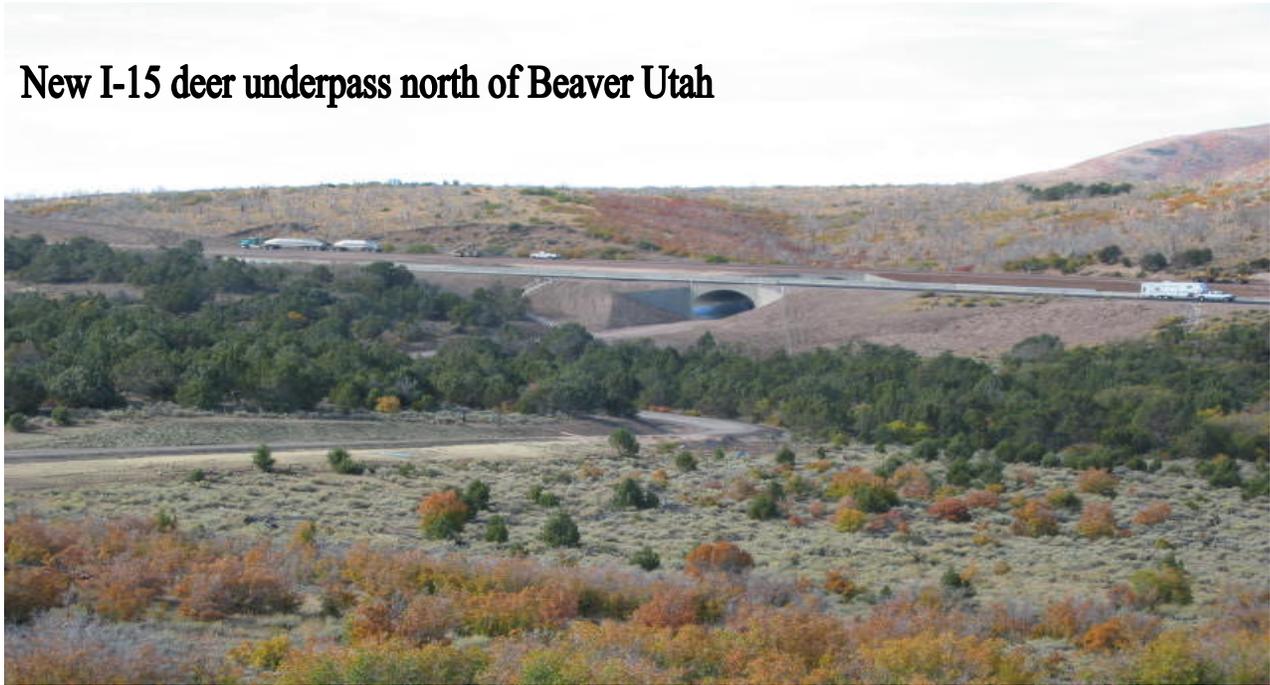

2004 ANNUAL REPORT
USGS Biological Resources Division
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Utah State University, Logan UT 84322-5290

New I-15 deer underpass north of Beaver Utah



2005 Coordinating Meeting
College of Natural Resources
Utah State University
6 April 2005



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

2005
Annual Coordinating Committee Meeting
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Dean's Conference Room, NR 108
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

Theme: Managing Initiatives in a Tight Fiscal Climate

Wednesday, 6 April 2005

- | | |
|-------------|--|
| 9:00-10:00 | Continental Breakfast (Dean's Conference Room NR 108) |
| 9:45-10:00 | Introductions and Meeting Overview |
| 10:00-12:00 | 2004 Unit Productivity (<i>J. Bissonette, T. Edwards, P. Budy</i>) |
| 12:00-1:00 | Catered Lunch in the Dean's Conference Room NE 108 |
| 1:00-1:20 | <u>U. S. Geological Survey</u>
<i>Bern Shanks</i> --Update on the Cooperative Research Units Program |
| 1:20-1:45 | <u>U.S. Fish and Wildlife Service</u>
<i>Terry Sexson</i> -- update of USFWS activities |
| 1:45-3:00 | <u>Utah Division of Wildlife Resources</u>
<i>Director & UDWR personnel</i> -- Update on UDWR Habitat Restoration and Education Initiatives |
| 3:00-4:30 | <u>College of Natural Resources</u> -- <i>Dean Fee Busby, Department Heads: Mike Wolfe, Chris Luecke, Terry Sharik</i> – CNR activities and initiatives |
| 4:30-5:00 | Final Discussion, presentations, and Departure |

2004 ANNUAL REPORT
USGS Biological Resources Division
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Utah State University, Logan UT 84322-5290



2004 Research Activities of the Unit Staff

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

Personnel

Cooperators – Coordinating Committee

United States Geological Survey

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U.S.D.I. Cooperative Research Units
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Utah Division of Wildlife Resources

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Utah Cooperative Fish and Wildlife Unit Staff

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Mission Statement
Utah Cooperative Fish and Wildlife Research Unit
2005

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 loss of riparian areas by agricultural practices, loss of 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), and Assessment of Fish and Wildlife Populations (emphasizes sampling design and estimation of abundance and survival). Unit personnel are increasingly 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.

Unit Productivity
USGS Utah Cooperative Fish and Wildlife Research Unit Productivity
1 January 2004 to 31 December 2004

PUBLICATIONS

Scientific Papers

- Switalski, A., J. A. Bissonette, T. H. Deluca, C. H. Luce, and M. A. Madej. 2004. Benefits and impacts from road removal. *Frontiers in Ecology and the Environment* 2:21-28.
- Bjurlin, C. D., and J. A. Bissonette. 2004. Survival during early life stages of the desert tortoise (*Gopherus agassizii*) in the south-central Mojave Desert. *Journal of Herpetology* 38:527–535.
- Meyers, P., W. D. Ostrand, M. Conover, and J. A. Bissonette. 2005. Effect of perch sites on mourning dove distribution. *Western North American Naturalist* 65:64-69.
- Edwards, T. C., Jr., Cutler, R., L. Geiser, J. Alegria, and D. McKenzie. 2004. Assessing rarity and seral stage association of species with low detectability: lichens in western Oregon and Washington forests. *Ecological Applications* 14:414-424.
- Edwards, T. C., Jr. 2004. A monumental leap forward in species-occurrence modelling. Book review of: Scott, J. M., P. J. Heglund, M. L. Morrison, J. B. Haufler, M. G. Raphael, W. A. Wall, and F. B. Samson, editors. 2002. Predicting species occurrence: issues of accuracy and scale. Island Press, Covello, California, USA. *Conservation Biology* 18:855-857.
- Edwards, T. C., Jr., G. G. Moisen, T. S. Frescino, and J. J. Lawler. 2004. Use of Forest Inventory and Analysis information in wildlife habitat modelling: a process for linking multiple scales. Pages 188-194 in McRoberts, R. E., G. A. Reams, P. C. Van Duesen, and J. W. Moser, Editors. *Proceedings of the Third Annual Forest Inventory and Analysis Symposium, General Technical Report NC-230, North Central Research Station, USDA Forest Service, St. Paul, Minnesota, USA.*
- McHugh, P., and P. Budy. 2004. Patterns of spawning habitat selection and site suitability for two populations of Snake River spring chinook salmon. *Transactions of the American Fisheries Society* 133:89-97.
- McHugh, P., P. Budy, and H. Schaller. 2004. A model-based assessment of the potential response of Snake River spring/summer chinook salmon to habitat improvements. *Transactions of the American Fisheries Society* 133:622-638.
- de la Hoz Franco, E.A., and P. Budy. 2004 a. Linking environmental heterogeneity to the distribution and prevalence of *Myxobolus cerebralis*: a comparison across sites in a northern, Utah. *Transactions of the American Fisheries Society* 133:1176-1189.
- de la Hoz Franco, E.A., and P. Budy. 2004 b. Effects of biotic and abiotic factors on the distribution of trout and salmon along a longitudinal stream gradient. *Environmental Biology of Fishes, Accepted July 18, 2004.*

In Press

- Zakrajsek, E. J., and J. A. Bissonette. 2005. Ranking the risk of wildlife species hazardous to military aircraft. *Wildlife Society Bulletin*, *In press*.
- McClure, M. F., J. A. Bissonette, and M. R. Conover. 2005. Migratory strategies, fawn recruitment, and winter habitat use by urban and rural mule deer (*Odocoileus hemionus*). 2005. *European Journal of Wildlife Research*, *In press*.
- Zimmermann, N. E., R. A. Washington-Allen, R. D. Ramsey, M. E. Schaepman, L. Mathys, B. Kötz, M. Kneubuehler, and T. C. Edwards, Jr. 2005. 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*.
- Edwards, T. C., Jr., Cutler, R., N. E. Zimmermann, L. Geiser, and J. Alegria. 2005. Use of model-assisted designs for sampling rare ecological events. *Ecology* 86, *In press*.
- Lawler, J. J., and T. C. Edwards, Jr. 2005. A variance-decomposition approach to investigating multi-scale habitat associations. *Condor*, *In press*.
- Edwards, T. C., Jr., G. G. Moisen, T. S. Frescino, and R. J. Schultz. 2005. The application of FIA-based data to wildlife habitat modelling: a comparative study. *Proceedings of the 2002 FIA Science Symposium*, New Orleans, Louisiana, USA. *In press*.
- Budy, P., T. Haddix, and R. Schneidervin. 2005. Factors affecting prey selection and feeding efficiency of rainbow trout (*Oncorhynchus mykiss*). *Transactions of the American Fisheries Society*, *In press*.
- Haddix, T. and P. Budy. 2005. Factors that limit growth and abundance of rainbow trout (*Oncorhynchus mykiss*) across ecologically distinct areas of Flaming Gorge Reservoir, Utah-Wyoming. *North American Journal of Fisheries Management*. *In press*.

In Review

- Bissonette, J. A., M. L. Hammer, and N. McCoy. *In review*. Getting deer off of the road: A better way. *Submitted to J. Wildlife Management*. November 1, 2004. In revision.
- Al-Chokhachy, R., Budy, P. and H. Schaller. *In review*. Understanding the demography and significance of redd counts for bull trout. *Submitted to North American Journal of Fisheries Management-Management Brief*. December 16, 2004.
- McHugh, P., and P. Budy. *In review*. A comparison of visual measurement-based techniques for quantifying cobble embeddedness and fine sediment levels in salmonid-bearing streams. *Submitted to North American Journal of Fisheries Management*. December 11, 2004.
- McHugh, P., and P. Budy. *In review*. An experimental evaluation of competitive and thermal effects on brown trout (*Salmo trutta*) and cutthroat trout (*Oncorhynchus clarki utah*) performance along an altitudinal gradient. *Submitted to Canadian Journal of Fisheries and Aquatic Sciences*. December 29, 2004.

Al-Chokhachy, R., and P. Budy. *In review*. An assessment of the transferability of bull trout microhabitat relationships across three streams in eastern Oregon. *Submitted to North American Journal of Fisheries Management*. February 18, 2005.

TECHNICAL & SEMI-TECHNICAL PAPERS

Bunnell, K. D., J. J. Shirley, J. T. Flinders, M. L. Wolfe, and J. A. Bissonette. 2004. Forest carnivores occurrence, distribution and limiting factors: Canada Lynx and wolverine surveys in Utah. Final Report to Utah Division of Wildlife Resources, U. S. Forest Service, and U. S. Fish and Wildlife Service. 113 pages.

Adair, W. A., and J. A. Bissonette. 2004. Vegetation exclosures: What can they tell us about long-term range trends. Final Report to Utah Division of Wildlife Resources, U.S. Forest Service, and Bureau of Land Management. 176 pages including 4 Appendices and 18 CDs (~7.5 Gb of ~14,000 scanned documents).

Toth, R. E., T. C. Edwards, Jr., R. J. Lilieholm, D. A. Bell, and E. R. Buteau. 2004. Alternative future growth scenarios for conserving open space along Utah's Wasatch Front: a case study for the Mountainland Association of Governments. Final Project Report No. 2004-1, USGS Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT 84322-5290 USA. 112 pages.

Budy, P., R. Al-Chokhachy, and G. P. Thiede. 2004. Bull trout population assessment and life-history characteristics in association with habitat quality and land use in the Walla Wall River Basin: a template for recovery planning. 2003 Annual Progress Report to US Fish and Wildlife Service. 70 pages.

Budy, P., P. McHugh, and G. P. Thiede. 2004. Logan River study: factors affecting trout population dynamics, abundance, and distribution in the Logan River, Utah. Project XIII, 2003 Annual Report to Utah Division of Wildlife Resources. Salt Lake City, Utah. 63 pages.

Budy, P., S. Vatland, and G. P. Thiede. 2004. Lake Powell food web dynamics. 2003 Annual Report to Utah Division of Wildlife Resources. Project XIV. Salt Lake City, Utah. 88 pages.

PROJECTS COMPLETED: THESES AND DISSERTATIONS

T. C. Edwards, Jr.

Major, D. 2004. Effects of prescribed burning on terrestrial salamanders in coniferous and mixed-coniferous forests of the Klamath/Siskiyou Region. PhD Dissertation. Utah State University.

P. Budy

Haddix, T. 2004. Factors affecting growth of rainbow trout in Flaming Gorge Reservoir, Utah- Wyoming. MS Thesis. Utah State University.

PAPERS AND POSTERS PRESENTED

Invited

Bissonette, J. A. 2004. Scale Sensitive Properties: Differentiating causality in landscape ecology. Invited lecture to landscape ecology class at Auburn University, AL.

Bissonette, J. A. 2004. Time: The forgotten dimension in landscape ecology. Invited Weaver lecture, Auburn University, Auburn AL.

Bissonette, J. A. 2005. Taking the road less traveled: The importance of scaling indirect effects allometrically. Invited Presentation for the Symposium titled "Reducing habitat fragmentation by roads: A comparison of measures and scales", INTECOL-ESA 2005 Joint Meeting, Montreal, Canada, August 2005.

Bissonette, J. A. 2005. Time: The neglected dimension in landscape ecology. Invited seminar to the Central Science Laboratory, Department for Environment, Food, and Rural Affairs, York, Great Britain August 2005.

Edwards, T. C., Jr. 2005. Classification approaches for modeling animal species distributions. Invited paper, 2004 Joint Statistical Meetings, Toronto, Canada.

Vatland, S., and P. Budy. 2004. Using present and past data to model predator-prey dynamics in Lake Powell, Utah-Arizona: A bioenergetics approach. Invited Seminar: Reservoir Management Symposium. Western Chapter of American Fisheries Society, Salt Lake City, UT. *Best Student Paper Award.*

Contributed

Wilson, T. L., E. J. Johnson, and J. A. Bissonette. 2005. Supplementation and sagebrush habitat specialists in patchy mountainous landscapes. US-IALE, Syracuse NY.

Kassar, C., and J. A. Bissonette. 2005. Identifying and describing road mortality hotspots: When is it necessary to be spatially explicit? US-IALE, Syracuse NY.

Cramer, P. C., J. A. Bissonette, N. Newhouse, T. Kinley, K. Knapp, B. Persaud, C. Lyon, I. Brakop, T. Clevenger, and S. Jacobson. 2005. Restoring permeability to the roaded landscape: Priorities for research. US-IALE, Syracuse NY.

Al-Chokhachy, R., and P. Budy. 2004. A hierarchical examination of bull trout habitat relationships in streams of northeast Oregon. Western Chapter of American Fisheries Society, Salt Lake City, UT.

de la Hoz Franco, E., and P. Budy. 2004. Effects of biotic and abiotic factors on the distribution of native cutthroat trout along the Logan River, Utah. Western Chapter of American Fisheries Society, Salt Lake City, UT.

McHugh, P., and P. Budy. 2004. Evaluating the potential for competition between introduced brown trout and native Bonneville cutthroat trout in the Logan River, Utah. Western Chapter of American Fisheries Society, Salt Lake City, UT.

- McHugh, P., and P. Budy. 2004. An experimental evaluation of altitudinal species-zonation patterns in montane streams: do abiotic or biotic factors determine the distribution of native and nonnative trout in Utah, USA, rivers? Utah State University – Water Initiative: Spring 2004 Runoff Conference, Logan, UT.
- Al-Chokhachy, R., and P. Budy. 2004. A hierarchical examination of bull trout habitat relationships in streams of northeast Oregon. Utah State University - Water Initiative: Spring Runoff Conference, Logan, UT.
- McHugh, P., and P. Budy. 2004. An experimental evaluation of altitudinal species-zonation patterns in montane streams: do abiotic or biotic factors determine the distribution of native and nonnative trout in Utah, USA, rivers? VI International Congress on the Biology of Fish. Manaus, Brazil. *Best Oral Presentation in the Fish Communities and Fisheries Symposium at the VI International Congress on the Biology of Fish.*
- Budy, P., G. P. Thiede, and P. McHugh. 2004. Modeling the synergistic effects of physical factors, disease, and species interactions on the survival and status of endemic cutthroat trout. Ecological Society of America, Portland, OR.
- Al-Chokhachy, R., P. Budy, and G.P. Thiede. 2004. Monitoring population trends and assessing limiting factors of aquatic species in decline: a bull trout case study. Ecological Society of America, Portland, OR.
- Vatland, S., P. Budy, and G. Thiede. 2004. A bioenergetics approach to modeling predator-prey dynamics in Lake Powell, Utah-Arizona. Ecological Society of America, Portland, OR.
- Thiede, G. P., S. Vatland, and P. Budy. 2004. Predator-prey dynamics in Lake Powell: a bioenergetics approach. American Fisheries Society, Madison, WI.
- Al-Chokhachy, R., P. Budy, and G. P. Thiede. 2004. Understanding the demography and significance of redd counts for freshwater salmonid species. American Fisheries Society, North Pacific Chapter, Skamania, OR.
- Budy, P., G.P. Thiede, and P. McHugh. 2005. Modeling the synergistic effects of physical factors, disease, and species interactions on the survival and status of endemic cutthroat trout. 11th Annual Whirling Disease Symposium, Denver, CO.
- VanDyke, E., and P. Budy. 2005. An assessment of the feeding relations between native and introduced trout in the Logan River: an ontogenetic perspective. Bonneville Chapter of American Fisheries Society, Garden City, UT. Undergraduate Research Project Sponsored by U.R.C.O (Undergraduate Research & Creative Opportunities) and CNR.
- Vatland, S., P. Budy, and G. Thiede. 2005. Potential effects of gizzard shad on the pelagic food web of Lake Powell, Utah-Arizona: a bioenergetics approach. Bonneville Chapter of American Fisheries Society, Garden City, UT.
- McHugh, P., and P. Budy. 2005. An experimental assessment of the multi-scale effects of exotic brown trout on native Bonneville cutthroat trout. Bonneville Chapter of American Fisheries Society, Garden City, UT.

Homel, K., and P. Budy. 2005. The influence of abiotic and biotic factors on the movement patterns of bull trout (*Salvelinus confluentus*) in Northeast Oregon. Bonneville Chapter of American Fisheries Society, Garden City, UT.

Thiede, G. P., P. Budy, and P. McHugh. 2005. Factors affecting the status of endemic cutthroat trout in the Logan River, Utah. Bonneville Chapter of American Fisheries Society, Garden City, UT.

CLASSES AND SHORT COURSES

J. A. Bissonette

FW6700/7700, Landscape Ecology, 3 credit hours, graduate class, Winter Semester 2005, 22 students.

T. C. Edwards, Jr.

FRWS 6500, Design and Analysis of Ecological Research, 4 credit hours, Fall 2004, graduate class, 26 students.

FRWS 6510, Topics in Spatial Ecology, 1-3 credit hours, Spring 2004, graduate class, 9 students.

P. Budy

AWER 6230/7230, Fish Ecology, 2 credit hours, Spring 2004, graduate class, 19 students.

AWER 6660, Population Assessment, 3 credit hours, Spring 2005, graduate class, 11 students.

MARK Mark-Resight Workshop. Coordinator- Continuing Education Short Course, USU, Departments of Aquatic, Watershed, and Earth Resources and Forestry, Wildlife, and Range Sciences, USU. May 5-7, 2004, 21 students.

The Principles and Practice of Stream Restoration. Coordinator and Co-Instructor- Continuing Education Short Course, Dept. of Aquatic, Watershed, and Earth Resources, USU. August 17-27, 2004, 14 students.

RECOGNITION & AWARDS

J. A. Bissonette

Elected Fellow of the Wildlife Society.

P. Budy

Bonneville Chapter of American Fisheries Society, President Elect, Program Chair for annual meeting.

T. C. Edwards

With R. Toth and R. Lilleholm, received the 2004 Award of Merit from the Utah American Planning Association for "Alternative Future Growth Scenarios for Conserving Open Space"

Students & Staff:

Gary Thiede chosen as CNR Employee of the Year 2005

Chris Kassar, M.S. student, awarded a NASA-MSU Professional Enhancement Award, March 2005

SPECIAL ASSIGNMENTS

J. A. Bissonette

Chair, Admissions Committee, Forestry, Range, and Wildlife Sciences Department, USU
Member, TWS Operations Review Team, Summer 2004

T. C. Edwards

Statistical Advisory Group, USDA Forest Service.

Survey and Management Program, Pacific Northwest Forest Management Plan.

Marbled Murrelett de-listing committee, USFWS Region 1.

P. Budy

Bull Trout Research, Monitoring, and Evaluation Technical Team, USFWS Region 1.

USU, Department of Aquatic, Watershed, and Earth Resources, GIS/Ecologist Faculty Search Committee,
Federal Collaborator Representative.

USU, Water Initiative, Seminar Series Committee (2003-2005).

USU, College of Natural Resources, New Dean Search Committee, Federal Collaborator Representative.

Board of Directors for the Western Regional Aquaculture Center, Utah Representative.

**UTAH COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT
PROJECTED FUNDING SUMMARY BY SOURCE
JANUARY - DECEMBER 2004**

Updated: 03/28/05

Agency Contributions

1. Cooperator Base Funds:

a. U. S. Geological Survey - Cooperative Research Units		
Federal Salaries & Benefits	338,510	
Operating	14,250	
Subtotal		352,760
b. Utah Division of Wildlife Resources Base		
Base Account	46,000	
10% Direct Administrative Costs paid on UDWR Project	61,361	
Subtotal		107,361
c. Utah State University Contribution		
Staff Support Salary & Benefits	34,038	
Space	25,607	
Indirect Costs Waived on CY 2004 Projects	445,849	
Subtotal		505,494
2. Indirect Costs Paid on CY 2004 Projects		128,558
3. Total CY 2004 Project Funding Invoiced (Includes IDC Paid + 10% UDWR-DAC)		1,472,785
4. TOTAL CY 2004 Funding Received		2,566,958

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**UTAH COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT
SUMMARY OF FUNDING
JANUARY - DECEMBER 2004**

Utah Division of Wildlife Resources	
Fishery Research	189,740
Other	485,233
Federal	
RWO	618,857
Other	178,954
Other Grants for	
Unit Scientists	-
Non-Unit Scientists	-
Grand Total	1,472,785

Utah Cooperative Fish & Wildlife Research Unit
UDWR Operating Base
January - December 2004

Personnel	\$2,905
Fringe	\$656
Travel	\$4,558
Commuting	\$124
Mail	\$533
Telecommunications	\$2,304
Supplies	\$2,671
Office Equipment	
Maintenance	\$10,670
Non-Capital	\$0
Equipment	\$0
Rentals	\$380
Insurance	\$500
Equipment	\$5,272
Repairs	\$0
Vehicles	\$0
Maintenance	-\$8,850
Professional	\$0
Development	-\$7,395
Guests	\$1,113
Tuition	\$9,882
Miscellaneous	\$3,041

Total

28,363.44

Active Research: Unit Scientists 2004

Project Duration	Account Number	Index Number	Project Title	Principal Investigator	Total Project	CY 2004 Funding
2001-2005	5-33254	A10489	RWO 48 The Influence of Biophysical Gradients in Sagebrush Steppe Communities and Their Influences on Selected Wildlife Taxa	Bissonette, J	145,538	57,031.06
1998-2004			Utah Vegetation Exlosures Database Study, Phase 1 JSA001099 T.O. 15 (Four accounts listed below)			
1998-2004	5-33331	A10444	BLM Contribution	Bissonette, J	16,003	10,863.32
2002-2004	Multiple		FS & DWR Contribution (#5-43597/ A10455 , #5-43543/ A10454, 5-43045/ A12762)	Bissonette, J	46,000	30,000.00
2003-2004	5-33540	A11090	NEW Funding	Bissonette, J	10,000	8,356.50
2004-2007	5-43073	A11123	Evaluation of the use and Effectiveness of Wildlife Crossings (NEW)	Bissonette, J	500,000	77,720.59
2004-2006	5-43049	A11100	Evaluation of Wildlife Crossings -Dept of Trans/BLM (NEW)	Bissonette, J	64,170	63,429.40
			RWO 49 Bull Trout Assembly/Life-History Characteristics: Habitat Quality/Land Use: Walla Walla Sub-Basin Recovery Planning			
2002-2005	5-33355	A10479	Quality/Land Use: Walla Walla Sub-Basin Recovery Planning	Budy, P	385,508	135,250.44
2002-2005	5-43493	A10373	Logan River Trout	Budy, P	162,270	67,701.61
2002-2005	5-43615	A10376	Lake Powell Food Webs	Budy, P	123,481	60,655.20
2003-2004	5-33516	A10583	Snake River Salmon Modeling (continuation of RWO#40 research)	Budy, P	69,321	9,513.82
			RWO 37 Population Level Response of Terrestrial Amphibians to Disturbance: Effect of Fire and Fuels Treatment			
2000-2004	5-33103	A10419	Disturbance: Effect of Fire and Fuels Treatment	Edwards, T	90,000	9,750.00
			RWO 41 Design & Analysis Protocols for Sampling Rare Ecological Events in Time & Space			
2000-2003	5-36984	A10426	Events in Time & Space	Edwards, T	142,000	250.00
2004-2007	5-43108	A11838	Shrubsteppe-Passerine Bird Species in Utah	Edwards, T	6,600	2,248.84
			Modeling Spatially Explicit Forest Structural Attributes Using Generalized Additive Mixed Models (USFS)			
1999-2004	5-33015	A10340	Generalized Additive Mixed Models (USFS)	Edwards, T	270,000	27,157.29
					2,030,891	559,928.07

**ACTIVE RESEARCH -- OTHER PRINCIPAL INVESTIGATORS
2004**

Project Duration	Account Number	Index Number	Project Title	Principal Investigator	Total Project	CY 2004 Funding
1995-2005	5-43544	A10619	Brine Shrimp of the Great Salt Lake (5-43196, 5-43278)	Belovsky, G	511,476	56,659.83
2004-2005	5-43115	A12098	Wildlife Research Coordinator	Conner, M	33,220	21,158.37
2003-2005	5-43613	A10521	Waterfowl and Shorbird Behaviour on the Great Salt Lake	Conover, M	20,174	28,664.33
2002-2005	5-33357	A10468	RWO 50 DNA Genetic Analysis	Dueser, R	15,000	7,791.25
2001-2005	5-33255	A10488	RWO 47 Swift Fox as an Indicator Species of Ecosystem Health on the Pinon Canyon Maneuver Site	Gese, E	191,593	59,361.10
2003	5-43626	A09733	Design & Testing Survey of Fishing License Sales Campaign	Jakus, Paul	10,000	3,252.30
2005	NEW		Survey of Utah Upland Game and Trukey Hunters Regarding Game Management and Hunting Opportunity Alternatives	Krannich, R	62,478	-
2004-2006	5-43583	A12426	2005 Statewide Utah Angler Survey	Lillieholm, R	79,051	14,958.01
2002-2005	5-33286	A10456	Bear Lake Endemic Fishes Research	Luecke, C	129,689	61,383.56
2003-2006	5-43678	A10508	Columbian Sharp-tailed Grouse	Messmer, T	107,800	29,813.84
2003-2006	5-43009	A10513	Enhancing Sage-Grouse Programs (5-43139)	Messmer, T	203,181	44,297.62
2002-2004	5-43593	A10482	Evaluating the Effects of Emergency Winter Feeding on Mule Deer Survival, Production and Habitat Conditions	Messmer, T	86,020	16,056.63
2002-2004	5-43552	A10494	Aggregate Economics Impacts of CWMU on Member Landowners and Local Communities	Messmer, T	7,500	5,126.86
1999-2004	5-43228	A10661	Sage Grouse Movements, Mortality, and Habitat Use in South Central Utah	Messmer, T	35,000	-
2003-2004	5-44717	A10548	Watchable Wildlife Interpretive Display	Middleton, B	2,765	905.28
2003-2005	5-43040	A11187	Whirling Disease Resistance in Rainbow Trout	Mock, K	83,180	60,523.50
2002-2006	5-43600	A08962	Provide a Genetic Analysis of June Sucker	Mock, K	33,350	29,558.41
2003-2005	5-43633	A09002	Demography and Mortality in Leatherside Chub	Mock, K	16,000	9,810.50
1999-2004	5-33113	A10421	RWO 33 Regional-Wide GAP Analysis Program for UT, NV, AZ, NM	Ramsey, D	979,036	170,874.77
2003-2005	5-33494	A11514	RWO 51 Southwest Gap Analysis	Ramsey, D	155,268	92,865.06
2002-2003	5-33417	A10541	Parashant National Monument	Shultz, L	9,720	10,135.32
2003-2004	5-33423	A10545	Accuracy for Vascular Plant Data	Shultz, L	20,907	511.60
1999-2004	5-33028	A10356	Biogeochemistry in GSMNP	VanMiegroet, H	221,883	85,683.00
2002-2005	5-43576	A10485	The Occurrence and Distribution of New Zealand Mud Snail in Utah	Vinson, M	25,000	14,765.00
2002-2004	5-43677	A10514	Macroinvertebrate Sampling, Sorting and Identification	Vinson, M	7,920	8,016.36
1995-2004	5-43566	A10617	The Accuracy and Utility of Using Population Estimators to Manage Cougar Populations in Utah	Wolfe, M	620,060	80,474.16
2003-2004	5-43035	A10584	Mule Deer and Elk Locations and Movement in Western Colorado	Wolfe, M	2,310	210.00
					3,669,581	912,856.66

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2004 RESEARCH ENDEAVORS

John A. Bissonette
U.S. Geological Survey
Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Utah State University
<http://www.cnr.usu.edu/faculty/jbissonette/index.htm>






UTCFWRU USGS

The 2004 Landscape Ecology Lab

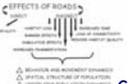
- Dr. Patty Cramer -- Research Associate
- Andy Leidolf - Ph.D. candidate
- Lisa Nordstrom - Ph.D. candidate
- Beth Johnson* - M.S. candidate
- Tammy Wilson* - M.S. candidate
- Silvia Rosa - M.S. candidate
- Chris Kassar* - M.S. candidate

* Finishing this spring

UTCFWRU USGS

Evaluation of the Use and Effectiveness of Wildlife Crossings

A National Cooperative Highways Research Program Project
Funded through the Transportation Research Board of the
National Academies of Science and Engineering


Goals

1. Develop and communicate successful designs, methods, and strategies to make roadways more permeable for wildlife
2. Develop methods to ascertain how to maintain road safety for motorists.
3. Provide states' Departments of Transportation with guidance on: the use and effectiveness of wildlife crossings to mitigate habitat fragmentation, and reduce the number of animal/vehicle collisions on our roadways

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Priorities in Road Ecology with Respect to Wildlife

Created a national list of Gaps and Priorities with respect to wildlife in both research and practice

- Priority Areas
 - Ecology
 - (e.g., wildlife reactions to roads and mitigation measures)
 - Safety
 - (e.g., standardize the collection of animal-vehicle collision data)
 - Communication
 - (e.g., among agencies and public)

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Final Product

Decision tool to provide guidance in the form of clearly written guidelines for:

- The selection of crossing types
- Their configuration
- Their appropriate location
- Monitoring and evaluation of crossing effectiveness
- Maintenance of mitigation measures

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Intended Audiences

- State transportation professionals in Departments of Transportation
- State Wildlife and Fisheries Agencies
- Federal Biologists in FWS, USGS, Federal Highways
- Non-profits involved in connectivity and transportation
- General public interested in transportation and wildlife issues

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Exclosures in Utah

Product: Utah Interagency Exclosure Database

- Final Report: 4 appendices
- Appendix III is the Exclosure Inventory Master Table with summary information for all 1,031 exclosures
 - ~65% still functional ~35% have data
- Appendix IV "Summary Tables" 26 tables of summary data for ease of understanding the patterns exhibited by the exclosure data.
 - > 14K scanned documents (>7.5 Gigabytes) for the exclosures on 18 CDs that are referenced by content on page 5 ~13,000 files scanned

FUNDORS: UDWR, BLM, USFS

COMPLETE PACKAGE SENT TO UDWR, BLM, FS

UTCFWRU USGS

Exclosures in Utah

Report also available on this website as a pdf file

<http://www.cnr.usu.edu/faculty/jbissonette/index.htm>

UTCFWRU USGS

The Effect of Fire on Avian Communities

Andreas Leidolf

THREE PHASED STUDY

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

UTCFWRU USGS

The Effect of Fire on Avian Communities

Objectives

- Understanding how the literature on **avian community response to fire** has advanced ecological knowledge and theory, specifically with respect to the role of disturbance in structuring biological communities.
- Investigate philosophical and methodological approaches likely to further that understanding.
- Provide useful information to inform natural resource management and policy in the form of databases, bibliographies, and synthetic reviews.

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The Effect of Fire on Avian Communities

Literature Search

Electronic

- Complete citations and relevant descriptors
- 48 fields (e.g., author, year, publication type, language, geographic location, biome, etc.)

Database
512 entries
1912-2003

Paper

- Full text
- Indexed and cross-referenced with electronic database for easy retrieval

Annotated Bibliography ↔ Literature Review ↔ Meta-analyses

Fire's effects on avian communities: an annotated bibliography 1912-2003 (Intended for USGS Report publication)

Fire's effects on avian communities: discernible trends in the literature 1912-2003 (Intended for Ecological Applications)

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Effects of Exclosure Design on Rhinos & Tapirs

Zoological parks play an increasing role in conservation as **ex situ conservation** is more frequently required to preserve the growing number of endangered species. However, few studies have examined the **effects of exclosure attributes** on the health, longevity, mortality, and breeding success of captive animals.

Exclosure Attributes:

Size, substrate, shade, water features, public viewing area, climate, etc.

Effect on Tapirs and Rhinos:

Reproduction, Mortality, Health

Lisa Nordstrom

Malayan Tapir, Chaffee Zoological Gardens of Fresno, CA Black Rhino, Los Angeles Zoo, CA

FUNDORS: USU PRESIDENTIAL SCHOLARSHIP, ECOLOGY CENTER

UTCFWRU
USGS

Effects of Enclosure Design on Rhinos & Tapirs

Studbook data obtained to provide data on reproduction, mortality, inter-zoo transfers.

Enclosure Attribute Survey to all U.S. zoos, questionnaires mailed to all zoos in U.S. with 95% response, + 15 international zoos participated.



RHINO EXHIBIT
SAN FRANCISCO ZOO



TAPIR EXHIBIT
LOS ANGELES ZOO



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USGS

Effects of Enclosure Design on Rhinos & Tapirs

Enclosure Design

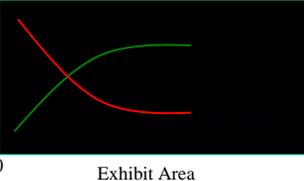
Captive Animal

Husbandry Public

Enclosure Size vs. Complexity

Rate (Births or Deaths / yr.)

0 Exhibit Area



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Effects of Enclosure Design on Rhinos & Tapirs

Implications

- Provide a database to zoos nationwide on North American captive tapirs and rhinos
- Identify key enclosure attributes
- Suggest improvement in enclosure design and captive management

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Landscape dynamics of bird and small mammal communities in sagebrush-dominated mountain meadows

- Overview**
 - Sagebrush steppe has been heavily impacted over much of its range
 - Conversion to agriculture
 - Changed fire regime
 - Heavy grazing
 - High elevation sagebrush steppe
 - More mesic conditions
 - Greater heterogeneity
 - Different history of land use



Montana Sagebrush Bibliography
www.fwp.state.mt.us/inside/fwp/library/sage.pdf

FUNDOR: U.S. FOREST SERVICE

UTCFWRU
USGS

Biodiversity in High Elevation Sagebrush Steppe

Some sagebrush obligates or near-obligate species of management concern

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



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USGS

Biodiversity in High Elevation Sagebrush Steppe

Overall Project Goal

- Determine the contribution of high elevation sagebrush steppe to bird and small mammal species diversity patterns



Beth Johnson and Tammy Wilson

UTC/FWRU
USGS

Biodiversity in High Elevation Sagebrush Steppe

- > Of 4 possible avian sagebrush-obligate species only Brewer's Sparrow was detected (25%)
- > Of the two sagebrush-obligate small mammals, sagebrush voles were caught; pygmy rabbits were not (50%).
- > Of the shrub-steppe associates:
 - > 17 of the 32 avian species (53.1%) were detected
 - > 4 of the 16 small mammal species (25%) were detected.

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.

UTC/FWRU
USGS

ASSESSING UNDERPASS CROSSING EFFECTIVENESS on the I-15 Wildcat Underpass Improvement Project

DIRECT EFFECTS

INVESTIGATE EFFECTIVENESS OF LINKED SYSTEM OF MITIGATION:

UNDERPASSES
HIGH FENCES
ROW ESCAPE RAMPS

TO LESSEN DEER MORTALITY

2 NEW UNDERPASSES BUILT

WILDCAT HIGHWAY IMPROVEMENT PROJECT ON I-15
underpasses, fences, escape ramps

CEGAR CITY

FUNDORS: BLM, UDOT, UDWR

Silvia Rosa

baiting sportsmen help

UTC/FWRU
USGS

ASSESSING UNDERPASS CROSSING EFFECTIVENESS I-15 Wildcat Underpass Improvement Project

UTC/FWRU
USGS

ASSESSING UNDERPASS CROSSING EFFECTIVENESS I-15 Wildcat Underpass Improvement Project

Figure 1: Total Mule Deer Crossings Underpass #1 Fall 2004

Figure 2: Total Mule Deer Crossings Underpass #2 Fall 2004

Figure 3: Total Mule Deer Crossings Control Underpass Fall 2004

Fall migration 2004 ended by mid to end of November

UTC/FWRU
USGS

Utah Wildlife Road Mortality Hotspots

An analysis of contributing environmental & demographic factors, economic impacts and implications for mitigation and management

Chris Kassar

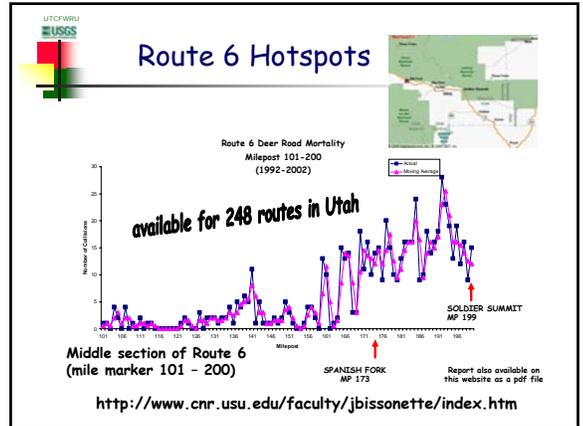
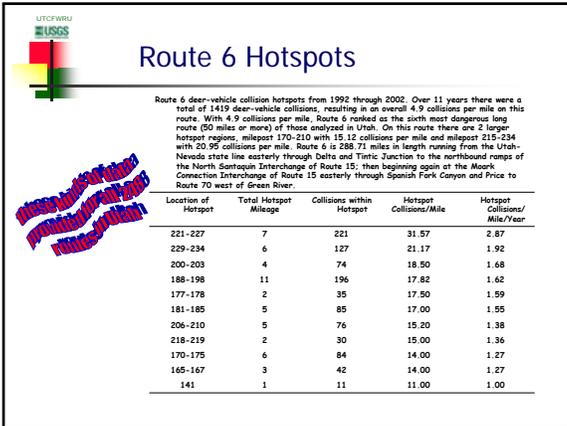
Funding: NCHRP, BLM, UDOT, UDWR

HOTSPOTS

UTC/FWRU
USGS

Utah Statistics

- 248 state routes in Utah analyzed using the Utah Department of Transportation (UDOT) vehicle crash database from 1992 to 2002
- 1/3 of all deer/vehicle crashes from October to December
- 55.7% of all collisions from 1800 to 2400 hr
- 61.15% of all collisions occurred on 10 routes
- 57.74% of all collisions occurred within ~1001 km (622 mi), or 10.5% of total highway miles (~9,500 total km, ~5,900 mi) that were analyzed.



UTCFWRU
USGS

Economic costs of DVCs in Utah

Factor	Cost (Dollars)
Vehicle Damage	17,521,970
Human Injury	1,002,401
Human Fatality	24,000,000
Deer Loss	2,651,083
Total Cost	45,175,454

DEER-VEHICLE COLLISIONS (DVCs) INCUR SIGNIFICANT COSTS AND IMPACT DEER HERD HEALTH AND HUMAN SAFETY

BASED ON THE UDOT AND CODES DATA BASES

Average per Year = \$7,529,242
Average per Crash = \$3,470

2004 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 2004 SPATIAL MODELLING LABORATORY

- Glenn Busch M.S. 2004
- Darren DeBloois M.S. Candidate
- Donald A. Major Ph.D. 2004
- Phoebe Zarnetske M.S. Candidate
- Russell E. Norvell Ph.D. Candidate

URBAN GROWTH SCENARIOS FOR UTAH'S WASATCH FRONT



Glenn Busch, M.S. 2004
 ENVS / Bioregional Planning

Robert J. Lillieholm
 Environment and Society



Thomas C. Edwards, Jr.
 USGS BRD UTCFWRU



Cooperators: USU, Eccles Foundation

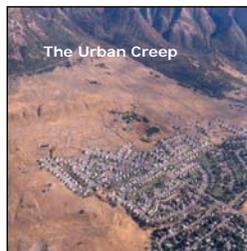
ALTERNATIVE FUTURE GROWTH SCENARIOS FOR UTAH'S WASATCH FRONT: ASSESSING THE IMPACTS OF DEVELOPMENT ON THE LOSS OF PRIME AGRICULTURAL LANDS



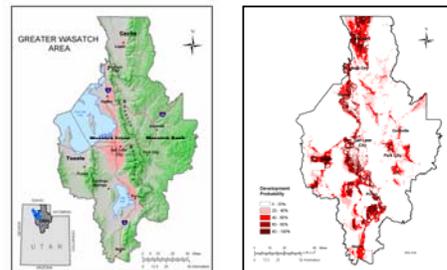
Glenn A Busch, M.S. Bioregional Planning 2004
 Currently: Bear River Planning Agency

Urban Growth Scenarios

- Over the next 30 years, in Utah's Wasatch Front:
 - The population will grow from 1.9 to 3.3 million
 - The urbanized area will increase from 320 mi² to 660 mi²
- Where is development likely to occur within the Wasatch Front?



Urban Growth Scenarios



- Predicted spatial growth along Utah's Wasatch Front in 2020

FIRE EFFECTS ON TERRESTRIAL SALAMANDERS



Donald J. Major, Ph.D. 2004
FRWS / Ecology

Thomas C. Edwards, Jr.
USGS BRD UTCFWRU



Cooperators:
USGS FRESC, Joint Fire Science Program

RESPONSE OF MIXED DOUGLAS-FIR/TANOAK FORESTS TO FIRE: IMPLICATIONS FOR TERRESTRIAL SALAMANDERS AND THEIR HABITATS



Donald J. Major, Ph.D. Ecology 2004
Currently: TNC Western Fire Ecologist

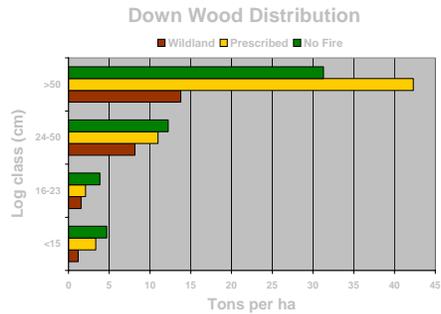
Objectives



- Examine fire effects on stand structure/composition of Douglas-fir / tanoak forests
- Evaluate fire-mediated responses in terrestrial salamander populations and their habitats
- Discuss the role of fire refugia in this vegetation community and its inhabitants

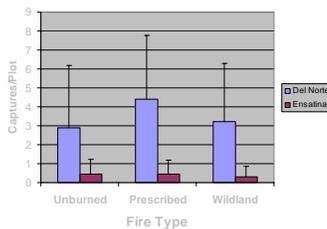


Forest Floor Structure by Fire Type



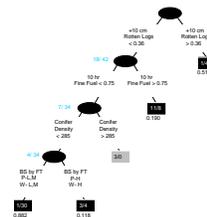
Salamander Density by Fire Type

Captures/plot (*B adjusted*)



Salamander P/A in Burned Sites

Salamander P/A = Stand Structure, Forest floor structure, Firetype * Severity



- Highest salamander occupancy in sites with:
 - high volume (> 2.8 tons/ha) of rotten logs
 - 10-hr Fine Fuel loadings > 0.75 tons/ha
 - low conifer density (< 285 trees/ha)
 - low to moderate canopy burn severity

UT DWR STATISTICAL EDUCATION WORKSHOPS



Darren DeBloois, M.S. Candidate
DWR Biometrician (designee!)



Thomas C. Edwards, Jr.
USGS BRD UTCFWRU



Cooperators: UT DWR, USU

UT DWR Statistical Workshops

- Three modular workshops on continuing education in statistics:
 - Study design
 - Elements of design for biologists
 - Comparing distributions
 - Basic statistical test for comparing population means
 - Associative statistics
 - Evaluating relationships among sets of response and predictor variables
- All workshops will be taught as 6-8 hr classes at DWR Regional offices

HABITAT MODELLING OF MANAGEMENT INDICATOR SPECIES IN UTAH



© Photo Researchers, Inc.

Phoebe L. Zarnetske
Utah State University
(MS Candidate)

Thomas C. Edwards, Jr
USGS BRD UTCFWRU

Gretchen G. Moisen,
Rocky Mountain Research Station

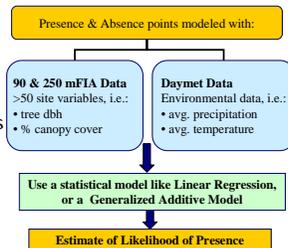


Research Objectives

- 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, CART)
 - Determine how well the FIA data models species distributions

Modelling Forest Indicator Species

- Species selection
 - Forest obligate
 - State or Federal species of concern
 - Sufficient presences for modelling
 - Species of different scales
- Northern goshawk
- 3-toed Woodpecker



shrubMAP THE SHRUBSTEPPE MODELLING AND ANALYSIS PROGRAM

Utah Cooperative Fish and Wildlife Research Unit
College of Natural Resources
Utah State University



Research Principals and Partners

- Thomas C. Edwards, Jr.
 - USGS / USU
- Frank P. Howe
 - UT DWR
- Karen H. Beard
 - FRWS / USU
- Michael A. White
 - AWER / USU
- Michael L. Wolfe
 - FRWS / USU
- Utah Division of Wildlife Resources
- Rich County CRM
 - John Haskell
- Natural Resources Conservation Service
 - Shane Green
- BLM
- Forest Service
- US Fish and Wildlife Service



Research Context

- Restoration / Disturbance Ecology
 - Understanding the role of anthropogenic and natural disturbance in the shrubsteppe; and
 - How disturbance can be used to achieve management and conservation objectives
- Inventory, Monitoring and Assessment (IMA)
 - An exploration of technologies and techniques to be used to inventory, monitor and assess the status of shrubsteppe plant and animal species and communities



Research Goals

- A dynamic modelling environment that will:
 - Portray potential future vegetation conditions, 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 the status and trends of shrubsteppe vegetation and the identified focal animal species and groups
 - Determine efficiency/effort ratios for IMA techniques having strong extrapolative capabilities
- Study region is within Rich County, Utah

Research Elements

- Plant species and communities
 - What is the current status of shrubsteppe vegetation
 - What are the dynamics of shrubsteppe vegetation
- Focal animal species and groups
 - Shrubsteppe passerines
 - Pygmy rabbit
 - Small mammal communities
 - Ungulates
 - Greater-sage grouse
 - Reptiles and amphibians
 - Bonneville cutthroat



Research Elements - Vegetation

- Two-pronged approach
 - Depicting the current status of vegetation in Rich County
 - Understanding the dynamics of shrubsteppe vegetation



What ecological mechanisms determine shrubsteppe change?

Research Elements - Vegetation

- Depicting the current status of vegetation in Rich County
 - Evaluation of methods for detecting change and impacts due to disturbance and/or management activities
 - Methods for modelling vegetation structure relevant to the focal animal species and groups
 - Determining resolutions of data necessary for management use
- Why?
 - Maps of vegetation type, structure and distribution crucial to animal modelling efforts
- Emphasis is on application of remote-sensing technologies
 - USU Investigator – Mike White
 - Partners – USU remote sensing community, NASA

Research Elements - Vegetation

- Modelling the dynamics of shrubsteppe vegetation
 - Determining ecological site potentials
 - Understanding the state – transition process that characterizes shrubsteppe ecosystems
- Why?
 - Necessary for establishing expected ecological trajectories subsequent to disturbance and management activities
- Emphasis is on integrating existing information rather than primary data collection
 - USU Investigator – Post-doctoral Research Associate
 - Partners – NRCS, BLM, DWR

Research Elements – Focal Animals

- Two-pronged approach
 - Understanding the impacts of disturbance and restoration management actions on sensitive wildlife species and groups
 - Developing cost-efficient IMA protocols that provide defensible scientific information to decision-makers



Focal Animal Research

- Focal animal species and groups and research responsibilities and partners

■ Shrubsteppe passerines	Edwards
■ Pygmy rabbit	Edwards
■ Small mammal communities	Beard
■ Greater sage-grouse	Wolfe
■ Ungulates	DWR
■ Reptiles and amphibians	DWR

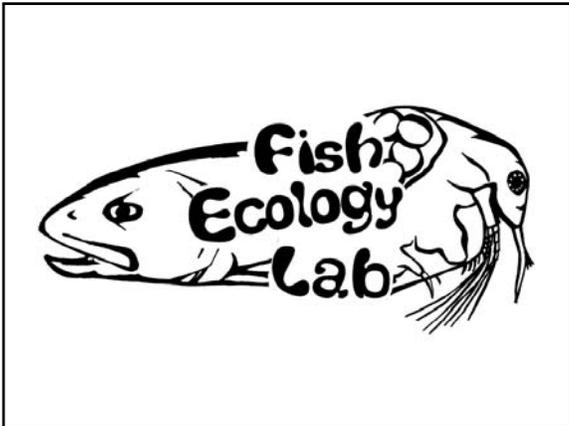


OTHER FUN STUFF

- Modelling species distributions in Switzerland
 - Antoine Guisan & Niklaus Zimmermann (Suisse)
 - Special edition in Ecological Modelling for 2005, 8 papers
- Invasive plant species in National Parks
 - Models for determining the spatial locations of invasive plants in the Klamath Network of National Parks
 - Collaboration with Richard Cutler (Math/Stat) and Karen Beard (FRWS)

FRIENDS, PLACES AND COLLEAGUES





Population demographics and limiting factors of bull trout : a template for recovery planning.



Funding provided by:





Robert Al-Chokhachy,
PhD candidate



Objectives – Phase I

- Determine the past, present, and future status of threatened bull trout
- Provide a better understanding of the key demographic features that structure populations
- Identify habitat needs within a hierarchical framework
- Formulate a template for recovery planning including an approach for rigorous M&E that can detect the effects of management actions within the time frame needed for recovery

Methods

- Comprehensive mark/recapture program
 - Multiple tags
 - Active and passive recapture techniques
 - Snorkeling surveys



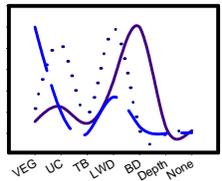


- Habitat assessment
- Habitat preference experiments
- Modeling

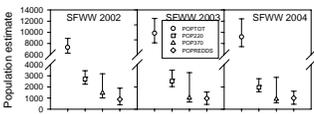


Results

- Much larger populations than previously thought
- Redds vs. population assessment:
 - inconsistent patterns between basins
 - consistency within basins



- Microhabitat HSI
 - prefer deeper, slower-moving habitats with cover (any kind)
 - relationships transfer




Genetics and plasticity: the movement paradigm of bull trout in northeastern Oregon

Funding provided by:

- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- Vice President for Research Fellowship

Collaborators:

- CTUIR
- ODFW
- USFWS Fish Technology Center

Kris Homel, MS candidate




Objectives-Phase II

- Evaluate potential genetic variation between life-history forms within these populations
- Evaluate potential environmental and biological cues for migration



Methods

- Fin clip all PIT-tagged tag bull trout
- Detect migration at antennae
- Microsatellite DNA analyses
- Record peak migration times and measure environmental variables that correspond with this timing

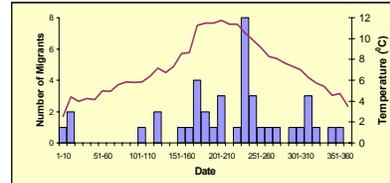


ENVIRONMENTAL CUES

- Average daily temperature daily explains 98% of subadult outmigration timing

GENETICS PILOT STUDY

- 60 samples from *a priori* groups representing migratory and likely residents currently being processed
- 340 more samples will be analyzed



Summary and Applications of Research

- Bull Trout Recovery
 - First known estimates of key demographic variables
 - Growth
 - Survival
 - Age structure
 - Emigration
 - Immigration
 - Population size
 - Population Trend
 - Evaluation of population assessment techniques
 - Modeling trade-offs between different M&E scenarios
 - Identified and validated habitat needs at microhabitat scale



Future

- Population assessment and genetics will continue (5-year study)
- Identify limiting factors and build a life-cycle model to evaluate the effect of these factors
- Identification of potential for genetic basis to life-history form, implications for conservation
- Hierarchical analyses of habitat requirements: microhabitat² channel type² reach² basin² watershed



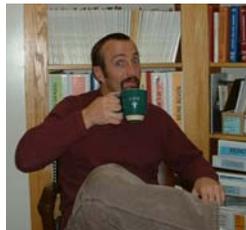
Determining the factors affecting the survival and status of endemic cutthroat trout in northern Utah

Funding provided by:

- Utah Division of Wildlife Resources
- USU Water Initiative
- USU Community/University Research Initiative
- Scholarships to Pete McHugh

Collaborators:

- USGS
- USU
- UDWR
- USFS
- Local anglers



Gary Thiede, Fishery Biologist



Objectives

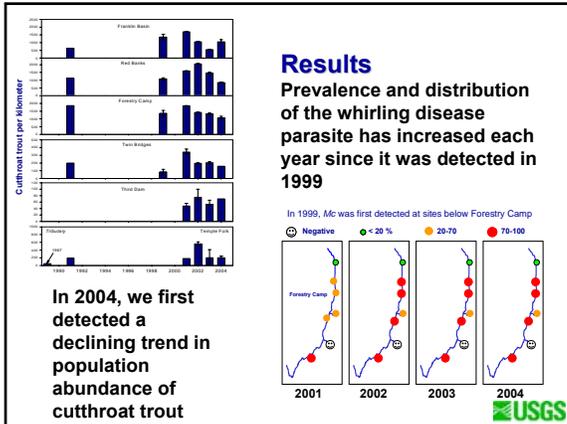
- Understand the combined effects of threats and natural factors on the survival and abundance of cutthroat trout
- Evaluate how these natural factors and threats vary spatially and temporally in the Logan River and across historical range
- Determine the present and future status of cutthroat trout



Methods

- Collect and tag trout and determine population abundances at eight long term index sites
- Measure biotic and abiotic factors that affect fish including disease
- Model synergistic effects





An assessment of the feeding relations between native and introduced trout in the Logan River: an ontogenetic perspective

Undergraduate research
Funding: USU, CNR, UDWR, USGS

High diet overlap between cutthroat trout and brown trout, and diets vary ontogenetically

Erin VanDyke,
Undergraduate Researcher

USGS

A multi-scale assessment of brown trout - cutthroat trout interactions in Bonneville Basin streams

Funding and support provided by:
 The Quinney Foundation, PhD Fellowship
 UDWR
 USU-Water Initiative
 USU-Community-University Research Initiative

USGS Biological Resources
Utah State UNIVERSITY
 FISH ECOLOGY LAB
 SOME OF OUR RESEARCHERS: ALPHEA BISHOP, JESSICA BISHOP, JESSICA BISHOP, JESSICA BISHOP, JESSICA BISHOP

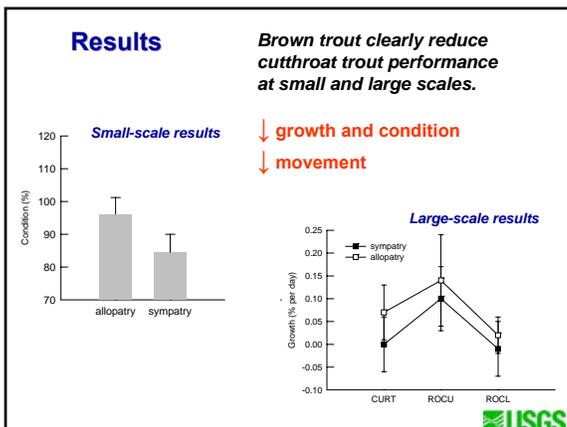
Peter McHugh, PhD candidate

USGS

Objective: assess the effects of brown trout on cutthroat trout across spatial scales and levels of biological organization.

Approach: contrast individual and population-level performance of experimental cutthroat trout raised in the presence and absence of brown trout at multiple scales (lab tanks, enclosures, and stream reaches)

USGS



Summary

- At observed population growth rates and increasing disease prevalence, cutthroat trout appear to be doomed at some sites
- Prevalence remains lowest in tributary sites; juvenile fish reared in sentinel cages in tributaries have lower prevalence rates
- Tributaries act as refuges- should be protected and restored as necessary
- The effects of brown trout should be given greater attention in the conservation of cutthroat trout
- At sites where cutthroat trout compete with exotic brown trout and have whirling disease, reducing competition has greatest potential for increasing cutthroat trout population growth rates

USGS

The effects of invasive brook trout removal on native Colorado River cutthroat trout in a small headwater stream in northeastern Utah

Funding

- Endangered Species Mitigation Fund
- National Fish and Wildlife Foundation

Collaborators

- Utah Division of Wildlife
- Utah State University
- USGS



Garn Birchell, MS candidate



Objectives

- Evaluate the response of cutthroat trout to brook trout removal
 - Body condition
 - Survival
 - Diet
 - Distribution
- Evaluate the effectiveness of mechanical removal



Methods

- Remove brook trout from Reader Creek via depletion removal electrofishing
- Determine percentage of brook trout removed
- Weigh and measure all cutthroat trout, tag fish > 150 mm, collect diet information, preserve some fish for lipid extraction
- Compare pre-removal data to post-removal data

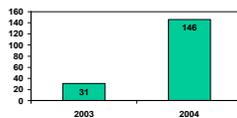


Results

- After 8 passes, a large portion of brook trout were removed
- Complete brook trout removal was not achieved
- Age-0 cutthroat trout survival increased
- Fish condition improved

Brook removal and Cutthroat captures			
Year	BK	CT	Ratio
2003	9,909	271	37:1
2004	4,518	386	12:1
Total	14,427	657	

of Age-1 cutthroat trout



Summary

- All reproducing brook trout were not eliminated and some adults spawned in 2003 (age-0 brook trout were still captured in 2004).
- After 8 removal passes in 2 summers, ~15,000 brook trout were removed; however, brook trout still outnumbered cutthroat trout nearly 4:1.
- Removal efforts in 2003 appeared to benefit age-0 cutthroat trout through increased survival and condition.

Future

- During October 2004, UDWR stocked 8,500 age-0 cutthroat trout into Reader Creek.
- A single-pass removal will occur annually for the next 3 to 4 years, to keep brook trout numbers in check until these fish are old enough to spawn.



Lake Powell food web dynamics: a bioenergetics approach



Shane Vatland, MS candidate

Funding:

- UDWR
- USGS
- Vice President for Research Fellowship

Collaborators:

- UDWR
- USU
- GCMRC
- NPS



Objectives

- Understand mechanisms driving the cyclic abundances of striped bass and threadfin shad
- Track the distribution and abundance of newly introduced gizzard shad and assess potential food web effects



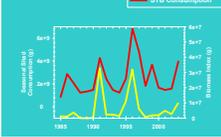
Methods

- Collect data on food web components including:
 - primary productivity
 - zooplankton distribution, density and biomass
 - relative abundance, distribution, growth and diet of forage fish and top predators
- Utilize bioenergetics modeling to assess predator-prey dynamics



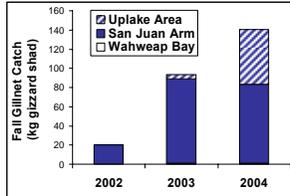
Results

Consumption vs. Availability



- Predator and prey dynamics appear to be tightly coupled in most years with no time lag

- Range and total biomass of gizzard shad has increased considerably over the past two years.



Summary

- Striped bass growth and consumption responds directly to threadfin shad forage
- The juvenile striped bass population consumes more shad than the adult population, and bioenergetic simulations suggest juveniles are performing better than adults
- Gizzard shad distribution, density, and biomass continue to increase, especially in the uplake area of the reservoir
- The nature and extent to which gizzard shad affect striped bass growth and consumption is highly dependent on the growth rate of gizzard shad
- Developing a predictive model of striped bass dynamics looks promising

