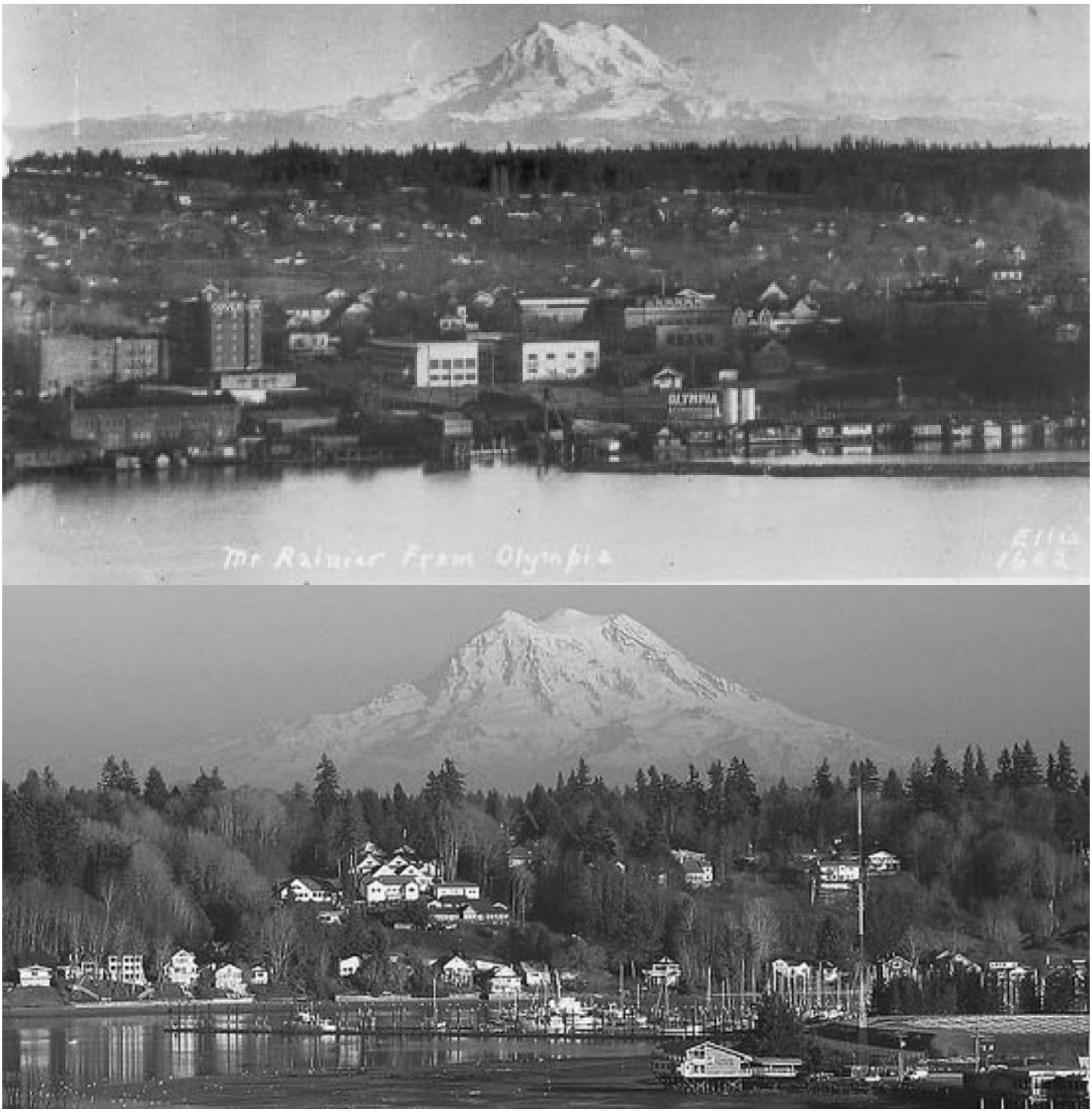
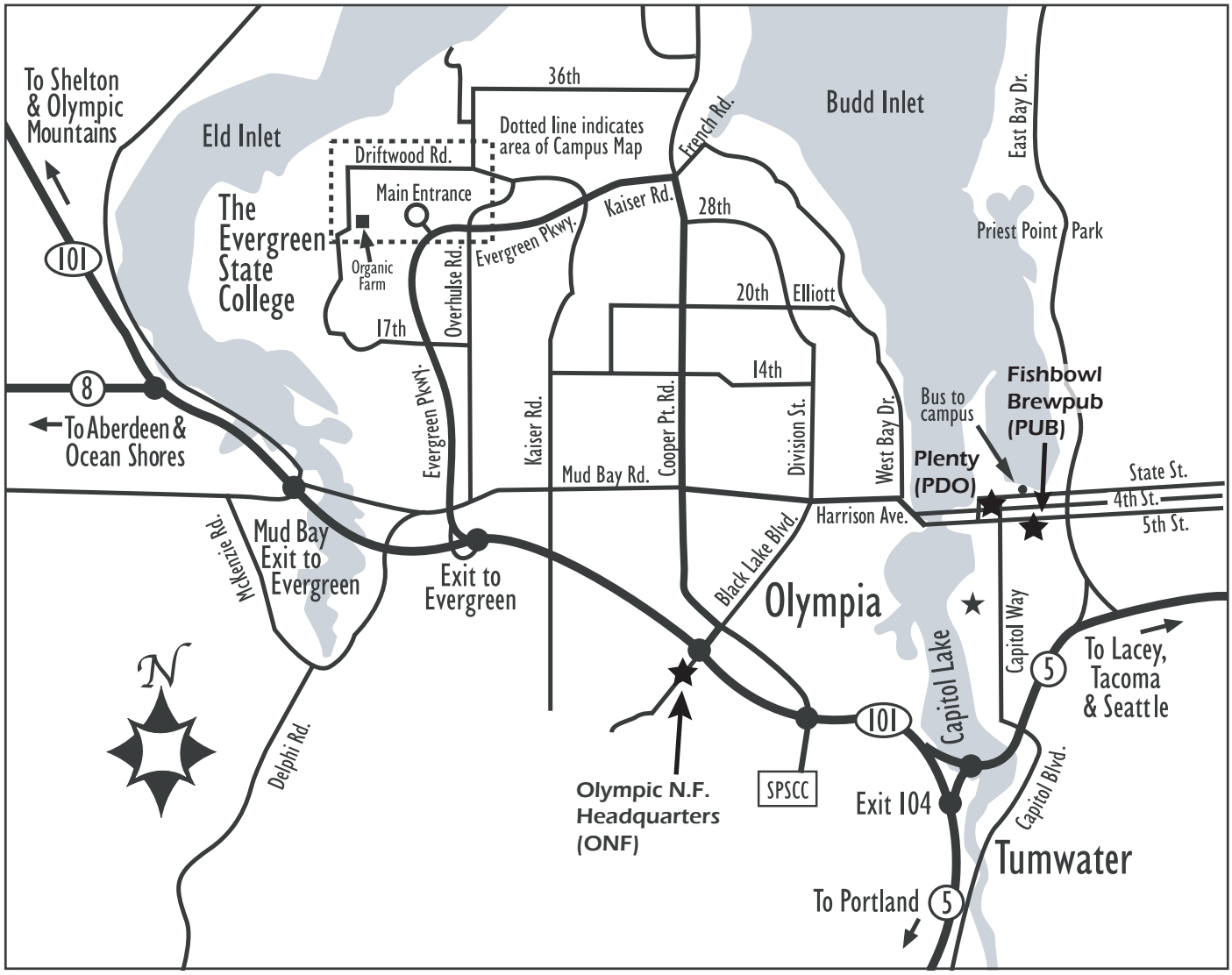
The 2006 Joint Annual Meeting of The Society for Northwestern Vertebrate Biology and the Washington Chapter of The Wildlife Society

in cooperation with the International Canopy Network and OR/WA Partners in Flight

"Challenges of a Changing World: Historical Perspectives and New Innovations"

27-31 March 2006, Olympia, Washington





Getting to The Evergreen State College Campus (TESC)

Whether you are coming from the north (Seattle, SeaTac Airport) or south (Portland): Take I-5 to Exit 104, and follow Highway 101 to the third exit (The Evergreen State College). Travel two miles on the Evergreen Parkway to the main campus entrance on your left. Please be sure to stop by the parking booth for a permit.

Other Conference Locations

Olympic National Forest Headquarters (ONF)

1835 Black Lake Boulevard. Site of Western Forest Carnivore Committee Conference, Monday and Tuesday.

Fishbowl Brew Pub (PUB)

514 Jefferson St. SE, in downtown Olympia. Location of Tuesday night pre-meeting social.

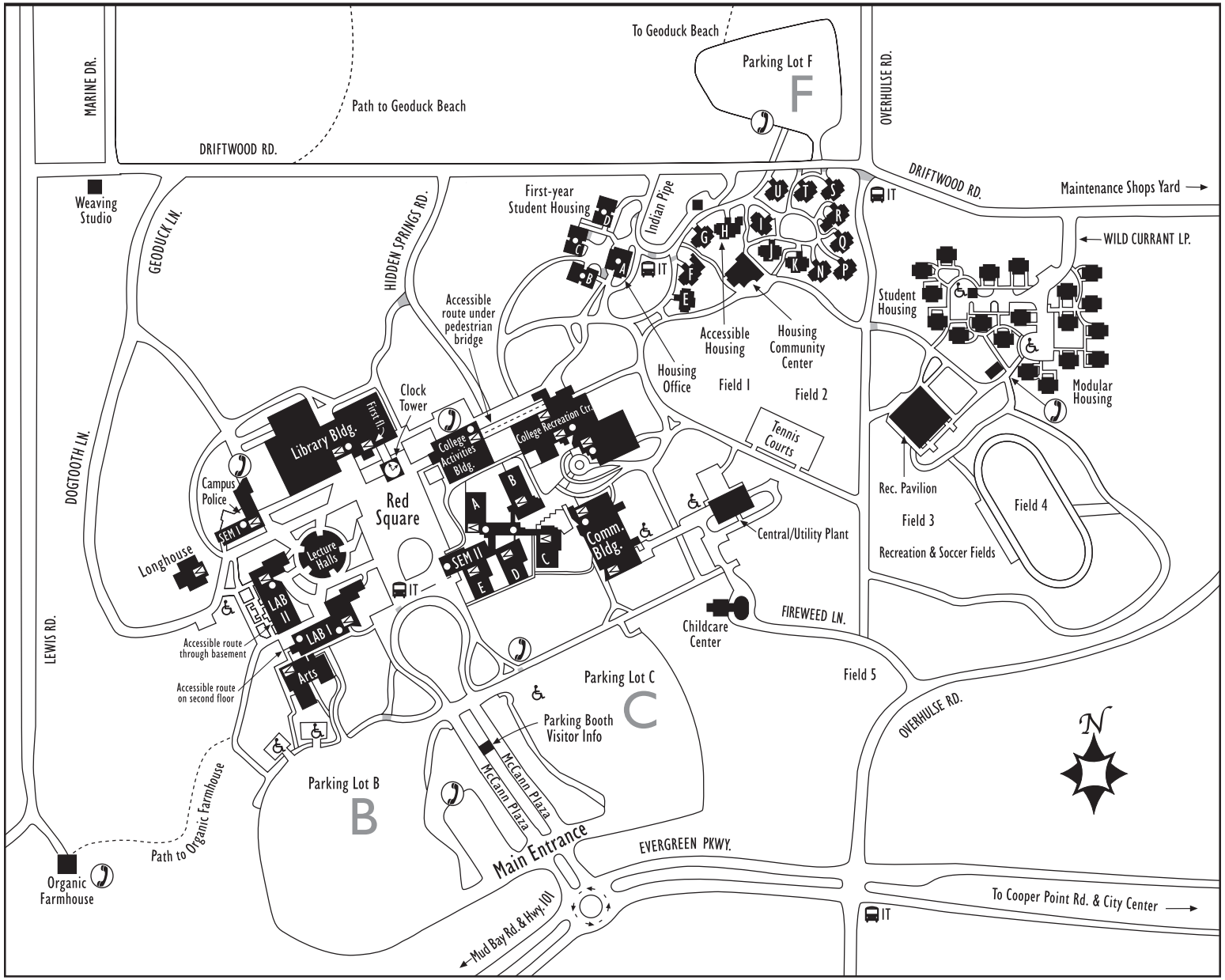
Plenty (PDO)

200 4th Avenue W, in downtown Olympia. Location of Wednesday evening soical.

Campus and Vicinity

The Evergreen State College in Olympia is an hour's drive from the Seattle-Tacoma (SeaTac) airport. The area is served by the Capital Aeroporter, and the Greyhound Bus Company stops in Olympia near the state capital. Many Washington scenic areas and urban points of interest are easily accessible from here.

EVERGREEN
AREA MAP



EVERGREEN

CAMPUS MAP KEY

Arts . . . . Arts Annex
CAB . . . . College Activities Bldg.
COM. . . . Communications
CRC . . . . Recreation Center
IT. . . . . IT Bus Stop
LAB I . . . Arts and Sciences
LAB II . . Arts and Sciences
LC . . . . . Longhouse
LH . . . . . Lecture Halls
LIB . . . . Library
SEM I . . . Seminar I
SEM II . . Seminar II

- Automatic Door
- Emergency Phone
- Accessible Parking
- IT Bus Stop
- Elevator
- Curb Cuts

The Evergreen State College
2700 Evergreen Parkway, NW
Olympia, WA 98505
(360) 867-6000
www.evergreen.edu

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The 2006 Joint Annual Meeting of The Society for Northwestern Vertebrate Biology and the Washington Chapter of The Wildlife Society

with Partners in Flight Oregon/Washington Chapter and International Canopy Network

"Challenges of a Changing World: Historical Perspectives and New Innovations"

Welcome!

The time has come and we are glad you made it! Look around and you'll probably see some folks you know and some haven't met yet. The joint annual conference of Society for Northwestern Vertebrate Biology and the Washington Chapter of The Wildlife Society is bringing together a group of people whose interests and professional pursuits overlap extensively, and it will give us an opportunity over six days to talk, think, learn, make friends, have fun, and possibly leave with a new perspective. When you look at the program you'll see there are many interesting workshops, symposia, field trips, sessions and topics, which is probably why you are here in the first place. We have three pre-meeting workshops (i.e., Amphibian Disease Diagnostics, Bird Banding, and Canopy Access), a pre-meeting symposium for Northwestern Ecology and Festschrift in honor of Bruce Bury (a northwest legend), and pre-meeting conference held by the Western Forest Carnivore Committee. And that's just what's happening before we get to the main course, so you know it's big! Make sure you get up and get to the Long House in time to catch all of the Plenary Session; Bruce Bury, Dave Fraser, Lynn Houck, Nalini Nadkarni, and Robert Pyle will not only give you a lot to think about, they will give you new ways to think about it. For your entertainment, we have brought in a banquet speaker from a far away land (i.e., Arizona), where the dry herps live. Larry L.C. Jones (a.k.a. Uncle Nardly, Commander Salamander), past SNVB president, noted herpetologist, and generally unpredictable conference speaker, will be presiding. Who knows what could happen? Hey, you made it, you're here, enjoy sunny Olympia (we could get lucky), and let the fun begin!

See you at the Longhouse!
Jeff Lewis (President-SNVB) and **Peter Singleton** (President-Elect - TWS-WA)

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Meeting Planning Committee

Chair: Marc Hayes
Committee Members: Hannah Anderson, Tara Chestnut, Steve Herman, Jeff Lewis, Aimee McIntyre, Susan Piper, Peter Singleton
Volunteer Coordinator: Daniel Dugger

Program Layout: Kathryn Ronnenberg

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Audit: Jeff Lewis, Chair
Board Nominations: Bryce Maxell, Chair
Education: Elke Wind, Chair; Committee Members: Tara Chestnut, Deanna Olson and Charles Peterson
Membership: Jeff Lewis, Chair; Committee Members: Hannah Anderson, Steve Herman and Aimee McIntyre
Publications: Jeff Lewis, Chair; Committee Members: Burr Betts, Bill Leonard, Ian Reid and Kathryn Ronnenberg
Scholarship: Tara Chestnut, Chair; Committee Members: R. Bruce Bury, Marc Hayes, Mary Linders, D. John Pierce, and Martin Raphael

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Frank S. Hall	1920-1938	George Hudson	1956-1958	Don Breakey	1981-1982
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Theodore Scheffer	1940	Kenneth Walker	1960-1962	Ellen Kritzman	1984-1986
E.A. Kitchin	1941	Earl Larrison	1962-1964	Steve Penland	1986-1988
Jay Kempes	1942	J. Burton Lauckhart	1964-1966	Keith Aubry	1988-1990
Stan Jewett	1943	Gordon Alcorn	1966-1968	Steve West	1990-1992
Arthur Svihla	1944-1945	Harold Leraas	1968-1970	John Lehmkuhl	1992-1993
Victor Scheffer	1946-1947	Clyde Senger	1970-1972	Larry Jones	1993-1999
G. Clifford Carl	1948-1949	Jack Larson	1972-1974	Greg Green	1999-2001
Murray Johnson	1950	David Manuwal	1974-1977	Bill Leonard	2001-2003
Webster Ranson	1951	John Sullivan	1977-1978	Deanna Olson	2003-2005
Garrett Eddy	1952-1954	F.H. Armstrong	1978-1979		
Gardiner Jones	1954-1956	Dennis Martin	1979-1981		

Washington Chapter of The Wildlife Society

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Board Position 3: Tim Cullinan
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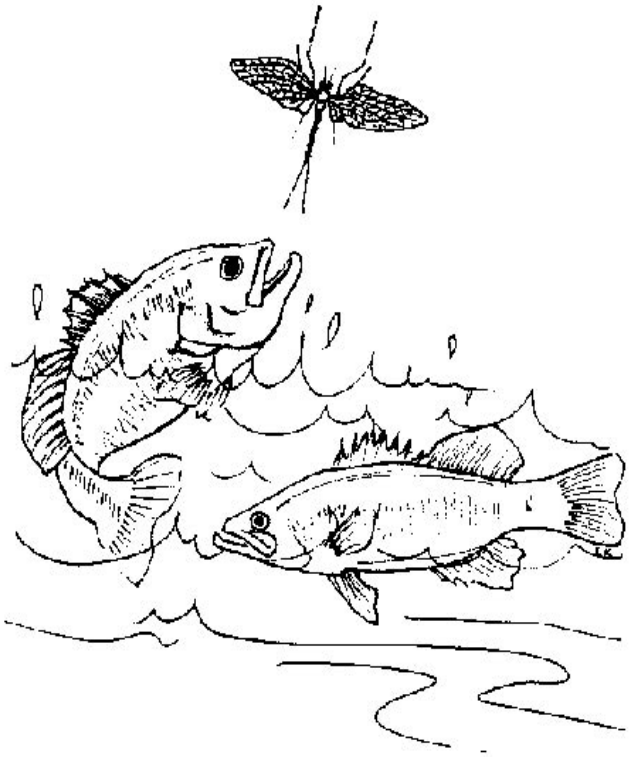
Grants: John Lehmkuhl
Legislative Affairs: vacant
Newsletter: Martin Vaughn
Scholarship: Don Utzinger
Workshops: Bill Vogel

Regional Representatives

Northeast: Chris Loggers
Northwest: vacant
Southeast: vacant
Southwest: Ken Bevis

WA TWS Recent Past Presidents

Bob Naney	1997-1998
Bill Gaines	1998-1999
Jim Bottorf	1999-2000
John Lehmkuhl	2000-2001
Paul Fielder	2001-2002
Don Utzinger	2002-2003
Ken Bevis	2003-2005



Sponsors and Contributors to the 2006 Annual Meeting

The Society for Northwestern Vertebrate Biology and the Washington Chapter of The Wildlife Society would like to acknowledge the generosity of the following sponsors of the 2006 annual meeting and pre-conference workshops:

General Meeting

Major Underwriters: David Evans and Associates
Regent Instruments, Inc.
USDA Forest Service (Olympic National Forest)
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Contributor: Green Diamond Resource Company
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Longview Fibre
The Evergreen State College Lab Stores

Bury Symposium

Sponsor:
U.S. Geological Survey, Forest Range and Ecosystem Science Center

We also wish to thank the individuals, businesses, and organizations who provided special contributions or donated items for our raffle and auction.

Collaborators

The SNVB/WA TWS annual meeting could not have been produced without the invaluable collaboration and cooperation of:
Western Forests Carnivore Committee (WFCC)
International Canopy Network (ICAN)
Partners in Flight - Washington/Oregon Chapter (PIF)
Partners in Amphibian and Reptiles Conservation (PARC)
Pacific Northwest Amphibian and Reptile Consortium (PNARC).

Workshops, Monday 27 March and Tuesday 28 March

Amphibian Disease Diagnostics Workshop and Lab

The SNVB and PNARC are presenting a timely workshop on field indicators of amphibian parasites and pathogens. Participants will be introduced to amphibian disease ecology, and given the tools to recognize parasites and pathogens in the field. Topics include chytrid fungus (Batrachochytrium dendrobatidis), water mold (Saprolegnia ferax), trematodes, and viruses. The workshop will be presented in three sessions: lectures, small group labs and a panel discussion. Lectures will address disease ecology, amphibian declines and conservation. Labs will provide a hands-on opportunity for participants to observe specimens, and learn sampling techniques and specimen preservation. Target participants include biologists, technicians, land managers and students. SNVB or WA TWS members and those conducting amphibian work in the Pacific Northwest will be given registration priority. (lunch included; maximum enrollment 60)

Beyond Counting Birds: Estimating Population Vital Rates through Banding

This Oregon-Washington PIF Workshop, hosted by the Klamath Bird Observatory, will focus on methods and conservation based applications of marking bird populations through banding. Both constant effort mist-netting and target-netting schemes will be outlined. Applied presentations will cover topics including: measuring population vital rates, estimating survival during migration and wintering seasons; monitoring avian disease; stable isotopes, genetics and biogeography; and education. This workshop will include a bird-banding field demo Tues AM. Target participants include biologists, land managers, students, and community members interested in learning more about bird banding as it relates to bird conservation. (maximum enrollment 60)

Forest Canopy Access Workshop

This exciting two-part workshop, hosted by ICAN, will present forest canopy research methodologies and canopy access, focusing on avian, small mammal and epiphyte sampling, and hemispherical photography. Northwest forest canopy researchers will present their experiences conducting research in the forest canopy, addressing what has worked and what has not worked. A field based tree-climbing session will follow morning presentations. An experienced arborist will discuss climbing safety, showcase climbing gear, and demonstrate rope-based canopy access techniques. Participants will then have the opportunity to climb trees and access the forest canopy. Target participants include biologists, land managers, students, and community members interested in learning about forest canopy research techniques, and forest conservation and management. (lunch included, maximum enrollment 35)

Special Events

Vendors

Vendors of books, ephemera, and art ware, including our own SNVB store, will available on Tuesday and Wednesday 28-29 March (**TESC**, Foyer of the Longhouse) and on Thursday and Friday 30-31 March in the Poster Session room (**TESC**, Seminar II Building, Pod A, Rm 1107).

Photo Contest

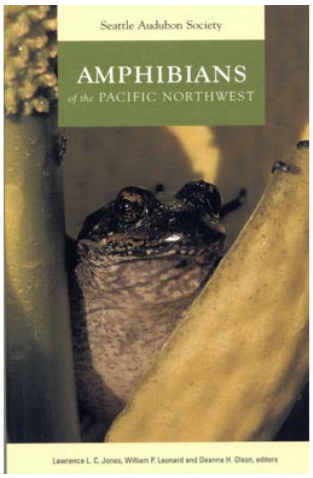
Photos entered for a photography contest will be on display on Tuesday and Wednesday 28-29 March in the Cedar Room and Foyer of the **Longhouse** and on Thursday and Friday in the Poster Session room in the **Seminar II** Building, Pod A, Room 1107, both at The Evergreen State College. Contest categories include birds, mammals, reptiles & amphibians, fish, landscapes, humor, and environmental action at work. Prizes awarded for the best photo and runner-up in each category, as well as best in show. Photos should be mounted, but need not be framed. If enough black and white entries exist, they will be judged separately. Photos must be hung for viewing no later than Thursday 30 March at 8:00 AM but can be hung as early as Tuesday 28 March at 8:00 AM; judging will occur Thursday afternoon and presentation will be made at the banquet.

Raffle and Auction

A raffle and live auction with the ever enthusiastic (some might say "hyperactive") former WA TWS president Ken Bevis will be held during Thursday's banquet, to benefit SNVB and Washington Chapter TWS programs. Auction and raffle items will be on display during the pre-banquet poster social in the Gymnasium at TESC, the site of the banquet.
The auction items include a sensational, once-in-a-lifetime tour opportunity. Check it out!
Raffle tickets are a buck each, or six for five bucks, and there are lots of great prizes that just might have your name on them. Think big--for twenty-five bucks, you could have thirty chances!

Book Signing

A book signing for the recently published Seattle Audubon **"Amphibians of the Pacific Northwest"** will occur at the mid-morning break for the Plenary Sessions on Wednesday 29 March (**TESC**, Foyer of the Longhouse). All three editors of the book will be available for this signing.



Field Trips, Saturday 1 April

Despite the date, these field trips are for real!
Five exciting field trips are scheduled. Bring raingear, proper footwear and layers; this is the Westside after all. Knee-high rubber boots are a minimum for the amphibian and mollusk trips, bring hip boots and waders if you have them. Sign up when you pick up your meeting packets at registration; meeting point locations will be provided at registration. Trips include:

Birding at Nisqually National Wildlife Refuge: Join Black Hills Audubon for a bird watching trip at the spectacular Nisqually National Wildlife Refuge (NNWR) located northeast of Olympia where the freshwaters of the Nisqually River meet the saltwaters of Puget Sound at the Nisqually River Delta. The delta, biologically one of the richest and most diverse in Puget Sound, supports a melange of estuarine, freshwater wetlands and riparian woodland habitats. Located on the last largely unspoiled major estuary in Puget Sound, NNWR is famous for the more than 275 migratory and resident bird species that use the refuge for breeding, migration, or wintering. Species of note that can be expected include American bittern, wood duck, Bonaparte's gull, northern harrier, green heron, common yellowthroat, common merganser, short-eared owl, Virginia rail, Lincoln sparrow, blue wing and cinnamon teals, and marsh wren. (Lead: Bill Shelmerdine; Enrollment limit 25)

Forest Wildlife Habitat Management at Fort Lewis: The US Forest Service, Pacific Northwest Research Station (Olympia) will host a field trip to Fort Lewis in Tacoma to visit selected sites in the landscape-level Forest Ecosystems Study begun in the early 1990s. This study emphasizes enhancement of wildlife habitat using different silvicultural thinning prescriptions that vary forest canopy density. Participants will be able to both see the structural variation in thinning treatments and discuss the responses of arboreal and forest-floor mammals, birds, and amphibians to these treatments, as well as their consequences for these forest systems.
(Lead: Todd Wilson; Enrollment limit 25)

Lowland Stillwater Herpetofauna: A field trip to a rich stillwater-breeding amphibian site in central Thurston County (secret location to be announced). Species that can be expected are almost guaranteed are long-toed salamander, northern red-legged frog, northwestern salamander, Pacific treefrog, roughskin newt, and if we are lucky, western toad and Oregon spotted frog. If the day is sunny, common and northwestern garter snakes, and maybe even northern alligator lizards may also be found. Great macrophotography opportunities.
(Leads: Kelly McAllister and Lisa Hallock; Enrollment limit 25)

Mollusc and Leaf-litter Invertebrate Trip: Casey Richart, mollusc-man extraordinaire, will lead a field trip into The Evergreen State College forest to regale the mollusc and litter-invertebrate lovers. If you want to see some hairy snails, jumping slugs, pseudoscorpions, or opiliones, then this is the field trip for you. Great macrophotography opportunities.
(Lead: Casey Richart; Enrollment limit 20)

Scenic and Photography Trip to Mt. Rainier Area: This early morning trip into the wilds around Mt. Rainier; great opportunities for landscape photograph.
(Leads: To be determined; Enrollment limit 20)

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"Challenges of a Changing World: Historical Perspectives and New Innovations"

27-31 March 2006, Olympia, Washington

PROGRAM

Locations are on The Evergreen State College campus (TESC), unless specifically stated otherwise.

Monday 27 March

8:30 am	Workshop registration opens	Seminar II building lobby
9:00 am - 5:00 pm	Forest Canopy Access Workshop, lunch provided	Seminar II bldg., Lecture Rm. 2107, Pod A
10:00 am - 5:00 pm	Beyond Counting Birds: Estimating Population Vital Rates Through Banding	Seminar II bldg., Workshop Rm. 1107, Pod A
10:00 am - 5:30 pm	Amphibian Disease Diagnostics Workshop, lunch provided	Seminar II bldg., Lecture Rm. 1105, Pod A
1:00 pm - 5:00 pm	Western Forest Carnivore Committee Conference	Olympic National Forest Headquarters (ONF) conference rooms

Tuesday 28 March

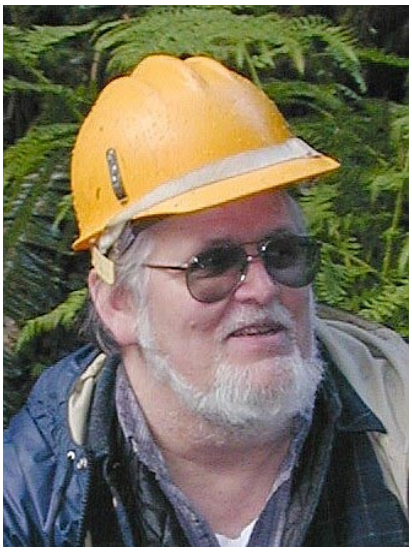
7:30 am	Registration for Joint Annual Meeting opens	Longhouse Foyer
8:00 am - 5:00 pm	Vendors open	Longhouse Foyer
8:00 am - 5:30 pm	Bury Symposium: Perspectives, Fieldwork and the Ecology of the Pacific Northwest	Longhouse, North Wing
8:00 am - 5:00 pm	Western Forest Carnivore Committee Conference, lunch provided	ONF conference rooms
8:00 am - noon	Beyond Counting Birds	field session, McLane Creek Nature Trail, meet at TESC bus loop at 8:00
5:30 pm - 10:00 pm	Bury Salmon and Clambake with pre-dinner social	Longhouse
5:30 pm - 11:00 pm	No-host pre-meeting social (Sorry, must be 21 or older)	Fishbowl Brew Pub (PUB on map), downtown Olympia

Perspectives, Fieldwork and the Ecology of the Pacific Northwest
A Symposium and Festschrift Honoring R. Bruce Bury

Location: The Evergreen State College Longhouse, North Wing

8:00 am - 8:10 am	**Introduction:** Marc Hayes; **Moderator:** Mike Adams
8:10 am - 8:35 am	**The academic and historical pedigree of R. Bruce Bury** Mark R. Jennings and Marc P. Hayes
8:35 am - 9:00 am	**Herpetologists and herpetology in the U.S. Fish and Wildlife Service** Norman R. Scott, Jr. and Jeffrey E. Lovich
9:00 am - 9:25 am	**Bruce Bury: Field biologist extraordinaire** -- Roger Luckenbach
9:25 am - 9:50 am	**Assessing bias in the estimation of abundance using distance sampling** Paul Stephen Corn
9:50 am - 10:10 am	----BREAK----
10:10 am - 10:20 am	**Introduction:** P. Stephen Corn
10:20 am - 10:45 am	**Winter habitat use by juvenile foothill yellow-legged frogs (*Rana boylii*): the importance of seeps** -- Chris Rombough
10:45 am - 11:10 am	**The role of introduced trout as amphibian predator and disease vector in the Northwest** -- David S. Pilliod, Blake Hossack, and Christopher A. Pearl
11:10 am - 11:35 am	**Spatial ecology of a population of the aquatic garter snake, *Thamnophis atratus*, associated with a montane, cold-stream environment in northwestern California** -- Hartwell H. Welsh, Amy J. Lind, and Clara A. Wheeler
11:35 am - noon	**Aquatic and terrestrial movements of coastal tailed frogs (*Ascaphus truei*) in relation to timber harvest in British Columbia** -- Tanya R. Wahbe, Fred L. Bunnell, and R. Bruce Bury
noon - 1:00 pm	---LUNCH---(provided)
1:00 pm - 1:10 pm	**Introduction:** Dick Weisbrod
1:10 pm - 1:35 pm	**Applications of traditional aboriginal knowledge in community-based ecological research** -- Eduardo M. Jovel
1:35 pm - 2:00 pm	**Bullfrog management revisited** -- Michael J. Adams and Christopher A. Pearl
2:00 pm - 2:25 pm	**Headwater streams** -- Deanna H. Olson
2:25 pm - 2:50 pm	**Sierra Nevada amphibian declines: the role of fungus and pesticides** -- Gary M. Fellers
2:50 pm - 3:05 pm	---BREAK---
3:05 pm - 3:15 pm	**Introduction:** Marshall Howe
3:15 pm - 3:40 pm	**Unraveling the "Klamath Knot": Review and prospectus of caudate research in the Klamath-Siskiyou region** -- Douglas J. DeGross and Stevan J. Arnold
3:40 pm - 4:05 pm	**Influence of altered thermal regime on body size and age of maturation on Western Pond Turtles (*Clemmys marmorata*) in Trinity County, California** Don T. Ashton, Hartwell H. Welsh, and James B. Bettaso
4:05 pm - 4:30 pm	**Basking patterns and thermal regulatory behaviors of Western Pond Turtles (*Clemmys marmorata*): comparing responses to thermal regimes in dammed and undammed tributaries of the Trinity River** -- James B. Bettaso, Don T. Ashton, Hartwell H. Welsh, and Robert M. Sullivan
4:40 pm - 4:50 pm	**Bury Story Time and Presentations, Moderator:** Marc Hayes
4:50 pm - 5:05 pm	**Bruce speaks**
5:05 pm - 5:30 pm	Pre-dinner mingle
5:30 pm - 10:00 pm	Bury Salmon and Clambake
	After dinner, head downtown to the Pre-Meeting Social at the Fishbowl Brew Pub! (see map)

Abstracts for Bury Symposium talks can be found in a special section preceding the Joint Annual Meeting abstracts, beginning on page 28.

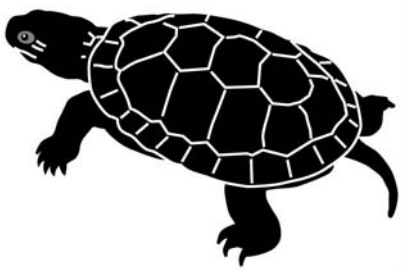


Richard Bruce Bury

Dr. Bury, a pioneer in ecological studies on amphibians and reptiles linked to human endeavors, is a native Oregonian (Roseburg) whose career has always been drawn back to the Pacific Northwest. His propensity for chasing critters was propelled a gigantic step forward when his family moved to the California redwood coast, where he went to Eureka High School and attended Humboldt State University (HSU), renowned for its wildlife and biology programs. Completing a Bachelors degree at HSU (1965) drew him into a Masters project (1965-1967) with Robert Livezey at Sacramento State University on the coastal tailed frog, a focal species in his later career. This work rapidly led him to the University of California at Berkeley and Robert Cyril Stebbins, the dean of modern herpetology in western North America, where Bruce dove after western pond turtles in the Trinity River for his PhD, his baptismal research on a chelonian. In 1972 (one year following the appearance of Endangered Species Act), he was the first fulltime herpetologist to be hired by the US Fish and Wildlife Service. After a stint as Chief of the Herpetology Section (1972-1977) at the National Museum of Natural History, following explorers of yore, he went west, first to the Mid-continent Ecological Science Center (Fort Collins, Colorado; 1977-1992), then to the Forest and Rangeland Ecosystem Science Center (since 1993). In his fieldwork, Dr. Bury covered a broad area (including southwest US deserts, northern Mexico, and Pacific Northwest forests), producing a veritable biological research cornucopia, including over 120 peer-reviewed articles, several books, and numerous reports and other contributions. The work of Dr. Bury consistently highlights three basic themes: a love for organisms, even though selected organisms had most-favored taxon status such as chelonians (aquatic and terrestrial alike) and stream-associated amphibians (a la Pacific Northwest); concern for the impacts of human endeavors on animals and their associated habitats; and the development of practical approaches to mitigate those impacts.

EVERYTHING I NEEDED TO KNOW ABOUT BIOLOGY I LEARNED EARLY OR DURING AN ODYSSEY OF FIELD TRIPS FROM ARCATA TO ZZYXX SPRINGS. **R Bruce Bury,** *USGS Forest and Rangeland Ecosystem Science Center, 3200 SW Jefferson Way, Corvallis, OR 97331;* **bruce_bury@usgs.gov**

Although not a career requirement, I dove into herpetology as a teen (age 14): subscribed to a journal, submitted a paper (rejected, but what the heck!), met famous scientists, and started my very own "herp society." You learn by experimenting and networking. Many of my pen pals became my heroes and mentors, and were great people, too. Starting my undergraduate days behind the redwood curtain (Humboldt State University, Arcata, California), I experienced much through field trips to the nearby California deserts (e.g., Zzyxx Springs), remote deserts (Mexico), coastland (Texas, Virginia, Florida), interior sand dunes (Nebraska), and other exotic and more parochial locales. Each field trip offered new and different learning and research opportunities and "lessons" of life for a budding, and then professional biologist (all the way to the National Museum, oh my!). This is an encapsulated story of those ventures, places and people over the last 40 years with notes on the good, the bad & the sometimes ugly. Also, it is time to get the historic names right: it was Lewis, Clark & Bury. Trust me on this one. Photo-documentation to be provided.

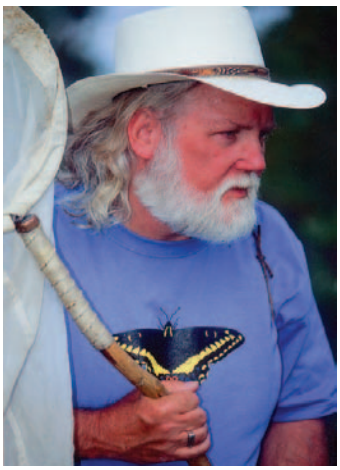


Nalini Moreshwar Nadkarni

Dr. Nadkarni has been both a pioneer in forest canopy studies and in fostering the communication of canopy research among scientists and to the general public around the world. In 1992, she joined the faculty at The Evergreen State College, in Olympia, Washington and the adjunct faculty at the University of Washington. Her research is on the ecology of tropical and temperate forest canopies, particularly the roles that canopy-dwelling plants play in forests. She carries out field research in Costa Rica and Washington State, supported by grants from the National Science Foundation and the National Geographic Society. She has published over 80 scientific articles and two scholarly books. Her recent awards include a Guggenheim Fellowship for excellence in scholarship and creativity, the J. Stirling Morton Award of The National Arbor Day Foundation, and an Aldo Leopold Leadership Fellowship. In 1994, she co-founded the International Canopy Network, a non-profit organization to foster communication among researchers, educators, and conservationists concerned with forest canopies. Her work has been featured in popular magazines such as Natural History, Glamour, and Ranger Rick, and she has appeared in numerous television documentaries. Dr. Nadkarni's recent efforts are to integrate aspects of artistic expression with scientific documentation of the natural world. She recently created the NSF-funded "Research Ambassador Program," in which she trains other scientists to do outreach to non-traditional public audiences.

PULPITS, PRISONS, AND POETS: DISSEMINATING ACADEMIC RESEARCH BEYOND ACADEMIA. **Nalini M Nadkarni**, *The Evergreen State College, Olympia, WA 98505;* nadkarnn@evergreen.edu

One of our major problems is the growing gap between science and society and the increasing distance and lack of connection between people and nature. Within academia, few rewards or training arenas for researchers exist to communicate their research outside of scientific venues. Such activities are often considered secondary to the "real work" of academics, such as publishing scientific papers and writing grant proposals. Some scientists communicate their research to the public, but they mainly do so to "environmentally aware" audiences, and often rely on via media spokespeople and informal science education institutions, which can sensationalize or dilute the work, or place it only in the minds of those who are already connected to science and nature. In 2003, I developed the "Science Ambassador Program" to empower academic scientists to communicate their passion for, and knowledge of science to non-scientists in ways that will both enhance their careers and provide outreach, with a focus on "environmentally unaware" public audiences. In this talk, I present examples of outreach that relate to canopy biology studies in tropical and temperate rainforests. Outreach venues have included giving sermons on trees and spirituality in churches and temples; working with rap singers to expose at-risk urban youth to field ecology; partnering with artists and poets to communicate the complexity of forests; and creating educational materials for tropical canopy ecotourism facilities. Formal assessment of these activities leads us to conclude that this program can be successful in both educational and conservation efforts targeted at traditionally underserved audiences.



Robert Michael Pyle

Dr. Robert Michael Pyle, a Coloradan, received a BS in Nature Perception and Protection and MS in Nature Interpretation from the University of Washington, and a PhD from the Yale University School of Forestry and Environmental Studies. In 1971, during a Fulbright Fellowship at the Monks Wood Experimental Station in England, Pyle founded the Xerces Society for invertebrate conservation. Bob has worked as butterfly conservation consultant in Papua New Guinea, Northwest Land Steward for The Nature Conservancy, and visiting professor or writer in residence at colleges and universities including Utah State, Portland State, Portland, Oregon State, Virginia, Alaska, Montana, Evergreen State, and Lewis & Clark. Pyle has published hundreds of papers, essays, stories, poems, and fourteen books including *Wintergreen*, *The Thunder Tree, Where Bigfoot Walks, Chasing Monarchs, and Walking the High Ridge: Life as Field Trip*; as well as *Nabokov's Butterflies*, *The Audubon Society Field Guide to North American Butterflies*, and *The Butterflies of Cascadia*. Coming next is a pastorale of his rural valley home, and a novel set in Colorado. His column "The Tangled Bank" appears in Orion magazine. A Guggenheim Fellow, Pyle has received the John Burroughs Medal for Distinguished Nature Writing, three Washington Governor's Writers Awards, the Pacific Northwest Booksellers Award, the Harry B. Nehls Award in Nature Writing, a Distinguished Service Award from the Society for Conservation Biology, and the John Adams Comstock Award from the Lepidopterists' Society. He lives along Gray's River, a tributary of the Lower Columbia, with botanist and silkscreen artist Thea Linnaea Pyle.

HERETICAL MONARCHS, WINTER TADPOLES, AND GIANT HAIRY APES: ASKING THE UNASKABLE QUESTIONS. **Robert Michael Pyle,** *369 Loop Road, Gray's River, WA 98621;* **tlpyle@willapabay.org**

Too often we frame questions according to the answers we expect. This is as true of scientists as the lay public. Thus, in an activity that should be the very enterprise of surprise, the questions frequently dictate their own solutions. Self-fulfilling answers may be the second greatest source of bias in science, after money. Contrarian, apostatic, or iconoclastic hypotheses seldom make it past the gates due to institutional, funding, or self-inflicted pressures for conformity. It is natural to follow our inclinations according to the world as we know it, or think we know it, to be. But sometimes posing a world other than we know it can lead to truly surprising conclusions, causing us to let out the seams of our mindset and alter our most jealously held theories. This talk considers several natural history paradigms overturned or at least unsettled by uncomfortable questions. First, the traditional, canonized model of North American monarch butterflies assumed a bipartite migration, with all the monarchs arising east of the Rockies overwintering in Mexico, all those from west of the Rockies migrating to California. Close questioning of the evidence found this model wanting, and subsequent field investigation supported a new picture, with strong implications for conservation. The second example concerns surprising recent findings of winter-active chorus frog larvae in southwest Washington. The third goes beyond the known into the often-ostracized realm of cryptozoology, asking whether we should close our biologists' minds even to the possibility of undiscovered apes in North America and elsewhere.

W. Leonard

David Fraser

David Fraser has a MSc from the University of Victoria. During his early career, he worked in ecosystem restoration in the Rocky Mountains of southeastern British Columbia. For 20 years, he worked as a consultant in environmental education, and biodiversity research and management. He founded and co-owns a nursery business specialising in rare and native plants. He currently is the endangered species specialist with the British Columbia Ministry of Environment, is a member of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and is the scientific authority for the Convention on International Trade in Endangered Species (CITES) for British Columbia.

WALL LIZARDS AND WOLVERINES, SPECIAL CHALLENGES FOR NORTH AND WESTERN NORTH AMERICA. **David F Fraser,** *B.C. Ministry of Environment, Species at Risk Branch, Box 9374 Stn. Prov. Gov. Victoria, BC. V8W 9M4;* **dave.fraser@gov.bc.ca**

Species collapse, the speed of habitat change, alien species introduction and patterns of human settlement are producing unprecedented pressures on species and ecosystems. Recent work on patterns of species range collapse and increased awareness of biodiversity loss at a global scale creates a particularly complex challenge and milieu for managers working in north and western North America. At the same time, an increasingly urbanized local population is changing its values, understanding and connection to wildlife and the environment. Prioritization systems for assigning conservation effort need to be fully informed of this biological and social complexity.

Lynne Diane Houck

Dr. Houck was a graduate student at UC Berkeley in the days when no one mentioned pond turtles without also saying "Bruce Bury". She was a graduate student with David Wake, and received her MA (1975) and PhD (1977) from the University of California at Berkeley. Her dissertation addressed the reproductive biology of neotropical salamanders, during which time she conducted fieldwork in Guatemala. In 1974, Dr. Houck moved to Chicago, taught at Lake Forest College from 1977-1978, and worked part-time at the Field Museum of Natural History before starting to teach at the University of Chicago, where she began studying sexual selection in salamanders. This work led to her documenting significant among-male variation in insemination success in eastern plethodontid salamanders (*Desmognathus*, *Plethodon*). After watching numerous courtship encounters, Dr. Houck became interested in courtship pheromones produced by the chin (mental) glands of males. An experiment using a crude mental gland extract actually increased female receptivity in *Desmognathus ocoee*. This result set the stage for more detailed work on pheromone biochemistry, developed in collaboration with the biochemists Richard and Pamela Feldhoff. After Dr. Houck moved to Oregon State University in 1997, additional collaborators joined the study of salamander courtship pheromones. Current work spans the gamut of: endocrine effects on pheromone reception, neurophysiological response of the female, biochemical characterization of pheromone components, behavioral tests of female response to different pheromone components, and molecular evolution of pheromone proteins. In conducting this research, Dr. Houck, students and colleagues typically spend most of August each year at the Highlands Biological Station (North Carolina) collecting several species of Plethodon for behavioral and other tests of pheromone components.

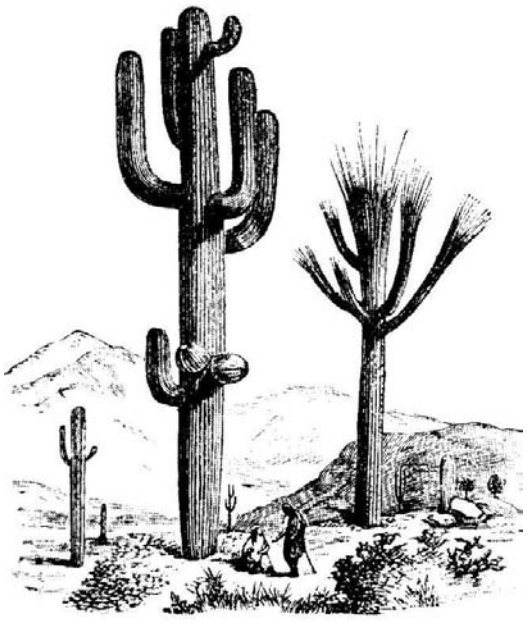
COLLABORATIVE RESEARCH PROVIDES NEW PERSPECTIVES ON SALAMANDER REPRODUCTIVE BEHAVIOR. **Lynne Houck, Stevan J Arnold, Richard Watts,** *Department of Zoology, Oregon State University, Corvallis, OR 97331;* **Kathleen Bowen, Pamela Feldhoff, Richard Feldhoff,** *Department of Biochemistry and Molecular Biology, University of Louisville School of Medicine, Louisville, KY 40292 ;* **houckl@science.oregonstate.edu**

Pheromones are chemical signals that mediate reproductive behavior in many vertebrates. In salamanders, certain male pheromones are delivered to the female only during courtship. A review of salamander courtship pheromones is focused on plethodontid salamanders. Behavioral tests in our main study species, Plethodon shermani, revealed the function of courtship pheromones by showing that female receptivity could be increased when the male delivered these multi-protein pheromones to the female. In fact, a single pheromone protein, Plethodontid Receptivity Factor (PRF), alone was able to increase female receptivity. The protein nature of courtship pheromones allowed us to examine genetic change in PRF across a lineage of Plethodon species. This molecular analysis revealed that strong positive (directional) selection has significantly altered this courtship pheromone, both among populations and across species. The evolutionary dynamics of this change is discussed, as is the effect of the pheromone on female neural response. Ultimately, the interaction of the courtship pheromone and the female response appears to represent a molecular tango in that the male pheromone and female receptors coevolve within a limited molecular space.

Lawrence (Larry) "Lagarto" Jones

Larry Lagarto, born on New Years Day (11:59 PM) in Houston (Texas) in 1954, spent most of his formative years in California, where he attended those celebrated institutions, El Camino College (1970-1972) and California State University Long Beach (1973-1985), while plying the desert wilds of the Mojave, Anza-Borrego, Palm Springs, and Baja California for every rampant creature imaginable (some unimaginable too). Under the tutelage of Uncle Festus (= Richard Loomis), Sr. Lagarto developed an unparalleled appreciation for the chiggers and mites of his favorite desert denizens. After this period, his field talents caught the eye of Martin "El Zorrito" Raphael and Raoul "the Bruce" Bury, and was irretrievably sucked to a career of veritably sinful fieldwork across the Great Pacific Northwest, where he spent almost 20 years. During that time, his unparalleled enthusiasm for and research on the crawlie cohort led him to found the Pacific Northwest Amphibian and Reptile Consortium (PNARC) and to join the board of the Society for Northwestern Vertebrate Biology (1993-1999). However, his longing for sunshine and the chance of finding a few more reptile species than simply garter snakes and northern alligator lizards drew Sr. Lagarto to the wilds of Arizona, where he spends his days sipping mojitos, chasing ridge-nosed rattlesnakes, and helping manage the Wildlife Program of the Coronado National Forest.

GUNKHOLING THE MADREAN ARCHIPELAGO. Larry "Lagarto" "Jaguarundi" "Pichecuate" "Mariposa" Jones, *¡Culebras Arizonas! y Coronado National Forest, Tucson, AZ 85701;* **ljones02@fs.fed.us.**



After two decades of living in the Pacific North-Wet, one particular morning…I suddenly snapped! As usual, I awoke to the sounds of Giant Salamanders barking in my ears. As I arose, I pulled back the blanket (realizing it was a six-inch blanket of moss) and slid out of my Gore-Tex jammies. As I walked toward the bathroom (enshrouded in a canopy of mold), I slipped on the algae-covered floor, which could have hurt me, were it not for the mushrooms growing out of my head that cushioned the fall. "That's it!" I spouted. "I gotta dry out!" I grabbed my wife and Domino the WonderDog (not in that order), loaded up the truck, and we moved to Sunny Airy-Zona. When we arrived in this strange new land (after being treated for blindness and third-degree burns), we discovered its plethora of Natural Wonders. The Madrean Archipelago or "Sky Islands" and its desert and grass-land "seas" were my playground, and being a biologist, I was the proverbial kid in the proverbial candy store. The Madrean Archipelago of southeastern Arizona is the most biologically diverse chunk of real estate in the western U.S. A quick nose-count reveals about 2,000 species of plants, 466 birds, 110 mammals, 90 reptiles, 19 amphibians (same as western Washington!), 240 butterflies, and three jillion insects. Join Janet and me as we board the HMS Buscador to poke around the Madrean Archipelago in search of RKKs (Really Kool Kritters), such as Elegant Quetzaloids, Chulos, y Gila Monstrosities.

Wednesday 29 March

7:30 am	Registration for Joint Annual Meeting opens	Longhouse Foyer
8:00 am - 5:00 pm	Vendors open	Longhouse Foyer

8:00 am - noon	**2006 Joint Annual Meeting Plenary Session** *Introduction:* Jeff Lewis and Peter Singleton		Longhouse, North Wing
8:20 am - 9:00 am	R. Bruce Bury	Everything I needed to know about biology I learned early or during an odyssey of field trips from Arcata to Zzyxx Springs	
9:00 am - 9:40 am	Nalini M. Nadkarni	Pulpits, prisons and poets: Disseminating academic research beyond academia	
9:40 am - 10:20 am	Robert M. Pyle	Heretical monarchs, winter tadpoles, and giant hairy apes: Asking the unaskable questions	
10:20 am - 10:40 am	---BREAK---		
10:40 am - 11:20 am	David Fraser	Wall lizards and wolverines, special challenges for north and western North America	
11:20 am - noon	Lynne Houck	Collaborative research provides new perspectives on salamander reproductive behavior	

noon - 1:30 pm	Hosted business lunch for WA TWS No-host lunch for all others	The Greenery, Campus Activities Building

Don't forget, all three editors of the new "Amphibians of the Pacific Northwest" (Seattle Audubon, 2005) will be available for a book signing during the morning break of the Plenary Session. Books will also be available for sale in the Longhouse Foyer on Wednesday, and the Seminar II lobby on Thursday and Friday.

Wednesday 29 March

1:30 pm - 5:00 pm Concurrent Paper Presentation Sessions

Time	Longhouse, North Wing, North Half	Longhouse, North Wing, South Half
1:30 pm - 5:00 pm	**Managed Landscapes - Forests** *Moderator:* Hannah Anderson	**Amphibian Ecology** *Moderator:* Tara Chestnut
1:30 pm - 2:00 pm	Wildlife research needs in managed forests -- Andrew Kroll	Northern Leopard Frog distribution in Washington -- Steve Germaine
2:00 pm - 2:30 pm	Variable retention logging effects on gastropods -- Kristiina Ovaska	Columbia torrent salamander diet -- Ryan O'Donnell
2:30 pm - 3:00 pm	Canopy heterogeneity creates young managed forest complexity -- Todd Wilson	Conboy Lake Oregon spotted frog population trends -- Marc Hayes
3:00 pm - 3:30 pm	**BREAK**	
3:30 pm - 4:00 pm	Small mammal responses to green-tree retention harvest -- Robert Gitzen	Rocky Mountain tailed frog distribution and abundance -- Jason Jones
4:00 pm - 4:30 pm	Post-timber harvest small mammal response -- Claudine Reynolds	Forest-associated salamander respiration constraints -- Lindy Mullen
4:30 pm - 5:00 pm	Mistletoes and wildlife in the Pacific Northwest -- David Shaw	Columbia torrent salamander distribution in headwater streams -- Amberlynn Pauley

5:30 pm - 10:00 pm
Evening Social -- to be held at Plenty, 200 4th Avenue W, in downtown Olympia (labeled PDO on map inside front program cover)

Thursday 30 March

7:30 am	Joint Annual Meeting registration opens	Seminar II lobby
8:00 am - 4:30 pm	Vendors open	Seminar II lobby
8:00 am - 4:30 pm	Poster display	Wkshop Rm. 1107, Pod A

All rooms shown are located in the Seminar II building.

8:00 am - 11:30 am Concurrent Paper Presentation Sessions

Time	Lect. Rm. 1105, Pod A	Lect. Rm. 1105, Pod B	Wkshp. Rm. 1107, Pod B
8:00 am - 11:30 am	**Prairie Landscapes/ Shrub Steppe Habitats** *Moderator:* Sally Butts	**Managed Landscapes - Amphibians** *Moderator:* Aimee McIntyre	**Land Mammals / Herptile Ecology** *Moderator:* Steve Germaine
8:00 am - 8:30 am	Streaked horned lark edge effects -- Hannah Anderson	Special PARC Presentation: Global amphibian declines -- Robin Moore	Bat chemilumnescent tagging -- Chad Hoxeng
8:30 am - 9:00 am	Restoration of remnant prairie -- Eric Beach	Forest harvest impacts on small ponds -- Elke Wind	Deer mouse identification -- Michael Kroeger
9:00 am - 9:30 am	Taylor's checkerspot butterfly translocation -- Mary J. Linders	Managed headwater forest protection -- Deanna Olson	no talk scheduled
9:30 am - 10:00 am		**BREAK**	
10:00 am - 10:30 am	Greater sage grouse reproductive habitat -- Jay Shepherd	Forest practices and Cascade torrent salamander -- James MacCracken	Amphibian invasions of new ponds at Mount St. Helens -- Eric Lund
10:30 am - 11:00 am	Pygmy rabbit habitat model -- Jennifer Meisel	Western toad recreation impacts -- Charlotte Corkran	Rattlesnake location using radio-transmitters -- Lisa Hallock
11:00 am - 11:30 am	Pygmy rabbit diet choices -- Lisa Shipley	Habitat fragmentation in Olympic National Park -- Chris Akios	Sharp-tailed snakes in British Columbia -- Christian Engelstoft
11:30 am - 1:00 pm		**LUNCH** **Hosted SNVB business lunch** **No-host lunch for all others**	**The Greenery, Campus Activities Building**

Thursday 30 March

Bios and abstracts for the Partners in Amphibian and Reptile Conservation (PARC) special session presenters and papers can be found on the next two pages.

1:00 pm - 4:30 pm Concurrent Paper Presentation Sessions

Time	Lect. Rm. 1105, Pod A	Lect. Rm. 1105, Pod B	Wkshp. Rm. 1107, Pod B
1:00 pm - 4:30 pm	**Managed Landscapes - Mammals** *Moderator:* Jim MacCracken	**Partners in Amphibian and Reptile Conservation** *Moderator:* Jeffery Holmes	**Conservation Planning I** *Moderator:* Cliff Rice
1:00 pm - 1:30 pm	Science of fisher translocation -- Jeffrey Lewis	Technical Working Group Adaptive Management Model -- Jeffery Holmes, Ernesto Garcia, and Priya Nanjappa Mitchell	Multi-scale planning for riparian buffers -- Steven Desimone
1:30 pm - 2:00 pm	Mountain goat habitat analysis -- David Wallin		Translating regional priorities to helpful guidelines -- Kelly Cassidy
2:00 pm - 2:30 pm	GPS bias correction in the Washington Cascades -- Adam Wells		Landscape planning for Washington wildlife -- Joanne Schuett-Hames
2:30 pm - 3:00 pm	**BREAK**		
3:00 pm - 3:30 pm	Wolf behavior and food availability -- David Stiles	Technical Working Group Adaptive Management Model -- Jeffrey Holmes, Ernesto Garcia, and Priya Nanjappa Mitchell (continued)	Spotted owl habitat on non-federal lands -- D. John Pierce
3:30 pm - 4:00 pm	Grizzly bear population estimates -- Kimberly Romain		Comparing American and Canadian species protection acts -- Brent Matsuda
4:00 pm - 4:30 pm	Impacts of supplemental black bear feeding -- Georg Ziegltrum		Consensus conservation plans -- Ruth Boyle

4:30 pm - 6:30 pm	**Pre-Banquet Poster Social**	**Gymnasium (TESC)**
6:30 pm - 10:00 pm	**Banquet**	**Gymnasium**

ROBIN DRUMMOND MOORE

Dr. Robin Moore has been involved in herpetological research and conservation since his first expedition to the rainforests of Africa to study chameleons ten years ago. Since then he has worked in Asia, Europe and Latin America on a variety of research and conservation projects. He received his PhD in 2002 from the Durrell Institute of Conservation and Ecology in the UK; his research focused on the impact of an introduced snake on the endemic midwife toad of Mallorca, Spain. In a rare conservation success story, the toad has recently been downlisted from Critically Endangered to Vulnerable as a result of a species recovery program combining captive breeding and reintroduction with research into the ecology and genetics of the species. Robin spent the next two years in Florida on a Postdoctoral fellowship where he worked on numerous research projects, including the ecology of an emerging infectious disease in gopher tortoises, and developed and taught a course in Tropical Ecology. In December of last year Robin was appointed "Amphibian Conservation Officer" at Conservation International. His work includes advancing the agenda of the Amphibian Conservation Action Plan through the development of an Amphibian Specialist Group Secretariat and global network to increase capacity for amphibian conservation worldwide.

THE GLOBAL DECLINE OF AMPHIBIANS: CURRENT TRENDS AND FUTURE PROSPECTS **Simon N Stuart, Janice C Chanson, Neil A Cox,** *IUCN/SSC - CI/CABS Biodiversity Assessment Initiative, Center for Applied Biodiversity Science, Conservation International, 1919 M Street NW, Suite 600, Washington, DC 20036***; Bruce E Young,** *Natureserve, apartado 75-5655, Monteverde, Puntarenas, Costa Rica***; Robin D Moore,** *Conservation International, 1919 M Street NW, Suite 600, Washington, DC 20036, USA; rdmoore@ci.conservation.org*

Over 520 herpetologists contributed to a study concluded in 2004, which showed that amphibians are much more threatened, and are declining much more seriously than either birds or mammals. Almost one-third of amphibian species are at elevated risk of extinction, and the number of species of the edge of extinction has almost doubled since 1980. Between 9 and 129 species have become extinct since 1980. There are three major causes of recent amphibian declines: a) extensive habitat loss, especially in tropical rainforests; b) over-harvesting by humans; and c) poorly-explained declines (probably mostly due to disease, perhaps exacerbated by climate change). The third of these types of decline has become the most serious in terms of driving species rapidly towards extinction. At present, these poorly explained declines have been confined mainly to the Americas and Australia, but there are recent signs that they are spreading, for example in Africa, Europe and New Zealand. New techniques are necessary to contain these declines; otherwise hundreds amphibian species could become extinct in the next few decades.

JEFFREY N. HOLMES

Jeffrey Holmes is the Co-Chair of both Southeastern Partners in Amphibian and Reptile Conservation (SE PARC) and the Upland Snake Conservation Initiative of the Gopher Tortoise Council. He is also a co-author of the SE PARC Habitat Management Guidelines. As Conservation Planner/Senior Field Biologist for Conservation Southeast, Inc., Holmes has extensive field experience throughout the Southeast. Prior to joining CSI, Jeff worked first as Zoologist, then as Director of Conservation Planning with The Nature Conservancy of Tennessee. During his five-year tenure with TNC, Jeff played a key role in the development and utilization of innovative conservation planning tools and protocols both within Tennessee and throughout the southeastern United States. Since joining Conservation Southeast in early 2003, Holmes has played a key role in designing and utilizing Species Viability and Ecological Integrity Evaluation tools and protocols for use with public and private conservation institutions region-wide. His clients include Ouachita National Forest, Ozark-St. Francis National Forest, National Forests of Mississippi, South Carolina Department of Natural Resources, Arkansas Game and Fish Commission, TNC, The Wolf River Conservancy, and the Ross Family Timberlands. Most recently, Holmes joined forces with Auburn University, Alabama Department of Conservation and Natural Resources, and The National Forests of Alabama to design and secure funding for a two-year study of herpetofauna response to longleaf restoration in Conecuh National Forest.

ERNESTO RICHARD GARCIA

Ernesto Garcia (U.S. Fish and Wildlife Service) is the Federal Agencies Coordinator for Partners in Amphibian and Reptile Conservation (PARC). In this capacity he coordinates and promotes herpetofaunal conservation activities among federal land and resource management agencies, facilitates the activities of PARC's Regional and Technical Working Groups, and works to build capacity and support for PARC. Prior to this he served as a 28-year veteran wildlife biologist for the U.S. Forest Service, where he initiated the agency's Herpetofaunal Conservation Initiative. This national initiative has promoted the development of several of PARC's regionally-based amphibian and reptile conservation tools including habitat management guidelines, inventory and monitoring handbooks, training modules and workshops. He completed his undergraduate degree in Wildlife Biology from Humboldt State University and his MS in Wildlife Biology from the University of Michigan. He developed and implemented a monitoring program for Eleutherodactylan frogs in Puerto Rico, and has authored or co-authored publications that vary from bighorn sheep, spotted owls, and grizzly bears in the Western U.S., to parrots and freshwater migratory shrimp and fish in the Caribbean.

PRIYA K NANJAPPA MITCHELL

Priya Nanjappa Mitchell is the State Agencies Coordinator for Partners in Amphibian and Reptile Conservation (PARC). In this capacity, she is responsible for coordinating and facilitating the herpetofaunal conservation activities of state wildlife agencies and other non-federal stakeholders, facilitating the activities of PARC Regional Working Groups (RWG) and Technical Working Groups (TWG), coordinating with the National PARC Steering Committees, and securing funding for RWG and TWG activities. Priya was previously employed with the U.S. Geological Survey's Amphibian Research and Monitoring Initiative (ARMI) in the Northeast region from 2001, where she assisted in the development and implementation of field protocols for monitoring seasonal pool amphibians and streamside salamanders. She received her MS in Biology in 2000 from Ball State University with Dr. Michael Lannoo, where she co-assembled county-based distribution data and GIS maps for all amphibian species known to occur in the US. Priya also co-authored several of the species accounts which, along with these maps, are featured in the recent Lannoo-edited book, Amphibian Declines: Conservation Status of United States Species.

PARTNERS IN AMPHIBIAN AND REPTILE CONSERVATION (PARC): TECHNICAL WORKING GROUP ADAPTIVE MANAGEMENT MODEL.
Jeffrey N Holmes, *Conservation Southeast, Inc., Nashville, TN 37206*; **Ernesto R Garcia,** *Office of the PARC Federal Agencies Coordinator, US Fish and Wildlife Service, Trinity River Restoration Program, Weaverville, CA 96093*; **Priya N Mitchell,** *Office of the PARC State Agencies Coordinator, Gurnee, IL 60031; priya@parcplace.org.*

Partners in Amphibian and Reptile Conservation (PARC) has developed a successful, multi-entity adaptive management model and organizational structure. PARC is deploying this model throughout its regional working groups. The model emphasizes communication and complementarity between technical working groups. This model is designed to optimize applied conservation biology and minimize resource expenditures that do not meaningfully impact wild populations and their habitats. In this model, partners affiliate themselves with one or more technical working groups based on their individual skills and interests. The model then provides a vehicle for the coordinated flow of knowledge, funding, and other resources between "Information Gathering" working groups (Research, Inventory/Monitoring) and "Implementation" working groups (Management, Education/Outreach, Policy/Trade) in order to maximize the net conservation impact of every penny and every drop of sweat.

Friday 31 March

7:30 am	Joint Annual Meeting registration opens	Seminar II lobby
8:00 am - 3:00 pm	Vendors open	Seminar II lobby
8:00 am - 3:00 pm	Poster display	Wkshop Rm. 1107, Pod A

All rooms shown are located in the Seminar II building.

8:00 am - 11:30 am Concurrent Paper Presentation Sessions

Time	Lect. Rm. 1105, Pod A	Lect. Rm. 1105, Pod B
8:00 am - 11:30 am	**Amphibian Diseases and Physiology** *Moderator:* Elke Wind	**Avian Ecology** *Moderator:* Aaron Holmes
8:00 am - 8:30 am	no talk scheduled	Pileated woodpecker foraging ecology -- Catherine Raley
8:30 am - 9:00 am	Assessing chytrid prevalence in British Columbia frogs -- Purnima Govindarajulu	Estimating "odds" of marbled murrelet nesting habitat -- Mark Huff
9:00 am - 9:30 am	A Silent Spring for Pacific Northwest amphibians? -- R. Steven Wagner	Marbled murrelet sea movements -- Thomas Bloxton
9:30 am - 10:00 am	**BREAK**	
10:00 am - 10:30 am	no talk scheduled	Barred owl movements in eastern Washington -- Peter Singleton
10:30 am - 11:00 am	Amphibian behavior and color response differences -- Tiffany Sacra Garcia	Bird diversity and abundance responses to fire restoration -- Jaime Stephens
11:00 am - 11:30 am	Genetic variation in high elevation Columbia spotted frogs -- Chris Funk	Managing wildlife on bridges -- Sharon Vecht
11:30 am - 1:00 pm	**LUNCH (No host)**	**The Market, Campus Activities Building**

Friday 31 March

Poster presenters should collect their posters between noon and 3:00 pm Friday. All posters unclaimed by the close of the meeting will be discarded.

1:00 pm - 3:00 pm Concurrent Paper Presentation Sessions

Time	Lect. Rm. 1105, Pod A	Lect. Rm. 1105, Pod B
1:00 pm - 4:30 pm	**Fish Ecology** *Moderator:* Ryan O'Donnell	**Conservation Planning II** *Moderator:* Carl Ward
1:00 pm - 1:30 pm	Spawning flow timing in desert streams -- Robert Vadas	Wildlife and Washington highways -- Craig Broadhead
1:30 pm - 2:00 pm	Chehalis River native non-game fish -- Julie Henning	Forest disturbance mapping in Washington -- Brian Cosentino
2:00 pm - 2:30 pm	Pacific lamprey ecology -- Molly Hallock	Implementing Partners in Flight bird conservation plans -- John Alexander
2:30 pm - 3:00 pm	Bright coloration of silver surfperch -- Michael Westphal	Highway maintenenace compliance for protected species -- Tracie O'Brien

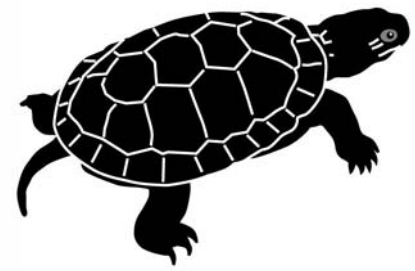
3:00 pm **2006 Joint Annual Meeting adjourns**

BULLFROG MANAGEMENT REVISITED. **Michael J Adams, Christopher A Pearl,** *USGS Forest and Rangeland Ecosystem Science Center, Corvallis, OR 97330***; mjadams@usgs.gov**

The American bullfrog (*Rana catesbeiana*) is invading temperate ecosystems around the world. It is widespread and continuing to spread in the western US. Direct removal can result in local eradication under some circumstances but is difficult to broadly implement. Other management options are limited but involve managing habitats and communities in a way that keeps bullfrogs in check or limits their impact on native species. These options require more research but recent findings suggest that there is hope. For example, some native species thought to be affected by bullfrogs have natural history and behavioral patterns that might be exploited to reduce bullfrog impacts. Moreover, an exploratory analysis suggests there are habitat features associated with the coexistence of native amphibians with bullfrogs. Finally, recent research has revealed community patterns that are related to bullfrog distribution and abundance. All of these findings point to the possibility of using indirect methods to cope with the bullfrog problem in cases where eradication and direct control are unlikely to be successful.

INFLUENCE OF ALTERED THERMAL REGIME ON BODY SIZE AND AGE OF MATURATION ON WESTERN POND TURTLES (*CLEMMYS MARMORATA*) IN TRINITY COUNTY, CALIFORNIA. **Don T Ashton, Hartwell H Welsh,** *Redwood Sciences Laboratory, U. S. Forest Service, Arcata, CA 99521***; James B Bettaso,** *U. S. Fish and Wildlife Service, Arcata, CA 95521***; dashton@fs.fed.us**

Body size and age at maturity are two important life history characteristics of vertebrate species. In pokilothermic species, such as turtles, size and age of maturity are often related to reproductive output by influencing the size and number of ova per clutch, frequency of clutches, and life-time reproductive output. Previous studies show that smaller turtles are more vulnerable to predation and produce smaller clutches so a decrease in body size has potential to reduce survivorship, reproductive output, and viability of offspring. We examined the influence of water temperature on body size and age to maturity on western pond turtles (*Clemmys marmorata*) by analyzing data collected from two separate populations from 1991-1996 and in 2004-2005. We compared dammed and non-dammed forks of the Trinity River, Trinity County, California. The dammed Mainstem Trinity River (MSTR) has a water temperature >10ºC colder than the non-dammed South Fork Trinity River (SFTR). Body size (carapace length and weight) per given age was significantly greater on the non-dammed SFTR compared to MSTR for both sexes. Gravid females were also significantly larger on the non-dammed SFTR and appear to mature at a later age, while they were significantly smaller and appear to mature at an earlier age on the dammed MSTR. The unnaturally depressed thermal regime of the dammed MSTR may influence the expression of phenotypic traits regulating body size and age at maturity.



BASKING PATTERNS AND THERMAL REGULATORY BEHAVIORS OF WESTERN POND TURTLES (*CLEMMYS MARMORATA*): COMPARING RESPONSES TO THERMAL REGIMES IN DAMMED AND UNDAMMED TRIBUTARIES OF THE TRINITY RIVER. **James B Bettaso,** *U. S. Fish and Wildlife Service, Arcata, CA 95521***; Don T Ashton, Hartwell H Welsh,** *Redwood Sciences Laboratory, U. S. Forest Service, Arcata, CA 99521***; Robert M Sullivan,** *Trinity River Restoration Program, Bureau of Reclamations***; Jamie_bettaso@fws.gov.**

Basking activities of western pond turtles (*Clemmys marmorata*) were studied on two forks of the Trinity River in northern California, the dammed Mainstem Trinity River (MSTR) and the undammed South Fork Trinity River (SFTR). The thermal regimes of these two forks are extremely different due to the hypolimnetic release from the Lewiston Dam on the Mainstem Trinity River. Turtles on the MSTR were exposed to summer water temperatures that are 10°C lower than the control population on the SFTR. In 2005 we placed radio-transmitters (Holohil PD-2) and micro-temperature loggers on 10 turtles on the MSTR and 15 turtles on the SFTR. We tested the null hypothesis of no difference in time devoted to thermal regulatory behavior between the two populations. Our results indicated that there were significant differences in thermal regulatory behavior, with the MSTR population spending more time in aquatic thermal refugia and emergent basking than the SFTR population (T-value = 3.2493, P = 0.002). Individual turtles from the undammed SFTR tended to emergent bask for shorter periods of time per day and utilized main channel aquatic basking behaviors more compared to turtles from the MSTR. The artificially colder thermal regime created by the hypolimnetic releases from the Lewiston Dam appears to be influencing the turtles' thermoregulatory behavior on the MSTR and forcing these animals to compensate by seeking alternative aquatic thermal refugia.

ASSESSING BIAS IN THE ESTIMATION OF ABUNDANCE USING DISTANCE SAMPLING. **Paul Stephen Corn,** *US Geological Survey, Aldo Leopold Wilderness Research Institute, 790 E Beckwith Ave, Missoula, MT 59801*; **scorn@usgs.gov.**

Distance sampling is widely used to estimate abundance of diverse animals. Among the reasons for its popularity is that few assumptions are necessary to minimize bias. The main assumption of distance sampling is g(0)=1, or that the objects of interest are detected with certainty when they occur on or very near the transect line (or center of a circular plot). Failure to meet this assumption results in underestimation of true abundance, which also occurs if some members of the population are not available to be sampled. Desert tortoises (*Gopherus agassizii*) are well suited for testing this assumption, because they easily satisfy the other requirements for successful sampling (e.g., there is no flight response to hamper accurate measurements). Data on live tortoises from line transects conducted throughout the Mojave Desert and from foam tortoise models at a training facility confirm that g(0)<1. Use of dual observers allows estimation of the detectability of tortoises near the line, from which a correction factor can be calculated. However, the data from the tortoise models, which have a known distribution, reveal that this correction is insufficient to account for the negative bias in the estimates of abundance. Some tortoise models are effectively invisible to sampling, and efforts to estimate the proportion of the population available for sampling would be ineffective in accounting for these individuals. The result is a persistent negative bias of 5-10%. This talk is dedicated to R. Bruce Bury, to honor his accomplishments in the study and conservation of tortoises.

UNRAVELING THE "KLAMATH KNOT": REVIEW AND PROSPECTUS OF CAUDATE RESEARCH IN THE KLAMATH-SISKIYOU REGION. **Douglas J DeGross,** *USGS Forest & Rangeland Ecosystem Science Center, Corvallis, OR 97331*; **Stevan J Arnold,** *Oregon State University, Corvallis, OR 97331;* **ddegross@usgs.gov**

The Klamath-Siskiyou region is one of the most complex temperate-forest regions in the world. Garnering the highest temperate zone diversity of conifer species, and home to over 130 endemic plants, this region's diverse biota has gained international attention for the region as one of the world's biodiversity "hotspots". The transition zones of the Cascade, Sierra, and Oregon Coastal Mountains with the Great Central Valley and Coastal Province of California intersect into a 'knot' of biodiversity and ecosystems known as the Klamath-Siskiyou. This mosaic of habitats, in addition to the extreme environmental gradients produced by the rugged topography, has cultivated the delineation of a diverse array of species. As our focus, salamander diversity is high in this region due in no small part to an overlap of southern and northern biogeographical elements. Recent molecular studies have increased the number of regional salamander species from 13 in 1999, to 15 currently, and could be on the verge of adding 2 more. Advancements in molecular techniques and analyses in combination with a decade of widespread surveys have helped reassign species ranges and boundaries, find new species, and hypothetically aid in development of sound conservation strategies. However, there is undeniably more 'unraveling' to be done. We review past studies, including those of R. B. Bury, which have been pivotal in development of our current understanding of regional species assemblages, as well as provide insights to future research needs to help better understand salamander biogeography in the "Knot".

SIERRA NEVADA AMPHIBIAN DECLINES: THE ROLE OF FUNGUS AND PESTICIDES. **Gary M Fellers,** *Western Ecological Research Center, USGS, Point Reyes National Seashore, Point Reyes, CA 94956;* **gary_fellers@usgs.gov.**

Most, if not all, pond-breeding amphibians in the Sierra Nevada mountains of California are declining. A fungal disease (chytridiomycosis), first described in 1999 and possibly introduced from Africa, has been closely associated with amphibian die-offs in the Sierra Nevada and elsewhere, but it is not clear whether the fungus is a primary cause of declines or whether it gets a foothold when amphibian populations are under stress. Chytrid fungus in Yosemite was reported in Rana muscosa in 2001. In 2005, I began a detailed study of two watersheds in Yosemite and one at Point Reyes National Seashore to determine the distribution of chytrid fungus in native amphibian tadpoles. Data from contaminants studies suggest that pesticides are playing a significant role in amphibian declines in the Sierra Nevada. Prevailing winds move pesticides from the Central Valley into the Sierra Nevada. Pond-breeding amphibians in watersheds that face the highly agriculturalized Central Valley of California have experienced the most dramatic declines. A series of studies comparing contaminants levels in frog and tadpole tissue, sediment, air, snow, and water in coastal and mountain parts of California strongly support the view that contaminants are playing a role in amphibian declines. The LC50 for several species of native amphibians is similar to environmental concentrations of at least one commonly used pesticide.

THE ACADEMIC AND HISTORICAL PEDIGREE OF R. BRUCE BURY. **Mark R. Jennings,** *RanaResources, Davis, CA 59616;* **Marc P. Hayes,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **RanaResources@aol.com**

R. Bruce Bury, the first fulltime herpetologist to be hired by the USFWS in 1972, had his academic development at Humboldt State University (BS), Sacramento State University (MA) and the University of California at Berkeley (PhD). His academic pedigree extends back from his dissertation advisor, Robert Cyril Stebbins (the dean of modern herpetology in western North American) to Raymond Bridgman Cowles (the largely self-taught desert naturalist and writer of the Zulu Papers) to Albert Hazen Wright (the consummate herpetologist-historian) to Burt Green Wilder (the premier comparative anatomy and physiologist) to Louis Agassiz (the first true American natural historian) and Alexander Von Humboldt (the German explorer-scientist and philosopher remembered for his interdisciplinary facilitation and financing of natural sciences). In his development at the University of California at Berkeley, Bruce drew and gave from his own cohort (Lloyd Cahill, Blair Csuti, Victor de Vlaming, Jim Lynch, Ted Papenfuss, Ray Stendell, and Jim Stuart); the postdocs and cohort that preceding him (Steve Arnold, Kristen Berry, George Gorman); and the undergraduates and cohort that followed him (Gary Fellers, Roger Luckenbach, Ron Marlow, Dave Morafka, Steve Ruth, and Steve West). Over a career that extends from the USFWS with a stint with the Smithsonian, the Biological Survey and USGS, R. Bruce Bury both influenced and drew from students and colleagues in the many hundreds in a manner that has left an indelibly legacy addressing the ecology and herpetology of Pacific Northwest and other parts of the North American continent.

APPLICATIONS OF TRADITIONAL ABORIGINAL KNOWLEDGE IN COMMUNITY-BASED ECOLOGICAL RESEARCH. **Eduardo M Jovel,** *BC ACADRE, Institute for Aboriginal Health, College of Health Disciplines, University of British Columbia, Vancouver, BC, V6T 1Z3, Canada;* **ejovel@interchange.ubc.ca**

Implementation of community-based research in partnership with Indigenous people has demonstrated the need for culturally sensitive frameworks and research environments. The incorporation of research capacity building, development of Indigenous research methodologies, and Indigenous research ethics protocols has been identified by the Indigenous community as fundamental to successful partnerships. Recognition of Indigenous researchers as equal partners, acknowledgement of the diversity of traditional knowledge, and its integration with contemporary research approaches are vital to the success of community-based research. An overview of the community-based research process in Aboriginal communities, from building relationships to research implementation, will be presented.

BRUCE BURY: FIELD BIOLOGIST EXTRAORDINAIRE. **Roger Luckenbach,** *Fresno City College, Fresno, California 93741;* **roger.luckenbach@fresnocitycollege.edu**

For almost a decade, when Bruce Bury was chief herpetologist for the then Bird and Mammals Laboratory of the US Fish and Wildlife Service, I had the unequalled privilege of serving as a co-investigator during his numerous research projects. During that time, he was easily among the hardest working of field biologists. The short field season was packed with intensive bouts of ecological investigations across the Western Hemisphere. A typical summer might start in the Four Corners region with vertebrate surveys, move to the Mojave Desert to examine desert tortoises (*Xerobates agasszii*), exploring sand dunes, then coastal beaches to census legless lizards (*Anniella*), then north to check on western pond turtles (*Clemmys marmorata*), then on to Washington State to conduct behavioral studies on western painted turtles (*Chrysemys picta belli*) and ranid frogs (*Rana*). It was not uncommon for the field season to start in a blizzard or mountain thunderstorm, a tornado on the high plains or a blazing desert in Mexico and then move to military bases in southwest deserts, wildlife refuges, projected coal strip-mining areas, Alabama lowland rivers, Florida cypress swamps, roadless islands in the Gulf of Mexico, sea turtle beaches in tropical Mexico, stretches of the Mojave overrun by dirt bikes, and top-secret military installations. This often entailed weeks of dry camping in deserts, grasslands, or mountains alternating with low-budget motels to preserve specimens, visit museums, crash on colleagues' floors, meet with NGO and government officials, and attend professional meetings. Papers and reports were often written in the field or en route between sites on a small portable typewriter propped on the dash. Through all this work and despite a seemingly gruff exterior, Bruce Bury revealed a heart of gold, and was a concerned citizen, passionate scientist and conservationist, and an abiding friend. And for all to remember: the coyote shits where the views are best and others cannot help but notice the excellent odor of his bowels.

HEADWATER STREAMS. Deanna H Olson, *USDA Forest Service, Pacific Northwest Research Station, Corvallis, OR 97331;* **dedeolson@fs.fed.us**

As ecosystem management approaches have been implemented in Pacific Northwest forests, headwater streams have become a central management issue. Research conducted by R. Bruce Bury has been pivotal in this development because he has provided the foundation of our knowledge base regarding the faunal ecology of headwater streams and management effects on endemic species. First, his characterization of headwater amphibians has advanced our understanding of several taxa unique to the region, particularly tailed frogs, torrent salamanders and giant salamanders. We now know at least 23 amphibian species occur in headwaters, 44% of the native amphibian fauna for the region, with 16 of these species having more specific headwater associations. Second, his work to establish and refine small stream sampling methods has been key to the development of regional inventory and monitoring designs. Third, he conducted landmark studies supporting the negative effects of clearcut timber harvest practices on headwater amphibians. Current investigations are pursuing alternative silvicultural practices as well as the efficacy of a variety of protections for headwater streams and their endemic fauna. Through R. Bruce Bury's tenure, headwater streams have gone from a relatively unrecognized portion of the forest landscape to a potential biodiversity hotspot warranting management consideration.

THE ROLE OF INTRODUCED TROUT AS AMPHIBIAN PREDATOR AND DISEASE VECTOR IN THE NORTHWEST. David S Pilliod, *California Polytechnic State University, San Luis Obispo, CA 93407, dpilliod@calpoly.edu;* **Blake Hossack,** *Aldo Leopold Wilderness Research Institute, USGS Northern Rocky Mountain Science Center, Missoula, MT 59807;* **Christopher A Pearl,** *USGS Forest and Rangeland Ecosystem Science Center, Corvallis, OR 97331.*

Introduced trout are implicated in amphibian declines both as a non-native predator capable of eliminating amphibians from water bodies and as a vector for diseases capable of causing mass mortality events. We examined each of these hypotheses using data on amphibian reproduction collected mostly in mountain lakes across the greater Northwest. For the predation study, we modeled the probability of breeding in 2260 water bodies and in 3 nested levels of catchments in relation to fish presence in the Rocky Mountains. After accounting for habitat features, *Ambystoma macrodactylum* was 5.3 times and *Rana luteiventris* was 1.3 times more likely to breed in fishless than fish-occupied water bodies. At about the 8th and 7th level HUCs, the probability of *A. macrodactylum* breeding in a catchment decreased as the proportion of water bodies with fish increased. These results imply that for some amphibians, a fish effect extends beyond the lakes actually stocked. For the disease study, we used a molecular approach to determine the occurrence of various water molds (oomycetes) and aquatic fungi on 210 egg samples representing 9 amphibian species. By comparing occurrence of the suspected pathogen *Saprolegnia ferax* and other oomycetes in 21 lakes with and 26 lakes without fish, our data did not support the conclusion that fish stocking is spreading oomycetes into mountain lakes. However, our phylogenetic analysis also revealed higher diversity of oomycetes than expected and our knowledge of the pathogenicity of these microorganisms remains limited.

WINTER HABITAT USE BY JUVENILE FOOTHILL YELLOW-LEGGED FROGS (*RANA BOYLII*): THE IMPORTANCE OF SEEPS. Chris Rombough, *Oregon State University Affiliate, Aurora, OR 97002;* **rambo2718@yahoo.com**

Field data on overwintering juvenile ranid frogs is generally difficult to obtain. From 1999 to 2006, I gathered data on habitat use of overwintering juvenile foothill yellow-legged frogs (*Rana boylii*) from a site on Oregon's South Santiam River. Surveys of the inhabited area for juvenile frogs (< 40 mm SVL) were conducted from November through March. During this interval, most frogs were found concealed under woody debris deposited along the high-water line. Among available habitat types, juvenile frogs were most often encountered in seeps located along the channel margin. Seeps possessing a combination of bedrock substrate, continuous laminar flow, and abundant woody debris harbored the most frogs. Examination of available habitats suggested that the presence of moisture, available prey, and maintenance of a thermally stable environment were key factors influencing use of seeps by frogs. Field data, including recaptures of marked frogs, revealed that juvenile *R. boylii* in seeps remain active and continue to grow through the winter months. Seeps thus appear to provide important overwintering habitat for juvenile frogs in this population.

HERPETOLOGISTS AND HERPETOLOGY IN THE U.S. FISH AND WILDLIFE SERVICE. **Norman J Scott Jr,** *USGS (retired), P.O. Box 307, Creston, CA 93432;* **Jeffrey E Lovich,** *USGS-Biological Resources Division, Southwest Biological Science Center, Flagstaff, AZ 86001;* **jeffrey_lovich@usgs.gov**

Between 1972 and 1983, the U.S. Fish and Wildlife Service (FWS) amassed one of the most important and productive teams of research herpetologists ever assembled. Initially, herpetological research was conducted peripheral to other, more directed research on birds and mammals. Herpetology in the Federal government has its roots in the collections of the 19th and early 20th century Bureau of Biological Survey, with Henry Fitch publishing the earliest herpetological contributions. In 1972, Bruce Bury was hired to be the first herpetologist in the FWS. In the ensuing two decades, many other herpetologists were added, until 1993, when all research functions were removed from the Service and ultimately incorporated into the U.S. Geological Survey as the Biological Resources Division. The first goal of the members of this team was the production of scientific papers. Bruce published more than 80 papers in those 20 years; the other stars, in terms of the number of papers published, were Ken Dodd, Tom Fritts, and Roy McDiarmid. Bruce continues to be an inspiring and productive leader in herpetology in the Pacific Northwest.

AQUATIC AND TERRESTRIAL MOVEMENTS OF COASTAL TAILED FROGS (*ASCAPHUS TRUEI*) IN RELATION TO TIMBER HARVEST IN BRITISH COLUMBIA. **Tanya R Wahbe,** *Institute for Aboriginal Health, University of British Columbia, Vancouver, BC V6T 1Z3 Canada;* **Fred L Bunnell,** *Centre for Applied Conservation Research, University of British Columbia, Vancouver, BC V6T 1Z4 Canada;* **R Bruce Bury,** *USGS Forest and Rangeland Ecosystem Science Center, Corvallis, OR 97331 USA;* **wahbe@interchange.ubc.ca.**

In British Columbia, Oregon, and California, coastal tailed frogs (*Ascaphus truei*) are at risk. Local extirpation is a concern because recolonization may be slow. In coastal BC streams, we investigated movements of larvae and associations with stream parameters using area-constrained stream surveys. In old-growth, larvae moved seven times farther than in clearcuts. Embedded logs, abundant in clearcut streams, may explain shorter larval movements. Using pitfall traps, we examined terrestrial movements in clearcuts and old growth. More juveniles were trapped in clearcuts but more mature adults were trapped in old growth, suggesting fewer effective migrants in clearcuts. Many frogs moved > 100 m from streams, and exhibited weaker stream affinity compared to inland *Ascaphus* that moved > 12 m. In fall, we trapped frogs farther from streams in old-growth than in clearcuts, and more frogs were trapped < 25 m of streams in clearcuts. Long distance overland movements appear more likely where forests remain. Using randomly amplified polymorphic DNAs (RAPDs), we examined population genetic structure of *Ascaphus* in an old-growth and clearcut stream. In the clearcut, larvae were less diverse than in the old-growth and exhibited no relationship between physical distance and genetic relatedness. Lower heterozygosity in the clearcut suggests that *Ascaphus* may be less able to adapt to environmental fluctuations and more susceptible to disease than larvae in old-growth. Our results suggest reduced recolonization potential and lower genetic variation where forest cover is absent. Connectivity between multiple streams will be a more meaningful unit of management than individual streams with forested buffers.

SPATIAL ECOLOGY OF A POPULATION OF THE AQUATIC GARTER SNAKE, *THAMNOPHIS ATRATUS*, ASSOCIATED WITH A MONTANE, COLD-STREAM ENVIRONMENT IN NORTHWESTERN CALIFORNIA, USA. **Hartwell H Welsh Jr,** *U.S. Forest Service, Redwood Sciences Laboratory, Arcata, CA 95521;* **Amy J Lind,** *U.S. Forest Service, Sierra Nevada Research Center, Davis, CA 95616;* **Clara A Wheeler,** *U.S. Forest Service, Redwood Sciences Laboratory, Arcata, CA 95521;* **hwelsh@fs.fed.us.**

We studied the movements, spacing patterns, and stream habitat use of the aquatic garter snake, *Thamnophis atratus*, at Hurdygurdy Creek in the Smith River National Recreation Area, from 1986 to 2001, using mark-recapture techniques. We captured and marked 1730 snakes and recorded 519 recaptures. Here we examine movements and hierarchical spatial patterns of this population of snakes by gender and age class at the: (1) macro-scale, the distribution of captures along the 4.7 km study reach, (2) meso-scale, reflected in the relative use of stream meso-habitats (i.e. riffles, runs, pools), and (3) micro-scale, evidenced by the use of differentiated sub-components of particular meso-habitat units, for example, the shallow stream margins or small back water pools adjacent to a riffle. This population of snakes exhibited differences in movement patterns, and in the use of stream meso- and micro-habitats, relative to both gender and age class. Our results are interpreted relative to age class differences in the foraging strategies employed by these snakes to capture a wide range of aquatic and riparian prey species. We suggest several non-exclusive hypotheses to explain these differences based on sexual selection, optimum foraging, and prey selection related to ontogenetic shifts associated with snake growth and development.

THE EFFECTS OF HABITAT FRAGMENTATION ON AMPHIBIANS IN OLYMPIC NATIONAL PARK. **Chris Akios,** *College of Environmental Science and Forestry, Syracuse, NY 13210;* **cakios@syr.edu**

In this study, the effects of habitat fragmentation on richness and relative abundance of amphibian species within old-growth and successional stands of Olympic National Forest, Washington, were contrasted. Wilcoxon matched - pairs signed - ranks tests and paired t-tests were utilized to compare amphibians captured during stream, stream bank, and terrestrial searches as well as pitfall traps and cover board arrays. Four species including Cope's giant salamander (*Dicamptodon copei*), Olympic torrent salamander (*Rhyacotriton olympicus*), western red-backed salamander (*Plethodon vehiculum*) and tailed frogs (*Ascaphus truei*) were cosmopolitan, whereas Van Dyke's salamanders (*Plethodon vandykei*) and Cascades frogs (*Rana cascadae*) were exclusive to old-growth sites. Olympic torrent salamanders were more prevalent in old-growth sites (P-values of 0.10 and 0.08 for Wilcoxon's and paired t-tests, respectively) while Cope's giant salamanders were more common in successional treatments (P-values of 0.03 for Wilcoxon's tests and 0.01 for t-tests). Tailed frogs were detected more in old-growth sites (P-values of 0.10 and 0.08 for parametric and non-parametric tests, respectively). Amphibians exhibit differential responses in presence and abundance within the various forest ages of Olympic National Forest, and after twenty years of succession following clearcutting, many species have not rebounded from timber harvesting. Old-growth stands are important for many of the amphibians detected in Olympic National Forest and strong consideration should be afforded to their populations when managing forests in the Pacific Northwest.

A STRATEGY FOR IMPLEMENTING PARTNERS IN FLIGHT BIRD CONSERVATION PLANS WITHIN CURRENT LAND MANAGEMENT POLICIES. **John D Alexander,** *Klamath Bird Observatory, Ashland, OR, 97520;* **Bob Altman,** *American Bird Conservancy, Corvallis, OR, 97330;* **Barbara Bresson,** *US Forest Service and Bureau of Land Management, Sandy OR, 97055;* **C John Ralph,** *US Forest Service, Arcata, CA 95520;* **John R Robinson,** *On My Mountain, Inc., Fairfield, CA 94534;* **Jaime L Stephens,** *Klamath Bird Observatory, Ashland, OR 97520;* **Geoffrey R Geupel,** *PRBO Conservation Science, Stinson Beach, CA 94970;* **Michael T Green,** *US Fish and Wildlife Service, Portland, OR 97232;* **Aaron L Holmes,** *PRBO Conservation Science, Corvallis, OR, 97330;* **Kim Kreitinger, Melissa J Pitkin,** *PRBO Conservation Science, Stinson Beach, CA 94970;* **jda@KlamathBird.org**

The Oregon/Washington and California Partners In Flight (PIF) chapters held a workshop in 2005 to establish a strategy for implementing regional bird conservation plans within current land management policies. Forest and district administrators, biologists, managers, and researchers participated focusing on the integration of PIF products (e.g. broad-based conservation plans, issue-specific decision support tools, and monitoring and research techniques) with agency policies and land management plans. The workshop resulted in a conservation planning strategy that includes three goals to advance the integration of conservation objectives and land management planning: 1) Develop products that present the link between specific management issues, science-based results, and conservation objectives; 2) Produce a white paper including examples of 'success stories' outlining how science-based PIF products were used to assist and evaluate land management decisions; and 3) Identify opportunities for linking PIF objectives with priority land management issues and projects within revisions of Bureau of Land Management and Forest Service management plans and integration of PIF monitoring techniques within agency effectiveness monitoring programs. As a result of the workshop, the NGOs present agreed to develop a west-wide coordinated monitoring and evaluation strategy to assist state and federal agencies in developing conservation and management plans using current biological information on focal bird species. The western states are in a unique position to build tools that will apply to common management issues across state borders thanks to the numerous NGOs with local expertise and strong partnerships with neighboring agencies, and the plethora of bird data already in existence.

THE EFFECTS OF INTERNAL EDGES AND NON-NATIVE SHRUBS ON STREAKED HORNED LARK NEST PREDATION. **Hannah E Anderson,** *The Evergreen State College, Olympia, WA 98505;* Scott Pearson, *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **hannie1119@yahoo.com**

The streaked horned lark (*Eremophila alpestris strigata*), a rare subspecies of the horned lark, is of high conservation concern in both Oregon and Washington. The occurrence of deleterious edge effects on birds that nest within 50 m of an external edge in both forest and grassland habitats has been well documented. Streaked horned larks do not nest within this 50 m range, but do nest near and among light-use roads and runways, which fragment the three inland Puget prairie breeding sites examined in Washington State. Few studies have addressed internal fragmentation of this nature. Predation was the primary cause of nest failure observed during the 2002-2004 breeding seasons. I examined both the effects of edge and the invasion of non-native Scotch broom (*Cytisus scoparius*) on streaked horned lark nest predation. I quantified the distance from nest site to nearest internal edge and recorded the corresponding edge type (pavement, gravel or dirt) for all nests discovered during the 2002-2004 (n = 166) breeding seasons. In 2004, I also measured the distance from nest site to the nearest Scotch broom plant and the estimated percent cover of Scotch broom within a 25-m radius around the nest site (n = 45). I used logistic regression to test for correlations between nest outcome and the above listed factors. Predation of streaked horned lark nests was not correlated with distance to internal edge, distance to Scotch broom, or percent cover of Scotch broom.

RESTORATION OF REMNANT PRAIRIE ON SITES CURRENTLY MANAGED FOR TIMBER PRODUCTION. **Eric Beach,** *Green Diamond Resource Co., 215N 3rd St, Shelton, WA 98371;* **ebeach@greendiamond.com**

The pre-settlement environment of Shelton, WA differed greatly from current conditions. The majority of the outlying area was a continuous coniferous forest. However, on dry relatively nutrient-rich sites with sunny aspects and shallow soils over recessional outwash plains, occasional patches of prairie existed. With settlement and the onset of intensive forest management, the prairie habitats decreased in size and occurrence. Currently only 5 known "fair to good" condition occurrences of oak prairie/savannah habitats remain in Washington. Those that remain are threatened by non-native species, conifer encroachment, and development. One such oak prairie habitat was found on part of the Green Diamond Resource Co Olympic tree farm. The McKewan prairie site has been replanted with conifer following timber harvest in the early 1990's. Growing conditions are such that establishment rates are poor and growth is slow. The McKewan prairie site is one of the two documented locations with a viable population of the Shelton pocket gopher subspecies of the Mazama (Western) Pocket Gopher (*Thomomys mazama*). Restoration includes removal of invasive species and plantation Douglas fir. Native vegetation; overstory (Oregon oak) and understory (native grasses and forbs) are retained and may be augmented with plantings of native species. The site will be monitored for vegetation and wildlife response. Maintenance of the prairie habitat may require ongoing active control (prescribed fire, cutting, herbicides). If the effort is a success, up to 50 ac. in the historic McKewan prairie area may be restored if an opportunity to lease the lands as mitigation sites exists.

AT-SEA MOVEMENTS OF RADIO-TAGGED MARBLED MURRELETS IN WASHINGTON. **Thomas D Bloxton, Jr., Martin G Raphael,** *USDA Forest Service, Pacific Northwest Research Station, 3625 93rd Ave SW, Olympia, WA 98512;* **tbloxton@fs.fed.us, mraphael@fs.fed.us**

We radio-tagged 67 adult Marbled Murrelets (*Brachyramphus marmoratus*) in marine waters of Washington state adjacent to the Olympic Peninsula during the 2004 and 2005 breeding seasons. We attempted to relocate each bird by using fixed wing aircraft on a daily basis from the time a bird was tagged (generally in May) until mid-July, then on a weekly basis until mid-September. On average, birds were located >90% of the time until they left the area or their transmitters died. We made a total of 2,112 at-sea relocation estimates and considered birds adequately sampled for home range analyses (95% fixed kernel and 100% Minimum Convex Polygon methods) after 20 relocations. At-sea home range size during this time period ranged from 26 to 8,254 km^2 (median size approx. 700 km^2), with ranges in 2005 being five times larger than in 2004. Tracking murrelets beyond the study area as they moved around more proved difficult, but we did manage to locate six birds to the north along Vancouver Island or near Desolation Sound, British Columbia. We did not locate any of the birds to the south of the study area even after four flights to central Oregon. We also observed frequent movements of some birds between the outer coast of Washington, the Strait of Juan de Fuca, and the San Juan Islands suggesting that all of Washington may be considered a single zone for conservation planning purposes. Successful management of murrelets in this region will require close cooperation between U.S. and Canadian entities throughout the Puget Sound/Georgia Basin region.

CONSENSUS CONSERVATION PLANS AS A TOOL FOR WILDLIFE RECOVERY. **Ruth E Boyle,** *M.S. Environmental Systems / International Development Technology, Humboldt State University, Arcata, CA 95521;* **ruthellenboyle@yahoo.com.**

Opposition from stakeholders who are averse to changing management practices on private land presents a formidable obstacle to successful mitigation of environmental factors negatively impacting wildlife populations. This conflict takes the form of protracted and expensive legal challenges, political interference with agency funding, interference with proactive legislation, and circulation of misinformation through propaganda. These challenges and their outcomes drain resources of all parties involved. These assets could be more productively applied toward ecosystem restoration activities (on the part of agencies and environmentalist organizations) or development of newer, more profitable land management practices and markets (on the part of private landowners.) My proposed pilot project examines the potential for reducing the above impacts by increasing public participation in the creation of consensus wildlife conservation plans. Web-based software allowing multiple users to collaborate on a single consensus document will be employed. An accompanying multimedia database provides photographs, data sets and audiovisual references to illustrate key terminology, scientific methods and significant concepts. The same database provides lesson plans for local educators based upon the peer reviews resulting from the consensus process. Relative success or failure of this project will be determined by comparison of a number of pre-project and post-project factors. These factors include wildlife recovery, profitability of private land use, level of stakeholder environmental literacy, the percentage of operating costs directed toward legal affairs, conflict resolution, and public affairs, self reported stress reduction, job satisfaction, and overall contentment with life.

WILDLIFE AND WASHINGTON HIGHWAYS - IDENTIFYING ISSUES AND SOLUTIONS. **Craig D Broadhead,** *Washington State Department of Transportation, Olympia, WA 98504-7331;* **broadhc@wsdot.wa.gov**

Washington's highways provide for the movement of people and goods across the state. Highways not only connect urban areas, but often times may cross high quality wildlife habitats, resulting in wildlife/vehicle collisions (WVC). In addition to causing injury and mortality to wildlife, WVCs associated with larger animals such as deer and elk are a significant safety threat to the traveling public. WSDOT has remained proactive and developed a number of methods to help address this issue. One method involves the identification of high WVC locations through the development and management of a statewide database of deer and elk removal locations. This "Deerkill Database" is updated twice per year, and currently contains over 58,000 records. WSDOT is currently working with the Washington Department of Fish and Wildlife (WDFW) on a research project to identify spatial relationships between deer/elk habitat use and highways. For other species, WSDOT has developed guidance for highway designers on the placement of concrete barriers to minimize the effect to wildlife populations. WSDOT is also in the process of developing guidance for highway designers on the use and placement of wildlife crossing structures. WSDOT is partnering with WDFW and local Sportsman's and Transportation groups on a project to install a fence in North Central Washington to protect a diminishing herd of bighorn sheep as well as mule deer.

FROM GLOBAL THOUGHT TO LOCAL ACTION: TRANSLATING REGIONAL CONSERVATION PRIORITIES TO HELPFUL LOCAL GUIDELINES. **Kelly M Cassidy,** *Conner Vertebrate Museum, Washington State University, Pullman, WA 99164;* **Christian E Grue,** *Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle, WA 98195;* **lostriver@completebbs.com**

The challenges of implementing conservation strategies on lands dominated by private ownership are more formidable than on state and federal lands. Despite the difficulties, there is an urgent need to address the issues of conservation on private land because many species have little of their ranges on state and federal lands; the fate of these species will be heavily influenced by local (county, city, and private) land management. Conservation at the local level might improve if conservation priorities were presented in a form more user-friendly to local land management. We report here on our effort to translate the results of one regional conservation prioritization study, the Washington State Gap Analysis Project, into a form more useful for local land managers in western Washington than the original report. We used a three-part approach: 1) We identified "Local Priority" terrestrial vertebrate species for each county, based on a combination of each species' sensitivity to human activities and the proportion of its range on private lands. 2) We used the Local Priority species habitat requirements to derive "Local Priority" habitats, i.e., threatened habitats on which the Local Priority species were most dependent. 3) Based on our assessment of each county's most distinctive and valuable ecological assets within a regional context, plus its human population characteristics, we identified Suggested Conservation Emphases for each county.

IS RECREATION IMPACTING WESTERN TOAD POPULATIONS ON THE MT. HOOD NATIONAL FOREST? **Charlotte Corkran,** *Northwest Ecological Research Institute, 130 NW 114th Avenue, Portland, OR 97229;* **Tierra Curry,** *Portland State University Biology Department, Portland, OR 97207;* **Chuti Fiedler,** *Columbia River Gorge National Scenic Area, 902 Wasco Avenue, Suite 200, Hood River, OR 97031;* **dccorkran@runningblue.com.**

Periodic episodes of predation on western toad (*Bufo boreas*) adults gathered at breeding sites have been reported by Dede Olson, Steve Corn, and others. During partial monitoring since 1987 at four toad breeding sites on the Mt. Hood National Forest in Oregon, observations of predation have been rare. But in 2005, at least 67 dead adult toads were found at Frog Lake and 7 at another site, an estimated 49% and 28% of these annual breeding aggregations. Common raven (*Corvus corax*) and raccoon (*Procyon lotor*) appeared to be the predators responsible, and low water levels made the toads more accessible. Partial predation of larvae and metamorphs has also been found at Frog Lake. In 1997, one or both back legs were missing on 70 of 173 late metamorphs examined (40%). The predator appeared to be speckled dace (*Rhinichthys osculus*). In subsequent years, 3% or fewer of the toad metamorphs showed damage. Frog Lake is a popular fishing lake with a campground. Both ravens and raccoon tracks are frequently observed, and garbage, fishing bait, fish guts, and wildlife killed on nearby roads are readily available. Studies of ravens and of raccoons have shown significant increases in density and reproductive success near campgrounds. Speckled dace probably were introduced from live fishing bait. While numbers of western toads breeding at the four sites appear to be stable, increasing recreational use on the Mt. Hood National Forest may be putting additional pressure on this population.

FOREST DISTURBANCE MAPPING IN WASHINGTON STATE. **Brian L Cosentino, D John Pierce, Joseph B Buchanan,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **Shelly Snyder, Sean P Healey,** *USFS Forestry Sciences Lab, Ogden, UT 84401;* **Warren B Cohen,** *USDA Forest Service, Pacific Northwest Research Station, Corvallis, OR 97331;* **cosenblc@dfw.wa.gov.**

A recently completed digital map is providing valuable insight to Washington's forest harvest and fire history. The map, produced by the USFS Pacific Northwest Forestry Sciences Lab, depicts forest stand-replacement events originating from harvest and fire disturbances from 1972 to 2004. The 8,690,394-hectare map encompasses the area from the east slope of the Cascade Mountains to the Pacific Ocean. Over the 32-year analysis period, stand-replacement events were mapped into eight time intervals using Landsat satellite data remote sensing techniques. Landscape-level cross tabulation summary results are reported for landowner type, total area harvested, proportion of area harvested, and mean patch size. The forest disturbance map data can be readily converted to age class information, improving efficiencies in habitat inventory and analysis. Other historical map data can augment the age class data as well and are demonstrated.

A MULTI-SCALE PLANNING PROCEDURE TO EVALUATE SPATIAL THRESHOLDS OF RIPARIAN BUFFERS FOR SPECIES WITH LARGE HOME RANGES. **Steven M Desimone, Brian L Cosentino, Joseph B Buchanan, D John Pierce, Timothy Quinn,** *Washington Department of Fish and Wildlife, 600 Capitol Way North, Olympia, WA 98501;* **desimsmd@dfw.wa.gov**

Conservation planning may be more successful when landowner costs of meeting specific ecological needs for wildlife are minimized. One way to achieve a specific wildlife habitat objective while minimizing costs is to identify landscapes where the objective could be accommodated given current conditions, or where the need for additional management is minimal. We developed a model to assess the amount and distribution of riparian areas that have the potential to function as habitat, at three spatial scales, now or in the future, for the Northern Goshawk (*Accipiter gentilis*). For demonstration purposes, we used the procedure to evaluate whether newly implemented riparian buffers in western Washington could meet habitat requirements for the goshawk. Our modeled buffers, which reflected conditions to be expected under new forest practice rules, were mapped in three landscapes that represented the range of stream densities on industrial forestlands in western Washington. We evaluated whether the spatial extent of riparian buffers met the habitat thresholds of the goshawk. Landscape channel density and pattern clearly influenced whether goshawk habitat thresholds were achieved. Goshawk area requirements at finer spatial scale were relatively more sensitive to changes in buffer area than coarse scale habitat needs and had a greater influence on the theoretical ability of the landscape to support goshawks. When spatial thresholds were not achieved, we identified areas on the landscape that most closely met the needs of goshawks. To provide management flexibility, the "solution" could originate from any of three spatial scales used in the goshawk model. Our model can be adapted to a variety of terrestrial wildlife species and provides flexible and parsimonious solutions to landowners wishing to meet wildlife goals.

POPULATION STUDIES OF THE SHARP-TAILED SNAKE IN BRITISH COLUMBIA. **Christian Engelstoft,** *1867 Nicholas Rd., Saanichton, BC, V8M 1X8;* **Kristiina Ovaska,** *424 Viaduct Ave., Victoria, BC V9E2B7;* **alula@telus.net**

Population ecology of the sharp-tailed snake (*Contia tenuis*) is very poorly known due to the small size, cryptic habits, and apparent rarity of the snakes in the northern portion of its range. Here we present an update of studies in British Columbia, focusing on the Gulf Islands (Pender and Saltspring sites) where the species has been studied within residential areas since 1997 and on a newly discovered, relatively undisturbed site near Victoria, Vancouver Island (Cole Hill). Seasonal day-time activity of snakes sampled with artificial cover-objects (ACOs) was similar at both sites, peaking in March - April in most years. However, at Cole Hill, we located the species at night on the surface (1 observation) and under ACOs on several occasions throughout the summer, suggesting nocturnal activity at this time. Preliminary data suggest that the snakes move relatively little at both sites. At Cole Hill, one snake tagged for the harmonic direction finder moved within and among 3 small forest openings in June - July. The snake was always concealed, either within a downed log or underground. The native slug *Prophysaon foliolatum* was relatively abundant in the openings used by the snakes at this site and is a potential prey item. At the Pender Island site, surveyed over 8 years, probabilities of annual survival (0.73) and recapture (0.47) were relatively high, and several individual snakes lived at least 8 - 10 years.

WHY IS GENETIC VARIATION REDUCED IN HIGH ELEVATION POPULATIONS OF COLUMBIA SPOTTED FROGS?: A TEST OF COMPETING HYPOTHESES. **W Chris Funk,** *USGS Forest and Rangeland Ecosystem Science Center, 3200 SW Jefferson Way, Corvallis, OR 97331;* **cfunk@usgs.gov**

I examined genetic variation at six microsatellite loci in 790 Columbia spotted frogs (*Rana luteiventris*) from 28 breeding ponds in western Montana and central Idaho in order to investigate the effects of landscape structure on patterns of gene flow and effective population sizes (Ne). Previous work demonstrated a strong negative correlation between within population genetic variation and

elevation in R. luteiventris. I tested whether this negative correlation is due to smaller local effective population sizes at higher elevations, or reduced gene flow into high-elevation populations. Using a maximum-likelihood coalescent approach, I found that Nes of high-elevation populations were not consistently smaller than Nes of low-elevation populations. Moreover, gene flow between high-elevation populations and between low- and high-elevation populations tended to be more restricted than gene flow between low-elevation populations. Taken together, these results suggest that the negative correlation between within population genetic variation and elevation is primarily due to restricted gene flow into high-elevation populations. Expansion into higher elevations after the recession of Pleistocene glaciers may have also contributed to reduced genetic variation in high- elevation populations due to founder effects. Management of high-elevation populations of Columbia spotted frogs should take into consideration the high level of isolation of these populations, which may limit the potential for rescue effects and recolonization.

AMPHIBIAN POPULATION DIFFERENCES IN BEHAVIOR AND COLOR RESPONSE TO MULTIPLE STRESSORS ACROSS AN ELEVATION GRADIENT. **Tiffany Sacra Garcia, David J Paoletti, Andrew R Blaustein,** *Oregon State University, Department of Zoology, Corvallis, OR 97331;* **garciat@science.oregonstate.edu**

Larval amphibians inhabiting complex aquatic habitats often face multiple dangers simultaneously. When multiple environmental stressors are present, individuals can mediate potential conflicts by relying on coupled responses from both behavioral and physiological traits. Ultraviolet-B (UV-B) radiation and predation risk can affect both behavior and body coloration in amphibians. Interactions between behavioral and color defenses may vary across an elevation gradient in response to changing UV-B conditions. We quantified activity rates and color change in two species of amphibians from high and low elevation populations: the Pacific treefrog (*Hyla regilla*) and the long-toed salamander (*Ambystoma macrodactylum*). We exposed larval individuals to predator chemical cues (*Taricha granulosa*) and naturally relevant levels of UV-B radiation for six days. Color and activity rates were quantified at multiple time points throughout the experiment. Significant species and population differences were found, with larval *Hyla regilla* coupling a decrease in activity rates to mediate predation risk and a darkening in body color to mediate UV-B damage. Both high and low elevation *Hyla* populations demonstrated similar trait interactions. *Ambystoma macrodactylum* exhibited population differences, with low elevation individuals responding to UV-B with darker body coloration, while individuals from high elevation populations showed no color response to UV-B. Low elevation individuals also decreased activity in response to UV-B. Only individuals from high elevation *Ambystoma* populations responded to predation risk, significantly increasing activity rate. Species and population differences in mediating multiple stressors with color and behavioral trait interactions may be due to differences in the strength of selection across habitats.

DISTRIBUTION AND POST-BREEDING ENVIRONMENTAL RELATIONSHIPS OF NORTHERN LEOPARD FROGS (*RANA PIPIENS*) IN GRANT COUNTY, WASHINGTON. **Steve Germaine,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **germassg@dfw.wa.gov**

Northern leopard frogs (*Rana pipiens*) are now listed as sensitive, threatened, or endangered in all northwestern states and provinces. Historically present in Washington in the Columbia, Crab Creek, Pend O'reille, Snake, Spokane, and Walla Walla River drainages, leopard frogs are now only known at Gloyd Seeps and Potholes Reservoir in Grant County. During late summer 2002-2005, we intensively surveyed both areas to: a) document leopard frog distribution; b) examine potential relationships among leopard frogs, non-native fish, and bullfrogs; and, c) describe habitat and vertebrate community characteristics associated with leopard frog occurrence. Surveys over a 5-km reach of Crab Creek revealed only two juvenile leopard frogs at one of three sites occupied in the mid 1990s. In 302 surveys at Potholes Reservoir, we confirmed leopard frog presence in only 4 of 7 distinct areas occupied during the 1980s. At Potholes Reservoir, leopard frogs were negatively associated with bullfrogs and with non-native predatory fish, but were not associated with carp. The most parsimonious of 5 competing models explaining leopard frog distributions classified 89% of occupied sites correctly. Occupied sites were more isolated from fish-bearing water bodies, were deeper, had fewer tall emergents, and had fewer neighboring ponds containing non-native predatory fish than did sites where few or no leopard frogs were observed. The Gloyd Seeps population appears extirpated, and Potholes Reservoir leopard frogs appear to be declining. Aggressive management of non-native fish, bullfrogs, and wetland vegetation need immediate initiation to avert the extirpation of leopard frogs from Washington State.

RESPONSES OF SMALL MAMMALS TO GREEN-TREE RETENTION HARVESTS IN FORESTS OF WESTERN OREGON AND WASHINGTON. **Robert A Gitzen, Stephen D West,** *College of Forest Resources, University of Washington, Seattle, WA 98195;* **Chris C Maguire,** *Geo-Environmental Section, Oregon Department of Transportation, Salem, OR 97301;* **Tom Manning,** *Department of Forest Science, Oregon State University, Corvallis, OR 97331;* **Michael R Kroeger,** *College of Forest Resources, University of Washington, Seattle, WA 98195;* **bgitzen@u.washington.edu**

Retaining some large live trees in harvest units (green-tree retention) may reduce the negative effects of timber harvest on interior forest species. As part of the Demonstration of Ecosystem Management Options (DEMO) experiment, we investigated responses of

terrestrial small mammals to different retention amounts (100, 75, 40, and 15% of original basal area) and patterns (aggregated and dispersed) in mature coniferous forests of western Oregon and Washington. DEMO has 6 replicates (blocks) with six 13-ha treatment units in each. We examined responses of small insectivores and rodents during the first 2 yrs after treatments on all blocks, and of *Peromyscus* and *Clethrionomys gapperi* 5 yrs after harvest on the Washington blocks. Relative abundance of *Sorex sonomae* and *C. californicus* decreased with decreasing retention amounts, but *P. maniculatus* and *Microtus* increased. *C. californicus* was nearly absent from all harvested areas, but it remained present in 1-ha aggregates. Initially, *C. gapperi* was captured frequently in harvested patches, but by 5 yrs after harvest, it was restricted to 1-ha aggregates and dispersed-retention treatments. Retention amount, rather than pattern, had a stronger influence on those species responding to harvest. *Neurotrichus gibbsii*, *S. trowbridgii*, and *P. keeni* unexpectedly showed no consistent declines after harvest. For retaining *C. californicus* in southern Oregon, managers should retain large aggregates (= 1 ha), with high retention amounts (= 40%). In Washington, either dispersed- or aggregated-retention, even as low as 15%, benefits *C. gapperi*. Future sampling of the DEMO sites is needed to compare short- with long-term responses to harvest.

ASSESSING PREVALENCE OF CHYTRID FUNGUS (*BATRACHOCHYTRIUM DENDROBATIDIS*) IN NATIVE AMPHIBIANS AND BULLFROGS (*RANA CATESBEIANA*) ON VANCOUVER ISLAND, BRITISH COLUMBIA. **Purnima P Govindarajulu,** *Department of Biology, University of Victoria, PO Box 3020 STN CSC, Victoria, BC V8W 3N5;* **Trenton W J Garner,** *Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY;* **Bradley R Anholt,** *Department of Biology, University of Victoria, PO Box 3020 STN CSC, Victoria, BC V8W 3N5;* **purnimap@uvic.ca**

First described in 1998, chytridiomycosis caused by the fungus Batrachochytrium dendrobatidis is an emerging infectious disease in amphibians. In recent years, reports of its catastrophic effects have been increasing exponentially and it has been implicated in population declines and species extinctions in many parts of the world. Our pilot project in 2005 detected this disease on Vancouver Island, British Columbia. However, the distribution and level of prevalence of the chytrid fungus is poorly known. Important vectors of introduction and dispersal are thought to be commercially traded amphibians, such as the African clawed frog (*Xenopus laevius*) and the American bullfrog (*Rana catesbeiana*). American bullfrogs have been widely introduced in the southwestern part of British Columbia and are expanding their range. We sampled native amphibians and bullfrogs in four bullfrog sites, and native amphibians alone from four control bullfrog-free sites on southeastern Vancouver Island. We used quantitative real time PCR methods to detect presence of the fungus from tissue samples of both the aquatic and terrestrial life-stages. Early results show that bullfrogs from Vancouver Island exhibit one of the highest prevalence rates and chytrid loads compared to bullfrog populations around the world. We will present up to date results from this ongoing study and compare levels of prevalence of chytrid fungus in bullfrog vs. bullfrog-free sites to assess whether introduced bullfrogs were acting as vectors of spread of the disease.

EXTERNAL ATTACHMENT OF RADIO-TRANSMITTERS ON WESTERN RATTLESNAKES (*CROTALUS VIRIDIS*) TO LOCATE COMMUNAL HIBERNACULA. **Lisa A Hallock,** *Washington Natural Heritage Program, Washington Department of Natural Resources, Olympia WA 98504;* **Lisa.Hallock@wadnr.gov**

Locating and protecting communal snake hibernacula on public lands is important for conservation of local snake populations. The purpose of this study was to determine if western rattlesnakes (*Crotalus viridis*) could be radio-tracked to hibernacula by attaching radio-transmitters to the dorsal surface of the tail. Traditionally, transmitters are implanted into the body cavity of snakes. This method requires surgical expertise and exposes the snakes to risks from anesthesia and infection. Such invasive procedures may also result in behavioral changes that could potentially alter study results. Holohil Systems Ltd LB-2N transmitters, the smallest and lightest transmitters currently commercially available, were glued on the tails of ten adult rattlesnakes in the fall of 2004. Snakes were radio-tracked for the duration of the transmitter lifespan (26-28 days). Information was collected on movements, habitat use and behavior. Five snakes were successfully tracked to hibernacula. This method will make it easier for biologists to locate hibernacula and conduct short-term studies on rattlesnake dispersal. Suggestions for improving the technique and its use on other snake species will also be discussed.

PACIFIC LAMPREY: WHAT ABOUT THEM? **Molly Hallock,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **hallomh@dfw.wa.gov**

Lampetra tridentata (Pacific lamprey) are an eel-like fish found in rivers along the Pacific Coast from California to Alaska. They are anadromous, spending their first 4-6 years as blind, toothless filter-feeders buried in the substrate of freshwater streams. Upon metamorphosis, they gain eyes and teeth and migrate to the ocean, where they are parasitic upon various fishes for 12-36 months. They return to freshwater streams to spawn and die. It is well documented that some Pacific lamprey populations appear to be declining, particularly in the Columbia River drainage. Causes of decline appear similar to those that affect salmon. These include habitat loss or degradation, poor water quality, poor ocean conditions, and barriers to migratory passage. We know little about this species and other causes undoubtedly exist of which we are unaware. The decline of this species has ecological and cultural significance. As juveniles, their filter feeding may contribute substantially to ecosystem dynamics. Like salmon, decaying carcasses of adult lampreys contribute nutrients

to the freshwater system. In all life stages, they serve as prey for many fishes, birds and mammals. Culturally, lampreys have always been important to coastal and Columbia River tribal communities. Not only are they subsistence food, but they also have ceremonial and medicinal importance. It is crucial that we learn more about the ecology of this unique species in order to guide management actions that can maintain or rebuild healthy Pacific lamprey populations.

TRENDS IN THE BREEDING POPULATION OF OREGON SPOTTED FROG (*RANA PRETIOSA*) AT CONBOY LAKE NATIONAL WILDLIFE REFUGE. **Marc P Hayes,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **Joseph D Engler,** *Ridgefield National Wildlife Refuge Complex, Ridgefield, WA 98642;* **Christopher J Rombough,** *Oregon State University Affliate, Aurora, OR 97002;* **hayesmph@dfw.wa.gov**

Since 1998, we have conducted systematic egg mass surveys for the Oregon spotted frog (*Rana pretiosa*), a species endangered in Washington State, at Conboy Lake National Wildlife Refuge. The purpose of these surveys were to establish trends in this population, thought to be the largest among the 40-odd populations remain across its geographic range. Surveys, intended to estimate total egg mass numbers, have been conducted with a suite of over 175 volunteers. Besides egg mass numbers, embryonic mortality was also estimated. Each year, Oregon spotted frogs begin laying eggs in late-February or early March synchronously with the filling of the Conboy Lake, which in its current state, is almost exclusively seasonal. Over 99% of all oviposition occurs in the extreme shallows (5-15 cm) of the lake margin. During the first 4 years of these surveys, we saw a 5-fold decline in egg mass numbers, from >7,500 in 1998 to <1,500 in 2001. During each year over this period, roughly 60-90% of all egg masses desiccated due to a drop in water levels during oviposition period that resulted from a combination of an archaic water control system that was incapable of maintaining water levels and the peculiar disappearance of beaver dams. Hence, in the fall of 2001 and with subsequent refinements, a water control system was created that would not make the lake-filling hydrology labile to water level drops during oviposition. As a result, egg survivorship has exceeded 90% since 2000 and except for a minor drop in 2005, egg mass numbers have increased.

ABUNDANCE OF OLYMPIC MUDMINNOW (*NOVUMBRA HUBBSI*) AND OTHER NATIVE NONGAME FISH IN WETLANDS OF THE CHEHALIS RIVER VALLEY. **Julie A Henning,** *Washington Department of Fish and Wildlife. 1182 Spencer Road, Toledo, WA 98591;* **hennijah@dfw.wa.gov**

Many wetland projects are created to increase waterfowl and shorebird production however, native nongame fishes and amphibians can also benefit. The Chehalis River of western Washington is an excellent example of a large river system with seasonal wetlands. Winter rains cause seasonal floodplain wetlands to fill and the river to overflow, reconnecting the mainstem to the associated floodplain. This hydrologic connection provides opportunity for fish and other aquatic species to access wetland habitats. Seasonally flooded wetlands in the floodplain of the lower Chehalis River, Washington were examined to determine the degree and extent of fish utilization. Fish and amphibian utilization was compared between restored and non-restored wetlands. Eighteen fish species were present with the most abundant being the Olympic mudminnow *Novumbra hubbsi* and three-spine stickleback *Gasterosteus aculeatus*. Olympic mudminnow, a State Sensitive species, is only found in Washington State where its southern distribution range extends to the Chehalis River Basin. Over 11,000 mudminnows were captured in fyke nets from March - May and spawning occurred at many of the sites. In addition, wetlands that contained the highest abundance of nongame fishes also contained the highest abundance of amphibians. Emergent wetland characteristics are important for many native nongame fishes and connecting aquatic floodplain habitats for salmon may have negative affects on those species. This paper will emphasize the importance of emergent wetland habitat and restoration for the conservation of native nongame fish species in an agricultural landscape.

PARTNERS IN AMPHIBIAN AND REPTILE CONSERVATION (PARC): TECHNICAL WORKING GROUP ADAPTIVE MANAGEMENT MODEL. **Jeffrey N Holmes,** *Conservation Southeast, Inc., Nashville, TN 37206;* **Ernesto R Garcia,** *Office of the PARC Federal Agencies Coordinator, US Fish and Wildlife Service, Trinity River Restoration Program, Weaverville, CA 96093;* **Priya N Mitchell,** *Office of the PARC State Agencies Coordinator, Gurnee, IL 60031;* **priya@parcplace.org.**

Partners in Amphibian and Reptile Conservation (PARC) has developed a successful, multi-entity adaptive management model and organizational structure. PARC is deploying this model throughout its regional working groups. The model emphasizes communication and complementarity between technical working groups. This model is designed to optimize applied conservation biology and minimize resource expenditures that do not meaningfully impact wild populations and their habitats. In this model, partners affiliate themselves with one or more technical working groups based on their individual skills and interests. The model then provides a vehicle for the coordinated flow of knowledge, funding, and other resources between "Information Gathering" working groups (Research, Inventory/Monitoring) and "Implementation" working groups (Management, Education/Outreach, Policy/Trade) in order to maximize the net conservation impact of every penny and every drop of sweat.

EFFECTS OF CHEMILUMINESCENT TAGGING ON HAREM DYNAMICS OF THE GREATER SPEAR-NOSED BAT, *PHYLLOSTOMUS HASTATUS*. **Chad M Hoxeng, Peter Ritson, Christine Portfors,** *Washington State University, Vancouver, WA 98686;* **choxeng@wsu.edu**

Common field techniques, such as adhering light tags to bats, are often utilized in bat foraging studies. However, effects of light tags on bat behavior are not known. We studied the effects of light tags on Phyllostomus hastatus because of their known harem social organization during roosting. We captured eleven *P. hastatus* from a roost site in an abandoned World War II building in Trinidad, West Indies. Using a hand net, we captured three males and eight females from separate harems. The objective of this study was to determine the effects of light tags on the roosting behaviors and harem member interactions of *P. hastatus*. We hypothesized that adhering chemiluminescent tags adversely alters the roosting behaviors of bats. To record roosting behaviors of bats with light tags and compare these behaviors to non-tagged bats, we recorded four different roosting behaviors using infrared videography. We found that female bats with light tags were involved in significantly more aggressive behavioral interactions than un-tagged bats ($P < 0.001$). These results suggest that the roosting behaviors of *P. hastatus* are altered when light tags are attached to their body. Not only did the behavior of the bats change, their inclusion in a harem was affected. This suggests that the causes of the behavioral changes are the adverse reactions of other bats to the light tags. This may be an important finding to species other than *P. hastatus*. Any bat that normally roosts in a group may have negative interactions with other colony members if a light tag is present. While our findings are specific to *P. hastatus*, they suggest that the effects of light tags on other bat species should be questioned.

ESTIMATING "ODDS" OF MARBLED MURRELET NESTING HABITAT. **Mark H Huff, Richard Young,** *USDI Fish and Wildlife Service, 911 NE 11th Ave., Portland, OR 97232;* **Martin G Raphael,** *USDA Forest Service, Pacific Northwest Research Station, 3625 93rd Ave. SW, Olympia WA 98512;* **Sherri L Miller,** *USDA Forest Service, Pacific Southwest Research Station, Redwood Sciences Laboratory, 1700 Bayview Dr., Arcata, California 95521;* **S Kim Nelson,** *Oregon State University, Oregon Cooperative Fish and Wildlife Research Unit, 104 Nash Hall, Department of Fisheries and Wildlife, Corvallis, OR 97331;* **Jim Baldwin,** *USDA Forest Service, Pacific Southwest Research Station 800 Buchanan Street, West Annex Building, Albany, CA 94710;* **Martin Brown,** *Synthesis Research and Analysis, 5826 SE Hawthorne Blvd., Portland, OR 97125;* **mark_huff@fws.gov.**

Our approach to modeling marbled murrelet (*Brachyramphus marmoratus*) nesting habitat in Washington, Oregon, and northern California tiered from two questions: (1) What attributes best predict murrelet nesting habitat? (2) What is the amount of potential nesting habitat on U.S. Forest Service and Bureau of Land Management land? We used existing marbled murrelet survey data to randomly select and locate occupied and absent sites from which we collected habitat information. The habitat information was used to make predictions about nesting habitat by developing logistic regression equations and to estimate odds ratios of 2,765 vegetation inventory grid locations as potential nesting habitat based on vegetation and spatial data characteristics of individual grid locations. Odds ratios of the grid locations, transformed to a -1 to 1 scale, served as a habitat suitability index. Combining the inventory grid's predictive capabilities with the odds ratios, we estimated the amount of federal land in four habitat suitability classes at varying analysis scales (e.g., physiographic province and land allocation). Only 13 percent of the U.S. Forest Service and Bureau of Land Management land had odds ratios that were equal to or exceeded that of known occupied nesting habitat (i.e., our high suitability class), totaling about 240,000 ha. By physiographic province, the largest amount of high suitability nesting habitat was in the Oregon Coast Range and Olympic Peninsula. Washington had the highest proportion of high suitability nesting habitat in federal reserves, 16.9 percent. Our experimental approach offers some new options for monitoring long-term habitat status and trends on federal lands.

CHYTRIDIOMYCOSIS: A SILENT SPRING FOR PACIFIC NORTHWEST AMPHIBIANS? **Jim Johnson, Eric Dean, Susan Belmont, Dave Darda,** *Biological Sciences, Central Washington University, 400 E University Way, Ellensburg, WA 98926;* **Steve Germaine,** *Washington Department of Fish and Wildlife, 600 Capitol Way North, Olympia WA 98501;* **R Steven Wagner,** *Central Washington University, 400 E University Way, Ellensburg, WA 98926;* **wagners@cwu.edu**

Chytrid fungus Batrachochytrium dendrobatidis has been implicated in mass mortalities and declines of amphibian species worldwide, but had not previously been reported from Washington State. During March 2005, routine amphibian monitoring revealed a mass mortality event in the Central Cascades. Evidence suggests Batrachochytrium dendrobatidis is the most probable cause of death of 85 individuals representing four species (*Hyla regilla, Rana cascadae, Ambystoma gracile* and *Ambystoma marcrodactylum*) recovered at Swamp Lake (Kittitas Co., WA). This evidence includes the presence of zoosporangia in skin sections, appearance and symptoms, and PCR products amplified using primers specific for B. dendrobatidis. Further monitoring of Swamp Lake through November 2005, yielded no adult amphibians and suggests they may have been extirpated from the site. In addition, this pathogen already appears to be more widespread in Washington. We have found evidence of B. dendrobatidis associated with the morbidity and mortality of four *Rana pipiens* from Crab Creek (Grant Co., WA). As a consequence of this initial report of chytrid in Washington and considering the conservation status of both *R. pipiens* (Endangered in Washington) and *R. cascada*e as Federal Species of Concern, we suggest state and federal management agencies

act expidiously to implement a monitoring program and develop strategies to mitigate the spread of this potentially devastating threat to northwest amphibian diversity.

FACTORS INFLUENCING ROCKY MOUNTAIN TAILED FROG (*ASCAPHUS MONTANUS*) DISTRIBUTION AND ABUNDANCE. **Jason L Jones, Charles R Peterson, Colden V Baxter,** *Idaho State University, Pocatello, ID 83209-8007;* **jonejaso@isu.edu**

The goal of this study is to examine the factors influencing the distribution and abundance of Rocky Mountain tailed frog (*Ascaphus montanus*) tadpoles. Few studies have evaluated the spatial context of limiting factors for tadpole occurrence and age-class distribution. To determine what factors influenced tadpole occurrence and abundance, we addressed four questions relating to tadpole distribution in a stream network. Between 28 June and 10 August 2005, we conducted this study in two different watersheds: the South Fork of the Flathead River watershed in northwestern Montana, and Mica Creek watershed in northern Idaho. With a stratified sampling design, we sampled tailed frog tadpoles in 5 randomly selected 1-m transect belts across = 24 stream reaches, starting in the headwaters and continuing to the largest stream order in the watershed. We measured physical habitat variables at each transect belt. In a minimum of 14 transect belts in each stream, we sampled 5 rocks for periphyton biomass. We also noted fish presence in each transect. To date, our statistical analyses have included linear regressions of tadpole biomass and density and ANOVA of tadpole occurrence. Tadpole occurrence decreased among transect belts in Mica Creek with increasing levels of chlorophyll-a, whereas in Youngs Creeks, tadpole occurrence increased with increasing chlorophyll-a. Fish presence did not appear to decrease tadpole occurrence in either system. Based on our results, we hypothesize that tadpoles exhibit niche shifts at different developmental stages and spatial scales.

IDENTIFYING WESTERN WASHINGTON *PEROMYSCUS MANICULATUS* AND *P. KEENI* USING AN EFFICIENT CYTOCHROME B RESTRICTION FRAGMENT LENGTH POLYMORPHISM (RFLP) PROCEDURE WITH IMPROVED MORPHOMETRIC ANALYSIS. **Michael R Kroeger,** *College of Forest Resources, University of Washington, Seattle, WA 98195;* **Lorenz Hauser,** *School of Aquatic and Fisheries Sciences, University of Washington, Seattle, WA 98195;* **Eric M Vigoren,** *Department of Environmental and Occupational Health Sciences, University of Washington, Seattle, WA 98195;* **Robert A Gitzen, Stephen D West,** *College of Forest Resources, University of Washington, Seattle, WA 98195;* **mrk5@u.washington.edu.**

In western Washington, two common rodents (*P. maniculatus* and *P. keeni*) segregate partially by habitat, but co-occur in many sites. A tail-length criterion (> or < 96 mm) commonly used to separate these species has an estimated 5% error rate in adults. However, under this criterion, juveniles and adults with damaged tails or tail lengths at 96 mm cannot be identified reliably. Imprecise identification has limited our ability to determine ecological factors affecting the occurrence and behavioral interactions of these two species. We used differences in the mitochondrial cytochrome-b gene to develop an RFLP assay that is easy to implement, has high through-put (approximately 384 mice can be assayed in 5 days), and costs $0.30 per sample for materials. We identified 704 adult and juvenile deer mice to species. From these identifications, we created logistic regression models to distinguish between these species based on tail length, mass, and other external measurements. These models could be used in future studies to discriminate individual deer mice based on morphology, and to quantify the degree of uncertainty of species identification. The morphological method we present has three major advantages over the previous 96 mm tail-length rule: mice of all ages can be identified to species, a greater proportion of deer mice can be correctly identified, and mice that have a high probability of misidentification using morphological characters can be selected for the RFLP assay.

WILDLIFE RESEARCH NEEDS IN COMMERCIAL FORESTS. **Andrew J Kroll,** *Weyerhaeuser Company, WTC 1A5, Federal Way, WA 98063-9777;* **aj.kroll@weyerhaeuser.com**

Past wildlife research efforts in commercial forests have been dominated by studies of single species, stand-level examinations of management effects, and quasi-experiments with low statistical power. Landscape studies that quantify how stand-level treatments collectively influence wildlife populations are rare. In addition, many studies have relied on estimates of density, abundance, and occupancy that lack statistical rigor and cannot provide strong inference about questions of interest. Three changes to research programs examining relationships between commercial forest management and wildlife habitat and populations would provide more reliable information to managers and policy-makers. First, recent advances in applied quantitative methods (e.g., model selection, occupancy estimation, adaptive optimization) provide researchers with powerful tools for application in research and management programs. Model selection and validation holds particular promise, as it allows for evaluation of multiple hypotheses about system dynamics and may represent an improvement over traditional tests of univariate significance. Second, research should advance beyond the density-occupancy paradigm to investigations of habitat selection and fitness consequences. We know that many organisms use commercial forests: patterns of habitat selection across habitat types and variation in reproductive success and survival are relatively unexplored. Finally, a more robust understanding of how set-asides (e.g., riparian management zones, geologic reserve areas, retained structures,

and non-forested features) function within commercial forests is critical. Riparian management zones and geologic reserve areas were established for non-wildlife purposes. As a result, an understanding of costs and benefits of these resources for wildlife populations would improve management practices to conserve biological diversity in commercial forests.

THE SCIENCE OF FISHER TRANSLOCATION: PLANNING, IMPLEMENTATION, AND MONITORING. **Jeffrey C Lewis,** *Washington Department of Fish and Wildlife, 600 Capitol Way North, Olympia, WA 98501-1091;* **lewisjcl@dfw.wa.gov**

Following an extensive decline via overtrapping and habitat loss, translocation efforts have successfully reestablished fishers (*Martes pennanti*) throughout much of their range. Among 34 known fisher translocations, 23 (72%) were considered successful. These efforts were undertaken for three reasons: to reestablish the fisher, to reestablish a valuable furbearer, or to control porcupines. A fisher translocation should be preceded by a feasibility assessment to determine (1) if the causes of decline or extirpation have been reduced or eliminated, (2) if there is an adequate amount and configuration of suitable habitat for a translocated population, (3) if there is an adequate prey base, and (4) if there is a suitable and available source population. While the characteristics of fisher translocations varied greatly, successful translocations frequently involved the most closely related (or nearest) source population, the release of 60 fishers, a female-biased (54%) founder population, the release of fishers in 2 consecutive years, fall or winter releases, hard releases, and protection from commercial harvest but not from incidental capture. Implementation involves authorization to obtain a source population; capture, housing and transport of individuals; a release strategy; and can include active monitoring and contingency planning. Reintroduction success was frequently based on the documentation of survival, reproduction, incidental capture or continued population persistence or expansion. Success has been actively monitored via telemetry, mark-recapture, genetic sampling, track-plate and camera detections, or track surveys. Reintroductions are important opportunities to conduct research on population demography, multi-scale habitat use and selection, behavior, and food habits.

TRANSLOCATION METHODS DEVELOPMENT FOR TAYLOR'S CHECKERSPOT BUTTERFLY IN SOUTH PUGET SOUND, WASHINGTON. **Mary J Linders,** *Washington Department of Fish and Wildlife, Olympia, WA 98501-1091;* **lindemjl@dfw.wa.gov**

The prairie-dependent Taylor's checkerspot butterfly (*Euphydryas editha taylori*) once ranged from southern Vancouver Island in British Columbia to the Willamette Valley in Oregon. It has declined significantly in recent decades, with notable local extirpations in Washington's South Puget Sound over the past 10 years. Less than 3% of native grasslands remain intact in the Puget Trough and habitat quality is often lacking. Checkerspots require open grassland or woodland edges with rich sources of floral nectar for adults and an abundance of appropriate larval food plants. Existing grasslands are small and isolated relative to historic conditions. Isolation decreases the likelihood of recolonization, particularly for low-vagility invertebrates, and increases the likelihood of extinction without human intervention. Active management is necessary to stem declines and prevent further loss of Taylor's checkerspot populations. An experimental translocation plan identifies methods for captive rearing, translocation, and release of Taylor's checkerspots using both wild and captive-reared individuals. Three release experiments using eggs, pre- and postdiapause larvae are destined for field trials in 2006; these seek to identify limiting factors and measure the survival of released animals. Field trials will be coupled with lab rearing to isolate rates and causes of mortality in the field. These are small-scale experiments designed to balance successful population establishment with avoiding costly mistakes that may result from untested methods applied over large scales. The long-range goal of the project is to increase the number of secure sites and overall population size of Taylor's checkerspot in South Puget Sound.

AMPHIBIAN INVASION OF NEWLY CREATED PONDS AFTER THE 1980 ERUPTION OF MOUNT ST. HELENS. **Eric M Lund, Charles M Crisafulli,** *USDA Forest Service, Pacific Northwest Research Station, Olympia, WA 98512;* **emlund@fs.fed.us**

The eruption of Mount St. Helens on 18 May 1980 triggered the largest recorded landslide in human history. The majority of the 2.5 km3 debris avalanche traveled down the North Fork Toutle River, burying 60 km^2 of the valley at an average depth of 45 m. The resulting hummocky terrain created complex topography, and groundwater and runoff quickly filled many of the depressions. Since that time 120 newly created ponds and marshes have been identified and mapped in the upper North Fork Toutle drainage. Earlier work documented that by 1983, two amphibian species (*Bufo boreas*, *Pseudacris regilla*) had colonized the ponds, and by 1990, six species (4 anurans, 2 salamanders) had arrived. Here we present results from annual surveys conducted at 120 ponds from 1995-2005 using a combination of visual surveys, dip netting, snorkeling, and aquatic funnel trapping techniques to determine species presence, breeding status, and relative abundance. *P. regilla* was the most frequently (> 90% of sites in all years) observed amphibian species during this period. The remaining five species, listed in decreasing frequency of occurrence were *Ambystoma gracile*, *Rana aurora*, *Taricha granulosa*, *B. boreas* and *Rana cascadae*. The number of species at these ponds ranged from zero (7 ponds) to six species (6 ponds), and the remaining 113 ponds had 2-5 species. In 2002 - 2003, biophysical measurements were recorded for vegetation (life form and cover), basin gradient,

substrate, depth, perimeter, area, and hydro period. Future analyses will aim at linking these biophysical measures to species abundance and distribution patterns.

EFFECTS OF FOREST PRACTICES ON CASCADE TORRENT SALAMANDERS IN WASHINGTON. **James G MacCracken,** *Timber Department, Longview Fibre Company, Longview, WA 98632;* **Craig A Steele, Kathleen M Pollett,** *Department of Biology, Utah State University, Logan, UT 84322;* **jmac@longfibre.com.**

We first examined the effects of regeneration silviculture on Cascade torrent salamanders (*Rhyacotriton cascadae*) by sampling streams along a chronosequence of stand ages ranging from 0 to 90+ years. A regression tree on forest age produced 4 terminal nodes where captures were lowest in 0-24 year old stands, intermediate in stands > 61 years old, greatest in 41-60 year old stands, and 2nd greatest in 25-40 year old stands. In addition, captures were greatest in streams with temperatures < 9°C but stand age was not related to water temperature. Following these findings, we examined the effects of stream buffers by sampling streams in clearcuts < 10 years old with and without buffers, streams in 2nd-growth harvest age stands, and streams in unmanaged stands. Captures were greatest ($p = 0.04$) in streams in unmanaged stands, similar between buffered streams and those in harvest age stands, and lowest in streams in clearcuts without buffers. A regression tree produced 2 terminal nodes based on consecutive hours of water temperature > 14°C. Torrent salamanders were present in 90% of streams with < 35 consecutive hours at 14°C and 13% of streams with > 35 consecutive hours at 14°C. These studies indicate that Cascade torrent salamanders are negatively impacted by regeneration harvest when streams are not buffered, recover within 25 years, and stream buffers ameliorate harvest impacts. However, water temperature plays a stronger role in Cascade torrent salamander abundance and distribution and water temperature is independent of forest practices.

THE AMERICAN ENDANGERED SPECIES ACT AND THE CANADIAN SPECIES AT RISK ACT: LESSONS FROM ACROSS THE BORDER? **Brent M Matsuda,** *Hyla Environmental Consulting Associates 1352 Drake Drive, Unit D, Davis, CA 95616; 984 West Broadway, Box 53510, Vancouver, BC V5Z 1K0;* **brent_matsuda@yahoo.ca**

In March 2003, Canada's Species at Risk Act (SARA) came into effect, with the last phases implemented on June 1, 2004. While the United States (US) has had the Endangered Species Act (ESA) in effect since 1973, it has taken Canada several years to develop and approve a modest equivalent. Industry and other parties have been recalcitrant towards SARA due to perceived and real economic hardships as a result of ESA enforcement. A lengthy and costly process occurs in the US for approving projects potentially impacting threatened or endangered species and habitats, with stringent regulations applicable nationwide. While aspects are modeled on the ESA (e.g., critical habitat designation), SARA only applies to federal lands. Other differences include habitat stewardship initiatives for private landowners, and priority enforcement through the provinces and territories to protect listed species, with an override for the federal government to act if a species or habitat is considered inadequately protected. To minimize lawsuits and political influence, the Canadian government relies on COSEWIC, a non-governmental, expert advisory group to SARA, to advise on issues pertaining to species at risk, including classification criteria, species status reports, and reports on the administration of SARA. The pros and cons of both Acts will be compared and contrasted to highlight practical and/or potential pitfalls and how the two Acts can stand to benefit from one another in application.

DEVELOPMENT AND APPLICATION OF A HABITAT SELECTION MODEL FOR PYGMY RABBITS. **Jennifer K Meisel, Richard Schmitz,** *Oregon State University, Department of Fisheries and Wildlife, Corvallis, OR 97331;* **Kelly Hogan,** *US Fish and Wildlife Service, Hart Mountain National Antelope Refuge, Plush, OR 97637;* **Heidi Newsome,** *US Fish and Wildlife Service, Hanford Reach National Monument, Richland, WA 99354;* **jennifer.meisel@oregonstate.edu**

Pygmy rabbits (*Brachylagus idahoensis*) in Oregon and Washington are a sagebrush obligate species of concern because of declining populations and extirpation from much of their range within the western United States. The Columbia Basin population of pygmy rabbits is currently listed as a federal and Washington State endangered species. Efforts are underway by the Washington Department of Fish and Wildlife to establish a captive bred population of the Columbia Basin pygmy rabbit for reintroduction into the wild. The purpose of this study was to develop a habitat selection model based on soil and vegetation characteristics of occupied pygmy rabbit habitat. Data were collected at Hart Mountain National Antelope Refuge in Oregon, and used to quantify local and landscape scale relationships of pygmy rabbits with their habitat. Using logistic regression and Akaike's Information Criterion to identify the best model, we determined that sagebrush height (mean 0.67m +/- 0.11m [95% CI]) and soil percent sand (mean 51.5% +/- 2.4% [95% CI]) were the two habitat characteristics most predictive of where active pygmy rabbit burrows are located. We then developed a GIS model based on sagebrush height and soil percent sand. This model was applied to lands at Hanford Reach National Monument (Monument) in Washington to determine potential areas for pygmy rabbit reintroduction. Results from the GIS model indicate that there are approximately 25,000 acres of potential pygmy rabbit habitat on the Monument. Data were collected on the ground within the 25,000 acres and will be used to refine results from the GIS model.

RESPIRATION CONSTRAINTS OF PACIFIC NORTHWEST FOREST-ASSOCIATED SALAMANDERS: IMPLICATIONS FOR STREAM MANAGEMENT. **Lindy Mullen, Jason Irwin, R Steven Wagner,** *Central Washington University, 400 E. University Way, Ellensburg, WA 98926;* **mullenl@cwu.edu.**

Rhyacotriton cascadae are primarily associated with cold, high gradient streams in mature forests. We examined the hypothesis that reduced lungs of adults and rudimentary gills of larvae limit R. cascadae to cutaneous respiration in aquatic systems. Therefore, the interaction of temperature (10°C, 15°C) and oxygen concentration (2.0 ppm, 10.0 ppm, 17.0 ppm) on aquatic respiration rates of *R. cascadae* was compared to sympatrically occurring *Dicamptodon tenebrosus*. In addition, the respiration of *R. cascadae*, *D. tenebrosus*, *Plethodon dunni* and *P. larselli* in an open system was measured with respect to temperature (10°C, 15°C) to assess similarities among stream and terrestrial lungless salamanders. Results indicated *R. cascadae* and *D. tenebrosus* respond differently to dissolved oxygen content and water temperature, when accounting for mass (ANCOVA; $p < 0.01$). In addition, *R. cascadae* demonstrated a significant interaction between temperature and oxygen concentration (ANCOVA; $p < 0.01$) while *D. tenebrosus* did not (ANCOVA; $p < 0.8$). Hence, respiratory surface area may limit the metabolic rate of *R. cascadae*. Open system respiration indicated no significant differences at 10°C and 15°C (ANCOVA; $p < 0.78$). However, there were significant differences for respiration rates among species (ANCOVA; $p < 0.02$). Specifically, *R. cascadae* respiration was different from plethodontids based upon Tukey-Kramer comparisons; suggesting plethodontids are more dependent on buccopharyngeal respiration. In sum, the delivery of oxygen to tissues in *R. cascadae* may be limited at higher temperatures. Therefore, forest management practices that alter stream temperatures and oxygen concentration may affect their persistence.

WSDOT HIGHWAY MAINTENANCE: ENVIRONMENTAL COMPLIANCE FOR PROTECTED TERRESTRIAL SPECIES. **Tracie O'Brien, Marion Carey,** *Washington State Department of Transportation, Olympia, WA 98504-7331;* **Bret Forrester,** *Tacoma Power, Tacoma Public Utilities, Tacoma, WA 98411;* **careym@wsdot.wa.gov**

Protected plant and wildlife species that grow, forage, nest, or roost within the Washington State Department of Transportation (WSDOT) highway system may be susceptible to impacts from routine maintenance. In response to maintenance personnel concerns related to the conservation of protected species and due to the lack of existing guidance, WSDOT biologists and maintenance personnel worked together to develop this new program. The purpose of the program is to provide maintenance personnel with resources that identify where sensitive plant and wildlife areas are and identify best management practices that can be implemented to minimize impacts of maintenance activities to protected terrestrial species in Washington State. The guidance is in the form of a field handbook presented in a step-by-step format to facilitate use by WSDOT maintenance personnel. The guidance provides maps and descriptions of sensitive areas, identified by state route and milepost. Specific species information, such as species name, nest sites, wintering sites, or locations of sensitive habitats, are not identified in the guidance. This project is currently being piloted with the Olympic Region Maintenance Program. Training courses with individual maintenance sheds have provided opportunity for discussion and question and answer sessions. Biologists and maintenance personnel have had the opportunity to work together to learn each other's programs, perspectives, and observations and to establish good working relationships. The Highway Maintenance Environmental Compliance Guidance for Protected Terrestrial Species Program has helped the Maintenance Program conduct their projects in a timely fashion, without unnecessary delays, and remain good stewards of the environment.

DIET OF THE COLUMBIA TORRENT SALAMANDER, ***RHYACOTRITON KEZERI*****: PRELIMINARY FINDINGS.** **Ryan P O'Donnell, Casey H Richart, Marc P Hayes,** *Habitat Program, Washington Department of Fish and Wildlife, Olympia, WA, 98501;* **odonnrpo@dfw.wa.gov**

We are conducting the first study of the diet of the Columbia torrent salamander, Rhyacotriton kezeri. Few studies have addressed the diet of any species in this genus, and none have addressed larval diet. During destructive sampling of 10 seeps and 10 non-seep riparian areas as part of comparative study of sampling methods during 1-18 November 2004, we systematically collected and preserved 177 Columbia torrent salamanders (including 137 larvae) from the Willapa Hills of southwest Washington. We are currently analyzing the gastrointestinal tract contents from these animals. To date, we have quantified the contents of 41 specimens, including 24 larvae, and preliminarily identified 233 prey items to the level of Order for insects, and at least Phylum but usually Class for other taxa. Larvae and post-metamorphs each contained a median of 5 prey items. For larvae, copepods (Arthropoda: Malacostraca: Maxillopoda) were the most commonly found prey item, occurring in 46% of salamanders examined and accounting for 55% of prey items. Collembola and larval Plecoptera, Coleoptera, and Diptera each occurred in 21-29% of larval salamanders and accounted for 4-17% of prey items. For post-metamorphic salamanders, larval Diptera were the most common prey item, accounting for 49% of prey and occurring in 47% of salamanders. Larval Coleoptera, adult Coleoptera, Collembola, and Mollusca each occurred in 35-41% of salamanders and accounted for 4-8% of prey. Analysis is ongoing, but our objective is to analyze the gastrointestinal contents of at least 100 salamanders from the 177 available.

DESIGNS FOR PROTECTING AMPHIBIANS IN MANAGED HEADWATER FORESTS IN THE US PACIFIC NORTHWEST. **Deanna H Olson, Cynthia Rugger,** *US Department of Agriculture, Forest Service, Pacific Northwest Research Station, 3200 SW Jefferson Way, Corvallis, OR 97331;* **David Rundio,** *Southwest Fisheries Science Center, National Marine Fisheries Service, 110 Shaffer Rd, Santa Cruz, CA 95060;* **Stephanie J Wessell,** *US Geological Survey, 3200 SW Jefferson Way, Corvallis, OR 97331;* **dedeolson@fs.fed.us**

Headwaters comprise the majority of US Pacific Northwest forest landscapes, and harbor a diversity of endemic species. Thinning of young managed stands is being used on federal lands for wood production, fuels reduction to reduce risk of severe fire and accelerated development of late-successional forest conditions. Thinning with headwater stream riparian buffers and upslope leave islands holds promise for species retention. Specifically, our research examines the effects on instream, bank-dwelling, and upslope amphibians of four riparian buffer widths (6, 15, 70, and 145 m on each side of streams) and three sizes of upslope leave islands (0.1, 0.2, and 0.4 ha circular patches) within a thinned forest matrix (50-80 yrs), which reduced Douglas-fir stands from about 600 trees per hectare (tph) to 200 tph. Instream amphibians were not affected by joint buffers and upslope thinning in years 1 and 2 post-treatment, while some effects were seen on bank and thinned upslope salamander species abundances. Larger leave islands retained habitats and fauna. We are tracking stream species' responses through year 5 post-thinning and propose to follow the study through a second entry of thinning, reducing stands to about 80 tph.

EFFECTS OF VARIABLE-RETENTION LOGGING ON TERRESTRIAL GASTROPODS IN SOUTHWEST BRITISH COLUMBIA. **Kristiina Ovaska,** *424 Viaduct Ave., Victoria, BC V9E2B7;* **Lennart Sopuck,** *1759 Colburne Place, North Saanich, BC V8L5A2;* **kovaska@shaw.ca**

Forest-dwelling terrestrial gastropods (slugs and snails) are potentially sensitive to disturbances to the forest floor and changes in microclimate associated with logging. As part of Cascadia Forest Products' (formerly Weyerhaeuser Company) Adaptive Management Program, we collected pre-disturbance data on the relative abundance and species diversity of gastropods at 6 experimental sites in coniferous forests on Vancouver Island and the mainland coast of British Columbia in 2001 - 2003. The treatments at each site consisted of a clearcut, 3 variable retention treatments, and an unlogged control. Post-logging surveys were conducted at two of the sites in 2005, 4 years after treatment application. At one site, sampling with artificial cover-objects revealed depressed abundance for one species group of snails, attributable to logging effects. At the other more productive site, abundance of 10 species or groups differed among treatments and several showed depressed numbers in the clearcut and lower level retention treatments when sampled with artificial cover-objects. However, extraction of small snails from litter samples failed to reveal differences attributable to logging. At the first site, there was an overall increase and at the second site a substantial decrease in the abundance of small litter snails between the pre- and post-logging surveys. These preliminary results illustrate importance of baseline data when analysing effects of disturbances and potentially complex relationships between relative abundance and survivorship.

TORRENT SALAMANDER DISTRIBUTION WITHIN HEADWATER STREAMS. **Amberlynn Pauley,** *University of Washington, College of Forest Resources, Seattle WA 98195;* **Marc P Hayes,** *Washington Department of Fish and Wildlife, Olympia WA 98501;* **Stephen D West,** *University of Washington, College of Forest Resources, Seattle WA 98195;* **Martin Raphael,** *USFS Pacific Northwest Research Station, Olympia WA 98512;* **amphibia@u.washington.edu**

The Pacific Northwest has a number of endemic amphibians, most of which occur in habitats subject to many uses, such as timber harvest, recreation and conservation. Columbia torrent salamanders (*Rhyacotriton kezeri*), one of these endemics, occurs in small, forested headwater streams. They appear abundant in suitable habitat, but factors that limit their abundance and distribution are largely unstudied. Like other members of the genus, Columbia torrent salamanders are thought to rank among the most sensitive to temperature and sediment changes among amphibians, and hence, they may represent good indicators of forest ecosystem health. Efforts are currently underway to develop tree retention and harvest strategies for forested headwater streams, habitat thought to be the most important to all four torrent salamander species. Yet, understanding of Columbia torrent salamander distribution in headwater systems remains poor, and in particular is insufficient to guide buffer prescriptions that propose different longitudinal patches along headwater stream channels. Data were collected on the longitudinal distribution of *Rhyacotriton kezeri* in headwater streams in southwestern Washington during low flow (July-October) during 2001, 2002 and 2005. We evaluated alternative hypotheses regarding Columbia torrent salamander distribution using an information theoretic approach from the 1,745 animals found. Differences in life-stage specific occurrence and abundance patterns will be discussed.

AN ASSESSMENT OF SPOTTED OWL HABITAT ON NON-FEDERAL LANDS IN WASHINGTON BETWEEN 1996 AND 2004. **D John Pierce, Joseph B Buchanan, Brian L Cosentino, Shelly Snyder,** *Washington Department of Fish and Wildlife, Olympia WA 98501;* **piercdjp@dfw.wa.gov.**

Forest Practices Rules for the northern spotted owl (*Strix occidentalis caurina*) were adopted for non-federal lands in Washington State in May 1996. These rules established 10 landscapes - known as spotted owl Special Emphasis Areas (SOSEAs) where proposed harvest of suitable owl habitat would receive environmental review designed to provide a high level of protection. In 2004 we undertook this study to gather information that could be used by the Forest Practices Board as part of a review of the spotted owl rules. We estimated that 330,346 hectares of suitable spotted owl habitat existed on all lands within our study area (1,208,735 hectares) in 2004. Most of the habitat (56%) occurred on federal lands and lesser amounts on state-local lands (21%), private lands (22%) and tribal lands (1%). An estimated 22,824 hectares of habitat were harvested from 1996-2004. Most of the harvested spotted owl habitat was on private (77%) and state-local (15%) lands. We estimated that 6% (95% confidence interval = 5% - 8%) of the maximum potential amount of habitat in 2004 was harvested during the 9 years following rule adoption in 1996; values on the study area ranged from 4% in the Olympics to 32% in southwestern Washington. We recommend that long-term landscape plans be encouraged and that a spatially explicit spotted owl habitat map be developed for the areas affected by the state Forest Practices Rules.

FORAGING ECOLOGY OF PILEATED WOODPECKERS IN COASTAL FORESTS OF WASHINGTON. **Catherine M Raley, Keith B Aubry,** *USDA Forest Service, Pacific Northwest Research Station, Olympia, WA 98512;* **craley@fs.fed.us.**

In the Pacific Northwest, providing adequate habitat for pileated woodpeckers (*Dryocopus pileatus*) has been a key component of federal forest management strategies for over 20 years. Although their nesting and roosting ecology has been well studied, information on their foraging ecology is limited. From 1990 to 1995, we studied food habitats of pileated woodpeckers in coastal forests (with scat analysis), investigated selection of forest structures used by pileated woodpeckers for foraging, and estimated the relative abundance of carpenter ants (*Camponotus* spp.; their primary prey) associated with logs and cut stumps. Pileated woodpeckers primarily consumed carpenter ants, but round-headed beetle larvae (Coleoptera, Cerambycidae) and dampwood termites (Isoptera, Hodotermitidae) were important food items during the breeding season (March - June). Selection of foraging structures was related to wood characteristics and microsite conditions that influence the presence and abundance of arthropod prey. Pileated woodpeckers foraged almost exclusively (95%) on standing structures, and selected tall, large-diameter snags in early to moderate stages of decay. Contrary to previous studies, pileated woodpeckers rarely (2%) foraged on logs. Carpenter ants were scarce at logs in closed-canopy habitats, suggesting that in coastal forests, logs are too cool and wet to support abundant populations of carpenter ants.

POST TIMBER HARVEST SMALL MAMMAL RESPONSE TO RETAINED COARSE WOODY DEBRIS. **Claudine R Reynolds,** *Green Diamond Resource Co, Shelton, WA, 98584;* **creynolds@greendiamond.com**

For the purpose of providing wildlife habitat, the Green Diamond Resource Co Habitat Conservation Plan (HCP) requires retention of two pieces of coarse woody debris (CWD), (volume > 100 bf), on each harvested acre of managed timberland. To examine the use of CWD by small mammals, we designed a study to track small mammal occurrence at four levels of retention. The study will track small mammal populations from the time of harvest (2005) to canopy closure (ca. 15 years). Treatments consist of 1) HCP prescription; removal of all wood except 2 -100 bf pieces/ac, 2) Piled wood; 3 m radius, 1 m high, 3) Residual wood; all material was removed except unsalvageable or decayed residual material, and 4) Control; amount of wood left following normal harvest operations (included HCP levels). Each treatment block was ca. 0.4 ha. Three replications of each treatment were installed within the harvest unit. Within each plot, ten baited Sherman traps were used to capture animals (120 total traps). Trapping was conducted for 15 nights. We examined the relative abundance and species diversity of small mammals found on each treatment block. Preliminary results indicate no significant difference ($p = 0.385$, Kruskal-Wallis) in relative abundance of small mammals between woody debris retention levels. The unit will be treated with pre-emergent herbicides in 2006 and planted with Douglas-fir at 1000 stems/ha. Vegetation reestablishment will be measured and used as dependant variable in future analysis. The long term results of this study may help to guide woody debris retention management.

DENSITY AND POPULATION SIZE ESTIMATES FOR NORTH CASCADE GRIZZLY BEARS USING DNA HAIR-SAMPLING TECHNIQUES. **Kimberly Romain,** *Washington Department of Fish and Wildlife, Winthrop, WA 98862;* **Robert Wielgus,** *Department of Natural Resource Sciences, Washington State University, Pullman, WA 99164-6410;* **Wayne Kasworm,** *US Fish and Wildlife Service, Libby, MT 59923;* **Lisette Waits,** *University of Idaho, Conservation of Natural Resources, Moscow, ID 83844-1136;* **Matt Austin,** *BC Ministry of Parks and Environment, Victoria, BC V8W9M4;* **Wayne Wakkinnen,** *Idaho Department of Fish and Game, Bonners Ferry, ID 83805;* **romaikar@dfw.wa.gov**

We used non-invasive DNA hair-sampling methods to detect bears and obtain density and population estimates for a threatened grizzly bear (*Ursus arctos*) population in the North Cascade Ecosystem of Washington and British Columbia. One grizzly bear was detected during 5304 trap nights over 3 years in the North Cascades. We used the same hair-sampling techniques in two other threatened grizzly bear populations in the Cabinet-Yaak Ecosystem of Montana and British Columbia, and the Selkirk Mountain Ecosystem of northern Idaho. We calculated catch per unit effort (grizzly bears detected per 1000 trap nights) for these threatened and 5 other grizzly bear populations.

We used linear, logistic, and linear through the origin regression analyses to determine the relationship between catch per unit effort and grizzly bear density, to predict the relative density and absolute number of bears in our North Cascade study area. Natural recovery seems unlikely for the North Cascade grizzly bear population, and the population has a high likelihood of extinction if subjected to demographic and environmental stochastic effects. While it is extremely difficult to detect a very small population of animals in an expansive ecosystem, DNA hair-sampling and catch per unit effort models can be a useful method to evaluate relative densities and numbers of animals in threatened grizzly bear populations.

LANDSCAPE PLANNING FOR WASHINGTON STATE'S WILDLIFE: MANAGING FOR BIODIVERSITY IN DEVELOPING AREAS. **Joanne P Schuett-Hames, Erik A Neatherlin,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **Jeff M Azerrad,** *Washington Department of Fish and Wildlife, Vancouver, WA 98661;* **Tiffany L Hicks, John E Jacobson,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **Michelle J Tirhi,** *Washington Department of Fish and Wildlife, Kent, WA 98032;* **George F Wilhere,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **schuejps@dfw.wa.gov.**

As Washington State absorbs 1.6 million people in the coming decades, where and how residential development occurs will determine the fate of many wildlife species. Most local governments address habitat protection through critical area ordinances (CAOs) which effect site-level projects and are invoked only when issuing project permits. Although CAOs require some protective measures, such as stream buffers and upland habitat retention, which species will actually persist is poorly understood. To get beyond site-scale, short-term thinking, the Washington Department of Fish and Wildlife is developing a guidance document to help land-use planners evaluate which species may be lost or retained in response to different types and intensities of development. This document is based on an extensive literature review coupled with input from teams of scientists and land-use planning experts. Residential development is considered at three spatial scales. First, county-wide recommendations help planners determine important areas for retaining habitat and maintaining connectivity. Second, at a mid-scale, areas are evaluated for landscape metrics (e.g., patch size) that indicate how well an area may support various species. The third scale addresses individual developments and describes actions (e.g., retention of amphibian upland active season habitat) to minimize impacts to wildlife. We anticipate this approach will promote "smart growth" by facilitating landscape-level planning and providing a better understanding of how residential development may impact wildlife.

MISTLETOES AND WILDLIFE IN THE PACIFIC NORTHWEST: A REVIEW. **David C Shaw,** *Department of Forest Science, Oregon State University, Corvallis, OR 97331;* **dave.shaw@oregonstate.edu**

There are two groups of perennial hemiparasitic mistletoes (Family Viscaceae) in the Pacific Northwest, the leafy mistletoes (*Phoradendron* spp.) associated with oaks, junipers and incense cedar, and the dwarf mistletoes (*Arceuthobium* spp.) associated with trees in the Pinaceae. The relationship between mistletoes and wildlife is complex and differs between these two groups. The leafy mistletoes are shrubs that can attain large size (1 m or more tall) and depend on birds to disperse the seed, which is in a berry on the female plant. Leafy mistletoes do not cause deformation of the tree stem, although swellings can form, and may be associated with heartrot in later stages of development. Leafy mistletoe berries may be an important fall food source for some birds, but much is to be learned in the PNW. Dwarf mistletoes have leaves that are reduced to scale-like appendages, and the plants are usually small (< 10 cm tall). The plant does not depend on the aerial shoot for survival, and is considered "more" parasitic on the tree. Many dwarf mistletoes cause serious deformation of the tree and create complex structures, such as witches brooms (dense clusters of branches). Birds and mammals use witches brooms for nesting, roosting and shelter. The berries are not thought to be important wildlife food, although the shoots are eaten by some mammals. Dwarf mistletoes have explosively discharged seeds, which is the primary mechanism for local dispersal. However there is evidence that animals provide long distance dispersal of seed.

MODELING AND MAPPING GREATER SAGE-GROUSE REPRODUCTIVE HABITAT AT THE LANDSCAPE-LEVEL. **Jay F Shepherd, Kerry P Reese,** *Department of Fish and Wildlife, College of Natural Resources, University of Idaho, Moscow, ID 83844;* **John W Connelly,** *Idaho Department of Fish and Game, 1345 Barton Road, Pocatello, ID, 83204;* **shep9737@uidaho.edu.**

Probable causes of greater sage-grouse (*Centrocercus urophasianus*) declines include various forms of habitat degradation, reduction, and fragmentation. Prescribed and natural fire, exotic plant invasions, mechanical or chemical treatments, and conversion to agricultural use has fragmented shrubsteppe habitat. Many studies have attempted to understand microhabitat-level habitat use by sage-grouse, yet at larger scales, the use of habitat has been studied much less and with limited methods. Our objectives were to quantify greater sage-grouse reproductive habitat use at the landscape level. We used remotely- sensed vegetation data to obtain landscape variables that measure habitat composition and heterogeneity. Landscape-level variables were obtained at several extents, including 150 and 450 meter buffered sage-grouse locations, and 70% fixed kernel home ranges. Using non-correlated landscape metrics, we explain nest and brood rearing success at various extents. The models were used in conjunction with discriminant analysis and other methods to map potential

reproductive habitat at the 150- and 450-m extents within a variety of study areas and jurisdictional boundaries. There is an increased need for the development of empirical methods using remotely-sensed data to understand habitat issues at the landscape level.

NUTRITIONAL REQUIREMENTS AND DIET CHOICES OF THE PYGMY RABBIT: A SAGEBRUSH SPECIALIST. **Lisa A Shipley, Tara B Davila, Nicole J Thines, Becky A Elias,** *Washington State University, Pullman, WA 99164-6410;* **Shipley@wsu.edu**

Sagebrush (*Artemisia tridentata*) comprises up to 99% of the winter, and 50% of the summer, diets of pygmy rabbits (*Brachylagus idahoensis*), despite its high concentrations of monoterpenes. Few animals specialize on plants like sagebrush that contain high levels of toxic plant chemicals. We investigated the nutritional requirements of pygmy rabbits and their consumption of sagebrush alone and as part of a mixed diet. We compared diet choices of pygmy rabbits with that of the generalist-forager, the eastern cottontail (*Sylvilagus floridanus*). Pygmy rabbits had a moderately-low nitrogen requirement (338.5 mg N/kg.75/d), but a relatively high energy requirement, needing 471.7 KJ digestible energy per day to maintain their body mass. They digested fiber similarly to other small hindgut fermenters, but both rabbit species digested the fiber in sagebrush better than expected based on its indigestible lignin component. Pygmy rabbits consumed more sagebrush than cottontails, regardless of the amount and nutritional quality of supplemental pellets provided. When consuming sagebrush alone, pygmy rabbits ate barely enough to meet their energy requirements, whereas cottontails ate only enough to meet 67% of theirs. Both rabbit species ate more sagebrush as the quality and quantity of supplemental pellets declined, and selected sagebrush grown in the greenhouse over that grown outside. Urine became more acidic as the amount of sagebrush in the diet increased, indicating detoxification by the liver. Pygmy rabbits do not require sagebrush to survive, but seem to have a greater capacity to avoid or detoxify monoterpenes in the sagebrush they eat than do cottontails.

BARRED OWL MOVEMENTS IN EASTERN WASHINGTON. **Peter Singleton, Scott Graham,** *USDA Forest Service, PNW Research Station, 1133 N. Western Ave., Wenatchee, WA 98801;* **William Gaines,** *USDA Forest Service, Okanogan and Wenatchee National Forests, 215 Melody Ln., Wenatchee WA, 98801;* **John Lehmkuhl,** *USDA Forest Service, PNW Research Station, 1133 N. Western Ave., Wenatchee, WA 98801;* **psingleton@fs.fed.us**

Movements of radio-tagged barred owls (*Strix varia*) have been monitored from April 2004 to March 2006 to study barred owl ecology in fire-prone forests. Our study area encompasses 30,900 ha of dry to mesic mixed conifer forest in the Wenatchee River Ranger District, Wenatchee National Forest. Call surveys for barred owls in our study area identified 18 barred owl pair sites. Seasonal (summer; March 1 to September 30, or winter; October 1 to February 28) home ranges have been documented through radiotelemetry at 11 of the 18 pair sites. Mean minimum convex polygon home range size was 223 ha for summer 2004 (n = 4), 282 ha for winter 2004-05 (n = 5), 197 ha for summer 2005 (n = 11), and approximately 445 ha for winter 2005-06 (n = 7, data to January 27, 2006). We will include a brief discussion of preliminary findings from habitat analysis in this presentation.

RESTORING FIRE IN LAVA BEDS NATIONAL MONUMENT, CALIFORNIA: SHORT-TERM EFFECTS OF PRESCRIBED FIRE ON BIRD DIVERSITY AND ABUNDANCE. **Jaime L Stephens, John D Alexander,** *Klamath Bird Observatory, Ashland, OR, 97520;* **Mary C Rasmussen,** *Grand Canyon National Park, Grand Canyon, AZ, 86023;* **Nathaniel E Seavy,** *Department of Zoology, University of Florida, Gainesville, FL 32611-8525;* **jlh@klamathbird.org.**

In an effort to restore natural disturbance regimes to Lava Beds National Monument in northern California, the National Park Service has implemented a prescribed fire program. In 2003, the "South Boundary" prescribed fire burned 570 hectares of the monument. To evaluate the effects of this prescribed fire on shrubsteppe bird communities, we collected data on bird abundance in the fall (1 year pre-fire and 2 years post-fire) and spring (2 years post-fire). There was no evidence that prescribed fire influenced the average number of bird species detected per station in both the spring and fall. Nor was there an effect on the total number of species detected in burned and unburned areas during spring. During fall, more species were observed on the burned area in both years following the fire than the year before the fire. There was no evidence that any species were more or less common at burned stations than at unburned stations during the first spring after the fire. However, in the second year after the fire, rock wrens (*Salpinctes obsoletus*) and Brewer's blackbirds (*Euphagus cyanocephalus*) were more common at the burned stations. In the fall, dark-eyed juncos (*Junco hyemalis*) were more abundant at burned stations during both years after the fire. These results suggest that prescribed fire in Lava Beds National Monument has created conditions favored by bird species that are characteristic of early successional conditions created by natural disturbances.

EFFECTS OF FOOD AVAILABILITY ON THE DISPLAY OF DOMINANT BEHAVIOR AND ENFORCEMENT OF GROUP HIERARCHY IN *CANIS LUPUS*. **David P Stiles,** *The Evergreen State College, PO Box 60334, Olympia, WA 98505;* **stidav22@evergreen.edu.**

During the spring and winter of 2005 and winter of 2006, I observed captive wolves (*Canis lupus*) at Northwest Trek (NWT) and free-ranging wolves at Yellowstone National Park (YNP) to determine whether food availability had any effect on group dynamics. I

focused on two elements: the display of dominant/aggressive behavior and the enforcement of pack hierarchy. Food in the form of dry kibble was available continuously at NWT, whereas wild wolves in YNP were required to hunt for food. I observed dominant/aggressive behavior only in the captive wolves. Free-ranging wolves were not seen to display dominant/aggressive behavior towards pack mates, although submissive behavior was documented.

THE GLOBAL DECLINE OF AMPHIBIANS: CURRENT TRENDS AND FUTURE PROSPECTS. **Simon N Stuart, Janice C Chanson, Neila A Cox,** *IUCN/SSC - CI/CABS Biodiversity Assessment Initiative, Center for Applied Biodiversity Science, Conservation International, 1919 M Street NW, Suite 600, Washington, DC 20036;* **Bruce E Young,** *Natureserve, apartado 75-5655, Monteverde, Puntarenas, Costa Rica;* **Robin D Moore,** *Conservation International, 1919 M Street NW, Suite 600, Washington, DC 20036, USA;* **rdmoore@ci.conservation.org**

Over 520 herpetologists contributed to a study concluded in 2004, which showed that amphibians are much more threatened, and are declining much more seriously than either birds or mammals. Almost one-third of amphibian species are at elevated risk of extinction, and the number of species of the edge of extinction has almost doubled since 1980. Between 9 and 129 species have become extinct since 1980. There are three major causes of recent amphibian declines: a) extensive habitat loss, especially in tropical rainforests; b) over-harvesting by humans; and c) poorly-explained declines (probably mostly due to disease, perhaps exacerbated by climate change). The third of these types of decline has become the most serious in terms of driving species rapidly towards extinction. At present, these poorly explained declines have been confined mainly to the Americas and Australia, but there are recent signs that they are spreading, for example in Africa, Europe and New Zealand. New techniques are necessary to contain these declines; otherwise hundreds amphibian species could become extinct in the next few decades.

VARIATIONS IN FISH SPAWNING-FLOW TIMING IN WASHINGTON DESERT STREAMS OF THE MID-COLUMBIA. **Robert L Vadas Jr,** *Habitat Program, Washington Department of Fish and Wildlife, Olympia, WA 98501-1091;* **vadasrlv@dfw.wa.gov.**

During 2003-2005, collaborative spawning surveys via redd, adult, and/or carcass counts were carried out on several Douglas County, Washinton, desert streams to assess spawning periodicity relative to flow and temperature conditions for steelhead/rainbow trout (*Oncorhynchus mykiss*) and *Catostomus* suckers. Of special interest was the noticeable timing differences in rainbow trout spawning among streams; warmer streams and stream sections showed earlier spawning. These differences in spawning periodicity among streams (i.e., late winter to mid-summer) correspond with differences in appearance of emergent (small) trout fry. Although the literature indicates that rainbow trout have a similarly wide collective periodicity for spawn timing, much of this variation is associated with large-scale geographic variation, rather than the smaller-scale variation seen here. This study revealed spawning temperatures of (a) 10-16°C (midpoint 13°C) for rainbow trout, based on spatiotemporally averaged temperatures (SATs) when possible/incipient and probable/definite (PD) redds were found; (b) 8-15°C (midpoint 11.5°C) for steelhead, based on SATs when PD redds, adults, and carcasses were found; and (c) 9-11 (under assessment) to 15°C (midpoint 12-13°C) for *Catostomus* suckers, based on SATs when adults were found. These results suggest that spawning occurs at somewhat colder temperatures for (a) steelhead than resident fishes or (b) Foster Creek than more-southern streams. This information will be used to develop habitat-suitability models to estimate optimal spawning temperatures for these three fish taxa, which should be useful for estimating spawning periodicity for flow-setting elsewhere on the arid, east side of the mid-Columbia and in upper Columbia River tributaries above Grand Coulee Dam.

MANAGING WILDLIFE ON BRIDGES. **Sharon A Vecht, Marion Carey,** *Washington State Department of Transportation, Olympia, WA 98504-7331;* **careym@wsdot.wa.gov**

The Washington State Department of Transportation's (WSDOT) bridges are inhabited by wildlife species that are protected by state and federal wildlife regulations. Notably peregrine falcons have taken-up residence on several WSDOT bridges in the past decade and the largest pelagic cormorant nesting colony in the state occurs on a WSDOT bridge. WSDOT is charged with maintaining safety on over 3,000 bridges and delivering bridge maintenance and repair projects in a cost effective and environmentally responsible manner. Potential conflicts between wildlife and bridge inspection, maintenance, and construction activities occur due to overlap of wildlife breeding seasons with these activities. WSDOT manages wildlife that inhabits state bridges to avoid or minimize impacts on wildlife while necessary maintenance and repairs are conducted. Wildlife impacts are avoided by tracking species that inhabit state bridges, providing training to bridge workers, and implementing conservation measures. For weather sensitive activities that must occur during nesting periods and/or multi-year projects where impacts may not be entirely avoidable, a management plan is created with state and federal agency input to address management of individual species and compliance with wildlife regulations. Management activities can come at a high cost for projects requiring delays, long term monitoring, nest manipulations, and rearing of birds at private facilities. WSDOT's challenge is to effectively protect wildlife resources while ensuring public safety and providing stewardship of public tax dollars.

HABITAT ANALYSIS OF MOUNTAIN GOATS IN THE WASHINGTON CASCADES. **David O Wallin, Adam G Wells,** *Western Washington University, Huxley College, 516 High St., Bellingham, WA 98225-9181;* **David.Wallin@wwu.edu.**

Seasonal variation in habitat selection for the mountain goat (*Oreamnos americanus*) is not well understood due to the difficulties of monitoring animal movement in all months of the year. The use of GPS wildlife telemetry collars offers an opportunity to overcome this obstacle. We analyzed two full years of data from over 40 GPS collared mountain goats in the Washington Cascades. Our data set included over 85,000 locations. Each location was weighted to correct for known bias in GPS position acquisition rate that associated with vegetation and topography. We used a weighted logistic regression procedure with Akaike's Information Criteria (AIC) to choose the most parsimonious model out of an a priori selected set of models. Predictor variables were derived from vegetation layers developed by the Interagency Vegetation Mapping Project (IVMP) and a 10 m digital elevation models (DEM). Candidate models were developed on the basis of ecological relevance and available GIS data. Based on previous studies, distance to escape terrain is known to be a particularly important predictor of habitat. Habitat maps were generated within a GIS to assist with future management activities and ecological studies of Washington's endemic mountain goat populations.

GPS BIAS CORRECTION IN THE WASHINGTON CASCADES. **Adam G Wells, David O Wallin,** *Western Washington University, Huxley College, 516 High St., Bellingham, WA 98225-9181;* **David.Wallin@wwu.edu.**

Satellite acquisition problems associated with global positioning system (GPS) wildlife telemetry collars create an observational bias of animal locations towards areas of favorable signal reception. In order to correct for this bias, we used logistic regression with Akaike's Information Criteria (AIC) and a generalized estimating equation (GEE) to develop a statistical model to predict GPS position acquisition rate (PAR) across the entire Cascade Mountain Range in Washington State. Predictor variables were derived from vegetation layers developed by the Interagency Vegetation Mapping Project (IVMP) and a 10 m digital elevation models (DEM). GPS success in the field was sampled at 543 locations using Vectronic-Aerospace GPS collars. At each site a collar was left in place for 24 hours and programmed to log a position every 30 minutes. Sample sites were selected to represent the full range of vegetation and topography that exist in our study area. Our final model had an area under the receiver-operating curve (ROC) of 0.70. This final data layer was used with an inverse weighting scheme to reduce the GPS observational bias in a seasonal habitat analysis of GPS collared mountain goats (Oreamnos americanus) in the western Cascades of Washington.

BRIGHT COLORATION IN THE SILVER SURFPERCH, ***HYPERPROSOPON ELLIPTICUM*** **(TELEOSTEI: EMBIOTOCIDAE).** **Michael F Westphal,** *Department of Zoology, Oregon State University, 3029 Cordley Hall, Corvallis, OR 97331;* **Steven R Morey,** *U.S. Fish and Wildlife Service, Science Support Program, 911 NE 11th Ave (4th Floor), Portland, OR 97232;* **westphm@science.oregonstate.edu.**

Descriptions of the silver surfperch typically mention the occurrence of orange pigmentation on the anal fin, but no worker has yet proposed a hypothesis for the function of these markings. Several aspects of the reproductive physiology of this species suggest a role for anal fin pigmentation in courtship and mating: surfperch have internal fertilization, and this is achieved by the seasonal thickening of the male anal fin into a gonopodium. We assessed variation for this trait in a sample of breeding silver surfperch. We found variation in orange pigmentation to be high, but this variation was not correlated with gender, suggesting that this trait is not sexually dimorphic. Observing that silver surfperch are sympatric with a superficially similar congener, the walleye surfperch Hyperprosopon argenteum, we speculate that the marks may serve as species recognition signals rather than sexual badges or ornaments.

INCREASING CANOPY HETEROGENEITY TO CREATE STRUCTURAL AND BIOLOGICAL COMPLEXITY IN YOUNG, MANAGED FORESTS. **Todd M Wilson,** *USDA Forest Service, PNW Research Station, Olympia, WA 98512;* **twilson@fs.fed.us.**

Young, simplified forests currently dominate much of the managed landscape in the Pacific Northwest. Increasing canopy heterogeneity through variable-density thinning (VDT) has been suggested as one way to help stimulate key ecological processes in these forests that, over time, can lead to structurally and biologically complex forests-forests that provide habitat for a wide range of organisms, including old growth associated species like northern spotted owls (*Strix occidentalis caurina*). Two large-scale experimental studies-The Forest Ecosystem Study in the Puget Trough and the Olympic Habitat Development Study on the Olympic Peninsula-were initiated in the early 1990s to test this hypothesis. Treatment effects were measured by monitoring key biotic communities in fifty-one stands, including arboreal rodents (squirrels and chipmunks), forest-floor small mammals (mice, voles, and shrews), resident and neotropical birds, terrestrial amphibians, mycorrhizal fungi, litter invertebrates, and under-, mid-, and over-story vegetation. Overall results to date suggest that (1) VDT had positive or neutral effects for most (but not all) organisms 2-11 years post-thinning; (2) prior management history had a major influence on treatment effects and stand trajectories; (3) future success in accelerating complexity may depend on managing for site-specific issues such as laminated root rot and competitive exclusion by clonal natives; and (4) VDT appears promising

as part of a suite of new eco-silviculture tools to create healthy forests that provide sustainable habitats for a wide range of plant and wildlife communities, including threatened and endangered species.

IMPACTS OF FOREST HARVEST ON SMALL PONDS AND AMPHIBIANS. **Elke Wind,** *E. Wind Consulting, Nanaimo, BC V9R 2G9;* **ewind@telus.net.**

Studies have shown that forest harvesting can reduce the abundance of amphibians in terrestrial environments, but few studies have investigated impacts on lentic aquatic habitats. Most amphibian species in the Pacific Northwest live in forests and breed in standing water, often laying their eggs in small, seasonal ponds that offer protection from predation. However, in British Columbia small ponds are not afforded protection under the Forest and Range Practices Act and the effects of forest harvesting on these habitats and the importance of riparian buffers are unknown. In 2002, I began a study with Weyerhaeuser's BC Coastal Group to investigate whether amphibians and small ponds were useful indicators to evaluate the effectiveness of variable retention (VR) harvesting methods at maintaining biodiversity. Weyerhaeuser's VR harvesting methods often result in the retention of tree patches around small ponds, so I initiated a pre- and post-harvest buffer experiment at three forested sites slated for harvest in 2004/2005. Results to date suggest that immediately after harvesting small ponds on south-eastern Vancouver Island have longer hydroperiods compared to pre-harvest conditions and that amphibians continue to breed in these habitats, with some species appearing to be attracted to the reduced canopy-cover conditions. However, the survival rate of larvae in cutover areas may be reduced based on the detection rate of larvae and metamorphs in harvested versus unharvested areas. As a result, creative retention solutions may be necessary to maintain adequate cover and microclimate conditions for amphibians within harvested landscapes.

ECOLOGICAL IMPACTS OF THE BLACK BEAR SUPPLEMENTAL FEEDING PROGRAM IN WESTERN WASHINGTON. **Georg J Ziegltrum,** *Washington Forest Protection Association, Olympia, WA 98501;* **gziegltrum@wfpa.org**

The Washington Forest Protection Association (WFPA) developed the black bear (*Ursus americanus*) spring supplemental feeding program to protect conifers from the bears' tree girdling and feeding on the newly forming phloem. I concluded previously that the supplemental feeding program in western Washington, USA, was a viable and cost effective non-lethal damage control tool for the forest products industry. Consequently, I summarized cooperative research efforts in Washington over the last 6 years and described the ecological impacts of the supplemental feeding program on: 1) behavioral characteristics of bears; 2) the population density of bears and reproductive success; 3) the nutritional status of bears; 4) the home range size of bears; 5) the benefits of bear conifer damage to cavity nesters; and 6) bear/human conflicts. Videos of motion sensor activated cameras at feeding stations showed little antagonistic behavior of bears. Supplemental feed did not influence the bear's reproductive success. Numbers of bears at feeding stations increased annually because sows brought their cubs to feeding stations which returned alone 2 years later. Few bears with home ranges outside feeding areas were drawn into feeding stations. Bears using feeding stations gained weight faster then bears without access to pellets but lost this advantage before winter denning. The bears' home range sizes were not changed by the feeding program. The bears' tree girdling created snags which benefited cavity nesters. No conflicts of bears with humans around feeding stations were ever reported. I concluded that the black bear spring supplemental feeding program, as currently used on private lands, had no ecological impact of concern.

Hoodsport, WA
ca. 1900

RECOVERY EFFORTS FOR THE NORTHERN LEOPARD FROG (*RANA PIPIENS*) IN BRITISH COLUMBIA, 2001-2005. **Doug Adama,** *Adama Wildlife and Columbia Basin Fish and Wildlife Compensation Program, Golden, BC V0A 1H0;* **adamawildlife@uniserve.com**

Confined to a single 400-hectare wetland in southeastern British Columbia, the southern mountain population of the northern leopard frog (*Rana pipiens*) is listed as "Endangered" by the Committee of the Status of Endangered Wildlife in Canada and protected under the Federal Species At Risk Act. Recovery efforts underway since 2001 include head-starting, reintroduction, habitat enhancement and population monitoring. During this five-year period, 10,147 *Rana pipiens* tadpoles (Gosner stage 30) and 14,487 *Rana pipiens* metamorphs were reared in captivity and released into the wild. Habitat enhancement has entailed channelization and vegetation control. In the final year of the project we documented successful breeding at two new sites of which one was "enhanced" the previous year. Our results suggest that reintroduction can be a viable recovery method for pond-breeding amphibians, particularly when coupled with habitat enhancement. While these results are positive, the population remains extremely vulnerable and recovery efforts are confounded by the presence of the chytrid fungus, *Batrachochytrium dendrobatidis*.

OVER-WINTERING LARVAE OF BULLFROGS (*RANA CATESBEIANA*) AS BIOLOGICAL RESERVOIRS OF THE PATHOGEN CAUSING CHYTRIDIOMYCOSIS (*BATRACHOCHYTRIUM DENDROBATIDIS*) IN TRINITY CO., CALIFORNIA. **James B Bettaso,** *U. S. Fish and Wildlife Service, Arcata, CA 95521;* **Lara J Rachowicz,** *Department of Integrative Biology, University of California, Berkeley, California 94720; Yosemite National Park, El Portal, CA 95318;* **Jamie_bettaso@fws.gov; lara_rachowicz@nps.gov.**

Invasive species have been recognized as one of four future challenges in the next twenty years by the USFWS and USGS. Threats posed by invasive species to native species include predation, competition, and spread of pathogens. The term "pathogen pollution" has been put forth for the spread of new or novel pathogens from invasive species to native species as a result of anthropogenic introduction of diseased animals into new geographical locations. Bullfrogs were brought into California in the late 1800's for a potential food crop and have since been established throughout the state. Adult bullfrogs have been recognized as potential carriers of the fungal pathogen, *Batrachochytrium dendrobatidis*, which has been associated with die-offs and population declines of numerous amphibian species. From October 2004 to April 2005, we conducted monthly collections and surveys of bullfrog larvae from a pond in Trinity Co., California, a site where native amphibians (*Bufo boreas* and *Hyla regilla*) are known to overlap with bullfrogs during the breeding season. We collected and tested bullfrog larvae to determine if they were infected with *B. dendrobatidis*, using mouthpart examinations and real-time PCR. Bullfrog larvae from the hatch year of 2003 were found to be infected with *B. dendrobatidis* through out the winter, although younger larvae from hatch year 2004 were not infected. Therefore, bullfrogs may act as biological reservoirs of the fungal pathogen, *B. dendrobatidis,* to the native amphibians during the spring/summer breeding season.

CHANGES IN THE ABUNDANCE OF MARBLED GODWITS IN COASTAL WASHINGTON. **Joseph B Buchanan,** *Washington Department of Fish and Wildlife, 600 Capitol Way North, Olympia, WA 98501;* **buchajbb@dfw.wa.gov.**

Marbled godwit (*Limosa fedoa*) abundance in Washington has increased dramatically in recent decades. I summarized seasonal data obtained from published field notes or my own observations from winter (November through February; 26 of 30 years between 1975-76 and 2004-05), spring (April; 23 of 38 years between 1967 and 2004) and autumn (August through October; 29 of 42 years between 1963 and 2004). In all seasons Marbled godwit numbers increased dramatically since the 1960s or 1970s, when most counts were <36 birds. Recent high counts were 1500 (winter), 675 (spring), and 800 (autumn). There are at least three possible explanations for the dramatic increases in marbled godwit abundance. First, the increases may reflect better coverage of the site by bird watchers and ornithologists in recent years. This seems an unlikely explanation as these birds are highly visible and have used the same foraging and roosting sites for more than three decades. Second, the increases may reflect actual population changes. Third, the increase may represent a shift in godwit distribution from further south. There are currently no data to evaluate the second and third hypotheses, which may not be mutually exclusive. The breeding distribution of godwits that occur as winter residents and migrants in Washington is unknown. Efforts to resolve this uncertainty may facilitate a better understanding of the factor(s) resulting in greater abundance of marbled godwits in coastal Washington.

SLOW RECOVERY OF HEADWATER HABITATS AND STREAM AMPHIBIANS TO LOGGING IN WESTERN OREGON. **R Bruce Bury, Stephanie Wessell, Willow Wegner,** *USGS Forest and Rangeland Ecosystem Science Center, 3200 S.W. Jefferson Way, Corvallis, OR 97331;* **Bruce_Bury@usgs.gov**

The Pacific Northwest harbors a rich amphibian fauna, including several endemic species that are the dominant vertebrates in headwater streams. However, we lack knowledge on the long-term effects of timber harvest on amphibians in aquatic and riparian habitats. Past studies suggest that clearcut logging effects may result in the local extirpation or reduced abundance of stream amphibians through decreased canopy cover and increased sedimentation and water temperatures. Some riparian and aquatic amphibian species

occupy a narrow range of habitats and may thus be particularly susceptible to environmental perturbations. We compared the occurrence and abundance of four aquatic amphibian species (*Dicamptodon tenebrosus*, *Ascaphus truei*, *Rhyacotriton variegatus*, and *Plethodon dunni*) along streams flowing through unharvested (mature or old-growth) forests to streams flowing through forests clearcut in 1945-1971. We conducted stream surveys in 1985, 1996, and 2005. Results indicate a general trend of decreasing amphibian occurrence in unharvested forest streams, perhaps related to logging around these forest patches. Conversely, there were increases in species richness and occurrence in logged streams over time. The species richness of streams in logged stands was approximately half that of unharvested stands in 1985 but was not significantly different in 2005. Results of 1985 surveys indicated that streams in logged stands had generally finer substrates than streams in unharvested stands while 2005 surveys showed no differences in stream substrate. Our results suggest a delayed recovery of 3-6+ decades for stream amphibians and stream substrate following clearcut timber harvest in western Oregon.

PHYLOGEOGRAPHY OF WOOD FROGS (*RANA SYLVATICA*): MTDNA CYTOCHROME B SEQUENCES INDICATE A DEEP EAST-WEST DIVISION, **Stan Cox, Joseph Fry, R Steven Wagner, Jason Irwin,** *Biological Sciences, Central Washington University, 400 E University Way, Ellensburg, WA 98926;* **irwinj@cwu.edu**

Historical morphological studies of the wood frog (*Rana sylvatica*) divided the species into several morphotypes. To examine the validity of the morphotypes, a phylogeographical analysis of the species was performed. Wood frogs were sampled across their very broad distribution from South Carolina to Ontario (Canada) and across to western Canada and Alaska, as well as relict populations in Arkansas and the Rocky Mountains. The mitochondrial cytochrome b gene sequences were used to construct phylogenetic trees to investigate population relationships. Results indicate a deep division between populations in eastern North America and those in the West. A relict population in Arkansas contained both of the haplotypes. There was little sequence variation within the two major clades, suggesting a rapid recolonization following glaciation.

EVALUATING TERRESTRIAL GASTROPODS AS INDICATORS FOR MONITORING THE EFFECTS OF ALTERNATIVE BUFFER CONFIGURATIONS ALONG HEADWATER STREAMS. **Alex D Foster,** *PNW Research Station, Olympia, WA 98512;* **Joan Zieglтrum,** *Olympic National Forest, Olympia, WA 98512;* **alexfoster@fs.fed.us**

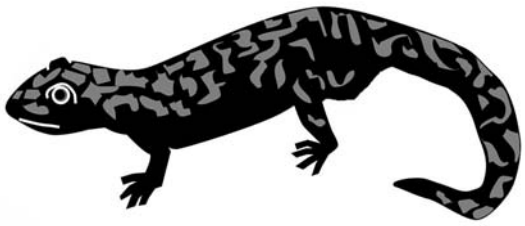
We are evaluating different buffer configurations and their effects on terrestrial gastropod populations along small headwater streams in SW Washington State. Study streams are located in two geologically distinct areas: Capitol Forest, located immediately west of the city of Olympia, and the Willapa Hills located along the Washington Coast. A total of 2190 gastropods were collected in Capitol Forest and 1548 were collected at the Willapa sites before timber harvest began. The ratio of snails to slugs was 22:1 at the Capitol sites and 15:1 at the Willapa sites. At both areas, snail abundance was lowest during the early fall and late spring, yet slugs did not follow this general trend. Diversity was highest at Capitol Forest with 14 snail species present; with the small snails *Columella* sp. and *Vertigo* sp. dominating the mollusk community at 44% and 20% respectively. Out of the 10 slug species detected at Capitol Forest, the warty jumping slug (*Hemphillia glandulosa*) made up 43% of the slug community, with the Malone's jumping slug (*H. malonei*) comprising 23% and the Pacific banana slug (*Ariolimax columbianus*) comprising 12%. At the Willapa sites, tightcoil snails (*Pristiloma* sp.) made up 64% of the community with the Northwest Heperian snail (*Vespericola columbianus*) comprising 23%, and the Pacific banana slug dominated the slug community at 56%. The Malone's jumping slug was absent from the Willapa sites, in contrast to Capitol Forest where it existed sympatrically with the warty jumping slug. Microhabitats within riparian areas may have influenced abundance and diversity; however continued data collection will be required to evaluate seasonal variability and possible treatment effects.

LONG-BILLLED CURLEW MONITORING SURVEYS: METHODS FOR POPULATION ESTIMATES AND HABITAT ASSOCIATIONS ON THE HANFORD REACH NATIONAL MONUMENT. **Kevin Goldie, Heidi Newsome,** *U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, WA 99354;* **Kevin_Goldie@fws.gov.**

The long-billed curlew (*Numenius americanus*) is a large shorebird species that breeds in the short-grass and mixed-grass habitats of the Great Plains, Great Basin, Columbia Basin, and intermontane valleys of the western United States and Canada. Due to historic and on-going population declines, the long-billed curlew is categorized as "highly imperiled" in the U.S. Shorebird Conservation Plan. The long-billed curlew is identified as the highest priority breeding shorebird for the Hanford Reach National Monument. Beginning in 2005, monitoring survey protocols were developed and implemented to establish local base-line data for this species. The objectives of these surveys are: 1) to develop local population estimates of long-billed curlews, 2) to determine habitat relationships of breeding long-billed curlews, and 3) to develop maps of curlew breeding areas and habitats to facilitate future management decisions. Surveys use a double-observer technique and are completed between March 21 and April 15. Routes are assigned based on geographic information system (GIS) data of existing drivable roads, vegetation cover types, and local and landscape slope calculations. Data collected during these surveys is analyzed using Microsoft® Access and ESRI® ArcGIS®. Using topography, habitat, and observation and behavior data collected at each survey point, population estimates corrected for visibility, sightability, and detectability are calculated. Using bearing and distance data, and habitat data collected at each curlew location, curlew physical position is determined and compared to GIS vegetation

cover maps, slope maps, and other habitat related data sets. This comparison is used to both verify the GIS data sets and to analyze the habitat associations of the long-billed curlew.

USING AQUATIC ORGANISMS AS INDICATORS OF PERENNIAL STREAM FLOW. Mark A Golliet, *Green Diamond Resource Company, Shelton WA 98584;* **mgolliet@greendiamond.com.**



Perennial and seasonal headwater streams receive considerably different levels of protection under Green Diamond Resource Company's (GDRCo) Habitat Conservation Plan (HCP) for its Olympic Tree Farm. Determining the flow regime of these channels except during low-flow (e.g. late summer) conditions is problematic. Three species of stream breeding amphibians are present in the higher elevation areas of our tree farm and are used as indicators of perennial flow: Cope's giant salamander (*Dicamptodon copei*), tailed frog (*Ascaphus truei*) and Olympic torrent salamander (*Rhyocotriton olympicus*). Invertebrates (insect larvae, crayfish, snails etc.) are often found while searching streambed material for amphibians. We hypothesize that a suite of invertebrates, including large bodied stonefly larvae from the families Pteronarcyidae and Perlidae, *Megaloptera* larvae, crayfish (*Pacifastacus leniusculus*) and certain aquatic snails, are only found in perennial streams and that they may be suitable indicators of perennial stream flow. Study plans are being developed and sampling will be conducted in 2006 to test the validity of using the aforementioned aquatic organisms to identify perennial flow in headwater streams.

WASHINGTON HERP ATLAS. Lisa A Hallock, *Washington Natural Heritage Program, Washington Department of Natural Resources, Olympia, WA 98504-7014;* **Lisa.Hallock@wadnr.gov**

The on-line Washington Herp Atlas provides a summary of current information available on Washington's herpetofauna (amphibians and reptiles). It is designed to be accessible to a wide audience with little training in herpetology. Information is presented to help field personnel identify species, and also to provide planners and managers with information on status and possible management concerns. Species accounts feature descriptions, identification tips, phenology information, habitat types and photographs. Photographs include a variety of life stages, typical habitat and a set of annotated photographs with key identification features indicated. Dot distribution maps, updated annually from the Washington Department of Fish and Wildlife amphibian and reptile database, are included for each species. In addition, information is included on current research projects in Washington and on additional inventory and research needs. The Washington Herp Atlas Project is a cooperative project of the Washington Department of Natural Resources (DNR), Bureau of Land Management (BLM), Washington Department of Fish and Wildlife (WDFW), and US Forest Service (USFS). Web address - http://www.dnr.wa.gov/nhp/refdesk/herp/index.html

STEELHEAD MOVEMENTS AND WETLAND MANAGEMENT AT TOPPENISH NATIONAL WILDLIFE REFUGE. Ian G Jezorek, *U.S. Geological Survey, Cook, WA 98605;* **Howard W Browers, Molly F Linville,** *U.S. Fish and Wildlife Service, 3250 Port of Benton Boulevard, Richland, WA 99352;* **James H Petersen, Patrick J Connolly,** *U.S. Geological Survey, Cook, WA 98605;* **ian_jezorek@usgs.gov**

Toppenish National Wildlife Refuge was established in 1964 in Yakima County, Washington to provide wetland habitat for waterfowl and other birds. Wetlands are flooded in late fall by diverting water from Toppenish Creek. Wetlands are managed for aquatic food production with spring drawdowns and if needed, mechanical soil-manipulation. Toppenish Creek supports Mid-Columbia River steelhead (*Oncorhynchus mykiss*), which are listed as threatened under the Federal Endangered Species Act. Concerned about wetland management impacts to steelhead, Refuge staff and U.S. Geological Survey researchers began investigating juvenile steelhead use of Refuge wetland units. During spring 2002-2004, we tagged steelhead with Passive Integrated Transponder (PIT) tags (n = 1,304) to investigate passage through one or both of two wetland units (Unit 3A and Unit 3B). Steelhead were trapped, PIT tagged, and released at the unit entrances. We also trapped, tagged, and released juvenile steelhead at the Unit 3B exit, which feeds into Toppenish Creek. Detections at facilities on the Yakima and Columbia Rivers gauged performance from each release site. Each year, frequency of downstream detection for steelhead that traversed Unit 3B only (mean = 40.0%) and steelhead from the Unit 3B exit (mean = 36.9%) was about twice that of steelhead that traversed both Unit 3A and Unit 3B (mean = 15.4%). Travel times to the first downstream detection site (72 km downstream) were equivalent for steelhead from the one-wetland and two-wetland routes (means = 5.5 and 5.1 days). Strategies to reduce or eliminate impacts to steelhead are being implemented by Refuge staff.

DEMOGRAPHY AND NON-INVASIVE INDIVIDUAL IDENTIFICATION USING SPOT PATTERNS IN CHINESE SALAMANDERS (*PACHYTRITON BREVIPES***). Deborah Lackey,** *Department of Biological Sciences, Central Washington University, Ellensburg, WA 98926;* **Megan Matheson,** *Department of Psychology, Central Washington University, Ellensburg,*

WA 98926; **Lori Sheeran,** *Department of Anthropology, Central Washington University, Ellensburg, Washington 98926;* **Li Jinhua,** *Ecology, Anhui University, Hefei, People's Republic of China;* **R. Steven Wagner,** *Department of Biological Sciences, Central Washington University, Ellensburg, Washington 98926;* **Lackeyd@cwu.edu**

Amphibian demographic studies often involve invasive and potentially deleterious techniques for individual identification (e.g., toe-clipping, PIT tags, elastomers). During August 2006, digital images of ventral spot pattern variations were used to individually identify Chinese Paddle Tail Salamanders (*Pachytriton brevipes*) in the Valley of the Wild Monkeys (Huangshan, China). Abundance and movement of salamanders was compared among three different (100 m) elevational stream plots. During 18 survey days, a total of 46 salamanders were captured, including five recaptures, yielding an 11.0% recapture rate. On average per day, 0.33 + 0.03 (SE) salamanders were caught in the lower plot with 1.61 + 0.03 (SE) salamanders for the middle, and 0.39 + 0.03 (SE) salamanders in the upper headwater plot. For recaptures, movement of individuals was less than a meter, suggesting they may have small home ranges. In addition, spot patterning varied with snout-vent-length to provide an easy mechanism to assign age class. Variation and substrate location among the captures of juveniles (N = 8), sub-adults (N = 17), and adults (N = 16) suggests that juveniles may occupy drier more terrestrial habitats whereas adults are aquatic. *P. brevipes* is an understudied threatened mountain stream salamander; therefore, the identification technique is of vital importance for demographic and population viability studies.

DEFINITION AND PROTECTION OF COEUR D'ALENE SALAMANDER HABITAT IN BRITISH COLUMBIA. **Lisa I Larson, John S Richardson,** *University of British Columbia, Vancouver, BC V6T 1Z4;* **larsonl@interchange.ubc.ca.**

The Coeur d'Alene salamander (*Plethodon idahoensis*) occurs in northern Idaho, northwestern Montana, and southeastern BC (Special Concern in Canada and the US). The species is riparian dependent along small, high-gradient streams, with an apparently specialised habitat. Surveys for the species in recent years have expanded its known range to 95 km north of Revelstoke, BC. Given the limited range and numbers of occurrences in BC (n = 53), there is a requirement to better define the habitat associations of the species at the landscape scale, at the stream scale, and the microhabitat scale to identify important habitat features for different life stages and activities. The small streams with which it is associated are vulnerable to habitat disturbance; in particular forest harvest and road building that can yield sediment and toxic inputs. In the absence of more specific descriptions of the habitat use and population structure of this species in BC, it remains vulnerable to changes in its habitat with unknown consequences, although in general, changes to riparian habitat have large impacts on riparian-dependent species. Surveys for Coeur d'Alene salamanders have been concentrated on presence/not detected data from easily accessible roadside locations. The distribution and relative abundance of salamanders along watercourses has not been explored. The goal of this study is to determine associations between relative abundance of Coeur d'Alene salamanders and habitat types near Mount Revelstoke National Park. Methods to determine abundance-habitat associations will be based on geomorphology, hydrology, vegetation and climate between streams, along streams and at encounter locations.

TYPE N EXPERIMENTAL (PRESCRIPTION-LEVEL) BUFFER TREATMENT STUDY. **Aimee P McIntyre, Marc P Hayes,** *Washington Department of Fish and Wildlife, Olympia, WA 98502;* **William J Ehinger,** *Washington Department of Ecology, Lacey, WA 98503;* **Robert E Bilby,** *Weyerhaeuser, Federal Way, WA 98063;* **Tiffany L Hicks,** *Washington Department of Fish and Wildlife, Olympia, WA 98502;* **James G MacCracken,** *Longview Fibre Company, Longview, WA 98632;* **Timothy Quinn, Casey H Richart,** *Washington Department of Fish and Wildlife, Olympia, WA 98502;* **Dave Schuett-Hames,** *Northwest Indian Fisheries Commission, Olympia WA 98516;* **Andrew Storfer,** *Washington State University, Pullman WA 99164;* **mcintam@dfw.wa.gov**

The Type N Experimental Buffer Treatment Study will assess the effectiveness of the Forest and Fish Report (FFR) patch buffer prescriptions along non-fishbearing (Type N) streams in western Washington. The purpose of this study is to evaluate the relative effectiveness of alternative prescriptions in meeting FFR resource goals, which include the response of stream-associated amphibians (SAAs) to differing buffer strategies. We will compare one application of the FFR buffer to 2 alternative treatments (0% and 100% stream length buffered) and an unharvested reference. Blocks of four treatments will be replicated 5 times for a total of 20 sites. Differences in treatments will be measured in changes of amphibian occupancy and density (target SAAs are *Ascaphus*, *Rhyacotriton*, and *Dicamptodon* species), water quality, primary productivity, and elements exported to fishbearing streams (e.g., invertebrates). The proposed study timeline includes 2 years of pre- and 2 years of post-treatment data collection. The study design will enable at least one post-treatment sampling to occur 10 years after the application of treatments. This project involves interactive cooperation among 2 state and 2 federal agencies, 8 private landowners, and 2 Indian Nations. Site selection involves a 4-part process, and includes: GIS screening of available non-fishbearing basins meeting size, elevation, gradient, and geology criteria; acquisition of landowner information including stand age and projected harvest; field verification of GIS information and target amphibian presence; verification of non-fishbearing basin size based on electroshocking data. Analyses will distinguish potential differences among treatments, and assess the ability of each alternative buffer prescription to maintain headwater habitat and system functions.

THE INTERNATIONAL CANOPY NETWORK: A PATHWAY OF GLOBAL COMMUNICATION TO FOSTER FOREST CANOPY RESEARCH, EDUCATION, AND CONSERVATION. **Nalini M Nadkarni, Anne CS Fiala, Hannah E Anderson,** *The Evergreen State College, Olympia, Washington 98505;* **canopy@evergreen.edu.**

The International Canopy Network (ICAN) was created in 1994 to facilitate communication among individuals and institutions concerned with research, education, and conservation of organisms in tree crowns and forest canopies. Prior to ICAN's establishment, the field of canopy studies suffered from a lack of communication pathways among diverse disciplines, institutions, and individual researchers. ICAN is devoted to facilitating the continuing interaction of people concerned with forest canopies and forest ecosystems around the world. ICAN is a non-profit organization supported by a global community of scientists, conservation advocates, canopy educators, and environmental professionals. Core activities of ICAN include maintenance of an electronic mail bulletin board, circulation of a quarterly newsletter and member directory, organization of canopy symposia, maintenance of a citations bibliographic database, and creation of instructional and outreach materials about forest canopies for children and adults.

A PROPOSAL FOR MONITORING WASHINGTON'S BIODIVERSITY USING CITIZEN SCIENCE. **D John Pierce,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **Karen M Dvornich,** *University of Washington School of Aquatic Sciences, Seattle, WA 98195;* **Margaret Tudor,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **piercdjp@dfw.wa.gov.**

In 2004, Governor Locke established the Washington Biodiversity Council to develop and promote more effective ways of conserving the biodiversity in Washington. At the same time the Governor's performance agreement with the Washington Department of Fish and Wildlife included the establishment of a Biodiversity Index for the state. In order to meet the expectations of the Governor and needs of the Biodiversity Council, we need help. We believe that citizen science is not just a nice idea that should be considered as an optional strategy for conservation. It must be a requirement. The design, development and integration of an organized Citizen Science Network into the monitoring strategy of all Comprehensive Wildlife Conservation Strategies is the only way we are going to achieve the long-term goals for conservation and biodiversity. We propose establishment of a Citizen Science network, organized according to Ecoregions in the state. The foundation of the network will be K-20 Schools, and non-governmental organizations. Volunteer adults, teachers, parents, and students will be charged with collecting biodiversity data using NatureMapping techniques according to scientifically designed protocols and plot locations. These data will be coupled with Agency and other professionally collected data to create a simple biodiversity index for Washington.

ESTIMATING THE AMOUNT OF SUITABLE SPOTTED OWL HABITAT ON NON-FEDERAL LANDS IN WASHINGTON. **D John Pierce, Joseph B Buchanan, Brian L Cosentino, Shelly Snyder,** *Washington Department of Fish and Wildlife, Olympia WA 98501;* **piercdjp@dfw.wa.gov.**

Forest Practices Rules for the Northern Spotted Owl (*Strix occidentalis caurina*) were adopted in May 1996. These rules, which apply to nonfederal lands, established 10 landscapes - known as Spotted Owl Special Emphasis Areas (SOSEAs) - wherein proposed harvest of suitable owl habitat would receive environmental review designed to provide a high level of protection. Under the rules, the level of habitat protection varied depending on whether habitat was located inside an owl management circle located inside or outside of SOSEAs or whether or not habitat lands were part of a Habitat Conservation Plan (HCP) approved by the U.S. Fish and Wildlife Service. In the summer of 2004 the Department of Natural Resources and WDFW entered into a cooperative agreement to gather information, as part of the Forest Practices Board's rule review, to assess the status and recent changes in spotted owl habitat on state and private lands affected by the Forest Practices Rules. The results presented on this poster address one of the primary objectives of this study: to estimate the amount of suitable spotted owl habitat in 2004 on lands affected by state and private forest practices.

CHEMOSENSORY RESPONSE TO PREY ODORS IN THE MASKED SHREW. **Fred Punzo,** *University of Tampa, Tampa, FL 33606;* **fpunzo@ut.edu**

Laboratory choice tests were conducted in an arena to test the responses of naive shrews (*Sorex cinereus*) to prey odors (cricket: Acheta domesticus). One end of the arena floor was divided into 3 equal sections and covered with paper that contained odor cues from crickets, a neutral (non-prey) odor (cologne), or tap water (control). Position of papers was randomly assigned for each trial. Shrews spent a significantly greater mean proportion of their time on cricket-conditioned paper (15.8 sec) compared to that spent on paper treated with cologne (5.7 sec) or water (6.1 sec). This represents the first demonstration for the innate ability of a shrew to detect chemosensory cues associated with a naturally-occurring prey species. The potential impact of this capability on patch residence time and shrew foraging patterns is discussed.

WASHINGTON TERRESTRIAL SLUGS AND SNAILS. **Casey H Richart, Marc P Hayes,** *Washington Department of Fish and Wildlife, Olympia WA 98501;* **William P Leonard,** *Washington State Department of Transportation, Olympia WA 98501;* **richachr@dfw.wa.gov**

Terrestrial gastropods are an important but often unrecognized component of ecosystems in Washington State. Washington State currently harbors 106 recognized species of terrestrial gastropods that represent 3 orders, 25 families, and 50 genera. Of this assemblage, 76 species (21 families, 40 genera) possess clearly visible shells (termed snails); the remaining 30 species (5 families, 11 genera) lack significant shell development (termed slugs). Eighty-two species (66 snails, 16 slugs) representing 3 orders, 20 families, and 36 genera are native; the remaining 24 species (10 snails, 14 slugs) representing 1 order, 8 families, and 11 genera are exotic. Microsnails (<5 mm in diameter) have been recorded in western forests at densities up to 38,690,000 individuals/ha. Up to 27 terrestrial species have been located within one km^2. Terrestrial gastropods are nearly ubiquitous, occurring in nearly every terrestrial habitat in Washington. They represent critical elements of terrestrial food webs, and are well-represented in the detritivore-based webs of Pacific Northwest forests. Of the 82 native species in Washington State, at least 52 include detritus as part of their diet, 43 graze living vegetation, 19 are known to eat fungi, and 7 eat or occasionally eat other slugs and snails. Moreover, terrestrial gastropods are known prey for snakes, salamanders, frogs, many birds and mammals, and beetles. Some species, like the northwestern garter snake (*Thamophis ordinoides*), the sharptail snake (*Contia tenuis*), and snail-eating beetles (*Scaphinotus*), are near-obligate molluscivores. Terrestrial gastropods also contribute to the dispersal of fungal spores and mycelia, and the seeds of selected plants; and may provide other ecosystem services. This presentation will synopsize terrestrial gastropod biology and highlight the diverse opportunities existing for their study in the Pacific Northwest.

SURVIVAL OF NUISANCE NORTHERN PACIFIC RATTLESNAKES AFTER LONG DISTANCE TRANSLOCATION. **John J Rohrer,** *U.S. Forest Service, Winthrop, WA 98862;* **Scott H Fitkin,** *Washington Department of Fish and Wildlife, Winthrop, WA 98862;* **jrohrer@fs.fed.us.**

Nuisance northern Pacific rattlesnakes were collected in the Methow Valley, WA in 2003 and 2004. Captured rattlesnakes were marked with Passive Integrated Transponder (PIT) tags for individual identification and held in captivity until early October. Marked rattlesnakes were released at a remote, occupied hibernaculum in an area that was greater than 10 miles from their capture sites and outside their normal home ranges. In October 2003, ten nuisance rattlesnakes were marked and released, and in October 2004, seventeen nuisance rattlesnakes were marked and released. We revisited the release site on 3 occasions each in April 2004 and April 2005 while rattlesnakes were basking at the den entrance. We captured as many rattlesnakes as possible and scanned each for a PIT tag. Of the 10 rattlesnakes released in 2003, 3 were recaptured in April 2004 and 3 were recaptured in April 2005. Two of the 3 recaptured in 2005 were different individuals than those recaptured in 2004. Of the 17 rattlesnakes released in 2004, 2 were recaptured in April 2005. Our findings indicate that at least a portion of northern Pacific rattlesnakes that are translocated to a new home range and hibernaculum are able to adapt and survive for 19 months.

FROM DATA TO DISPLAY: IMPROVING YOUR POSTER PRESENTATION. **Kathryn L Ronnenberg,** *USDA Forest Service, Pacific Northwest Research Station, Corvallis, OR 97331;* **kronnenberg@fs.fed.us.**

Creating an effective poster based on your research requires more than slapping text and figures from your manuscript onto a big sheet of poster paper. Better poster design begins with a good outline, and a clear plan for the direction of information flow on the poster. A working knowledge of the basic principles of graphic design and typography, along with careful use of color, can help you communicate your results in a more engaging and compelling manner. Fonts should be chosen for easy reading at a distance of 1.25 m (4 ft), with serif fonts used for paragraph text. Use visual means (diagrams, photos, figures, graphs, tables) to convey as much of your information as possible. Make the text you include concise, but use list formats sparingly. Avoid boldly outlined text and figure boxes, and don't place paragraph text on very saturated background colors or busy photos. Photos may be used as poster backgrounds, but should be filtered, faded, or muted. Make sure figure photo resolutions are high enough to print clearly. Use direct labeling on figures to aid interpretation. Be especially careful not to encode critical distinctions on data plots or maps using red and green, as these colors are not distinguishable to some viewers; use a color-blind friendly color scheme instead. Design elements should support, but not overwhelm, your content. Finally, ask a colleague to proof-read your draft to review the design and catch errors you may have missed.

DATABASE STEWARDSHIP: MANAGING WASHINGTON'S WILDLIFE DATA. **Lori Salzer,** *Washington Department of Fish and Wildlife, Olympia, WA 98506;* **Tom Owens,** *Washington Department of Fish and Wildlife, Spokane, WA 99216;* **Jane Jenkerson, Gretchen Blatz,** *Washington Department of Fish and Wildlife, Olympia, WA 98506;* **salzeljs@dfw.wa.gov**

Washington Department of Fish and Wildlife (WDFW) has been managing wildlife data in Washington for over 25 years. WDFW serves as a central repository for wildlife data and maintains several spatial datasets that include information on species location, abundance, distribution, and breeding chronology. WDFW solicits, collects and interprets information on species and their habitats, and uses and distributes information to help preserve the diverse wildlife and ecosystems found in Washington State. WDFW maintains

datasets on breeding and non-breeding locations; and for selected species, information on survey effort, site occupancy, and site productivity are also recorded. These data, collected by WDFW, other state and federal agencies, nongovernmental organizations, and private citizens provide a broad range of information on over 250 threatened, endangered, and priority species comprised of 140,000 unique georeferenced locations, 23,000 non-detection surveys and over 40,000 site visits. Species status reports, recovery plans, briefing reports, annual survey reports, Priority Habitats and Species (PHS) digital data and maps, and numerous other products generated from these data are available to researchers, landowners, land managers, and others interested in the conservation and management of wildlife in Washington.

WASHINGTON'S COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY. **Chris L Sato,** *Washington Department of Fish & Wildlife, Olympia, WA 98504;* **Joe E La Tourrette,** *La Tourrette & Associates, Olympia, WA 98501;* **Rocky J Beach,** *Washington Department of Fish & Wildlife, Olympia, WA 98504;* **beachrjb@dfw.wa.gov**

In 2000, Congress established a new Wildlife Conservation and Restoration Program to help state and tribal wildlife agencies address the unmet needs of wildlife and associated habitats for conservation, education and wildlife-associated recreation. To be eligible for these federal grants, each state was required to develop a Comprehensive Wildlife Conservation Strategy to be submitted to the US Fish and Wildlife Service by October 2005. The Washington Department of Fish and Wildlife is currently beginning implementation of its Comprehensive Wildlife Conservation Strategy in partnership with other governmental and nongovernmental organizations to create a dynamic vision that will ensure the protection of Washington's wildlife species and habitats in greatest need of conservation. The statewide strategy is a landscape-based document that addresses the full array of the state's fish and wildlife, with a focus on species and habitats in greatest need of conservation. In developing the plan, the Department incorporated information from past and ongoing inventory and planning efforts, and based its structure on ecoregional conservation assessments.

LANDSCAPE PLANNING FOR WASHINGTON STATE'S WILDLIFE: MANAGING FOR BIODIVERSITY IN DEVELOPING AREAS. **Joanne P Schuett-Hames, Erik A Neatherlin,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **Jeff M Azerrad,** *Washington Department of Fish and Wildlife, Vancouver, WA 98661;* **Tiffany L Hicks, John E Jacobson,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **Michelle J Tirhi,** *Washington Department of Fish and Wildlife, Kent, WA 98032;* **George F Wilhere,** *Washington Department of Fish and Wildlife, Olympia, WA 98501;* **schuejps@dfw.wa.gov.**

As Washington State absorbs 1.6 million people in the coming decades, where and how residential development occurs will determine the fate of many wildlife species. Most local governments address habitat protection through critical area ordinances (CAOs) which effect site-level projects and are invoked only when issuing project permits. Although CAOs require some protective measures, such as stream buffers and upland habitat retention, which species will actually persist is poorly understood. To get beyond site-scale, short-term thinking, the Washington Department of Fish and Wildlife is developing a guidance document to help land-use planners evaluate which species may be lost or retained in response to different types and intensities of development. This document is based on an extensive literature review coupled with input from teams of scientists and land-use planning experts. Residential development is considered at three spatial scales. First, county-wide recommendations help planners determine important areas for retaining habitat and maintaining connectivity. Second, at a mid-scale, areas are evaluated for landscape metrics (e.g., patch size) that indicate how well an area may support various species. The third scale addresses individual developments and describes actions (e.g., retention of amphibian upland active season habitat) to minimize impacts to wildlife. We anticipate this approach will promote "smart growth" by facilitating landscape-level planning and providing a better understanding of how residential development may impact wildlife.

STUDYING PRESCRIBED FIRE IN RIPARIAN AREAS OF SOUTHWEST OREGON: PROJECT HURDLES AND LESSONS LEARNED. **Jeffrey T Stephens,** *Bureau of Land Management, Medford, OR 97504;* **jeff_stephens@or.blm.gov.**

In 2005 the Medford District BLM treated over 20,000 target acres for fuels reduction. These fuels reduction projects avoided riparian areas due to the threat of litigation and the perception that these areas are sensitive to any type of treatment. This has resulted in stringers of vegetated corridors along stream channels that are susceptible to fire, and may carry fire into untreated upland areas. Data is not available to justify either inclusion or exclusion of riparian areas in fuels treatment projects within southwest Oregon. The Applegate Valley has a high frequency, low intensity fire regime and historically these riparian areas have burned. The Medford BLM, in collaboration with USGS and Klamath Bird Observatory, submitted a successful Joint Fire Science Program proposal to study the effects of treatments in these riparian areas. With such a prominent fuels program, the group felt there would be ample areas to implement the study. Little did we know the hurdles and road blocks to come. The study team has been in the process of site selection since early September, and faced a number of obstacles, including unsold timber sales, changing legislation and protected sites to name a few.

THE EVERGREEN ECOLOGICAL OBSERVATION NETWORK (EEON). **Alison R Styring, Dylan Fischer, Carrie Leroy, Paul Pryzbylowicz,** *The Evergreen State College, 2700 Evergreen Parkway NW, Olympia, WA 98505;* **styringa@evergreen.edu**

In January 2006, ecological monitoring efforts began on ca. 850 acres of forest on The Evergreen State College Campus in Olympia, Washington. The goal of this project was to establish a framework for long-term ecological monitoring and to collect baseline information on forest structure and animal communities found on The Evergreen State College campus. This framework will provide the opportunity for Evergreen faculty to engage students in field research through long-term monitoring and short-term research projects. Students have been involved in this project since winter 2006. They have worked in the field to establish plots and collect data, and have integrated field data into GIS. This winter, 17 students conducted research projects in the forests on The Evergreen State college campus, 10 of which focused on EEON plots. This poster highlights results from several student and faculty projects and outlines the uses, methodologies, future plans of EEON.

POPULATION DIFFERENCES IN SURVIVAL AND PREDATION OF THE SIERRAN GARTER SNAKE (*THAMNOPHIS ELEGANS*) IN NORTHEASTERN CALIFORNIA. **Donald von Borstel, Department of Zoology, Oregon State University, Corvallis, OR 97331; Anne M Bronikowski, Department of Ecology, Evolution, And Organismal Biology, Iowa State University, Ames, IA 50011; Paul Hohenlohe, Stevan J Arnold, Department of Zoology, Oregon State University, Corvallis, OR 97331; vonborsd@onid.orst.edu.**

A study of demography and population structure in *T. elegans* has been underway for more than 25 years in the vicinity of Eagle Lake, Lassen County, California. That work has identified two ecotypes that differ in scalation, coloration and life history. One ecotype inhabits rocky lakeshores, and the other inhabits meadows. In the project reported here we focused on the causes of lower survivorship in lakeshore populations. To test the hypothesis that bird predation was responsible for the ecotype difference in survival, we summarized records of bird sightings over a 25 yr period and analyzed wounds that were visible on live snakes. Several types of wounds represented impressions of bird bills that resulted from unsuccessful predation events. We were able to identify the species of bird predators from these bill marks. We also used a stochastic model to reconcile the incidence of unsuccessful avian attacks with demographic estimates from our study populations. Our overall conclusion is that avian predation is a significant source of mortality in our study populations, and that it may be the cause of the ecotypic difference in survivorship.

USING CHIN SPOT PATTERNS TO IDENTIFY INDIVIDUAL MOUNTAIN YELLOW-LEGGED FROGS. **Greta M Wengert, Mourad W Gabrial,** *MGW Biological, Arcata, CA 95521;* **James B Bettaso,** *EartHerp, Arcata, CA 95521;* **greta@mgwbio.com**

The study of animals in the field often requires the ability to identify individuals. Numerous techniques at marking individual animals have been developed that require extensive handling and sometimes invasive measures, like ear tags, elastomer injections, and PIT tags. An alternative to physical alteration of study animals is the use of natural markings for identification. Mammals that have unique pelage and skin patterns, such as some felids, pinnipeds, juvenile cervids, and whales, are readily identified using these markings. Some of these identification techniques have been extended to amphibians when individual identification is necessary. In our study of mountain yellow-legged frog (*Rana muscosa*) movements, we photographed the chin spot patterns of all captured frogs at the time of radio attachment and three months later at recapture in order to test the effectiveness of identifying individual frogs using these natural markings. Throughout the first three months, observers were able to identify individual frogs based on chin spot patterns all but one time. Further field tests and photo comparison trials were conducted with similar results, though definite changes in certain aspects of spot patterns were apparent. Although this method of individual identification requires animal handling, it is a reliable alternative to other animal-marking techniques

CANNIBALISM IN THE FOOTHILL YELLOW-LEGGED FROG (*RANA BOYLII*). **Kevin D Wiseman, Karla R Marlow, Joseph E Drennan, Ronald E Jackman,** *Garcia and Associates (GANDA), San Francisco, CA 94110;* **James B Bettaso,** *U.S. Fish and Wildlife Service, Arcata, CA 95521;* **kwiseman@garciaandassociates.com**

Cannibalism has been reported in 12 of 21 families of frogs including ranids. Dietary studies of *Rana boylii* indicate that these frogs consume a wide variety of invertebrate prey including insects, spiders, centipedes, and snails. Cannibalism, however, has not been documented in this species. Herein, we report two field observations of cannibalism in *R. boylii* from El Dorado and Humboldt Counties, California. In both cases, adult frogs (one adult female and an adult of undetermined sex) preyed upon post-metamorphic juvenile conspecifics during the month of September. Post-metamorphic frogs may constitute a significant amount of the available prey base during the late summer and early fall for adult frogs. In other western ranid species, adult predation upon juvenile conspecifics is the most commonly reported form of cannibalism, and may occur more frequently in nature than previously believed. It is unlikely that adult frogs prefer juvenile conspecifics over other prey, but rather that juveniles are of appropriate size and elicit a feeding response.