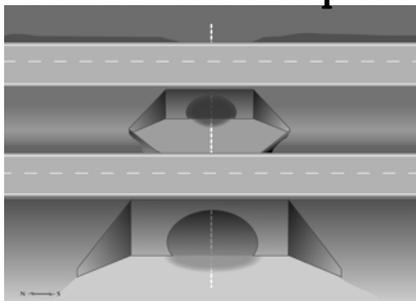
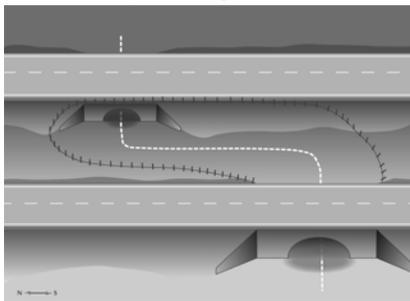


2006 ANNUAL REPORT
USGS Biological Resources Division
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Utah State University, Logan UT 84322-5290

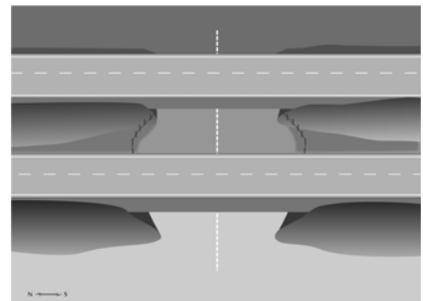
New I-15 deer underpasses north of Beaver Utah



Underpass 1



Underpass 2



Control Underpass

Images ©Diana Marques www.dianamarques.com

2007 Coordinating Meeting
College of Natural Resources
Utah State University
11 April 2007



Utah Department of
 Natural Resources
 Division of Wildlife
 Resources



Utah State
UNIVERSITY

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

2007 AGENDA
Annual Coordinating Committee Meeting
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Ellen Eccles Conference Center Rm. 207
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

Theme:

Wednesday, 11 April 2007

8:00-9:00	Continental Breakfast (Ellen Eccles Conference Center Room 207)
8:00- 4:00	Student Posters and Interactions with Students
9:15-9:30	Introductions
9:30-10:15	Mike Styler (Director Utah Department of Natural Resources) “Important Natural Resources Issues in Utah”
10:15-10:30	Questions for Director Styler
10:30-12:00	Summary of Unit Research (<i>J. Bissonette, T. Edwards, P. Budy</i>)
12:00-1:30	Catered Lunch outside Conference Center Room 207
1:30-1:45	Information Items: F. Howe/B. Baldwin Student Agency Internships
1:45-4:30	University and Agency Updates <u>College of Natural Resources --</u> <i>Dean Nat Frazer (National Cooperative Coalition), Department Heads: Chris Luecke, Johan du Toit, Terry Sharik</i> <u>U.S. Fish and Wildlife Service</u> <i>Lucy Jordan (state) Greg Watson (region),</i> <u>U. S. Geological Survey</u> <i>Bern Shanks -- Cooperative Research Units Program</i> <u>Utah Division of Wildlife Resources</u> <i>Director & UDWR personnel</i> Information Items: F. Howe, B. Baldwin
~4:30	Departure

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2006 Research Activities of the Unit Staff

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

Personnel

Cooperators – Coordinating Committee

United States Geological Survey

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Unit Research Staff and Students

Research Associates:

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

Graduate Students by Degree Program:

	
Robert Al-Chokhachy, Post Doc	Garn Birchell, M.S.
	
Amy Croft, Ph.D.	Kirk Dahle, M.S.



Eriek Hansen, M.S.



Kris Homel, M.S.



Randy Larsen, Ph.D.



Andy Leidolf, Ph.D.



Peter McHugh, Ph.D.



Ben Nadolski, M.S.



Lisa Nordstrom, Ph.D.



Russell Norvell, Ph.D.



Carrie O'Brien, Ph.D.



Silvia Rosa, M.S.



Hillary White, M.S.



Tammy Wilson, Ph.D.



Jeremiah Wood, Ph.D.



Phoebe Zarnetske, M.S.

Mission Statement
Utah Cooperative Fish and Wildlife Research Unit
2007

The major limiting influences upon fishery and wildlife resources in the Intermountain West are terrestrial habitat degradation and loss and watershed and water issues. Loss of winter range for big game, degradation and impacts on riparian areas by agricultural practices, impacts on wildlife rangeland habitat by practices such as sagebrush removal and the planting of cattle forage, 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 problems relating to the fishery and wildlife resources of Utah and the Intermountain West.

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, expert systems, artificial intelligence, sociological science, survey methodology, 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, geographical information system and habitat restoration methodology, terrestrial habitat analysis, population management and assessment, 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 fish and wildlife species, sustainable game and sport fish management, terrestrial and aquatic riparian studies, migratory non-game bird research, and geographical information system methodology, 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), Assessment of Fish and Wildlife Populations (emphasizes sampling design and estimation of abundance and survival), 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
2006
PRODUCTIVITY SUMMARY**

PUBLISHED

1 BOOK
17 PEER-REVIEWED PAPERS
11 TECHNICAL PUBLICATIONS
6 THESES AND DISSERTATIONS
1 BOOK IN PREPARATION

SUBMITTED

9 MANUSCRIPTS

SEMINARS AND PRESENTATIONS

8 INVITED
32 CONTRIBUTED

Unit Productivity
USGS Utah Cooperative Fish and Wildlife Research Unit Productivity
1 January 2006 to 31 December 2006

PUBLICATIONS

Scientific Papers, Books, and Chapters in Books

- Al-Chokhachy, R., and P. Budy. 2007. An assessment of the transferability of bull trout microhabitat relationships across three streams in eastern Oregon. *North American Journal of Fisheries Management*. *In press*.
- Bissonette, J. A., and I. Storch, eds. 2007. Temporal dimensions of landscape ecology: Wildlife responses to variable resources. Springer-Verlag, New York and Heidelberg. 284 pp.
- Bissonette, J. A. 2007. Resource acquisition and animal response in dynamic landscapes: Keeping the books. Pages 13-29 in: J. A. Bissonette, and I. Storch, eds. 2006. Temporal dimensions of landscape ecology: Wildlife responses to variable resources. Springer-Verlag, New York and Heidelberg. 284 pp.
- Budy, P., and H. Schaller. 2007. Evaluating tributary restoration potential for Pacific Salmon recovery. *Ecological Applications*. *In press*.
- Budy, P., G.P. Thiede, P. McHugh. 2007. A quantification of survival, site-fidelity, abundance, and trend for an important population of endemic cutthroat trout. *North American Journal of Fisheries Management*. *In press*.
- Cramer, P. C., and J. A. Bissonette. 2006. Wildlife crossings in North America: The state of the science and practice. Pp. 442-447; *In: Proceedings of the International Conference on Ecology and Transportation*, San Diego, California. Center for Transportation and the Environment, North Carolina State University, NC.
- Edwards, T. C., Jr., D. R. Cutler, N. E. Zimmermann, L. Geiser, and G. G. Moisen. 2006. Effects of underlying sample survey designs on the utility of classification tree models in ecology. *Ecological Modelling* 199:132-141.
- Edwards, T.C., Jr., D. R. Cutler, and K. H. Beard. 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. *In press*.
- Lawler, J. J., and T. C. Edwards, Jr. 2006. A variance-decomposition approach to investigating multi-scale habitat associations. *Condor* 108:47-58.
- McHugh, P., and P. Budy. 2006. Exotic brown trout affect the individual- and population-level performance and dietary habits of native cutthroat trout. *Transactions of the American Fisheries Society* 135:1441-1455.
- McHugh, P., P. Budy, G.P. Thiede, and E. VanDyke. 2006. Trophic relationships of nonnative brown trout, *Salmo trutta*, and native Bonneville cutthroat trout, *Oncorhynchus clarkii utah*, in a northern Utah, USA river. *Environmental Biology of Fishes* – presently available online. *In press*.
- Meyers, P. M., W. D. Ostrand, M. R. Conover, and J. A. Bissonette. 2006. Assessing differences in mourning dove *Zenaida macroura marginella* nesting activity after 40 years. *Wildlife Biology* 12(2):171-178.
- Moisen G. G., E. A. Freeman, J. A. Blackard, T. S. Frescino, N. E. Zimmermann, and T. C. Edwards, Jr. 2006. Predicting tree species presence and basal area in Utah: a comparison of

- stochastic gradient boosting, generalized additive models, and tree-based methods. *Ecological Modelling* 199:176-187.
- Moisen G. G., T. C. Edwards, Jr., and P. E. Osborne. 2006. Further advances in predicting species distributions. *Ecological Modelling* 199:129-131
- Vatland, S., P. Budy, and G.P. Thiede. 2007. An approach to modeling striped bass and threadfin shad predator-prey dynamics in Lake Powell, Utah-Arizona. *Special American Fisheries Symposium Series. In press.*
- Zarnetske, P. L., T. C. Edwards, Jr., and G. G. Moisen. Habitat classification modelling with incomplete data: pushing the habitat envelope. *Ecological Applications. In press.*
- Zimmermann, N. E., Moisen, G. G., Edwards, T. C., Jr., Frescino, T. S., and J. A. Blackard. Testing the partial contributions of remotely-sensed and topo-climatic predictors for tree species modelling in Utah. *Journal of Applied Ecology. In press.*
- Zimmermann, N. E., R. A. Washington-Allen, R. D. Ramsey, M. E. Schaeppman, L. Mathys, B. Kötz, M. Kneubuehler, and T. C. Edwards, Jr. Modern remote sensing for environmental monitoring of landscape states and trajectories. Pages XX-XX in F. Kienast, S. Ghosh, and O. Wildi, editors. *A changing world: challenges for landscape research.* Springer, Berlin, Germany. *In press.*

In Review

- Al-Chokhachy, R., and P. Budy. *In review.* Using a combination of active and passive mark-recapture techniques to evaluate the population viability of imperiled bull trout (*Salvelinus confluentus*). *Submitted to Canadian Journal of Fisheries and Aquatic Sciences.*
- Bissonette, J. A., and W. A. Adair. *In Review.* Restoring habitat permeability to roaded landscapes with isometrically-scaled wildlife crossings. *Submitted to Oikos.*
- Budy, P., G.P. Thiede, C. Luecke, and R. Schneidervin. *In review.* 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 special publication.
- Gunson, K. E., A. P. Clevenger, J. A. Bissonette. *In Review.* Limited applications of wildlife-vehicle collision analyses for mitigation planning due to spatial inaccuracy. Intended for *Wildlife Biology. Submitted for review to USGS.*
- Grilo, C., J. A. Bissonette, and M. Santos-Reis. *In Review.* Response of carnivores to existing highway culverts and underpasses: Implications for road planning and mitigation. Intended for *Wildlife Biology, Submitted for Review by USGS.*
- Homel, K. and P. Budy. *In review.* Temporal and spatial variability in the migration patterns of juvenile and subadult bull trout (*Salvelinus confluentus*) in Northeast Oregon. *Submitted to Transactions of the American Fisheries Society.*
- Homel, K., P. Budy, M.E. Pfrender, T.A. Whitesel, L. Bjerregaard, and K. Mock. *In review.* Evaluating the consequences of life-history variation on genetic structure within a population of bull trout (*Salvelinus confluentus*) in Northeast Oregon. *Submitted to Conservation genetics.*
- Loureiro, F., J. A. Bissonette, D. W. Macdonald, and M. Santos-Reis. *In Review.* Temporal variation and trade-offs in Mediterranean food resources for badgers. *Submitted to J. Mammalogy.*
- Wilson, T. L., E. J. Johnson, and J. A. Bissonette. *In Review.* Landscape arrangement and shrub-steppe associated bird species in a patchy, mountainous landscape. *Submitted to Landscape Ecology.*

TECHNICAL REPORTS

- Bissonette, J. A., 2007. Evaluation of the use and effectiveness of wildlife crossings. 2007. Final Draft Report prepared for the National Cooperative Highway Research Program, Transportation Research Board, National Research Council, National Academy of Science. USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, Utah. *In Review*.
- Bissonette, J. A., E. Johnson, and T. L. Wilson. 2006. Sagebrush-Dominated Mountain Meadows Bird and Small Mammal Community Dynamics. Project Report No. 4. USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan Utah. 2006(4):1-166
- Bissonette, J. A., P. C. Cramer, A. P. Clevenger, K. K. Knapp, B. Persaud, N. Newhouse, T. Kinley, C. Lyon, S. Rosa, E. Shaw Schowalter-Hay, A. Hardy, K. Gunson, J. Anderson, C. O'Brien, K. G. Wolfe, B. Jennings, S. Jacobson, I. Brakop. 2006. Evaluation of the use and effectiveness of wildlife crossings. Two Year Interim Report prepared for the National Cooperative Highway Research Program, Transportation Research Board, National Research Council, National Academy of Science. USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, Utah. url: <http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+25-27>
- Budy, P., R. Al-Chokhachy, K. Homel, and G.P. Thiede. 2006. Bull trout population assessment and life-history characteristics in association with habitat quality and land use in the Walla Walla River Basin: a template for recovery planning. 2005 Annual Progress Report to US Fish and Wildlife Service.
- Budy, P., P. McHugh, E. Hansen, and G.P. Thiede. 2006. Logan River study: factors affecting trout population dynamics, abundance, and distribution in the Logan River, Utah. Project XIII, 2005 Annual Report to Utah Division of Wildlife Resources.
- Budy, P., E. Hansen, and G.P. Thiede. 2006. Spawn Creek whirling disease study: evaluating the effectiveness of passive stream restoration for improving native fish health and reducing the impact of whirling disease. Grant XIII, 2005 Annual Report to Utah Division of Wildlife Resources. UCFWRU 2006(3):1-32.
- Budy, P., S.K. Dahle, and G.P. Thiede. 2006. An evaluation of the fish community of Cutler Reservoir and the Bear River above Cutler with consider of the potential for future fisheries enhancement. 2005 Annual Report to Utah Division of Water Quality. 58 pages.
- Cramer, P., S. Rosa, and J. A. Bissonette. 2006. Condition of Highway 91 Wildlife Underpasses, Escape Ramps, and Fencing in Sardine Canyon, Wellsville Mountains, Utah, Winter 2006. Project Report No. 1. USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan Utah. 2006(1):1-20.
- Edwards, T. C., Jr., and P. L. Zarnetske. 2006. Habitat modelling of management indicator species on forest lands in the Intermountain West: a role for the Forest Service Forest Inventory and Analysis data. Final Project Report No. 2006-5, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA.
- Edwards, T. C., Jr., D. R. Cutler, K. H. Beard, and J. Gibson. 2007. Predicting invasive plant species occurrences in national parks: a process for prioritizing prevention. Final Project Report No. 2007-1, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA
- Zarnetske, P.L., T. C. Edwards, Jr., and G. G. Moisen. 2007. Modeling forest bird species' likelihood of occurrence in utah with FIA and LANDFIRE map products and ecologically-based pseudo-absence points. Accepted, Proceedings of the Fifth Annual Forest Inventory

and Analysis Symposium, Portland, Maine, USA, R. E. McRoberts, G. A. Reams, and P. C. Van Deusen, Eds.

Johnson, J. A., B. A. Andres, and J. A. Bissonette. 2006. Distribution, abundance, and habitat associations of birds during the breeding season at major mainland rivers of Southeastern Alaska. USFWS Report Series publication. *In press*.

GRADUATE STUDENTS DIRECTED

Theses and Dissertations Completed

J. A. Bissonette

Nordstrom, Lisa. 2006. Tapirs and rhinoceroses in captivity: An examination of the North American captive populations and their husbandry. Ph.D. Dissertation, Utah State University, Logan UT.

Rosa, Silvia. 2006. Highway effects on small mammal communities and effectiveness of a deer-vehicle collision mitigation strategy. M. S. Thesis, Utah State University, Logan UT.

T. C. Edwards, Jr.

Phoebe L. Zarnetske, Phoebe. 2006. Multiple species modelling: the management indicator species issue revisited. M. S. Thesis, Utah State University, Logan UT

P. Budy

Al-Chokhachy, Robert. 2006. Understanding and quantifying the factors that limit bull trout abundance and survival. PhD Dissertation. Utah State University.

Homel, Kristen. 2006. Understanding differences in genetic and environmental determinants of life-history stage in threatened bull trout. MS Thesis. Utah State University.

McHugh., Peter. 2006. A multi-scale assessment of brown trout (*Salmo trutta*) – cutthroat trout (*Oncorhynchus clarkii utah*) interactions in Bonneville Basin streams. PhD Dissertation. Utah State University.

Active Graduate Research Projects

J. A. Bissonette

Andy Leidolf, (Ph.D. Candidate). Fire's Effects on Avian Communities

Randy Larsen (Ph.D.) Water Ecology of Chukars (*Alectoris chukar*): Implications for Species Management in Arid Environments

Carrie O'Brien (M.S.) Small Mammal habitat in Gabon

Hillary White, (M.S.). Riparian Bird Habitat Associations: Guidelines for Management.

Bissonette is advisor on the committees for 3 Ph.D. students and 1 Post-Doctoral student at the University of Lisbon, Portugal.

T. C. Edwards, Jr.

Amy Croft, (PhD Candidate, Biology Co-chair). Modelling effects of urban disturbance fronts on endangered plant species in the Las Vegas metropolitan area

Tammy Wilson, (PhD Candidate). Effects of anthropogenic disturbance on habitat use of pygmy rabbits: the role of legacy effects

Russel E. Norvell, (PhD Candidate). Disturbance effects on avifauna community structure in shrubsteppe environments

P. Budy

Garn Birchell, (MS) The effects of non-native Colorado River cutthroat trout following the removal of invasive brook trout from a small headwater stream in Utah. Utah State University. To be completed March 2007.

Eriek Hansen, (MS) Evaluating the effectiveness of passive stream restoration for improving native fish health and reducing the impacts of whirling disease. To be completed September 2007.

Kirk S Dahle, (MS) Understanding the abiotic and biotic factors that determine fish abundance and diversity along the gradient of a highly altered stream ecosystem. To be completed September 2007.

Benjamin Nadolski, (MS) Evaluating the factors determining the extent and abundance of exotic brook trout in a native cutthroat trout system. To be completed December 2007.

Jeremiah Wood, (MS) What controls the upper distribution of exotic brown trout: a focus on spawning and early life history with implications on native trout conservation. To be completed September 2008.

PRESENTATIONS

Invited

Al-Chokhachy, R., and P. Budy. 2006. *Invited Seminar*. Using mark-recapture techniques to assess bull trout demographics and guide recovery efforts. Bull Trout Symposium at the American Fisheries Society, Western Division Meeting, Bozeman MT.

Budy, P. 2006. *Invited Seminar*. Understanding the synergistic effects of disease, species interactions, and environmental variation on the survival and persistence of an imperiled trout. Dept. of Fisheries and Wildlife, Oregon State University, Corvallis OR.

Budy, P. 2006. *Invited Seminar*, Understanding the food web interactions and role of a new invader in a large, western reservoir. The Ohio State University, Dept. of Evolution, Ecology, and Organismal Biology, Columbus OH.

Budy, P. 2006. *Invited International Seminars*: a) Evaluating the combined effects of environmental variation, biotic interactions, and disease on the abundance and distribution of exotic brown trout (*Salmo trutta*); b) Ecology of stream fishes: State of the art and future prospects. Leon, Spain.

Cramer, P. C., and J. A. Bissonette. 2006. *Invited Seminar*. Evaluation of the use and effectiveness of wildlife crossings. The University of Utah J. S. Quinney Law School, 7 February 2006.

Cramer, P. and J. A. Bissonette. 2006. *Invited Seminar*. Wildlife crossings and transportation planning in the United States. Transportation Conference, U.S. Fish and Wildlife Service, West Virginia.

Edwards, T.C., Jr. 2006. *Invited Plenary Seminar*. Monitoring in the 21st Century: A framework for meeting the challenges. Utah Wildlife Society 2006 Annual Meeting, Moab, Utah.

Homel, K., and P. Budy. 2006. *Invited Seminar*. The influence of abiotic and biotic factors on the migration timing of subadult bull trout (*Salvelinus confluentus*) in Northeast Oregon. Bull

Trout Symposium at the American Fisheries Society, Western Division Meeting, Bozeman MT.

Contributed

- Adair, W. A., and J. A. Bissonette. 2006. Modeling spatial constraints limiting resource acquisition: A case study with the Newfoundland marten (*Martes americana atrata*). 21st Annual Symposium US-IALE, San Diego, CA.
- Al-Chokhachy, R. and P. Budy. 2006. The importance of pacific salmon to resident fish populations in a changing environment. American Fisheries Society, National conference, Lake Placid, NY.
- Bissonette, J. A., and P. C. Cramer. 2007. North American Decision Guidelines for mitigating roads for wildlife. ICOET meeting, Little Rock, AR.
- Cramer, P. C. and J. A. Bissonette. 2006. NCHRP 25-27 Update: Evaluation of the Use and Effectiveness of Wildlife Crossings in North America. Transportation Research Board Wildlife and Highways Workshop. Washington, D.C.
- Cramer, P. C. and J. A. Bissonette. 2006. Priorities for research related to wildlife and roads. Transportation Research Board Wildlife and Highways Workshop. Washington, D.C.
- Cramer, P. C. and J. A. Bissonette. 2006. Wildlife crossings in North America. Transportation Research Board Wildlife and Highways Workshop. Washington, D.C.
- Cramer, P. C., and J. A. Bissonette. 2006. Carnivore crossings and roads in North America: How are we doing? Carnivores 2006, St. Petersburg, Florida
- Cramer, P. C. and J. A. Bissonette. Integrating Wildlife Crossings into Transportation Plans in Projects in North America. ICOET meeting, Little Rock, AR
- Cramer, P. and J. A. Bissonette. 2006. Wildlife passages: How does Utah compare to the rest of North America. Presented at the Utah Chapter of the Wildlife Society, Moab Utah.
- Dahle, K.S, and P. Budy. 2006. Predicting the growth potential of a shallow, warm-water sport fishery: a spatially explicit bioenergetics approach. American Fisheries Society, Bonneville Chapter Meeting, Park City, UT.
- Dahle, K.S., and P. Budy. 2006. Predicting the growth potential of a shallow, warm-water sport fishery: a spatially explicit bioenergetics approach. American Fisheries Society, National conference, Lake Placid, NY.
- Edwards, T. C., Jr., P. L. Zarnetske, and G.G. Moisen. FIA-based habitat models for sensitive species: the case of the missing absence. Paper presented at the Eighth Annual Forest Inventory and Analysis Symposium, Monterey, California
- Edwards, T. C., Jr., D. R. Cutler, N. E. Zimmermann, L Geiser and G. G. Moisen. Landscape-level classification models in ecology: effects of sample survey design on prediction accuracy. Paper presented at the 21st Annual Symposium of the International Association for Landscape Ecology, U.S. Regional Association, San Diego, California.
- Edwards, T. C., Jr., D. R. Cutler, and K. Beard. A process for determining the likelihood of invasive establishment in national parks. Paper presented at the National Park Service Annual Inventory and Monitoring Meeting, San Diego, California.
- Grilo, C., M. Cruz, J. A. Bissonette, and M. Santos-reis. 2006. The role of patch size and isolation to carnivore relative abundance in an oak woodland landscape. Poster presented at the 1st European Congress of Conservation Biology, Eger, Hungary.
- Grilo, C. L. Gomes, C. Silva, C. Baltazar, J. Bissonette & M. Santos-Reis. 2007. Patterns of carnivore road casualties in southern Portugal. ICOET meeting, Little Rock, AR.

- Hansen, E. S., P. Budy, and G.P. Thiede. 2006. Evaluating the effectiveness of passive stream restoration for improving native fish health and reducing the impacts of whirling disease. 12th Annual Whirling Disease Symposium "War of the Whirls". Denver, CO.
- Hansen, E.S., P. Budy, and G.P. Thiede. 2006. Evaluating the effectiveness of passive stream restoration for improving native fish health and reducing the impacts of whirling disease. American Fisheries Society, Bonneville Chapter Annual Meeting "Fish in the Balance". Park City, UT.
- Hansen, E. S., P. Budy, G. P. Thiede. 2006. Evaluating the effects of passive stream restoration on riparian and benthic habitat, and ultimately fish health. North American Benthological Society, 54th Annual Meeting. Anchorage, AK.
- Homel, K., and P. Budy. 2006. The movement continuum: evaluating the migration patterns of juvenile bull trout (*Salvelinus confluentus*) in Northeast Oregon. Poster Presentation. American Fisheries Society, Bonneville Chapter Meeting, Park City, UT. Best Poster Presentation Award.
- Homel, K., R. Al-Chokhachy, P. Budy, and G.P. Thiede. 2006. An evaluation of key population characteristics for bull trout in the South Fork Walla Walla River: a template for recovery planning. Walla Walla Watershed Council: Research, Monitoring, and Evaluation Conference. Walla Walla, WA.
- Homel, K., and P. Budy. 2006. Evaluating the genetic population structure and movement patterns of bull trout (*Salvelinus confluentus*) in Northeast Oregon. American Fisheries Society, National Meeting, Lake Placid, NY. Best Paper Award.
- Homel, K., and P. Budy. 2006. Evaluating genetic population structure and movement patterns of bull trout (*Salvelinus confluentus*) in northeast Oregon. American Fisheries Society, National conference, Lake Placid, NY.
- Loureiro, F., J. A. Bissonette, D. W. Macdonald and M. Santos-Reis. 2006. Pulsed resources in a Mediterranean Landscape and their importance to Eurasian badgers conservation . Poster presented at the 1st European Congress of Conservation Biology, Eger, Hungary.
- Santos, M. J., J. M. Matos, J. A. Bissonette, and M. Santos-Reis. 2006. Riparian areas in the fragmented landscape of southern Portugal: Applications for conservation Planning. Poster presented at the 1st European Congress of Conservation Biology, Eger, Hungary.
- Thiede, G.P., P. Budy, and P. McHugh. 2006. Quantification of survival, site fidelity, abundance, and trend for a critical population of endemic cutthroat trout. American Fisheries Society, National conference, Lake Placid, NY.
- Rosa, S., and J. A. Bissonette. 2006. Preliminary Results of a Wildlife Mortality Mitigation Strategy on Interstate 15 in Utah. Presented at the Utah Chapter of the Wildlife Society, Moab Utah,
- Rosa, S., and J. A. Bissonette. 2007. Roads and desert small mammal communities: Positive interactions? ICOET meeting, Little Rock, AR.
- Wilson, T., and J. A. Bissonette. 2006. Moving beyond area-density relationships- a challenge for conservation planning. US-IALE, San Diego, CA.
- Zarnetske, P.S., T.C. Edwards, Jr., and G.G. Moisen. Pushing the envelope: habitat classification modeling with incomplete data. Poster presented at the 91st Annual Meeting of the Ecological Society of America, Memphis, Tennessee.
- Zarnetske, P. S., T. C. Edwards, Jr., and G. G. Moisen. Bioregional species distribution modeling with pseudo-absence points. Poster presented at the 21st Annual Symposium of the International Association for Landscape Ecology, U.S. Regional Association, San Diego, California.

Zarnetske, P. S., T. C. Edwards, Jr., and G. G. Moisen. Wildlife Habitat Suitability Modeling with Incomplete Data: Incorporating Ecological Pseudo-Absence Points. Poster presented at the Utah Wildlife Society 2006 Annual Meeting, Moab, Utah.

EDUCATION AND OUTREACH

Classes

J. A. Bissonette

FW6700/7700, Landscape Ecology, 3 credit hours, graduate class, Winter Semester 2006, 15 students.

T. C. Edwards, Jr.

WILD 6510, Topics in Spatial Ecology, Spring Semester 2006, 9 students

WILD 6500, Biometry: Design and Analysis of Ecological Research, Fall Semester 2006, 28 students

P. Budy

FRWS 6400, Graduate Population Ecology, Utah State University, College of Natural Resources, Fall Semester 2006, 22 students.

Workshops/Outreach

P. Budy

Stream Restoration, Utah State University, Department of Watershed Sciences. Spring Semester 2006, Co-taught with J. Schmidt, M. Kondolf, and P. Wilcox. 5-day short course, 20 students.

RECOGNITION & AWARDS

J. A. Bissonette

Recipient, National Cooperative Research Units Recognition Star Award, US Department of Interior, 2006.

P. Budy

Recipient, National Cooperative Research Units Recognition Star Award, US Department of Interior, 2006.

USU/CNR Undergraduate Mentor of the Year 2006.

T. C. Edwards

Recipient, National Cooperative Research Units Recognition Star Award, US Department of Interior, 2006.

Students & Staff:

- Patty Cramer*, 2006. (Coop Unit Research Associate) Best Professional Presentation, 2nd place, Utah Chapter TWS Meeting, Moab.
- Eriek Hansen*, 2006. \$1000 tuition scholarship to attend the USU Stream Restoration Short-course, American Fisheries Society, Bonneville Chapter Meeting, Park City, UT. (P. Budy student)
- Tarita Harju*, 2006. Best Student Oral Presentation (\$500 travel scholarship) American Fisheries Society, Bonneville Chapter Meeting, Park City, UT. (M. Vinson student)
- Kristen Homel*, 2006. Best Poster Presentation Award (\$500). American Fisheries Society, Bonneville Chapter Meeting, Park City, UT. , and Best Student Paper Award (\$500). American Fisheries Society, National Meeting, Lake Placid, NY. (P. Budy student)
- Russell Norvell*, 2006. received the "Best Student Paper" Award at the Utah Chapter of The Wildlife Society in Moab Utah. (T. Edwards student)
- Silvia Rosa*, 2006. Best Student Paper, 3rd Place, Utah Chapter TWS Meeting, Moab UT March 2006, and \$500 student scholarship from the UT Chapter of TWS (J. Bissonette student)
- Tammy Wilson*, 2006. Awarded NASA-MSU Professional Enhancement Award March 2006 International Association for Landscape Ecology (T. Edwards student)
- Phoebe Zarnetske*, 2006. Winner of the 2006 Utah Chapter of The Wildlife Society Best Poster Award. (T. Edwards student)

PROFESSIONAL SERVICE***J. A. Bissonette***

Reviewed for: Acta Theriologica, American Midland Naturalist, Bioscience, European Journal of Wildlife Research, Journal of Mammalogy, Landscape and Urban Planning, Editorial Board. European Journal of Wildlife Research

T. C. Edwards

Reviewer for: Conservation Biology, Ecology (2), Ecological Applications, Landscape Ecology, Ecological Modelling
 Editorial Board, Journal of Applied Vegetation Science
 Assistant Treasurer, Cooper Ornithological Society

P. Budy

Associate Editor, North American Journal of Fisheries Management.
 Assistant Director, Intermountain Center for River Rehabilitation and Restoration, Utah State University. 2006 – present.
 Past President, Bonneville Chapter of American Fisheries Society, (2003 - Elected Vice President, 2004 - President Elect, 2005 – President.
 Eugene Maughan Graduate Student Scholarship Selection Committee member, Western Division American Fisheries Society, 2005- present.
 Undergraduate Research and Creative Opportunities (URCO) - Utah State University, Grant Selection Committee, 2006-2007.

RESEARCH*Ongoing, Completed, and New Starts****J. A. Bissonette***

- 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, \$533,031 NEW START
- 2006-2008 Riparian Bird Habitat Models and Habitat Guidelines (Co-PI with Mary Conner)
 - Utah Division of Wildlife Resources \$40,000 NEW START
- 2004-2007 Evaluation of the Use and Effectiveness of Wildlife Crossings (PI)
 - National Academy of Sciences, TRB, NCHRP, \$559,000 ONGOING
- 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

- 2007-2012 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€(\$513,170€WSL) NEW START
- 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 NEW START
- 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
- 2005-2007 Predicting invasive plant species occurrences in National Parks: a spatially explicit process for prioritizing prevention (PI)
 -National Park Service and U.S. Geological Survey, \$98,500 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, \$1,100,000
 -S. E. J. Quinney Foundation, \$180,000 ONGOING

- 2004-2006 Habitat modelling of management indicator species on forest lands in the Intermountain West: a role for the Forest Service Forest Inventory and Analysis data (PI)
 -USDA Forest Service, \$100,000 COMPLETED

P. Budy

- 2001-2006 Limiting factors affecting trout population dynamics, abundance, and distribution in the Logan River, Utah. Four primary components:
- 1) Population dynamics and disease: Principal Investigator: Budy, Utah Division of Wildlife Resources, UDWR, \$300,229
 - 2) Species interactions, Principal Investigator: Budy, Utah State University, Community-University Research Initiative (CURI), and the Quinney Foundation, \$53,510
 - 3) Anthropogenic impacts: Principal Investigator: Budy; Co-P.Is: M. Vinson and J. Schmidt, Utah State University, Water Initiative, \$42,919
 - 4) Passive stream restoration: Principal Investigator for research: Budy, USU Research Funds, UDWR, Trout Unlimited, Embrace-A-Stream, and EPA CWA 319 Grant, \$98,963 (does not include fencing). ONGOING
- 2002-2006 Bull trout population assessment and life history characteristics in association with habitat quality and land use: template for recovery planning. Principal Investigator: Budy, US Fish and Wildlife Service (USFWS), \$701,094. ONGOING
- 2005-2007 Understanding the abiotic and biotic factors that determine fish abundance and diversity along the gradient of a highly altered stream ecosystem: the Bear River and Cutler Reservoir, Utah: Principal Investigator: Budy. Utah Division of Water Quality (UDWQ), \$109,463. ONGOING
- 2005-2007 Determining the factors affecting trout population dynamics, abundance, and distribution in the Mill Creek drainage, Utah. Principal Investigator: Budy, UDWR, \$85,785. 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. Principal Investigators: Budy and 5 others, administered through U.S. Geological Survey, New Mexico Cooperative Fish and Wildlife Research Unit. Whirling Disease Initiative, \$196,310. ONGOING

**UTAH COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT
SUMMARY OF FUNDING
JANUARY - DECEMBER 2006**

Utah Division of Wildlife Resources	
Fishery Research	203,116
Other	919,279
Federal	
RWO	199,463
Other	442,074
Other Grants for	
Unit Scientists	80,463
Non-Unit Scientists	-
Grand Total	<u>1,844,394</u>

**UTAH COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT
PROJECTED FUNDING SUMMARY BY SOURCE
JANUARY - DECEMBER 2006**

Updated: 03/29/07

	Agency Contributions	
1. Cooperator Base Funds:		
a. U. S. Geological Survey - Cooperative Research Units		
Federal Salaries & Benefits	374,775	
Operating	6,503	
Subtotal		381,278
b. Utah Division of Wildlife Resources Base		
Base Account	46,000	
10% Direct Administrative Costs paid on UDWR Projects	102,036	
Subtotal		148,036
c. Utah State University Contribution		
Staff Support Salary & Benefits	36,562	
Space	27,045	
Indirect Costs Waived on CY 2006 Projects	631,521	
Subtotal		695,128
2. Indirect Costs Paid on CY 2006 Projects		90,630
3. Total CY 2006 Project Funding Invoiced (Includes IDC Paid + 10% UDWR-DAC)		1,844,394
**IDC and 10% UDWR-DAC (shaded) are listed individually and also included in #3. This figure prevents double entries.		(192,666)
4. TOTAL CY 2006 Funding Received		2,966,800

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Active Research: Unit Scientists 2006

Project Duration	Index Number	Project Title	Principal Investigator	Total Project	CY 2006 Funding	Source
2006-2009	A15326	Riparian Bird Habitat Models and Management Guidelines	Bissonette, J	40,000	13,333	UDWR
2004-2007	A11123	Evaluation of the use and Effectiveness of Wildlife Crossings	Bissonette, J	568,998	189,666	CDWR
2003-2006	A11100	Evaluation of Wildlife Crossings -Dept of Trans/BLM	Bissonette, J	123,695	37,109	UDWR
2006-2009	being assigned	Water Ecology of Chukars: Implications for Management	Bissonette, J	134,000	20,000	Quinney
2002-2007	A10479	RWO 49 Bull Trout Assessment/Life-History Characteristics	Budy, P	683,231	130,754	FWS
2002-2006	Multiple	Logan River Trout/Lake Powell Food Webs	Budy, P	505,203	66,576	UDWR
2005-2006	A13855	Spawn Creek Whirling Disease Study	Budy, P	65,000	56,000	UDWR
2006	A15305	Mill Creek Trout	Budy, P	36,481	36,481	UDWR
2007	being assigned	Mill Creek Trout	Budy, P	49,304	-	UDWR
2005-2007	A14110	Fisheries Study on Cutler Reservoir in Bear River	Budy, P	109,463	53,676	UDEQ
2007	being assigned	USU Water Initiative	Budy, P	19,884	-	USU
2006	A15986	Utah Lake - PB portion only	Budy, P	6,787	6,787	CUWCD
2005-2006	A12617	RWO 54 Predicting Invasive Plant Species Occurrences in Nat'l Pks	Edwards, T	95,476	47,738	NPS
2004-2008	A13255	Monitoring of Wildlife and Vegetation responses to Manipulation	Edwards, T	1,120,000	240,000	UDWR
2004-2006	A11768	Distribution of Forest Wildlife Species	Edwards, T	50,000	7,500	FS
2004-2008	A15490	Effects of Vegetation Manipulation (NRCS) ShrubMap	Edwards, T	581,950	221,950	NRCS
2006-2008	A15493	Effects of Vegetation Manipulation (NRCS) Extension Outreach	Edwards, T	67,070	17,700	NRCS
				4,256,542	1,145,270	

**ACTIVE RESEARCH -- OTHER PRINCIPAL INVESTIGATORS
2006**

Project Duration	Index Number	Project Title	Principal Investigator	Total Project	CY 2006 Funding	Source
2007		Renovate Sagebrush Steppe important to sage grouse and livestock production	Banner, R	31,000	-	UDWR
2005-2006	A13912	Wildlife Research Coordinator	Conner, M	32,157	16,079	UDWR
2006	109569	Develop & Implement statewide mule deer monitoring plan for UDWR	Conner, M	31,414	31,414	UDWR
2003-2006	A10521	Waterfowl and Shorbird Behaviour on the Great Salt Lake...Avian and Brime Shrimp Communities	Conover, M	167,854	33,571	UDWR
2006-2007	A15287	Waterfowl and Shorbird Behaviour on the Great Salt Lake...Avian and Brime Shrimp Communities	Conover, M	58,620	26,053	UDWR
		Survey of Utah Upland Game and Turkey Hunters Regarding Game Management and Hunting				
2004-2006	A12548	Opportunity Alternatives	Krannich, R	62,478	31,239	UDWR
2004-2006	A12426	2005 Statewide Utah Angler Survey	Liliehholm, R	56,871	17,959	UDWR
2002-2007	A10456	Bear Lake Endemic Fishes Research	Luecke, C	231,311	44,059	UDWR
2003-2007	A10508	Columbian Sharptailed Grouse	Messmer, T	107,800	29,400	UDWR
2003-2006	Multiple	Enhancing Sage-Grouse Programs (5-43139)	Messmer, T	203,181	33,864	UDWR
2005-2007	A13859	Evaluation of Long-Term Effects of Emergency Winter-Feeding of Mule Deer	Messmer, T	77,550	38,775	UDWR
2006-2007	A15099	Support Community-Based Conservation and Wildlife Damage Management	Messmer, T	65,000	43,333	UDWR
2006-2008	A10453	Utah Management Plan for Prairie Dogs	Messmer, T	42,724	21,362	UDWR
2006-2011	A15241	Sage-grouse Conservation Plans and Community-Based Conservation Process	Messmer, T	658,872	131,774	UDWR
2002-2006	A10504	Effects of Livestock Grazing	Messmer, T	105,000	13,125	UDWR
2005-2009	A13285	Parker Mtn Mgmt Plan (PARM)	Messmer, T	27,500	5,500	UDWR
2007-2010	assigned	Intergenerational Fidelity of Femal Greater Sage-grouse to Nest Areas, Brood Areas and Habitat Characteristics	Messmer, T	57,834	-	UDWR
2002-2006	A08962	Provide a Genetic Analysis of June Sucker	Mock, K	104,021	13,003	UDWR
2003-2007	A09002	Demography and Mortality in Leatherside Chub	Mock, K	58,429	14,023	UDWR
2005-2006	A12750	Genetic Characterization of ... population of least chub	Mock, K	8,491	2,830	UDWR
2005-2007	A13913	Reducing Reliance on Supplemental Winter-Feeding in Elk	Provenza, F	45,181	22,591	UDWR
2006-2008	A15181	Bear Amendment	Shivik J	25,000	12,000	UDWR
2003-2006	A10541	Parashant National Monument	Shultz, L	28,917	5,258	NPS
2004-2008	A12721	Estimation of Cougar Population	Wolfe, M	371,347	90,942	UDWR
			Wolfe, Mike			
2001-2006	A10488	RWO 47 Swift Fox as an Indicator Species of Ecosystem Health on the Pinon Canyon Maneuver Site	(Gese, E)	209,706	20,971	FWS
				2,868,258	699,124	

**Utah Cooperative Fish & Wildlife Research Unit
UDWR Operating Base
Expenditures**

	Calendar Year 2004	Calendar Year 2005	Calendar Year 2006
Personnel	\$1,133	\$5,831	\$2,722
Fringe	\$656	\$1,564	\$1,190
Travel	\$4,338	\$6,270	\$9,118
Commuting	\$331	\$593	\$1,427
Mail	\$465	\$896	\$507
Telecommunications	\$2,230	\$2,981	\$3,582
Supplies	\$1,762	\$11,161	\$3,374
Office Equipment	\$0	\$0	\$0
Maintenance	\$256	\$1,544	\$584
Non-Capital Equipment	\$0	\$0	\$0
Rentals	\$380	\$0	\$0
Insurance	\$500	\$500	\$625
Equipment	\$5,337	\$16,006	\$5,074
Repairs	\$0	\$0	\$0
Vehicles	\$0	\$0	\$0
Maintenance	\$759	\$985	\$4,404
Professional Development	\$914	\$1,585	\$668
Guests	\$1,113	\$1,486	\$4,928
Tuition	\$1,130	\$0	\$761
Miscellaneous	\$4,283	\$906	\$4,500

CY04/05/06

Total	\$25,587	\$52,307	\$43,464	\$121,358
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2006-7 RESEARCH ENDEAVORS

John A. Bissonette
U.S. Geological Survey
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Utah State University

Home Page: <http://www.wildlifeandroads.org/john>
Website: <http://www.wildlifeandroads.org>







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The 2006-7 Landscape Ecology Lab

- ❖ Tammy Wilson - M.S. < Completed
- ❖ Lisa Nordstrom - Ph.D. > Ongoing
- ❖ Silvia Rosa - M.S.
- > Andy Leidolf - PH.D. candidate
- > Randy Larsen- Ph.D
- > Carrie O'Brien - M.S.
- > Hillary White - M.S.
- > Dr. Patty Cramer -- Research Associate

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Project Summary

1. Landscape Dynamics of Bird and Small Mammal Communities in Sagebrush-Dominated Mountain Meadows
2. Tapirs and Rhinoceroses in Captivity: An Examination of the North American Captive Populations
3. Deer Road Mortality: Effectiveness of a mitigation strategy on I-15
4. The Effects of Fire on Avian Communities
5. Water Ecology of Chukars (*Alectoris chukar*): Implications for Species Management in Arid Environments
6. Landscape dynamics of small mammal communities in the Gamba Complex, Gabon
7. Developing Riparian Bird Habitat Association Models and Management Guidelines
8. Evaluation of the Use and Effectiveness of Wildlife Crossings

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Landscape Dynamics of Bird and Small Mammal Communities in Sagebrush-Dominated Mountain Meadows

QUESTIONS ADDRESSED

Does landscape arrangement affect sagebrush-associated bird species?

Do high elevation sagebrush habitats provide a substitutable habitat for sagebrush associated birds and small mammals?



Tammy L. Wilson

- Sage Sparrow
- Brewer's Sparrow
- Sage Thrasher
- Greater Sage Grouse
- Pygmy Rabbit
- Sagebrush Vole
- Gray Flycatcher
- Least Chipmunk
- Vesper Sparrow
- Green-tailed Towhee

THE MESSAGE

mountain meadows are important habitat for a number of species, but it is clear that they cannot substitute for loss of lower elevation sagebrush shrubsteppe habitat.

Funding: USFS

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Landscape Dynamics of Bird and Small Mammal Communities in Sagebrush-Dominated Mountain Meadows

landscape arrangement

- Arrangement of habitat patches affects sagebrush bird occurrence patterns.
- Responses to habitat pattern are species-specific.

sagebrush habitats as substitutable habitat

- Sagebrush dominated mountain meadows provide valuable habitat for some sagebrush associates
- Birds
 - 69 species observed
 - 18 sagebrush associates
- Small Mammals
 - 18 species observed
 - 9 sagebrush associates

Legend: correlation?	Brewers Sparrow	Vesper Sparrow	White-crowned Sparrow
Meadow Area	+	+	+
Isolation	-	-	0
Proximity	+	+	0

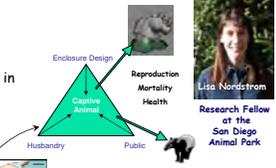
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TAPIRS AND RHINOCEROSSES IN CAPTIVITY

AN EXAMINATION OF THE NORTH AMERICAN CAPTIVE POPULATIONS

Main Objective

Assess the relationship between the captive environment and response of tapirs and rhinos in terms of their reproduction, mortality, and health




Funding: USU-CNR (Presidential Scholarship), USU Ecology Center, Tapir Preservation Fund, UTCFWRU

Methods

- survey of North American zoos currently housing tapirs and rhinos
- studbook data

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Road Effect on Small Mammal Communities

Questions:
What is the effect of road proximity on small mammal communities?







Some Results:




Higher diversity further from the road (2004) Higher diversity closer to the road (2005)

Conclusion:
Small mammals on the site were not consistently influenced by proximity to the road. Other papers have suggested that small mammals tended to avoid road surfaces, but were not affected by road proximity or traffic volume.

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The Effects of Fire on Avian Communities

Literature Search
Database
Annotated Bibliography Literature Review Meta-Analyses Synthesis



Andreas Leidolf
Assistant Professor
Westminster College
Fulton, Missouri
Fall 2006

Manuscripts submitted:
The effects of fire on avian communities: an annotated bibliography 1912-2003 (USGS Report Series)

Manuscripts prepared:
The effects of fire on avian communities: spatial, temporal and biogeographic aspects of the literature 1912-2003 (Frontiers in Ecology and the Environment)
Publication and citation rates of non-replicated research: a case study of the literature on the effects of fire on avian communities (Trends in Ecology and Evolution)

In Progress

Funding: UTAH ARMY NATIONAL GUARD, UDWR, ECOLOGY CENTER, UICPWRU
TEACHING ASSISTANTSHIPS: FRWS DEPT, CONTINUING ED.

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Water Ecology of Chukars (*Alectoris chukar*): Implications for Species Management in Arid Environments




Water Development (Guzzler)
Nevada Department of Wildlife

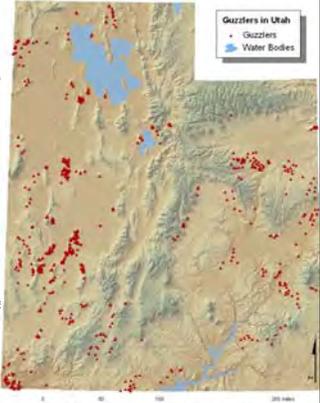
Chukar

Funding: Quinney Scholarship, Utah Habitat Council, Sportsmen for Habitat, Nevada Chukar Foundation, Carson Valley Chukar Club, Utah Chukar Foundation, Water for Wildlife Foundation, Pheasants Forever, Salt Lake County Fish and Game Association, Pershing County Chukars Unlimited, UDWR, Utah State Parks, BYU, Utah Cooperative Fish and Wildlife Research Unit.

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Context

- Water considered limiting factor
- Large investment in water developments by western states
 - Utah > 700
 - Nevada ~ 1,600
- Recent criticism of effectiveness due to limited research and lack of evidence



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Goals

- Quantify impact of water developments on Chukar populations
- Develop framework describing benefits of water developments using Chukars as model system:
 - When?
 - Where?
 - How?



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Methods and Current Status

- Location:
 - Several Great Basin ranges in both western Utah and Nevada
- Methods:
 - Radio telemetry
 - Density flights
 - Treatment/control
 - Observational study
- Status:
 - One year complete
 - Three years remaining



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Landscape dynamics of small mammal communities in the Gamba Complex, Gabon

Very little is known about the small mammals of Gabon
 The rainforests of the central African region have diverse assemblages of species with unknown distributions; recent taxonomic revisions and new species named
 Much work needed to determine small mammal habitat preferences and relationship to landscape features

Objectives

- Document rodent and insectivore species at 5 locations in the Gamba Complex
- Examine the relationship between small mammal richness and certain landscape features
- Explore the differences among coastal and inland habitat



Carrie O'Brien

UTOPWU
USGS

Landscape dynamics of small mammal communities in the Gamba Complex, Gabon

Study Area and Methods

- The Gamba complex in southwestern Gabon encompasses over 11,000 sq. km of coastal and inland rainforest
- 5 locations were surveyed intensively for one month each during 2002-2003
- 22 species of small mammals were found over a total of 15,792 trap-nights
- Coastal sites were found to be less diverse than inland sites



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Landscape dynamics of small mammal communities in the Gamba Complex, Gabon

Analysis

- Obtained 3 post-2000 images for my study areas, also elevation images
- Performed an unsupervised classification into forest - nonforest; delineated upland and lowland forest; determined elevation at each study site; digitized roads; obtained daily rainfall data
- Placed buffers (200, 500m) around each study site and quantified the amount of forest, roads, and upland/lowland forest within buffers
- Analyzed rodents and shrews separately using backwards stepwise linear regression with bootstrapping; examined individual species found at 3+ sites using backwards stepwise logistic regression

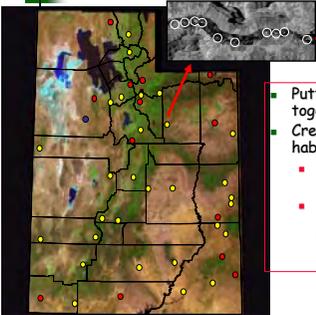
Results (so far)

- Rodent richness associated positively with both lowland and upland forest (or total amount of forest)
- Shrew richness associated positively with elevation and negatively to rainfall and roads



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Riparian Bird-Habitat Associations




- Putting bird and vegetation data together
- Create models of riparian bird habitat
 - What combination of factors => maximum diversity
 - What combination of factors => best Yellow-billed Cuckoo habitat (or other management indicator species)

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Context

- Riparian is the most critical habitat in Utah
 - >75% of UT bird species rely on riparian in some way
 - ~50% of those are riparian obligates
 - ~60% are neotropical migrants
- DWR's long-term monitoring project:
 - Linear and non-linear trend assessment (1992-2001) for select species
 - Trend and survival estimates for the banding effort (in progress)
 - Habitat associations have largely been ignored up to this point

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Objectives

- Estimate breeding bird densities in Utah's riparian areas
 - breeding bird species richness, diversity, relative abundance, density, and community composition through continued monitoring.
- Determine habitat characteristics of all bird monitoring sites
 - >30 important habitat variables (% shrub cover, density, etc.)
- Model bird-riparian habitat associations.
 - Putting the bird & habitat data together
 - Describe & Predict avian diversity/density
 - Framework for the development of conservation and restoration guidelines for Utah's riparian areas.

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Methods / Progress

- Avian Surveys
 - Distance sampling methods (point transects)
 - 2007 = 16th year of data, 37 sites, 10 points/site
 - Density estimation in progress
- Habitat surveys:
 - 21 habitat variables collected at each point station
 - 2007 = 5th year of data collected over 16 years (once every 3 years)
 - Multivariate analysis to begin after 2007 field season
- Bird-Habitat Association Model
 - Incorporate data from bird and habitat analysis

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Evaluation of the Use and Effectiveness of Wildlife Crossings

National Cooperative Highway Research Program
Project Transportation Research Board
National Academies of Science and Engineering

UTAH

Patty Cramer & boss

This project is a three year team effort with the objectives to provide guidance, in the form of clearly written guidelines for the selection, configuration, and location of wildlife crossing structures, and the monitoring and evaluation of crossing effectiveness as well as maintenance of those structures.

The primary products are a written report and a website that is intended to provide guidance for mitigation of wildlife-vehicle crashes

Funding: NAS-TRB-NCHRP

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USGS

RESEARCH RESULTS INCLUDE THE FOLLOWING

A analysis of past, present, and in-progress research of the usefulness and applicability of current information related to the selection, configuration, and location of wildlife crossing structures

A synthetic report of current domestic and international practices that evaluates the use and effectiveness of crossings

A web-based set of guidelines to lead the practitioner in the selection, configuration, and location of wildlife crossing structures, as well as guidelines for evaluating, monitoring and maintaining these structures

UTOPWRU
USGS

Wildlife and Aquatic Crossings as of March 2007

TO BE COUNTED, A CROSSING IS REQUIRED TO HAVE BEEN INSTALLED FOR AQUATIC OR WILDLIFE CROSSING PURPOSES

T = Terrestrial crossings
A = Aquatic crossings

UTOPWRU
USGS

WHAT SHOULD I KNOW?

www.wildlifeandroads.org

THE WEBSITE ALLOWS USERS EASY ACCESS TO ITS CONTENTS. BY CLICKING ON THE RED ICON IN THE SITE NAVIGATION BAR, THE USER IS PROVIDED WITH INFORMATION THAT DESCRIBES THE PROBLEMS OF ROADS AND WILDLIFE, AND THE STRUCTURE OF THE WEBSITE

UTOPWRU
USGS

DECISION GUIDE OVERVIEW

www.wildlifeandroads.org

THE SITE IS HIERARCHICAL IN NATURE. USERS CAN START WITH EVALUATING RESOURCES (STEP 1) AND END UP WITH AN IMPLEMENTATION PLAN THAT SPELLS OUT THE MITIGATION NECESSARY

UTEPWRU
USGS

SEARCH ENGINE

www.wildlifeandroads.org

Wildlife and Roads
A resource for compiling the effects of roads on wildlife using wildlife knowledge, such as migration, distribution, and occurrence.

Wildlife and Roads Search Engine

WITH THIS SEARCH ENGINE, THE USER CAN SEARCH FOR DATA, PICTURES, REPORTS, AND PUBLISHED ARTICLES BY STATE AND KEY WORD

A 'SHOPPING CART' ALLOWS THE USER TO DOWNLOAD PERTINENT INFORMATION AT THE END OF THE SESSION ONLINE

2006 RESEARCH ENDEAVORS

Thomas C. Edwards, Jr.
USGS Biological Resources Division
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Utah State University



THE 2005 SPATIAL MODELLING LABORATORY

And the Students who made my year ~~stressful~~ ...oops, successful

- Phoebe Zarnetske M.S. 2006
- Amy Croft Ph.D. Candidate (Co-Chair)
- Russell Norvell Ph.D. Candidate
- Tammy L. Wilson Ph.D. Candidate

T. Edwards, UTCFWRU 2006 Coordinating Meeting, 11 Apr 07

THE 2006 SPATIAL MODELLING LABORATORY

- Completed Projects
 - Forest Wildlife Modelling
 - Invasive Species Modelling
- Ongoing Projects
 - Shrubsteppe Restoration
 - Las Vegas Futures Modelling
- New Projects
 - Upper Colorado River Ecosystem
 - ECOCHANGE



T. Edwards, UTCFWRU 2006 Coordinating Meeting, 11 Apr 07

HABITAT MODELLING OF MANAGEMENT INDICATOR SPECIES IN UTAH



Phoebe L. Zarnetske
Utah State University
M.S. 2006

Thomas C. Edwards, Jr
USGS BRD UTCFWRU

Cooperator:
Gretchen G. Moisen,
Rocky Mountain Research Station



T. Edwards, UTCFWRU 2006 Coordinating Meeting, 11 Apr 07

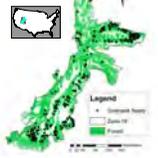
Forest Wildlife Modelling

▣ Objectives:

- Examine the utility of Forest Inventory & Analysis (FIA) forest habitat data for modeling suitable habitat of management indicator species at 3 different scales
- Develop process for creating pseudo-absence points for use in discrimination models (e.g. logistic regression)
- Determine how well the FIA data models species distributions



Northern Goshawk nest sites

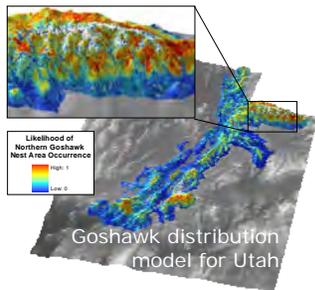


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Forest Wildlife Modelling

▣ Goshawk model accuracies

$D^2_{adj} = .72$
Cross-validation error = 22.7%
AUC = .84



Paper accepted by
Ecological Applications

T. Edwards, UTCFWRU 2006 Coordinating Meeting, 11 Apr 07

shrubMAP THE SHRUBSTEPPE MODELLING AND ANALYSIS PROGRAM

Approaches for Assessing Shrubsteppe Restoration Efforts



T. Edwards, UTCFWRU 2006 Coordinating Meeting, 11 Apr 07

Research Principals and Partners

- Thomas C. Edwards, Jr.
 - USGS / USU
- Frank P. Howe
 - UT DWR
- Karen H. Beard
 - WILD / USU
- Michael A. White
 - WATS / USU
- Utah Division of Wildlife Resources
 - Rich County CRM
 - Scott Pratt
- Natural Resources Conservation Service
 - Shane Green
- BLM
- Forest Service
- US Fish and Wildlife Service



T. Edwards, UTCFWRU 2006 Coordinating Meeting, 11 Apr 07

Research Goals

- A dynamic modelling environment that will:
 - Portray potential future vegetation, and consequently wildlife, given specific management actions
 - Provide a simulation environment that can evaluate potential ecological consequences of policy decisions
- Technologies and protocols that:
 - Provide defensible estimates on status and trend of vegetation and focal animal species and groups
 - Determine efficiency/effort ratios for IMA techniques having strong extrapolative capabilities
- Study region is Rich County, Utah



T. Edwards, UTCFWRU 2006 Coordinating Meeting, 11 Apr 07

Focal Animal and Vegetation Research

- Research responsibilities and partners
 - Shrubsteppe passerines Edwards
 - Pygmy rabbit Edwards
 - Small mammal communities Beard
 - Greater sage-grouse Howe
 - Mule deer Conner / Howe
 - Vegetation modelling White



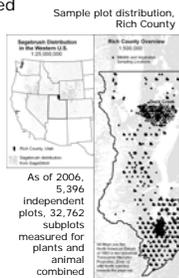
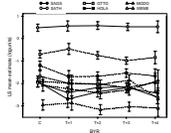
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Focal Animal and Vegetation Research

- **UPDATE:** Loss of Federal FY07 (and FY08) funding for project will affect deliverables
 - Effects of funding loss being evaluated



Nonetheless, wonderful data so far ...



T. Edwards, UTCFWRU 2006 Coordinating Meeting, 11 Apr 07

MODELLING ALTERNATIVE FUTURES FOR THE LAS VEGAS METROPOLITAN AREA



James MacMahon, BIOL & EC
 Richard Toth, ENVS
 Janis Boetinger, PSB & EC
 Richard Krannich, SOC
 Thomas C. Edwards, Jr.,
 UTCFWRU / WILD

Cooperator:
 Nevada BLM



T. Edwards, UTCFWRU 2006 Coordinating Meeting, 11 Apr 07

Las Vegas Futures Modelling

Objectives:

- Develop and compare alternative Conservation Transfer Areas in the Upper Las Vegas Wash (ULVW)
- Develop an assessment strategy for evaluating development impacts on the ULVW
- Characterize urban disturbance fronts and model effects on ULVW
 - Effects of disturbance fronts on rare plants
 - Spatial attributes of disturbance fronts
 - Soci-economic characteristics of disturbance fronts

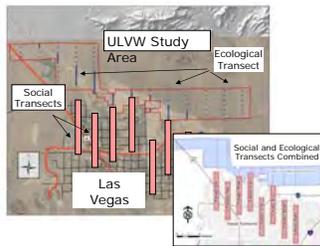


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Las Vegas Futures Modelling

Sample design for urban disturbance fronts

- Mixture of social and ecological transects
- Social
 - Population characteristics, eg income, age, perceptions
- Ecological
 - Soil characteristics, plant species and communities



T. Edwards, UTCFWRU 2006 Coordinating Meeting, 11 Apr 07

New Projects – FWS R6 Partnership

Upper Colorado Ecosystem Modelling

- Characterize landscape-level biological and physical elements of the UCRE
- Identify current and potential stressors affecting these elements
- Model effects of these stressors on the elements as functions of different land-use decisions (scenarios) in the UCRE

Some likely UCRE stressors

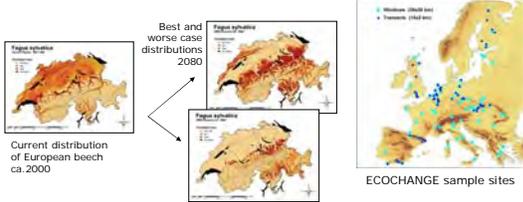


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New Projects – Switzerland WSL

ECOCHANGE

- Modelling global change effects on Western Europe
 - Biological models based on 4 CGMs
 - Social models of future land-use / change patterns
- Collaboration among 11 different nations, 19 different institutions



FRIENDS, PLACES AND COLLEAGUES (The Best Part, of Course, of 2006)



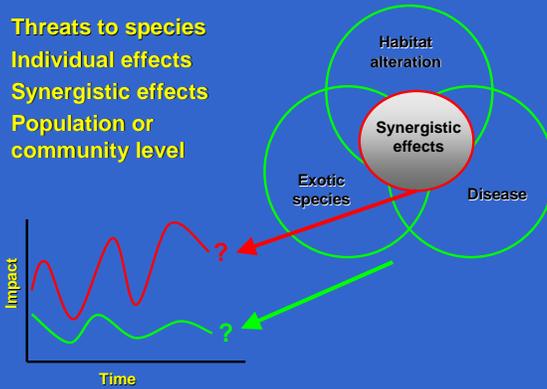
Understanding the combined effects of disease, species interactions, and habitat degradation on the survival and persistence of an imperiled trout.



Phaedra Budy



- Threats to species
- Individual effects
- Synergistic effects
- Population or community level



Common causes for declines in native trout

- *Habitat degradation*
- *Fragmentation and loss of connectivity*
- *Hybridization with exotics*
- *Predation/Competition – exotics*
- *Disease*



Bonneville cutthroat trout in the Logan River:

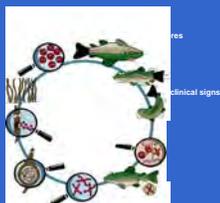
- One of the largest, remaining populations through out range
- Most (not all) of the habitat is in relatively good condition and connected
- Shares threats common to cutthroat trout range-wide



Oncorhynchus clarki utah

opportunity to learn...

Common Threats



Whirling Disease

Drought



Habitat degradation

Exotics

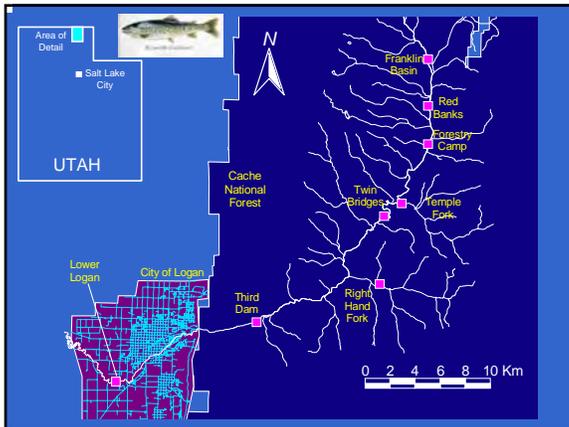


Research Goals

- Understand the combined effects of anthropogenic threats and natural factors on the status and viability of cutthroat
- Evaluate how these natural factors and threats vary spatially and temporally
 - Logan River
 - Across Historical Range
- Build a template for conservation and recovery planning

APPROACH

- **Combination of:**
 - **Long-term Monitoring and Evaluation**
 - Including comprehensive mark/recapture
 - **Experiments**
 - **Modeling**



Monitoring & Evaluation

- **Fish:**
 - Abundance and distribution
 - depletion
 - Diet
 - Condition ...
- **PCR analyses for *WD***
- **Abiotic and Biotic variables-**
affect fish and disease



Mark – Recapture

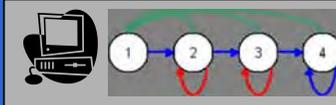
- Individual and site-specific tags
- Recapture -electroshocking and anglers
- > 1500 fish tagged over 5 years
- ~50% recaptured
- Program MARK
- CJS Survival
- Growth, site-fidelity, and movement



EXPERIMENTS:
DISEASE
SPECIES
INTERACTIONS



MODELING:
POPULATION
VIABILITY

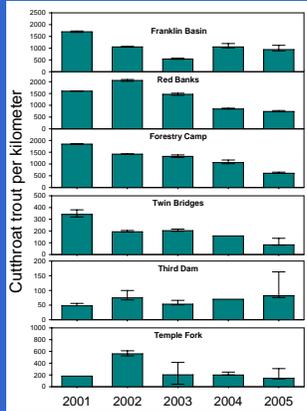


- Population Viability & Disease
- Species Interactions
- Habitat & synergistic effects

Population Viability

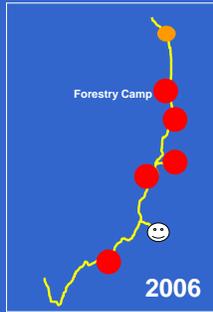
Population is fluctuating

Decline?

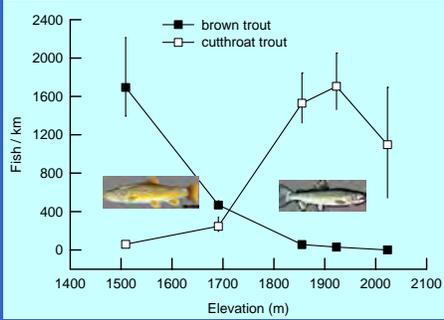


In 1999, *Mc* was first detected at sites below Forestry Camp

😊 Negative 🟢 < 20% 🟡 20-70% 🔴 70-100%



- Population Viability & Disease
- Species Interactions
- Habitat & synergistic effects



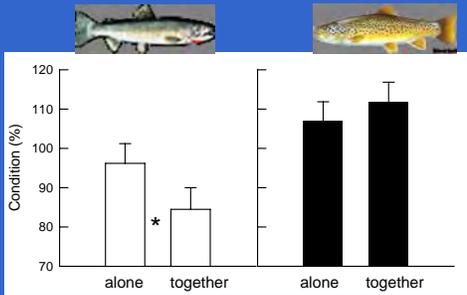
Field pattern suggests brown trout negatively affect cutthroat trout.

Species Interaction Experiments

- CUTTHROAT
- BROWN
- CUTTHROAT + BROWN



McHugh



*Cutthroat trout have no effect on brown trout.
Brown trout out-compete cutthroat trout.*

Brown trout distribution

- MS Thesis: Jeremiah Wood
- Document timing and extent of brown trout spawning
- Identify limiting factors for egg-to-fry survival
- Estimate predation potential

- Population Viability & Disease
- Species Interactions
- Habitat & synergistic effects

Disease and Habitat Alteration

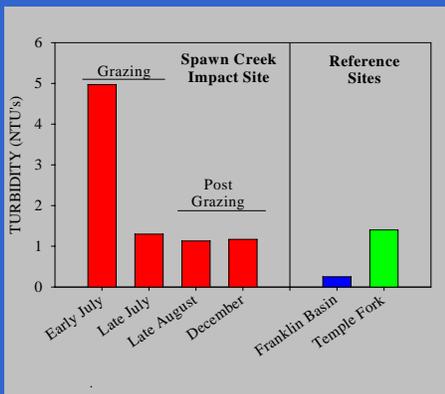
- Avian influenza and Asian agriculture
– e.g., Walters 2004
- Dengue fever and urbanization
– e.g., Schrag and Wiener 1995



Grazing impacts on tributaries

- Sediment ↑
- Eliminate Vegetation
- Temperature ↑
- Nutrients ↑



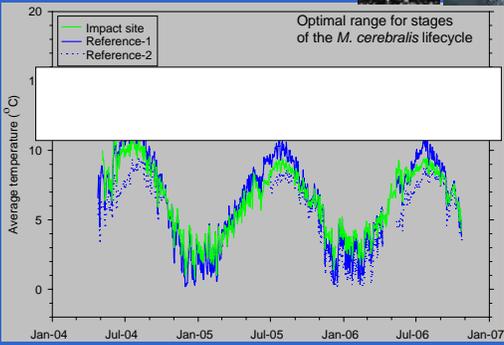
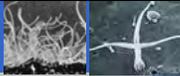


Spawn Creek Passive Stream Restoration- Cattle Exclusion

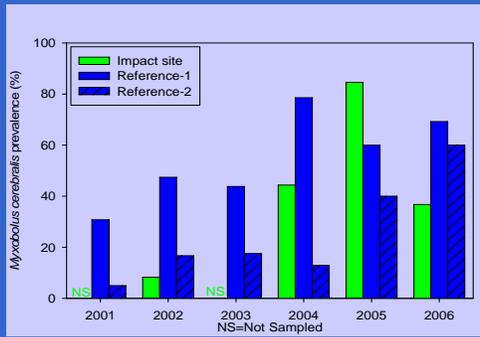
- Increase habitat quality
 - = decreased temps, sedimentation etc.
 - = lower prevalence and impact of WD
 - = improved fish health and condition
- Asymmetric BACI design



Temperature



Mc Prevalence (Wild Cutthroat)



Conclusions and Implications

- Impact site short term responses
 - Intra-annual
 - Inter-annual
- Turbidity
- Nutrients
- Reference sites
- Temperature
- *M. cerebralis*
- Resilient system
- Long term response
- Natural variation
- Small attainable changes need
 - Vegetation
 - Stream shading
- Applicable to other salmonids



Collaborators and Funding Sources

Collaborators/Volunteers

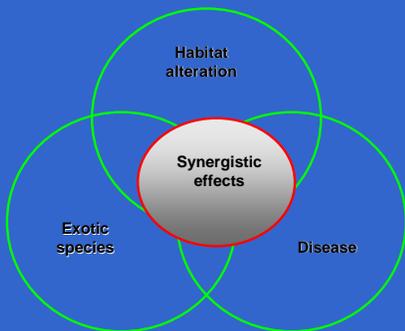
- Cache Anglers Chapter-Trout Unlimited
- Fisheries Experiment Station-UDWR
- Fish and Aquatic Ecology Unit-USFS
- Logan Ranger District-USFS
- Dedicated Hunter Program-UDWR
- Utah Cooperative Fish and Wildlife Research Unit-USGS
- John Carter-Western Watersheds
- Utah State University Faculty/Staff
- USU Student Subunit-Bonneville Chapter AFS

Funding Sources

- Utah Division of Wildlife Resources
 - Federal Aid, Sport Fish Restoration
 - Blue Ribbon Fisheries
- U.S. Forest Service
- Utah State University
- Trout Unlimited
 - Cache Anglers, Embrace a Stream, Utah Council, Weber Basin Anglers
- The Stonefly Society
- Bridgerland Audubon Society
- Sportsmen for Fish and Wildlife
- Bonneville Chapter of the AFS
- Utah Division of Water Quality

Cutthroat trout spawning ecology and early life history

- *new MS Thesis – USFS and UDWR*
- Document timing and extent of cutthroat trout spawning
- Understand cues and habitat choice
- Identify limiting factors for egg-to-fry survival



ACKNOWLEDGEMENTS

* Peter McHugh, Eriek Hansen, and Ernesto de la Hoz Franco
* Gary Thiede

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Utah Division of Wildlife Resources
US Geological Survey
Utah State University - Water Initiative and Community University
Research Initiative

UDWR Fisheries Experiment Station
US Forest Service
USU Fish Ecology Lab
Numerous volunteers and paid technicians