundation, Water for Wildlife Foundation, Sportsman for Habitat, Nevada Chukar Foundation, Carson Valley Chukar Club, Pheasants Forever, Salt Lake County Fish and Game Association, Pershing County Chukars Unlimited, Utah State Parks, BYU, USU Quinney Foundation, \$489,361. ONGOING.
- 2006-2008 Riparian Bird Habitat Models and Habitat Guidelines (Co-PI with Mary Conner) - Utah Division of Wildlife Resources \$130,850. ONGOING.
- 2004-2007 Evaluation of the Use and Effectiveness of Wildlife Crossings—Phase 1&2. (PI) - National Academy of Sciences, TRB, NCHRP, \$559,000. COMPLETED.
- 2007-2008 Evaluation of the Use and Effectiveness of Wildlife Crossings—Phase 3 (PI)- National Academy of Sciences, TRB, NCHRP, \$75,000. COMPLETED.
- 2004-2006 Vegetation Exclosures (PI) -Bureau of Land Management, Forest Service, Utah Division of Wildlife Resources, \$56,00. COMPLETED.
- 2003-2006 Biophysical Gradients in Sagebrush Shrub Steppe (PI) - Forest Service \$145,538. COMPLETED.
- 2004-2006 Highway Effects in Small Mammal Communities and Effectiveness of a Deer-Vehicle Collision Strategy (PI) - Bureau of Land Management, Utah Department of Transportation, Utah Division of Wildlife Resources, \$123,695. COMPLETED.

T. C. Edwards

- 2007-2011 ECOCHANGE: Challenges in assessing and forecasting biodiversity and ecosystem changes in Europe (Co-PI) -European Union - (funded through Swiss Federal Research Lab WSL, Birmensdorf, Switzerland, \$7,000,000€(7513,170€ WSL). ONGOING.

- 2007-2009 Upper Colorado River Ecosystem: the identification and modelling of anthropogenic stressor effects on an ecosystem (PI) - US Fish and Wildlife Service, \$120,000. ONGOING.
- 2006-2008 The Las Vegas Valley boundary disposal area: evaluating alternative land-use planning scenarios and potential relationships with measures of disturbance and area ecological integrity (Co-PI) - Bureau of Land Management, \$750,000. ONGOING.
- 2004-2009 Integrated resource assessment, inventory and monitoring of wildlife responses to manipulation of the shrubsteppe environment (PI) - Utah Division of Wildlife Resources and Federal Partners, \$1,120,000, - Natural Resources Conservation Service, \$640,000, - S. E. J. Quinney Foundation, \$180,000. ONGOING.

P. Budy

- 2007-2008 Habitat needs, movement patterns, and vital rates of endemic Utah fishes in a tributary to the Green River, Utah. Principal Investigator: Budy. 2007-2008, Bureau of Reclamation (BoR) \$123,388. ONGOING.
- 2008-2009 Comparative survival of triploid brook trout and food web interactions in high Utah lakes. (PI) - UDWR, \$64,227. ONGOING.
- 2001-2006 Limiting factors affecting trout population dynamics, abundance, and distribution in the Logan River, Utah. Four primary components:
- 1) Population dynamics and disease: Utah Division of Wildlife Resources, (PI) - UDWR, \$358,742. ONGOING
 - 2) Species interactions. (PI) - Utah State University, Community-University Research Initiative (CURI), and the Quinney Foundation, \$53,510. COMPLETED
 - 3) Anthropogenic impacts: Co-P.Is: M. Vinson and J. Schmidt, Utah State University, Water Initiative, \$42,919. ONGOING
 - 4) Passive stream restoration. (PI) - USU Research Funds, UDWR, Trout Unlimited, Embrace-A-Stream, and EPA CWA 319 Grant, \$98,963 (does not include fencing). ONGOING
- 2002-2008 Bull trout population assessment and life history characteristics in association with habitat quality and land use: template for recovery planning. (PI) - US Fish and Wildlife Service (USFWS), \$846,623. ONGOING
- 2006-2008 Southwest regional risk assessment for whirling disease in native salmonids in arid and semi-arid lands: Arizona, Colorado, New Mexico, and Utah. (PI) : Budy and 5 others, -Administered through U.S. Geological Survey, New Mexico Cooperative Fish and Wildlife Research Unit. Whirling Disease Initiative, \$196,310. ONGOING

The Effects Of Fire On Avian Communities

Dates:

2003-2009

Abstract:

This three-part study examines the effects of fire on avian communities based on an analysis of the extant literature. In the first phase of this investigation, we constructed an indexed and cross-referenced bibliographic database of 512 studies investigating the effects of fire on avian communities published during 1912-2003. In the second phase, we reviewed the temporal, geographic, and biogeographic distribution, as well as relevant research and publication attributes, of these documents to provide an assessment of their scope and recommendations for future research. The third, ongoing phase of this project, focuses on a comprehensive ecological synthesis of the literature to be completed in 2009.



Funding:

Utah Army National Guard
Utah Division of Wildlife Resources
The Wildlife Society, Utah Chapter

Investigators:

John A. Bissonette, U.S. Geological Survey and Utah State University
Andreas Leidolf, Graduate Research Assisitant (Ph.D.)

Publications:

Leidolf, A., and John A. Bissonette. 2009. The effects of fire on avian communities: spatio-temporal attributes of the literature 1912-2003. *International Journal of Wildland Fire* 18:*in press*.

Leidolf, A., and John A. Bissonette. *In review*. Literature searching in ecology: a case study. *Auk*.



Causes And Consequences For Lead-Pellet Contamination Of Chukars (*Alectoris Chukar*): Examining Habitat, Search Images, And Toxicology

Dates:

2007- 2009)

Abstract:

We conducted various sampling and experimental techniques to assess potential causes, including density of lead pellets in soils, use of natural and man-made water sources, and similarities between lead pellets and food/grit items, for lead-pellet ingestion in chukars (*Alectoris chukar*). We performed toxicological experiments addressing consequences of lead in chukars stemming from both ingestion of spent lead and penetration of spent lead into edible tissues. We collected hunter-harvested chukars to have their liver and bone tissues analyzed for lead residues to compare lead concentrations of wild chukars with those of captive chukars receiving known quantities of lead. We are currently in the process of organizing and analyzing our data. We anticipate that valuable management implications and suggestions will emerge from our research concerning the causes and consequences of lead-pellet contamination in chukars, and the concomitant effects of such contamination on humans and other wildlife.



Funding:

Utah Department of Natural Resources (Division of Wildlife, Division of State Parks), Nevada Department of Wildlife, Water for Wildlife, Utah Chukar and Wildlife Foundation, Carson Valley Chukar Club, Pershing County Chukars Unlimited, Salt lake County Fish and Game, and Nevada Chukar Foundation

Investigators:

John A. Bissonette, U.S. Geological Survey and Utah State University (CO-PI)
Randy T. Larsen, Brigham Young University (CO-PI)

R. Justin Bingham, Graduate Research Assistant (M.S. Candidate)

Publications:

Bingham, R. J., R. T. Larsen, J. A. Bissonette, and J. T. Flinders. 2009. Causes and consequences of ingested lead pellets in Chukars. Abstract in R. T. Watson, M. Fuller, M. Pokras, and W. G. Hunt, (Eds.). Ingestion of Lead from Spent Ammunition: Implications for Wildlife and Humans. Peregrine Fund, Boise, Idaho, USA. DOI 10.4080/ilsa.2009.0204

TERRESTRIAL SMALL MAMMALS FROM THE GAMBA COMPLEX IN GABON: DISTRIBUTION PATTERNS AND LANDSCAPE INFLUENCES

Dates:

2005-2008

Abstract:

The small mammal communities of central Africa and especially Gabon is not well understood. We set out to compare the community composition between inland and coastal sites. The ecological factors influencing distribution patterns of small mammals in central Africa is not well understood. We evaluated the role of disturbance at paired inland and coastal sites using landscape variables generated from satellite imagery. Regression analyses revealed that while the amount of forest present at a site was strongly correlated with rodent richness ($F = 16.437$; $df = 1$; $p = 0.001$), shrew richness was negatively correlated with the amount of roads (partial $F = 12.232$; $df = 1$; $p = 0.007$) and rainfall (partial $F = 6.035$; $df = 1$; $p = 0.036$) and positively with elevation (partial $F = 6.832$; $df = 1$; $p = 0.028$). Our results suggest that while disturbance has created additional habitats for rodents, the loss of specialist rodents from coastal sites reflects their inability to tolerate the edge-affected, fragmented, and less diverse forests in that region.



Funding:

Smithsonian Institution

Investigators:

John A Bissonette, U.S. Geological Survey and Utah State University (PI)
Carrie O'Brien, Graduate Research Assistant (M.S.)

Reports:

The thesis is in its final stages, and two manuscripts are in preparation.

Developing Riparian Bird Habitat Association Models and Management Guidelines.

Dates:

2006-2009

Abstract:

Avian surveys were conducted in riparian habitats at 37 sites statewide from 1992-2008 using variable radius distance sampling techniques. Avian species density is estimated using a computer package (Program DISTANCE) that is designed to analyze distance sampling surveys of wildlife populations. More than twenty species have been selected for analysis based on adequate sample size and includes some species that have been identified as species of management concern or priority species. Point-level vegetation data was also collected at these bird monitoring sites every 3 years, for a total of 5 survey years over the course of this riparian monitoring program. These data are currently being compiled and analyzed. Several statistical methods will be used to create bird-habitat association models.



Funding:

Utah Division of Wildlife Resources

Investigators:

J.A. Bissonette, Leader, USGS Utah Cooperative Fish and Wildlife Research Unit
Frank Howe, Utah Division of Wildlife Resources.
Hillary White, Graduate Research Assistant, M.S.
Tim Avery, Adam Brewerton, Matt Brooks, Alison Cebula, Matt Christensen, B.J.Evans,
Landon Jones, Stacie Schoppman, Kim Score, Field Technicians

Reports:

Thesis in preparation

Publications:

Planned once thesis is completed

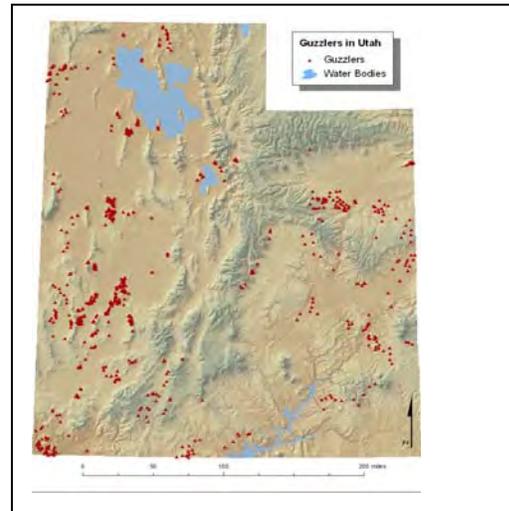
Water Ecology Of Chukars: Implications For Management

Dates:

2006-2009 (Completed 2006)

Abstract:

I developed the following framework to gain an integrated understanding of the ways free water influences animal populations. The following five elements are fundamental to an integrated understanding of wildlife water developments in the western U.S.: 1) consideration of the variable nature in time and space of available free water, 2) location and availability of pre-formed and/or metabolic water, 3) seasonal temperature and precipitation patterns that influence the physiological need for water, 4) behavioral constraints that limit use of otherwise available free water, and 5) proper spacing of water sources for target species.



Funding:

Utah Chukar Foundation , Carson Valley Chukar Club, Sportsmen for Fish and Wildlife, Water for Wildlife Foundation, Utah State Parks, Utah Division of Wildlife

Investigators:

John A Bissonette, U.S. Geological Survey and Utah State University (PI)
Randy Larsen, Graduate Research Assistant (Ph.D.)
Justin Bingham, field technician

Reports:

Dissertation completed, manuscripts currently in progress

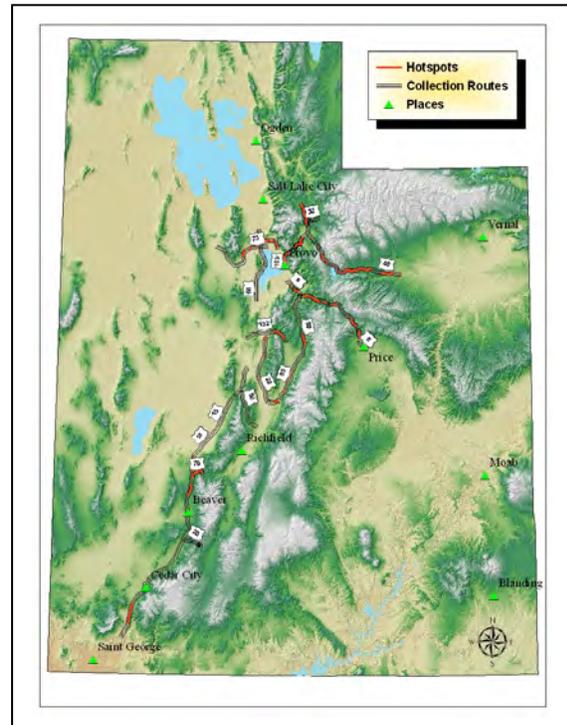
VEHICLE-RELATED MORTALITY IN MULE DEER: POPULATION EFFECTS, ESTIMATION BIAS, AND ASSOCIATED LANDSCAPE FEATURES

Dates:

2008-2012

Abstract:

We are initiating a project to evaluate mortality of mule deer populations in Utah. We are working with the Utah Division of Wildlife Resources to assess over-wintering mortality with road-related mortality from deer-vehicle collisions (DVCs). We will document survival rates (with emphasis on over-wintering mortality) of adult, female mule deer by radio collaring and monitoring deer in areas with elevated vehicle-related mortality. To do that we have identified long term carcass mortality data and overlaid the location of those data with known hotspots of DVCs. We will also evaluate the effectiveness of carcass collections as a means to estimate vehicle-related mortality. We will double sample a selection of routes that are regularly covered by UDWR personnel. Finally, we will describe the landscape features that are associated with deer-vehicle collision hotspots and generate a predictive model for the state.



Funding:

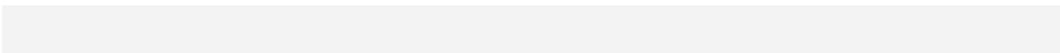
We are currently seeking funding from: Utah Division of Wildlife Resources, Mule Deer Foundation, Boone and Crockett Club, and Sportsmen for Fish and Wildlife.

Investigators:

John C. Bissonette, USGS Utah Cooperative Fish and Wildlife Research Unit (PI)
Daniel D. Olson, Utah State University (Graduate Student)

Reports:

Publications:



Integrated Resource Assessment, Inventory and Monitoring of Wildlife Responses to Manipulation of the Shrubsteppe Environment

Dates:

2004-2009 (Completed 2009)

Abstract:

This long-term, experimentally-based research is designed to evaluate impacts of sagebrush steppe disturbance and restoration on associated animal species and groups. Research involves the experimental manipulation of ~10,000 ha of sagebrush steppe in northern Utah, and measurement of 5-year disturbance effects on selected animal species and groups, and plant communities. We are simultaneously evaluating inventory, monitoring, and assessment techniques for determining the status of plant and animal species and communities in the sagebrush steppe environment. Research also includes a historical retrospective study designed to reconstruct the past 100 years of management and disturbances impacts over a 440,000 ha study region. Project is on a mixture of public and private lands in northern Utah, and involves coordination with a public Coordinated Resource Management group, and numerous Federal, State and non-government



Funding:

Natural Resources Conservation Service
Utah Division of Wildlife Resources
S.J. Quinney Foundation

Investigators:

Thomas C. Edwards, U.S. Geological Survey and Utah State University (PI)
Frank Howe, Utah Division of Wildlife Resources
Karen H. Beard, Wildland Resources, Utah State University

Russel E. Norvell, Graduate Research Assistant (PhD Ecology 2008)
Tammy M. Wilson, Graduate Research Assistant (PhD)
Julie Ripplinger, Graduate Research Assistant (MS)
Roger Stringham, Graduate Research Assistant (MS)

Reports:

Edwards, T. C., Jr., K. H. Beard, and F. Howe. 2009. Integrated Resource Assessment, Inventory and Monitoring of Wildlife Responses to Manipulation of the Shrubsteppe Environment. Final Project Report No. 2009-1, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA.



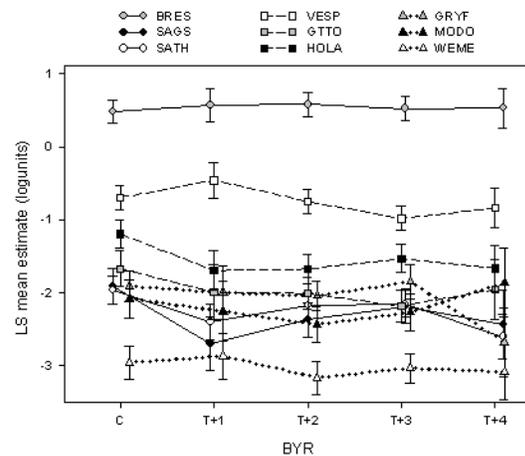
Disturbance as Restoration in the Intermountain Sagebrush-Steppe: Effects on Non-Target Bird Species

Dates:

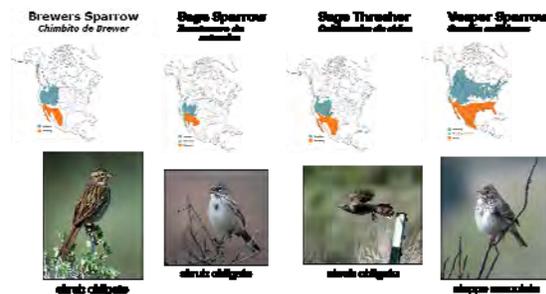
2005-2008 (Completed 2008)

Abstract:

Changes in shrubsteppe passerine bird habitat associations in response to disturbance were investigated at multiple temporal and spatial scales. Spatial measures incorporated the effects of area at different ecological scales (nest site, territory, and landscape) to include ecologically meaningful extents. Temporal measures included seasonal and annual effects, and were designed to detect lagged responses should they occur. Local-to-landscape scale effects of mechanical restoration treatments on local extirpation and abundances of nine species indicated most were insensitive to changes in habitat quality, while abundance models showed only broad declines. Time since treatment affected nest success in two of the four species, yet the changes in habitat quality did not forecast changes in habitat preference as expected.



Change in density of nine shrubsteppe associated bird species as a function of time since mechanical treatment to sagebrush.



Funding:

Utah Division of Wildlife Resources
Natural Resources Conservation Service, State of Utah Office

Investigators:

Thomas C. Edwards, U.S. Geological Survey and Utah State University (PI)

Russell E. Norvell, Graduate Research Assistant (PhD Ecology 2008)

Reports:

Norvell, R. E. 2008. Disturbance as Restoration in the Intermountain Sagebrush-Steppe: Effects on Non-Target Bird Species. Unpublished Ph.D. Dissertation, Utah State University, Logan, Utah 84322-5230 USA.

Publications:

Norvell, R.E., T. C. Edwards, Jr., and F. P. Howe. Disturbance as restoration in shrubsteppe: mixed effects on non-target bird species. In review, Ecological Applications.

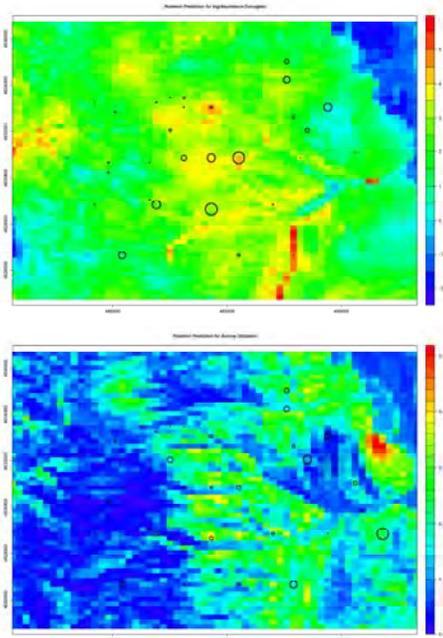
Hierarchical Spatial Models for Predicting Pygmy Rabbit Distribution in Sagebrush-steppe

Dates:

2006-2010 (Ongoing)

Abstract:

A common problem with species distribution models for inconspicuous species is low detection probabilities, resulting in poor model sensitivity and high parameter uncertainty. Problems are further compounded when only indirect sign of animal occupancy are available to build models. To solve some of these problems, we specify and implement a spatially-explicit Bayesian hierarchical model for a cryptic mammal species (pygmy rabbit-*Brachylagus idahoensis*). Our model takes advantage of two levels of indirect sign to build posterior distributions of regression coefficients as well as predictions of burrow intensity and rabbit occupancy. Model outputs can then be used to generate statistically rigorous abundance, occupancy, and management action maps as well as spatial representations of uncertainty in these modeled quantities to aid in scientific inference.



Bayesian posterior probabilities for pygmy rabbit burrow abundance (top) and utilization (bottom). Warmer colors indicate higher likelihoods.

Funding:

Utah Division of Wildlife Resources
Natural Resources Conservation Service, State of Utah Office

Investigators:

Thomas C. Edwards, U.S. Geological Survey and Utah State University (PI)

Tammy L. Wilson, Graduate Research Assistant (PhD Ecology)

Reports:

None; research is ongoing

Publications:

None; research is ongoing

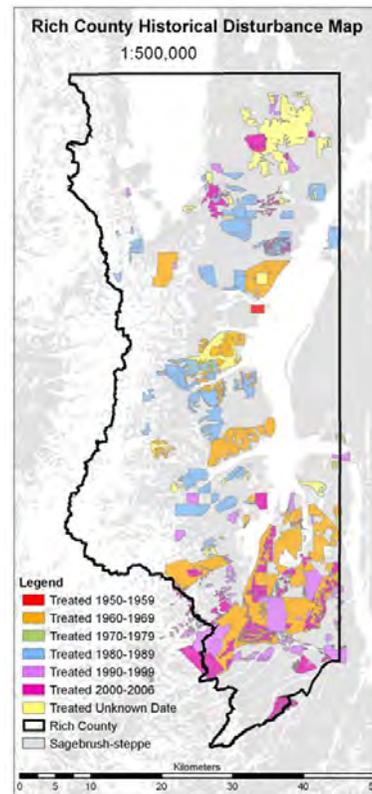
Legacy Effects: The Future of Arid Land Plant Communities is Determined by the Past

Dates:

2007-2009 (Ongoing)

Abstract:

This research investigates the effect of historical (legacy) and modern land-use practices on plant community composition in the shrubsteppe of Rich County, Utah, USA. To conduct this study, we will first construct GIS maps of historical disturbances using private and management agency records. We will classify historical land-use into three management types for investigation: prescribed burning, mechanical and herbicidal shrub removal. Primary vegetation data (e.g. Modified-Whittaker nested plots and line-point intercept) will be collected at randomly selected points within the boundaries of land-use map polygons. We will use general linear models and multivariate techniques to statistically test differences through time in plant community composition, species richness and biodiversity. Finally, we will model the trajectories of vegetation community succession in response to the three different land-use regimes.



Spatial distribution of past management treatments (fire, herbicide, mechanical) in Rich County, Utah.

Funding:

Utah Division of Wildlife Resources
Natural Resources Conservation Service, State of Utah Office

Investigators:

Thomas C. Edwards, U.S. Geological Survey and Utah State University (PI)

Julie Ripplinger, Graduate Research Assistant (MS Ecology)

Reports:

None; research ongoing

Publications:

None; research ongoing

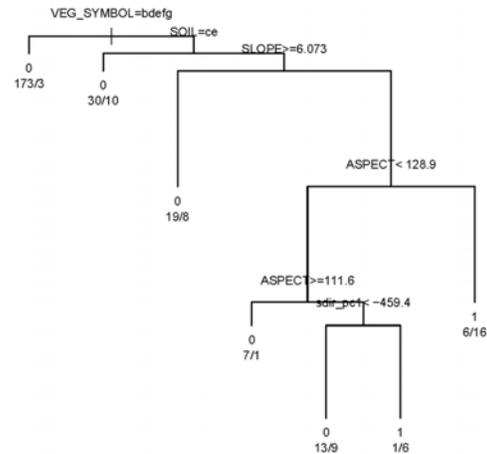
The Las Vegas Valley Boundary Disposal Area: Evaluating Alternative Land-Use Planning Scenarios and Potential Relationships with Measures of Disturbance and Area Ecological Integrity

Dates:

2006-2009 (Completed)

Abstract:

We evaluated the capability of different spatial configurations of a proposed Conservation Transfer Area (CTA) within the boundary of the Congressionally-mandated Las Vegas Boundary Land Disposal Area, Las Vegas, Nevada, to preserve specified ecological and paleo-ecological resources. Research specifics were to characterize urban disturbance fronts, including socio-economic and spatial attributes, and to model potential effects of these disturbance fronts on two rare plant species (golden bearclaw-poppy (*Arctomecon californica*), Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii*)), plant communities, and paleo-ecological resources in the Land Disposal Area.



Classification tree model predicating the likelihood of presence of the golden bearclaw-poppy, one of the plant species of concern in the Las Vegas Wash Conservation Area, Las Vegas, Nevada, as a function of environmental predictors.

Funding:

Bureau of Land Management, State of Nevada Office, Las Vegas

Investigators:

James A. MacMahon, Ecology Center and Biology, Utah State University (PI)
Richard E. Toth, Environment and Society, Utah State University (PI)
Richard S. Krannich, Sociology, Social Work, and Anthropology, Utah State University
Thomas C. Edwards, U.S. Geological Survey and Utah State University
Janis L. Boettinger, Plants, Soils and Biometeorology, Utah State University
Amy Croft, Graduate Research Assistant (PhD Ecology)

Reports:

MacMahon, J. A., R. E. Toth, R. S. Krannich, T. C. Edwards, Jr., J. L. Boettinger.
The Las Vegas Valley Boundary Disposal Area: Evaluating Alternative Land-Use Planning Scenarios and Potential Relationships with Measures of Disturbance and Area Ecological Integrity. Final Project Report No. 2009-2, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA.

Publications:

In preparation.

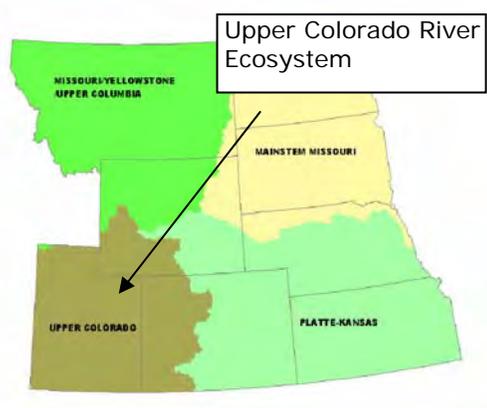
Upper Colorado River Ecosystem: The Identification and Modelling of Anthropogenic Stressor Effects on an Ecosystem

Dates:

2006-2009 Ongoing

Abstract:

Research is a "proof-of-concept" approach for newly developing ecosystem planning for R6, US Fish and Wildlife Service. Research elements are to identify and model relationships among current and potential future anthropogenic stressors (e.g., gas/oil development, urban growth) affecting landscape-level elements and selected plant and animal species of the Upper Colorado River Basin. Stressor impacts to be evaluated consist of those resulting in: (i) changes in land-use; (ii) the introduction of exotic species; (iii) the release of toxic substances into water, land and air; and (iv) over-harvesting of resources, whether renewable or not.



Funding:

U.S. Fish and Wildlife Service, Region 6

Investigators:

Thomas C. Edwards, USGS Utah Cooperative Fish and Wildlife Research Unit, Wildland Resources, Utah State University (PI)

Richard E. Toth, Environment and Society, Utah State University

Students of the Environment and Society Bioregional Planning MS Program, Utah State University

Reports:

Annual Report 2007

Annual Report 2008



Publications:

None yet; research ongoing

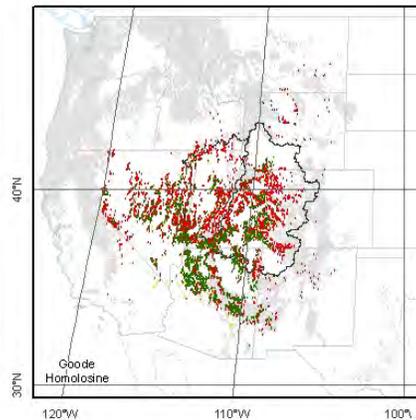
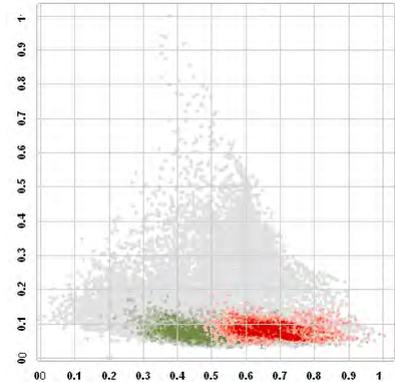
Modelling Climate Effects on North American Dry Mid-latitude Conifers

Dates:

2007-2009 Ongoing

Abstract:

We are evaluating projected climate-induced geographic distribution shifts for 29 species of arborescent conifers inhabiting North America's arid interior west. Magnitude of climate change for the current century was calculated from the Hadley Climate Center HadCM3 model run with the Intergovernmental Panel on Climate Change emission storylines A2 and B1, representing severe and moderate scenarios, respectively. The utility of three contemporary classification techniques will be compared, including Classification Trees, Random Forests, and MaxEnt. Distribution models were developed on a species by species basis using USDA Forest Service FIA Program forest inventory data. The application of climate change scenarios to the distribution models should detect of areas becoming suitable to colonizing populations, as well as areas no longer suitable for regeneration of existing populations. The selection of a regional pool of functionally and taxonomically related species provided a context for gauging shifts in the co-occurrence of species.



Shift in climate space (top, green to red) and potential geographic loss (red) for Utah Juniper under projected climate change scenarios, HadCM3 model

Funding:

U.S. Fish and Wildlife Service, Region 6
USDA Forest Service, Rocky Mountain Research Station, FIA Program

Investigators:

Thomas C. Edwards, U.S. Geological Survey and Utah State University (PI)
Gretchen G. Moisen, USDA Forest Service RMRS

Jacob Gibson, Graduate Research Assistant (MS Ecology)

Reports:

None; research ongoing

Publications:

None; research ongoing.

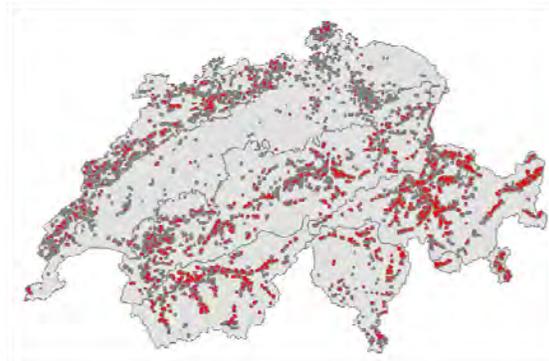
ECOCHANGE: Challenges in assessing and forecasting biodiversity and ecosystem changes in Europe

Dates:

2007-2011 Ongoing

Abstract:

Research objectives are to evaluate the synergistic effects of land-use and global climate change on plant and animal distributions in western Europe using satellite-derived land-use transition matrices, hindcasting for land-use history, and predictive forecasting of potential gains/losses in species areal extents due to economic and ecological forces. I work with the Swiss Federal Research Lab WSL research group, with responsibilities for development of spatially explicit models of land-use from socio-economic data, and distribution models of selected plant and animal species and groups. The project is a 5-year research effort on global change effects involving a consortium of 19 European Research Institutions from 11 nations.



Current (grey) and predicted loss (red) of high Alp meadows in Switzerland under projected climate change for Western Europe. Switzerland high Alp meadows contain up to 40%-50% of the IUCN Red List flowering plant species.

Funding:

European Union (funded through Swiss Federal Research Lab WSL, Birmensdorf, Switzerland)

Investigators (WSL associates only):

Niklaus Zimmermann, Felix Kienast, Ana Hersberger
Swiss Federal Research Lab WSL, Birmensdorf, Switzerland
Thomas C. Edwards, U.S. Geological Survey and Utah State University

Reports:

ECOCHANGE Reports available at: <http://www.ecochange-project.eu/>

Publications:

Niklaus E. Zimmermann, N. E., N. G. Yoccoz, T. C. Edwards, Jr., E. S. Meier, W. Thuiller, A. Guisan, D. R. Schmatz and P. B. Pearman. Do climatic extremes better predict tree species range limits than means? In review (Invited paper), Proceedings of the National Academy of Science.

Edwards, T. C., Jr., F. Kienast, and J. Bolliger. Assessing the effectiveness of agro-environmental conservation programs in maintaining high Alp meadow biodiversity. In review (USGS FSP process).

Bolliger, J, T. Dalang, T. C. Edwards, Jr., F. Kienast, and E. Meier. Reforestation risks in dry grasslands of high conservation priority: challenges for management. In review, Conservation Biology.

Riederalp 2008: The Utility of Species Distribution Models as Tools for Conservation Ecology

Dates:

2007-2008 (Completed 2008)

Abstract:

Previous Riederalp workshops were held in 2001 and 2004. The workshops combined resulted in 49 direct publications in 5 journals. ISI citations of the 49 publications have totaled 1,045 as of December 2007, solid evidence that of the effectiveness of focused workshops such as Riederalp on advancing scientific inquiry. The purpose of the 2008 workshop was to evaluate the utility of the output of statistical tools used to model species distributions for resolving crucial conservation and ecological issues. Two special publication issues are planned.



Participants of Riederalp 2008: The Utility of Species Distribution Models as Tools for Conservation Ecology, Riederalp, Switzerland, August 2008.

Funding:

Swiss Federal Research Lab WSL, Birmensdorf, Switzerland

Investigators:

Thomas C. Edwards, U.S. Geological Survey and Utah State University (PI)
Niklaus Zimmermann, Swiss Federal Research Lab WSL, Birmensdorf, Switzerland (PI)

Reports:

None required.

Publications:

Special Issue #1: The Temporal Aspect of Species Distribution Models: An Unrealized Potential (In development, Ecological Applications)

Editors:

Thomas C. Edwards, Jr., US Geological Survey and Utah State University
Janet Franklin, San Diego State University
Gretchen Moisen, US Forest Service
Boris Schroeder, Postdam University
Niklaus Zimmermann, Swiss Federal Research Lab

Special Issue #2: Understanding the Niche: How Can Species Distribution Models Help? (In development, Ecography)

Editors:

Niklaus Zimmermann, Swiss Federal Research Lab
Antoine Guisan, University of Lausanne
Jens-Christian Svenning, Aarhus Universitet
Peter Pearman, Swiss Federal Research Lab
Catherine Graham, State University of New York
Thomas Edwards, US Geological Survey

Maintaining population persistence in the face of an extremely altered hydrograph.

Dates:

2007-2009

Abstract:

We evaluated limiting factors for three sensitive fish species (the bluehead sucker, flannelmouth sucker, and roundtail chub) in the San Rafael River by examining fish distribution and community composition across time, movement patterns, and habitat preferences. In addition, we completed a random forest analysis, which identified and ranked the most important predictors of species distribution. Our results indicate that bluehead sucker and roundtail chub are likely habitat limited, and source-sink dynamics are driving population persistence. Removing barriers to dispersal and ensuring year-round flows would increase juvenile recruitment and adult survival.



Funding:

US Bureau of Reclamation, Utah Division of Wildlife Resources, US Geological Survey - UCFWRU

Investigators:

Phaedra Budy, Principle Investigator, USGS – UCFWRU, USU- Dept. of Watershed Sciences

Gary P. Thiede, Fishery Biologist, USU- Dept. of Watershed Sciences

Jared Bottcher, Graduate Research Assistant (M.S.) USGS – UCFWRU, USU- WATS

{expected graduation, April, 2009}

Publications:

Budy, P., J. Bottcher, and G.P. Thiede. 2008. Habitat needs, movement patterns, and vital rates of endemic Utah fishes in a tributary to the Green River, Utah. 2007 Annual Report to the Bureau of Reclamation, Upper Colorado Region. UTCFWRU 2008(3):1-32.

Triploid versus diploid brook trout: a comparative evaluation of relative performance with consideration of factors limiting survival and growth of stocked brook trout

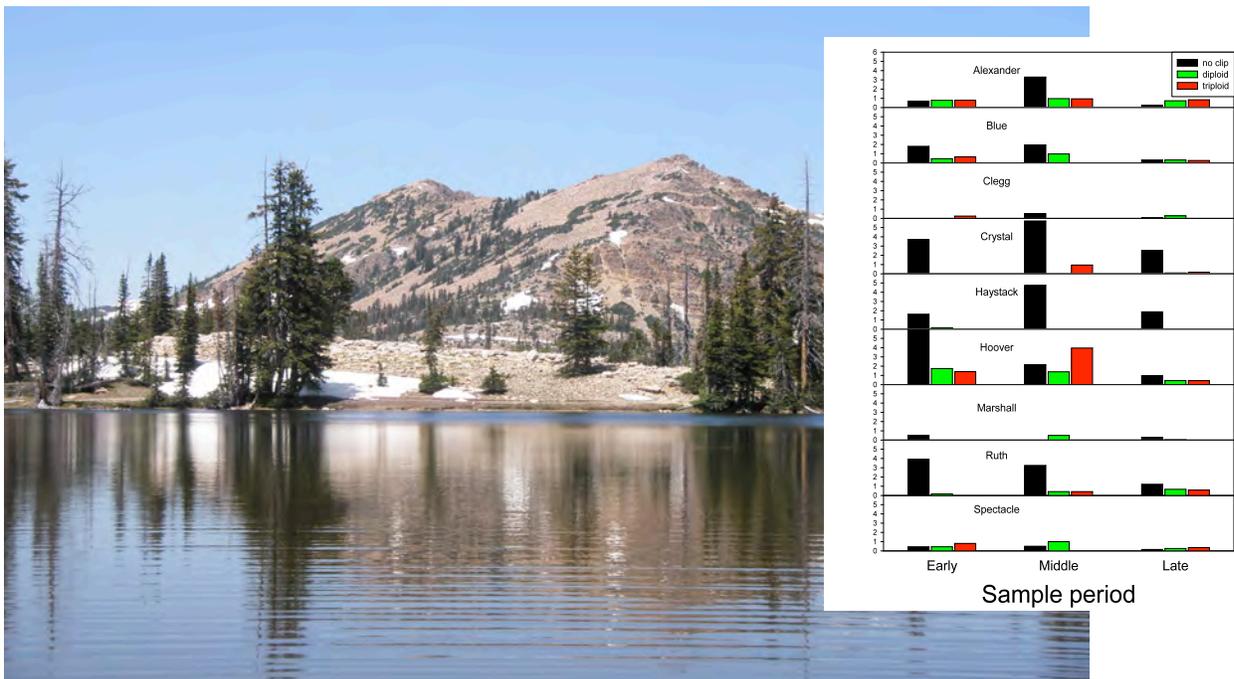
Dates:

2008-2010

Abstract:

Triploid (sterile) fish potentially offer a more risk-averse option to stocking non-native sport fish. However, the relative performance of triploid versus diploid (reproductive) fish in a natural setting is not well understood. We compare the relative performance of stocked triploid and diploid brook trout (*Salvelinus fontinalis*) in high mountain Uinta lakes. A pilot study revealed suitable environmental conditions for brook trout survival and growth over the summer. We observed no statistical differences between the catch (CPUE) of triploid versus diploid fish across our study lakes in 2008. Additional sampling and analysis will continue in June 2009.

Preliminary Results:



Funding:

Utah Division of Wildlife Resources, US Geological Survey - UCFWRU
USGS, UCFWRU

Investigators:

Phaedra Budy, Principle Investigator, USGS – UCFWRU, USU- Dept. of Watershed Sciences
Gary P. Thiede, Fishery Biologist, USU- Dept. of Watershed Sciences
Andy Dean, Graduate Research Assistant (M.S.) USGS – UCFWRU, USU- WATS
{expected graduation, April, 2010}

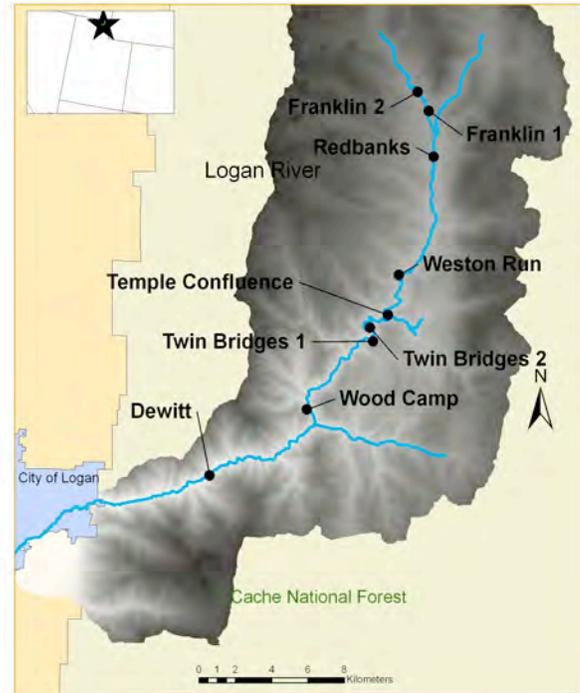
The influence of stream geomorphology on early life stages of brown trout (*Salmo trutta*) and limitations for brown trout invasion

Dates:

2008-2011

Abstract:

A need exists to better identify mechanisms contributing to altitudinal species zonation of brown trout (*Salmo trutta*) versus native species. Although brown trout help augment fishing opportunities throughout much of their introduced range, expansion into higher elevations due to climate change or anthropogenic alterations could be deleterious to conservation of key populations including other native fishes. We are evaluating the potential influence of streambed scour on early life stages brown trout in intermountain streams at sites arranged along an altitudinal gradient of the Logan River, Utah using field estimates of sediment entrainment and models of entrainment potential over the duration of emergence. In addition, we will explore the influence of potential environmental variables such as temperature, gradient, and native species densities, on brown trout distributions, by conducting a meta-analysis of brown trout densities along altitudinal gradients within the species native and non-native range.



Study sites on the Logan River, Utah

Funding:

Utah Division of Wildlife Resources, USGS Utah Cooperative Fish and Wildlife Research Unit, United States Forest Service, Utah State University Ecology Center

Investigators:

Phaedra Budy, Principle Investigator, USGS – UCFWRU, USU- Dept. of Watershed Sciences
Gary P. Thiede, Fishery Biologist, USU- Dept. of Watershed Sciences
Christy Meredith, Graduate Research Assistant (PhD) USGS – UCFWRU, USU- WATS
{expected graduation, 2011 }

Publications:

Meredith, C. and P. Budy. Relationships between channel gradient, gravel availability, and brown trout (*Salmo trutta*) spawning densities on the Logan River, Utah. Presented at Utah Chapter American Fisheries Society Meeting, February 17-19, 2009.

LR annual XX

Bull trout population assessment in northeastern Oregon: a template for recovery planning

Dates:

2002-2009

Abstract:

Within the overall framework of conservation and recovery planning for threatened bull trout, we provide critical information on abundance, trend, vital rates, habitat needs, and information on the potential for improving survival at one or more life stages. In addition, we gather information related to population structure (e.g., age, life history, and genetic components). We provide a template against which different strategies for monitoring and evaluation can be evaluated in terms of accuracy, precision, cost/effort, and limiting factors. Our goal is to provide the data and conservation assessment tools to aid in the efforts of the US Fish and Wildlife Service, to determine the necessary courses of action and management actions for recovery of bull trout populations throughout this as well as other provinces. The project was initiated in 2002 and has continued through 2008, with plans to continue work through 2009. To meet our goals, we have developed and implemented each year, a comprehensive mark-recapture program including two tag types, multiple capture techniques (both passive and active) and systematic sampling of two large study areas (South Fork Walla Walla and North Fork Umatilla) with a high degree of effort.



Funding:

US Fish and Wildlife Service, US Geological Survey, and Utah Cooperative Fish and Wildlife Research Unit

Investigators:

Phaedra Budy, Principle Investigator, USGS – UCFWRU, USU- Dept. of Watershed Sciences
Gary P. Thiede, Fishery Biologist, USU- Dept. of Watershed Sciences
Peter D. MacKinnon, Post Graduate Research Assistant, USU – Dept. Of Watershed Sciences
Tracy Bowerman, Graduate Research Assistant (PhD) USGS – UCFWRU, USU- WATS
{expected graduation, 2011}

Publications:

Budy, P., P.D. MacKinnon, T. Bowerman, and G.P. Thiede. 2008. Bull trout population assessment in northeastern Oregon: a template for recovery planning. 2007 Annual Progress Report to US Fish and Wildlife Service. UTCFWRU 2008(4):1-62.

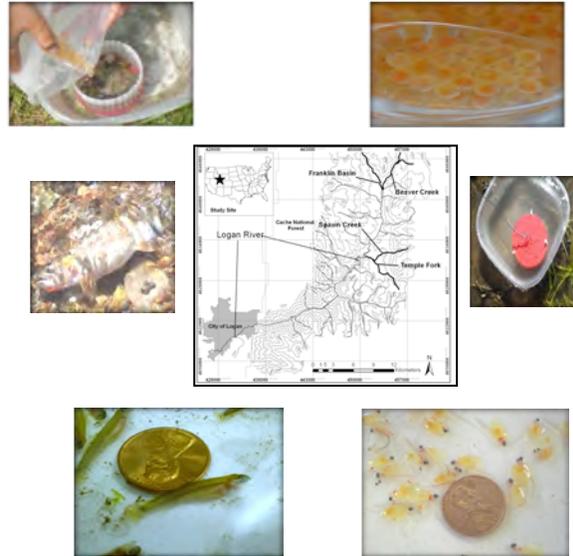
Evaluating the spawning ecology and early life history of Bonneville cutthroat trout (*Oncorhynchus clarkii Utah*) in the Logan River, Utah

Dates:

2007-2009 (Completed 2009)

Abstract:

We quantified the spawning ecology and early life history of the endemic Bonneville cutthroat trout (BCT) via biweekly redd counts and field-based, egg-to-fry experiments in two tributaries and two headwater streams to the Logan River, in northern Utah. We observed large variability in the timing, magnitude, and duration of BCT spawning among our tributaries and headwater streams, in response to a variable, multi-peaked hydrograph; in addition, we observed among and within-site variability in hatch and emergence survival rates in our tributaries and headwater streams, with key abiotic variables, such as fine sediment, driving such variability at the microhabitat scale.



Funding:

USDA Forest Service, U.S. Geological Survey Fish and Wildlife Cooperative Unit, Utah Division of Wildlife Resources, Utah State University

Investigators:

Phaedra Budy, Principle Investigator, USGS – UCFWRU, USU- Dept. of Watershed Sciences
Gary P. Thiede, Fishery Biologist, USU- Dept. of Watershed Sciences
Sara Seidel, Graduate Research Assistant (MS) USGS – UCFWRU, USU- WATS
{expected graduation, May, 2009}
Brett Roper, USDA Forest Service

Publications:

Budy, P., G.P. Thiede, J. Wood, S. Seidel, and S. Bennett. 2008. Logan River whirling disease study: factors affecting trout population dynamics, abundance, and distribution in the Logan River, Utah. 2007 Annual Report to Utah Division of Wildlife Resources. Sport Fish Restoration. Grant number XIII. Project F-47-R. UTCFWRU 2008(XX):1-XX.