Society for Northwestern Vertebrate Biology

The Wildlife Society

and

Pacific Northwest Amphibian & Reptile Consortium

1997 ANNUAL MEETING

March 26-29, 1997

The Holiday Inn Conference Center

Yakima, Washington
Society for Northwestern Vertebrate Biology
Founded January 7, 1920

EXECUTIVE BOARD 1996-1997

President: Lawrence L. C. Jones, USDA Forest Service, Pacific Northwest Research Station, 3625 93rd Ave SW, Olympia, WA 98512. 360-753-7672; fax 360-956-2346; E-mail NARDLEE@AOL.com

Vice-President for Washington: Anna Bruce, Washington Department of Fish and Wildlife, 249 Harms Rd., Ethel, WA 98542. 360-260-6132 then 1884006. Fax is same, but call first.

Vice-President for Northern Region (acting): Lisa Hartman, Wildlife Branch, Ministry of the Environment, 780 Blanchard St, Victoria, BC V8Z 1X4 CANADA. 604-387-1188; fax 604-357-9145; E-mail LHARTMAN@FWHDEPT.ENV.GOV.BC.ca

Vice-President for Oregon: R. Bruce Bury, Biological Resources Division, USGS, 3080 Clearwater Dr., Corvallis, OR 97330. 541-754-4382; fax 541-754-4711; E-mail BuryB@HEART.cor.EPA.gov

Vice-President for Inland Region: Charles Peterson, Department of Biological Sciences, Campus Box 8007, Idaho State University, Pocatello, ID 83209. 208-284-3922; cell phone 208-241-6551; fax 208-236-4570; E-mail PeteChar@ISU.edu

Vice-President for Southern Region (acting): Gary Fellows, Biological Resources Division, USGS, Point Reyes National Seashore, Point Reyes, CA 94956. 415-663-8522; fax 415-663-0469; E-mail Gary_Fellows@NBS.gov

Treasurer: Janet Jones, 4820 Yelm Hwy SE, Suite B-175, Olympia, WA 98503. 360-753-7663; fax 360-956-2346; E-mail CEEOTTES@AOL.com

Secretary: Elizabeth Milliman, USDA Forest Service, Hood Canal Ranger District, 150 N. Lake Cushman Rd., P.O. Box 68, Hoodspor, WA 98548. 360-877-5254; fax 360-352-2569; E-mail EMILLIMAN@AOL.com

Trustees:

David Darda, Central Washington University, Department of Biological Sciences, Ellensburg, WA 98926. 509-963-2730; E-mail DardaD@CWU.edu

Gregory Green, Parametrix, 5808 Lake Washington Blvd. NE, Kirkland, WA 98033. 206-822-8880; fax 206-889-8808; E-mail GAGreen@Parametrix.com

William P. Leonard, 223 Foote St. NW, Olympia, WA 98502. 360-407-7273 or 360-902-1670; fax 360-407-6305 or 360-902-1788; E-mail BPMM490@WADNR.gov

Editor (not on Board): P. Stephen Corn, Aldo Leopold Research Institute, P.O. Box 8089, Missoula, MT 59807. 406-542-4191; fax 406-543-2653; E-mail SteveCorn@NBS.gov
**Washington Chapter of**
**THE WILDLIFE SOCIETY**

**LEADERSHIP COUNCIL**

<table>
<thead>
<tr>
<th>BOARD</th>
<th>COMMITTEES</th>
</tr>
</thead>
<tbody>
<tr>
<td>President</td>
<td>Legislative Affairs</td>
</tr>
<tr>
<td>Gary Witmer</td>
<td>Sylvia Thorpe</td>
</tr>
<tr>
<td>509-335-2518</td>
<td>206-647-1192</td>
</tr>
<tr>
<td>President-Elect</td>
<td>Workshops</td>
</tr>
<tr>
<td>Marilyn Stoll</td>
<td>Paul Fielder</td>
</tr>
<tr>
<td>360-753-4325</td>
<td>509-663-8121 x4299</td>
</tr>
<tr>
<td>Treasurer</td>
<td>Newsletter</td>
</tr>
<tr>
<td>Steve Penland</td>
<td>Ken Bevis</td>
</tr>
<tr>
<td>360-902-2598</td>
<td>509-865-6262</td>
</tr>
<tr>
<td>Secretary</td>
<td>Conservation</td>
</tr>
<tr>
<td>Ken Bevis</td>
<td>Ann Eissinger</td>
</tr>
<tr>
<td>509-865-6262</td>
<td>360-766-6008</td>
</tr>
<tr>
<td>Board Position 1</td>
<td>REGIONAL</td>
</tr>
<tr>
<td>Bill Vogel</td>
<td>REPRESENTATIVES</td>
</tr>
<tr>
<td>360-753-4367</td>
<td></td>
</tr>
<tr>
<td>Board Position 2</td>
<td>Chris Loggers (NE)</td>
</tr>
<tr>
<td>Bill Gaines</td>
<td>509-684-1216</td>
</tr>
<tr>
<td>509-782-1413 x221</td>
<td>Lee Stream (SE)</td>
</tr>
<tr>
<td>Board Position 3</td>
<td>509-575-2740</td>
</tr>
<tr>
<td>Becky Herbig</td>
<td>Bob Kuntz (NW)</td>
</tr>
<tr>
<td>206-821-1004</td>
<td>360-856-5700</td>
</tr>
<tr>
<td></td>
<td>Joe Engler (SW)</td>
</tr>
<tr>
<td></td>
<td>360-887-4106</td>
</tr>
</tbody>
</table>
Welcome to the 1997 Joint Annual Meeting of the Washington Chapter of The Wildlife Society (WA-TWS), the Society for Northwestern Vertebrate Biology (SNVB), and the Pacific Northwest Amphibian and Reptile Consortium (PNARC). Every phase of the planning process has been a cooperative effort by these societies. We hope meeting jointly will set a precedent for our societies. Not only will it make life easier on students and professionals who might have to otherwise choose between meetings, it also helps expand the horizons of participants. Our fine array of contributing and invited speakers will present a variety of papers on all aspects of natural history and management of Pacific Northwestern wildlife. This year’s meeting place, Yakima, the Palm Springs of Washington, is apropos and timely, as the Interior Columbia Basin Ecosystem Management Project is currently a hot topic...and the subject of our Plenary Session. But we’ve ensured that a plethora of papers emphasizing the wet side of the mountains will be presented. This year’s planning committee has done an exceptional job of putting this meeting together. This is evident when you look at the contents of this program. We have it all: great oral and poster presentations, workshops, vendors, banquet, luncheon, a fabulous keynote speaker, mentoring, photo and art contest, welcome bash, animal call competition, social, dance (featuring a great live band), and plenty of field trips. We thank all of the committee members and participants for this valiant effort. We hope you will find the meetings rewarding from both professional and entertainment aspects. Thank you for attending and enjoy the Palm Springs of Washington!

--Gary Witmer, President, WA-TWS
--Lawrence Jones, President, SNVB

MEETING COMMITTEE:

| Marilyn Stoll                        | Co-chair, logistics, facilities, program |
| Lawrence Jones                      | Co-chair, call for papers, program      |
| Elizabeth Milliman                  | Call for papers, facilities, program    |
| Ken Bevis                           | Local organizer for field trips         |
| Janet Jones                         | Registration, abstracts                 |
| Jeff Lewis                          | Entertainment                           |
| Tina Sato                           | Abstracts, program                      |
| Debbie Young                        | Posters and exhibitors                  |
| Brian Biswell                       | Photo and art contest                   |
| Gary Witmer                         | Mentoring                               |
| Becky Herbig                        | Associated meetings                     |
WA-TWS: The Wildlife Society is an international, non-profit scientific and educational organization serving professionals in all areas of wildlife conservation and resource management. For nearly 60 years our membership of dedicated men and women has sought to enhance the capability of wildlife professionals in conserving diversity, sustaining productivity, and ensuring responsible use of wildlife resources for the benefit of society. Today, The Wildlife Society is working harder than ever to provide wildlife professionals with the information and skills needed to be effective in these challenging times. The Washington Chapter focuses on that state and regional issues.

SNVB: The Society for Northwestern Vertebrate Biology is a regional, non-profit scientific society. It is one of the oldest professional societies for vertebrates in the United States — this is its 77th year! The society was originally called the Northwest Bird and Mammal Society. Its official journal was the Murrelet. In 1988, the society voted to include 2 more classes of vertebrates into their scope: reptiles and amphibians. Because the name “Northwest Bird and Mammal and Reptile and Amphibian Society” was a bit long and far too silly, they adopted the current name to reflect the new taxonomic coverage. Its journal is the Northwestern Naturalist, and its monograph and special publication series, Northwest Fauna, is blossoming as a popular outlet for major treatises. The logo is a marbled murrelet.

PNARC: The Pacific Northwest Amphibian and Reptile Consortium is an interagency regional group. In 1995, both SNVB and PNARC voted to make the latter a special committee within SNVB. PNARC is an umbrella organization representing herpetologists from all over the Northwest. The primary purpose of PNARC is networking: providing a forum for exchange of information. PNARC is composed of working groups that address specific tasks, including a directory, training, databases, and surveys. The logo is a clouded salamander.

EVENTS AND INFORMATION

ROOM ASSIGNMENTS AND AGENDA CHANGES ARE POSTED AT REGISTRATION DESK.

MEALS: Luncheon and Banquet are included in registration fees. Your name badge or guest ticket allows you entry (except for Workshop-only attendees). Munchies will be provided at the Social and Welcome Bash. For other meals, the hotel has a fine restaurant and Yakima has a multitude of fine eateries.

REGISTRATION BOOTH AND BULLETIN BOARD: For registration, sign-ups, People’s Choice Award ballots, information on local activities, etc, please go to the registration booth.
WELCOME BASH: We will have a Welcome Bash on Tuesday night for weary-eyed travelers. Have a cold toddy and muchibbles and ready yourselves for one of the most fantastulous meetings you’ve laid eyes upon. Chat with your old chums. Find a new employee! We’re easy...we’re here to network!

SOCIAL: On Wednesday before the dance, we will gather around the watering hole and exchange wild stories of Northwestern vertebrates. We will have some exceptionally delicious microbrews from Grant’s of Yakima (good stuff, Maynard), as well as the usual array of non-alcoholic beverages and munchies.

DANCE: On Wednesday night, put on your dancin’ shoes and shuffle to the sounds of The Mavens, who play all kinds of great danceable music. One of the members is even a biologist for the US Fish and Wildlife Service in Portland! They even have a wildlife song or 2 tucked under their field vests!

BANQUET: The banquet will be held Thursday night. Relax to a sit-down dinner and enjoy the entertainment.

Keynote speaker: Our honored guest speaker is Dr. Mark A. Norell (Dr. Velociraptor), Chairman of the Department of Vertebrate Paleontology at the American Museum of Natural History in New York. Our distinguished guest was one of the co-leaders for the recent expeditions to Gobi desert. This famous television and in many National Geographic and Norell as he guides us on a past, when birds were herps thunder. Those were the something to be reckoned with! Can you imagine yourself fitting a velociraptor with a radiotransmitter? (gee....I think the anesthesia is wearing off....aaaarrRRRRGGGGGHHHHH!).

Animal Call Competition: Don’t forget to sign up for the Animal Call Competition at the registration desk. Get your warbling muscles in the ready—we can make you a star! (We dare you to imitate a hermit thrush!). Beside becoming terribly famous, the winner will receive a prize packet of fun stuff.

LUNCHEON: On Friday, we will have a delectable sit-down luncheon. For our general membership meetings, we will present a brief synopsis of what the societies are doing (and give 20 good reasons to join, if you haven’t already). Then, we will present the People’s Choice Awards, where you, the people, will have chosen the winners of the Photo and Art Contest and Poster and Speaker Awards (with categories such as most informative, best slides, most entertaining). Prize packets will be presented to the person with the best photograph and the best talk.
PHOTOGRAPH AND WILDLIFE ART SALON:
Don't be shy...show your best photos or art work. Categories are:

- Reptiles or Amphibians
- Birds
- Mammals
- Scenery or Habitat
- People in Biology
- Humor
- Wildlife Art Work (non-photo media)

A People's Choice Award will be given to all first-place contestants and the best overall photograph will win the coveted Prize Packet.

POSTERS, DISPLAYS, AND VENDORS: Posters and displays will be exhibited in the Evergreen Room during the week. Authors will attend their posters on Wednesday evening. Vendors will also be present to sell their wares. Check in at registration desk for details of setting up and taking down your poster or exhibit.

MENTORING: This is a golden opportunity for budding young biologists to hook up with an old, seasoned one to learn the ins and outs of the business. Mentors and mentees will be identified by a sticker on the name tag.

SLIDE VIEWING: Can be done in the Cascade Room nearly any time during the meetings.

EXECUTIVE BOARD MEETINGS: WA-TWS and SNVB board meetings will be held on Tuesday, from 5-7:00 PM.

GENERAL MEMBERSHIP MEETINGS: for SNVB and TWS will be held at the Luncheon. If there is a demand for further involvement, we can set up another meeting later in the week!

PNARC MEETING: Anyone who is a member or interested in becoming a member of PNARC is cordially invited to attend. On the platter for this meeting is a re-evaluation of the organization, working groups, and chairs. Also, some specific issues have come up: stream-breeding amphibians, a database, and the directory. The first portion of the meeting covers the general topics; we will split into working groups in the second hour. Come and join us if you are interested in herps--some important issues and products are coming from this group.

FIELD TRIPS: If you plan on attending a field trip, please be aware that your field trip is at the mercy of mother nature; in the Great Northwest, you have to expect the unexpected (e.g., it is difficult to look for snakes under 1 m of snow)! There may also be scheduling changes--please go to the information booth/bulletin board for updates.
<table>
<thead>
<tr>
<th>Week At-a-Glance</th>
<th>Tuesday, March 25</th>
<th>Wednesday, March 26</th>
<th>Thursday, March 27</th>
<th>Friday, March 28</th>
<th>Saturday, March 29</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0700-0830</strong></td>
<td>Registration &amp; Continental Breakfast</td>
<td>Plenary Session (0800): Riparian Wildlife, Partners in Flight, Contrib. Session 3 Columbia Basin</td>
<td>Lunch around town</td>
<td>Lunch around town</td>
<td>Lunch around town</td>
</tr>
<tr>
<td><strong>0840-1200</strong></td>
<td>Noon-1330</td>
<td>Urban Wildlife, Contributed 1, Contributed 2 Columbia Basin</td>
<td>Lunch around town</td>
<td>Lunch around town</td>
<td>Lunch around town</td>
</tr>
<tr>
<td><strong>1330-1800</strong></td>
<td>Registration, TWS, SNVB Board Meetings</td>
<td>Posters and Exhibitors (all day)</td>
<td>Poster and Exhibitors (all day), PNARC meeting</td>
<td>Posters and Exhibitors (all day)</td>
<td>Posters and Exhibitors (all day)</td>
</tr>
<tr>
<td><strong>1800-2000</strong></td>
<td>Welcome Social</td>
<td>Mentoring</td>
<td>Banquet: Dr. Mark Norell keynote speaker.</td>
<td>BoxLunch</td>
<td>BoxLunch</td>
</tr>
<tr>
<td><strong>2000-2300</strong></td>
<td>Bash</td>
<td>Dance: The Mavens</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### DAY AT A GLANCE:

**Wednesday, March 26**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>L.L.C. Jones</td>
<td>RIMROCK</td>
</tr>
<tr>
<td>8:10</td>
<td>T. Quigley</td>
<td>RIMROCK</td>
</tr>
<tr>
<td>8:30</td>
<td>W. Hann/J.Jones</td>
<td>RIMROCK</td>
</tr>
<tr>
<td>8:50</td>
<td>P. Hessburg</td>
<td>RIMROCK</td>
</tr>
<tr>
<td>9:10</td>
<td>B. Marcot</td>
<td>RIMROCK</td>
</tr>
<tr>
<td>9:50</td>
<td>Questions to Panel</td>
<td>RIMROCK</td>
</tr>
<tr>
<td>10:10</td>
<td><strong>BREAK</strong></td>
<td>RIMROCK</td>
</tr>
<tr>
<td>10:30</td>
<td>J. Blackwood</td>
<td>RIMROCK</td>
</tr>
<tr>
<td>10:50</td>
<td>B. Naney</td>
<td>RIMROCK</td>
</tr>
<tr>
<td>11:10</td>
<td>M. Wisdom</td>
<td>RIMROCK</td>
</tr>
<tr>
<td>11:30</td>
<td>Questions to Panel</td>
<td>RIMROCK</td>
</tr>
<tr>
<td>11:50</td>
<td>G. Wittmer</td>
<td>RIMROCK</td>
</tr>
<tr>
<td><strong>NOON</strong></td>
<td></td>
<td><strong>LUNCH</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:30</td>
<td>Ferguson</td>
<td>MAPLELEAF A</td>
</tr>
<tr>
<td>1:50</td>
<td>Stenberg</td>
<td>MAPLELEAF A</td>
</tr>
<tr>
<td>2:10</td>
<td>Quinn</td>
<td>MAPLELEAF A</td>
</tr>
<tr>
<td>2:30</td>
<td>McAllister</td>
<td>MAPLELEAF A</td>
</tr>
<tr>
<td>2:50</td>
<td><strong>BREAK</strong></td>
<td>MAPLELEAF A</td>
</tr>
<tr>
<td>3:10</td>
<td>P. Thompson</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>3:30</td>
<td>Lewis</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>3:50</td>
<td>Richter</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>4:10</td>
<td>Leighty</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>1:30</td>
<td>Bosakowski</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>1:50</td>
<td>Corkran</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>2:10</td>
<td>Iverson</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>2:30</td>
<td>Loafman</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>2:50</td>
<td><strong>BREAK</strong></td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>3:10</td>
<td>Paulus</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>3:30</td>
<td>Vaughn</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>3:50</td>
<td>Pearson</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>4:10</td>
<td>Leighty</td>
<td>MAPLELEAF B</td>
</tr>
<tr>
<td>1:30</td>
<td>Gregory</td>
<td>MAPLELEAF C</td>
</tr>
<tr>
<td>1:50</td>
<td>Cooper</td>
<td>MAPLELEAF C</td>
</tr>
<tr>
<td>2:10</td>
<td>Dvornich</td>
<td>MAPLELEAF C</td>
</tr>
<tr>
<td>2:30</td>
<td>Waldien</td>
<td>MAPLELEAF C</td>
</tr>
<tr>
<td>2:50</td>
<td><strong>BREAK</strong></td>
<td>MAPLELEAF C</td>
</tr>
<tr>
<td>3:10</td>
<td>Nieland (Madrona)</td>
<td>MAPLELEAF C</td>
</tr>
<tr>
<td>3:30</td>
<td>Everett</td>
<td>MAPLELEAF C</td>
</tr>
<tr>
<td>3:50</td>
<td>Millspaugh</td>
<td>MAPLELEAF C</td>
</tr>
<tr>
<td>4:10</td>
<td>Leighty</td>
<td>MAPLELEAF C</td>
</tr>
</tbody>
</table>

**POSTERS** available for viewing all day. They will be attended from 7:00 to 8:00 pm.

MENTORING from 6:00 to 7:00 pm. SOCIAL: 7:00 pm. DANCE: The Mavens -- Starts at 8:00 pm.
<table>
<thead>
<tr>
<th></th>
<th>RIPARIAN WILDLIFE</th>
<th>PARTNERS IN FLIGHT</th>
<th>CONTRIBUTED 3: AMPHIBIANS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MAPLELEAF A</td>
<td>MAPLELEAF B</td>
<td>MAPLELEAF C</td>
</tr>
<tr>
<td>8:40</td>
<td>Kovalchik</td>
<td>Zimmerman</td>
<td>Adams</td>
</tr>
<tr>
<td>9:00</td>
<td>Borman</td>
<td>Arnett</td>
<td>Bartelt</td>
</tr>
<tr>
<td>9:20</td>
<td>Edge</td>
<td>Huff</td>
<td>Jones</td>
</tr>
<tr>
<td>9:40</td>
<td>Perkins (Anderson)</td>
<td>Bettinger</td>
<td></td>
</tr>
<tr>
<td>10:00</td>
<td><strong>BREAK</strong></td>
<td><strong>BREAK</strong></td>
<td><strong>BREAK</strong></td>
</tr>
<tr>
<td>10:40</td>
<td>Duberstein</td>
<td>Manuwal</td>
<td>Piper</td>
</tr>
<tr>
<td>11:00</td>
<td>Saab</td>
<td>Leu (C. Thompson)</td>
<td>Seeley</td>
</tr>
<tr>
<td>11:20</td>
<td>Bull</td>
<td>Seavey</td>
<td>Stevens-Ayers</td>
</tr>
<tr>
<td>11:40</td>
<td>Kindschy</td>
<td></td>
<td>Strauh</td>
</tr>
<tr>
<td><strong>NOON</strong></td>
<td><strong>LUNCH</strong></td>
<td><strong>LUNCH</strong></td>
<td><strong>LUNCH</strong></td>
</tr>
<tr>
<td></td>
<td><strong>CARNIVORE WORKSHOP</strong></td>
<td><strong>SURVEY/MANAGE AMPHIBIANS</strong></td>
<td><strong>ROOM TBA</strong></td>
</tr>
<tr>
<td>1:30</td>
<td>See other agenda for specific times</td>
<td>See other agenda for specific times</td>
<td></td>
</tr>
<tr>
<td>1:50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BANQUET** begins at 7:00 pm. **PNARC MEETING** will be held at 6:00 pm.
### DAY AT A GLANCE: Friday, March 28

<table>
<thead>
<tr>
<th>Time</th>
<th>Forest Wildlife</th>
<th>Shrub-Steppe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mapleleaf A</td>
<td>Mapleleaf C</td>
</tr>
<tr>
<td>8:40</td>
<td>Lehmkuhl</td>
<td>Green</td>
</tr>
<tr>
<td>9:00</td>
<td>Erickson</td>
<td>Raedeke</td>
</tr>
<tr>
<td>9:20</td>
<td>Forsman</td>
<td>Tiller</td>
</tr>
<tr>
<td>9:40</td>
<td>Leonard</td>
<td>Keany</td>
</tr>
<tr>
<td>10:00</td>
<td>BREAK</td>
<td>BREAK</td>
</tr>
<tr>
<td>10:40</td>
<td>McCorquodale</td>
<td>Rickard</td>
</tr>
<tr>
<td>11:00</td>
<td>Moser (Witmer)</td>
<td>Brandt</td>
</tr>
<tr>
<td>11:20</td>
<td>Nowak</td>
<td>Vander Haegen</td>
</tr>
<tr>
<td>11:40</td>
<td>Stagg</td>
<td></td>
</tr>
<tr>
<td>NOON</td>
<td>LUNCHEON</td>
<td>LUNCHEON</td>
</tr>
<tr>
<td></td>
<td>WILDLIFE TREE WORKSHOP</td>
<td>REPTILE WORKSHOP</td>
</tr>
<tr>
<td></td>
<td>ROOM TBA</td>
<td>ROOM TBA</td>
</tr>
<tr>
<td>1:30</td>
<td>See other agenda for specific times</td>
<td>See other agenda for specific times</td>
</tr>
<tr>
<td>1:50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
*Velociraptor* *norelli*, a new species of hideous, nasty, gruesome, and not-very-cute bird-herp from the Phrynosomine Deposits of Yakima, Washington. This amazing animal fed on primitive horny toads and shrew-mole eggs. (Reprinted from Natural History Bunk Vol III. Prehistorical Faunas)

© 1997. Uncle Nardly Graffix Labs
LIFE IN THE RAINDS HADOW: ECOLOGY OF XERIC HABITATS

Wednesday 3/26/97


8:00-8:10 am OPENING REMARKS. L.L.C. Jones, President of the Society for Northwestern Vertebrate Biology.

8:10-8:30 am OVERVIEW AND SCIENCE ASSESSMENT. T. Quigley.

8:30-8:50 am BROADSCALE LANDSCAPE ASSESSMENT. W. Hann or J. Jones.

8:50-9:10 am MID-SCALE LANDSCAPE ASSESSMENT. P. Hessburg.

9:10-9:50 am TERRESTRIAL ASSESSMENT. B. Marcot

9:50-10:10 am QUESTIONS TO PANEL.

10:10-10:30 am BREAK

10:30-10:50 am EIS OVERVIEW. J. Blackwood.

10:50-11:10 am WILDLIFE EVALUATION OF ALTERNATIVES. B. Naney.

11:10-11:30 am IMPLEMENTATION AND WILDLIFE. M. Wisdom.

11:30-11:50 am QUESTIONS TO PANEL.

11:50-NOON CLOSING REMARKS. G. Witmer, President of the WA Chapter of The Wildlife Society.

Urban Wildlife, Jeff Lewis, Chair. Mapleleaf Room A, afternoon session.

1:30-1:50 pm URBAN WILDLIFE BIOLOGY - WHY IGNORE WASHINGTON'S ONE MILLION URBAN/SUBURBAN RESIDENTS AND ASSOCIATED WILDLIFE? Howard L. Ferguson.

1:50-2:10 pm ISSUES AND CONCERNS IN URBAN WILDLIFE MANAGEMENT. Kate Stenberg.
2:10-2:30 pm  COYOTE (CANIS LATRANS) HABITAT SELECTION IN URBAN AREAS OF WESTERN WASHINGTON AS DETERMINED BY ROUTINE MOVEMENTS. Timothy Quinn.

2:30-2:50 pm  WESTERN POND TURTLE EXTERMINATION AND REINTRODUCTION IN THE PUGET TROUGH OF WASHINGTON. Kelly McAllister.

2:50-3:10 pm  BREAK

3:10-3:30 pm  WASHINGTON DEPARTMENT OF FISH AND WILDLIFE BACKYARD WINTER BIRD COUNTS. Patricia A. Thompson.

3:30-3:50 pm  TRAILS AND TRIBULATIONS: ECOLOGY OF THE URBAN RED FOX. Jeffrey C. Lewis.

3:50-4:10 pm  AMPHIBIAN EXTINCTIONS IN URBANIZING LANDSCAPES. Klaus Richter.

4:10-4:30 pm  BASIC ACOUSTICS FOR WILDLIFE BIOLOGISTS. Robin L. Leighty.

---

Contributed Session 1, Harriet Allen, Chair. Mapleleaf Room B, afternoon session.

1:30-1:50 pm  NORTHERN GOSHAWKS NESTING ON A PRIVATE INDUSTRIAL FOREST IN WESTERN WASHINGTON. Thomas Bosakowski, Bruce McCullough, Frank J. Lapsansky, and Martin E. Vaughn.

1:50-2:10 pm  NESTLING DIETS OF WESTERN AND MOUNTAIN BLUEBIRDS IN CENTRAL OREGON. Charlotte C. Corkran.

2:10-2:30 pm  REPRODUCTIVE SUCCESS OF NORTHERN SPOTTED OWLS IN THE NORTHWESTERN WASHINGTON CASCADES. Wayne F. Iverson.

2:30-2:50 pm  SNAKE PREDATION ON COASTAL SCRUB NESTING BIRDS. Patrick M. Loafman, Geoffrey R. Geupel, and Nadav Nur.

2:50-3:10 pm  BREAK

3:10-3:30 pm  BREEDING ECOLOGY OF COMMON RAVEN ON THE US ARMY YAKIMA TRAINING CENTER. Stuart L. Paulus, Devin R. Malkin, and Margaret A. Pounds.

3:30-3:50 pm  PRESENCE AND ABUNDANCE OF SPOTTED OWL PREY IN YOUNG, MANAGED CONIFEROUS FOREST DESIGNATED AS NORTHERN SPOTTED OWL (STRIX OCCIDENTALIS) DISPERAL HABITAT IN THE WESTERN WASHINGTON CASCADES. Martin E. Vaughn, Diana L. Olson, and Thomas Bosakowski.
3:50-4:10 pm  COMPETITION AND REPRODUCTIVE SUCCESS IN A NARROW MOVING HYBRID ZONE. Scott F. Pearson.

Contributed Session 2, Brian Biswell, Chair. Mapleleaf Room C, afternoon session.

1:30-1:50 pm  WHAT GARTER SNAKES EAT, HOW IT VARIES, AND WHY IT MATTERS. Patrick T. Gregory.

1:50-2:10 pm  MODELING THE LOCATION OF SNAKE DENS ON THE IDAHO NATIONAL ENGINEERING LABORATORY. Sarah L. Cooper and Charles R. Peterson.

2:10-2:30 pm  THE WASHINGTON GAP ANALYSIS PROJECT: USING REPTILE AND AMPHIBIAN DATA, MODELS, AND EXPERTS TO CREATE THE BEST MAPS POSSIBLE. Karen M. Dvornich and Kelly McAllister.

2:30-2:50 pm  ROOST STRUCTURES OF MYOTIS EVOTIS (LONG-EARED MYOTIS) IN MANAGED FORESTS OF WESTERN OREGON: PRELIMINARY RESULTS. David L. Waldien and John P. Hayes.

2:50-3:10 pm  BREAK

3:10-3:30 pm  CHRISTMAS TREE CAVE BAT GATE PROJECT, MT. ADAMS RANGER DISTRICT. Jim Nieland, David Anderson, and Chandra Madrona.


Thursday 3/27

Riparian Wildlife, Howard Ferguson, Chair. Mapleleaf Room A, morning session.

8:40-9:00 am  A BRIEF VIEW OF THE NATURAL POTENTIAL OF RIPARIAN AND WETLAND PLANT COMMUNITIES IN EASTERN OREGON AND WASHINGTON (AND SOME COMPARISONS TO DISTURBED CONDITIONS). Bernard (Bud) L. Kovalchik.

9:00-9:20 am  RIPARIAN AREA REHABILITATION. Michael M. Borman.
9:20-9:40 am  SMALL MAMMAL DISTRIBUTIONS, ABUNDANCE, AND HABITAT SELECTION IN MANAGED RIPARIAN HABITATS OF BEAR VALLEY, EASTERN OREGON. W. Daniel Edge and Walfrido Tomas.

9:40-10:00 am  RELATIONSHIPS OF BAT ABUNDANCE TO SNAG ABUNDANCE IN A MANAGED FOREST. J. Mark Perkins and Ralph G. Anderson.

10:00-10:40 am  BREAK

10:40-11:00 am  HABITAT SELECTION BY SPRING MIGRANT LAND BIRDS IN RIPARIAN ZONES OF SOUTH-CENTRAL WASHINGTON. Corey A. Duberstein, Rodney D. Sayler, and Charles A. Brandt.

11:00-11:20 am  INFLUENCE OF SPATIAL SCALE AND LAND-USE PRACTICES ON HABITAT USE BY BREEDING BIRDS IN ARID LAND RIPARIAN FORESTS. Vicki Saab.

11:20-11:40 am  AMPHIBIANS IN RIPARIAN HABITATS IN NORTHEASTERN OREGON. Evelyn L. Bull.


---

**Partners in Flight**, Ruth Milner, Chair. Mapleleaf Room B, morning session.

8:40-9:00 am  THE OREGON & WASHINGTON PARTNERS IN FLIGHT PROGRAM: AN UPDATE ON ACCOMPLISHMENTS AND OUR FUTURE DIRECTION. Tara Zimmerman.

9:00-9:20 am  LAND MANAGER PERCEPTIONS OF AVIAN RESEARCH NEEDS AND INFORMATION DISSEMINATION: A CASE STUDY FROM THE PACIFIC NORTHWEST. Edward B. Arnett, Rex Sallabanks, and Randy Floyd.

9:20-9:40 am  CURRENT PERSPECTIVES ON GREAT GRAY OWL MANAGEMENT STRATEGIES. Mark H. Huff.

9:40-10:00 am  BIRD COMMUNITIES IN 5- TO 34-YEAR OLD MANAGED DOUGLAS-FIR STANDS ON THE WILLAMETTE NATIONAL FOREST, OREGON CASCADES. Kelly A. Bettinger and William C. McComb.

10:00-10:40 am  BREAK

10:40-11:00 am  SPRING BIRD COMMUNITIES ASSOCIATED WITH OAK-DOMINATED WOODLANDS IN SOUTH-CENTRAL WASHINGTON. David A. Manuwal.
11:00-11:20 am  THE IMPORTANCE OF MOLT-MIGRATION STOPOVER SITES FOR THE CONSERVATION OF NEOTROPICAL MIGRANTS. Matthias Leu and Christopher W. Thompson.


Contributed Session 3, Anna Bruce, Chair. Mapleleaf Room C, morning session.

8:40-9:00 am  RESPONSE OF NATIVE TADPOLES TO EXOTIC VERTEBRATES IN WESTERN WASHINGTON. Michael J. Adams.

9:00-9:20 am  A TECHNIQUE FOR ATTACHING RADIO TRANSMITTERS TO WESTERN TOADS (BUFO BOREAS). Paul E. Bartelt and Charles R. Peterson.


9:40-10:00 am

10:00-10:40 am  BREAK

10:40-11:00 am  AMPHIBIAN ABUNDANCE IN RIPARIAN HABITATS OF EASTERN WASHINGTON CASCADE FORESTS. Susan Dixon Piper.

11:00-11:20 am  EFFECTS OF ELEVATED pH ON FROG EMBRYO SURVIVAL - RESULTS OF INITIAL TESTS WITH THE AFRICAN CLAWED FROG. Maureen Seeley, Martin Grassley, and Christian Grue.


11:40-12:00 am  AMPHIBIANS AND REPTILES OF THE YAKIMA TRAINING CENTER. Bradley R. Strauch, Ronda L. Little, Margaret A. Pounds, and Stuart L. Paulus.

Friday 3/28

Forest Wildlife, Peter Forbes, Chair. Mapleleaf Room A, morning session.

8:40-9:00 am  SNAG LONGEVITY AND WILDLIFE CAVITY OCCURRENCE IN BURNED FOREST STANDS. J. Lehmkuhl, R. Everett, R. Schellhaas, and D. Keenum.
9:00-9:20 am A COMPARISON OF BAT ACTIVITY BETWEEN LOW AND HIGH ELEVATION SITES. Janet Erickson.


9:40-10:00 am NATURAL HISTORY AND APPARENT DECLINE OF WESTERN TOADS (BUFO BOREAS) ON FORT LEWIS MILITARY RESERVATION IN WASHINGTON STATE. William P. Leonard and Lisa A. Hallock.

10:00-10:40 am BREAK

10:40-11:00 am POPULATION ECOLOGY AND MANAGEMENT OF MIGRATORY BLACK-TAILED DEER IN THE KLICKITAT BASIN OF WASHINGTON. Scott M. McCorquodale.

11:00-11:20 am THE EFFECTS OF ELK AND CATTLE GRAZING ON THE VEGETATION, BIRDS, AND SMALL MAMMALS ON THE BRIDGE CREEK WILDLIFE AREA, OREGON. Brian W. Moser and Gary W. Witmer.


---

Shrub-Steppe, Charlie Brandt, Chair. Mapleleaf Room C, morning session.

8:40-9:00 am HABITAT USE BY NORTHERN SAGEBRUSH LIZARDS IN THE COLUMBIA BASIN, OREGON. Gregory A. Green, Kent B. Livezey, and Russell Morgan.

9:00-9:20 am ECOLOGY OF A MULE DEER POPULATION IN THE SHRUB-STEPPE OF CENTRAL WASHINGTON. Kenneth J. Raedeke.

9:20-9:40 am ECOLOGY OF MULE DEER ON THE HANFORD SITE. Brett L. Tiller.

9:40-10:00 am HABITAT USE PATTERNS OF SAGE SPARROWS AND SAGE THRASHERS ON A LARGE SHRUB-STEPPE PARCEL IN THE COLUMBIA BASIN. Jim Kean, Julia Tims, Mark Rector, and Bruce Hollen.

10:00-10:40 am BREAK
3:35-4:00 pm LARCH MOUNTAIN SALAMANDER. Charlie Crisafulli.

4:00-4:25 pm VAN DYKE'S SALAMANDER. Lawrence Jones.

---

**Friday 3/28**

**WILDLIFE TREE WORKSHOP.** William Vogel and Ken Bevis, Coordinators.

1:30-1:35 pm INTRODUCTION AND LOGISTICS. Ken Bevis.

1:35-2:05 pm SNAG DYNAMICS. Evelyn Bull.

2:05-2:25 pm LIFE AFTER DEATH. Paul Torgeson.

2:25-2:45 pm AGENCY OBJECTIVES. Craig Hansen.

2:45-3:05 pm SAFETY GUIDELINES. William Vogel.

3:05-3:20 pm SNAG CREATION PREVIEW. Tim Brown

3:20-3:35 pm BREAK

3:35-4:05 pm MODELING. Kim Mellen.

4:05-4:15 pm SNAG COUNTING TECHNIQUE. Ken Bevis.

4:15-5:00 pm PANEL DISCUSSION: CREATIVE SILVICULTURE. Lorin Hicks, Neal Wilkins, and Doug Runde.

---

**REPTILE WORKSHOP.** Charles Peterson, Greg Green, and Cindy Barkhurst, coordinators.

1:30-1:40 pm OVERVIEW OF REPTILES. Chuck Peterson.

1:40-1:50 pm TOPIC 1: TURTLES OF PNW (WESTERN POND TURTLE AND PAINTED TURTLE) PANEL PRESENTATION OVERVIEW. Marc Hayes.

1:50-2:00 pm THREATS TO SPECIES CONSERVATION. Kate Slavens.

2:00-2:10 pm TECHNIQUES FOR DETECTION. Bruce Bury.

2:10-2:20 pm CARE AND HANDLING. Teresa Delorenzo.

2:20-2:30 pm QUESTIONS.
2:30-2:40 pm  BREAK

2:40-3:30 pm  TOPIC 2: LIZARDS. Greg Green.

3:30-4:30 pm  TOPIC 3: SNAKES. Chuck Peterson.

---

**Saturday, March 29**

**FIELD TRIPS**
One-half to full-day excursions into the surrounding bush. Lunch will be provided. Field trips are coordinated by Ken Bevis. Information will be posted at the registration desk.

**HANFORD:** The nuclear reservation provides dry, shrub-steppe habitat for a host of species. Join a Hanford scientist to view species, projects, and habitats in this unique environment.

**REPTILES:** A population concentration of sharptail snakes was recently located near Cle Elum, WA. We will visit this site and a nearby area with long-term rattlesnake research along the Yakima River. This field trip will highlight the reptile workshop.

**YAKIMA CANYON:** This area is known for its raptors, including prairie falcons and golden eagles. There is also good shrub-steppe habitat. Join local experts to view the spectacular scenery and great birding.

**WENATCHEE NATIONAL FOREST:** Visit the dry east-side forest and view selective harvest forestry, wildlife tree management, and carnivore detection techniques. Watch a tree become a snag before your eyes! This trip will be a follow-up for the wildlife tree and carnivore detection workshops.

**WHITE BLUFFS OVER THE COLUMBIA:** See the spectacular scenery from cliffs overlooking the famed Hanford Reach. Join a local expert naturalist to see some great shrub-steppe habitat and its denizens.

**SURVEY AND MANAGE AMPHIBIANS:** Open only to workshop attendees. The authors will walk participants through the Protocols and emphasize general methods used to search for salamanders. The field trip will target the 2 northern species: Larch Mountain and Van Dyke's Salamander.
Hi. I'm doing a telemetry study on Grizzlies. You?

Me? I'm into bat guano!
RESPONSE OF NATIVE TADPOLES TO EXOTIC VERTEBRATES IN WESTERN WASHINGTON. Michael J. Adams. University of Washington, College of Forest Resources, Box 352100, Seattle, WA 98195.

Introduced *Rana catesbeiana* and fish are hypothesized to affect the distribution and abundance of anurans native to lowland areas of western Washington. This hypothesis predicts a negative association between exotics and natives, that exotics can impact natives in some way, and that excluding exotics will improve the fitness of natives. These predictions were tested for 2 native tadpoles, *R. aurora* and *Hyla regilla*, over a 3-year period on the Fort Lewis Military Reservation. *H. regilla* distribution and abundance is best predicted by the presence of exotic fish. A negative association between exotics and *R. aurora* exists at the scale of whole wetlands and at habitats within wetlands. However, habitat variables related to emergent vegetation and hydroperiod were better predictors in all years at all scales, and presence of exotics was not significant after habitat was accounted for. Enclosure experiments suggest that in a simple environment, exotic fish can be major predators of native tadpoles, but there was no evidence that overall survival of tadpoles improved by excluding exotics at most wetlands. Exotics appear to have some effect on native tadpole survival, but other habitat variables may be more important on Fort Lewis.

![Image of a gecko](image)


We describe forest health and management relationships with bald eagle nesting territory occupancy and productivity in the Klamath Basin of south-central Oregon. The Doak Mountain Management Area northwest of Klamath Falls, Oregon, has been actively managed to provide eagle nesting and roosting habitat while sustaining production of forest products since 1967. Drought conditions plagued the Klamath Basin for more than 7 years and by 1992, forest health conditions deteriorated and posed an imminent threat to eagle nesting habitat. From 1992 to 1994, Weyerhaeuser implemented a selective timber harvest plan across nearly 7400 acres to protect eagle nest trees, reduce fire hazard, and reverse trends in tree mortality and forest health. Following harvest, stocking densities ranged between 61 and 301 trees/acre across a range of diameters for 4 different tree species. A total of 57 bald eagle nest trees were protected during harvest operations. The number of occupied and successful eagle territories and productivity have been maintained or increased since harvest implementation in 1992. Between 1971 and 1991, an average of 7.3 chicks (s.e. = 0.73, range = 1-13) were fledged per year from 1 to 9 successful territories at Doak Mountain. Following harvest operations (1992 to 1996), an average of 12.4 chicks (s.e. = 2.38, range = 8 to 20) were fledged annually from between 5 and 12 successful territories. A total of 62 chicks have fledged from Doak Mountain since 1992. The 3-year average number of chicks/occupied territory at Doak Mountain (0.98/site) is comparable with that throughout the Klamath Basin (0.99) and the state of Oregon (0.94) between 1994 and 1996. Our data suggest that bald eagle territory occupancy and nesting success can be maintained in conjunction with forest management.

We prepared a research needs questionnaire on behalf of Partners In Flight and targeted land managers to evaluate their specific needs relative to avian conservation and management. Questionnaires were mailed to nearly 450 land managers representing federal and state agencies, private industry, non-governmental organizations, and Native American tribes. A total of 185 recipients participated in the survey (40% return), most of whom were forest land (69%), range land (19%), or wetlands (6%) managers. Respondents overwhelmingly agreed that current avian monitoring and research efforts are not adequately addressing their day-to-day needs, and most indicated that not enough scientific information had been gathered relative to bird response to common management activities (e.g., grazing, timber harvest). Most respondents suggested that communication and information dissemination between researchers and managers warranted improvement. We present detailed results of specific research needs and offer suggestions for improving communications and transfer of information to land managers.

A TECHNIQUE FOR ATTACHING RADIO TRANSMITTERS TO WESTERN TOADS (BUFO BOREAS). Paul E. Bartelt and Charles R. Peterson. Idaho State University, Pocatello, ID.

Using radio telemetry to study smaller animals has become increasingly popular as technological advances have allowed the manufacture of smaller transmitters. However, some features of anurans (body shape and delicate, moist skin) have made attaching transmitters to them problematic. During 1993-1995, we used radio telemetry to study the movements and habitat use of western toads (Bufo boreas) in western Idaho. We used surgical grade, polyethylene tubing (ID = 0.58mm, OD = 0.965mm) to attach 1.85-g transmitters around the waist of adult toads, and a portion of a large-size flyline eyelet to secure the ends of each belt. This method had several advantages. It was lightweight (<0.05g) and generally had little effect on the movements and foraging of toads. A laboratory, time-lapse videography study failed to find any effect on the behavior of three captive toads. There were some disadvantages. Transmitters slipped off several of the toads; other toads developed skin abrasions or sores at the site of contact with the belt, some severe. However, adjusting the belt and applying vitamin E oil to the affected area allowed complete healing within a week. Removing dead skin from the belt each week reduced the incidence of skin sores. This technique has been used on frogs (especially Rana pretiosa) with less success. Modifications that reduce the possibility of skin sores would substantially improve the usefulness of this method.
BIRD COMMUNITIES IN 5- TO 34-YEAR-OLD MANAGED DOUGLAS-FIR STANDS ON THE WILLAMETTE NATIONAL FOREST, OREGON CASCADES.  Kelly A. Bettinger. Washington Department of Fish and Wildlife. William C. McComb. University of Massachusetts.

Breeding bird communities were examined in 18 managed Douglas-fir stands in 6 age classes from 5 to 34 years old in spring and early summer 1993 on the Detroit Ranger District, Willamette National Forest, Oregon. The range of seral stages included early shrub/sapling, late shrub/sapling, and pole. Of the 50 bird species recorded, 18 had large enough sample sizes for analysis. Of these 18, eight showed a pattern of increasing abundance with increasing stand age (chestnut-backed chickadee, golden-crowned kinglet, hermit thrush, hermit warbler, Pacific-slope flycatcher, Swainson’s thrush, Wilson’s warbler, winter wren). Four species showed a pattern of decreasing abundance with increasing stand age (American robin, dark-eyed junco, rufous hummingbird, white-crowned sparrow), and 4 species peaked in abundance in age class 2 (10-14 years old) before decreasing with increasing age (dusky flycatcher, MacGillivray’s warbler, orange-crowned warbler, rufous-sided towhee). Two species did not exhibit any particular pattern associated with stand age (warbling vireo, western tanager). Total abundance, species richness, and species diversity did not differ (P<0.05) among the age classes. However, bird community composition changed with increasing stand age. The rate of bird community change was rapid along the gradient of open-canopy stands (the 9 younger stands), but appeared to reach a plateau once canopy closure was reached.

RIPARIAN AREA REHABILITATION.  Michael M. Borman. Department of Rangeland Resources, Oregon State University, Corvallis, OR.

Our knowledge base on riparian rehabilitation is growing, but it is still somewhat limited. Very few publications on this topic are based on actual research with an appropriate experimental design. Many have been based on non-replicated demonstration projects, case studies, and general observations. In-stream structures have often been attempted, but have often failed to achieve rehabilitation because management has not been addressed. Prescribed fire has shown potential, but it has not been much used, or at least reported, as a vegetation management tool in riparian areas. Artificial seeding and transplanting have been extensively attempted and have frequently failed. Site selection and timing, handling of materials, and follow-up maintenance are critical. If livestock grazing is responsible for maintaining a deteriorated riparian area, a change to an appropriate management will often result in improvement within the potential/capability of a site without additional intensive rehabilitation activities. Proper Functioning Condition (PFC) assessment is currently being used by the Bureau of Land Management and Forest Service to evaluate whether a riparian-wetland area is functioning properly based on capability/potential, which is a function of the interaction of vegetation, landform/soils, and hydrology. PFC can help prioritize sites for rehabilitation efforts and prescribe rehabilitation methods.
NORTHERN GOSHAWKS NESTING ON A PRIVATE INDUSTRIAL FOREST IN WESTERN WASHINGTON. Thomas Bosakowski, Bruce McCullough, Frank J. Lapsansky, and Martin E. Vaughn. Beak Consultants Incorporated, 12931 NE 126th Place, Kirkland, Washington 98034-7716.

Very little is known about northern goshawk (*Accipiter gentilis*) nesting on private, intensively managed timberlands in the Pacific Northwest. We conducted systematic surveys from 1994 to 1996 for goshawks on the 21,600-ha Mineral Tree Farm in Lewis County, Washington, which is owned and operated by the Murray Pacific Corporation. The maximum number of active nests (3) occurred in 1996, which translates into a maximum nesting density of 1 nest per 7200 ha or 0.0139 nests per 100 ha. The density of goshawks on the tree farm was about 1/5 to 1/4 of the mean nesting densities (0.06-0.07 nests/100 ha) found in 3 National Forests in eastern Oregon (DeStefano et al. 1994, *Studies in Avian Biology* No. 16). In terms of reproductive success, at least 1 young was produced in 1994 and 1995, and 2 fledglings were produced at each of the 3 nests in 1996. Reproduction was relatively the same or higher than reproduction occurring in more pristine National Forests of Oregon (DeStefano et al. 1994, Bull and Hohmann 1994, *Studies in Avian Biology* No. 16). The 3 nest stands, aged at 40, 43, and 54 years, were below normal harvest age for western Washington, and show that goshawks are nesting successfully in forests being managed as spotted owl (*Strix occidentalis*) dispersal habitat. GIS analysis of all closed-canopy conifer forests (>27 years) around the 3 nests showed an average of 100% forest cover at the nest site (12 ha), an average of about 60% cover of the post-fledgling family area (240 ha), and an average of about 30% cover of the entire home range (2,400 ha).

SPECIES OCCURRENCE IN BIG SAGEBRUSH HABITAT PATCHES FRAGMENTED BY INDUSTRIAL CONSTRUCTION, HANFORD NUCLEAR RESERVATION, WA. C.A. Brandt, R.A. Burrows, and W.H. Rickard. Pacific Northwest National Laboratory, Richland, WA.

Plant, reptile, bird, and mammal species occurrence data were collected on 18 big sagebrush- (*Artemisia tridentata*) dominated habitat island patches on the Hanford Nuclear Reservation, WA. The patches, which are relicts of the former continuous shrub-steppe, have been isolated by Hanford industrial construction. They range in size from 0.4 ha to 383.9 ha. The surveys were conducted in May 1996 in the 200 West area, a major industrial area on the Hanford site. Numbers of plant, bird, and mammal species were compared with patch size and degree of isolation of each patch. The number of reptile species recorded was too small to do these analyses. However, the number of plant, bird, and mammal species increased with patch size in conformance with species-area predictions, but poorly with degree of isolation using any of 3 different indices of isolation. To determine whether patches supported only those species able to acquire sufficient resources from the patch, we evaluated the correlation between patch size and the largest home range size for any species (within a taxon) found within the patch. The relationship was significant for birds and mammals: larger patches supported species with greater home range requirements. Patch context was clearly important to use by mammals. Mule deer (*Odocoileus hemionus*) used a variety of patches independent of size, but did not use patches isolated by >250 meters from other patches. However, badgers (*Taxidea taxus*) avoided patches that were smaller in size than the expected home range for this species, even where patches coalesced into a relatively large size based on low degree of isolation among the patches. Common birds found in all patches were non-shrub obligate species, such as western meadowlark (*Sturnella neglecta*) and American robin (*Turdus migratorius*). Sage sparrows (*Amphispiza belli*) rarely used patches smaller in size than their expected home range. They were not regularly observed in any patch <10x their home range size. Horned larks (*Eremophila alpestris*) were found only in the largest patch (~2000x home range size).
AMPHIBIANS IN RIPARIAN HABITATS IN NORTHEASTERN OREGON. Evelyn L. Bull. USDA Forest Service, Pacific Northwest Research Station, La Grande, OR.

In northeastern Oregon, streams and ponds provide most of the breeding sites for amphibians. In a study that compared wildlife use of fenced and unfenced ponds, there were no significant differences in the abundance of larval Pacific treefrogs (Hyla regilla) or long-toed salamanders (Ambystoma macrodactylum). There were significantly more birds detected using fenced ponds than unfenced ponds. In another study, reproduction of Columbian spotted frogs (Rana luteiventris) was compared between grazed and ungrazed breeding sites. The ungrazed sites contained approximately double the number of eggs that grazed sites contained. Although the eggs occurred in the same depth of water at both types of ponds, they were double the distance from the shore at the grazed sites compared to the ungrazed. In a third study, it appeared that stream characteristics were more important than landscape characteristics in predicting the abundance of tailed frogs (Ascalaphus truei) in streams.

EVALUATION OF THE PROTECTION OF BIODIVERSITY IN WASHINGTON STATE — RESULTS OF THE WASHINGTON GAP ANALYSIS PROJECT. Kelly Cassidy, Michael Smith, Karen Dvornich and Christian Grue. Washington Cooperative Fish and Wildlife Research Unit, School of Fisheries, University of Washington, Seattle, WA.

Gap analysis is a process by which land cover types and vertebrate species underrepresented on lands managed to protect biodiversity are identified on a landscape scale. Land cover is mapped using satellite (TM) imagery to a minimum mapping unit of 100 ha; distributions of breeding vertebrates (excluding fish) are modeled; and these data layers are overlaid onto a map of land ownership classified into categories of “protection” with the highest level of protection (Status 1 & 2 lands) assigned to National Parks, wilderness areas, fish & wildlife refuges, state wildlife management areas, and state and private reserves, among others. Within Washington State, 9 of the 15 vegetation types most poorly protected are steppe habitats. Other types poorly protected include lowland forests (Douglas-fir and western hemlock), oak woodlands, and prairie on the west side of the Cascades, and ponderosa pine on the east side. A high percentage of the amphibians (54%), reptiles (76%), breeding birds (60%), and mammals (43%) within the state have less than 10% of their predicted distributions on Status 1 and 2 lands. Applications of Washington State Gap Analysis (WA-GAP) data and analyses to land use planning in the state will be identified, and draft copies of the 5-volume WA-GAP Final Report will be available for review.

ABUNDANCE, DISTRIBUTION, AND HABITAT ASSOCIATIONS OF RAPTORS WINTERING IN THE KITTITAS VALLEY, KITTITAS COUNTY, WASHINGTON. Tara Chestnut and Keri Boomgarden. The Evergreen State College, Olympia, WA.

Seventeen roadside surveys for raptors were conducted in the Kittitas Valley, Kittitas County, Washington, from January to March 1996 and 1997. Observations on seasonal abundance, distribution, and habitat associations in farming communities were made. Eleven species were observed. Red-tailed hawks (Buteo jamaicensis), rough-legged hawks (Buteo lagopus), bald eagles (Haliaeetus leucocephalus), and American kestrels (Falco sparverius) were the most commonly encountered species. Northern harriers (Circus cyaneus), prairie falcons (Falco mexicanus), merlins (Falco columbarius), sharp-shinned hawks (Accipiter striatus), and Cooper’s hawks (Accipiter cooperii) were documented infrequently. Two owl species, great horned (Bubo virginianus) and short-eared (Asio flammeus) owls were also detected.

We studied bat use on the US Army Yakima Training Center (YTC) to characterize bat species diversity, abundance, and habitat use during summer 1994. Bats were captured using mist nets and harp traps, bat calls were recorded with ultrasonic bat detectors, and bat behavior was observed by using a night-vision scope. We captured 40 bats including western small-footed myotis (Myotis ciliolabrum), little brown myotis (M. lucifugus), big brown bat (Eptesicus fuscus), silver-haired bat (Lasionycteris noctivagans), and pallid bat (Antrozous pallidus). Most (71%) were adult males, 13% were adult females, and 16% were juveniles. Only one-third of females were lactating and none was obviously gravid. Most bats were captured within a railroad tunnel or near streams associated with cliff habitat. Bats fed along streams and roosted in cliffs or the railroad tunnel. Bat activity was recorded using echolocators at 90 sites, and calls were obtained from the silver-haired bat, red bat (Lasiurus borealis), big brown bat, pallid bat, hoary group (hoary bat [L. cinereus]), and myotis group. Most (86%) calls were from species in the myotis group. The most active sites were along pooled streams, near cliffs, and at the railroad tunnel, while a few calls were recorded at upland sage sites, stock troughs, canals, and over 5 km from cliffs. Most calls were recorded during the first 2 to 3 hours after dusk and again about 5 hours after sunset. Stream and cliff habitat should be protected for bats in arid environments and travel corridors protected along streams.

MODELING THE LOCATION OF SNAKE DENS ON THE IDAHO NATIONAL ENGINEERING LABORATORY. Sarah L. Cooper and Charles R. Peterson. Department of Biological Sciences, Idaho State University, Pocatello, ID 83209.

In northern climates, snakes typically congregate in communal den areas (hibernacula) to overwinter. Because these areas serve as critical habitat, the detection of snake hibernacula is important for the protection and conservation of snake species. To predict the locations of snake dens on the Idaho National Engineering Laboratory in southeastern Idaho, we measured the habitat features of 10 known snake dens and used a GIS to locate areas that had a similar complement of habitat features (slope values [30-75%], aspect values [90-260°], and lava age classes [Qbc and Qbd]). Using this information, we were able to create a predictive map that we tested out by visiting 50 randomly selected locations that lay within the predicted areas and 50 randomly selected areas that were not predicted to be denning areas. The predicted areas on our map were less than 1% of the total area of the site. Out of the 50 predicted sites that were surveyed, 32% (16) showed snake activity, while none of the not-predicted sites showed snake activity. Exact testing indicated that the model was statistically significant at the α=0.05 level (P=0.012). Because of the current difficulty in locating snake dens, we consider the model to be a useful tool for located snake dens in southeastern Idaho.
NESTLING DIETS OF WESTERN AND MOUNTAIN BLUEBIRDS IN CENTRAL OREGON. Charlotte C. Corkran. Northwest Ecological Research Institute, Portland, OR.

As part of a long-term study of western bluebirds (Sialia mexicana) and mountain bluebirds (S. currucoides) in juniper (Juniperus occidentalis) steppe habitats of central Oregon, the composition of the diet of nestlings was examined. Using 10X binoculars and patience, observations were made at nest boxes to identify (to order or family) food items brought to nestlings by their parents. The order Orthoptera predominated, but ten orders of insects were represented, as well as undifferentiated arachnids and berries. The composition varied significantly by season, and less consistently by year, location, and individual birds. Bluebirds were observed to use several foraging strategies, and were opportunistic in response to local abundance. None of these foraging techniques were productive in cold, rainy conditions, probably contributing to nest failures during inclement weather.

HABITAT SELECTION BY SPRING MIGRANT LAND BIRDS IN RIPARIAN ZONES OF SOUTH-CENTRAL WASHINGTON. Corey A. Duberstein and Rodney D. Sayler. Department of Natural Resource Sciences, Washington State University, Pullman, WA. Charles A. Brandt, Battelle Pacific Northwest National Laboratory, Richland, WA.

Many land bird populations that breed in temperate North America are declining across all or parts of their ranges. Potential causes may include habitat deterioration in wintering and breeding areas, as well as along migration corridors. I studied stopover habitat selection by migrant passerines in the spring of 1995 and 1996 on the Department of Energy Hanford Site. The riparian habitats which serve as stopover habitat within this semi-arid shrub-steppe environment total <1% of the land area. I established pedestrian survey routes in 14 riparian patches representing 3 habitats: lowland river, upland stream and lacustrine. More than 2400 individuals of 35 species were recorded. The most common migrants, accounting for almost 75% of the birds observed, were the ruby-crowned kinglet (Regulus calendula), golden-crowned kinglet (R. satrapa), orange-crowned warbler (Vermivora celata), Wilson's warbler (Wilsonia pusilla), Empidonax flycatcher, Lincoln's sparrow (Melospiza lincolnii) and the Nashville warbler (V. ruficapilla). Density of these taxa was greatest near the upland streams except for the Lincoln's sparrow, which occurs at higher densities along the river. Species richness was also higher in the upland stream habitat. Habitat selection at the patch scale was not detected when bird densities were compared to percentage cover of tree, shrub or snag/downed wood, or percentage cover of native vegetation. Species richness does not appear to be influenced by patch characteristics. Migrants in this region may be relating to large-scale geographical features and using stopover habitat along these corridors.

The herp database created for the Washington Gap Analysis Project consisted of 14,206 digitized records, of which 2965 were used to conduct an “accuracy” assessment. The records were used to draw range boundaries. Habitat association models were developed as matrices delineating ecoregion, vegetation zone, and land cover based on literature and expert opinion. The subsequent range maps were created using range limits, habitat models, and actual land cover. The points were overlaid on the range maps and used to refine the maps in an iterative process. The initial “accuracy” assessment was 96% for amphibians and 95% for reptiles. The maps were refined using recent and more locationally accurate data, incorporating elevation, slope, aspect, substrate, land cover, and more expert opinion to create the best maps possible. The first set of maps were based on what we knew about the species; the final set on what we learned during the process. Further improvement of the models will be possible with finer scale habitat data as well as better information on the attributes of suitable habitat for each species. To better understand how stream size, substrate types, elevation, plant communities, slope, and aspect relate to the habitat needs of reptiles and amphibians, field surveys should begin to measure and record these parameters.

SMALL MAMMAL DISTRIBUTIONS, ABUNDANCE, AND HABITAT SELECTION IN MANAGED RIPARIAN HABITATS OF BEAR VALLEY, EASTERN OREGON. W. Daniel Edge and Walfrido Tomas. Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR 97331-3803.

Riparian zones are critical habitats for management because of their importance for both cattle production and wildlife, and have a high potential for resource conflicts. Riparian management should address habitat and microhabitat features that sustain both livestock production and wildlife diversity. I conducted a study to determine how small mammal distributions and abundance differ among 3 structurally different riparian habitats in eastern Oregon. The 3 habitat types: herbaceous, discontinuous willow, and continuous willow, represent a range of habitats typical of riparian zones in central and eastern Oregon. We estimated small mammal population sizes in 9 trap grids placed in riparian zones using capture-recapture techniques. Four species of small mammals were captured during 7 trapping periods from August 1994 to September 1995. Small mammal distributions and population sizes of each species varied both within and among riparian pastures. Montane voles (Microtus montanus) were the most abundant species in all grids. Deer mice (Peromyscus maniculatus) had high population sizes in grids with low montane vole populations and moderate to high willow cover. Western jumping mice (Zapus princeps) were captured at relatively low numbers and almost exclusively in continuous willow habitats. Vagrant shrews (Sorex vagrans) were captured on all grids, and population sizes were small. Having negatively affected survival rates of voles.
A COMPARISON OF BAT ACTIVITY BETWEEN LOW AND HIGH ELEVATION SITES. Janet Erickson. College of Forest Resources, University of Washington, Seattle, WA 98105.

That fewer bats occupy high elevation regions compared to lowland regions is a familiar pattern to many mammalogists. However, few studies have quantified elevational effects on bat activity and species composition. To provide a more detailed description of the relationship between bat communities and elevation, I examined the differences in activity patterns and community structure of bats between low (<500 ft) and high (>1850 ft) elevation sites within the Capitol State Forest, Washington. Total bat activity averaged 4 times higher at low elevation sites than at high elevation sites. Feeding activity, quantified by the presence of feeding buzzes, was almost 20 times higher at low elevation sites. Different levels of activity between elevations could be the result of differences in insect abundance, climatic conditions, and morphology of the bat species.


Historical (1940s) and current aerial photographs of 8 forest meadows were compared for change in meadow area, perimeter, and identification of ecotone types. Vegetation transects were placed across identified ecotone types at each meadow to describe both forest edge dynamics and herbaceous meadow species response. Forest encroachment characterized much of the forest-meadow ecotone, but there were segments of the ecotone that were stable and others that were shifting back into the forest because of tree mortality. Meadow area (<10% tree cover) had declined by 10% to 45% (mean =31%) over the last 50 years. Perimeter of the meadow edge had also declined, and percent change could exceed that of meadow area. Percent tree cover in a 100m buffer area adjacent to the original forest edge had increased, and mortality from root rot, insect attack, and blow down was observed. The forest edge was dynamic both in its meadow encroachment (sequential or leap-frog) and in the apparent waves of successional and stand development stages that ran into a stable ecotone boundary. Herbaceous species composition changed significantly from forest to ecotone to meadow proper, but some species were common to all 3. Decline in meadow area and altered species composition should be evaluated for on-edge species habitat and hydrological processes. Increased tree mortality at the forest edge could create fuel ladders and the potential for meadow ground fires to move into tree crowns.
URBAN WILDLIFE BIOLOGY - WHY IGNORE WASHINGTON'S ONE MILLION URBAN/SUBURBAN RESIDENTS AND THEIR ASSOCIATED WILDLIFE? Howard L. Ferguson. WA Department of Fish and Wildlife, Spokane, WA.

It would be rather myopic to think we are preserving, protecting, and enhancing our state's wildlife populations if we choose to ignore our urban and suburban wildlife. It has been estimated that over 30,000 acres of wildlife habitat are now being lost in Washington each year. That's more than one entire township. The task of the urban biologist is to address this "front line" in as many ways as possible. This requires not only the typical biological component, but also expertise in public relations, habitat/landscape, and environmental education. Because of this atypical nature, support is often lacking for urban biologists. Despite this, the urban biologist performs varied tasks to help promote both the short-term preservation of our wildlife and the recreational enjoyment of our wildlife by the majority of our citizens.


We enumerated prey in pellets of spotted owls in 4 different regions of Washington in 1983-1994. Diets varied among regions and among territories within regions; but in all regions, the northern flying squirrel was the most common prey in the diet, comprising approximately half of the individual prey identified in pellets. A few pairs on the east side of the Olympic Peninsula and east slope of the Cascades captured more woodrats than flying squirrels. Differences in diet among regions and territories were probably the result of regional or local variation in prey abundance, but could also have reflected individual variation in prey selection. Although there was some variation in diet composition among years, diets of most pairs of owls were dominated by the same prey species in all years. Some species of prey were largely restricted to the summer diet. This was especially true of insects and snowshoe hare. Approximately 95% of the hare in pellets were small juveniles or subadults, and 99% were captured between 1 April - 20 September. Average annual productivity of spotted owls on the east slope of the Cascades in Washington is higher than anywhere else in the owl's range. We hypothesize that this may be due to greater total prey biomass on the east slope.

Habitat use by northern sagebrush lizards (Sceloporus graciosus) was investigated on the US Navy's 48,000-acre NWSTF Boardman facilities as part of an integrated multi-resource research program. The objectives of the study were to determine what major habitat types these lizards occupied and what habitat components they specifically selected within these habitat types. In general, northern sagebrush lizards were found in big sagebrush- (Artemisia tridentata) and antelope bitterbrush- (Purshia tridentata) dominated habitat types, and largely avoided the gray rabbitbrush (Chrysothamnus nauseosus), cheatgrass (Bromus tectorum), and western needle-and-thread grass (Stipa comata) habitat types. Usage within the bitterbrush and sagebrush habitats was determined by comparing sites occupied by lizards (n = 60) with sites randomly located within each habitat (n = 60) representing the general habitat. Differences between occupied and general habitats should indicate selection or avoidance. The results showed that these lizards selected for areas with 2 to 4 times higher bare-soil coverage than average and conversely selected for significantly lower than average coverage of grass, litter, and lichen. Furthermore, all the sites occupied by lizards were located in sandy soils, while this soil type represented only half of the general habitat sites. In overall conclusion, northern sagebrush lizards were essentially selecting for sandblows with approximately 20% shrub coverage, and avoiding areas where soils were stabilized and therefore covered with grass, litter, or lichen.

WHAT GARTER SNAKES EAT, HOW IT VARIES, AND WHY IT MATTERS. Patrick T. Gregory. University of Victoria, BC.

Feeding is a fundamental activity that influences, and is constrained by, an animal's other activities. Whether snakes are useful models for testing such interactions remains to be seen, but studies of the natural food habits of snakes provide the necessary context for doing so. In this paper, I summarize several years of field study focusing on feeding in 3 species of garter snakes, Thamnophis, on Vancouver Island, British Columbia. The 3 species all differ in diet, even when syntopic, but interspecific competition has not been demonstrated. Moreover, within species, diets vary somewhat from site to site, possibly reflecting food availability. Although temporal variation in diet of a given species seems modest at most sites, there is significant variation in feeding frequency or prey type among different classes (i.e., sex, body size) within a population. The link between feeding ecology and population ecology has not been explored, but availability of prey of appropriate size might limit survival of young. Prey availability may also be related to geographic variation in size of neonates in one of the species. Finally, frequency of reproduction by individual females is presumably related to food intake, but the relative significance of reproductive frequency to population dynamics is unclear.
REPRODUCTIVE SUCCESS OF NORTHERN SPOTTED OWLS IN THE NORTHEASTERN WASHINGTON CASCADES. Wayne F. Iverson. Seattle Central Community College, Seattle, WA.

Loss of old-growth forest due to current timber harvesting practices is the major threat to northern spotted owls. But other factors such as weather conditions may also affect the ability of a threatened species to survive and reproduce. I hypothesize that the cold, wet weather conditions found in the northwestern Washington Cascade Mountains may adversely affect the annual reproductive success of spotted owls. This study examines the reproductive success of spotted owls in the Mount Baker-Snoqualmie National Forest (MBSNF), which covers the west slope of the Cascade Mountains from Mount Rainier National Park to the Canadian border. This area approaches to within approximately 150 km of the northernmost latitude of the owl’s historic range. If ambient temperature and moisture are limiting factors, then spotted owls in the MBSNF should show greater reproductive success in years with warmer winter temperatures and less spring precipitation. Northern spotted owl sites in relatively dryer or warmer portions of the owl’s range might also exhibit greater reproductive success overall than sites in the MBSNF.

EFFECTS OF CLEARCUT LOGGING AND RIPARIAN BUFFER STRIPS ON TERRESTRIAL PACIFIC GIANT SALAMANDERS (DICAMPTODON TENEBROSUS). Barb Johnston. Department of Zoology, University of British Columbia.

Details of the movement and activity patterns of terrestrial Pacific giant salamanders (PGS) are poorly known, as are the effects of logging on the terrestrial life stage of this species. In Canada, PGS are found solely within the Chilliwack River valley, and the persistence of this population is being threatened by logging. We are conducting research on the movements, activity patterns, and habitat use of terrestrial PGS in the Chilliwack River valley using radio-telemetry. A preliminary study conducted in June-October 1996 revealed that within forested sites (mature second growth), terrestrial PGS have an average home range size of 1600m². While some individuals confined their movements to the stream channel, most spent the majority of their time away from the stream in upland forest areas. They generally spent several days in a small area, utilizing one or a few retreats, followed by movement to a new area. Terrestrial PGS are active both day and night, although they traveled slightly farther during nighttime sojourns. In 1997 we will continue this study, following salamanders in logged (both clearcut to the stream margin and clearcut leaving forested buffer strips) as well as in forested sites. We will be assessing the effectiveness of riparian buffer strips, a proposed management strategy in the new BC Forest Practices Code, for the conservation of terrestrial PGS in Canada.

At the SNVB annual meeting in Corvallis, Oregon, last year, Jones et al. (1996) mentioned the repetitive use of this absurdly silly poster. We learned that they intend to use this very same poster for self-gratification this year in Yakima and are, quite frankly, disgusted by their intentions. We hypothesized that reusing old, farcical posters was counterproductive for professional biologists attending scientific meetings. To test our hypothesis, we summed the caloric expenditure of the authors’ conducting various tasks of poster reuse (retyping pointless abstract, packing, dusting, re-adhesion of yellowing paper, carrying, shipping, etc.). To this we factored the cumulative caloric expenditure on the viewers (e.g., eye-rolling, head-scratching, sighing, nasal-digitizing, snoring, etc.). We analyzed these data using a variety of really unwieldy statistics, including the Kruskal-Wallace-Darwin-Gromit test for Phlegm Expulsion Extrapolation. Our findings indicate the poster had a highly significant ($P = 0.00000000000000000000000000000000666$) value. In other words, the total effort associated with this poster is greater than the caloric expenditure of Congress in session for 6 weeks, and equal to a mental anguish index (in sighs/person/day) of 72.6. We hope that this level of mental anguish will not be inflicted upon the scientific community in future years.

RELATIVE ABUNDANCE OF AMPHIBIANS IN AND NEAR STREAMS IN DIFFERENT STAND CONDITIONS OF THE OLYMPIC PENINSULA: A PROGRESS REPORT. Lawrence L. C. Jones and Martin G. Raphael. Pacific Northwest Research Station, Olympia, WA.

We conducted amphibian surveys on 300-meter stream reaches in logged and unlogged forests of the Olympic Peninsula, Washington. In-stream surveys were performed at 18 headwater streams during late summer to early fall, and streambank surveys were performed at 14 of those sites during mid- to late fall. During in-stream surveys (10 equally spaced, variable width, 1-meter belts), we captured 575 individuals. Three species were common: tailed frogs (Ascaphus truei) (43%, $n = 251$), Cope’s giant salamander (Dicamptodon copei) (38%, $n = 221$), and Olympic torrent salamanders (Rhyacotriton olympicus) (14%, $n = 79$). Captures per stand were greater in old, unmanaged forests (60%) and mature, previously harvested forests (31%) than in young, previously harvested stands (9%). Amphibians used the 4 most available flow types (cascade, riffle, scour pool, overflow) in differing proportions. Streambank surveys were 2-meter long transects in the valley bottom (variable width), the near-stream (10-m wide, adjacent to valley bottom), and upland (10-m wide, 40m above valley bottom) habitats. Only 169 amphibians were captured (55 individuals/hectare), but the low densities of surface-active animals may have been influenced more by cold nighttime temperatures at that time of year than by actual abundance. Western red-backed salamanders (Plethodon vehiculum) accounted for most (71%) of the 9 species captured. They were found throughout valley bottom to upland habitats; capture rates of other species were too low to draw meaningful conclusions.
Southern torrent salamanders (*Rhyacotriton variegatus*) lay their eggs in headwater streams in the Pacific Northwest. On 28 September 1995, a southern torrent salamander nest site was found approximately 10 km south of Orick, Humboldt County, California. This is the first documented torrent salamander nest site in California. The nest site was located in a first-order stream on private, managed forest land and was discovered while searching for torrent salamander larvae and adults. The clutch consisted of 11 large (x=5.6 mm, s=0.39), cream-colored eggs deposited singly beneath a small boulder (28 cm x 20 cm) near the center of the stream channel. One egg was lost in the current when the site was disturbed. Ten remaining eggs were placed in a small perforated plastic container, submerged near the location of the original nest site, and anchored in the stream with rebar and large boulders. The eggs were checked frequently with a hand lens, and embryo development was documented. Two eggs decomposed within the first 2 months of observation and were removed from the container. Seven of the 8 eggs in the container hatched between 9 April and 15 May 1996 (193 - 229 days after discovery), and the last egg hatched between 15 May and 13 June 1996. Though parental care was lacking, the relatively large egg size and small clutch size at this nest site suggest mode II reproduction in southern torrent salamanders.

The purpose of the study was to determine the habitat use patterns of 2 bird species, the sage sparrow and the sage thrasher, on the Yakima Training Center (YTC). As one of the remaining large blocks of shrub-steppe in eastern Washington, the 500-square mile YTC is ecologically vital to these species. A stratified-random sampling design was developed to collect breeding bird data along 32 one-kilometer-long transects in high and low elevations, and ridge and drainage topography. Vegetation data was collected to compare habitat use patterns. Bird densities were calculated using a distance-function model. Habitat data for nest sites was compared to random plot data to determine if birds were selecting habitats or nest shrubs in patterns that differ from what was randomly available. Sage sparrow habitat use was related to topographic features, while sage sparrow habitat use was strongly associated with elevation. These observed habitat use patterns appear to be related to vegetation attributes that were significantly different between habitat groups. Density of sage sparrows and sage thrashers were compared to published and unpublished studies of these species on the nearby Hanford Site, the only other large block of relatively undeveloped shrub-steppe habitat in the Columbia Basin. Similarities and differences in habitat use patterns between these sites have implications in managing sage sparrows and sage thrashers on an ecological landscape scale.

I will address 3 topics:
Site Potential. Present environmental and ecological conditions will determine the response of sites when the primary limiting factor to successional advancement is reduced. Such knowledge is important in prioritizing site selection for riparian improvement.
Exclosures (benchmark) Areas. These are often a valuable initial action which will demonstrate site potential if factors such as livestock grazing are suspected as the primary factor limiting site potential.
Monitoring Studies. Both qualitative and quantitative information are desirable, and often essential, to document the successional change in managed riparian systems. Several successful techniques will be discussed.


Understanding the ecology of riparian and wetland systems is complicated by extreme variation in sites as well as disturbances caused by humans. Therefore, it is often difficult to recognize the potential of riparian and wetland sites and develop management plans accordingly. I have been doing riparian and wetland classification work in central Oregon and eastern Washington since 1982. These classifications use a 4-level geomorphic/floristic approach to help identify the potential of disturbed sites. This talk will take a brief tour through examples of both disturbed and natural plant communities east of the Oregon and Washington Cascades.

SNAG LONGEVTITY AND WILDLIFE CAVITY OCCURRENCE IN BURNED FOREST STANDS. J. Lehmkuhl, R. Everett, R. Schellhaas and D. Keenum. USDA Forest Service, Wenatchee Forestry Sciences Laboratory, Wenatchee WA.

Snag longevity, decay class, snag height, and cavity occurrence on 22 burned sites on the east slope of the Washington Cascades were sampled. Snags were on burned sites from 2 to 88 years following a stand replacement fire. Approximately 87% of cavities were found in snags of decay class 3 or greater. Snags of tree species that fell entire from the base and either took an extended time to reach decay class 3 (40+ yr subalpine fir) or were of smaller diameter (Engelmann spruce, lodgepole pine) had fewer cavities than ponderosa pine or Douglas-fir that rapidly reached decay class 3 (10-15 yr) and broke and fell in pieces from the top. Wildlife cavities occurred in ponderosa pine and Douglas-fir snags in greater proportion than their representation in the stand. Ponderosa pine had the highest percentage of cavities (40% and 39%) per available snag (16% and 25%) of diameter classes 16 to 25 and >25 inches, respectively. Douglas-fir snags accounted for the majority of snags on the sample sites and had the greatest number of wildlife cavities, 71-80%, for snag diameters of 9 to 25 inches. Snag height of ponderosa pine and Douglas-fir continually declined with age, with over 70% of cavities in snags 6 to 40 feet in height. Number of wildlife cavities is directly related to 2 opposing effects of the snag decay process; snags need to be sufficiently decayed for cavity occurrence, and decay causes the continual topping of trees most likely to have cavities.

Noise emitted during human activities such as construction, timber harvesting, and vehicle traffic poses a potential and actual disturbance to wildlife. Many of us would like to know whether an activity is likely to affect a particular species of interest; for example, whether noise from pile driving will be too loud for nesting bald eagles 0.25 miles away. Unfortunately, there is a considerable lack of data on what a species will tolerate, and more importantly, what an individual within a species will tolerate. We can, however, get a general idea of the potential for disturbance by using existing data, noise attenuation models, and an understanding of acoustics. I will provide basic information on acoustics for biologists attempting to predict the potential effects of noise to wildlife. Types of sounds, sources, frequency weighting, and statistical descriptors will be characterized. Further, I will describe the addition of sound levels from multiple sources, outline noise reduction over distance, and present models for estimating attenuation. I will also present an example of how noise analysis was used to determine the potential for disturbance. Identifying the limitations of these methods is important when determining the potential effects of an activity on wildlife.


Historical accounts, museum records, and reports indicate the western toad (Bufo boreas) occurred throughout the vicinity of the Fort Lewis Military Reservation into the early 1970s. Fort Lewis covers 86,176 acres and is composed of large tracts of forested, prairie, and wetland habitats with relatively little development. Amphibian and reptile surveys on Fort Lewis in Pierce and Thurston Counties in the last 5 years have been able to find B. boreas only in the southwestern portion of the base. In 1996 intensive searches of this area found only a single breeding site, Fiander Lake. Males congregated in the first week of April, and 2 schools of newly hatched tadpoles were found in late April. By June, only 1 school could be located. Dissimilar to many reports of this species, the main portion of the school was always observed in water over 2 meters deep. B. boreas is reported to have experienced declines throughout much of its range. In Washington the current status is unknown, but available information suggests a dramatic range reduction in the vicinity of Fort Lewis.

The decline of many species of neotropical migrants has led to increased research on the ecology of these species at their breeding and wintering grounds. However, studies of their ecology during migration are relatively few. Despite recent documentation of molt-migration of numerous neotropical and palearctic migrants, this phenomenon has been ignored in current conservation strategies for neotropical migrants. This may be partially due to an assumption that both latitudinal and elevational molt-migration are rare in neotropical migrants and to a lack of studies that describe the molt cycle of passerines. We argue that food resources at molt-migration stopover sites may be essential for some populations of neotropical migrants. In turn, habitat loss and fragmentation of such sites may pose serious threats to some neotropical migrant species. We suggest that molt studies need to be incorporated into conservation strategies of neotropical migrants so that habitats occupied by species that exhibit molt-migration can be protected, as has been done for some waterfowl and shorebirds.


Non-native red foxes have become common in a number of urban centers in the Pacific states within the last 50 years. These foxes are the descendants of foxes that were released or escaped from fox fur farms, escaped from hunters who released them for game, or were released by wildlife rehabilitators, animal control officials, or disenchanted pet owners. Consequently, thriving populations now occur in some of our cities, where life hasn't been so bad for some of them. Urban foxes use a variety of landscapes for their home and breeding ranges, from airports to cemeteries. These urban habitats provide substantial and diverse food sources, as well as risks uncommon to rural foxes. Foxes are capable predators of small and medium-sized birds and mammals, and it is this ability, along with the ability to move effectively through urban environments, that makes them a threat to some endangered species. I will present ecological relationships of non-native red foxes in urban areas of California and Washington, and discuss some of their implications for humans, pets, and native wildlife.
DISTRIBUTION OF AMPHIBIANS AND REPTILES ON CRAIG MOUNTAIN, IDAHO: A TEST OF GAP ANALYSIS MODELS. Robin L. Llewellyn and Charles R. Peterson. Idaho State University and Idaho Museum of Natural History, Pocatello, ID.

The objective of this study was to provide a field test of the accuracy of gap analysis-predicted distributions for amphibian and reptile species in northern Idaho. The study was conducted in 1994 and 1995 on Craig Mountain (CM), a 60,000-acre area characterized by a high-elevation, coniferous plateau with grassland breaks down to the Snake and Salmon Rivers. CM is a good site for testing gap analysis because of its diverse topography and vegetation. Sampling techniques used included trapping, pond surveys, road driving, etc. Of the 21 native species of amphibians and reptiles potentially occurring in the CM area, we detected 6 amphibian and 10 reptile species (about half of the species occurring in Idaho). The gap analysis models (based on county records, habitat associations, vegetation maps, and lilac blooming dates) predicted 6 amphibian and 9 reptile species. Inaccurate predictions included 1 commission error and 2 omission errors (which were due to incomplete county records). We compared our field results with gap-predicted distributions at 3 spatial scales (large, intermediate, and small scale). Our analysis indicated relatively high accuracies at the large and intermediate scales (86% and 83% respectively), but lower accuracy at the small scale (55%). These results provide a better understanding of the limitations of gap analysis models and how to improve them.

SNAKE PREDATION ON COASTAL SCRUB NESTING BIRDS. Patrick M. Loafman, Geoffrey R. Geupel, and Nadav Nur. Point Reyes Bird Observatory, 4990 Shoreline Highway, Stinson Beach CA 94970.

Monitoring over 150 nests annually for 13 years (1980 to 1992) of open-cup nesting passerines, breeding on the same 36-ha coastal scrub study plot, revealed 20 instances of known nest failure due to snake predation. Seventeen of these nest failures (85%) were caused by the western terrestrial garter snake (Thamnophis elegans), with three other species of snakes (including rubber boa [Charina bottae]) observed only once. These observations suggest that when garter snakes locate nests during the incubation period, they do not prey upon the eggs, but return to nests after hatching to prey upon nestlings. The regular occurrence of predation over time (where nestlings disappear over a few days) and partial predation (where some of a brood successfully fledge) suggest snakes commonly prey upon and return to nests. Relative density estimates of the local snake populations were compared to Mayfield nest success estimates and nestling survivorship of three common coastal scrub species: wrentits (Chamaea fasciata), white-crowned sparrows (Zonotrichia leucophrys), and song sparrows (Melospiza melodia). Predation on song sparrow nestlings significantly increases with increasing garter snake densities, but not with any other snake species. Wrentits appear to be more successful than the other 2 species at avoiding snake predation.
SPRING BIRD COMMUNITIES ASSOCIATED WITH OAK-DOMINATED WOODLANDS IN SOUTH-CENTRAL WASHINGTON. David A. Manuwal, Wildlife Science Group, College of Forest Resources, University of Washington, Box 352100, Seattle, WA 98195.

Using point counts during 1995 and 1996, we surveyed birds at 15 upland and 5 riparian sites. Study sites had various mixes of oak, Douglas-fir, and ponderosa pine. Over 70 species were found at the 20 sites. Total detections in upland stands ranged from 259 to 590 per stand. In riparian sites, the range was 177 to 428. There was considerable variation in abundance between years at some sites. The mean number of neotropical migrant species per stand averaged 12 for both upland and riparian sites. Neotropical migrants comprised 37-44% of the total number of birds detected. Bird abundance was highest in stands with large amounts of short oak and short pine; it was lowest in riparian sites. The most abundant breeding species in upland sites were the Nashville warbler, chipping sparrow, and rufous-sided towhee. Brown-headed cowbirds were detected in all stand types. Mean number of cowbirds detected per visit was 3.0 (range 0.5-10.5). During migration, substantial numbers of yellow-rumped warblers and western tanagers were found at many sites.


The western pond turtle (Clemmys marmorata) was described from specimens collected from the vicinity of Puget Sound, probably near Fort Steilacoom (south Tacoma vicinity). They were described as common in freshwater ponds and rivers west of the Cascade Mountains. The species was well known to the Nisqually Indians, who called the species "El-la-chick". In the late 1930s when James Slater and John Slipp busied themselves with documenting the amphibians and reptiles of Washington, western pond turtles were documented from various lakes and ponds in Pierce, King, and Thurston Counties. There is very little documentation of the subsequent decline of the western pond turtle in the Puget Sound lowlands. By 1986, when the Washington Department of Game initiated extensive surveys, viable populations were gone. Starting in 1989 single turtles, probable relicts of former populations, were taken into captivity, and eventually captive breeding became possible. The Woodland Park Zoo accepted the challenge, and by 1996, 15 captive-bred western pond turtles were ready for release. Ponds created by Pierce County on Washington Department of Fish and Wildlife-owned property near Steilacoom were enhanced with oak trees felled on nearby Weyerhaeuser property. Once these basking trees were lifted into place, the turtles were released. Seven of the 15 were equipped with transmitters. All are believed alive at this time, and plans exist to trap as many as possible this spring to check growth and put on new transmitters.
The ecology and management of migratory black-tailed deer (*Odocoileus hemionus columbianus*) in the Klickitat River Basin (KRB) of Washington were studied during 1988-1995. During 1988-1993, 490 deer were captured and visually marked on KRB winter ranges; an additional 69 deer received radio collars and were collectively relocated 3152 times. Telemetry data indicate 86% of radioed deer were migratory, with distances between seasonal activity centers averaging 27.8 km. Temporal and geographic movement patterns of KRB deer and their relationship to deer mortality are discussed. Replicated mark-recapture density estimates and population modeling based upon sample demographics indicate the population increased during 1989-1994 ($r=0.09$ and $r=0.08$, respectively). The use of replicated mark-recapture subsampling to assess bias in density estimates is reported. Data are presented on age-specific fecundity and sex-specific survival. Survival was estimated from telemetry and age-at-death distributions. Proximate causes of mortality were determined for 113 marked deer. Hunting was the major source of mortality for all radio-collared deer, whereas winterkill was the major mortality source for neck-banded female deer, despite limited antlerless seasons. Historical and recent trends in KRB deer populations and their relationship to management practices, winter severity, and trends in habitat quality are discussed.


Over the past 50 years, there has been a great deal of interest in estimating the home range sizes of many wildlife species. We used computer simulations to compare sizes, spatial relations, and sample size effects of an adaptive kernel (ADK), harmonic mean (HM), and a minimum convex polygon (MCP) contained within the program CALHOME. Mean ADK, HM, and MCP estimates were compared to known sized regular- and irregular-shaped home ranges over different sample sizes (10 to 500 data points) and simulated home range sizes (75 to 4000 ha). Mean MCP estimates were smaller ($P<0.05$) than theoretical knowns over all sample sizes tested. Mean HM estimates were smaller ($P<0.05$) than known ranges <70 data points. Mean ADK estimates were similar ($P>0.05$) to simulated ranges over all sample sizes, suggesting that an ADK estimator accurately estimates home range size with few data points. However, ADK estimates include a significant ($P<0.05$) proportion of area not included in the known home range boundary with <90 data points. The decision of which estimator to use depends largely on the researcher’s objectives and the sample size used to estimate home ranges.

The vegetation, birds, and small mammals of 4 ungulate exclosures in the Blue Mountains of eastern Oregon were compared to similar grazed sites. Each exclosure was paired with a grazed site, and differences between each grazed/ungrazed pair were analyzed using t-tests. Small mammal abundance, species richness, and diversity were higher on 3 of the 4 ungrazed sites. Bird abundance, species richness, and diversity were generally higher on 3 of the 4 ungrazed sites; however, differences appeared to be more variable. Shrub cover, species richness, and diversity were consistently higher on all ungrazed sites. In addition, organic litter cover was higher on 3 of the 4 ungrazed sites. No consistent trends for herbaceous cover, biomass, species richness, or diversity were found for either the grazed or ungrazed sites. Overall, few significant values (p<0.05) were obtained. It appears that the effects of grazing on vegetation, birds, and small mammals may be a function of multiple factors such as habitat type, grazing history, and years of recovery. Well-replicated studies are necessary to accurately determine the effects of ungulate foraging on vegetation, birds, and small mammals.

SONGBIRD MONITORING IN RIPARIAN HABITATS ON THE UMATILLA NWR. Eric Nelson, Sherry Hudson, and Kelly Moroney. USDI Fish & Wildlife Service, Mid-Columbia River National Wildlife Refuge Complex, Umatilla, OR.

Native riparian habitat in the Mid-Columbia River Basin is extremely rare, with an increasing problem of invasion by exotic plants such as Russian olive and false indigo bush. Intensive agricultural development, water diversion, and grazing have severely impacted the quality of the remaining riparian habitat in this region. During 1995-96, we collected data on songbirds using riparian habitats on Umatilla NWR. This included gathering information on songbird presence, breeding and migratory status, and relative abundance by habitat type. To meet these objectives, we used constant-effort mist netting and banding, area searches, point counts, and habitat evaluation. Riparian vegetation on the Oregon side of the Columbia River is dominated by non-natives, primarily Russian olive and pepperweed. The Washington side of the river still has native willow and cottonwood as the dominant riparian vegetation. Washington had more mean shrub species per site (2.6 vs. 0.8); more shrub coverage (62.5% vs. 11.3%); more mean tree species; and more mean coverage of willow and cottonwood in the shrub and canopy layers, respectively. The Oregon site had more Russian olive in the canopy layer (mean of 55.4% vs. 6.0%), and no willow or other native species in the shrub layer. Early results indicate that the riparian habitats in the Mid-Columbia Basin may be more important as migratory habitat (especially during fall) than as significant breeding areas for songbirds. Fall capture rates varied between 16 and 77.9 birds/100 net hours. During both fall seasons the Washington site had higher capture rates, caught more species/day, and caught more neotropical migrants than did the Oregon site. Most commonly captured species on the Washington side during fall were yellow, yellow-rumped, and orange-crowned warblers; while on the Oregon site the most commonly captured birds were white-crowned sparrows, Oregon juncos, and song sparrows.
CHRISTMAS TREE CAVE BAT GATE PROJECT, MT. ADAMS RANGER DISTRICT. Jim Nieland. USDA Forest Service, Amboy, WA. David Anderson. Washington State Department of Fish and Wildlife (WDFW), Trout Lake, WA. Chandra Madrona, USDI Fish and Wildlife Service, Olympia, WA.

Three significant maternity colonies of Townsend's big-eared bats (Corynorhinus townsendii) are known to occur in the state of Washington. Christmas Tree Cave is a 1000-foot segment of lava tube with entrances opening at each end. It is unusual because it meets environmental criteria for both a maternity roost site and a hibernaculum for the species. The west entrance harbors a maternity colony of 150 animals. During a WDFW survey in 1995, a trail was discovered that had been cut through a heavy growth of vine maple to the entrance. Because the species is thought to have undergone a decline throughout its range and is known to be intolerant of disturbance, the Cave Habitat Work Group organized an effort to gate the cave. The ad hoc work group, established in 1994 to address cave habitat issues and cave species in Washington, consists of approximately 25 representatives from various public agencies and caving organizations. In the fall of 1996, over 46 volunteers provided 660 hours of labor to gate the cave. Seven tons of steel were carried to the 2 entrances, cut, and welded to fit the design for zero air flow disturbance bat gates. An exit survey will be conducted each year, and every 3 years hibernating bats will be counted. These surveys will monitor the effectiveness of the gating project in protecting Townsend's bats from disturbance. In February of this year, 129 Townsend's bats were counted using the cave, an average number based on previous surveys. The hibernation survey shows acceptance of the gates by the species.


In June 1996, we began an investigation of the foraging ecology of mountain lions in the Catherine Creek Wildlife Management Unit in northeast Oregon. Preliminary data collected through February 1997 will be presented. Individual lions are located by ground radio-telemetry each day, and these sites are subsequently searched for kills. Study animals have been documented at day beds up to 1.5 km from a kill. This, combined with the near-complete consumption of fawns and calves, makes it difficult to locate kills based on radio-telemetry at day bed sites. However, documentation of kills has improved since November with the aid of snow tracking. To date, we have documented 22 ungulate kills and 13 interkill intervals from 5 lions. Of these, 17 were young of the year (11 mule deer fawns, 6 elk calves) and 5 were adult mule deer. The mean interkill interval to date is 6 days. The study is planned to continue through June 1998 for a total of 2 years in the field. During the upcoming snow-free season we will test alternative methods, such as more frequent telemetry locations and the use of trained lion hounds, to increase our success at finding kills.

This study determined whether human activity on the US Army Yakima Training Center (YTC) led to increased common raven (Corvus corax) populations and whether ravens preyed upon western sage grouse (Centrocercus urophasianus). The YTC consists of shrub-steppe arid lands surrounded by agricultural lands. We collected information on the reproductive status, breeding chronology, activity budgets, and food habits of ravens during 1994. Eggs hatched from 24 of 28 nests, and on average 5 eggs were laid, 3.2 eggs hatched, and 1.8 young fledged per active nest. Early nesters were more successful than late nesters, and nests near agricultural lands were more successful (67%) than nests in the interior of the YTC (44%). On average, ravens spent 33% of their time at the nest during incubation, and about 7% during brood-rearing. Ravens seemed little disturbed by military activities, and little correlation was found between level of human activity and nest success. Based on an examination of 294 pellets, animal matter (mostly rodents) comprised 61% of the diet by weight. Vegetation comprised 14%, bird parts and eggs 6%, and refuse 6% of diets. Small mammals were more common in diets of ravens nesting near agricultural areas than ravens nesting in the interior of the YTC. We did not find remains of western sage grouse in pellets, nor did we see ravens prey upon grouse. Attempts to remove nests and limit the amount of refuse left by troops have had limited success in controlling raven numbers on the YTC. Because adults and chicks are highly visible, they make an ideal subject for behavioral and bioenergetics studies.

COMPETITION AND REPRODUCTIVE SUCCESS IN A NARROW MOVING HYBRID ZONE. Scott F. Pearson. University of Washington, Seattle, WA.

Three hybrid zones exist between Townsend’s (Dendroica townsendi) and hermit (Dendroica occidentalis) warblers in the Pacific Northwest. Analyses of plumage characteristics suggest that the zones are narrow and moving, with Townsend’s replacing hermits. These species overlap broadly in their habitat use, suggesting that differences in habitat preference is not responsible for the narrowness or dynamic nature of these zones. I tested an alternative hypothesis explaining narrow, moving hybrid zones in the Washington Cascades: that one parental species (Townsend’s) is competitively superior to and more fit than the other and their hybrids. To document the existence of competition between these species, I mapped territories of and recorded aggressive interactions between male warblers, and found them to be interspecifically territorial and aggressive. To compare relative competitive abilities between these species, I monitored territories throughout the breeding season and found 80% of the Townsend’s, 53% of the hermits, and 61% of the hybrid males maintained their territories long enough to breed. Differences in arrival dates on the breeding grounds could help explain competitive differences, but none were found. To compare the relative fitness of these species, I used an index of reproductive success, and found Townsend’s warblers to have higher success scores than either hermits or hybrids. These results suggest that the competitive superiority of the Townsend’s warbler is responsible for the narrow and dynamic nature of the Washington Cascade hybrid zone.
RELATIONSHIPS OF BAT ABUNDANCE TO SNAG ABUNDANCE IN A MANAGED FOREST. J. Mark Perkins. 2217 E. Emerson, Salt Lake City, UT 84108. Ralph G. Anderson. Wallowa Valley Ranger District, Enterprise, OR 97828.

We compared abundance of bat captures with abundance of 2 size classes (10"-20", <20" dbh) of living and dead trees from 11 sites on the Wallowa-Whitman National Forest. We used GIS data to determine mean numbers of snags and trees by size and species within a 2-mile radius of capture sites. Bat abundance was negatively correlated with living Douglas-fir 10-20" (p>0.024), and the abundance of all living trees 10-20" dbh. GIS data indicate that these stands are second-growth stands, and as numbers of stems per acre increase for this tree size, there are significantly fewer snags, resulting in the negative correlations. Bat abundance was positively and significantly correlated with abundance of snags for all tree species except *Abies lasiocarpa* (both class sizes, *Larix occidentalis* (10-20" size), *Pinus ponderosa* (10-20" size, and *P. engelmannii* (<20" size). We considered differences in snag morphology and habitat to account for nonsignificant correlations in these species. Data indicate that this correlation is not due to snag quantity. Probable relationships are presented.

AMPHIBIAN ABUNDANCE IN RIPARIAN HABITATS OF EASTERN WASHINGTON CASCADE FORESTS. Susan Dixon Piper. USDA Forest Service, Leavenworth, WA.

Amphibian composition and abundance were examined for 8 north-central Washington riparian forests: 2 unharvested, 3 harvested without a riparian buffer, and 3 harvested with a riparian buffer. Habitat analyses objectives were to determine differences in riparian species composition and structure between the stand treatments. Amphibian species were sampled by mark-recapture trapping using pitfall traps over a 2-year period. A total of 107 individual adults of 5 species of amphibians were captured in all stand treatments. Components of vegetation that distinguished unharvested forests from managed forests included tree basal area, the number of medium diameter (23-53 cm dbh) trees, and the density of silver fir (*Abies amabilis*) and grand fir (*A. grandis*). Tailed frog (*Ascaphus truei*) and Cascades frog (*Rana cascadae*) exhibited significant associations with unharvested stands. Unharvested stands had significantly higher captures than the other stand treatments. However, amphibian species diversity did not differ among the stand treatments. Only *R. cascadae* was found in the unharvested stands. *Ascaphus truei* was the only species captured during all trapping periods and was the most frequently captured amphibian in all stand treatments. *Ascaphus truei* was significantly more abundant in the unharvested stands than in the harvested stands. The relatively low captures of amphibians in managed stands suggest that riparian buffers can provide microhabitat and microclimate conditions for amphibians that are usually found in unharvested forests.
COYOTE (CANIS LATRANS) HABITAT SELECTION IN URBAN AREAS OF WESTERN WASHINGTON AS DETERMINED BY ROUTINE MOVEMENTS. Timothy Quinn. Washington Department of Fish and Wildlife, Yakima, WA.

I determined coyote habitat preference in urban areas of Washington by examining habitat used by 6 radio-collared coyotes during routine movements. I represented routine movements as straight lines connecting consecutive radio-relocations taken at 1-hour intervals. I used compositional analysis to determine if coyotes selected for particular habitat types at 2 spatial scales: i) home range from within an arbitrarily defined study area containing all home ranges, and ii) areas used during routine movements from within the home range. There was no difference (P = 0.631) in habitat composition between the home ranges and the study area. However, based on habitat availability in home ranges, coyotes preferred (P < 0.036) forest = shrub > densely mixed vegetation > moderately mixed vegetation > sparsely mixed vegetation during routine movements. I used stepwise multiple regression to determine the relationship between movement distance and the habitat type in which the movement began (initial habitat), habitat in which the movement ended (final habitat), habitat gradient (initial-final habitat), and light conditions (night vs. day). Light conditions (P = 0.006) and the interaction of light and initial habitat (P = 0.004) were significant but weak predictors (multiple $R^2 = 0.137$) of movement distance. Coyotes' movements were longer at night than during the day, tended to increase with decreasing habitat quality at night, and showed little relationship with habitat quality during the day. Coyotes preferred to travel through and remain in close proximity to forest and shrub habitats in urban environments of Washington.

ECOLOGY OF A MULE DEER POPULATION IN THE SHRUB-STEPPE OF CENTRAL WASHINGTON. Kenneth J. Raedeke Raedeke Associates, Inc., 57121 NE 63rd Street, Seattle, WA.

Habitat use, food habitats, and population dynamics of a mule deer population on the Yakima Training Center were studied over a 2-year period. Analysis of radio-telemetry data showed deer had very large home ranges (average of 59 km$^2$). Deer avoided summer heat and selected areas with the highest forage values, including seeps and riparian areas. Deer were largely non-migratory. Food habits, determined by microhistological analysis of fecal samples, showed a dramatic shift from low-quality browse in 1994 to higher-quality grass diet in 1995 after a period of higher precipitation. Reproductive rates were low and fawn mortality high. Numbers of adult males were limited by hunting, while adult females were regulated by intraspecific competition for forage.
AMPHIBIAN EXTINCTIONS IN URBANIZING LANDSCAPES. Klaus Richter. King County Natural Resource Division, Seattle, WA 98104-2311.

Spawning and habitat surveys of northwestern salamanders (*Ambystoma gracile*) in 19 wetlands, and habitat manipulation at 2, indicate that the northwestern salamander has very specific oviposition preferences, and that hydrological changes associated with urbanization are major causes of breeding failure. Specifically, changes in current velocity, water level fluctuations, and average water depths in wetlands caused by clearing and increased impervious surfaces within watersheds were determined to be the most significant factors affecting breeding. Given that other amphibians also exhibit unique breeding adaptations resulting from selective evolutionary pressures prior to urbanization, the dramatic hydrological changes in wetlands (along with stochastic losses attributable to weather and toxicants, habitat fragmentation, and the introduction of exotic species) are causing the extirpation of amphibians in urban environments.

---

BIRD USE OF PLANTED TREES AT THE ABANDONED TOWNSITE OF HANFORD, WASHINGTON. W.H. Rickard and C.A. Brandt. Pacific Northwest National Laboratory, Richland, WA.

Forty-six daytime bird surveys equitably distributed among 4 seasons in 1996 were conducted in 2 kinds of planted tree habitats: street trees and isolated tree clumps. Twenty-seven species used the street trees, and 45 used the tree clumps. Bird abundance was also greater in the tree clump habitats. Tree clumps were located in close proximity to the Columbia River, where trees tended to be taller in stature with more dead fallen trees. The most abundant tree species in both habitats was Siberian elm (*Ulmus pumila*). Planted trees have survived for 50 years in the absence of irrigation water, but the trees are senescing and their life expectancy is limited to the foreseeable future. The data provide insights as to bird acceptability of planted trees as a substitute for native woody riparian habitat in semiarid shrub-steppe ecoregions.
INFLUENCE OF SPATIAL SCALE AND LAND-USE PRACTICES ON HABITAT USE BY BREEDING BIRDS IN ARID LAND RIPARIAN FORESTS. Vicki Saab. USDA Forest Service, Intermountain Research Station, Boise, ID and University of Colorado, Boulder, CO.

Patterns of habitat use by breeding birds were examined in cottonwood riparian forests in relation to spatial scale and land-use practices along the South Fork Snake River in southeastern Idaho from 1991 to 1994. To examine the importance of spatial scale, a hierarchical approach was used at 3 scales: microhabitat (local vegetation characteristics), macrohabitat (features of cottonwood forest patches), and landscape (composition and patterning of surrounding vegetation types and land uses). Landscape features were the most important and frequent predictors of distribution and abundance for most bird species and for species richness of the native avifauna, while macrohabitat and microhabitat were of secondary importance. Thus, landscape features should be a primary consideration for selecting riparian reserves in xeric regions. Factors potentially influencing habitat selection in relation to local land-use practices and forest-patch dynamics were analyzed by land use (grazed, recreation, and unmanaged) and patch size (small [<3 ha], medium [3-10 ha], and large [>10 ha]). Ground-nesting species were most susceptible to disturbances created by livestock grazing and were also most sensitive to fragmentation of riparian habitats. Five species were unaffected by patch size on unmanaged lands, but showed significant area effects in grazed and/or recreation sites. These results suggest that some species may need larger patches of breeding habitat on lands with certain management practices.

COMPARISON OF TWO BAIT TYPES FOR ASSESSING SMALL MAMMAL COMMUNITIES ON THE OLYMPIC PENINSULA. Allen Schaffer, Constance A. Harrington, and Andrew B. Carey. USDA Forest Service, Pacific Northwest Research Station, Olympia, WA.

We tested the efficacy of 2 types of bait in Sherman live traps in three 50-year-old conifer stands on the Olympic peninsula. We suspected our original bait of peanut butter, oats, and molasses contributed to trap smashing by black bears at our Eats site. We compared the original bait to one consisting of unsalted, unshelled sunflower seeds and oats on alternate trap lines on plots with 8x12 trap stations (Triton and Snow White). This was done for a total of 5760 trap nights per bait type. At Eats we used peanut butter bait in 1995 and seed bait in 1996 (7680 trap nights per year). In the alternate line comparison, the numbers of individuals and species composition were similar between bait types. Total numbers of captures for the primary genera (Peromyscus and Sorex) did not differ between bait types (Peromyscus 2.86 per 100 TN; Sorex 1.92 per 100 TN). For Clethrionomys gapperi at Snow White, the number of individuals did not differ, but the frequency of recapture was higher with the seed bait (2.21 per 100 TN with seed vs. 1.24 per 100 TN with peanut butter). Species composition was similar for the 2 years of trapping at Eats. The same pattern between baits for Clethrionomys gapperi was present between years (1.17 per 100 TN with seed vs. 0.27 per 100 TN with peanut butter).
NEST SITE SELECTION AND NESTING SUCCESS OF THE ASH-THROATED FLYCATCHER IN KLIKKTAT COUNTY, WA. Jennifer Seavey. University of Washington, Seattle, WA.

Washington State’s population of the ash-throated flycatcher is primarily restricted to the oak woodlands of Klickitat County. To explore the fitness of this species, my research has focused on nesting success and nest site selection. A total of 32 nests were located and monitored. Habitat variables were collected from the nest tree and a circular plot around the tree. Random unused nests were also located and equivalent habitat measurements were obtained. A statistical comparison of these variables was performed. Variables effective in determining usefulness of the nests are nest tree canopy radius, nest cavity height, nest cavity hole width, cavity hole height diameter, nest cavity depth, nest tree dbh, and nest cavity width. The variables found to determine nest selection are distance to nearest oak, nest cavity depth, nest cavity width, and distance to water. These results suggest that the ash-throated flycatcher’s fitness is tied to particular habitat variables which are scrutinized in their habitat selection process.

EFFECTS OF ELEVATED pH ON FROG EMBRYO SURVIVAL — RESULTS OF INITIAL TESTS WITH THE AFRICAN CLAWED FROG. Maureen Seeley, Martin Grassley, and Christian Grue. Washington Cooperative Fish and Wildlife Research Unit, School of Fisheries, University of Washington, Seattle, WA.

Elevated pH (>9.0) has been reported in waters within the Klamath Basin and other areas in the arid West. Although the effects of low pH on freshwater resources have been well studied, the effects of elevated pH have not. This is particularly true for amphibians, a taxonomic group suffering dramatic population declines in many parts of the world, including the Basin. The objectives of the present study are to determine the effects of elevated pH on embryos of a variety of frog species using a modification of the Frog Embryo Teratogenesis Assay — Xenopus (FETAX), in which embryos are exposed to different hydrogen ion concentrations for 96 hours. Initial tests with Xenopus indicate that pH above 9.5 results in an increase in embryo mortality and malformation. The median lethal pH for embryos with jelly coats was 10.42 (95% CI = 10.36-10.49), with many of the surviving larvae malformed. Results suggest that elevated pH may be contributing to the decline of amphibian populations where waters exceed a pH of 9.0. Comparable studies with embryos of naturally occurring species of frogs will be conducted this spring and summer.

Because generalist herbivores tend to prefer plants with higher nutrient availability, a generalist herbivore's home range size (HRS) should be smaller in a habitat where its preferred food is present than in a similar habitat lacking its preferred food. Mountain beavers (*Aplodontia rufa*) are generalist herbivores that prefer bracken fern (*Pteridium aquilinum*). Therefore, we predicted that mountain beaver home range sizes would be smaller in habitats with bracken fern than in those without. We compared the HRS's of 6 female mountain beavers in the eastern Cascades, 3 in each habitat type. HRS's were determined by live-trapping for 12 weeks over the summer. Each mountain beaver was trapped 1 night a week on a 150m x 90m grid with 15 traps. HRS's were then calculated using Lovejoy's length times width method and the minimum convex polygon method. As determined by paired t-tests using data from both HRS calculation methods, the HRS's of mountain beavers in habitats with bracken fern were significantly smaller. Home range size could be influenced by body size, but we found no significant difference in mean weights between site types. These findings suggest that presence of preferred food may be a good indicator of habitat quality for some generalist herbivores.

ISSUES AND CONCERNS IN URBAN WILDLIFE MANAGEMENT — AN OVERVIEW. Kate Stenberg. King County Wildlife Program, King County Water & Land Resources Division, Seattle, WA.

The effects of urbanization on wildlife are diverse. Some of the general trends in wildlife populations that are observed as urbanization occurs will be discussed. An overview of some of the causes for observed changes will be presented. Changes in wildlife populations may result from changes in habitat area, habitat fragmentation, plant species composition and structure, availability and types of food, water, and cover, landscape connectivity, hydrology, and even climatic factors. Managing these changes to benefit wildlife is even more complex. Strategies must be applied in a milieu that includes such challenges as multiple small land ownerships, varying attitudes towards wildlife, inconsistent regulatory frameworks, limited budgets, and public processes in which wildlife concerns are typically a minor component.

The effects of temperature and food level on the expression of paedomorphosis in Ambystoma gracile were explored through a laboratory manipulation and a field survey of aquatic habitats over the elevational gradient. A 3-factor cross of temperature, food level, and egg cluster of origin was conducted. Size (snout-vent length) at metamorphosis or end of experiment, growth rate, and days to metamorphosis were all affected by temperature, food level, and an interaction between the two. However, 95% of larvae metamorphosed, precluding statistical analysis of effects on life history choice. Size, growth rate, and life history choice were affected by egg cluster of origin. Twenty-six ponds from 300 to 1550 m in elevation in southwestern Washington were sampled for larval and paedomorphic A. gracile. Paedomorphs were captured at all elevations, and the proportion of paedomorphs/total captures did not vary with elevation. Results of both lab and field investigations suggest that temperature may not be as important as previously thought in controlling the expression of paedomorphosis. Alternately, trends in paedomorphosis over the elevational gradient may be masked by larval adaptations and differences in pond temperature caused by insolation and water source. Correlations between proportion of paedomorphs and other habitat variables were also explored.

AMPHIBIAN AND REPTILES OF THE YAKIMA TRAINING CENTER. Bradley R. Strauch, Ronda L. Little, Margaret A. Pounds, and Stuart L. Paulus. ENSR, Redmond, WA (BRS, RLL, SLP) and Yakima Training Center, Yakima, WA (MAP).

A baseline survey of amphibians and reptiles was conducted at the US Yakima Training Center (YTC) during 1994 and 1995. This study determined herpetofauna species presence and habitat use. Artificial shelters, drift fences, pitfall traps, and funnel traps were used to capture herpetofauna at 10 fixed-plot sites. Additionally, random surveys were performed to assess diurnal and nocturnal activity patterns and habitat use by both terrestrial and aquatic species. Twelve species of herpetofauna were encountered during surveys, including 3 amphibians (Hyla regilla, Scaphiopus intermontanus, and Ambystoma macrodactylum) and 9 reptiles (Phrynosoma douglassi, Eumeces skiltonianus, Uta stansburiana, Crotalus viridis, Pituophis catenifer, Thamnophis elegans, T. sirtalis, Coluber constrictor, and Charina bottae). Four species (A. macrodactylum, E. skiltonianus, T. sirtalis, and C. bottae) were previously undocumented on the YTC. Most amphibians were found during May and June, at night, and during random surveys. Lizards were encountered most often during midday in May, June, and September. Snakes were typically found in May from late morning through the evening. Herpetofauna were typically located in drainages with surface water and rock outcrops. Trapping success varied by species and by trap type, and random surveys were the most productive in encountering herpetofauna. The preservation and enhancement of riparian areas, artificial ponds, and rocky habitats was recommended to maintain and increase herpetofauna populations on the YTC.
WASHINGTON DEPARTMENT OF FISH AND WILDLIFE BACKYARD WINTER BIRD COUNTS. Patricia A. Thompson. Washington Department of Fish and Wildlife, Mill Creek, WA.

Since 1993, the Urban Wildlife program of the WDFW has coordinated winter bird surveys statewide, in which the public contributes data collected in their backyards. This project is patterned after the Cornell University Laboratory of Ornithology Project FeederWatch, but differs in that birds are counted within the habitat of people's yards and not solely at feeders. The goals of the WDFW project are to 1) provide meaningful and enjoyable non-hunting public recreational opportunities; 2) track the effectiveness of the WDFW Backyard Sanctuary Program; 3) track regional increases and declines in bird species over time; and 4) measure bird number and species' use of backyards and correlate species use with backyard habitat type. We also hope to find concentrations or occurrences of priority species, such as the band-tailed pigeon, to collect more data on these species. Public response was overwhelming, with 534 volunteers the first season. A total of 304 homes returned completed surveys statewide from 28 counties that year. Data management has been challenging, with entries from 1 year totaling in the hundreds of thousands. A professional statistical consulting firm was hired to manage and analyze the data. In the 1993-94 season, 148 species of birds were recorded. Tabular and graphical reports of the 1993-94 data have been constructed so far, such as the 20 most widespread backyard bird species and the top 10 backyard bird species. The dark-eyed junco is the most widespread species, visiting 92% of our participants' yards. Twelve percent of the participants' yards were entirely urban, and 23% indicated built-up suburban. The success of the program has prompted the interest and cooperation of the US Fish and Wildlife Service Gap Analysis Program and the Cornell Ornithology Lab, who will also use the data.

ECOLOGY OF MULE DEER ON THE HANFORD SITE. Brett L. Tiller. Pacific Northwest National Laboratory, Richland, WA 99352.

Buck:doe:fawn ratios were determined from roadside surveys from July through August 1993, 1994, and 1995. Standardized to 100 does, an average of 47 males (+/-2.9 1 SE) and 26 fawns (+/-3.8 1 SE) was found within the north and south study areas. Four (19%) of the males were harvested during the 1994 hunting season, three (14%) of those animals legally and one (5%) illegally on the Saddle Mountain Wildlife Refuge near State Highway 24. Based on data collected from radio-equipped deer from 1991 to 1994, an average of 11% (range 0% to 37% at the 95% confidence level) of the male deer residing along the Columbia River may be harvested in 1 year. Natural causes of mortality were minimal (less than 1% of total mortalities). A rather unique condition of the Hanford mule deer herds is the age distribution. A relatively large proportion (over 20%) of the animals are 5 years of age or older.

A Bald Eagle (Haliaeetus leucocephalus) Management Plan (BEMP) was prepared in 1996 for the 10,000-acre (4046-ha) Naval Air Station Whidbey Island (NASWI) near Oak Harbor. The BEMP will help to ensure that NASWI operations and land uses are compatible with bald eagle populations and habitat. The study was carried out cooperatively with the Washington Department of Fish and Wildlife (WDFW). Methods included weekly eagle censuses, food habit studies, breeding eagle monitoring, and radio/satellite telemetry. A Geographic Information System (GIS) was used to analyze eagle observations, vegetation communities, and land uses to determine distribution and habitat use and evaluate conflicts between eagles and Navy operations. The investigations revealed nearly daily use of Ault Field, the Seaplane Base, and Lake Hancock by up to 19 bald eagles, including 4 territorial pairs. Most shoreline was used for foraging, including sites near runways. Nests are located in isolated areas, as well as near Navy campgrounds/picnic areas and housing complexes. Roosting occurs in a forested tract used for military exercises. WDFW satellite tracking of territorial eagles indicated foraging areas on NASWI property, at Skagit Bay, and at Penn Cove. The satellite data also showed long-range movement to British Columbia and southwestern Washington. Primary management recommendations include improving forest and wetland management, minimizing disturbance, reducing operational hazards, and long-term monitoring.

SHRUB-STEPPE BIRD RESPONSE TO HABITAT AND LANDSCAPE VARIABLES IN EASTERN WASHINGTON. Matthew Vander Haegen, Frederick Dobler, and John Pierce. Washington Department of Fish and Wildlife, Olympia, WA.

Conversion to agriculture has reduced the availability of shrub-steppe habitats in eastern Washington, with only 40% of an historic 10.4 million acres remaining. Several species of birds and 1 State-endangered mammal exist only in shrub-steppe communities. How wildlife responds to varying physical characteristics within the shrub-steppe communities is of significant interest to managers, but is poorly understood. The Washington Department of Fish and Wildlife has had an active shrub-steppe research project since 1987, with efforts focusing on bird/habitat associations. From 1988 to 1993, we used line-transect methods to estimate the density of birds across a wide variety of shrub-steppe communities in eastern Washington. These surveys have provided useful information on the distribution of birds in Washington’s shrub-steppe and on relationships among vegetation, soils, and abundance of breeding birds. Current efforts focus on the fragmentation of Washington’s shrub-steppe and how landscape characteristics may affect avian productivity and distribution.
PRESENCE AND ABUNDANCE OF SPOTTED OWL PREY IN YOUNG, MANAGED CONIFEROUS FOREST DESIGNATED AS NORTHERN SPOTTED OWL (STRIX OCCIDENTALIS) DISPERSAL HABITAT IN THE WESTERN WASHINGTON CASCADES.

Martin E. Vaughn, Diana L. Olson and Thomas Bosakowski. Beak Consultants, Inc., 12931 NE 126th Place, Kirkland, WA 98034.

This small mammal study was conducted as part of the validation of Murray Pacific’s Habitat Conservation Plan for the Mineral Tree Farm, Lewis County, WA, which was implemented in 1993. The plan commits to increasing and maintaining spotted owl dispersal habitat between the USDA Forest Service’s Late Successional Reserves east and west of the tree farm. Structurally, dispersal habitat is supposed to provide thermal cover and protection from predators, but it was not known whether a prey base existed on the tree farm, or to what extent. Four stands of dispersal habitat (managed, second-growth forest between 41 and 56 years old) and 2 stands of spotted owl nesting-roosting-foraging (NRF) habitat (the positive control, comparable to mature forest) were surveyed for 8 nights in October 1994, 1995 and 1996. All 3 of the primary prey mammals in western Washington, the northern flying squirrel (Glaucomys sabrinus), deer mice (Peromyscus spp.), and voles (primarily Clethrionomys gapperi), were present in both types of habitat. Capture rates for flying squirrels were significantly higher in the NRF (mature) habitat than in the dispersal habitat. Significant between-year variation in experiment-wide capture rates was also indicated, with an increase in capture rates from 1994 to 1996. Capture rates for deer mice and voles did not differ significantly by habitat type, year, or their interaction. Our results suggest that dispersal habitat stands on the Mineral Tree Farm can provide a foraging base for dispersing spotted owls, although the extent of the resource can vary widely on an annual basis. However, even during years of low flying squirrel abundance, we found there are other prey species inhabiting the dispersal habitat stands that can provide at least a temporary food base for dispersing spotted owls.

ROOST STRUCTURES OF MYOTIS EVOTIS (LONG-EARED MYOTIS) IN MANAGED FORESTS OF WESTERN OREGON: PRELIMINARY RESULTS. David L. Waldien and John P. Hayes. Oregon State University, OR.

Forest management practices and a lack of information pertaining to habitat use by bats in the Pacific Northwest has contributed to a concern for the welfare of many forest-dwelling bats. During summer 1996, we used radio-telemetry to locate 43 structures used as day-roosts by long-eared myotis (Myotis evotis); 37 roosts for females and 6 for males. Pregnant females (n=4) exclusively used snags (n=10) as day-roosts, whereas lactating and post-lactating females (n=5) used stumps (n=23), logs (n=2), and live trees (n=2). The 6 roosts located for male M. evotis consisted of a log, rock crevice, stump, slash pile, and 2 snags. Roost structures were located in gaps or along edges. Conifer snags used as day-roosts by female M. evotis were generally shorter and smaller in diameter, and had less bark than randomly available snags. In addition, unlike randomly available snags, used snags did not extend above the forest canopy. Roosts were located within 1 kilometer of the capture site and were generally associated with up-slope habitats. We emphasize that these results are preliminary, based upon a small sample size, and await statistical analysis following an additional year of study. However, these results suggest that land managers should take a landscape approach to managing habitat for M. evotis, providing for a diversity of roost structures and taking temporal patterns of use into account.
Mammalian carnivores in the Pacific Northwest include 12 medium- to large-sized species of canids, felids, mustelids, and ursids. These large carnivores have widely varying status in the region, with some harvested in regulated furbearing seasons, some taken for depredations, and some protected because of rarity. Most large carnivores have declined in numbers or range from human encroachment, loss of forest habitat, accidental deaths (e.g., mortality from vehicles), illegal kills, and our inability to adequately monitor and protect populations. Efforts to reverse these trends include new approaches to reduce conflicts with humans, research to better define habitat needs, formation of expert carnivore working groups, and use of GIS models to predict specific impacts of habitat modifications. Long-term preservation of large carnivores in the region is problematic, unless we reduce forest fragmentation and conflicts with humans and improve our ability to quantitatively integrate population dynamics with landscape-level habitat requirements.

THE OREGON & WASHINGTON PARTNERS IN FLIGHT PROGRAM: AN UPDATE ON ACCOMPLISHMENTS AND OUR FUTURE DIRECTION. Tara Zimmerman. USDI Fish and Wildlife Service, Portland, OR.

The Partners In Flight (PIF) program was initiated in 1990 to address declines in neotropical migratory bird populations, and the Oregon and Washington Chapter was formed shortly thereafter. Initial efforts at the national and state working-group levels focused on improving and expanding programs to monitor bird population trends, and on information and education programs. The PIF program has since evolved to include active international, research, and training components. Recent developments include the incorporation of resident species groups and a coordinated effort to prioritize species and habitats of greatest concern. Recognizing the numbers and diversity of species to be considered, PIF developed a template for avian conservation called “The Flight Plan”. The plan focuses on habitats rather than the more traditional single species approach and outlines a comprehensive strategy for avian conservation. The Flight Plan provides a template for developing objectives and strategies for implementing broad-scale conservation measures. The Oregon and Washington PIF Chapters are participating the “The Flight Plan” conservation planning effort as a pilot project, and will focus on eastside riparian habitats and westside coniferous forest habitats.