
2009 ANNUAL REPORT
USGS Biological Resources Division
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Utah State University, Logan UT 84322-5290



Photo: J. Leffler



Photo: H. White

Presented at the:
2010 Coordinating Meeting
Utah Division of Wildlife Resources
Salt Lake City, UT
14 April 2010



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



2010 AGENDA - Annual Coordinating Committee Meeting
Utah Cooperative Fish and Wildlife Research Unit
Venue: UDWR, 1594 West North Temple, Salt Lake City, UT
Rotating Chair: 2005:USGS, 2006:UDWR, 2007:WMI, 2008:USU, 2009:USGS, 2010:UDWR

Theme: Research and Conservation Plans for the New Decade

Tuesday, 13 April 2010

6:30 PM Dinner at Squatters with Joe Margraf (USGS_BRD) & Unit leaders in SLC. USU, FWS, and UDWR administrators invited to attend. RSVP shauna.lee.leavitt@usu.edu

Wednesday, 14 April 2010

8:00-8:45 **Continental Breakfast, Informal Introductions**

8:45-9:30 **The Unit: who we are and what do we do – J. A. Bissonette**

9:30-12:00 **Student presentations**

- 9:30-9:55 **Andy Dean**, M.S. candidate, A comparative evaluation of performance of triploid and diploid brook trout with consideration of ploidy treatment, lake morphology and productivity.
- 9:55-10:20 **Christy Meredith**, Ph.D. candidate, Interactions between geomorphic factors and exotic brown trout abundance patterns along an altitudinal gradient of the Logan River.
- 10:20-10:45 **Tammy Wilson**, Ph.D. candidate, A multi-scale evaluation of pygmy rabbit space use in a managed landscape
- 10:45-11:10 **Julie Ripplinger**, M.S. candidate, Plant community diversity and resilience on historic sites of chemical, fire, and mechanical managed disturbance
- 11:10-11:35 **Hillary White**, M.S. candidate, Developing riparian bird habitat association models and management guidelines for UDWR
- 11:35-12:00 **Justin Bingham**, M.S. candidate, Causes and consequences of lead-pellet ingestion by chukars (*alectoris chukar*) in western Utah: Examining soil, search images, and toxicology

12:00-1:15 **Sub Sandwich Lunch provided by UT CFWRU**

1:15-1:30 **Cooperative Research Program Status – Joe Margraf—CRU Program**

1:30-2:00 **CNR Initiatives – Dean Nat Frazer**

2:00-2:30 **DWR Major Initiatives—TBA Director Jim Karpowitz and staff**

2:30-3:00 **FWS initiatives—Utah Ecol. Serv. and Region 6 – Larry Crist, Mike Stempel**

3:00-4:00 **Breakout with Terrestrial and Aquatic groups: research ideas future needs**

3:00-4:00 **Cooperators Closed Meeting: USGS, UDWR, USU, FWS**

~4:15 **Wrap up & Departure**

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

Thursday 15, April 2010

9:00-4:00 Joe Margraf in Logan, meet with administrators, interested faculty and students

6:30-9:00 Evening Social at Tom Edwards house @ 6:30 P.M. 798 Juniper Dr., Logan UT

Friday 16, April 2010

9:00-4:00 Department of Wildland Resources Pre-Project Symposium

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Photo: P. Budy Crew



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Photo: Hillary White Crew

2009
RESEARCH
ACTIVITIES
OF
THE
UNIT
STAFF

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

Personnel

Cooperators – Coordinating Committee

UNITED STATES GEOLOGICAL SURVEY

(January-September 2009)

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Utah Cooperative Fish and Wildlife Unit

LEADERS

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Unit Research Staff and Students

Research Associates:

	
<p style="text-align: center;">Patricia Cramer, Ph.D.</p>	<p style="text-align: center;">Gary Thiede, M.S.</p>

Graduate Students by Degree Program:

		
<p style="text-align: center;">Justin Bingham, Wildlife Biology - Master's</p>	<p style="text-align: center;">Tracy Bowerman Fisheries Biology - Master's</p>	<p style="text-align: center;">Adam Brewerton, Avian Ecology, Master's</p>
		
<p style="text-align: center;">Andy Dean Fish Ecology - Master's</p>	<p style="text-align: center;">Jacob Gibson Landscape Ecology - Master's</p>	<p style="text-align: center;">Christy Meredith, Aquatic Ecology – Ph.D.</p>



Daniel Olson,
Wildlife Biology - Ph.D.



Julie Ripplinger
Historical Ecology - Master's



Timothy Walsworth
Aquatic Ecology – Master's



Hillary White,
Riparian Ecology - Master's



Tammy Wilson,
Landscape Ecology - Ph.D.

Mission Statement
Utah Cooperative Fish and Wildlife Research Unit
2009

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, change of reservoir and riverine habitat through activities associated with hydroelectric and water delivery systems as well as the increasing influences of climate change 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, Bayesian statistics, 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 extent habitat studies, ecological modeling of lake, reservoir, and riverine systems, avian and terrestrial ecology, and the effects of climate change. 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, geographical information system methodology, and landscape studies involving modeling for future climate 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.

**U. S. Geological Survey
Utah Cooperative Fish and Wildlife Research Unit
2009
Productivity Summary**

PUBLISHED

**5 Book Chapters
13 Peer-Reviewed Papers
11 Papers Submitted and in Review
10 Technical Reports
2 Public Relations Publication**

STUDENTS

**5 M.S., 1 Ph.D. Theses and Dissertations Completed
11 Active Unit-Directed Students (5 Ph.D., 6 M.S.)**

SEMINARS AND PRESENTATIONS

**8 Invited
19 Contributed**

INVITED EXTERNAL THESIS AND DISSERTATION EXAMINER

4 Ph.D. (Australia, Germany, New Zealand, Switzerland)

WORKSHOPS, OUTREACH, CLASSES, AND DISTANCE EDUCATION

8 offered

CONFERENCES HOSTED

**2009 Annual Meeting, International Association of Landscape
Ecologists, Snowbird, Utah**

Awards

**3 U.S. Geological Survey Star Awards for research productivity
Tracy Bowerman CNR Teaching Assistant of the Year
Christy Meredith CNR Terry Lynn Steel Award**

UNIT PRODUCTIVITY CY 2009

Publications

Chapters in Books

- Budy, P., G.P. Thiede, C. Luecke, and R.W. Schneidervin. 2009. Warmwater and coldwater fish in two-story standing waters. Pages 159-169 in S. Bonar, W.A. Hubert, and D.W. Willis (eds.) Standard methods for sampling North American freshwater fishes. American Fisheries Society, Bethesda, Maryland.
- Edwards, T.C., Jr., D.R. Cutler, and K.H. Beard. Accepted. Chapter 7. Predicting Risk of Invasive Species Occurrence-- Plot-Based Approaches. Pages XX in B. Welch (ed.) Tools for prioritizing, predicting and managing invasive plants on public lands.
- Edwards, T.C., Jr., D.R. Cutler, and K.H. Beard. Accepted. Chapter 9. The Process of Model Assessment and Evaluation. Pages XX in B. Welch (ed.) Tools for prioritizing, predicting and managing invasive plants on public lands.
- Edwards, T.C., Jr., D.R. Cutler, and K.H. Beard. Accepted. Chapter 12. Predicting Invasive-Plant Species Occurrences in Klamath Network National Parks-A Process for Prioritizing Prevention. Pages XX in B. Welch (ed.) Tools for prioritizing, predicting and managing invasive plants on public lands.
- Grilo, C., J.A. Bissonette, and P. A. Cramer. 2010 (In press). Mitigation measures to reduce impacts on biodiversity. In F. Columbus (ed.) Highways: Construction, Management, and Maintenance, Nova Science Publishers, Inc., Hauppauge, NY 11788.

Peer- Reviewed Papers

- Al-Chokhachy, R., B.B. Roper, T. Bowerman, and P. Budy. In press. A review of bull trout habitat associations and exploratory analyses of patterns across the Interior Columbia River Basin. North American Journal of Fisheries Management.
- Al-Chokhachy, R., P. Budy, and M. Conner. 2009. Detecting declines in the abundance of a bull trout (*Salvelinus confluentus*) population: understanding the accuracy, precision, and costs of our efforts. Canadian Journal of Fisheries and Aquatic Sciences 66:649–658.
- Bissonette J.A. and S. Rosa. 2009. Road zone effects in small mammal communities. Ecology and Society 14:27 URL: <http://www.ecologyandsociety.org/vol12/iss1/art27/>.
- Grilo, C., J.A. Bissonette, and M. Santos-Reis. 2009. Spatial-temporal patterns in Mediterranean carnivore road casualties: Consequences for mitigation. Biological Conservation 142:301-313.
- Gunson, K.E., A.P. Clevenger, A.T. Ford, J.A. Bissonette, and A. Hardy. 2009. A comparison of data sets varying in spatial accuracy used to predict the occurrence of wildlife-vehicle collisions. Environmental Management 44:268-277.
- Larsen, R.T., J.A. Bissonette, J. T. Flinders, M.B. Hooten, and T.L. Wilson. 2010. Summer spatial patterning of chukars in relation to free water in Western Utah. Landscape Ecology 25:135-145.
- Leidolf, A. and J.A. Bissonette. 2009. The effects of fire on avian communities: spatio-temporal attributes of the literature 1912-2003. International Journal of Wildland Fire 18(1):609-622.
- Loureiro, F., J.A. Bissonette, D. W. Macdonald, and M. Santos-Reis 2009. Temporal variation in availability of Mediterranean food resources: do badgers track them? Wildlife Biology 15:197-206.
- Miller, S.W., P. Budy, and J.C. Schmidt. 2010. Quantifying macroinvertebrate responses to in-stream habitat restoration: applications of meta-analysis to river restoration. Restoration Ecology 18:8-19.

- Wilson, T.L., J.B. Odei, M.B. Hooten, and T.C. Edwards, Jr. In press. Hierarchical spatial models for predicting pygmy rabbit distribution and abundance. *Journal of Applied Ecology*.
- Wood, J. and P. Budy. 2009. An investigation of the early life-history and potential influences on invasion success of exotic brown trout (*Salmo trutta*). *Transactions of the American Fisheries Society* 138:756-767.
- Vinson, R., and P. Budy. In press. Sources of variability and comparability between salmonids stomach contents and isotopic analyses: study design lessons and recommendations. *Canadian Journal of Fisheries and Aquatic Sciences*.
- Zimmerman, N.E., N.G. Yoccoz, T.C. Edwards, Jr., E.S. Meier, W. Thuiller, A. Guisan, D.R. Schmatz, and P.B. Pearman. 2009. Do climatic extremes explain tree species spatial patterns at a regional scale? *Proceedings of the National Academy of Sciences* 106:19723-19728.

Submitted

- Albert, C.H., N.G. Yoccoz, T.C. Edwards, Jr., C.H. Graham, N.E. Zimmermann, and W. Thuiller. Applied sampling in ecology and evolution – integrating questions and designs. In review *Ecography*.
- Bisrat, S.A., M.A. White, K.H. Beard, D.R. Cutler, and T.C. Edwards, Jr. Predicting the distribution of the invasive Puerto Rican Frog in Hawaii using remote sensing data. In review *Ecography*.
- Bolliger, J., T. Dalang, T.C. Edwards, Jr., F. Kienast, S. Ismail, and I. Seidl. Dry grassland meadows of high conservation priority: trade-offs between environmental risks and maintenance costs. In review *Conservation Biology*.
- Edwards, Jr., T.C., Jr., F. Kienast, J. Bolliger, and T. Dalang. Maintaining high Alp dry grassland meadows of high conservation priority in short- and long-term ecological change. *Conditional acceptance Biological Conservation*.
- Grilo, C., M. Cruz, J.A. Bissonette, and M. Santos-Reis. Identifying carnivore sensitivity to fragmented landscapes: A multi-scale approach. In review *Biodiversity and Conservation*.
- Hansen, E.S., and P. Budy. The potential of passive stream habitat restoration to improve ecosystem health with consideration of the impacts of disease? In review *Journal of the North American Benthological Society*.
- Meier, E.S., T.C. Edwards, Jr., F. Kienast, M. Dobbertin, and N.E. Zimmermann. Competition patterns of trees along macro-climatic gradients and their potential influence on the present and future distribution of *Fagus sylvatica*. In review *Journal of Biogeography*.
- 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*.
- Sales-Luis, T., J.A. Bissonette, and M. Santos-Reis. Conservation of Mediterranean otters: the importance of choosing the right map scale resolution. In review *River Research and Applications*.
- Seidel, S.P. Budy, D. Koons, and B. Roper. Exploring spawning dynamics and potential limiting factors for the early life stages of native cutthroat trout. In review *North American Journal of Fisheries Management*.
- Wilson, T.L., F.P. Howe, and T.C. Edwards, Jr. Effects of sagebrush restoration treatments on multi-scale resource selection by pygmy rabbits. In review *Journal of Wildlife Management*.

Technical Reports

- Bingham, R. J., R. T. Larsen, J. A. Bissonette, and J. T. Flinders. 2009. Causes and consequences of ingested lead pellets in Chukars. Extended 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. The Peregrine Fund, Boise, Idaho, USA. DOI 10.4080/ilsa.2009.0204
- Budy, P., P.D. MacKinnon, T. Bowerman, and G.P. Thiede. 2009. Bull trout population assessment in northeastern Oregon: a template for recovery planning. 2008 Annual Progress Report to US Fish and Wildlife Service. UTCFWRU 2009-1, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA. 57pp.
- Budy, P., G.P. Thiede, C. Meredith, and S. Seidel. 2009. Logan River whirling disease study: factors affecting trout population dynamics, abundance, and distribution in the Logan River, Utah. 2008 Annual Report to Utah Division of Wildlife Resources. Sport Fish Restoration, Grant number XIII. Project F-47-R. UTCFWRU 2009-2, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA. 43pp.
- Budy, P., A. Dean, and G.P. Thiede. 2009. Triploid trout in high Uinta lakes: a comparative evaluation of relative performance of triploid versus diploid brook trout. 2008 Annual Report to Utah Division of Wildlife Resources. Sport Fish Restoration, Grant number XIII. Project F-47-R. UTCFWRU 2009-3, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA. 45pp.
- Budy, P., J. Bottcher, and G.P. Thiede. 2009. Habitat needs, movement patterns, and vital rates of endemic Utah fishes in a tributary to the Green River, Utah. 2008 Annual Report to the Bureau of Reclamation, Upper Colorado Region. UTCFWRU 2009-4, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA. 52pp.
- Edwards, T.C., Jr., F.P. Howe, R.E. Norvell, T.L. Wilson, J. Ripplinger, and J. Gibson. 2009. Disturbance as a management tool: effects on selected wildlife species in Rich County. UTCFWRU 2009-5. USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA.
- Gresswell, R.E. and 13 others including P.Budy. 2009. Scientific Review Panel Evaluation of the National Park Service Lake Trout suppression program in Yellowstone Lake, August 25th–29th. Final Report. USGS Northern Rocky Mountain Science Center, Bozeman, Montana. YCR–2009–05.
- Hurst, L.A., R.E. Toth, T.C. Edwards, Jr.. 2009. Alternative Futures 2030: Ogden Valley, Utah. UCFWRU 2009-6, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA.
- MacMahon, J.A., R.E. Toth, J.L. Boettinger, G. Busch, T.C. Edwards, Jr., R.S. Krannich, A. Croft, B. Jennings, and E. Leydsman. 2009. Upper Las Vegas Wash Conservation Transfer Area: A system to develop alternative scenarios. UTCFWRU 2009-7, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA.
- Miller, S.W., N.L. Salant, P. Budy, J.C. Schmidt. 2010. Assessing responses of Bonneville cutthroat trout to restoration strategies implemented under the 1997 Conservation Agreement. 2009 Annual Report. Endangered Species Mitigation Fund Project Number: 0809.

Public Relations Publications

- Cramer, P.C., and J. A. Bissonette 2009. Transportation Ecology and Wildlife Passages: The state of the practice and science of making roads better for wildlife. Transportation Research News 262:12-19 (May-June 2009)

Cramer, P.C., and S. L. Leavitt 2009. Right of Way: Giving animals safe passage across roadways. *The Wildlife Professional* Vol. 3, No. 4: 56-57 (Winter 2009)

Graduate Students Directed

Theses and Dissertation Completed

J.A. Bissonette

Grilo, Clara Bentes. 2009. Habitat connectivity for carnivores in Mediterranean landscapes: Implications for conservation planning, Ph.D. Dissertation Universidade de Lisboa, Faculdade de Ciências, Departamento de Biologia Animal, Co-advisor with Margarida Santos Reis).

T.C. Edwards

Ripplinger, Julie. 2009. Legacy effects in sagebrush steppe: the key to understanding the future. M.S. Thesis, Utah State University, Logan, UT.

Gross, Donovan H. 2009. Mountain pine beetle fecundity and offspring size differ among lodgepole pine and whitebark pine hosts. M.S. Thesis, Utah State University, Logan, UT.

P. Budy

Dahle, Kirk S. 2009. Understanding the abiotic and biotic factors that determine fish abundance and diversity along the gradient of a highly altered stream ecosystem. M.S. Thesis, Utah State University, Logan, UT.

Seidel, Sara. 2009. Spawning ecology and early-life history of imperiled, endemic cutthroat trout. M.S. Thesis, Utah State University, Logan, UT.

Botcher, Jared. 2009. Maintaining population persistence in the face of an extremely altered hydrograph: Implications for three sensitive fishes in a tributary of the Green River, UT. M.S. Thesis, Utah State University, Logan, UT.

Active Graduate Research Projects

J.A. Bissonette

Dan Olson, Ph.D. Candidate. Modeling population effects of deer vehicle collisions.

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.

Teresa Sales Luís. Ph.D. Niche breadth and patterns of distribution and abundance of Eurasian otters in southern Portugal: Conservation implications, (Co-chair with Dr. Margarida Santos Reis, University of Lisbon)

T. C. Edwards

Adam Brewerton. M.S. Candidate. Fire effects on ground-nesting passerine birds.

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

Amy Croft. Ph.D. Candidate, Co-Chair. Modelling effects of urban disturbance fronts on endangered plant species in the Las Vegas metropolitan area. (Co-chair with J. MacMahon, Utah State University).

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

P. Budy

- Tracy Bowerman. Ph.D. Candidate. Understanding the effects of land use and natural variation in habitat on early life-history of threatend bull trout.
- Andy Dean. M.S Candidate. Comparative survival of triploid brook trout and food web interactions in high Uintah lakes.
- Christy Meredith. Ph.D. Candidate. Geomorphoc controls of exotic fish expansion.
- Timothy Walsworth. M.S. Candidate. Understanding the role of source sink dynamics in controlling population persistence of imperiled desert fishes.

Presentations

Invited

- Bissonette, J.A. 2009. Future directions and needs in road ecology. Road Ecology Symposium, associated with the 4th Australian Road Engineering and Maintenance Conference 2009, Brisbane, Australia, 5/5/2009.
- Bissonette, J.A. 2009. Roaded landscapes: Scaling animal movement to achieve landscape permeability. Road Ecology Symposium, associated with the 4th Australian Road Engineering & Maintenance Conference 2009, Brisbane, Australia, 5/5/2009.
- Bissonette, J.A. 2009. Decision-making in road ecology: Developing the framework. 4th Australian Road Engineering & Maintenance Conference 2009, Brisbane, Australia, 6/5/2009.
- Bolliger, J., T. Dalang, F.Kienast, and T.C. Edwards, Jr. 2009. Dry grassland meadows of high conservation priority: trade-offs between environmental risks and maintenance costs. 2009 Meeting of the European Chapter of the International Association for Landscape Ecology, Salzburg, Austria, 7/15/2009.
- Edwards, T.C., Jr., J. Bolliger, and F. Kienast. 2009. Assessing the effectiveness of agro-environmental conservation programs in maintaining high Alp meadow biodiversity. 2009 Meeting of the European Chapter of the International Association for Landscape Ecology, Salzburg, Austria, 7/15/2009.
- Edwards, T.C., Jr., J. Gibson, G.G. Moisen, and N.E. Zimmermann. 2009. Forecasting climate-induced distribution shifts in Western North American conifers. IUFRO Division 4 Conference on Extending Forest Inventory and Monitoring, Quebec City, Canada, 5/21/2009.
- Edwards, T.C., Jr. Random Forests: applications to conservation issues (subtitled: Is the forest *really* better than the tree? And what if you're in the grasslands?). 2009. Workshop on Random Forests, 2009 Meeting of the U.S. Chapter of the International Association for Landscape Ecology, Snowbird, Utah, 4/15/2009.
- Edwards, T.C., Jr., G.G. Moisen, A. Guisan, N.E. Zimmermann, and W. Thullier. 2009. Modelling species under global change scenarios: more questions than answers. 2009 Meeting of the U.S. Chapter of the International Association for Landscape Ecology, Snowbird, Utah, 4/14/2009.

Contributed

- Adair, W.A., and J.A. Bissonette. 2009. Modeling spatial constraints limiting resource acquisition: A case study with the Newfoundland marten. Poster presented at the 5th International Martes Symposium, Seattle, Washington. 9/9/2009.
- Al-Chokhachy, R., B. Roper, T. Bowerman, and P. Budy. 2009. Exploring bull trout habitat relationships: where do we need to go from here? American Fisheries Society, Oregon Chapter Annual Meeting, Bend, Oregon, 25/2/2009.

- Boettinger, J.L., G.A. Busch, B. B. Fonnesbeck, J.R Lawley, A.A. Croft, T.C. Edwards, Jr., and J.A. MacMahon. Elucidating soil-geomorphic relationships and soil properties associated with *Arctomecon californica* and *Eriogonum corymbosum* var. *nilesii*. Poster presented at the 94th Annual Meeting of the Ecological Society of America, Albuquerque, New Mexico, 5/8/2009.
- Bowerman, T. and P. Budy. 2009. Comparison of mark-recapture methods to estimate juvenile bull trout survival. American Fisheries Society, Oregon Chapter Annual Meeting, Bend, Oregon, 25/2/2009.
- Bottcher, J., P. Budy, and G.P. Thiede. 2009. Limiting factors and management recommendations for three sensitive species in the San Rafael River, Utah, as revealed by Random Forest modeling. American Fisheries Society, Utah Chapter Annual Meeting, 18-19/2/2009. Moab, Utah.
- Bowerman, T., and P. Budy. 2009. Comparison of mark-recapture methods to estimate juvenile bull trout survival. American Fisheries Society, Oregon Chapter Annual Meeting, Bend, Oregon, 25/2/2009.
- Bowerman, T., and P. Budy. 2009. River Engineers: Do spawning fish alter small-scale stream hydrology? 94th Annual Meeting of the Ecological Society of America, Albuquerque, New Mexico, 3/8/2009.
- Budy, P., G.P. Thiede, K. Landom, T.A. Crowl, and C. Luecke. 2009. An energetic assessment of predator consumption in Utah Lake with consideration of future options for June sucker recovery. Utah Chapter Annual Meeting, 18-19/2/ 2009. Moab, UT.
- Budy, P., J. Lobón-Cerviá, G. Ganzalez, L. A. Vøllestad, G. P. Thiede, and E. Becares. 2009. 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, Utah Chapter Annual Meeting, 18-19/2/2009. Moab, UT.
- Budy, P., and C. Luecke. 2009. Understanding the drivers of fish population dynamics in unique, Arctic lakes with special consideration of the role of climate and climate change. 94th Annual Meeting of the Ecological Society of America, Albuquerque, New Mexico, 3/8/2009.
- Dean, A., and P. Budy. 2009. Triploid versus diploid brook trout: a comparative evaluation of relative performance with consideration of lake food web structure. Poster Presentation. American Fisheries Society, Utah Chapter Annual Meeting, 18-19/2/2009. Moab, UT.
- Gibson, J., T.C Edwards, Jr., and G.G. Moisen. Forecasting climate induced distribution shifts for the conifers of North America's arid interior west. 2009 Meeting of the U.S. Chapter of the International Association for Landscape Ecology, Snowbird, Utah, 14/4/2009.
- Gibson, J.R., T.C. Edwards, Jr., G.G. Moisen, and N.E. Zimmermann. Forecasting climate induced distribution shifts for the pinions and junipers of the Western U.S. 94th Annual Meeting of the Ecological Society of America, Albuquerque, New Mexico, 7/8/2009.
- Meredith, C. and P. Budy. 2009. Exploring relationships between channel gradient, gravel availability, and brown trout (*Salmo trutta*) spawning densities in the Logan River, Utah. American Fisheries Society, Utah Chapter Annual Meeting, Moab, Utah, 7/2/2009.
- Meredith, C. and P. Budy. 2009. Investigating the invasion potential of brown trout (*Salmo trutta*) in high mountain streams: Are early life-stages limited by interactions between geomorphic and hydrologic factors? 94th Annual Meeting of the Ecological Society of America Albuquerque, New Mexico, 3/8/2009.
- Ripplinger, J., and T.C. Edwards, Jr. Land-use legacies: Quantifying vegetation dynamics for sustainable shrubsteppe management. 94th Annual Meeting of the Ecological Society of America, Albuquerque, New Mexico, 7/8/2009.

- Ripplinger, J., and T.C. Edwards, Jr. Quantifying legacy effects of past land-use on shrubsteppe environments. 2009 Meeting of the U.S. Chapter of the International Association for Landscape Ecology, Snowbird, Utah, 14/4/2009.
- Seidel, S., P. Budy, and B. Roper. 2009. Quantifying the early life history of Bonneville cutthroat trout in northern Utah. American Fisheries Society, Utah Chapter Annual Meeting, 18-19/2/2009. Moab, UT.
- Wilson, T.L., J.B. Odei, M.B. Hooten, and T.C. Edwards, Jr. Hierarchical spatial models for pygmy rabbit distribution and abundance. 2009 Meeting of the U.S. Chapter of the International Association for Landscape Ecology, Snowbird, Utah, 13/4/2009.

University Courses

J.A. Bissonette

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

T. C. Edwards

WILD 6500, Biometry (Fall 2009, 21 students)

P. Budy

WATS 3100/5100, Fish Diversity and Conservation (Fall 2009, 40 students)

WATS 3100/5100, Fish Diversity and Conservation Laboratory Practicum (Fall 2008, 19 students)

Workshops

T. Edwards

Modelling species distributions using R. U.S. Fish and Wildlife Service NCTC shortcourse, Panama City, Florida, 7-11/12/2009. (17 students).

Predictive habitat distribution models: tools for building projections of global change impact on biodiversity. ECOCHANGE, Summer School, Co-taught with Niklaus Zimmermann, Antoine Guison, Wilfried Thullier, and Nigel Yocczuz, Lausanne, Switzerland, 14-18/9/2009. (23 students).

Outreach and Distance Education

Public Presentations

P. Budy

Invited Presentation to NGO as part of an environmental film series. "Challenges for conserving and protecting Utah's fishes". Presented at Swaner EcoCenter, Park City, Utah, 15/7/2009.

Invited Presentation to Cache Anglers, Local Chapter of Trout Unlimited. "Eight years of trout research on the Logan River: what have we learned? Options for BCT restoration" Presented in Logan, Utah, 10/6/2009.

Invited External Thesis and Dissertation Examiner

J. A. Bissonette

Sofce Spasikova, M.S. 2009. Effectiveness of forest corridors for biodiversity conservation.

Albert Ludwigs Universität (Universität Freiburg), Freiburg Germany (Supervisor: I. Storch).

Erin Roger, Ph.D. 2009. The persistence of common wombats in road impacted environments.

School of Biological, Earth and Environmental Sciences, University of New South Wales, Sydney, Australia

T. Edwards

Robin M. Engler, Ph.D. 2009. Unfolding nature *in silico* – overcoming practical and methodological limitations of species distribution models, University of Lausanne, Switzerland.

P. Budy

Darragh Woodford, Ph.D. 2009. River-scape-mediated effects of introduced trout on native galaxiid fishes in New Zealand. University of Canterbury, Christchurch, New Zealand.

Professional Service

J.A. Bissonette

Reviewer 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, Chapter on wolf recovery for edited book, Journal of Wildlife Management, Journal of Applied Ecology, Landscape Ecology, Ambio, Annals of the Association of American Geographers, Bioscience, CSIRO Wildlife Research, European J. Wildlife Research, Ecological Applications, Environmental Management, Human Dimensions of Wildlife, International Journal of Biodiversity Science and Management, Wildlife Biology in Practice, Environmental Monitoring and Assessment, and proposals from National Science Foundation and NSERC

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

Coordinating Editor: Landscape Ecology, 2008-present

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

Member: TWS 75th Anniversary Celebration Committee

T.C. Edwards

Reviewer for: Journal of Wildlife Management, Condor, Current Ornithology, Conservation Biology, Wildlife Society Bulletin, Ecology, Ecological Monographs, Remote Sensing and Environment, American Naturalist, Ecological Applications, Landscape Ecology, Ecological Modelling, Environmental Management, Biological Conservation, Journal of Vegetation Science, Trends in Ecology and Evolution, Diversity and Distributions, Ecography

Editorial Board: International Association of Vegetation Scientists

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

Secretary General: International Association of Landscape Ecology

P. Budy

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

Reviewed for (2009): Journal of Applied Ecology, Biological Invasions, Oecologia, Ecology of Freshwater Fish, Ecology, Conservation Biology, North American Journal of Fisheries Management, Transactions of the American Fisheries Society.

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

Member: USGS, CRU Award Nominating Committee (2010).

Member: USU, Watershed Sciences, Watershed Scientist Faculty Search Committee (2009).

Research

J. A. Bissonette

- 2007-2009 Lead pellet ingestion by chukars in the west desert (PI)
- 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 Water ecology of chukars (*Alectoris chukar*): implications for species management in arid environments. (PI).
- 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. COMPLETED.
- 2006-2008 Riparian bird habitat models and habitat guidelines (Co-PI).
- 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.

T. C. Edwards

- 2009-2011 Sustainable communities and landscape designs (PI).
- U.S. Geological Survey, \$349,500. ONGOING.
- 2009-2011 Effects of projected climate change on distribution patterns of Western North America conifers (PI).
- USDA Forest Service, Rocky Mountain Research Station, \$125,000. ONGOING.
- 2009-2012 Assessing the importance of biotic interactions for predicting the impact of climate change on the future distribution of plant assemblages (Co-PI).
- Swiss National Science Foundation, \$425,000 CHF. ONGOING.
- 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€ (\$713,170€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. COMPLETED.
- 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. COMPLETED.

P. Budy

- 2009-2010 Evaluating fish growth and production potential across Ute Reservation reservoirs. (PI).
- Department of Watershed Sciences, The Ute Indian Tribe, Uintah and Ouray Reservation, \$100,951. ONGOING.

- 2009-2010 Upper Donner und Blitzen River Geomorphology Study. (PI).
 - Intermountain Center for River Rehabilitation and Restoration, Department of Watershed Sciences., US Fish and Wildlife Service (USFWS), R1/R8 Water Resources Branch, 2009-2010, \$25,000. ONGOING.
- 2002-2009 Limiting factors affecting trout population dynamics, abundance, and distribution in the Logan River, Utah: Population dynamics, disease, and synergistic effects. (PI).
 - Utah Division of Wildlife Resources, \$459,460. ONGOING.
- 2002-2009 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), \$977,425. ONGOING.
- 2007-2010 Habitat needs, movement patterns, and vital rates of endemic Utah fishes in a tributary to the Green River, Utah. (PI).
 - Bureau of Reclamation (BOR), \$231,987. ONGOING.
- 2008-2009 Comparative survival of triploid brook trout and food web interactions in high Utah lakes. (PI).
 - Utah Division of Wildlife Resources (UDWR), \$127,631. ONGOING.
- 2007-2009 The role of nonnative fish predators/competitors on June sucker survival in Utah Lake: The food web model. (Co-PI).
 - Central Utah Water Conservancy District, Budy Portion of Award = \$13,574. COMPLETED.
- 2007-2008 Movement patterns and multi-scale factors that influence exotic brook trout distribution and abundance.
 - Utah Division of Wildlife Resources (UDWR), \$97,306. COMPLETED.

Recognition and Awards

J. A. Bissonette

USGS Star Award- 2009

T.C. Edwards

USGS Star Award- 2009

P.Budy

USGS Star Award- 2009

2010 CNR, Utah State University, Researcher of the Year, CNR, Utah State University, Teacher of the Year.

Students Awards:

Tracy Bowerman CNR Teaching Assistant of the Year

Christy Meredith CNR Terry Lynn Steel Award

Other: 2010

Julie Ripplinger accepted into Ph.D. Program in Monica Turner's lab at U. Wisconsin

Tammy Wilson and her co-authors (J.B. Odei, M.B. Hooten, and T.C. Edwards, Jr.) had the lead article in the Journal of Applied Ecology with a picture of a pygmy rabbit on the cover of the journal. See the cover of this report to see that picture.

CAUSES AND CONSEQUENCES FOR LEAD-PELLET CONTAMINATION OF CHUKARS (*ALECTORIS CHUKAR*): EXAMINING HABITAT, SEARCH IMAGES, AND TOXICOLOGY

Dates:

Fall 2007-Present (Completion expected by May 2010)

Abstract:

Ingestion of lead pellets and the resulting toxicosis are well-documented in waterfowl, raptors, and some doves and lead-pellet ingestion can cause mortality in many additional species of birds. We assessed potential causes of lead-pellet ingestion in chukars (*Alectoris chukar*), including density of lead pellets in soils, use of natural and man-made water sources, and similarities between lead pellets and food/grit items. We conducted 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 determined that search images for food and grit items that are similar in appearance to lead pellets can increase the probability of lead ingestion. We also observed that springs likely contribute to an elevated exposure of chukars to lead pellets. A single #6 lead pellet can lead to death in captive chukars.

We found that unhealthy concentrations of lead are present in breast tissues of chukars, when harvested with lead shot, even when we removed pellets, traumatized tissues, and other embedded objects, such as feathers and bone fragments. In our sample of 343 wild-harvested chukars, we have found 34 (9.9%) with ingested lead pellets. Approximately 10 % of our wild-harvested chukars contain ingested lead pellets. Additionally, we found ingested lead in chukars from seven mountain ranges and four counties. It is likely that the lead toxicosis is negatively affecting chukars in Utah at large landscape extents. Additionally, the risk of elevated exposure to lead is apparent for humans and wildlife if they consume chukars that were harvested with lead shot. A switch to non-toxic ammunition would immediately alleviate the risk of elevated lead exposure to human and wildlife consumers of chukars and other game species, and over time this switch would eliminate the risk of lead-pellet ingestion by chukars and wildlife in general.



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)

Reports:

Bingham, R. J., R. T. Larsen, J. A. Bissonette, and J. T. Flinders. 2009. Causes and consequences of ingested lead pellets in Chukars. Extended 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. The Peregrine Fund, Boise, Idaho, USA. DOI 10.4080/ilsa.2009.0204



ASSESSING VEHICLE-RELATED MORTALITY OF MULE DEER IN UTAH

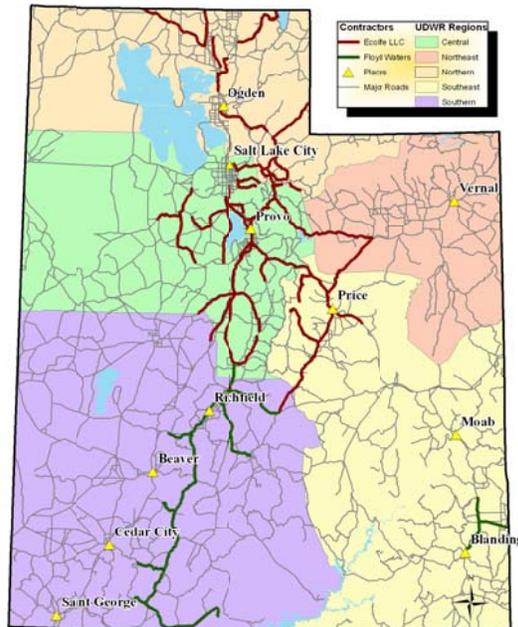
Dates:

2009-2013 (Ongoing)

Abstract:

Mule deer (*Odocoileus hemionus*) are the most abundant big game species in Utah with numbers that exceed a quarter of a million individuals (UDWR 2008). They are also widely distributed with a range that covers >50% of the state. Much of their range, however, is now bisected by road networks with increasing traffic volumes. This project was designed to fill knowledge gaps on vehicle-related mortality in mule deer that have been identified by the Utah Division of Wildlife Resources. Our research questions include: 1) how many deer are being hit on Utah's highways? 2) what effect does vehicle-related mortality have on population growth?, and 3) how are deer movement patterns related to risk of being killed by vehicle traffic? To estimate the number of deer that are being killed by vehicles, we will double sample sections of highways that are regularly patrolled for wildlife carcasses. We will also model the effect of vehicle-related mortality on population growth using a stage-structured matrix model. Finally, we will analyze moment data from 30 GPS collared female deer to determine how vehicle-related mortality is related to movement patterns.

UDOT Carcass Collection Routes
as of 2/8/2010



Highways in red and green are regularly patrolled for wildlife carcasses.

Funding:

Utah Division of Wildlife Resources

Investigators:

John A. Bissonette, U.S. Geological Survey UTCFWRU and Utah State University (PI)
Daniel D. Olson, Graduate Research Assistant (Ph.D. Ecology)

Reports:

None; research ongoing.

Publications:

None; research ongoing.

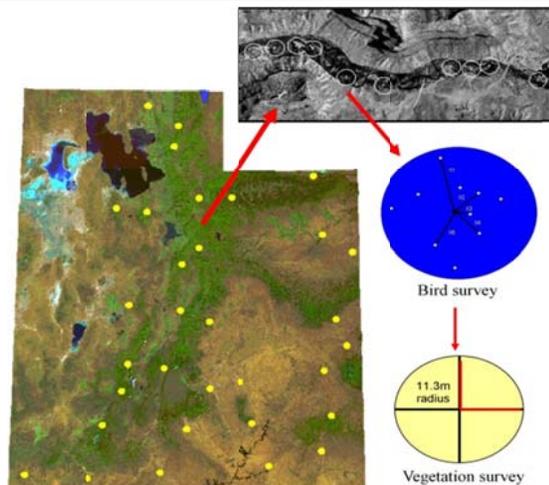
DEVELOPING RIPARIAN BIRD-HABITAT ASSOCIATION MODELS IN UTAH: A FRAMEWORK FOR SUCCESSFUL MANAGEMENT AND RESTORATION

Dates:

2006-2010 (Ongoing)

Abstract:

Approximately 75% of Utah's avian species use riparian habitats at some time during their life cycles and at least 80% of this habitat in Utah has been lost or altered since settlement. In 1992, the Utah Division of Wildlife Resources began a statewide neotropical migratory bird (NTMB) monitoring program in this critical habitat at over 50 riparian survey sites. Our primary study goals are 1) to assess population trends for focal avian species, 2) describe changes in vegetation over time, and 3) investigate how these two processes are related by creating bird-habitat association models. To better understand these large scale effects, riparian-bird habitat association models are being developed using 17 years of statewide bird and vegetation data and will form the basis for the development of management guidelines for riparian restoration and conservation in Utah.



Funding:

Utah Division of Wildlife Resources (UDWR), U.S. Fish and Wildlife Service (USFWS)
U.S. Forest Service (USFS), Utah Bureau of Land Management (BLM), U.S. Geological Survey (USGS), Utah Reclamation and Mitigation Conservation Commission (URMCC)
U.S. Bureau of Reclamation (BOR), Utah State University (USU)

Investigators:

Hillary M. White, Utah Division of Wildlife Resources, USU Graduate Research Assistant
John A. Bissonette, U.S. Geological Survey UTCFWRU and Utah State University
Frank P. Howe, Utah Division of Wildlife Resources

Reports:

Population monitoring of neotropical migratory birds in riparian habitats of Utah. UDWR
Publication Number 07-17; 2007

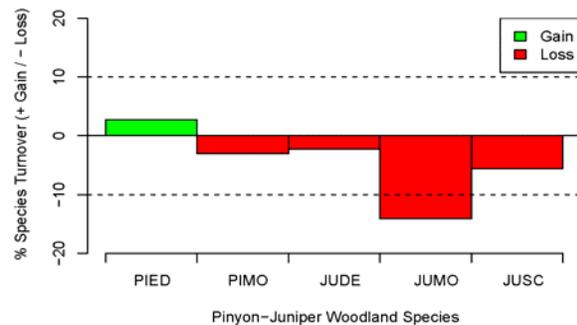
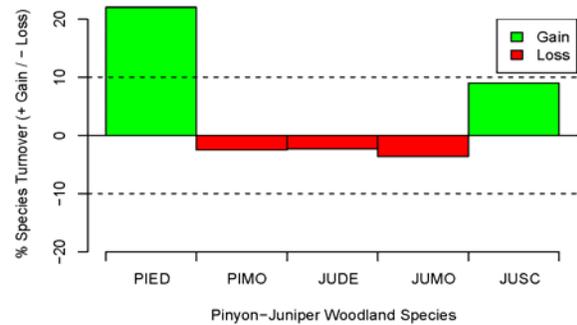
FORECASTING CLIMATE-INDUCED DISTRIBUTION SHIFTS FOR THE PIÑON-JUNIPER COMPLEX OF THE WESTERN U.S.

Dates:

2007-2010 (Ongoing)

Abstract:

Two species of piñon pine (*Pinus monophylla*, *P. edulis*) and four species of juniper (*Juniperus osteosperma*, *J. monosperma*, *J. deppeana*, *J. arizonica*) are dominant in the Colorado Plateau, and comprise a mosaic of overlapping distributions. We developed bioclimatic distribution models and applied climate change scenarios to gauge potential shifts in the distributions of individual species and their co-occurrence. Results suggest individualistic responses of species to climate change will likely cause shifts in their spatial co-occurrence. For example, *J. osteosperma* is predicted move northwest whereas *J. monosperma* is predicted to move northeast resulting in a decrease of co-occurrence. *P. edulis* is predicted to increasingly co-occur with *J. osteosperma* while *P. monophylla* is predicted to decrease or increase depending on the climate change scenario. Individual species distributions shifts and their resulting changes in co-occurrence will be largely determined by changes in the summer monsoon rains and in the minimum winter temperatures.



Modeled areal gain and loss (%) for piñon-juniper woodland species under projected climate change, Hadley A2 (top) and B2 (bottom) Scenarios.

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 UTCFWRU and Utah State University (PI)
Gretchen G. Moisen, USDA Forest Service Rocky Mountain Research Station
Jacob Gibson, Graduate Research Assistant (MS Ecology)

Reports:

None; research ongoing.

Publications:

None; research ongoing.

A MULTI-SCALE EVALUATION OF PYGMY RABBIT SPACE USE IN A MANAGED LANDSCAPE

Dates:

2007-2010 (Ongoing)

Abstract:

Throughout the intermountain American West widespread mechanical, chemical, and fire treatments are being performed to improve degraded sagebrush stands. While it is generally thought that these treatments will improve wildlife habitat, their effects remain unclear for many sagebrush-dependent species. Due to their reliance on sagebrush for both food and cover, and a preference for tall and dense sagebrush stands, the pygmy rabbit (*Brachylagus idahoensis*) is one of the species for which sagebrush treatments may be detrimental. The main goal of this dissertation is to evaluate distribution, relative abundance, and habitat selection of pygmy rabbits at multiple scales in order to improve management and conservation for this species.



Photo by J. Lefler

Funding:

Natural Resources Conservation Service
Utah Division of Wildlife Resources

Investigators:

Thomas C. Edwards, U.S. Geological Survey UTCFWRU and Utah State University (PI)
Tammy Wilson, Graduate Research Assistant (PhD Ecology)

Reports:

Dissertation under committee review

PDF available

Publications:

Wilson, T.L., J.B. Odei, M.B. Hooten, T.C. Edwards, Jr. In press. Hierarchical spatial models for pygmy rabbit distribution and relative abundance. *Journal of Applied Ecology* 47.



Wilson, T.L., F.P. Howe, T.C. Edwards, Jr. Effects of sagebrush restoration treatments on resource selection of pygmy rabbits. In review, *Journal of Wildlife Management*.



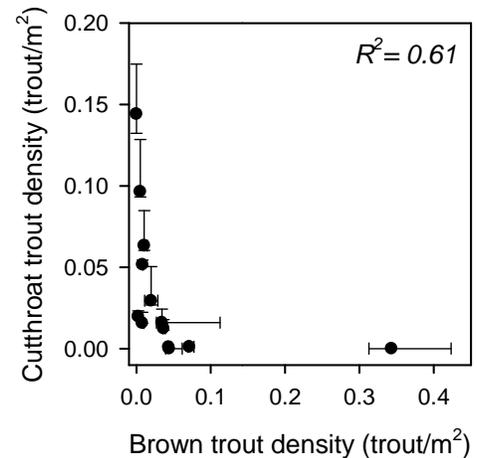
A TEST OF THE BIOTIC RESISTANCE HYPOTHESIS WITH NATIVE AND EXOTIC TROUT ASSEMBLAGES IN STREAM ECOSYSTEMS: TOWARDS A BETTER UNDERSTANDING OF NATIVE CUTTHROAT TROUT RESTORATION OPTIONS

Dates:

2009-2011

Abstract:

Bonneville cutthroat trout, endemic to Utah, are imperiled due to the combined impacts of habitat degradation, disease, and hybridization and interactions with exotic fish. Bonneville cutthroat trout are currently restricted to 33% of their historical range and are protected under a Conservation Agreement in an effort to avoid ESA listing. The Logan River supports one of the largest remaining meta-populations of this cutthroat trout species across its range; however, as elsewhere, these native trout are threatened by negative interactions with invasive brown trout. Towards a broader goal of gaining a better understanding of native trout restoration options, we are testing the hypothesis of biotic resistance in the Logan River using a large-scale, manipulative field study coupled with controlled laboratory experiments, and a meta-analysis of evidence for and against this hypothesis conducted at a larger spatial scale. The overall goal of this project and collaborative effort is to protect and conserve this extremely important meta-population of native trout and the popular sport fishery it supports. We are attempting this through nonnative brown trout removals, native cutthroat trout restoration (i.e., reintroduction), and monitoring and evaluation. In 2009, we began work and removed ~ 5,000 brown trout in the Right Hand Fork tributary and mapped all removed trout onto a physical habitat template within 25-m reaches. We then compared brown trout density, biomass, and condition among habitat unit types, and used this information to better identify habitat suitability criteria for nonnative brown trout and for future native cutthroat trout.



Funding and collaborators:

Utah Division of Wildlife Resources, USGS UT-CFWRU, Trout Unlimited, Cache Anglers Chapter, US Forest Service

Investigators:

Phaedra Budy, Principle Investigator, USGS – UTCFWRU, USU – Watershed Sciences
Gary P. Thiede, Fisheries Biologist, USU – Watershed Sciences
Reed Chaston, Undergraduate Researcher, USU – Watershed Sciences

Publications:

Budy, P, G.P. Thiede, C. Meredith, and N. Burbank. 2010. Logan River whirling disease study: factors affecting trout population dynamics, abundance, and distribution in the Logan River, Utah. 2009 Annual Report to Utah Division of Wildlife Resources. Sport Fish Restoration, Grant number XIII. Project F-47-R. UTCFWRU 2010.

A COMPARISON OF THE RELATIVE PERFORMANCE OF TRIPLOID VS. DIPLOID BROOK TROUT IN HIGH Uinta LAKES: WHO IS THE BIGGEST LOSER?

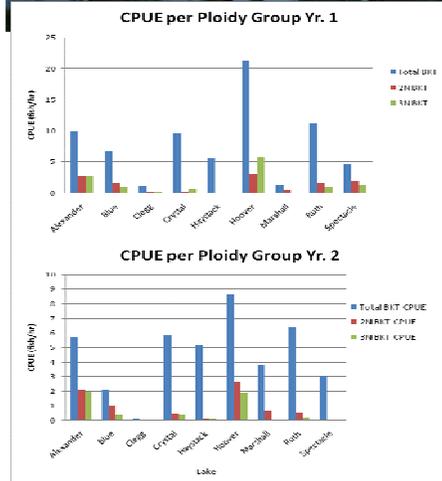
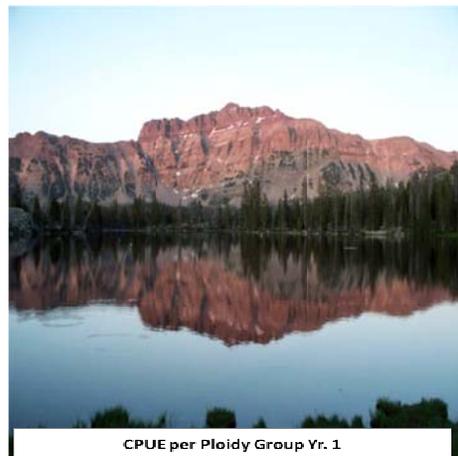
Dates:

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 fish in a natural setting is not well understood. We compared relative performance of stocked triploid and diploid brook trout (*Salvelinus fontinalis*) in high mountain Uinta lakes. CPUE varied greatly across lakes and years but did not differ significantly between the two ploidy groups.

Condition was not as variable between ploidy groups, within lake or across years. Physical lake characteristics (e.g., oxygen and dissolved oxygen do not appear to affect fish growth and survival throughout the summer months, but may limit relative performance over the winter months. Our research will provide fishery managers with information regarding the use of triploid brook trout in providing large catchable brook trout while alleviating some potential negative impacts of stocking a non-native species.



Funding:

Utah Division of Wildlife Resources

Investigators:

Andy Dean, Graduate Research Assistant (M.S.)

Phaedra Budy, U.S. Geological Survey, Utah Cooperative Fish and Wildlife Research Unit, Department of Watershed Sciences, Utah State University, Logan, UT, 94322-5210

Reports:

Budy, P., A. Dean, and G.P. Thiede. 2009. Triploid trout in high Uinta lakes: a comparative evaluation of relative performance of triploid versus diploid brook trout. 2008 Annual Report to Utah Division of Wildlife Resources. Sport Fish Restoration, Grant number XIII. Project F-47-R. UTCFWRU 2009(3):1-45.

THE INFLUENCE OF STREAM GEOMORPHOLOGY ON EARLY LIFE STAGES OF BROWN TROUT (*SALMO TRUTTA*) AND LIMITATIONS FOR INVASION

Dates:

2008-2011 (Ongoing)

Abstract:

Brown trout densities are high at lower elevations of the Logan River, but this exotic species is near absent from the highest elevations, dominated by native Bonneville cutthroat trout. The goal of this research is to determine how geomorphic characteristics that change along an elevational gradient potentially influence the distribution of brown trout on the Logan River, which could inform management efforts to protect native species from brown trout invasion in the face of climate change or habitat alterations. Results from scour chains inserted prior to the spring flood of 2009 demonstrated that flood scour depths are typically less than egg burial depths, regardless of increases in reach-average shear stress with elevation. Thus, streambed scour is not likely to be a mechanism limiting brown trout densities along the elevational gradient, indicating the influence of another factor (s). We also compared the distribution of redd abundance at select reaches to estimates of gravel availability (Figure 1) and to temperature, both of which have been proposed to control brown trout distribution in the literature. Mid and high elevation sites with low winter temperatures had characteristically low redd densities, while the highest redd densities were observed in reaches of low stream power and high gravel availability at lower elevations, suggesting that the dominant mechanism influencing brown trout abundance may change along the elevational gradient. Preliminary results also indicate that the presence of anchor ice limits brown trout abundance, while side channels and backwaters increase abundance by augmenting habitat in reaches containing poor habitat suitability.

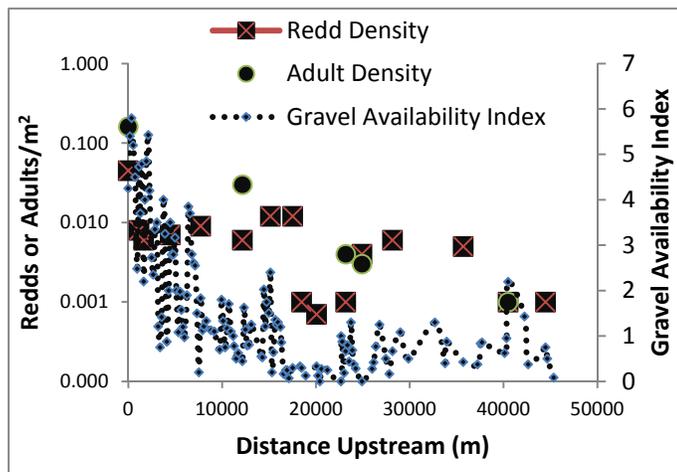


Figure 1. Estimated spawning gravel availability on the Logan River in relation to adult and redd densities, from Dewitt Campground to Franklin Basin

Funding:

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

Investigators:

Phaedra Budy, Principle Investigator, USGS – UCFWRU, USU- Dept. Of Watershed Sciences
Jack Schmidt, Co- Principle Investigator, USU- Dept. Of Watershed Sciences, Intermountain Center for River Rehabilitation and Restoration
Gary P. Thiede, Fishery Biologist, USU- Dept. of Watershed Sciences
Christy Meredith, Graduate Research Assistant (PhD) USGS – UCFWRU, USU- WATS

Publications:

Budy, Phaedra, G. Thiede, C. Meredith, and S. Seidel. Logan River whirling disease study: factors affecting trout population dynamics, abundance, and distribution in the Logan River, Utah. Annual Report of the UTCFWRU: May 2009.

Wood, Jeremiah, and P. Budy. 2009. The role of environmental factors in determining early survival and invasion success of exotic brown trout. *Trans. of the American Fisheries Society* 138:7 56-767.