

FOCUS

on Renewable Natural Resources



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From the Director



Leonard R. Johnson

Discovering the Past and Future: From Pleistocene Grazers to Revitalized Youth

The last two years have been years of initiative and completion for the College of Forestry, Wildlife and Range Sciences. Important studies came to a close, and new programs commenced. Every one of our five departments made a mark on the public in 1993 and 1994, including the Departments of Fish and Wildlife Resources, Forest Products, Forest Resources, Range Resources, and Resource Recreation and Tourism.

In the national discussion on forest ecosystem health, forest resources faculty scientists led the way by helping initiate a 1993 workshop in Sun Valley, Idaho to learn about the state of western forests and what we can do about it. They then compiled their conclusions, made recommendations to state legislators and Congress, and ended with an interdisciplinary, inter-organizational text offering histories, and restorative and preventative forest treatments. What is their expert diagnosis for Inland West forests? Turn to page one to find out.

The Forest Products Department continued a 10-year tradition of educating Idaho's timber working people by offering the Wood Products Academies and starting new outreach courses. All faculty in the department

and some from forest resources, fish and wildlife, and cooperative extension joined to help loggers and others in the industry understand new forest technology, forest soils and water quality, and more. It's all part of making the people who work in the woods a part of the ecosystem management equation. They also took the incredible characteristics and technologies of wood to Idaho teachers through the brand new workshop *Wood--A Remarkable Fiber*. See page 2 for more on two energetic years.

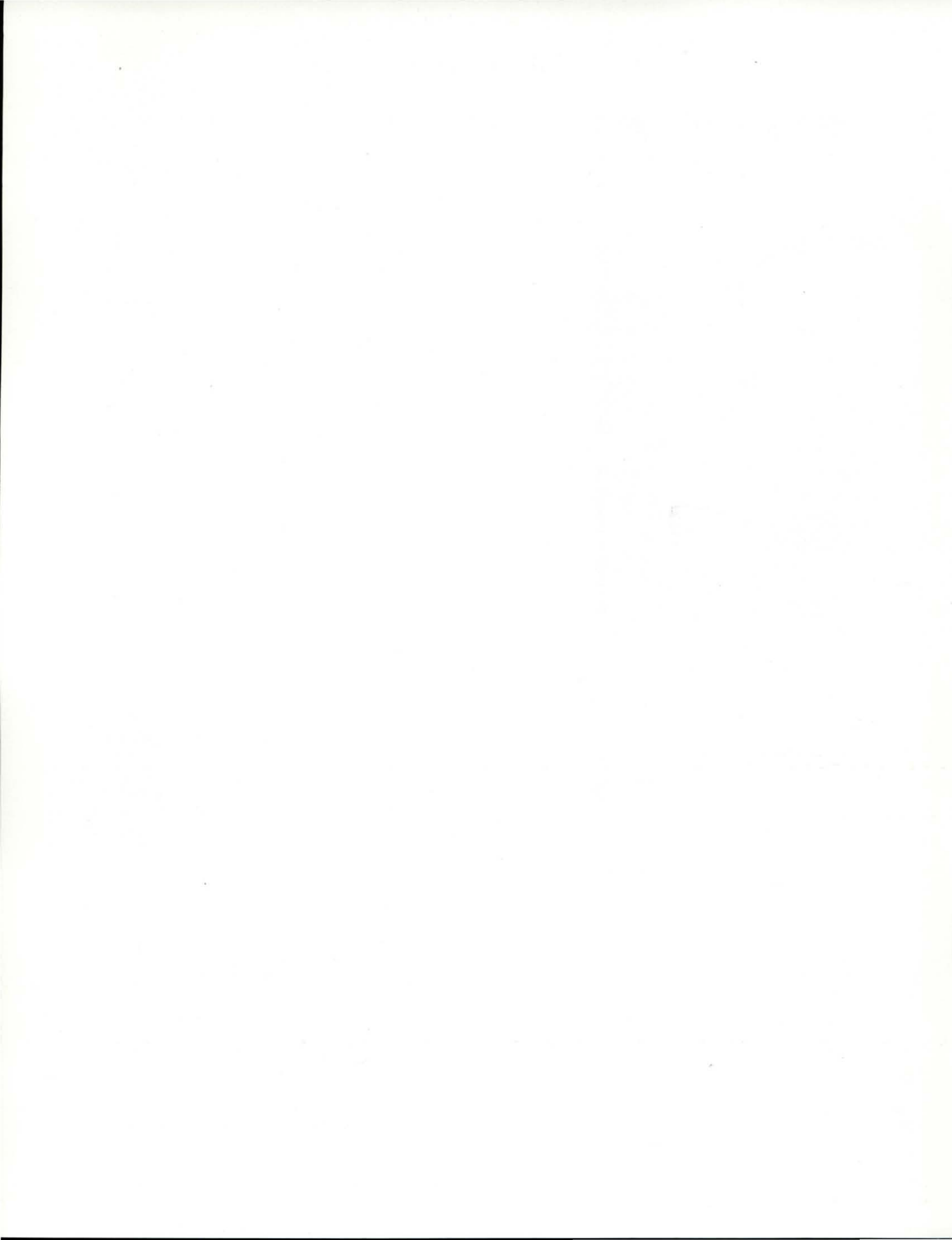
The special middle section of this 1993 and 1994 *Focus*, the college's annual report, features descriptions of some of over a dozen bird studies conducted by scholars in the Fish and Wildlife Department. The amount and quality of work they are doing on these important pieces of the ecosystem are a testament to the college's growing reputation as the center of avian research excellence in Idaho and the West.

From range resources and a new affiliate faculty member comes a bold new theory about the place of grazing animals in the ecosystems of the Intermountain West. Could it be that they have a role to play that goes back to the Pleistocene herbivory? The article on page 14 might answer that question.

The college also knows that people are a part of natural resources, and resource, recreation and tourism studies highlight the place of people. Leave it to the newly rededicated Wilderness Research Center to bring untouched wild lands into contact with troubled youth for healing, goal-setting, and life changes. The center has joined hands with the federal Job Corps Program to create the Wilderness Discovery Program. Headed by former college dean John Hendee, the center's graduate students lead disadvantaged teenagers into northwestern wilderness and out of abuse and hopelessness. One Ph.D. student details his adventures with the possible national model on page 16.

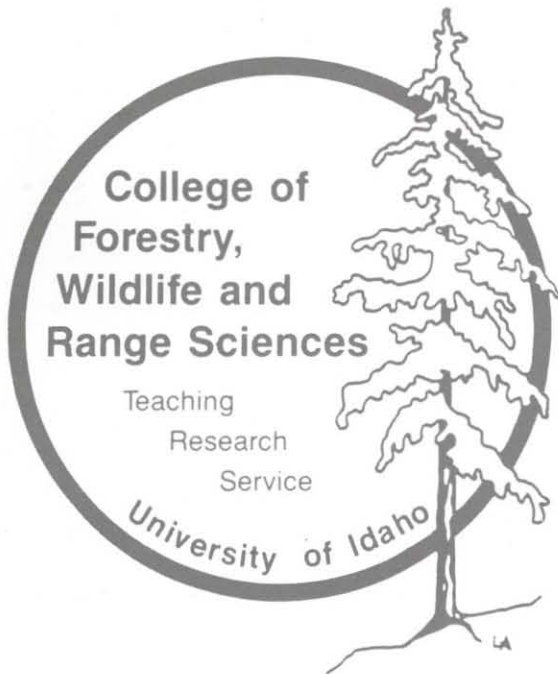
It's difficult to describe the innumerable contributions of outstanding faculty and student research for two years. There were tourist surveys used by Idaho's Department of Commerce, and much much more. That's why we need a whole magazine to list them all, and an impressive appendix of projects and publications. Please enjoy this year's *FOCUS*.

A handwritten signature in dark ink, appearing to read "Leonard R. Johnson". The signature is written in a cursive, flowing style.



FOCUS

on Renewable Natural Resources



Idaho Forest, Wildlife and Range Experiment Station

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Cover: Grouse, sapsuckers, quail, owls, and goldfinches. Even turkeys and several species of woodpeckers--from the hairy to the white-headed, are the subjects of over a dozen ongoing bird studies in the college's Department of Fish and Wildlife Resources. Acrylic and watercolor painting by Bev Jaquish of Post Falls, Idaho. Cover photo by Jerry Prout.

Annual Report 1993 & 1994

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Forest Ecosystem Health in Idaho and the Inland West

Editor

The diagnosis for forests of the Inland West? In a nutshell: more pines, fewer firs, more fire. That according to the long-awaited text on the health of western forests which appeared from Haworth Press in New York in 1994. The book--*Assessing Forest Ecosystem Health in the Inland West*--was born of the November 1993 gathering in Idaho's Sun Valley for a scientific workshop instigated by David Adams and R. Neil Sampson. Adams, forest resources professor and co-editor of the book, spent much of 1994 with fellow editor Sampson (*American Forests*) briefing Congress on the conclusions of the 35 scientists who made up the workshop and wrote the book.

Several faculty from the college are chapter authors, including Dave Adams, (also workshop co-chair), Jay O'Laughlin, Charley McKetta, Penny Morgan, and Jim Moore, all of the Department of Forest Resources.

American Forests pre-published parts of the book and the quarterly *Journal of Sustainable Forestry* devoted all of its 1994 issues to publishing the book in serial form. Adams and Sampson reported findings to Idaho Governor Cecil Andrus, the Chief of the Forest Service, the Washington D.C. press, the Senate Agriculture Committee, and U.S. House members and Chair Bruce Vento (Minnesota) of the National Parks, Forests, and Public Lands Subcommittee of the Natural Resources Committee.

Sponsors of the 1993 workshop were the Forest Policy Center, American Forests; the College of Forestry, Wildlife and Range Sciences, UI; Idaho Department of Lands; the Boise Cascade Corporation; the Boise National Forest; and the Intermountain Forest and Range Experiment Station. Forest Resources Department Head Joe Ulliman worked on the workshop's coordinating committee and Leon Neuenschwander, fire specialist in forest resources, assisted with the workshop.

"It's not just a bunch of academic or Forest Service scientists," said Dave Adams. "The book was put together by experts from a wide variety of organizations, universities, and fields of study." The workshop and book brought together the opinions of scientists and land managers repre-

senting 18 different entities: governmental agencies such as the Bureau of Land Management, universities such as nearby Washington State University, the University of Idaho, and the University of Washington, and organizations such as the Wilderness Society and the Nature Conservancy. "This wide range of expertise is one of the things that makes the document credible," Adams added.

These forest experts came together to attempt to answer a question much on many people's minds: what is the state of western forests and what can we do about it? Amid various issues, varying expert opinions, and even lunch on a field tour of the Sawtooth National Recreation Area, they hammered out a consensus.

Part of the purpose of the original workshop was to communicate the information gathered from these scientists to a wider scientific and policy audience through peer-reviewed publication in the shortest time possible. And they achieved that.

At the workshop, the scientists started with the following statement. *The questions of whether or not to manipulate forest vegetation by salvage logging, thinning, prescribed burning, or other means are controversial and value-laden. There are also, however, important scientific questions that need to be resolved, including the need for sound estimates of the environmental and economic impacts inherent in the different options, including the "no action" option. Agreement on what scientists believe to be the best available understanding of these forest systems, their management, and the risks associated with various options, will not answer all these questions, or resolve value-based political conflicts. It is essential however, as one basis for the debate.*

In the resulting book, the authors discuss the widespread poor health of forests in the Inland West and recommend restorative and preventative forest treatments. Adams says the first five chapters were written on site at the workshop.

Penny Morgan contributed a chapter on the historical range of variability as a tool for evaluating ecosystem change. Jay O'Laughlin wrote about how to define and

measure "forest health." Charley McKetta examined the "Human Dimensions of Forest Health Choices." Jim Moore explained the role of nutrition in forest health. There are also sections on the role of insects and disease in forests, the role of fire and past fire suppression, the past and present value of ecosystem disturbances, as well as those that address wildlife habitat and riparian areas. Ecosystems covered include the spectrum of western landscapes, from Arizona deserts to Northwest old-growth forests. And it re-examines, in some cases it questions, assumptions.

The volume suggests (among others) these remedial actions in bringing back the forests of the inland western United States: thinning the woods to return them to the more open, less crowded state they used to enjoy; changing the species composition back from the current Douglas-fir to the original predominant ponderosa pine; re-introducing fire as a management tool, just as in the past nature used fire to maintain healthy forests.

Stated Adams, "We're saying we feel there is a forest health problem in the Inland West and that we collectively have determined the basic causes of the problem and offer suggestions for how to manage the forest to improve the current situation and avoid similar future forest health problems."

"In many Inland West forests, the costs and risks of inaction are greater than the costs and risks of remedial action," comments Sampson in the overview chapter. "Inaction in the face of current forest conditions will likely prove to be the most costly and environmentally destructive option." Adams agrees by pointing to recent wildfires which burned 400,000 acres of Idaho forestland in 1994.

"Most importantly," said Stan Tixier (retired regional forester) when he reviewed the document, the 433-page text "explains how progressive forest management can be used to overcome destructive effects of insects, disease, and wildfire to promote improved wildlife habitat and healthy forests--with economic benefits."

Dave Adams is professor of forest resources with decades of forestry experience in Idaho, Colorado, California, and Wyoming. His co-author (and co-compiler) is R. Neil Sampson, 16-year veteran of the U.S. Soil Conservation Service and now executive vice president of American Forests in Washington, D.C.

The hardcover book *Assessing Forest Ecosystem Health in the Inland West* can be purchased for \$69.95 through Haworth Press, Inc.

Forest Products And Ecosystem Management

Editor, with Leonard Johnson

Nineteen ninety-three and 1994 were years of initiative and evolution for the Department of Forest Products, years to build on a growing tradition of continuing education courses that serve the forest products industry. The department extended one and initiated three different workshop series in 1993: the ever popular Wood Products Academies, Wood--A Remarkable Fiber (for teachers), the Logger Education to Advance Professionalism (LEAP) program, and in 1994 an extension of LEAP that will provide loggers and landowners with methods to determine harvesting costs and establish timber sale contracts that achieve the goals of forest ecosystem management. Every teaching member of the department and faculty from forest resources and forestry extension have taken active parts in these outreach programs.

The Wood Products Academies

The tremendously popular Wood Products Academies continue to evolve. Targeted to forest products industry line workers, foremen/supervisors, plant managers, and office staff, the two- to five-day academies make up the cornerstone of the department's continuing education repertoire.

The academies upgrade workers' skills and knowledge, foster more productive workplaces, teach more effective use of wood fiber, increase profitability through training about new technology, and help participants understand current and future marketing and manufacturing procedures. Instruction involves both classroom work and field trips in courses on the economics of lumber manufacturing, quality control, and the basics of wood properties and technologies. The academies started with one basic course in 1990 and now include three regular yearly offerings.

Wood--A Remarkable Fiber

In the heart of two of Idaho's most scenic areas, kindergarten through 12th grade teachers learn about wood and its products in *Wood--A Remarkable Fiber*, offered once a year at each of the college's McCall and Clark Fork field campuses. Growing from 38 teacher participants in 1993 (the program's first year) to 72 in

1994, this four-day shortcourse stresses hands-on experience and exercises and experiments teachers can take back to the classroom. Field trips include visits to area timber operations and lumber mills.

Educators learn about the characteristics of wood, why wood behaves as it does, how wood composition is related to the products created from it, and manufacturing processes. Introducing not just the science and technology of wood, the Remarkable Fiber course also addresses the ethical questions associated with harvest and use of wood. The class considers everything from society's historical wood utilization and efficiency to site-sensitive harvest alternatives, from paper recycling to issues surrounding human demand for forest resources. Said one 1993 participant, "I will be using what I've learned as a one-week unit...I can't wait to teach them this fall."

School teachers from Idaho, Montana, and Washington attended in 1993 and 1994. Course costs have been underwritten by the Idaho Forest Products Commission and the University of Idaho. Local forest products companies have also provided scholarships.

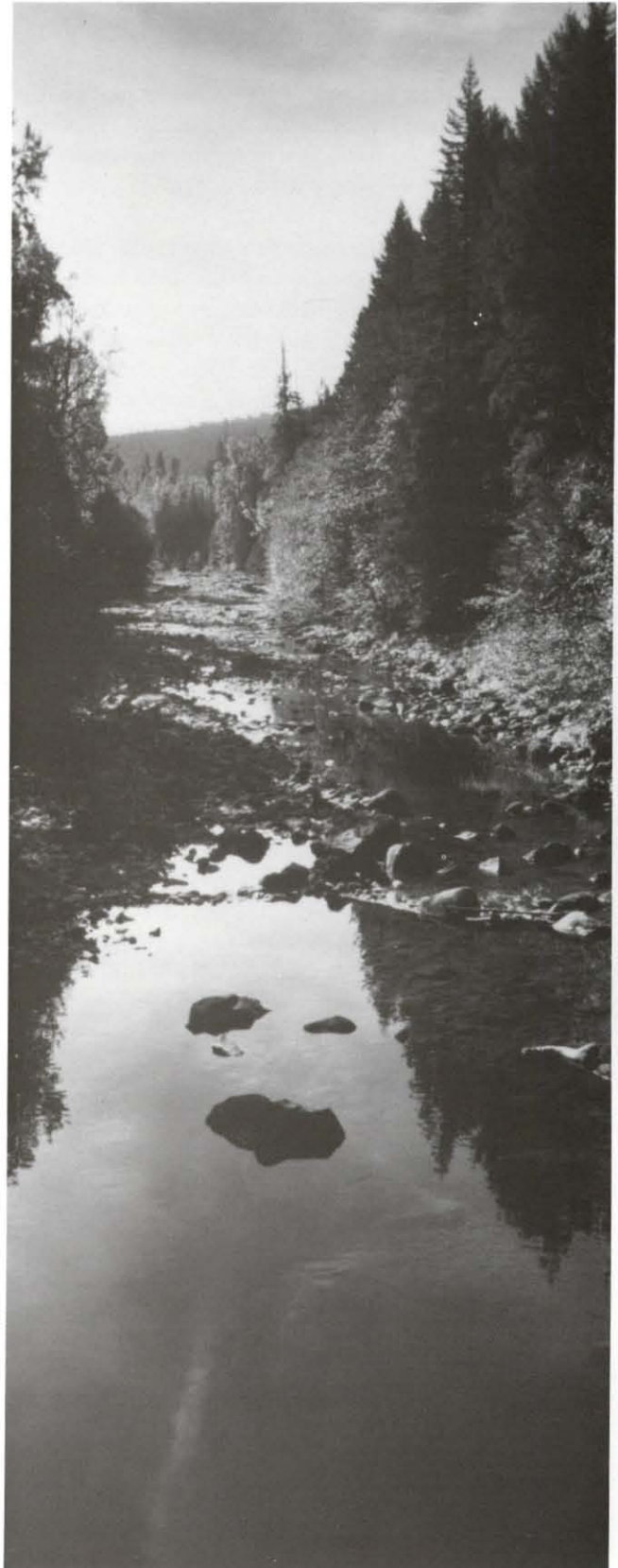
The LEAP Program

They came from Idaho, Washington, Montana, even Canada. One came from the Colville Tribe. They were 20 years old, 60 years old, and in between. Some were women. A few had logged one year, others 45 years. Some wielded chainsaws, other owned logging operations--both large and small. Eager to learn, they asked lots of questions. One veteran commented that this was the first time in all his 30 years in the woods that anybody had explained to him the reasons why he must do some things to the forest and not others. "There's really a reason..." he discovered about forestry prescriptions.

Loggers and ecology are a marriage made in Idaho thanks to two years of spring workshops in Moscow, Sandpoint, and McCall during 1993 and Coeur d'Alene and Orofino in 1994. LEAP, or "Logger Education to Advance Professionalism," helps loggers get "a clearer picture of what foresters are after in their management prescriptions," according to Professor Leonard Johnson, one of the program leaders.

"I enjoyed hearing other people's opinions," remarked one of 120 loggers at the end of a 1993 course. Others observed: "[We] need to involve more people...landowners, timber company personnel, Forest Service, loggers, and others...Let the public know more about it so we can use the course properly."

Scheduled for each March and April, the courses



Continued on page 4

Research Highlights

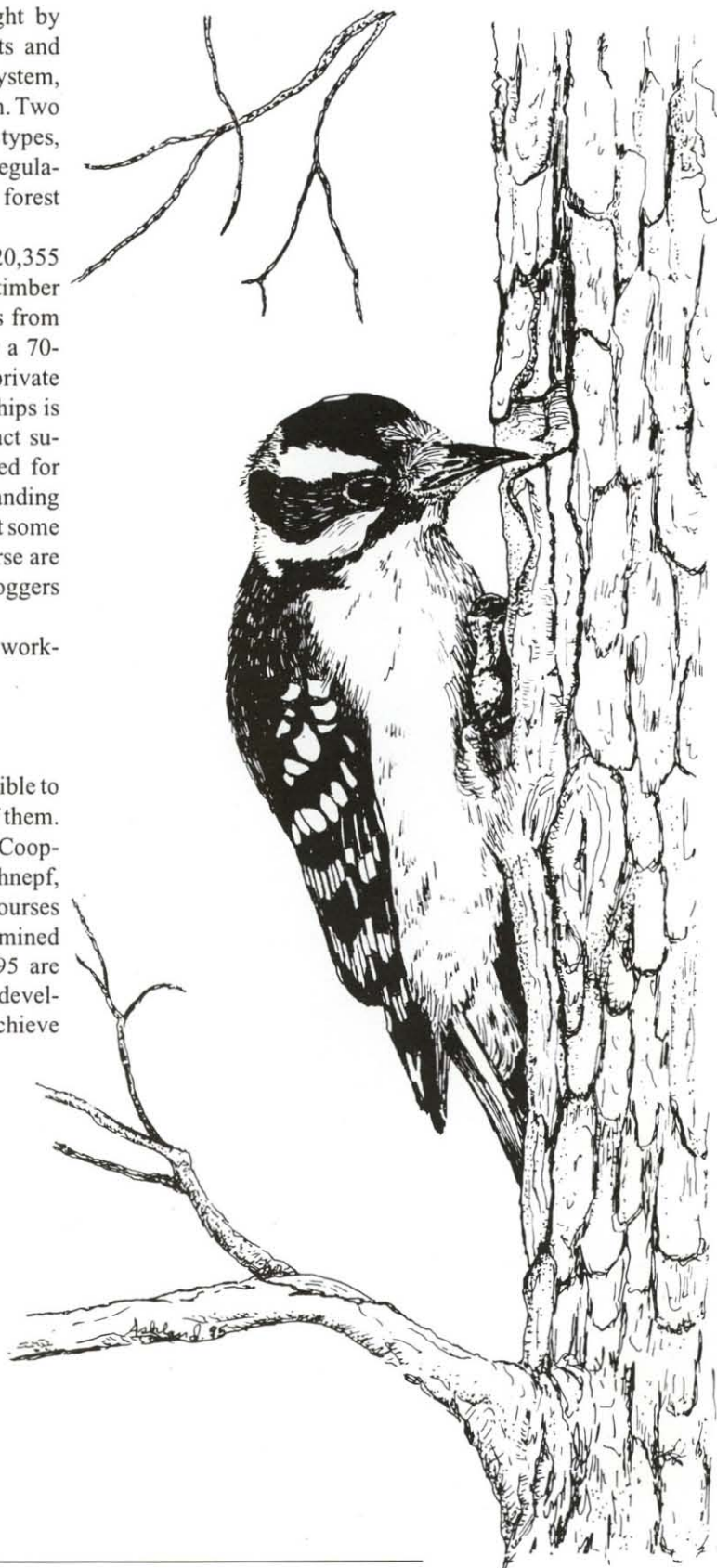
reach 90-120 loggers every year. LEAP is taught by professors in the Departments of Forest Products and Forest Resources and the Cooperative Extension System, the first year funded by the USDA Extension System. Two 2-day courses feature basic tree biology, habitat types, forest management practices, new water quality regulations, and ways to avoid negative impacts on forest ecosystems.

Johnson and his colleagues were awarded \$20,355 in 1993 to bring the program to Idaho, where timber harvest patterns have shifted in the last five years from private industrial timberlands and public lands to a 70-percent increase of logging on non-industrial private lands. Such harvesting activity on smaller ownerships is often accomplished with little professional contract supervision, so Idaho loggers and others see a need for education targeted at giving them a better understanding of the principles of forest ecology. An added benefit some sponsors see is that loggers who complete the course are expected to have a competitive advantage over loggers who do not.

The Forest Products Department has offered workshops to the industry for the last 10 years.

LEAPing Across Idaho

The next phase in making LEAP more accessible to more loggers is to take the "classroom" to more of them. Johnson is now working with forest resources and Cooperative Extension faculty Ron Mahoney, Chris Schnepf, and William Schlosser. They will present LEAP courses in other Idaho locations with course structure determined by them with local committees. Planned for 1995 are workshops on estimating timber harvest costs and developing timber sale contracts for operations that achieve forest ecosystem management goals.



Birds of the Gem State

BIRDS! Warblers. Thrushes. Grouse. Spotted owls. Woodpeckers. They fill our nursery rhymes, our political debates, and our mornings. They can reduce timber losses or tell us what shape our forests are in. For scientists, they can be neotropical species, endangered species, or indicator species. For the Fish and Wildlife Resources Department, they are the subjects of at least 16 research projects of 1993-1994, many still ongoing. From Oregon to the Rockies, these scholars are making the College of Forestry, Wildlife and Range Sciences the center of avian research excellence in the West. ❖

White-Headed Woodpeckers and Timber Harvest

Master's student Rita Dixon bands, radio-tags, mist-nets, and counts white-headed woodpeckers in the national forests of the Central Oregon Cascades--for the birds' own good. Funded by various arms of the Forest Service as well as the Oregon Department of Fish and Wildlife and the University of Idaho, Dixon, UI wildlife Professor Oz Garton, and agency scientists spent 1991-1993 studying the abundance, home range size, and habitat use of white-headed woodpeckers. They looked at everything from the birds' nesting and roosting sites to their foraging strategies in the ponderosa pine forests of the Deschutes, Winema, and Ochoco National Forests.

The researchers will use this information to compare mature old growth sites with intensively harvested sites in terms of impact on the bird population. White-headed woodpeckers are closely associated with the status of mature old-growth forests, according to Dixon.

"White-headed woodpeckers had significantly larger home range sizes on fragmented areas than they did in contiguous stands of mature and old-growth ponderosa pine," commented Dixon, although "ideally, we need to leave large tracts of mature and old-growth forest. If the landscape is very broken up, the birds spend more time searching for food...." She continues, "I found the highest density of *breeding* white-headed woodpeckers in contiguous stands of mature and old-growth ponderosa pine." While the woodpeckers roosted in a wide spectrum of live and dead trees, Dixon reported that they preferred large

diameter (20- to 26-inch) snags for nests.

Managers of the pine forests of Oregon will be able to use this information to allocate enough space in appropriate habitat for maintaining abundant white-headed woodpecker communities, and presumably, healthy forests as well. ❖

The Wild Turkeys of West-Central Idaho

The 23 Merriam's wild turkeys who survived to August of 1993 were troopers, according to graduate research assistant Frank Edelman, Department of Fish and Wildlife Resources. Of the 35 turkeys he and colleagues radio-tagged, these 23 survived nesting and brooding season, hunting season, a poaching incident, and being eaten by predators. Edelman studied the species in 1993 with Kerry Reese, wildlife associate professor, and Pete Zager, principal research biologist, Idaho Department of Fish and Game.

The historic range of Merriam's wild turkeys included not only Washington and Oregon, but Arizona, Colorado, New Mexico, and West Texas. Wild turkeys were first introduced into Idaho in 1961 and 1962 from Colorado, New Mexico, South Dakota, North Dakota, and Wyoming.

But the number of wild turkeys in Idaho has declined recently, possibly because of disease and poor weather during the crucial nesting and brood-rearing periods. Edelman says that some logging, agricultural, and grazing practices may also eliminate roost sites and impact the habitat in which turkeys raise their broods. Land managers need to know how these human uses affect wild turkey habitat so they can better manage the demands that such activities place on these areas. They also need to understand how to manage turkeys in response to increasing hunting demand.

Edelman's study looked at the habitat use, reproduction, and survival rates of Merriam's wild turkeys. He worked an area of some rolling hills, and mostly steep canyons and ravines, a study area that extends from Cottonwood Butte, Idaho, 21 miles westward toward Waha. Bordered by the Camas Prairie, the Salmon River, and the Craig Mountains, this region is owned primarily by the Nez Perce Tribe, with livestock grazing, logging, and hay and grain growing as the major land uses. Types of cover available to the turkeys in this area range from grasslands to forests of ponderosa pine, Douglas-fir, and grand fir.



Edelman radio-tracked the collared hens of two flocks wintering near the base of Cottonwood Butte--21 turkeys in 1992 and 35 in 1993. In 1993, he found overall egg hatchability was 90 percent and nest success was 68 percent. All unsuccessful nests were due to predation. Seventy-two percent of hens raised broods in mixed conifer habitat, 13 percent among grasses and forbs, 10 percent in grand fir, and 6 percent in ponderosa pine. Of 35 turkeys radio-tracked in 1993, 23 survived, with four killed by unknown predators, seven lost to radio-transmitter failure, and one hen poached. Edelman is continuing his work into 1995. ❖

Spotted Owls in Second Growth

The place is a quiet timberland in northwestern California, owned by Simpson Timber Company. With live mouse ready to entice any male owl he encounters, graduate researcher Lee Folliard stalks through redwood and Douglas-fir stands in search of nesting spotted owls. He discovers where the general nesting areas are in this commercial forest by imitating owl calls, then trails any male owl who snatches the mouse and carries it back home to his incubating female and their nest. Once Simpson Timber Wildlife Biologist Lowell V. Diller and Folliard--advised by major professor Kerry Reese, have found the nests, they mark and record the area immediately surrounding the nest tree and the entire forest stand, using aerial photography to describe the overall landscape.

Funded by Simpson Timber, the scientists are learning what habitat is suitable for spotted owls in second-growth commercial forests, which features promote successful owl reproduction, and how such areas would best be managed.

Folliard and colleagues have found spotted owls on the 380,000-acre Simpson property in forests ranging from conifer to hardwood, with some owls nesting in even-aged stands resulting from past clearcuts. They have discovered most owl pairs in small (1-5-acre) patches of older trees left from previous logging, patches that provide roost and nest sites for the owls within a younger, re-growth forest.

The scientists captured and banded just over 600 adult and juvenile spotted owls on or near the Simpson property from 1990 to 1993, and new pairs are discovered each year.

According to Folliard, this northwestern California region is unique because of the high number of spotted owls reproducing in such young forests, stands about 35 to 80 years old. "The region supports rapid tree growth

and abundant populations of dusky-footed woodrats, the favorite food of spotted owls here," explains Folliard. He notes that the dusky-footed woodrat thrives in forests ranging from those recently cut to mature second-growth timber (these conditions do not occur in spotted owl ranges in Oregon and Washington).

"We think we can grow spotted owl habitat" is how Folliard sums it up. As a result of the research thus far, Simpson Timber has modified its former clearcut practices, managing instead for spotted owls by mimicking the forest conditions that Folliard and others are finding affable to owls on the property. That means a design of old-growth patches amidst a background of clearcuts, second-growth forest, and abundant woodrats.

On September 24, 1993, *NBC News* with Tom Brokaw featured the study in a three-minute segment. Simpson Timber Company has employed Folliard as a biologist since 1993. ❖

How Do Idaho's Sage Grouse Respond to Prescribed Fire?

How can you tell if prescribed fire affects sage grouse in southeastern Idaho? One way is to capture grouse at night, then fit them with radio transmitters that help you locate their nests. From there, you observe their movements and record the characteristics of the sagebrush, grass, and other shrubs that make up their nests. If you are graduate researcher Rich Fischer and scientists from the UI Wildlife Department and Idaho Fish and Game Department, you were on the 600,000-acre Big Desert portion of the Upper Snake River Plain near Big Southern Butte for three years, studying 14,000 acres burned in the fall of 1989. Fischer and his team compared this information with data

from about 14,000 *unburned* acres five miles away where grouse also live and nest.

Notes Fischer, because past studies addressed only the effects of herbicides, plowing, and disking on the removal of sagebrush that grouse need, "we hope to determine what effects, if any, fire has on breeding and nesting sage grouse." Although sage grouse are known to migrate to summer range up to 50 miles away from their breeding grounds, these areas are important because it is here that females also nest and raise their chicks.

Fischer isn't looking only for negative impacts; some researchers have speculated that burning might increase the abundance of herbaceous plants (forbs) that sage grouse need. Both effective and cost-efficient, burning is becoming the popular way to clear sagebrush to boost the growth of grasses that livestock prefer. However, nobody has yet investigated the long term effects of burning away the sagebrush that grouse use for food, cover, and nesting. Fischer did this by comparing the status of sage grouse breeding, nesting, and brood habitat both before and after fire.

Fischer found that the number of active leks (lek: a mating system) was highly correlated with maximum attending males, suggesting that counts of active leks may be used as an index to abundance. He also found no habitat characteristic differences at nest or random sites in a comparison between burned and unburned habitat. He observed no differences in timing, distance, or direction of movements by females from burned and unburned habitat.

Fischer's study discovered one negative impact on grouse chicks: fire in the study area decreased insect populations, especially the ants that sage grouse chicks need to survive. However, "cover of forbs important in sage grouse summer diets was similar in burned and unburned habitat," he added. "My results provided evi-

Picture Credits

Birds featured in this section are the **downy woodpecker** on page 4, an Idaho **wild turkey** (female) on page 6, a breeding male **sage grouse** on page 7, a **Columbian sharp-tailed grouse** doing a mating dance on page 8, the bright red-crested **pileated woodpecker** on page 9, and a flock of blue-chested blue-crested **mountain quail** on page 10. Photos are by Marlin Jones, drawings by Lorraine Ashland.



dence for excluding fires that eliminated large blocks of vegetation in brood habitat...because of its impacts on insects." Presumably, that impact means potentially fewer birds setting up house next year, and fewer sage grouse on Idaho's Big Desert.

"Land managers should continue to use fire with caution in sage grouse habitat," advised Fischer. Co-researchers on the study were wildlife associate professor Kerry Reese and Senior Research Biologist John Connelly of the Idaho Department of Fish and Game. Funding was from the Idaho Department of Fish and Game and the U.S. Bureau of Land Management. ❖

Warblers on the Payette

Counting yellow warblers on Idaho's Payette National Forest is how wildlife graduate student Ann Rocklage is measuring the health of the forest. More specifically, the USDA Forest Service is funding her research to develop a "rapid assessment" technique for estimating how their planned timber inventory will affect forest-dwelling birds. Poor management means lower densities of birds, which in turn means fewer birds to eat the pests that kill trees. It is like a partnership between foresters and birds.

Rocklage's major professor is UI wildlife specialist Oz Garton. According to Rocklage and Garton, different bird species thrive in different habitats. For example, chickadees, thrushes, and woodpeckers prefer older conifer stands, but killdeer, sparrows, flycatchers, and grouse prefer clearcuts and shrubfields during their breeding seasons. Robins are the ones who like the "in-between." They move in when conifers just begin to reach several feet tall after a cut. Notes Garton, "If you want the highest diversity of birds, you want both kinds of habitat--both cut areas and old growth, and the in-between as well."

Rocklage, Garton, forest resources Associate Professor Penny Morgan, and wildlife Professor Mike Scott are building a model so efficient that Forest Service biologists could predict in just two days how changes in the forest would affect the various bird communities. The Forest Service funded their research over the summers of 1993 and 1994. Results are forthcoming. ❖



Wintering Grouse in The Intermountain West

For the first time in the history of grouse studies, scientists at the UI have taken a comprehensive look at the plants grouse prefer to eat, and why. Once the most abundant and well-known game bird in the Pacific Northwest, Columbian sharp-tailed grouse are a sensitive subspecies of sharp-tailed grouse native to the Intermountain West.

With funding from the Bureau of Land Management, Idaho Department of Fish and Game, and the Caribou National Forest, graduate students Jim Schneider and Mark Ulliman sought to answer the following questions during the winters of 1992 and 1993. How big is the home range of Columbian sharp-tailed grouse? What are their movements during the winter? What kinds of vegetation do they prefer to live in and to eat? And perhaps most intriguing: are sharp-tailed grouses' dietary preferences related to the internal make-up of their bodies?

These pioneers worked in the Hansel Mountains of southeastern Idaho, adjacent to Curlew National Grasslands, with bird specialist Kerry Reese, Jack Connelly of Idaho Fish and Game, and James Klott of the BLM.

To answer their research questions, they not only tracked radio-collared grouse and analyzed vegetation, but they analyzed the structural design of their internal organs. They were looking at the dietary selections and the

internal make-up of the birds' bodies to determine the best natural diet for southeastern Idaho grouse. What they learned will help agencies to manage lands to keep plants abundant that native grouse species rely on.

Some results. Schneider reports that primary forage for the birds was buds and berries from chokecherry and serviceberry, and alfalfa, yellow salsify, and draba--with distinctions based on which habitat the birds selected (riparian, mountain-shrub, grassland). Some chose Russian olive berries and midge galls from sagebrush. "This is the first documentation of midge galls being selected by Columbian sharp-tailed grouse as winter forage," explained Schneider.

When the researchers analyzed the birds' gizzards for grit content, they found that Columbian sharp-tailed grouse in southeastern Idaho retain chokecherry seeds during periods of low stone availability to assist in the grinding of winter foods.

Schneider and Ulliman examined the digestive organs by measuring small intestine and liver masses, and small intestine and ceca lengths; they also conducted crop content analysis and microscopic fecal analysis. They found the latter to be an unreliable alternative for documenting grouse winter food habits. ❖

Counting Tropical Birds That Settle in the West

Idaho is a good place to raise a family, especially if you're a bird. Half of the 214 bird species that breed in Idaho are "neotropical migrants," birds that journey almost 3,000 miles each spring from Central America, Mexico, and the Caribbean to raise their broods in Idaho.

Since the number of these migrants are declining in the eastern United States, graduate student Jerry Deal, two UI wildlife professors, and a forest resources professor have been tramping through the forested and mountainous regions of 11 western states to learn what is happening to bird numbers in the west. To accomplish such a huge task they evaluated data from the American Breeding Bird Survey or BBS (U.S. Fish and Wildlife Service) for the years 1968 to 1991. Using ANOVA, linear regression models, and BBS trend estimates, they examined differences in landbird population trends based on migratory habit, breeding habitat characteristics, vulnerability to predation and parasitism, and primary diet. This allowed them to detect whole trends in bird populations, providing information on the status of birds in the west, and possibly even beginning to answer the question of why migrant

bird numbers are declining in the east.

Deal says his results "suggest that landbird trends in the West may be mediated by landscape-level influences of human activities and demonstrate the value of BBS data for evaluating broad-scale patterns in avian populations."

Funding was from the college-headquartered Idaho Cooperative Fish and Wildlife Research Unit, a cooperative unit of both the University of Idaho and the U.S. Fish and Wildlife Service. Deal's co-researchers were Mike Scott, wildlife professor and the cooperative's leader; Oz Garton, wildlife professor; and Dave Verbyla, former forest resources assistant professor now at the University of Alaska-Fairbanks. ❖

Forest Service to Use Woodpeckers in Logging Practices

No, not for chopping down trees. For monitoring the effectiveness of Forest Service logging policies in preserving the status of national forests throughout the entire Region IV-Pacific Northwest area, starting with Oregon and moving eastward.

Wildlife graduate student Lisa Bate and Professor Oz Garton, along with Forest Service researchers in Oregon, censused woodpeckers on the Willamette National Forest, Oregon from 1992 to 1994. They have already counted white-headed woodpeckers, common flickers, sapsuckers, and hairy woodpeckers, among others, on the Deschutes National Forest in that state. These species, especially the pileated woodpecker in the Douglas-fir and ponderosa pine forests of the Cascade Mountains, are the current old growth forest indicators. They not only reveal the health of the forests they live in, but they also act as a



gauge of the general health of populations of other cavity-dwelling bird species.

Funded by the Forest Service and the University of Idaho, the scientists are testing the old assumption that the only thing woodpeckers require are snags. It seems they are territorial and need large portions of property as well.

The researchers are helping the Forest Service test the effectiveness of its formula for keeping logged national forests healthy. It involves setting targets for maintaining a certain number of woodpeckers after harvest. For example, in the even-aged stands of central Oregon's Deschutes Forest, the Forest Service strives to maintain 40 percent of the number of woodpeckers that would exist if the forest were an old growth forest. Management for uneven-aged stands tries to achieve 60 percent of potential old growth forest woodpecker numbers. ❖

The Secretive Idaho Mountain Quail

Where's the best (and most accessible) place to spot mountain quail in Idaho? Researcher Patricia Heekin searched over 40 drainages between White Bird and Pinehurst, Idaho, during 1991-1993. She looked for feathers, droppings, ground scratched clean of leaves, and cupped-out areas in river drainages off the Salmon and Little Salmon Rivers. Idaho is the region yielding the most evidence of mountain quail, especially south of Pollock. She also talked with local residents of the Riggins-Pollock

area about where they have seen the birds and where the best places are to place traps baited with cracked corn, wheat, or sunflower seeds. "Without the cooperation of the landowners in the Riggins-Pollock area, this study would not be possible," states Heekin, wildlife graduate research assistant. "While the landowners have not been official sponsors, they have been very helpful," she adds. "Most of the quail I have trapped and relocated remain on or move through private land."

Heekin's project investigating the habitat, movements, and productivity of mountain quail in west-central Idaho was funded by Quail Unlimited chapters in Idaho, Oregon, and California, as well as the Bureau of Land Management and Idaho Department of Fish and Game. Idaho's mountain quail have declined in numbers to the point that they are no longer found in many parts of their historic range, posing the threat of statewide extinction. This project was only the second in-depth study of mountain quail in Idaho since the 1960s. Other studies have taken place in Oregon and California.

Heekin, wildlife faculty Kerry Reese, Idaho Department of Fish and Game biologist Pete Zager, and BLM Cottonwood District Biologist Craig Johnson studied mountain quail until June 1994. Heekin captured quail with baited funnel traps in several drainages and slopes, weighing, measuring, and banding the birds, and radio-collaring selected birds for tracking by radio telemetry. This was the first time that scientists used radio-collars on mountain quail. Now that radio collars can be made in miniature, even small creatures like quail can be fitted. Heekin is grateful for that because they make possible the



nearly impossible task of finding log- and shrub-hidden nests. Quail are experts at hiding their nests and staying quiet.

What the collared birds told the scientists was which vegetation they prefer for nesting and brooding, what their home ranges are, where they move as the seasons change, and how well they survive.

Heekin says the average nest found in 1992 and 1993 contained about 12 eggs each, with about 54 percent of nests hatching successfully in 1992, and 77 percent in 1993. She discovered nests between 2,340 feet elevation and 4,680 feet.

In spite of the current drought, mountain quail in the study area "did pretty well," according to Heekin. "They nest so late they missed the cold spring rains of 1993." This late nesting saves down-covered chicks from the state's wet spring that comes before they have grown their feathers. Not all bird species are so lucky, so late nesting is a tool of survival for mountain quail in Idaho.

Heekin and her colleagues will use their information to develop management recommendations designed to maintain or enhance the habitat and numbers of this species designated by the cooperating agencies as a "species of special concern" and a "sensitive species." ❖

Merriam's Turkeys in SE Idaho

With proper management, the wild turkey population in North America currently exceeds 2.5 million, up from just 30,000 at the turn of the century. Timber management practices are the primary means of manipulating turkey habitat, states John P. O'Neill, wildlife graduate researcher. Thus the Forest Service, BLM, and Idaho Department of Lands need information on wild turkey habitat as they try to maintain and create important habitat components while meeting their goals for intensive timber and live-stock programs.

Past wild turkey research has focused on the Eastern wild turkey in the eastern United States. Few studies have looked at the the Merriam's subspecies, particularly in non-native habitat. Merriam's wild turkeys were introduced into Idaho in 1961, partly to establish a huntable population and also to provide transplant stock for future introductions. The bird's range in Idaho is concentrated in the west-central portion of the state along the Snake and Weiser Rivers.

O'Neill has been on the Payette National Forest and private lands near the Washington town of Council and in southwestern Idaho to study turkeys. "My overall re-



search objective," he explains, "is to determine if turkeys select seasonal habitat based on specific characteristics that may increase survival and productivity." The study area "mimics the natural habitat of this bird," says O'Neill, meaning rugged topography, ponderosa pine, and basin and stream bottom features. Since agriculture and grazing dominate land uses in the valley, O'Neill will add to the very little knowledge of how agriculture and other practices affect the species.

Results from his study will provide guidelines for evaluating potential introduction or transplant sites. Further, it will be applicable to similar habitats in southern Idaho, eastern Oregon, and western Wyoming and Montana. Associate Professor Kerry Reese is O'Neill's major professor. ❖

SE Idaho's Nesting Grouse

For management recommendations sensitive to sage grouse and Columbian sharp-tailed grouse in southeastern Idaho, the Bureau of Land Management, Forest Service, Idaho Department of Fish and Game, and UI are funding the work of Ph.D. student Tony Apa and three other scientists. They study grouse nesting strategies to help with management decisions that better conserve nesting habitat. Their intent is to "understand the relationships of various grouse species that share the region," according to Apa.

From 1988 to late 1993, Apa's research included capturing and radio-collaring female grouse, and analyzing sites to learn what vegetation is needed for grouse nesting and rearing their broods. Especially interesting has been Apa's construction of artificial nests to test current theories about why grouse choose their nest sites. Associate Professor Kerry Reese explains that the artifi-

Birds of the Gem State

cial nests filled with chicken eggs and placed at various distances from the leks allow Apa to learn about the typical distances that predators such as coyotes search out for nests; hen choice of nest location is related.

This research is taking place on the Curlew National Grasslands 15 miles north of Snowville, Utah, 20 miles west of Malad, Idaho. Apa is assisted by Kerry Reese, Jack Connelly of the Idaho Department of Fish and Game, and Jack Klott of the Bureau of Land Management. ❖

Photo Credit

In the field: Associate Professor Kerry Reese, Department of Fish and Wildlife Resources. Photo by Jeff Yeo.



Forest Grouse and Sharp-Shinned Hawks at Taylor Ranch Wilderness Field Station

Jeff Yeo, Sushan Han, and Jason Karl

Large areas on the Idaho map have no towns and few place names. In present times, we label these areas "wilderness," thinking of wilderness mostly as a place to recreate--to experience the earth as it once was. But increasingly, society recognizes that knowing what goes on in these "natural" areas is vital to our understanding of how all ecosystems function, "natural" or "unnatural." At the University of Idaho Taylor Ranch Wilderness Field Station, located in the middle of the 2.4-million acre Frank Church-River of No Return Wilderness (FC-RNRW), scientists and students have begun the process of understanding how this huge area works--and birds are playing an important role in that process.

Populations of certain species of migratory birds in some regions of North America have been declining for many years. Originally, these declines were attributed to deforestation in Central and South America. But recent research suggests the problem may originate on their breeding grounds: here in the U.S. and Canada.

Specifically, conversion of natural landscapes for agriculture and timber production and fragmentation of remaining habitats have diminished these species' abilities to survive and reproduce.

Nearly nothing is known about how these migratory birds and other groups of birds are faring in large areas little disturbed by humans, such as the FC-RNRW. And wilderness is just the place to differentiate "natural" changes wrought by weather, predation, and other processes from "unnatural" changes caused by human perturbations such as clearing of forest or grassland, pesticides, hunting, and noxious species invasion (English, sparrows, starlings, etc.).

Jason Karl, undergraduate wilderness research intern, started a study of forest owls and hawks that once complete, will augment a decade-long study in the FC-RNRW by Greg Hayward and Oz Garton, research associate and professor of wildlife resources, respectively.

Karl is studying six sharp-shinned hawk nests built in Douglas-firs infected by mistletoe. Mistletoe's broom-shaped clusters of live twigs and leaves effectively camouflage hawk nests. Future research will look at the hawks' food habits and activity budgets (time animals spend in

different activities) as well as another two resident species--goshawks and Cooper's hawks. When combined with Hayward's and Garton's work on owls, we'll then have a comprehensive picture of how forest avian predators partition their resource use in this pristine area.

Another project in the FC-RNRW is Jeff Yeo's monitoring of breeding bird populations. Resident scientist and manager of the Taylor Ranch Field Station, Yeo has already identified over 130 bird species in the wilderness surrounding the station. To create a meter for gauging how birds in the West are faring outside wilderness, he will combine data on the wilderness birds' breeding rates, response to habitat changes, and abundance with food availability, weather, and landscape patterns.

Forest grouse typically are hunted wherever they occur. But few are taken in the FC-RNRW. Kerry Reese, associate professor of wildlife resources, seized the opportunity in 1993 to begin study of near-natural populations of blue grouse and ruffed grouse that congregate at Taylor Ranch each year. His work addresses the reproductive successes of hens and their offspring over time. Do certain hens produce offspring that consistently outlive and out-reproduce other hens' offspring? If so, is this related to differential use of habitats by fitter hens or is differential survival and productivity controlled by genetic features passed through hen lineages?

With the guidance of Dr. Reese, undergraduate field station intern Sushan Han caught and marked 30 grouse, including complete broods with hens. Trapping and marking will continue the next couple years as relative survival of individual hen lineages is determined. Reese's and Sushan's intent is to expand study to include radio telemetry for determination of habitat selection and genetic fingerprinting to identify parent lineages.

A junior in wildlife resources, Jason Karl was a 1994 recipient of the college's annually awarded Curt Berklund Undergraduate Honorarium for Self-Initiated Research. His winning paper Nest Site Characteristics of Sharp-Shinned Hawks in Idaho's Frank Church-River of No Return Wilderness is available in booklet form through Forestry Publications for \$3.00.

Lessons From the Past: Herbivory in the Intermountain West

J. Wayne Burkhardt, with Editor

Traditional consumptive uses of renewable natural resources are coming under increasing scrutiny, especially on public lands. Certainly a major part of these land use concerns focuses on livestock grazing.

While livestock grazing may be one of humankind's oldest endeavors--second to hunting or food gathering--its environmental sustainability is being questioned.

The biota of Intermountain rangelands evolved over several million years as a natural grazing ecosystem. The fossil record indicates that this herbivory exceeded the modern Serengeti for faunal diversity. Between 10,500 and 7,000 years ago massive extinctions removed most of the larger bodied fauna from the system. There are indications that these extinctions were related to the arrival of humans to North America.

At the time of European contact with North America, the biologic system was in flux. Evolution and species immigration had not yet filled the vacant herbivore niches. The science of ecology, largely unaware of the fossil record, assumed that the biologic conditions at the time of European contact were pristine or climax. This view has shaped the development of range science and land management profoundly. The underlying assumption has been that the Intermountain biome was largely unadapted to large herbivore grazing. Consequently, livestock grazing management largely focused on minimizing and mitigating the negative impacts to the natural system.

Perhaps the interpretations of our historic experience in the region suffer as a result of narrow temporal limits. Certainly the historic record regarding an obvious paucity of large ungulates is convincing. However, whether ecological conditions at the time of initial European contact in the far West were normal, "natural," and stable remains largely unquestioned. Plant ecologists and range scientists have generally assumed that ecological conditions immediately prior to European settlement of the West represented the climax or pristine natural state.

"Characterization of the Pleistocene herbivory provides a potential model for functional livestock grazing."

Departure from those conditions is viewed as human disturbances of the natural system. We now know that herbivory, including large grazers, is part of the natural biologic system on terrestrial landscapes, the Intermountain region

included. Herbivory is a functional process that serves both flora and fauna. Grazing management should be designed to assure that our livestock grazing is functional within the parameters of the biologic system. Characterization of the Pleistocene herbivory provides a potential model for functional livestock grazing.

Our experience with historic livestock grazing in western North America provides a mixed track record. While most rangelands remain productive and stable after more than a century of grazing, problems abound with altered plant communities and eroding streams. The paper resulting from my 1994 study is a review of the pertinent scientific literature in archeology, paleo-ecology, paleo-climatology, and geology relating to prehistoric and historic herbivory in the Intermountain West biome of North America.

What I found logically leads to the formulation of several hypotheses which should be tested against the available scientific data in ecology, archeology, paleo-ecology, and paleo-climatology. Those hypotheses are:

- 1) Biotic conditions and relationships of the Intermountain West at the time of European contact do not represent the pristine, stable state ecology of the region;
- 2) Rangeland biota of the Intermountain region evolved in the presence of large bodied herbivores and is adapted to such grazers;
- 3) Domestic livestock (horses and cattle) introductions to the Intermountain region represent a potential replacement of the extinct Pleistocene mega-fauna;
- 4) Domestic livestock introductions to Intermountain rangelands have produced significant biologic impacts on the system;
- 5) Characterization of the Pleistocene herbivory in

Research Highlights

the Intermountain region would provide a model for management of domestic livestock grazing today.

Questions raised here are of fundamental importance to our understanding of western North American ecosystems and sustainable land management practices. This information and model of prehistoric herbivory should be synthesized with the historical and range science literature to better understand historic ecological changes and suggest more sustainable livestock grazing strategies.

An alumnus of the University of Idaho (BS, MS, Ph.D), J. Wayne Burkhardt is now affiliate professor of range resources in the college, having retired as professor emeritus at the University of Nevada. This article condenses a 49-page paper written for the Eastside Ecosystem Project.



The Wilderness Discovery Program for Poverty Youth--Idaho Takes the Lead

Randall C. Pitstick, John C. Hendee

The use of wilderness for personal growth, therapy, and inspiration is a well established activity in the United States and many other countries. Benefits of such use are documented in literally hundreds of studies that consistently note increased self-esteem and sense of personal control by participants completing wilderness programs. Some key studies have noted significantly greater effects on participants from poverty and/or delinquent backgrounds. We implemented and are evaluating a week-long wilderness experience program for disadvantaged youth in the Curlew Job Corps Conservation Center on the Colville National Forest in Washington state during the summer of 1993.

Job Corps students are young people at risk--they are attempting to overcome years of social, economic, physical, sexual, emotional, and psychological marginalization, as well as the consequences of poor choices. Our goal was to establish a program that would enhance students' abilities and performance both within the federal Job Corps program and in their transition to contemporary society. That means using a wilderness living situation to help the participants improve self-esteem, clarify their identity, set future personal and career goals, and learn to live in balance with nature and each other, among other goals. Journals, personal action plans, and strict adherence to the rules of the trail and leaders were required of the youths. The program allowed us to create a database for and to perfect the Wilderness Discovery Program for potential future adoption at other Job Corps centers. We also wanted to provide a quality wilderness experience for impoverished youth who normally lack such opportunities.

Wilderness Discovery is the first wilderness experience program designed specifically to enhance personal growth, thus enhancing progress in Job Corps training and future life prospects. Over the summer of 1993, we took groups of 16- to 24-year-olds on seven- and eight-day wilderness trips. Randall Pitstick personally led all groups as Wilderness Discovery Field Director. We also underwent extensive pre-summer planning and orientation. On the trail, we emphasized a "soft skills" approach, focusing on helping

students expand insight, evaluation, and reflection about their patterns of behavior, values, beliefs, and motivations. This contrasts with a "hard skills" approach emphasizing competition, aggressiveness, vigorous exercise, and risk.

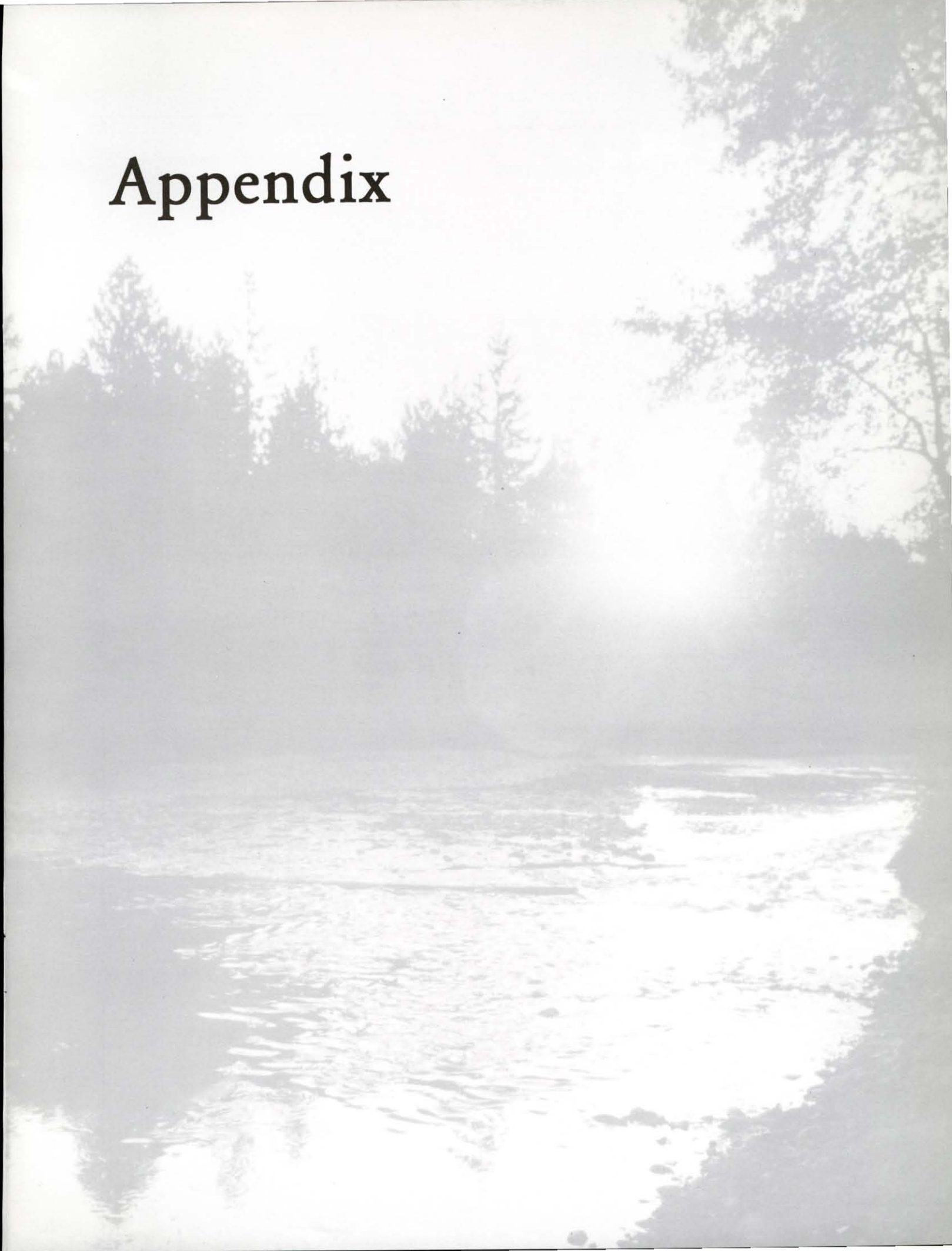
Clearly, the expeditions demonstrated the program's feasibility, for we safely led 50 inexperienced Job Corps students on a series of six, week-long wilderness trips, despite the fact that this was the coldest, wettest summer on record in the Pacific Northwest. At the end of every trip, we evaluated the performance of every participant, the trip's logistics, and effects on both participants and staff.

Overall, we observed increased self-esteem and confidence among almost all students, and Job Corps staff also report dramatically improved student attitudes. Through a combination of alone time and group activities, many students considered diverse views and peer feedback on sensitive issues for the first time. Opportunities for cooperation were more prevalent on Wilderness Discovery trips than most students had previously experienced in their lives. Many students said Wilderness Discovery was the most important experience of their lives. In addition, Job Corps staff say that the level of dialogue achieved with students on the trips allowed them to better understand their behavior. Staff report positive changes in their own performance back at the center, and there has been a reduction of delinquent behavior and greater involvement by the students when they return to the center.

In end-of-trip recorded interviews, student participants were *unanimous* in their affirmation that the program be continued. We have recommended that a three-year pilot study be implemented to expand Wilderness Discovery to a few select Job Corps centers to gather additional information on the costs, benefits, and feasibility of a large scale program.

Randall C. Pitstick has a master's degree in wilderness psychology and is finishing his Ph.D. in the college in wilderness experience and personal growth. John C. Hendee, professor in both the Departments of Forest Resources and Resource Recreation and Tourism, is former dean of the college and currently director of the Wilderness Research Center.

Appendix



Experiment Station Scientists

Department of Fish and Wildlife Resources

- Ables, Ernest D.
Professor and Department Head
Wildlife ecology, especially animal behavior and radiotelemetry techniques
- Bennett, David H.
Professor
Warmwater fishery management, fish ecology, fish population dynamics
- Bizeau, Elwood G.
Professor Emeritus
Associate, Wildlife Research Institute
Birds, principally waterfowl and marsh
- Bjornn, Theodore C.
Professor
Assistant Leader, Idaho Cooperative Fish and Wildlife Research Unit
Management and ecology of wild and hatchery salmonids, endangered species management
- Brannon, Ernest L.
Professor
Director, University of Idaho Aquaculture Program and Idaho Aquaculture Institute
Finfish culture, fish behavior, salmonid life histories, sturgeon life histories
- Congleton, James L.
Associate Professor
Assistant Leader, Idaho Cooperative Fish and Wildlife Research Unit
Fish immunology, stress physiology
- Csuti, Blair A.
Adjunct Associate Professor, Idaho Cooperative Fish and Wildlife Research Unit
Strategies for the selection and design of nature reserves, endangered species conservation, Geographic Information System (GIS) analysis
- Dennis, Brian
Associate Professor
Statistical ecology, biometrics, theoretical population biology
- Dresser, Tom
Scientific Aide
- Falter, C. Michael
Professor
Reservoir limnology, stream and lake ecology and management, aquatic pollution ecology
- Garton, Edward O.
Professor
Wildlife population biology, systems ecology, wildlife census methods, statistical analysis
- Hornocker, Maurice G.
Professor
- Director, Wildlife Research Institute
Population ecology, predator-prey interactions
- Hungerford, Kenneth E.
Professor Emeritus
Wildlife management
- Hunt, Joel
Research Associate
- Jepson, Michael
Scientific Aide
Fish physiology, statistical analysis
- ❖ Klontz, George W.
Professor Emeritus
Aquatic animal medicine, aquaculture
- Kress, Albert (Duke)
Research Technician
- Lohman, Kirk
Assistant Professor
Assistant Professor, Range Resources
Riparian ecology, stream ecology
- MacPhee, Craig
Professor Emeritus
Fish behavior, ecology, toxicology
- Moffitt, Christine M.
Adjunct Associate Professor
Research Scientist
Biology and management of anadromous fish, fish chemotherapeutants
- Nelson, Lewis, Jr.
Extension Professor
Adjunct Professor, Resource Recreation and Tourism
Continuing education, communications/public relations, environmental education
- Peek, James M.
Professor
Big game ecology and management, habitat systems
- Peery, Chris
Research Assistant
Adult salmon and steelhead passages at dams
- Ratti, John T.
Adjunct Professor
Avian ecology; behavioral, evolutionary, and population ecology; habitat analysis
- Reese, Kerry P.
Associate Professor
Wetland, waterfowl, and upland game ecology and management; nongame wildlife
- Riggers, Brian
Scientific Aide
Limnology, river ecology

Experiment Station Scientists

- Ringe, Rudy R.
Research Associate, Idaho Cooperative Fish and Wildlife Research Unit
Anadromous fish ecology and management
- Rubin, Stephen A.
Research Associate
Salmonid ecology
- Scamecchia, Dennis L.
Associate Professor
Salmon, trout, and paddlefish ecology and management; fish populations and community ecology in large rivers, streams, and natural lakes
- Scott, J. Michael
Professor
Leader, Idaho Cooperative Fish and Wildlife Research Unit
Ecosystem management, endangered species management, systems approaches to conservation biology and ecology
- Setter, Ann L.
Research Associate
Fish culture, sturgeon life history, electrophoresis
- Wright, R. Gerald, Jr.
Professor
Project Leader (Biology), Cooperative Park Studies Unit
Wildlife habitat management, national park wildlife management, natural resource data management and geographic information systems
- Yeo, Jeffrey J.
Adjunct Assistant Professor
Scientist/Field Manager, Taylor Ranch Wilderness Research Center
Big game ecology and management, wilderness ecology and management
- ❖ Johnson, Leonard R.
Professor
Interim Dean, College of Forestry, Wildlife and Range Sciences
Interim Director, Idaho Forest, Wildlife and Range Experiment Station
Timber harvesting systems, wood energy, recovery and processing of forest residues
- Lee, Harry W.
Assistant Professor
Harvesting systems, road design, site productivity, soil-water relationships
- Moslemi, Ali A.
Professor
Director, FWR Graduate Programs
Wood particle composites, wood technology
- O'Laughlin, Jay
Adjunct Professor
Adjunct Professor, Forest Resources
Director, Policy Analysis Group
Natural resources economics and policy analysis, structural changes in wood-based industries
- Steinhagen, H. Peter
Associate Professor
Drying of lumber and wood particulates, heat transfer in frozen and nonfrozen wood systems, wood energy, wood preservation
- Wagner, Francis G.
Professor and Department Head
Operations research and management science techniques applied to primary and secondary wood products manufacture
- ❖ Head, Department of Fish and Wildlife Resources until July 1, 1994

Department of Forest Products

- Bottger, Richard F.
Adjunct Associate Professor
Director of Administrative Services
Assistant Director, Idaho Forest, Wildlife and Range Experiment Station
Business and personnel management
- Campbell, Alton G.
Associate Professor
Associate Dean for Academics and Continuing Education
Pulp and paper science, waste treatment and resource recovery
- Folk, Richard L.
Research Assistant Professor
Bioenergy, silviculture/wood quality, utilization of wood products
wood processing wastes
- Gorman, Thomas M.
Associate Professor
Wood construction and design, physical properties of wood, secondary wood products manufacturing, moisture problems in wood-frame houses
- Adams, David L.
Professor
Silviculture, forest health, forest regeneration
- Appelgren, Ross
Assistant Manager/Logging Superintendent, University of Idaho
Experimental Forest
Logging systems
- Belt, George H.
Professor
Director, Idaho Riparian Cooperative
Forest hydrology and watershed management, social forestry, agroforestry
- Brunsfeld, Steven J.
Assistant Professor
Director, Forestry, Wildlife and Range Sciences Research Herbarium
Ecology, autecology, genetics, biotechnology, synecology, dendrology
- Burlison, Vernon H.
Extension Forester Emeritus
Extension Professor Emeritus

Department of Forest Resources

Experiment Station Scientists

- Canfield, Elmer R.
Associate Professor Emeritus
Forest pathology
- Carree, Yvonne
Forestry Extension Associate
Forestry extension, hardwood growth and management
- Dumroese, R. Kasten
Research Associate, Forest Research Nursery
Forest nursery technology and production, nursery management
- Edson, John L.
Research Associate, Forest Research Nursery
Vegetative propagation, biotechnology, seedling production
- Fins, Lauren
Professor
Director, Inland Empire Tree Improvement Cooperative
Genetics, biotechnology, urban forestry
- Force, Jo Ellen
Professor
Forest planning and policy, social forestry, agroforestry, community stability, land use planning, society and natural resources
- Hatch, Charles R.
Professor
Associate Dean, College of Forestry, Wildlife and Range Sciences
Associate Director, Idaho Forest, Wildlife and Range Experiment Station
Forest mensuration and statistics
- ❖ Hendee, John C.
Professor
Professor, Resource Recreation and Tourism
Director, Taylor Ranch Wilderness Field Station
Director, UI Wilderness Research Center
Human behavior aspects of resource management—public involvement, conflict resolution, social impact analysis; wilderness, recreation, wildlife, and forest policy and management; use of natural environments for personal growth, therapy, and leadership development
- Johnson, Frederic D.
Professor Emeritus
Dendrology (temperate and tropical), ecology
- Littlejohn, Margaret E.
Western Coordinator, Visitor Services Project
(National Park Service duty stationed in Cooperative Park Studies Unit)
- Loewenstein, Howard
Professor Emeritus
Forest soils and tree nutrition
- Lotan, James E.
Adjunct Professor
Research Scientist
Silviculture and fire management
- Machlis, Gary E.
Professor
Adjunct Professor, Resource Recreation and Tourism
Project Leader (Sociology), Cooperative Park Studies Unit
Sociology of natural resources, human ecology, community stability, land use planning, social forestry
- Mahler, Robert
Adjunct Associate Professor
Professor, Soil Sciences (Department of Plant, Soil, and Entomological Sciences, College of Agriculture)
Soil fertility, plant nutrition
- Mahoney, Ronald L.
Associate Extension Professor
Extension Forester, UI Cooperative Extension Service
Silviculture, natural resources education
- Marshall, John D.
Assistant Professor
Tree physiology, ecology, forest ecosystem processes
- Mattson, Kim G.
Research Assistant Professor (located at Oregon State University)
Forest ecology
- McKetta, Charles W.
Associate Professor
Economist, Idaho Forest, Wildlife and Range Experiment Station
Forest policy, international forestry, fire and fuel management economics, forest economics and finance, land use planning, social forestry
- Medema, E. Lee
Associate Professor
Forest economics and finance, forest policy, social forestry
- Mika, Peter G.
Research Associate
Biometrics, forest nutrition
- Moore, James A.
Professor
Director, Intermountain Forest Tree Nutrition Cooperative
Forest growth and yield modeling, mineral nutrition of forest trees, quantitative silviculture
- Morgan, Penelope
Associate Professor
Director, Prescribed Burning Program
Fire ecology and management, silviculture and forest ecology, ecological modeling, landscape ecology, forest health
- Morrison, Sue
Nursery Technician, Forest Research Nursery
- ❖❖ Neuschwander, Leon F.
Professor
Fire ecology and management, forest health
- O'Laughlin, J.
Adjunct Professor
Adjunct Professor, Forest Products
Director, Policy Analysis Group
Natural resource economics and policy analysis, structural changes in wood-based industries
- Osborne, Harold L.
Associate Extension Professor
Manager, University of Idaho Experimental Forest
Silviculture, harvesting, forest regeneration
- Partridge, Arthur D.
Professor
Pathology, urban forestry

Experiment Station Scientists

- Pym, Geneva E.
Research Technician
Quantitative and qualitative analysis
Forest nursery technology and production, forest regeneration, nursery techniques, biotechnology, forest regeneration, silviculture
- Quick, Ken
Nursery Technician, Forest Research Nursery
- Robison, M. Henry
Adjunct Assistant Professor
Senior Research Economist, Center for Business Development and Research (Department of Business and Economics, College of Letters and Science)
Urban and regional economics, natural resources and environmental economics
- Rust, Marc
Research Associate
Genetic improvement of forest trees, application of computer technology to forestry
- Schenk, John A.
Professor Emeritus
Forest entomology, silviculture
- Schlosser, William E.
Adjunct Assistant Extension Professor
Woodland forestry, youth education, general agriculture
- Schnepf, Chris
Adjunct Assistant Extension Professor
- Seale, Robert H.
Professor Emeritus
Forest economics
- Shaw, Terry M.
Research Associate, Intermountain Forest Tree Nutrition Cooperative
Forest resource inventories and data base management, forest nutrition, nutrition/disease interaction
- Stark, Ronald W.
Professor Emeritus
Population dynamics and integrated pest management of forest insects
- Stiff, Charles T.
Assistant Professor
Mensuration, growth, and yield modeling; forest inventory
- Stock, Molly W.
Professor
Artificial intelligence/expert systems applications in natural resource management, entomology
- Stoszek, Karl J.
Professor
Forest protection, silviculture, forest health
- Ulliman, Joseph J.
Professor and Department Head
Co-Director, UI Remote Sensing Research Unit
Director, Forestry, Wildlife and Range Sciences Remote Sensing Center
Aerial photographic interpretation, mapping and remote sensing
- Wenny, David L.
Professor
Manager, Forest Research Nursery
- ❖ Dean, College of Forestry, Wildlife and Range Sciences and Director, Idaho Forest, Wildlife and Range Experiment Station until July 1, 1994
- ❖ Associate Dean for Research and International Programs and Associate Director, Idaho Forest, Wildlife and Range Experiment Station until July 1, 1994

Department of Range Resources

- Bunting, Stephen C.
Professor
Fire ecology, range ecology, range management
- Ehrenreich, John H.
Professor
Agroforestry, international forest and range management, range ecology
- Hironaka, Minoru
Professor Emeritus
Range ecology, rangeland classification, soil-plant relationships
- Johnson, Kendall L.
Professor and Department Head
Shrubland ecology and management, range extension
- Kingery, James L.
Assistant Professor
Forest grazing policy and management, rangeland rehabilitation, range management
- Lohman, Kirk
Assistant Professor
Assistant Professor, Fish and Wildlife Resources
Riparian ecology, stream ecology
- Mosley, Jeffrey C.
Associate Professor
Grazing management of wild and domestic ungulates, foraging behavior, livestock-wildlife relations
- Rimbey, Neil R.
Adjunct Professor
Extension Range Economist, Southwest Idaho Research and Extension Center
Rangeland economics and policy
- Robberecht, Ronald
Associate Professor
Ecophysiology, autecology, range ecology
- Sanders, Kenneth D.
Professor
Extension Range Specialist, Twin Falls Research and Extension Center
Manager, Lee A. Sharp Experimental Area
Range extension, range livestock nutrition, grazing systems
- Sharp, Lee A.
Professor Emeritus
Integrated range resource management, range management planning, grazing systems

Experiment Station Scientists

Department of Resource Recreation and Tourism

Armstrong, Terry R.

Adjunct Professor
Professor, College of Education
Strategies for teaching, science education, environmental education, neurological basis for learning and memory

Brown, Greg

Adjunct Assistant Professor
Computer/Networking Specialist, UI Computer Services
Resource management, policy, and planning; environmental advocacy; regional planning

Fazio, James R.

Professor
Resource communication, environmental interpretation, conservation history, urban and community forestry, continuing education

Ham, Sam H.

Professor
Director, Natural Resources Communication Laboratory
Environmental education and interpretation, natural resource communication, natural resource tourism, reserve management in developing Latin American countries

Harris, Charles C.

Associate Professor
Resource management, policy, and planning; organizational psychology of resource management; natural resource tourism, impacts, and market analysis; recreation and amenity values

❖ Hendee, John C.

Professor
Professor, Forest Resources
Director, Taylor Ranch Wilderness Field Station
Director, UI Wilderness Research Center
Human behavior aspects of resource management—public involvement, conflict resolution, social impact analysis; wilderness, recreation, wildlife, and forest policy and management; use of natural environments for personal growth, therapy, and leadership development

Hughett, Harvey

Adjunct Assistant Professor
Director, UI Division of Instructional Media Services
Instructional technology, mediated instruction, distance education, Spanish language pedagogy

Hunt, John D.

Professor and Department Head
Tourism planning, development, marketing, and management; integration of natural resource uses with tourism and recreation development; human behavior aspects of tourism and recreation development

Krumpe, Edwin E.

Associate Professor
Principal Scientist, UI Wilderness Research Center
Wilderness and dispersed recreation management, recreation and tourism behavior and the decision process, interpretation and communication, administration, group facilitation for decision-making

Leidner, Stuart

Research Analyst
Rural community tourism, recreation planning and economic development, survey research, economic impacts of tourism and recreation, applications of economic theories

Machlis, Gary E.

Adjunct Professor
Professor, Forest Resources
Project Leader (Sociology), Cooperative Park Studies Unit
Sociology of natural resources, human ecology, community stability, land use planning, social forestry

McLaughlin, William J.

Professor
Regional planning including natural resources, nature conservation, tourism, economic development, group facilitation for decision-making and conflict resolution, social science research methods

Nelson, Lewis, Jr.

Adjunct Professor
Extension Professor, Fish and Wildlife Resources
Continuing education, communications/public relations, environmental education

Sanyal, Nick

Assistant Research Professor
Recreation planning, recreation behavior, human dimensions of fish and wildlife management, research methodologies, survey research

Vlaming, Jonathan C.

Senior Research Analyst
Travel and tourism research, social implications of geographic information systems, spatial analysis and modeling, visual aesthetics research, survey research

Whiteman, Michael R.

Adjunct Assistant Professor
Director, UI International Programs Office
Natural resources planning, collaborative problem-solving/decision-making, conflict management

❖ Dean, College of Forestry, Wildlife and Range Sciences and Director, Idaho Forest, Wildlife and Range Experiment Station until July 1, 1994

Policy Analysis Group (PAG)

MacCracken, James G.

Research Scientist
Natural resource policy, wildlife-habitat relationships, plant ecology, predator-prey interactions

Merrill, Troy

Research Assistant

O'Laughlin, Jay

Adjunct Professor
Adjunct Professor, Forest Resources
Director, Policy Analysis Group
Natural resource policy

Publications and Reports

The following list contains most works published during 1993 and 1994. Copies of Idaho Forest, Wildlife and Range Experiment Station publications are available from Forestry Publications, and reprints of some journal articles are available from the authors. Reports issued to fulfill contracts are generally not available for distribution to the public.

Department of Fish and Wildlife Resources

- Adams, S., and T.C. Bjornn. 1994. Bull Trout Distribution in the Weiser River Drainage. Report to U.S. Forest Service, McCall.
- Austin, D.J., D.L. Scarnecchia, and E.P. Bergersen. 1994. Usefulness of structural and condition indices in the management of high mountain stream salmonid populations. *North American Journal of Fisheries Management* 14:681-691.
- Baker-Nelson, W. 1993. *Learning by Doing: An Environmental Guide for Teachers, 1st to 6th Grades*. 169 pp. (English and Spanish).
- Bennett, D.H., T.J. Dresser, Jr., T.S. Curet, K.B. Lepla, and M.A. Madsen. 1993. Lower Granite Reservoir In-Water Disposal Test: Results of the Fishery, Benthic, and Habitat Monitoring Program, Year 4. Completion Report to U.S. Army Corps of Engineers, Walla Walla, Washington.
- Bennett, D.H., J.M. DuPont. 1993. Fish Habitat Associations of the Pend Oreille River, Idaho. Final Report to Idaho Department of Fish and Game, Boise.
- Bennett, D.H. 1994. Symptoms and Causes of Ecosystem Stress: Hydroelectric Power and the Columbia River System. Department of Fish and Wildlife Resources, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Bennett, D.H., T.J. Dresser, Jr., and M.A. Madsen. 1994. Evaluation of the Effects of the 1992 Test Drawdown on the Fish Community in Lower Granite and Little Goose Reservoirs, Washington. Report to U.S. Army Corps of Engineers, Walla Walla, Washington.
- Bennett, D.H., C.M. Falter, S.R. Chipps, K. Neimela, and J. Kinney. 1994. Effects of Underwater Sound Simulating the Intermediate Scale Measurement System on Fish and Zooplankton of Lake Pend Oreille, Idaho. Report, Department of Fish and Wildlife Resources, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Bennett, D.H., and J.W. Garrett. 1994. Abundance and Habitat Use of Box Canyon Reservoir, Pend Oreille River, Washington and Tributaries by Trout with Emphasis on Brown Trout. 1992-1993 Report, Department of Fish and Wildlife Resources, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Bevan, D.E., J.P. Harville, P.K. Bergman, T.C. Bjornn, J.A. Crutchfield, P.K. Klingeman, and J.W. Litchfield. 1994. Snake River Salmon Recovery Team: Final Recommendations to the National Marine Fisheries Service. National Marine Fisheries Service, Portland, Oregon.
- Bjornn, T.C., C.R. Steward, and R.R. Ringe. 1992. Steelhead Spawning and Embryo Survival in Riffles at Hayden Creek Research Station in 1989. Technical Report 92-5, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow.
- Bjornn, T.C., M.A. Bruzven, N.H. Hetrick, R.M. Keith, and W.R. Meehan. 1993. Effects of Canopy Alterations in Second-Growth Forest Riparian Zones on Bioenergetic Processes and Responses of Juvenile Salmonids to Cover in Small Southeast Alaskan Streams. Technical Report 92-7, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow.
- Bjornn, T.C., J.P. Hunt, K.R. Tolotti, P.J. Keniry, and R.R. Ringe. 1994. Migration of Adult Chinook Salmon and Steelhead Past Dams and Through Reservoirs in the Lower Snake River and Into Tributaries—1992. Report to U.S. Army Corps of Engineers, Walla Walla District; and Bonneville Power Administration, Portland, Oregon. Technical Report 94-1, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow.
- Brannon, E.L. 1993. The perpetual oversight of hatchery programs. *Fisheries Research* 18:19-27.
- Brannon, E.L. 1994. Prince William Sound pink salmon populations and human impacts. Pages 243-262 in *Proceedings of the International Symposium on Human Impact on Self-Recruiting Populations*, G. Sundnes, ed. The Royal Norwegian Society of Sciences and Letters Foundation, Trondheim, Norway.
- Brink, S.R. 1993. Relative and Temporal Abundance and Habitat Associations of Larval Fishes in Lower Granite Reservoir, Washington. 1992 Curt Berklund Undergraduate Honorarium for Self-Initiated Research, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Butterfield, B.R., B. Csuti, and J.M. Scott. 1993. Modeling vertebrate distributions for gap analysis. In *Mapping the Diversity of Nature*, R.I. Miller, ed. Chapman and Hall Ltd., London, England.
- Chang, K., J.J. Yeo, D.L. Verbyla, and Z. Li. 1993. Interfacing GIS with wildlife habitat analysis: A case study of Sitka black-tailed deer in southeast Alaska. Pages 95-104 (vol. 1) in *GIS/LIS 92 Conference*, San Jose, California.
- Chang, K., D.L. Verbyla, J.J. Yeo, and Z. Li. 1994. GIS-based program aids wildlife habitat and timber management. *GIS World* 7(1):40-43.
- Chang, K., D.L. Verbyla, and J.J. Yeo. 1994. Deer habitat analysis of two spatial scales. Pages 109-117 (vol. 1) in *GIS/LIS Conference*, Minneapolis, Minnesota.
- Collins, K., and E.L. Brannon. 1993. Deep Creek Fish Farm Effluent Study. Report to Idaho Idaho Aquaculture Association, Twin Falls and Cooperative Extension Service, University of Idaho; Aquaculture Research Institute Technical Report 93-1, University of Idaho, Moscow.
- Congleton, J.L. 1993. Introduction and overview, passage and survival of juvenile chinook salmon migrating from the Snake River Basin. In *Workshop Proceedings, American Fisheries Society Idaho Chapter and Idaho Water Resources Institute*.

Publications and Reports

- Congleton, J.L., ed. 1993. Annual Report to the Fish and Wildlife Service. Idaho Cooperative Fish and Wildlife Research Unit, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Congleton, J.L., ed. 1993. Annual Report to Cooperators 1992/1993. Idaho Cooperative Fish and Wildlife Research Unit, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Congleton, J.L., ed. 1994. Annual Report to the Fish and Wildlife Service. Idaho Cooperative Fish and Wildlife Research Unit, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Congleton, J.L., ed. 1994. Annual Report to Cooperators 1993/1994. Idaho Cooperative Fish and Wildlife Research Unit, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Connelly, J.W., R.A. Fisher, A.D. Apa, K.P. Reese, and W.L. Wakinnen. 1993. Renesting by sage grouse in southeastern Idaho. *Condor* 95:1041-1043.
- Csuti, B.A., and R.F. Noss. 1993. Habitat fragmentation. *In* An Introduction to Conservation Biology, G. Meffe, R. Carroll, eds. Sinauer Associates, Inc., Sunderland, Massachusetts.
- Csuti, B., R.C. Harmon, and D. Stoms. 1993. Mapping biodiversity for conservation planning. *ARC News* 15(1):22-23.
- Csuti, B. 1994. Gap analysis: Mapping biodiversity for conservation and management. *Endangered Species Update* 11(5):1-4.
- Damiba, T., and E.D. Ables. 1993. Promising future for an elephant population: A case study in Burkina Faso, West Africa. *Oryx* 27(2):97-103.
- Damiba, T., and E.D. Ables. 1994. Population characteristics and impacts on woody vegetation of elephants on Zazinga Game Ranch, Burkina Faso. *Pachyderm* 18:46-53.
- Dennis, B., and M.L. Taper. 1994. Density dependence in time series observations of natural populations: Estimation and testing. *Ecological Monographs* 64:205-224.
- Edelmann, F., K.P. Reese, and P. Zager. 1993. Cottonwood Turkey Ecology. Job Progress Report. Idaho Department of Fish and Game Project W-160-R-19, Boise.
- Faler, J.C., and M.C. Moffitt. 1994. Toxicity of erythromycin rations administered to juvenile spring chinook salmon. *In* Proceedings of the 44th Annual Northwest Fish Culture Conference, Spokane, Washington.
- Falter, C.M., and B. Riggers. 1993. Aquatic Community Responses to Aquatic Macrophyte Habitat Alterations in Box Canyon Reservoir, Washington. Final Report to Pend Oreille County PUD#1, Newport, Washington.
- Falter, C.M., and J.W. Carlson. 1993. Middle Snake River Productivity and Nutrient Assessment. Idaho Division of the Environment, Twin Falls.
- Falter, C.M. 1994. Watersheds and streams. Chapter 10 *in* Conservation and Management of Forests and Renewable Resources, 6th edition, McGraw-Hill Inc.
- Fischer, R.A., T. Apa, W. Wakinen, K.P. Reese, and J.W. Connelly. 1993. Nesting-area fidelity of sage grouse in southeastern Idaho. *Condor* 95:1038-1041.
- Fischer, R.A., J.H. Guidice, and J.T. Ratti. 1993. Status, General Ecology, Biodiversity, and Management of Riparian Areas in the United States. Technical Report, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.
- Fischer, R.A., K.P. Reese, and J.W. Connelly. 1994. The Effects of Prescribed Fire on the Ecology of Migratory Sage Grouse in Southeastern Idaho: An Executive Summary. Report to Idaho Department of Fish and Game, Boise.
- Guidice, J.H., and J.T. Ratti. 1994. Interior Wetlands of the United States: A Review of Wetland Status, General Ecology, Biodiversity, and Management. Technical Report WRP-SM-##, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.
- Guidice, J.H., and J.T. Ratti. 1994. Inland fresh water marshes: Strategies and techniques for biodiversity management. *In* U.S. Army Corps of Engineers Wetlands Management Manual, Technical Report WRP-SM-##, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.
- Guidice, J., and J.T. Ratti. 1994. Biodiversity and wetland management: An introduction. *In* U.S. Army Corps of Engineers Wetlands Management Manual, Technical Report WRP-SM-##, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.
- Haukenes, A.H., and C.M. Moffitt. 1994. Injections of erythromycin and oxytetracycline in adult chinook salmon challenged with *Renibacterium salmoninarum*. *In* Proceedings of the 44th Annual Northwest Fish Culture Conference, Spokane, Washington.
- Hayward, G.D., P.H. Hayward, and E.O. Garton. 1993. Ecology of Boreal Owls in the Northern Rocky Mountains, U.S.A. *Wildlife Monographs* 124, The Wildlife Society.
- Heekin, P.E. 1993. Radio-telemetry reveals secrets of mountain quail in Idaho. *Quail Unlimited Magazine* 12(2):8-11.
- Heekin, P.E., K.P. Reese, and P. Zager. 1993. Current research on mountain quail in Idaho (abstract). Page 186 *in* Quail III: National Quail Symposium, K.E. Church, T.V. Dailey, eds. Kansas Department of Wildlife and Parks, Pratt, Kansas.
- Heekin, P.E., C.A. Vogel, and K.P. Reese. 1994. Uncovering the elusive habits of mountain quail in Idaho. *Quail Unlimited Magazine* 13(3):14-16.
- Hendee, J.C., J.J. Yeo, V. LaSalle, and J. Akenson. 1993. The Taylor Ranch Wilderness Field Station in the Frank Church-River of No Return Wilderness. *In* Proceedings of the National Conference on the Economic Value of Wilderness. USDA Forest Service Southeastern Forest Experiment Station, Athens, Georgia.
- Hendee, J.C., J.J. Yeo, V. LaSalle, and J. Akenson. 1993. The University of Idaho Taylor Ranch Wilderness Field Station. Idaho Forest, Wildlife and Range Experiment Station Miscellaneous Publication 15, University of Idaho, Moscow.
- Hornocker, M.G. 1993. Wildlife Research Institute Interim Report. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.

Publications and Reports

- Hunt, J.P., and T.C. Bjornn. 1993. Assessment of Fish Abundance and Habitat in the Coeur d'Alene River. Report to Idaho Department of Fish and Game, Boise.
- Hunt, J.P., and T.C. Bjornn. 1993. Chinook salmon and steelhead migration past Snake River dams. FOCUS on Renewable Natural Resources 18:8. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Isaak, D.J., and T.C. Bjornn. 1992. Movements of Northern Squawfish Near Lower Granite Dam in the Spring of 1992. Annual Progress Report to Bonneville Power Administration, Portland, Oregon.
- Isaak, D.J., and T.C. Bjornn. 1994. Movements of Northern Squawfish in the Lower Snake River During 1993. Annual Progress Report to Bonneville Power Administration, Portland, Oregon.
- Jennings, M.D., and J.M. Scott. 1993. Building a macroscope: How well do places managed for biodiversity match reality? Renewable Resources Journal 11(2):16-20.
- Jennings, M.D. 1993. A natural terrestrial cover classification for Gap Analysis. In Integrated Ecological and Resource Inventories, H.G. Lund, ed. USDA Forest Service Publication WO-WSA-4.
- Jennings, M.D. 1993. Natural Terrestrial Cover Classification: Assumptions and Definitions. Gap Analysis Technical Bulletin 2. Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow.
- Jennings, M.D., ed. 1993. Gap Analysis Bulletin. No. 3. Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow.
- Jennings, M.D. 1993. National coordination: Putting state data together is the nexus of Gap. Gap Analysis Bulletin 3. Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow.
- Jennings, M.D., and J.M. Scott. 1993. Gap analysis: Information for conserving biodiversity. The Idaho Forester (1993):40-41. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Jones, C. 1994. Analysis of Methods for Estimating Mortality and Survival in Fisheries. 1994 Curt Berklund Undergraduate Honorarium for Self-Initiated Research, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Karl, J.W. 1994. Nest Site Characteristics of Sharp-Shinned Hawks in Idaho's Frank Church-River of No Return Wilderness. 1994 Curt Berklund Undergraduate Honorarium for Self-Initiated Research, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Kemp, W.P., and B. Dennis. 1993. Density dependence in rangeland grasshoppers (*Orthoptera: Acrididae*). Oecologia 96:1-8.
- Klontz, G.W. 1993. Producing a marketable fish. Part V. Inventory techniques. Northern Aquaculture 9(2):21-25.
- Klontz, G.W. 1993. The problem and a solution. The Fish Farm News 6(11):6-9.
- Klontz, G.W. 1993. Major noninfectious diseases and their prevention. Pages 30-34 in Proceedings of the 43rd Annual Northwest Fish Culture Conference, Wenatchee, Washington.
- Klontz, G.W., and H. Kaiser. 1993. Producing a marketable fish. FOCUS on Renewable Natural Resources 18:9. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- MacCracken, J.G., and V. Van Ballenberghe. 1993. Mass-diameter regressions for moose browse on the Copper River Delta, Alaska. Journal of Range Management 36(4):302-308.
- MacCracken, J.G., and V. Van Ballenberghe. 1993. Comparison of rumen and fecal samples to estimate moose diets. Northwest Science 67(4):256-261.
- MacCracken, J.G., V. Van Ballenberghe, and J.M. Peek. 1993. Use of aquatic plants by moose: Sodium hunger or foraging efficiency? Canadian Journal of Zoology 71(12):2345-2351.
- MacCracken, J.G., T.R. Stephenson, and V. Van Ballenberghe. 1994. Peculiar antler cast by moose on the Copper River Delta, Alaska. Alces 30:1-7.
- Maganga, S.L.S., and R.G. Wright. 1993. Food habits of blue monkeys on Mount Meru, Tanzania. Novare et Fauna 8(4):16-25.
- Master, L., and M.D. Jennings. 1993. Hexagons: A new way to display predicted distributions of vertebrate species. In Gap Analysis Technical Bulletin 3. Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow.
- Moen, C.T., D.L. Scarnecchia, and J.S. Ramsey. 1993. Paddlefish movements and habitat use in Pool 13 of the Upper Mississippi River during abnormally low stages and discharges. North American Journal of Fisheries Management.
- Musil, D.D., J.W. Connelly, and K.P. Reese. 1993. Movements, survival, and reproduction of sage grouse translocated into central Idaho. Journal of Wildlife Management 57:85-91.
- Musil, D.D., K.P. Reese, and J.W. Connelly. 1994. Nesting and summer habitat use by sage grouse translocated to central Idaho. Great Basin Naturalist 54:228-233.
- Nelson, L., Jr., and W. Baker-Nelson. 1993. Strangers in Paradise: A Visitor's Guide to Guanare, Venezuela.
- Noss, R.F., and B. Csuti. 1994. Habitat fragmentation. Pages 237-264 in Principles of Conservation Biology. G.K. Meffe, C.R. Carroll, eds. Sinauer Associates, Inc., Sunderland, Massachusetts.
- Pauley, G.R., J.M. Peek, and P. Zager. 1993. Predicting white-tailed deer habitat use in northern Idaho. Journal of Wildlife Management 57:904-913.
- Peek, J.M. 1994. The wolves are coming! The wolves are coming! Fair Chase (Summer).
- Peek, J.M. 1994. Play hooky ram. Fair Chase (Fall).
- Peery, C.A., and T.C. Bjornn. 1994. Ecological Effects of Hatchery Reared Chinook Salmon on Naturally Produced Chinook Salmon—1993. Annual Report to Idaho Department of Fish and Game, Boise.
- Ratti, J.T., and E.O. Garton. 1993. Research and experimental design. In Research and Management of Wildlife Habitats: A Techniques Manual, T.A. Bookhout, ed. The Wildlife Society, Washington, D.C.

Publications and Reports

- Reese, K.P., G.K. Landua, and A. Rocklage. 1994. Water Quality, Fish and Wildlife Characteristics of Box Canyon Reservoir, Washington; Wildlife and Riparian; Phase II; Completion Report, 1992-1993. Pend Oreille County Public Utility District, Newport, Washington.
- Roper, B.B., D.L. Scarnecchia, and T. LaMarr. 1994. The summer distribution and habitat use of chinook salmon and steelhead trout within a major basin of the South Umpqua River, Oregon. *Transactions of the American Fisheries Society* 123:298-308.
- Sankovich, P., and T.C. Bjornn. 1993. Distribution and spawning behavior of hatchery and natural adult chinook salmon released upstream of weirs in two Idaho rivers. Technical Report 92-9, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow.
- Sargeant, G.A., L.E. Eberhardt, and J.M. Peek. 1994. Thermoregulation by mule deer in arid rangelands of southcentral Washington. *Journal of Mammalogy* 75:536-544.
- Scott, J.M., B. Csuti, B. Butterfield, J.J. Ulliman, R.G. Wright, et al. 1993. Gap Analysis: A Geographic Approach to Protection of Biological Diversity. Wildlife Monographs No. 123, *Journal of Wildlife Management* 57(1) Supplement (41 pp.).
- Setter, A., and E.L. Brannon. 1994. Examination of 18S, 28S, mtDNA probes for use in distinguishing anadromous from non-anadromous sockeye salmon (*O. nerka*). In *Proceedings of Application of DNA Technology to the Management of Pacific Salmon Workshop*, National Oceanographic and Atmospheric Administration, National Marine Fisheries Service, Northwest Alaska Fisheries Center, Seattle, Washington.
- Stoms, D.M., F.W. Davis, C.B. Cogan, M.O. Painho, B.W. Duncan, J. Scepan, and J.M. Scott. 1993. Geographic analysis of California condor sighting data. *Conservation Biology* 7(1):148-159.
- Tear, T.H., J.M. Scott, P.H. Hayward, and B. Griffith. 1993. Status and prospects for success of the Endangered Species Act: A look at recovery plans. *Science* 262 (Nov. 12):976-977.
- Ulliman, M.J., K.P. Reese, J.W. Connelly, and J.H. Klott. 1993. Winter habitat ecology of Columbian sharp-tailed grouse (abstract). In *Proceedings, 1st Joint Meeting Prairie Grouse Technical Council and Western States Sage/Columbian Sharp-Tailed Grouse Workshop*, Fort Collins, Colorado.
- Ulliman, M.J., K.P. Reese, J.W. Connelly, and J.H. Klott. 1993. Winter habitat ecology of Columbian sharp-tailed grouse (abstract). In *Proceedings, 1993 Annual Meeting of the Idaho Chapter of The Wildlife Society*, Boise.
- Vales, D.J., and J.M. Peek. 1994. Estimates of the Potential Interactions Between Hunter Harvest and Wolf Predation on the Sand Creek, Idaho, and Gallatin, Montana, Elk. In *Ecological Issues on Reintroducing Wolves Into Yellowstone National Park*, R.S. Cook, ed. National Park Service Monograph Series NPS/NRYELL/NRSM-93-22.
- Vales, D.J., and J.M. Peek. 1994. Projecting the effects of wolf predation on elk and mule deer in the east front portion of the Northwest Montana Wolf Recovery Area. In *Proceedings, 2nd North American Symposium on Wolves*, Edmonton, Canada.
- Wolda, H., and B. Dennis. 1993. Density dependence tests, Are they? *Oecologia* 95:581-591.
- Wolda, H., B. Dennis, and M.L. Taper. 1994. Density dependence tests, and largely futile comments: Answers to Holyoak and Lawton (1993) and Hanski, Woiwod, and Perry (1993). *Oecologia* 98:229-234.
- Wright, R.G. 1993. Wildlife management in parks and suburbs: Alternatives to sport hunting. *Renewable Resources Journal* 11(4):18-23.
- Wright, R.G., J.G. MacCracken, and J. Hall. 1994. An ecological evaluation of proposed new conservation areas in Idaho. *Conservation Biology* 8(1):207-216.
- Wright, R.G., and S.C. Bunting. 1994. The Landscapes of Craters of the Moon National Monument: An Evaluation of Ecological Change. University of Idaho Press, Moscow.
- Yeo, J.J., J.M. Peek, W.T. Wittinger, and C.T. Kvale. 1993. Influence of rest-rotation cattle grazing on mule deer and elk habitat use in east-central Idaho. *Journal of Range Management* 46:245-250.
- Yeo, J.J. 1993. From frogs to fish, long-term monitoring lets us know what's changing. *Frankly Speaking* (Summer):10. USDA Forest Service, Salmon, Idaho.
- Yeo, J.J. 1993. Minimum tools for wilderness science. *Frankly Speaking* (Winter). USDA Forest Service, Salmon.
- Yeo, J.J. 1994. High tech provides low impact tools. *Frankly Speaking* (Winter):9. USDA Forest Service, Salmon.
- Zhang, Y., and J.L. Congleton. 1994. Detection of infectious hematopoietic necrosis (IHN) virus in rearing units for steelhead trout before and during IHN epizootics. *Journal of Aquatic Animal Health* 6(4):281-287.

Department of Forest Products

- Ananias, R.A., H.P. Steinhagen, E. Vergara, and G. Hernandez. 1994. Drying a second-growth *Nothofagus* sawnwood—Preliminary results. In *Proceedings, 4th International IUFRO Wood Drying Conference*. New Zealand Forest Research Institute, Rotorua, New Zealand.
- Beard, J.S., F.G. Wagner, F.W. Taylor, and R.D. Seale. 1993. The influence and growth characteristics on warp in southern pine lumber. *Forest Products Journal* 43(6):51-56.
- Bryan, E.L. 1994. Principle-Centered Leadership: The Key to a Healthy Forest Products Industry. 1993 Forest Products Distinguished Lectureship, Department of Forest Products, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Campbell, A.G., R. Tripepi, and R. Engebretson. 1993. Composting of pulp and paper sludge and evaluation of the compost for growth of horticultural and forest plants. Pages 179-188 in *Proceedings of the National Extension Compost Utilization Conference*, Minneapolis, Minnesota.
- Campbell, A.G., R. Tripepi, and R. Engebretson. 1993. Composting of pulp and paper sludge and use as a soil additive. In *Conference Proceedings, Pulpmill Waste Utilization in the Forest*, Edmonton, Alberta, Canada.

Publications and Reports

- Campbell, A.G., H. Huang, R.L. Folk, and R.L. Mahler. 1993. Wood ash as a liming agent and soil additive. *In* Conference Proceedings, Pulpmill Waste Utilization in the Forest, Edmonton, Alberta, Canada.
- Campbell, A.G., R.L. Folk, and R. Tripepi. 1994. Amended and composted log yard fines as a growth medium for crimson clover and red top grass. *Communications in Soil Science and Plant Analysis* 24(13&14):2439-2454.
- Gomben, P.C., and T.M. Gorman. 1993. Treatability of laminated veneer lumber (LVL) made from lodgepole pine. *Forest Products Journal* 44(2):39-41.
- Gorman, T.M., and N.D. Hesterman. 1993. Producing LVL from interior Pacific Northwest species. *In* Proceedings of the International Panel and Engineered Wood Technology Exposition. Miller Freeman, Inc., San Francisco, California.
- Gorman, T.M. 1993. Log homes and energy performance. *In* Log Home Design, Engineering, and Marketing, Conference Proceedings. Wood Use and Design Publication No. 93-1, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Gorman, T.M., ed. 1993. Log Home Design, Engineering, and Marketing, Conference Proceedings. Wood Use and Design Publication No. 93-1, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Gorman, T.M. 1993. Standards that strengthen log homes. *FOCUS on Renewable Natural Resources* 18:11. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Johnson, L.R., R.L. Mahoney, and D.L. Adams. 1993. Training in Silviculture and Ecology for Loggers in the State of Idaho. Report submitted to U.S. Department of Agriculture, Agricultural Extension Service.
- Khattabi, A., and H.P. Steinhagen. 1993. Analysis of transient nonlinear heat conduction in wood using finite-difference solutions. *Holz Roh-Werkstoff* 51(4):272-278.
- Moslemi, A.A. 1993. Inorganic-bonded composites: From sludge to siding. *Journal of Forestry* 91(11):27-29.
- Moslemi, A.A., ed. 1993. Inorganic-Bonded Wood and Fiber Composite Materials, Volume III. Forest Products Society, Madison, Wisconsin. 144 pp.
- Moslemi, A.A., columnist. 1993. Matrix. *In* Panel World. Panel World Incorporated, Montgomery, Alabama.
- Moslemi, A.A., columnist. 1994. Matrix. *In* Panel World. Panel World Incorporated, Montgomery, Alabama.
- Steele, P.H., F.G. Wagner, L. Kumar, and P.A. Araman. 1993. Influence of lumber volume maximization in hardwood sawlogs. *In* Proceedings of the Forest Industries Wood Technology Clinic, Portland, Oregon.
- Steele, P.H., F.G. Wagner, L. Kumar, and P.A. Araman. 1993. The value versus volume yield problem for live-sawn hardwood sawlogs. *Forest Products Journal* 43(9):35-40.
- Steinhagen, H.P. 1993. Energy cost and capital expense associated with artificial drying of sawnwood. Pages 63-67 *in* Proceedings (3.1), Second National Energy Congress. University of Concepción, Chile.
- Steinhagen, H.P., A. Helvez, and N.I. Mohor. 1994. Chilean lumber export update—A need for increased drying capacity. Pages 219-220 *in* Proceedings, Globalization of Wood Conference 1993, Forest Products Society, Madison, Wisconsin.
- TenWolde, A., and T.M. Gorman. 1993. An Improved Attic Humidity Model for Evaluating Ventilation Strategies in Roof Systems. USDA Forest Products Laboratory Technical Report.
- Uskoski, D.A., F. Bechtel, and T.M. Gorman. 1993. Ultrasonic stress graded veneer. *In* Proceedings of the International Panel and Engineered Wood Technology Exposition. Miller Freeman, Inc., San Francisco, California.
- Wagner, F.G., and J.O'Laughlin. 1993. Idaho's 1992 Timber Harvest. Contribution No. 708, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Wagner, F.G., and F.W. Taylor. 1993. Low lumber recovery at southern pine sawmills may be due to misshapen sawlogs. *Forest Products Journal* 43(3):53-55.
- Wagner, F.G. 1993. Look inside the log for more dollars. *FOCUS on Renewable Natural Resources* 18:10. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Wagner, F.G., T.M. Gorman, and A.D. Dickson. 1994. Directory of Idaho Wood Products Manufacturers. Miscellaneous Publication 19, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Wagner, F.G. 1994. Increased lumber value from optimum orientation of internal defects in hardwood sawlogs. *Forest Products Journal* 44(3):69-72.
- Wagner, F.G., and J.O'Laughlin. 1994. Idaho's 1993 Timber Harvest. Contribution No. 740, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Warren, M.B., F.G. Wagner, D.S. Ladd, F.W. Taylor, R.D. Seale, and C.C. Tasma. 1993. Expert system development and use in particleboard manufacture. *Forest Products Journal* 41(1):47-50.
- Wu, S.-Y., J.S. Morris, and T.M. Gorman. 1994. A simulation analysis of the effectiveness of drum-buffer-rope scheduling in furniture manufacturing. *Computers in Industrial Engineering* 26(4):757-764.
- Zeng, M., A.G. Campbell, and R.L. Mahler. 1993. Log yard fines as a soil amendment: Pot and field studies. *Communications in Soil Science and Plant Analysis* 24(15&16):2025-2041.
- Zhang, X., A.G. Campbell, and R.L. Mahler. 1993. Newsprint pulp and paper sludge as a soil additive/amendment for alfalfa and bluegrass: Greenhouse study. *Communications in Soil Science and Plant Analysis* 24(11&12):1371-1388.

Publications and Reports

Department of Forest Resources

- Adams, D.L., and L. Morelan, eds. 1993. Forest Health in the Inland West, A Symposium. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Adams, D.L. 1993. Is "New Forestry" really new? The Idaho Forester (1993):32-33. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Adams, D.L. 1994. The northern Rocky Mountain region. Pages 387-440 in Regional Silviculture of the United States, J.W. Barrett, ed. John Wiley & Sons, Inc., New York, New York.
- Bentley, W.R., C.R. Hatch, and J.C. Gordon. 1994. Impact of forest resources and forest policies on agricultural productivity and environmental quality. Pages 140-157 in Proceedings of the International Symposium on World Agricultural Resources in the 21st Century: Environmental Quality and Natural Resources Technologies.
- Blatner, K.A., C.E. Keegan, III, J. O'Laughlin, and D.L. Adams. 1994. Forest health management policy: A case study in southwestern Idaho. Pages 317-338 in Assessing Forest Ecosystem Health in the Inland West, R.N. Sampson, D.L. Adams, eds. The Haworth Press, Inc., Binghamton, New York.
- Bromley, W.A. 1993. Preplant fertilization influences stem diameter and foliar nutrition of three species of hardwood seedlings. Master of Science Professional Paper, University of Idaho.
- Brunsfeld, S.J. 1993. Botanical Footnotes. Vol. 8 in Journals of the Lewis and Clark Expedition, G.E. Moulton, ed. University of Nebraska Press.
- Brunsfeld, S.J. 1993. Jurassic forestry: Application of biotechnology to natural resources. Woodland Notes 5(3):2-3.
- Brunsfeld, S.J., P.S. Soltis, D.E. Soltis, P.A. Gadek, C.J. Quinn, D.A. Strenge, and T.A. Ranker. 1994. Phylogenetic relationships among the genera of Taxodiaceae and Cupressaceae: Evidence from rbcL sequences. Systematic Botany 19:253-262.
- Carree, Y., and C. Schnepf. 1993. Porcupine damage control. Woodland Notes 5(2):1,3.
- Carree, Y. 1994. Timberrrr! Woodland Notes 6(1):2-3.
- Carree, Y. 1994. Agroforestry and the agroforestry coalition. Woodland Notes 6(2):2,4.
- Catlin, T., R.T. Graham, and D.L. Adams. 1993. Survival and growth of containerized fall-planted conifers. In Proceedings, Interior Cedar-Hemlock-White Pine Forests: Ecology and Management, Washington State University Cooperative Extension, Pullman, Washington.
- Contor, R. 1993. A Vision for Wilderness in the National Parks. Wilderness Resource Distinguished Lectureship 12, University of Idaho Wilderness Research Center, Idaho Forest, Wildlife and Range Experiment Station, Moscow.
- Danso, A.A., and P. Morgan. 1993. Alley cropping rice (*Oryza sativa* var. *Barafita*) with cassia (*Cassia siamea*): Soil fertility and crop production. Agroforestry Systems 21:147-158.
- Danso, A.A., and P. Morgan. 1993. Alley cropping maize (*Zea mays* var. *Jeka*) with (*Cassia siamea*): Soil fertility and crop production. Agroforestry Systems 21:133-146.
- Dumroese, R.K., R.L. James, and D.L. Wenny. 1993. *Fusarium* root infection of container-grown Douglas-fir: Effect on survival and growth of outplanted seedlings and persistence of the pathogen. New Forests 7:143-9.
- Dumroese, R.K., and D.L. Wenny. 1993. Idaho's State Treasures: The Natural Histories of Idaho's State Flower, Tree and Bird. Idaho Forest, Wildlife and Range Experiment Station Contribution No. 679, University of Idaho, Moscow.
- Dumroese, R.K., and D.L. Wenny. 1993. A Guide to Seedling Selection (revision). The Research Nursery Catalog and Order Form. Idaho Forest, Wildlife and Range Experiment Station Miscellaneous Publication No. 18, University of Idaho, Moscow.
- Dumroese, R.K., R.L. James, and D.L. Wenny. 1993. Sodium metabisulfite reduces fungal inoculum in containers used for conifer nursery crops. Tree Planters' Notes 44(4):161-165.
- Dumroese, R.K., and D.L. Wenny. 1994. A Guide to Seedling Selection (revision). The Research Nursery Catalog and Order Form. Idaho Forest, Wildlife and Range Experiment Station Miscellaneous Publication No. 18. University of Idaho, Moscow.
- Dumroese, R.K. 1994. The worker protection standard: You must comply by April 15, 1994. Pages 8-10 in Forest Nursery Notes, T.D. Landis, ed. USDA Forest Service, State and Private Forestry, Pacific Northwest Region, Portland, Oregon.
- Durall, D.M., J.D. Marshall, M.D. Jones, R. Crawford, and J.M. Trappe. 1994. Morphological changes and photosynthetic allocation in aging *Hebeloma crustuliniforme* and *Laccaria bicolor* mycorrhizas of *Pinus ponderosa*. New Phytologist 127:719-724.
- Edson, J.L., and D.L. Wenny. 1993. Vegetative propagation of western larch. In Proceedings—International Symposium on Ecology and Management of Larix Forests: A Look Ahead, W.C. Schmidt, K.J. McDonald, compilers. General Technical Report, USDA Forest Service Intermountain Research Station, Ogden, Utah.
- Edson, J.L., and D.L. Wenny. 1994. Micropropagation of endangered plants of the American Interior Northwest. Botanic Gardens Micropropagation News 1(7):91-92.
- Edson, J.L., D.L. Wenny, and A.D. Leege-Brusven. 1994. Micropropagation of Pacific dogwood. HortScience 29(11):1355-1356.
- Edson, J.L., D.L. Wenny, A.D. Leege-Brusven, R.L. Everett, and D.M. Henderson. 1994. In National Proceedings, 1994 Forest and Conservation Nursery Associations, T.D. Landis, R.K. Dumroese, tech. coords. General Technical Report RM-257, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- Edson, J.L. 1994. Micropropagation of Mountain Mahogany and Mountain Big Sagebrush. Final Report to Idaho Bureau of Land Management, Boise.

Publications and Reports

- Ferguson, D.E. 1994. Advance regeneration in the Inland West: Considerations for individual tree and forest health. Pages 411-421 in *Assessing Forest Ecosystem Health in the Inland West*, R.N. Sampson, D.L. Adams, eds. The Haworth Press, Inc., Binghamton, New York.
- Fins, L., ed. 1993. Inland Empire Tree Improvement Cooperative: Seventeenth Progress Report. Inland Empire Tree Improvement Cooperative, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Fins, L., and W.J. Libby. 1994. Genetics of giant sequoia. In *Proceedings of the Symposium on Giant Sequoias: Their Place in the Ecosystem and Society*. USDA Forest Service, Technical Report PSW-GTR-151, Pacific Southwest Experiment Station.
- Fins, L., and M. Rust, eds. 1994. Inland Empire Tree Improvement Cooperative: Eighteenth Progress Report. Inland Empire Tree Improvement Cooperative, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Fins, L., and M. Rust. 1994. Thinning Douglas-fir progeny tests—A pilot project. In *Eighteenth Progress Report*. Inland Empire Tree Improvement Cooperative, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Flanagan, L.B., J.D. Marshall, and J.R. Ehleringer. 1993. Photosynthetic gas exchange and the stable isotopic composition of leaf water: Comparison of a xylem-tapping mistletoe and its host. *Plant, Cell and Environment* 16:623-631.
- Flanagan, L.B., J.R. Ehleringer, and J.D. Marshall. 1992. Differential uptake of summer precipitation among co-occurring trees and shrubs in a pinyon-juniper woodland. *Plant, Cell and Environment* 15:831-836.
- Force, J.E., G.E. Machlis, L.J. Zhang, and A. Kearney. 1993. The relationship between timber production, local historical events, and community social change: A quantitative case study. *Forest Science* 39(4):722-742.
- Force, J.E. 1994. Profiles of International Programs at U.S. Natural Resource Schools. Forestry Support Program, USDA and USAID; University of Idaho, Moscow.
- Fritz, R.S., C.M. Nichols-Orians, and S.J. Brunsfeld. 1994. Interspecific hybridization of plants and resistance to herbivores: Hypothesis, genetics, and variable responses in a diverse herbivore community. *Oecologia* 97:106-117.
- Gast, S.J., M.W. Stock, and M.M. Furniss. 1993. Physiological factors affecting attraction of *Ips pini* (Say) (Coleoptera: Scolytidae) to host odor or natural male pheromone in Idaho. *Annals, Entomological Society of America (Ecology and Population Biology)* 86(4):417-422.
- Gast, S.J., and M.W. Stock. 1994. Genetic diversity in overwintered and non-wintered *Ips Pini* (Say) (Coleoptera: Scolytidae) in Idaho. *Pan-Pacific Entomologist* 70(4):259-266.
- Graham, R.T., J.R. Tonn, and D.L. Adams. 1993. The role of silviculture in ecosystem management—A practice in transition. In *Proceedings, Interior Cedar-Hemlock-White Pine Forests: Ecology and Management*, Washington State University Cooperative Extension, Pullman, Washington.
- Grigsby, W., and J.E. Force. 1993. Forests, women, and credit in developing countries. *Journal of Forestry* 91(6):29-34.
- Hatch, C.R., and G.G. Naughton. 1994. Using industrial wood markets to sustain farm forestry: The Pakistan experience. Pages 169-177 in *Proceedings of an International Workshop on Marketing of Multipurpose Tree Products in Asia*.
- Hendee, J.C., and A. Ewart. 1993. Wilderness research: Future needs and directions. *Journal of Forestry* 91(2):18-21.
- Hendee, J.C., and D.S. Carr. 1994. U.S. National Wilderness Research Needs, Priorities, and Strategies. Report of the Society of American Foresters National Wilderness Research Needs Committee. In *Proceedings, Society of American Foresters Annual Meeting*.
- Iqbal, M., J.A. Moore, and C.R. Hatch. 1993. Estimation of crown biomass production of *Populus nigra* Italica Muench in Pakistan. *Pakistan Journal of Forestry* 42(3):118-129.
- James, R.L., R.K. Dumroese, and D.L. Wenny. 1993. Potential for practical biocontrol in forest and conservation nurseries. Pages 122-131 in *Proceedings: Combined Meeting of the Western Forest Nursery Associations*, T.D. Landis, tech. coord. General Technical Report RM-221, USDA Forest Service Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- James, R.L., R.K. Dumroese, and D.L. Wenny. 1993. Principles and potential for biocontrol of diseases in forest and conservation nurseries. Pages 122-131 in *Proceedings, Western Forest Nursery Association*, T.D. Landis, tech. coord. General Technical Report RM-221, USDA Forest Service Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- James, R.L., R.K. Dumroese, and D.L. Wenny. 1994. Fungi Carried by Adult Fungus Gnats (*Diptera: Sciaridae*) in Idaho Greenhouses. USDA Forest Service Northern Region Report 94-5, Missoula, Montana.
- Keane, R.E., P. Morgan, and J. Menakis. 1994. Landscape assessment of the decline of whitebark pine (*pinus albicaulis*) in the Bob Marshall Wilderness Complex, Montana, USA. *Northwest Science* 6(3):213-229.
- Keane, R.E., and P. Morgan. 1994. Decline of whitebark pine in the Bob Marshall Wilderness Complex of Montana, USA. Pages 245-253 in *Proceedings—International Workshop on Subalpine Stone Pines and Their Environment: The Status of Our Knowledge*, W.C. Schmidt, F. Holtmeier, compilers. USDA Forest Service, Intermountain Research Station, General Technical Report INT-GTR-309.
- Koch, L., and L. Fins. 1993. Genetic variation in wood-specific gravity from ponderosa pine in northern Idaho and western Montana. In *Seventeenth Progress Report of the Inland Empire Tree Improvement Cooperative*, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Lajtha, K., and J.D. Marshall. 1994. Sources of variation in the stable isotope composition of plants. Pages 1-21 in *Stable Isotopes in Ecology and Environmental Science*, K. Lajtha, R.H. Michener, eds. Blackwell Scientific Publications, London.

Publications and Reports

- Landis, T.D., and R.K. Dumroese, tech. coords. 1994. National Proceedings, 1994 Forest and Conservation Nursery Associations. General Technical Report RM-257, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- Lea, S.M., and P. Morgan. 1993. Resprouting response of ninebark (*Physocarpus malvaceus*) shrubs to burning and clipping. *Forest Ecology and Management* 56:199-210.
- Leege-Brusven, A.D., J.L. Edson, D.L. Wenny, and M. Hironaka. 1994. Protocols for mass micropropagation of antelope and desert bitterbrush. In National Proceedings, 1994 Forest and Conservation Nursery Associations, T.D. Landis, R.K. Dumroese, tech. coords. General Technical Report RM-257, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- Lienhard, M., ed. 1993. The Idaho Forester, A Magazine of Natural Resources. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Machlis, G.E. 1993. Social science and protected area management: The principles of partnership. *George Wright Forum* 10(1):9-20.
- Machlis, G.E. 1993. Wilderness stewardship. WEA Legend (Newsletter of the Wilderness Education Association) (Spring):4-5.
- Machlis, G.E., K. Grinde, and W.B. Bowler. 1993. We Are All Principal Responsible Parties: Future Visions of a Superfund Site. Exhibit and installation: Synthesis of art, ecology, and architecture. National Endowment for the Arts. Prichard Gallery, Moscow, June 4.
- Machlis, G.E., D.J. Forester, and J.E. McKendry. 1994. Biodiversity Gap Analysis: Critical Challenges and Solutions. Report on an Advanced Research Workshop.
- Machlis, G.E., and D.J. Forester. 1994. Social factors as driving forces: Towards interdisciplinary models of global change. Pages 20-52 in *Biodiversity, Temperate Ecosystems and Global Change*, T. Boyle, ed. Springer-Verlag, New York, New York.
- Mahoney, R.L. 1993. Silvicultural decisions III: Thinning. *Woodland Notes* 5(3):3.
- Mahoney, R.L., Y. Carree, C. Schnepf, and W.E. Schlosser, eds. 1993. *Woodland Notes*. Vol. 5 (1-2). University of Idaho Cooperative Extension System.
- Mahoney, R.L., Y. Carree, C. Schnepf, and W.E. Schlosser, eds. 1994. *Woodland Notes*. Vol. 6 (1-2). University of Idaho Cooperative Extension System.
- Mahoney, R.L. 1993. DANGER! Windthrown trees! *Woodland Notes* 5(2):3-4.
- Mahoney, R.L. 1994. Ecosystem management for private woodlands? *Woodland Notes* 6(1):1,4.
- Mahoney, R.L. 1994. Monitoring tree health on private woodlands. *Woodland Notes* 6(2):2-3.
- Mandzak, J.M., and J.A. Moore. 1994. The role of nutrition in the health of Inland Western forests. Pages 191-210 in *Assessing Forest Ecosystem Health in the Inland West*, R.N. Sampson, D.L. Adams, eds. The Haworth Press, Inc., Binghamton, New York.
- Mandzak, J.M., and J.A. Moore. 1994. The role of nutrition in the health of Inland Western forests. *Journal of Sustainable Forestry* 2:191-210.
- Marshall, J.D., T.E. Dawson, and J.R. Ehleringer. 1993. Gender-related differences in gas exchange are not related to host quality in the xylem-tapping mistletoe, *Phoradendron juniperinum* (Viscaceae). *American Journal of Botany* 80:641-645.
- Marshall, J.D., and J. Zhang. 1993. Altitudinal variation in carbon isotope discrimination by conifers. Pages 187-199 (Chapter 13) in *Stable Isotopes and Plant-Water Relations*, J.R. Ehleringer, A.E. Hall, and G.D. Farquhar, eds. Academic Press, New York, New York.
- Marshall, J.D. 1993. The concept of health: Trees, stands, and ecosystems. In *Forest Health in the Inland West*, A Symposium. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Marshall, J.D., J.R. Ehleringer, E.D. Schulze, and G.D. Farquhar. 1994. Carbon isotope composition, gas exchange, and heterotrophy in Australian mistletoes. *Functional Ecology* 8:237-241.
- McCallum, D.A., P. Morgan, J. Verner, and G.D. Hayward, eds. 1994. Conservation Assessment for the Flammulated Owl in the United States. USDA Forest Service General Technical Report, Rocky Mountain Research Station, Fort Collins, Colorado.
- McKendry, J.E., and G.E. Machlis. 1993. The role of geography in extending biodiversity gap analysis. *Applied Geography* 13:135-152.
- McKetta, C.W. 1993. Forest products: Economics of timber supply. Chapter in *Manual of Chemical Processing and Design*. Marcel Dekker, New York.
- McKetta, C.W., et al. 1993. Below Cost Timber Sales Programs: Are the Costs at Fault? Report to county commissioners of three Northeast Oregon counties, November 17, 1993.
- McKetta, C.W., et al. 1993. Current and Future Timber Sales Values on the Wallowa-Whitman National Forest. Report to county commissioners of three Northeast Oregon counties, November 17, 1993.
- McKetta, C.W., et al. 1993. The Linkage Between Wallowa-Whitman National Forest Harvest Levels and Regional Timber Availability—A Scenario Basis for Impact Analysis. Report to county commissioners of three Northeast Oregon counties, November 17, 1993.
- McKetta, C.W. 1993. A Regression-Based Transactions Evidence Appraisal Model for Timber Valuation on the Payette National Forest, Report. (June).
- McKetta, C.W., K.A. Blatner, R.T. Graham, J.R. Erickson, and S.S. Hamilton. 1994. Human dimensions of forest health choices. Pages 135-152 in *Assessing Forest Ecosystem Health in the Inland West*, R.N. Sampson, D.L. Adams, eds. The Haworth Press, Inc., Binghamton, New York.
- McKetta, C.W. 1994. Socio-Economic Implications of a Below-Cost Timber Program on the Wallowa-Whitman National Forest. Report to county commissioners of three Northeast Oregon counties (February 1994).

Publications and Reports

- McKetta, C.W. 1994. Economic outlook for 1994: Forest products. Idaho Farmer (January).
- McKetta, C.W. 1994. Economic outlook for 1994: Forest products. Pacific Farmer (January).
- McKetta, C.W. 1994. Economic outlook for 1994: Forest products. Inland Farmer (January).
- Mika, P.G., J.A. Moore, and T.M. Shaw. 1993. Technical Documentation Report. Intermountain Forest Tree Nutrition Cooperative, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Mika, P.G., J.A. Moore, and T.M. Shaw. 1994. Technical Documentation Report. Intermountain Forest Tree Nutrition Cooperative, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Mitchell, M.Y., J.E. Force, M.S. Carroll, and W.J. McLaughlin. 1993. Forest places of the heart: Incorporating special places into public land management. *Journal of Forestry* 91(4):32-37.
- Moore, J.A., L. Zhang, and J.D. Newberry. 1993. Effects of nitrogen fertilization treatments on within-stand relative size/growth relationships. Pages 77-87 in *Modelling Stand Response to Silvicultural Practices*, Proceedings of IUFRO 4.01 Conference, H.E. Burkhart, T.G. Gregoire, J.L. Smith, eds. VPI & SU, Blackburg, Virginia.
- Moore, J.A., P.G. Mika, and T.M. Shaw, eds. 1993. Thirteenth Annual Report. Intermountain Forest Tree Nutrition Cooperative, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Moore, J.A., P.G. Mika, and T.M. Shaw, eds. 1994. Fourteenth Annual Report. Intermountain Forest Tree Nutrition Cooperative, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Moore, J.A. 1993. Healthy forests need a good DIET. *Woodland Notes* 5(2):2,4.
- Moore, J.A. 1993. The tree nutrition cooperative. *FOCUS on Renewable Natural Resources* 18:6. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Moore, J.A., A. Zhang, and J.D. Newberry. 1994. Effects of intermediate silvicultural treatments on the distribution of within-stand growth. *Canadian Journal of Forest Research* 24:398-404.
- Morgan, P. 1993. Shape and Extent Influence Landscape Metrics. Report to Oak Ridge National Laboratory, Oak Ridge, Tennessee.
- Morgan, P., G.H. Aplet, J.B. Haufler, H.C. Humphries, M.M. Moore, and W.D. Wilson. 1994. Historical range of variability: A useful tool for evaluating ecosystem change. *Journal of Sustainable Forestry* 2:87-111.
- Morgan, P., G.H. Aplet, J.B. Haufler, H.C. Humphries, M.M. Moore, and W.D. Wilson. 1994. Historical range of variability: A useful tool for evaluating ecosystem change. Pages 87-112 in *Assessing Forest Ecosystem Health in the Inland West*, R.N. Sampson, D.L. Adams, eds. The Haworth Press, Inc., Binghamton, New York.
- Morgan, P. 1994. Dynamics of Ponderosa and Jeffrey pine forests. Pages 47-73 (Chapter 3) in *Flammulated, Boreal, and Great Gray Owls in the United States: A Technical Conservation Assessment*, G.D. Hayward, J. Verner, tech. eds. General Technical Report RM-253, USDA Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado.
- Morgan, P., S.C. Bunting, R.E. Keane, and S.F. Arno. 1994. Fire ecology of whitebark pine forests of the northern Rocky Mountains, U.S.A. Pages 136-141 in *Proceedings, International Workshop on Subalpine Stone Pines and Their Environment: The Status of Our Knowledge*. General Technical Report INT-GTR-309, USDA Forest Service, Intermountain Research Station.
- Nayital, R.K., D.L. Wenny, and K.S. Verma. 1993. Germination of western larch seed surface sterilized with bleach. *Indian Journal of Forestry* 16(4):319-322.
- Newberry, J.D., J.A. Moore, and L. Zhang. 1993. Evaluation of simple quantile estimation functions for modeling forest diameter distributions. *Canadian Journal of Forest Research* 23:2376-2382.
- Omer, R.M., S.A. Khan, and C.R. Hatch. 1993. Private farm nurseries in Punjab and NWFP. *Pakistan Journal of Forestry* 42(4):180-190.
- Omer, R.M., S.A. Khan, and C.R. Hatch. 1993. A Study of Farm Nurseries in Punjab and NWFP. Forestry Planning and Development Project, Research Report No. 5.
- Omi, S.K., K.L. Eggleston, J.D. Marshall, and D.L. Wenny. 1993. Primary vs. secondary needle development in lodgepole pine: Update on current investigations from Coeur d'Alene nursery. Pages 35-42 in *Proceedings, 12th Annual Meeting of the Forest Nursery Association of British Columbia*, Penticton, British Columbia, Canada.
- Partridge, A.D., and C.L. Bertagnolli. 1993. Defect Estimators of Standing Timber. USDA Forest Service Technical Publication.
- Patterson, M., and R.L. Mahoney. 1993. Environmental Education Software and Multimedia Sourcebook. University of Idaho Cooperative Extension Service Publication No. 161.
- Reffalt, W. 1994. A Vision for Wilderness in the National Wildlife Refuge System. Wilderness Resource Distinguished Lectureship 13, UI Wilderness Research Center, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Sampson, R.N., and D.L. Adams. 1994. *Assessing Forest Ecosystem Health in the Inland West*. The Haworth Press, Inc., Binghamton, New York.
- Sampson, R.N., D.L. Adams, S. Hamilton, S.P. Mealey, R. Steele, and D. Van De Graaff. 1994. Assessing forest ecosystem health in the Inland West. *American Forests* (March/April):13-16.
- Sampson, R.N., and D.L. Adams, eds. 1994. *Assessing forest ecosystem health in the Inland West*. *Journal of Sustainable Forestry* 2(1-4).
- Schierenbeck, K.A., and J.D. Marshall. 1993. Seasonal and diurnal patterns of photosynthetic gas exchange for a native (*Lonicera sempervirens* L.) and an exotic (*L. japonica* Thunb.) woody vine. *American Journal of Botany* 80:1292-1299.
- Sheikh, M.I., and C.R. Hatch. 1993. Expected Returns From Farm-Grown Trees. Forestry and Planning Development Project, Forester Field Guide No. 4.

Publications and Reports

- Stock, M.W., G.D. Amman, and B.J. Bentz. 1993. Isozyme studies of bark beetle population genetics and systematics. Pages 7-9 in USDA Forest Service General Technical Report PSW-138.
- Stock, M.W. 1993. The first wave. Women in Natural Resources 15(1):33-34.
- Stock, M.W., ed. 1993. AI Applications. Vol. 7.
- Stock, M.W., ed. 1994. AI Applications. Vol. 8.
- Townsend, L., D.L. Adams, and B. Wight. 1993. The windbreak suitability group system of the United States: A case study analysis. In Proceedings, Society of American Foresters National Convention, Indianapolis, Indiana.
- Unger, D.R., and D.L. Verbyla. 1993. Use of Landsat Thematic Mapper Thermal Infrared Data to Delineate Climatic Zones within Idaho GAP Analysis Forested Polygons. Internal Report, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Valdes, M.C., C.T. Stiff, and T.V. Dechert. 1993. Site quality evaluation and yield of *Pinus oocarpa* in Honduran Central Zone. In Proceedings of the 2nd International Symposium on Forest Soils, Cuidad Guayana, Venezuela.
- Van Den Belt, R., C.R. Hatch, C. Stastny, J. Raintree, S. Ghosh, N.C. Saxena, and D. Garrity. 1994. Farm forestry comes of age—The emerging trend in Asia. Farm Forestry News 6(2):1,4-7.
- Verbyla, D.L., and D.R. Unger. 1993. Space age forest climate mapping. FOCUS on Renewable Natural Resources 18:7. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Walker, D., and L. Fins. 1994. A survey of private non-industrial forest nurseries and seed dealers on practices that may affect gene pools of forest planting stock. In Eighteenth Progress Report. Inland Empire Tree Improvement Cooperative, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Wenny, D.L. 1993. Calculating filled and empty cells based on number of seeds sown per cell: A microcomputer application. Tree Planters' Notes 44(2):49-52.
- Wenny, D.L. (ed.) 1993. Forest Nursery Update Number 7. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Wenny, D.L. (ed.) 1994. Forest Nursery Update Number 8. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Wenny, D.L., and L. Geer. 1994. Microcomputer order processing and inventory control. In National Proceedings, 1994 Forest and Conservation Nursery Associations, T.D. Landis, R.K. Dumroese, tech. coords. General Technical Report RM-257, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- Whiteman, M.R., J.E. Force, and W.J. McLaughlin. 1992. Is successful mediation likely?—An analysis of situational factors. Page 128 in Book of Abstracts, The Fourth North American Symposium on Society and Natural Resource Management, University of Wisconsin-Madison.
- Worf, W.A. 1992. A Vision for Wildernesses in the National Forests. Wilderness Resource Distinguished Lectureship 11, UI Wilderness Research Center, Idaho Forest, Wildlife and Range Experiment Station, Moscow.
- Zack, A.C., and P. Morgan. 1993. Early succession on hemlock habitat types in northern Idaho. In Symposium Proceedings, Interior Cedar-Hemlock-White Pine Forests: Ecology and Management, Washington State University Cooperative Extension, Pullman, Washington.
- Zhang, J., J.D. Marshall, and B.C. Jaquish. 1993. Genetic differentiation in carbon isotope discrimination and gas exchange in *Pseudotsuga menziesii*: A common garden experiment. Oecologia 93:80-87.
- Zhang, L., J.A. Moore, and J.D. Newberry. 1993. Estimating asymptotic attributes of forest stands based on bio-mathematical rationales. Ecological Applications 3(4):743-748.
- Zhang, L., J.A. Moore, and J.D. Newberry. 1993. A whole-stand growth and yield model for interior Douglas-fir. Western Journal of Applied Forestry 8(4):120-125.
- Zhang, L., J.A. Moore, and J.D. Newberry. 1993. Disaggregating stand volume growth to individual trees. Forest Science 39:295-308.
- Zhang, J., and L. Fins. 1993. Variation in shoot growth components among western larch families. Canadian Journal of Forest Research 23(8):1520-1527.
- Zhang, J., and J.D. Marshall. 1994. Population differences in water-use efficiency of well-watered and water-stressed western larch seedlings. Canadian Journal of Forest Research 24:92-99.
- Zhang, J., L. Fins, and J.D. Marshall. 1994. Stable carbon isotope discrimination, photosynthetic gas exchange, and growth differences among western larch families. Tree Physiology 14:531-540.
- Zhang, J.W., L. Fins, and J.D. Marshall. 1994. Genetic differences in physiology and morphology among western larch families. In Symposium on Ecology and Management of Larix Forests: A Look Ahead, W.C. Schmidt, K.J. McDonald, compilers. General Technical Report, USDA Forest Service Intermountain Research Station, Ogden, Utah.

Department of Range Resources

- Ahmed, K., and J.H. Ehrenreich. 1994. Potential use of black locust (*Robinia pseudoacacia*) in silvopastoral systems in Azad Kashmir. Pages 9-12 in Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference.
- Baig, M., and J.H. Ehrenreich. 1993. Promoting agroforestry through agriculture extension: A Pakistan example (abstract). Page 12 in Third North American Conference.
- Baig, M., and J.H. Ehrenreich. 1993. Possibilities, potentials, and limitations of agroforestry problem soils of Pakistan (abstract). Page 50 in Third North American Agroforestry Conference.

Publications and Reports

- Baig, M., and J.H. Ehrenreich. 1994. Possibilities, potentials, and limitations of agroforestry problem soils of Pakistan. Pages 409-410 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- Baig, M., and J.H. Ehrenreich. 1994. Promoting agroforestry through extension: A Pakistan example. Pages 283-287 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- Crane, K.J., J.C. Mosley, and J.L. Kingery. 1993. Influence of prescribed sheep grazing on deer and elk winter forage (abstract). In *Proceedings, 46th Annual Meeting of the Society for Range Management*.
- Darby, N.W., J.C. Mosley, G.A. Bohach, and B.B. Davitt. 1993. Fecal bacterial ratios for quantifying riparian utilization by sympatric ungulates (abstract). In *Proceedings, 46th Annual Meeting of the Society for Range Management*.
- Darby, N.W., J.C. Mosley, and G.A. Bohach. 1994. Using the polymerase chain reaction to assess water pollution from elk and cattle (abstract). In *Proceedings, 47th Annual Meeting of the Society for Range Management*.
- Ehrenreich, J.H. 1993. Forest Sector Development for Punjab and Capital Territory, Pakistan. World Bank Publication, Misc. Series.
- Ehrenreich, J.H. 1993. Farm Forestry in Punjab, Pakistan. World Bank Publication, Misc. Series.
- Ehrenreich, J.H. 1993. Irrigated Forest Plantations in Punjab, Pakistan. World Bank Publication, Misc. Series.
- Ehrenreich, J.H., and J. Wyant. 1993. Social Range and Scrub Forest Management in Punjab, Pakistan. World Bank Publication, Misc. Series.
- Ehrenreich, J.H., and M. Ashraf. 1993. Forest Policy and Legislation in Punjab, Pakistan. World Bank Publication, Misc. Series.
- Ehrenreich, J.H. 1993. Forest Products, Markets and Prices in Punjab, Pakistan. World Bank Publication, Misc. Series.
- Ehrenreich, J.H. 1993. Forestry Research and Training in Punjab, Pakistan. World Bank Publication, Misc. Series.
- Ehrenreich, J.H. 1993. Natural resource science degree offered at University College of Cariboo: First of its kind in the world. *Beef in British Columbia* 6(6):24-26.
- Ehrenreich, J.H. 1993. New program designed to address forestry issues. *University College of the Cariboo Network* 2(1):1-2.
- Ehrenreich, J.H., G. Keerio, and G. Khan. 1993. Opportunities and problems in agroforestry: Comparison between developed and less developed countries (abstract). Page 19 in *Third North American Agroforestry Conference*.
- Ehrenreich, J.H., G. Keerio, and G. Khan. 1994. Opportunities and problems in agroforestry: A comparison between developed and less developed countries. Pages 317-318 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- Gibson, C., K.D. Sanders, J.C. Mosley, and N. Rimbey. 1993. Planning range use following drought. University of Idaho Cooperative Extension System, Owyhee County.
- Iqbal, Q., and J.H. Ehrenreich. 1993. Strategies to improve social forestry in Sindh, Pakistan (abstract). Page 45 in *Third North American Agroforestry Conference*.
- Ishfaq, A., and J.H. Ehrenreich. 1993. Potential use of black locust (*Robina pseudoacacia*) in silvopastoral systems, Azad Kashmir, Pakistan (abstract). Page 30 in *Third North American Agroforestry Conference*.
- Jirik, S.J., and S.C. Bunting. 1994. Post-fire defoliation response of *Agropyron spicatum* and *Sitanion hystrix*. *International Journal of Wildland Fire* 4:77-82.
- Junttila, O., and R. Robberecht. 1993. The influence of season and phenology on freezing tolerance in *Silene acaulis* L., a subarctic and arctic cushion plant of circumpolar distribution. *Annals of Botany*.
- Kaleemullah, M., and J.H. Ehrenreich. 1993. Prospects of GIS in agroforestry (abstract). Page 36 in *Third North American Agroforestry Conference*.
- Keerio, G., and J.H. Ehrenreich. 1993. *Acacia nilotica* Hurry plantation agroforestry system: Effect on some physical and chemical properties (abstract). Page 17 in *Third North American Agroforestry Conference*.
- Keerio, G., and J.H. Ehrenreich. 1993. Soil fertility dynamics and crop performance after harvesting *Acacia nilotica* Hurry Agroforestry System without fertilization (abstract). Page 48 in *Third North American Agroforestry Conference*.
- Keerio, G., J.H. Ehrenreich, and R.J. Mahler. 1994. Soil fertility dynamics and crop performance after harvesting *Acacia nilotica* Hurry Agroforestry System without fertilization. Pages 215-220 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- Keerio, G., and J.H. Ehrenreich. 1993. *Acacia nilotica* Hurry plantations. Pages 203-214 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- Khan, G., and J.H. Ehrenreich. 1993. Economics of agroforestry in cultivated fields of Punjab, Pakistan (abstract). Page 47 in *Third North American Agroforestry Conference*.
- Khan, G., and J.H. Ehrenreich. 1993. Cotton yield affected by Shisham (*Dalbergia sissoo*) (abstract). Page 8 in *Third North American Agroforestry Conference*.
- Khan, G., and J.H. Ehrenreich. 1993. Agroforestry as a watershed management tool (abstract). Page 26 in *Third North American Agroforestry Conference*.
- Khan, G., and J.H. Ehrenreich. 1994. Cotton yield as affected by Shisham (*Dalbergia sissoo*). Pages 49-50 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.

Publications and Reports

- Khan, G., and J.H. Ehrenreich. 1994. Economics of agroforestry in cultivated fields of Punjab, Pakistan. Pages 361-365 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- Khan, G., and J.H. Ehrenreich. 1994. Effect of increasing distance from *Acacia nilotica* trees on wheat yield. *Journal of Agroforestry Systems* 25:23-29.
- Khan, G., and J.H. Ehrenreich. 1994. Agroforestry as a watershed management tool. Pages 43-48 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- Khan, G., and J.H. Ehrenreich. 1993. Wheat production as affected by *Shisham*. *Women in Natural Resources* 14(2):14-18.
- Khan, G., and J.H. Ehrenreich. 1993. Some thoughts on the problem of fuelwood in Punjab, Pakistan. *The Idaho Forester* (1993):60-63. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Lance, T.A., J.C. Mosley, J.W. Walker, D.E. Lucas, and C.M. Falter. 1993. Influence of herbage mass on nutrient export from a riparian meadow (Abstract). In *Proceedings, 46th Annual Meeting of the Society for Range Management*.
- Malik, B., and J.H. Ehrenreich. 1993. Fuelwood scarcity in Pakistan (abstract). Page 58 in *Third North American Agroforestry Conference*.
- Malik, B., J.H. Ehrenreich, and M. Amjad. 1993. Wood production through agroforestry on farmlands of Punjab, Pakistan (abstract). Page 18 in *Third North American Agroforestry Conference*.
- Malik, B., J.H. Ehrenreich, and M. Amjad. 1994. Wood production through agroforestry on farmlands of Punjab, Pakistan. Pages 233-238 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- Malik, B., and J.H. Ehrenreich. 1994. Fuelwood scarcity situation in Pakistan: An overview. Pages 427-432 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- McCoy, S.D., J.C. Mosley, and J.L. Kingery. 1992. Influence of grazing intensity on sheep grazing within conifer plantations (abstract). In *Proceedings, 46th Annual Meeting of the Society for Range Management*.
- Mosley, J.C. 1993. Is conservation an endangered philosophy? *Journal of Extension* 31:29-30.
- Mosley, J.C., K.D. Sanders, and M.V. Spaulding. 1993. Can crested wheatgrass survive prolonged drought? *FOCUS on Renewable Natural Resources* 18:4. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Mosley, J.C., T.A. Lance, J.W. Walker, D.E. Lucas, and C.M. Falter. 1993. How does grazing affect water quality? *FOCUS on Renewable Natural Resources* 18:5. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Mosley, J.C. 1994. BMPs for livestock grazing in riparian areas: What are the facts? (abstract). In *Proceedings, Water Quality 2000 Conference*.
- Mosley, J.C. 1994. Prescribed sheep grazing to enhance wildlife habitat on North American rangelands. *Sheep Research Journal* (Special Issue):79-91.
- Mouille, J., and J.H. Ehrenreich. 1993. The KITMO and agroforestry development in the Congo. *Agroforestry Today* 8(1):24-26.
- Mouille, J., and J.H. Ehrenreich. 1993. Agrisilvicultural development and potential in Mvoute District, the Congo (abstract). Page 46 in *Third North American Agroforestry Conference*.
- Mouille, J., and J.H. Ehrenreich. 1994. Effects of *Eucalyptus tereticornis* in coastal plains of the Congo. *African Journal of Ecology*.
- Muhammed, T., and J.H. Ehrenreich. 1993. Scope of agroforestry research and development in Pakistan (abstract). Page 46 in *Third North American Agroforestry Conference*.
- Muhammed, T., and J.H. Ehrenreich. 1994. Scope of agroforestry research and development in Pakistan. Pages 377-380 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- Murray, M.P., S.C. Bunting, and P. Morgan. 1993. Fire history and whitebark pine relationships within a small roadless area, northern Rocky Mountains, USA. In *Proceedings, Symposium on International Wilderness Allocation, Management and Research, 5th World Congress*. WILD Foundation and University of Idaho Wilderness Research Center.
- Olsen, S., and J.H. Ehrenreich. 1993. Characteristics and use of live fences in West Africa: Possibilities for use in North America (abstract). Page 33 in *Third North American Agroforestry Conference*.
- Olsen, S., and J.H. Ehrenreich. 1994. Characteristics and use of live fences in West Africa: Possibilities for use in North America. Pages 83-88 in *Opportunities for Agroforestry in the Temperate Zone Worldwide: Proceedings of the Third North American Agroforestry Conference*.
- Pellant, M., J.C. Mosley, and L. Wessman. 1994. Use of the dry weight rank procedure to determine ecological status on Idaho rangelands (abstract). In *Proceedings, 47th Annual Meeting of the Society for Range Management*.
- Peters, E.F., and S.C. Bunting. 1994. Fire conditions pre- and post-occurrence of annual grasses. *Symposium Proceedings: Ecology, Management and Restoration of Intermountain Annual Grasslands*. USDA Forest Service Technical Report INT-GTR-313 (pp. 31-36).
- Sanders, K.D. 1993. Fall seeding of grasses. *Extension FOCUS, District Extension Newsletter* (October).
- Sanders, K.D., S.C. Bunting, and R.G. Wright. 1993. Use of geographic information system in preparing grazing management plans (abstract). In *Proceedings, 46th Annual Meeting of the Society for Range Management*.
- Sanders, K.D. 1993. The Idaho Section 8 process. *Idaho Line Rider*. Idaho Cattle Association, Boise.
- Sanders, K.D. 1993. The Idaho Section 8 process. *Idaho Wool Growers Association Newsletter*.

Publications and Reports

- Sanders, K.D. 1993. Draft Grazing Management Plan, City of Rocks National Reserve. Idaho Forest, Wildlife and Range Experiment Station Report, University of Idaho, Moscow.
- Sanders, K.D. 1994. Can annual rangelands be converted and maintained as perennial grasslands through grazing management? *In* Symposium on Ecology, Management, and Restoration of Intermountain Annual Rangelands. Intermountain Forest and Range Experiment Station Publication, Ogden, Utah.
- Sanders, K.D. 1994. Managing for drought. Idaho Line Rider. Idaho Cattle Association, Boise.
- Sharp, L.A., K.D. Sanders, and N. Rimbey. 1994. Management decisions based on utilization—Is it really management? *Rangelands* 16(1):38-40.
- Spaulding, M.V., J.C. Mosley, and K.D. Sanders. 1993. Factors influencing crested wheatgrass mortality in southern Idaho (abstract). *In* Proceedings, 46th Annual Meeting of the Society for Range Management.
- ### Department of Resource Recreation and Tourism
- Alamilla, L., L. Furlan, R. Movich, S. Bales, T. Heath, K. McGuire, A. Black, A. Hoare, and W.J. McLaughlin, et al. 1994. Results from Ecosystem Management Workshop, Inland Empire Society of American Foresters 1994 Annual Meeting. Department of Resource Recreation and Tourism, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Cerkel, M. 1993. The Potential for Conflict Between Mountain Bikers and Hikers Using the Trail System of Mount Tamalpais Watershed, California. 1993 Curt Berklund Undergraduate Honorarium for Self-Initiated Research, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Fazio, J.R., ed. 1993. Trees for Fuelwood: A Step Toward Energy Diversity. The National Arbor Day Foundation, Lincoln, Nebraska.
- Fazio, J.R. 1993. World of Trees. *In* Arbor Day. The National Arbor Day Foundation, Lincoln, Nebraska.
- Fazio, J.R., ed. 1993. Tree City USA Bulletin. The National Arbor Day Foundation, Lincoln, Nebraska.
- Fazio, J.R. 1994. World of Trees. *In* Arbor Day. The National Arbor Day Foundation, Lincoln, Nebraska.
- Fazio, J.R., ed. 1994. Tree City USA Bulletin. The National Arbor Day Foundation, Lincoln, Nebraska.
- Ham, S.H., and R.A. Meganck. 1993. The transferability of U.S. environmental education programs in rural Central America. *La Educación* 115(2):289-301.
- Ham, S.H., D.S. Sutherland, and R.A. Meganck. 1993. Applying environmental interpretation in protected areas in developing countries. *Environmental Conservation* 20(3):232-242.
- Ham, S.H., and R.A. Meganck. 1993. Taking environmental interpretation to developing countries—Crossing borders and rethinking a craft. Pages 121-124 *in* Proceedings of the National Association of Interpretation Conference.
- Ham, S.H., and R.A. Meganck. 1994. Environmental interpretation in developing countries: Crossing borders and rethinking a craft. *Legacy* 5(1):18-22.
- Ham, S.H., and R.A. Meganck. 1994. Crossing boundaries: Interpretation in lesser developed countries. *British Journal of Environmental Interpretation* 9(2):10-13.
- Harris, C.C., and G. Brown. 1993. Implications of workforce diversification for the U.S. Forest Service. *Administration and Society* 25(1):85-113.
- Harris, C.C., G. Brown, and J. O'Laughlin. 1993. Allowable Sale Quantity (ASQ) as a focal point for national forest planning. *Natural Resources Journal* 33(3):569-594.
- Harris, C.C., W.J. McLaughlin, and J.D. Hunt. 1994. Method for estimating total statewide travel based on enroute travel survey. *Annals of Tourism Research* 21(4).
- Hunt, J.D. 1993. The opportunities and challenges of outdoor recreation and tourism. *In* Proceedings, Annual Conference of the Association of Conservation Engineers.
- Hunt, J.D. 1993. The promises and challenges of sustainable tourism. *In* Proceedings, Montana Governor's Conference on Tourism.
- Hunt, J.D. 1993. Toward the 21st century: Moving beyond tourism marketing. *In* Proceedings, 3rd Annual North American Tourism Marketing Conference.
- Hunt, J.D. 1993. The promises and challenges of tourism for Wyoming. *In* Proceedings, Wyoming Governor's Conference on Tourism.
- Hunt, J.D., N. Sanyal, J. Vlaming, and S.R. Leidner. 1994. 1993 Nonresident Motor Vehicle Travel in Idaho. Final report to Idaho Department of Commerce, et al. Department of Resource Recreation and Tourism, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Hunt, J.D. 1994. The promises and challenges of nature tourism. *In* Proceedings, South Carolina Conference on Nature-Based Tourism.
- Hunt, J.D., N. Sanyal, J. Vlaming, and S.R. Leidner. 1994. 1994 Nonresident Commercial Air Travel. Report to Idaho Department of Commerce, et al. Department of Resource Recreation and Tourism, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Kim, Y., and W.J. McLaughlin. 1994. The attitudes and values of the Korean Forestry Administration toward resource management and environmental paradigms: Do they differ from the U.S. Forest Service? Page 168 *in* Proceedings, IUFRO Interim Meeting and Excursion in South Korea and China-Taipei, S.-I. Kim, ed.
- McLaughlin, W.J., N. Sanyal, and K.L. McCoy. 1993. Idaho County Vision 2000: Draft Vision Statements and Potential Actions. Idaho County Economic Vision Task Force and Department of Resource Recreation and Tourism, University of Idaho, Moscow.
- McLaughlin, W.J., N. Sanyal, and J.D. Hunt, compilers. 1993. Regional Caucus Results: 1993 Idaho Governor's Conference on Outdoor Recreation and Tourism. Idaho Department of Commerce, Boise.

Publications and Reports

- McLaughlin, W.J., and N. Sanyal. 1994. Venture 20 "Identifying Common Ground" Facilitated Workshop Outputs. Report to Interagency Leadership Review Team (U.S. Forest Service, Idaho Department of Fish and Game, Nez Perce Nation), Idaho Department of Fish and Game, Lewiston.
- McLaughlin, W.J., N. Sanyal, and K.R. Steinhorst. 1994. Payette River Basin Interagency Recreation and Tourism Study: Draft Questionnaires, Sampling Strategy, and Data Analysis Plan. Payette River Basin Interagency Recreation and Tourism Technical Committee; Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Medlin, N.C., and S.H. Ham. 1993. Evaluating interpretation: Research methods for non-social scientists. National Association for Interpretation, Santa Clara, California.
- Merrill, T., and W.J. McLaughlin. 1993. Evaluation of Selected South Fork of the Snake River Corridor Recreational Studies (1983-93). Report for Task 1: Data Review. Idaho Department of Parks and Recreation, Idaho Department of Water Resources, Boise.
- O'Connor, J.C. 1993. Monitoring Visitor Responses to the Morrison Knudsen Nature Center, Boise. 1993 Curt Berklund Undergraduate Honorarium for Self-Initiated Research, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Perin, S., W.J. McLaughlin, and L. Grussing. 1993. The 1992 Riggins Area Visitor Information Study. Contribution No. 709, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Sanyal, N., and W.J. McLaughlin. 1993. The link between hunting goals and strategy and harvest outcome. *Leisure Sciences* 15:189-204.
- Sanyal, N., ed. 1993. A Methodology to Conduct an Idaho Rural Tourism Development Planning Process. Phase One: Recreation and Tourism Services and Attractions in Idaho —An Inventory. Department of Resource Recreation and Tourism, University of Idaho, Moscow.
- Sanyal, N. 1993. People projects in Idaho. *FOCUS on Renewable Natural Resources* 18:13. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Sanyal, N., and W.J. McLaughlin. 1994. Market Segmentation, Satisfaction and Activity Persistence of Idaho Anglers. Report to Idaho Department of Fish and Game, Boise.
- Sanyal, N., and W.J. McLaughlin. 1994. Angling and Gender Bias in Idaho: An Examination of the Factors for Lower Participation by Women in Fishing and a Proposal for Future Research. Report to Idaho Department of Fish and Game, Boise.
- Vlaming, J., D. Netherton, N. Sanyal, and J.D. Hunt. 1994. Nonresident Motor Vehicle Travel in Idaho: Highway Rest Areas 1993. Department of Resource Recreation and Tourism, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow.
- Whiteman, M., and S.H. Ham. 1993. Interim Progress Report of the ROCAP M.S. Program in Environmental Education. Report to U.S. Agency of International Development, Regional Office of Central American Programs, Guatemala.
- Whiteman, M., and S.H. Ham. 1994. Environmental Education for Bolivian Rural Educators. Final report to Development Associates, Inc., Washington, D.C., and U.S. Agency for International Development, La Paz, Bolivia.

Policy Analysis Group (PAG)

- Belt, G.H., and J. O'Laughlin. 1993. Buffer strip design for protecting water quality and fish habitat (technical commentary). *Western Journal of Applied Forestry* 9(2): 41-45.
- Cabbage, F.W., J. O'Laughlin, and C.S. Bullock, III. 1993. Forest Resource Policy. John Wiley & Sons, New York, New York. 562 pp.
- Hendee, J.C., and J. O'Laughlin. 1993. Program Review of Idaho Forest, Wildlife and Range Policy Analysis Group. Contribution No. 672, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Hendee, J.C., and J. O'Laughlin. 1993. PAG Client Evaluation Survey Questionnaire and Results: Phase III, Program Review of Idaho Forest, Wildlife and Range Policy Analysis Group. Contribution No. 673, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- MacCracken, J.G., J. O'Laughlin, and T. Merrill. 1993. Idaho Roadless Areas and Wilderness Proposals. PAG Report No. 10. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- MacCracken, J.G., D. Goble, and J. O'Laughlin. 1994. Grizzly Bear Recovery in Idaho. PAG Report No. 12. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- Merrill, T., and J. O'Laughlin. 1993. Analysis of Methods for Determining Minimum Instream Flows for Recreation. PAG Report No. 9. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- O'Laughlin, J. 1993. Exploring the definition of forest health. Pages 9-14 in *Symposium Proceedings, Forest Health in the Inland West*. USDA Forest Service and Department of Forest Resources, University of Idaho.
- O'Laughlin, J. 1993. Guest opinion: Analyzing Idaho's resources. *Idaho Council on Industry and the Environment* (Fall): 2.
- O'Laughlin, J. 1993. Federal constraints on forestry--Current and future. *Inland Empire Society of American Foresters Annual Meeting, Post Falls*. Contribution No. 678, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- O'Laughlin, J. 1993. Determining Timber Harvest Levels on National Forests in the Inland Northwest: Past, Present, and Future. Contribution No. 705, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- O'Laughlin, J. 1993. Good policy needs good information—The PAG provides it. *FOCUS on Renewable Natural Resources* 18:1-3. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.

Publications and Reports

- O'Laughlin, J., J.G. MacCracken, D.L. Adams, S.C. Bunting, K.A. Blatner, and C.E. Keegan, III. 1994. Forest Health Conditions in Idaho. PAG Report No. 11. Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- O'Laughlin, J. 1994. The Politics Driving Ecosystem Management. Contribution No. 715, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- O'Laughlin, J. 1994. A Comparison of Timber Resources in the Inland and Coastal Regions of the Northwest. Contribution No. 718, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- O'Laughlin, J. 1994. The Role of Public Lands in Local Government Financing. Contribution No. 721, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- O'Laughlin, J. 1994. Forest Policy, Forest Health, and the Future. Contribution No. 733, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- O'Laughlin, J. 1994. Forest Ecosystem Health Assessment Issues: Definition, Measurement, and Management Implications. Contribution No. 735, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- O'Laughlin, J., J.G. MacCracken, D.L. Adams, S.C. Bunting, K. Blatner, and C.E. Keegan, III. 1994. Salvage Logging and Forest Health. Contribution No. 739, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.
- O'Laughlin, J., and G.H. Belt. 1994. Functional approaches to riparian buffer strip design. *Western Forester* 39(6):12-14.
- O'Laughlin, J. 1994. Forest health conditions in Idaho (abstract). *Backpacker Magazine* 22(7):14.
- O'Laughlin, J., R.L. Livingston, R. Thier., J. Thornton, D.E. Toweill, and L. Morelan. 1994. Defining and measuring forest health. *Journal of Sustainable Forestry* 2(1&2): 65-85.
- O'Laughlin, J. 1994. Assessing forest health conditions in Idaho with forest inventory data. *Journal of Sustainable Forestry* 2(3&4): 221-247.
- O'Laughlin, J. 1994. A definition of forest health (sidebar). *Journal of Forestry* 92(7): 13.
- O'Laughlin, J., R.L. Livingston, R. Thier., J. Thornton, D.E. Toweill, and L. Morelan. 1994. Defining and measuring forest health. Pages 65-85 in *Assessing Forest Ecosystem Health in the Inland West*, R.N. Sampson, D.L. Adams, eds. The Haworth Press, Inc., Binghamton, New York.
- O'Laughlin, J. 1994. Assessing forest health conditions in Idaho with forest inventory data. Pages 221-247 in *Assessing Forest Ecosystem Health in the Inland West*, Papers from the American Forests Workshop, Sun Valley, Idaho. R.N. Sampson, D.L. Adams, eds. The Haworth Press, Inc., Binghamton, New York.
- O'Laughlin, J. 1994. Forest health in Idaho: Conditions, concepts, causes, cures, and concerns. Written testimony presented to U.S. Senate Committee on Agriculture, Nutrition, and Forestry, Subcommittee on Agricultural Research, Conservation, Forestry, and General Legislation, Field Hearing on Forest Health Conditions in the Intermountain West, Boise.
- O'Laughlin, J. 1994. Forest health conditions in Idaho. *Idaho Timberland* (October):1:6.
- O'Laughlin, J. 1994. Endangered and threatened species related to riparian management. In *Proceedings, Northwest Regional Riparian Symposia, Diverse Values: Seeking Common Ground*. Boise.
- O'Laughlin, J. 1994. The role of tree improvement in forest health and sustainable forestry (abstract). Pages 11-18 in *Nimbyism, Genetic Improvement, and Plantation Forestry, Proceedings, Inland Empire Tree Improvement Cooperative Annual Meeting, Post Falls*.

The Cooperative Park Studies Unit (CPSU)

- Littlejohn, M. 1993. Big Bend National Park. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Littlejohn, M. 1993. Bent's Old Fort National Historic Site. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Littlejohn, M. 1993. Zion National Park. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Littlejohn, M. 1993. Klondike Gold Rush National Historic Park. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Littlejohn, M. 1993. Santa Monica Mountains National Recreation Area. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Littlejohn, M. 1994. Sitka National Historical Park. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Littlejohn, M. 1994. Redwood National Park. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Littlejohn, M. 1994. Pecos National Historical Park. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Littlejohn, M. 1994. Canyon de Chelly National Monument. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Littlejohn, M. 1994. Death Valley National Monument Backcountry. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Littlejohn, M. 1994. San Antonio Missions National Historical Park. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Machlis, G.E., and J. Harvey. 1993. The adoption and diffusion of recreation research programs: A case study of the Visitor Services Project. *Journal of Park and Recreation Administration* 2(1):49-65.

Publications and Reports

- Machlis, G.E., D.J. Forester, and J.E. McKendry. 1994. Gap Analysis and the national parks: Adding the socioeconomic dimension. *Park Science* 14(1):6-10.
- Machlis, G.E., M. Littlejohn, and J. Harvey. 1993. The White House Tours: A Report on Visitors to the White House. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Machlis, G.E., and N.C. Medlin. 1994. Serving the Visitor: A Report on Customers of the National Park Service. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Madison, D.L. 1993. Frederick Douglass National Historic Site. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Madison, D.L. 1993. Glen Echo Park. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Madison, D.L. 1993. Jefferson National Expansion Memorial. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Madison, D.L. 1993. New River Gorge National River. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Madison, D.L. 1993. Arlington House, The Robert E. Lee Memorial. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Madison, D.L. 1994. Belle Haven Park/Dyke Marsh Wildlife Preserve. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Madison, D.L. 1994. Whitman Mission National Historic Site. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Madison, D.L. 1994. Indiana Dunes National Lake Shore. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Madison, D.L. 1994. Channel Islands National Park. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Madison, D.L. 1994. Bryce Canyon National Park. Visitor Services Project Report. Cooperative Park Studies Unit, University of Idaho, Moscow.
- Tuler, S., G.E. Machlis, and R.E. Kasperson. 1993. A Social Risk Assessment of the 1991 Winter Snow Removal Program at Mt. Rainier National Park. University of Idaho Cooperative Park Studies Unit, Moscow, Idaho. Technical Report NPS/PNRUI/NRTR-92/05.
- Wright, R.G. 1993. The Pacific Northwest Region Resource Database Project: A Synthesis. Natural Resources Report NPS/NRUI/NRR-93/11.

Research Projects and Investigations

This listing shows the range of work in progress through the Idaho Forest, Wildlife and Range Experiment Station. For additional information, please write to the principal investigators or to the Associate Director, Idaho Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow, Idaho 83844.

Department of Fish and Wildlife Resources

- Development of social systems among Arabian oryx reintroduced into Oman. T. Tear, E.D. Ables
- Effects on wildlife communities of disturbance to pinyon-juniper woodlands. E.D. Ables
- Effects of in-water disposal of dredged materials on fish and benthic communities in Lower Granite Reservoir, Idaho and Washington. D.H. Bennett
- Fishery and habitat surveys of the Pend Oreille River. D.H. Bennett, J. Dupont
- Monitoring fish community activity at disposal and reference sites in Lower Granite Reservoir, Washington. D.H. Bennett
- Water quality, fish and wildlife of Box Canyon Reservoir, Washington. D.H. Bennett, J. Garrett
- Plan for determining timing, location, magnitude, and cause of mortality for wild and hatchery spring/summer chinook salmon smolts above Lower Granite Reservoir. D.H. Bennett, et al
- Determining incubation success and fry production and potential to enhance fry recruitment from the North Fork Payette River, Idaho. D.H. Bennett, F. Frost
- Evaluation of proposed drawdown in Lower Granite and Little Goose Reservoirs and reservoir operations. D.H. Bennett
- Thermal and velocity characteristics in the lower Snake River reservoirs, Washington, as a result of regulated upstream water releases. D.H. Bennett
- Abundance, habitat, and migration of age 0 fall chinook salmon in the Snake River reservoirs with emphasis on Little Goose Reservoir, Washington. D.H. Bennett, T. Curet
- Habitat features that affect stream productivity. T.C. Bjornn
- Supplementation of wild salmon and steelhead. T.C. Bjornn
- Hatchery versus wild steelhead in supplementation. T.C. Bjornn, S. Rubin
- Survival of salmonid embryos in natural redds. T.C. Bjornn
- Passage of adult chinook salmon and steelhead at the Lower Snake River Dam and reservoir projects. T.C. Bjornn, J. Hunt, K. Tolotti, P. Keniry, R. Ringe
- Assessment of fish abundance and habitat in the Coeur d'Alene River. T.C. Bjornn, J. Hunt
- Substrate composition and trout survival relationships. T.C. Bjornn
- Response of salmonids to riparian vegetation and instream cover modification in second-growth forest streams of southeast Alaska. T.C. Bjornn, M. Brusven, R.M. Keith, N. Hetrick
- Spawning behavior of wild and hatchery salmon. T.C. Bjornn, P. Sankovich
- Interaction of coho salmon with resident cutthroat trout and Dolly Varden in the Slippery Creek Drainage, Kuiu Island, Alaska. P. Porter, T.C. Bjornn
- Genetic analysis of *Oncorhynchus nerka*. E.L. Brannon, G. Thorgaard
- Status of *Oncorhynchus nerka* in Redfish Lake. E.L. Brannon
- The effect of the Exxon Valdez oil spill on pink salmon early life history. E. L. Brannon, L. Moulton, L. Gilbertson, A. Maki, J. Skalski
- Altered operating practices on fish farms to reduce solid waste. E.L. Brannon, K. Collins
- Best Management Practices to reduce fish farm effluent on Billingsly Creek. E.L. Brannon, K. Collins
- Effect of initial feeding on otolith growth pattern of pink salmon. E.L. Brannon
- Control of bacterial kidney disease: Nonspecific resistance factors in chinook salmon. J.L. Congleton, D. Siegal
- Control of infectious hematopoietic necrosis virus: Antiviral effects of the trout macrophage. J.L. Congleton, B. Sun
- Stress response of chinook salmon smolts collected and transported from Snake River Dams. J.L. Congleton, T. Mosey
- Influence of growth rate on maturation schedules for kokanee salmon. J.L. Congleton, D.L. Scarnecchia, S. Patterson
- Stochastic population modelling in conservation biology. B. Dennis
- Modelling insect phenology. B. Dennis
- Ecology and management of Pend Oreille River limnology in north-eastern Washington. C.M. Falter
- Nutrient and sediment processing in the middle Snake River below pollution inputs. C.M. Falter
- Effects of underwater sound simulating the Intermediate Scale Measurement System on fish and zooplankton of Pend Oreille Lake, Idaho. C.M. Falter, D.H. Bennett, K. Niemela, J. Kenney
- Aquatic ecology of Craters of the Moon National Monument. C.M. Falter
- Design and feasibility analysis of an artificial wetland for high level treatment of wastewater effluents from Moscow, Idaho and the University of Idaho. C.M. Falter, R. Mink
- Effects of Auger Falls on water quality of the mid-Snake River. C.M. Falter

Research Projects and Investigations

- Population ecology of trumpeter swans and whooping cranes. E.O. Garton
- Impact of wolf reintroduction on Yellowstone elk, deer, and bison populations. E.O. Garton
- Aerial census methods for elk, mule deer, and bighorn sheep. E.O. Garton
- Estimating minimum viable meta-populations for rare animals. E.O. Garton
- Dietary selection of pocket-gophers in north-central Idaho. E.O. Garton
- Impact of timber harvests on woodpecker populations. E.O. Garton, E. Bull, B. Carter, L. Bate
- Ecology of white-headed woodpeckers in eastern Oregon. R. Dixon, E.O. Garton
- Analysis of neotropical migratory bird population trends in the western United States. J. Deal, E.O. Garton, J.M. Scott, D.L. Verbyla
- Applying a rapid assessment program for neotropical migrants on the Payette National Forest. A. Rocklage, E.O. Garton, J.M. Scott, P. Morgan
- Regulating growth of finfish by feeding regimen. G.W. Klontz
- Use of erythromycin to control bacterial kidney disease in chinook salmon. C.M. Moffitt
- Behavioral and physiological components of smoltification in chinook salmon and steelhead trout. C.M. Moffitt
- Development of methods to assess smolt quality in hatchery-reared salmon and steelhead trout. C.M. Moffitt
- Fish and wildlife ecology workshop. L. Nelson
- Biodiversity workshop. L. Nelson
- Leadership and communications workshop. L. Nelson
- Big game management workshop. L. Nelson
- Seasonal habitat use and group dynamics of translocated woodland caribou into the southern Selkirk Mountains of Idaho. J.M. Peek, L. Allen-Johnson
- Ecology of bull moose in Copper River Delta, Alaska. J.M. Peek
- Ecology of bull elk in Yellowstone National Park. J.M. Peek
- Mule deer habitat use in Idaho. J.M. Peek
- Bighorn sheep ecology, Middle Fork, Salmon River, Idaho. J.M. Peek
- Wolf ecology on the Copper River Delta, Alaska. J.M. Peek
- Effectiveness and validation monitoring of the modelling of mule deer habitat and populations in south-central Oregon. J.M. Peek
- Development of "Type A" risk assessment and response procedures for wetlands and inland waters of ecoregions of the United States. J.T. Ratti
- Analysis of wetland biodiversity and development of a wetlands evaluation and restoration techniques manual. J.T. Ratti
- Determining the impact of climate change on the distribution of Pacific Northwest plants and animals. J.T. Ratti, R.A. Black, J.M. Scott
- Analysis of techniques to minimize exposure by tundra swans to environmental toxicity. J.T. Ratti
- Analysis of biodiversity and management of riparian ecosystems in the United States. J.T. Ratti
- The effects of prescribed fire on sage grouse ecology in southeastern Idaho. K.P. Reese, R. Fischer, J.W. Connelly
- Ecology of Merriam's wild turkeys in southwestern Idaho. K.P. Reese, W.L. Bodie, J. O'Neill
- Winter ecology and nutritional status of Columbian sharp-tailed grouse in southeastern Idaho. K.P. Reese, J. Schneider, M. Ulliman, J.W. Connelly, J. Klott
- Vegetation response to fire on the Big Desert of Idaho. K.P. Reese
- Ecology of sympatric sage and Columbian sharp-tailed grouse in southeastern Idaho. K.P. Reese, J.W. Connelly, T. Apa
- Ecology of Merriam's wild turkey in west-central Idaho. K.P. Reese, F. Edelmann
- Seasonal habitat use, population characteristics, and management of quail in north/central Idaho. K.P. Reese, P.E. Heekin
- Wildlife use of the Pend Oreille River Reservoir in northeast Washington. K.P. Reese
- Seasonal habitat use, population characteristics, and management of chukar partridge in west-central Idaho. K.P. Reese, J.S. Koza
- Life history and ecology of south Umpqua spring chinook salmon. D.L. Scarnecchia
- Yellowstone River and Lake Sakakawea paddlefish investigations. D.L. Scarnecchia
- Bull trout ecology in northern Idaho. D.L. Scarnecchia
- Analysis of life history strategies of Icelandic stocks of Atlantic salmon in relation to environmental factors. D.L. Scarnecchia
- Rough fish investigations in Bowman-Haley Reservoir. D.L. Scarnecchia
- Sturgeon investigations in Yellowstone River. D.L. Scarnecchia
- Gap Analysis of biodiversity protection in Oregon. J.M. Scott, B. Csuti
- Gap Analysis of biodiversity protection in Idaho. J.M. Scott, S. Caicco, H. Anderson, C. Groves
- Review of endangered species recovery planning. J.M. Scott, P. Hayward
- Proactive approaches to sustaining biodiversity. J.M. Scott
- Preserve design in North America. J.M. Scott

Research Projects and Investigations

A Gap Analysis of the significant plant and animal resources contained in and adjacent to proposed northwest national parks. R.G. Wright

Development of computerized natural resource data management systems for Pacific Northwest parks. R.G. Wright

Analysis of historic vegetational change at Craters of the Moon National Monument. R.G. Wright

A synthesis of research and knowledge about non-ungulate non-migratory vertebrates in national parks. R.G. Wright

Development of a grazing management plan at City of Rocks National Reserve. R.G. Wright, S.C. Bunting

Application of GIS to land use planning and resources management at Lake Chelan National Recreation Area. R.G. Wright

Application of GIS to geologic hazard mapping at Hagerman Fossil Beds. R.G. Wright

Identification and mapping of the plant communities at Hagerman Fossil Beds. R.G. Wright

History of the Lochsa elk population and management. J.J. Yeo

Long-term wildlife population and habitat monitoring. J.J. Yeo

Bighorn sheep range carrying capacity. J.J. Yeo

Department of Forest Products

Pulp and paper sludge as a substitute for peat moss. R. Tripepi, A.G. Campbell

Assessment of wood pellet fuel quality and characteristics for Idaho and the Intermountain West. R.L. Folk, R.L. Govett

Cubic measurement implementation in tomorrow's management of the nation's forests. R.L. Folk

Properties of laminated veneer lumber made from interior species. T.M. Gorman

Affordable housing. T.M. Gorman

Insulation value of logs for home construction. T.M. Gorman

Simulation and analysis of mobile merchandizing centers. L.R. Johnson

Timber harvesting under adaptive forestry prescriptions. L.R. Johnson

Soil disturbance from low cost line machines. H.W. Lee

Costs of producing firewood from recovered slash. H.W. Lee

Woodland owners utilization guide. H.W. Lee

Environmental impacts on site productivity from increased utilization of biomass for energy and fiber. H.W. Lee

The use of kraft and TMP pulp sludge in mineral-bonded composites. A.A. Moslemi

The use of carbon dioxide gas injection on the properties of cement-bonded fiber composites. A.A. Moslemi

Durability of cement-bonded particleboards. A.A. Moslemi

Development of a computerized heat transfer model for frozen and nonfrozen logs. H.P. Steinhagen

Heat conditioning of veneer blocks. H.P. Steinhagen

Graphic visualization of pine log data. F.G. Wagner

Impact of log form upon warp in structural grades of softwood lumber. F.G. Wagner

Idaho timber supply analysis and impacts on the forest products industry. F.G. Wagner, J. O'Laughlin

Determination of Idaho's sustainable timber harvest level. F.G. Wagner

Department of Forest Resources

Survival and growth of fall-planted conifer seedlings. D.L. Adams, R. Graham, T. Catlin

Effects of residual overstory tree retention on establishment and growth of natural regeneration. D.L. Adams, A. Schlenker, D. Ferguson

Effects of pocket gophers and plant interference on regeneration success in grand fir habitat types. D.L. Adams, D. Ferguson

Response of advance Douglas-fir regeneration to overstory removal. D.L. Adams, C. Maranto, D. Ferguson

Silvopastoral systems in the Ecuadorian highlands. D.L. Adams, M. Garrison

Implications of Adaptive Forestry practices. D.L. Adams, H.L. Osborne, H. Whitlach

The role of carbon storage in forest habitat types of the Rocky Mountain ecosystems. D.L. Adams, T. Jain, R. Graham

Response of advance lodgepole pine regeneration to overstory removal. D.L. Adams, D. Ferguson, T. Lewis

Evaluation of introduced and native tree species for forage and soil improvement in Columbia. D.L. Adams, B. Barber

Riparian buffer strip design. G.H. Belt

Development of a physical process model for predicting evotranspiration from rangeland. G.H. Belt

Molecular genetics and ecology of bitterbrush. M. Jabbes, S.J. Brunsfeld

Ecology and reproductive biology of *Epipactis gigantea* in the northern Rocky Mountains. M. Mantas, S.J. Brunsfeld

Documenting genetic races of ponderosa pine using ribosomal DNA sequence data. A. Patten, S.J. Brunsfeld

Assessment of the genetic resources of Idaho's relict populations of Pacific dogwood. S.J. Brunsfeld

Genetics and ecology of *Asarum wagneri*. C. Baldwin, S.J. Brunsfeld

Research Projects and Investigations

- Role of understory vegetation in nutrient cycling. J. Nelson, S.J. Brunsfeld, R. Graham
- Phylogenetic relationships of *Taxodiaceae* and *Cupressaceae*: Evidence from rbcL DNA sequence. S.J. Brunsfeld
- Evidence for interspecific recombination of chloroplast DNA in *Salix*. S.J. Brunsfeld
- Genetic analyses of chemical variation and resistance to a diverse phytophage community on willow hybrids. S.J. Brunsfeld, R. Fritz
- Hardwood field trials. Y. Carree
- Nitrogen and phosphorus leaching and runoff from a conifer crop in a container nursery. R.K. Dumroese, D.L. Wenny, D.S. Page-Dumroese
- Western white pine seed germination. R.K. Dumroese, D.L. Wenny
- Comparing cutting propagation methods for Idaho hybrid poplar, arctic blue willow, and golden willow. J.L. Edson, D.L. Wenny, A. Leege-Brusven
- Snowberry propagation. J.L. Edson, D.L. Wenny
- Micropropagation plan to conserve *Hackelia venusta*. J.L. Edson, R. Everett, D.L. Wenny, A. Leege-Brusven
- Propagation of western white pine by branch cuttings, fascicles, and buds. J.L. Edson, L. Fins, D.L. Wenny, A. Leege-Brusven, R.R. Tripepi
- Micropropagating fire-resistant clones of bitterbrush and sagebrush of value to wildlife. J.L. Edson, M. Hironaka, D.L. Wenny, A. Leege-Brusven
- Micropropagation of rare plants of the Columbia Basin for a plant adaptability test. J.L. Edson, R. Everett, D.L. Wenny, A. Leege-Brusven
- Evaluating growth and form in western larch stockings and plantlets. J.L. Edson, L. Fins
- Selection of giant sequoia genotypes for ornamental planting in the Inland Northwest. L. Fins
- Response of western larch clones to hexazinone. L. Fins, D.L. Wenny, J.L. Edson, J. Mandzak
- Comparisons of cone production on grafts, root cuttings, and seedlings of western larch. L. Fins, V. Reedy
- Efficiency of early selection of Douglas-fir for improved growth rates. L. Fins, M. Rust
- Genetic variation in nutrient content among Douglas-fir families. L. Fins, V. McKee
- Genetic variation in wood-specific gravity of Inland Empire ponderosa pine. L. Fins, L. Koch
- Differences in carbon isotope discrimination, photosynthetic exchange and growth among western larch families. J. Zhang, L. Fins, J.D. Marshall
- Differences in carbon isotope discrimination among Douglas-fir families. L. Fins, J. Zhang
- Genetics, nutrition, and disease susceptibility of Douglas-fir. L. Fins, J.A. Moore
- Empirical studies on public participation in forest planning activities: Who participates, why, and how. J.E. Force, L. Marten, W.J. McLaughlin
- Community social change in resource-dependent communities. J.E. Force, G.E. Machlis
- Use of wilderness and natural environments for personal growth and leadership development. J.C. Hendee
- Benefits and costs of conservation corps programs. J.C. Hendee
- Biological control of *Fusarium* root disease in container-grown Douglas-fir seedlings: Evaluation of Mycostop fungicide. R.L. James, R.K. Dumroese, D.L. Wenny
- Persistence of *Fusarium* inoculum in copper-treated containers. R.L. James, R.K. Dumroese, D.L. Wenny
- Ecology and distribution of Idaho woody plants. F.D. Johnson
- Pan-tropical trees—Identification, distribution, and use. F.D. Johnson
- Galapagos Islands Human Ecosystem Project. G.E. Machlis
- Relations between strangers: A new theory of social ecology. G.E. Machlis, B. Burch
- Visitor Services Project studies in U.S. national parks. G.E. Machlis
- Visitor Services Project pilot database. G.E. Machlis
- Anthropogenic factors influencing biodiversity loss: A collaborative research program to extend Gap Analysis. G.E. Machlis
- Dyke Marsh/Belle Haven Park visitor survey video. G.E. Machlis
- The social ecology of landscape: An experimental course in art, ecology, and architecture. G.E. Machlis, K. Grinde, W. Bowler
- A geographic information system for the Charles Darwin Research Station, Galápagos, Ecuador. G.E. Machlis
- Field trials of elite black cherry. R.L. Mahoney
- High value hardwoods for the Pacific Northwest. R.L. Mahoney
- Gas exchange and carbon budgets of xylem-tapping mistletoes and their hosts. J.D. Marshall
- Water-use efficiency differences among provenances of western conifers. J.D. Marshall, L. Fins
- Differences in water sources among tree species in northern Idaho. J.D. Marshall
- Scaling of root respiration estimates to partition root respiration from soil respiration. J.D. Marshall, K.G. Mattson
- Use of carbon isotopes in tree rings to detect physiological responses to increasing atmospheric CO₂. J.D. Marshall, R. Monserud
- Comparison of leaf-area estimation techniques. J.D. Marshall, G. McDonald
- Nitrogen and potassium nutrition in relation to susceptibility of Douglas-fir to *Armillaria* infection. J.D. Marshall, T.M. Shaw

Research Projects and Investigations

- Chilean forest industry structure. C.W. McKetta
- Econometric analysis of Chilean forest products trade. C.W. McKetta
- Elasticities of price transmission in imperfect markets. C.W. McKetta
- Fire suppression cost estimation. C.W. McKetta
- Alaskan forest products transportation. C.W. McKetta
- Investment analysis of fuelwood plantations in Sri Lanka. E.L. Medema
- Comparison of tree establishment techniques in south and southeast Asia: Plantlets versus seedlings. E.L. Medema
- Cost-effectiveness of applying additional macronutrients to Siberian peashrub, honeylocust, and black locust grown in styro-20 containers. W. Bromley, E.L. Medema, D.L. Wenny
- Growth response of forests to intermediate silvicultural treatments. J.A. Moore
- Mineral nutrition of forest trees in the Intermountain Northwest. J.A. Moore
- Testing and development of forest growth and yield simulators in the Intermountain Northwest. J.A. Moore
- Wildlife habitat under alternative timber harvest and fire management regimes in ponderosa pine-Douglas-fir forests. P. Morgan, E.O. Garton
- Evaluating past and future role of fire in maintaining whitebark pine cone production within a small roadless area. P. Morgan, S.C. Bunting
- Ecology and management of interior Douglas-fir forest ecosystems. P. Morgan
- Hardwood sprout control. W. Wilkinson, P. Morgan
- Modelling succession in two forest habitat types in northern Idaho. A. Zack, P. Morgan
- Assessing future abundance and cone production of whitebark pine in the Bob Marshall Wilderness Complex. R.E. Keane, P. Morgan
- Characterizing landscapes with spatial pattern indices. L. Cosko, G. Wright, P. Morgan
- Collaborative, interdisciplinary learning in ecology. K. Guilgoyle, P. Morgan
- Modeling historical fire regimes in the Swan Valley, northwestern Montana. D.G. Long, P. Morgan
- U.S. Forest Service land use planning and biodiversity. M. Behrens, E.O. Garton, P. Morgan
- Development and management of the cedar/hemlock ecosystem. R. Graham, P. Morgan
- Landscape planning for ecosystem sustainability in cedar/hemlock white pine forest. S. McConnell, P. Morgan
- Fire effects and processes in forest ecosystems. L.F. Neuenschwander
- Horselogging applied to the Group Selection Harvest Regeneration Method. H.L. Osborne
- Herbicide potential for managing forest vegetation: Chemicals suitable for site preparation and conifer release. H.L. Osborne
- Vegetation control for ponderosa pine seedling establishment on Conservation Reserve Program lands. H.L. Osborne
- Electron microscopy of root-disease fungi. A.D. Partridge
- Frequency and damage by urban tree pests in Idaho. A.D. Partridge
- Periodicity of root-disease/bark-beetle activity in northwestern forests. A.D. Partridge
- Defect estimators for standing timber. A.D. Partridge
- Composite estimators for predicting individual tree height. C.T. Stiff, A. Samih, and J.D. Newberry
- The northern Rocky Mountain version of the Timber Resource Inventory Model—TRIM. C.T. Stiff, C.W. McKetta, R.O. Barkley
- An evaluation and comparison of two distance-independent forest projection models in the Inland Northwest. C.T. Stiff, D.A. Patterson
- Growth and yield models for *Pinus oocarpa* Schiede stands in central Honduras. C.T. Stiff, D.N. Perez
- Soil-site models for *Pinus oocarpa* Schiede stands in central Honduras. C.T. Stiff, M.C. Valdes
- Effects of fugitive cement kiln dust on forest productivity. C.T. Stiff, C.M. Stiff
- Simultaneous height and diameter increment models for second-growth Douglas-fir in the Inland Northwest. C.T. Stiff, W. Zhang, J.A. Moore
- Simultaneous height, diameter, and crown recession models for Douglas-fir using simulated data from TASS. C.T. Stiff, J.W. Goudie
- Development of expert systems for natural resource management. M.W. Stock
- Studies of computer use by foresters. M.W. Stock
- Effects of stress on the genetics of bark beetle populations. M.W. Stock
- Development and demonstration of New Perspective (adaptive, ecosystem, and land-based) forest management approach. K.J. Stoszek
- Response of high-graded ponderosa pine stands to simulated uneven-aged and selection silviculture. K.J. Stoszek
- Silvicultural guidelines for blister rust-infected white pine stands. K.J. Stoszek
- Evaluation of afforestation and reforestation attempts of savannas. K.J. Stoszek
- Assessing the causes and effects of deforestation in Panama. K.J. Stoszek
- Evaluation selection silviculture prospects in selectively logged ponderosa pine stands of Washington. K.J. Stoszek
- Small format aerial photography. J.J. Ulliman

Research Projects and Investigations

- Classification of clearcut harvest activity using remotely sensed data. T.P. Tady, J.J. Ulliman
- GIS methods for mapping temperature zones within the University of Idaho Experimental Forest. D.R. Unger, J.J. Ulliman
- Strategies for micropropagating rare and endangered plants of Idaho. D.L. Wenny, J.L. Edson, D.M. Henderson, A. Leege-Brusven
- Nursery management software. D.L. Wenny
- Plantation microsite selection. D.L. Wenny
- Effective fertilizer rates for containerized Siberian peashrub, honeylocust, and black locust grown in styro-20 containers. W. Bromley, D.L. Wenny
- Effectiveness of Anipel™ in reducing gopher damage to *Pinus monticola* and *Pinus ponderosa*. J. Bucher, D.L. Wenny
- Micropropagation and rooting stem cuttings of Scouler willow. D.L. Wenny, J.L. Edson
- Conserving Idaho's Pacific dogwood through micropropagation, layering, and rooting of shoot-tip cuttings. D.L. Wenny, J.L. Edson
- Developing cultural practices to promote growth and survival of micropropagated plantlets. D.L. Wenny, J.L. Edson
- Tree-agricultural crop interactions in agroforestry systems in Punjab, Pakistan. J.H. Ehrenreich, G. Khan
- Arid tropical agroforestry in Cameroon, Africa. J.H. Ehrenreich, S. Olsen
- Silvopastoral systems in Iran. J.H. Ehrenreich, S. Yassemi
- Genetic improvement of selected native range shrubs. M. Hironaka
- Revegetation of pipeline disturbances. K.L. Johnson
- Long-term ecological change of shortgrass prairie. K.L. Johnson
- Photographic studies of vegetation change. K.L. Johnson
- Evaluation of methods to monitor herbaceous utilization. J.L. Kingery, S.C. Bunting
- Animal damage and plantation performance. J.L. Kingery
- Assessing production and utilization techniques for herbaceous vegetation. J.L. Kingery
- Sheep grazing as a silvicultural tool in conifer plantations. J.L. Kingery, J.C. Mosley, H.L. Osborne, S.D. McCoy
- Influence of riparian herbage on water quality of rangeland streams. J.C. Mosley, C.M. Falter, T.A. Lance
- Habitat use and diet selection by Chihuahuan pronghorns. J.C. Mosley, E.L. Smith
- Diet nutrient quality of elk inhabiting a sagebrush steppe in summer. J.C. Mosley, D.C. Strohmeyer, J.M. Peek
- Sheep grazing strategies for deer and elk habitat improvement. J.C. Mosley, J.L. Kingery, K.J. Crane
- Identification and quantification of nonpoint-source pollution. J.C. Mosley, N.W. Darby, G.A. Bohach
- Influence of social hierarchy on site selection by free-ranging cattle. J.C. Mosley, K.D. Sanders
- Behavioral mechanisms responsible for resource partitioning between sheep and cattle. J.C. Mosley, J.W. Walker, B.C. Glidewell
- Evaluation of the dry/weight/rank procedure for estimating plant species composition in sagebrush steppe. J.C. Mosley, M. Pellant, L. Wessman
- Establishment and management of rangeland seedlings following wildfire. J.C. Mosley, K.D. Sanders, M. Eno
- Mechanisms of competition between bunchgrasses and tree seedlings during forest regeneration. R. Robberecht
- Freezing stress, cold acclimation, and photosynthetic capacity of coniferous seedlings and bunchgrasses: Consequences for forest regeneration and responses to global climatic change. R. Robberecht
- Reseeding arid rangelands. K.D. Sanders
- Short duration grazing system on crested wheatgrass. K.D. Sanders
- Control of broom-snakeweed on rangelands. K.D. Sanders
- Effect of drought on crested wheatgrass. K.D. Sanders, J.C. Mosley, M. Spaulding

Department of Range Resources

- Effects of fire on juniper soils. S.C. Bunting
- Use of prescribed fire in young maritime pine (*Pinus pinaster*) forests in Portugal. S.C. Bunting, P. Morgan, F.M.C. Rego, H. Botelho
- Fire ecology of caldenal vegetation of central Argentina. S.C. Bunting, R.M. Boo
- Heat flow into soils during simulated fire and postfire response of *Agropyron spicatum*. S.C. Bunting
- Evaluation of shrub utilization methods. S.C. Bunting, J.L. Kingery
- Agroforestry development in the Congo. J.H. Ehrenreich
- Effect of agroforestry on soils of the coastal plains of the Congo, Africa. J. Mouelle, J.H. Ehrenreich
- A vocational agriculture approach to development of agroforestry in the Philippines. J.H. Ehrenreich
- Promotion of agroforestry through community involvement in Pakistan. J.H. Ehrenreich, G. Keerio
- Livestock grazing, wildlife, and recreation interactions in Balouchistan. J.H. Ehrenreich, M. Taj
- Tree legume-grass interactions on the productivity of rangelands in Kashmir. J.H. Ehrenreich, A. Ishfaq
- Tree-forage interactions under seasonal grazing in the northwest frontier province of Pakistan. J.H. Ehrenreich, G. Khan

Research Projects and Investigations

Evaluation of salt-desert shrub communities through time. L.A. Sharp
Ecology and classification of Pacific Northwest grasslands. E.W. Tisdale

Department of Resource Recreation and Tourism

Management methods, financing, and other aspects of urban and community forestry needed for upgrading local programs nationwide. J.R. Fazio

Antecedents to environmental education commitment among elementary school teachers. S.H. Ham, D. Shuman

Barriers to environmental education in Costa Rican institutions of higher education. S.H. Ham, C. Charpentier

Environmental interpretive strategy to complement the National Quarantine Program for Galápagos National Park, Ecuador. S.H. Ham, T. Larson

Strategy and design of environmental education programs for radio in the Darién, Panama. S.H. Ham, R. Spadafora

Environmental ethics in resource management. C.C. Harris

Organizational change and its impact on resource management policy analysis and decision-making. C.C. Harris

Integration of psychology, economics, and philosophy/religion in valuation of public amenity resources. C.C. Harris

Social psychology of carrying capacity and rural tourism development. C.C. Harris

Idaho outdoor recreation facility inventory. J.D. Hunt, N. Sanyal

Non-resident commercial air and resident traveler study. J.D. Hunt, N. Sanyal

A system to measure Idaho travel and recreation participation: Phase I—The non-resident motor vehicle traveler. J.D. Hunt, N. Sanyal

Idaho rural tourism development plan. J.D. Hunt, S. Sanyal, W.J. McLaughlin, C.C. Harris

Frank Church-River of No Return Wilderness Information and Education Planning Project. E.E. Krumpe, L. Matthews

The Limits of Acceptable Change planning process—Perspectives from participants. E.E. Krumpe, L. McCoy

Strategies and methods for local governments to encourage and assess tourism development. W.J. McLaughlin, et al

Case study of the economic development and nature conservation programs used in French regional natural parks. W.J. McLaughlin

Consumptive orientation of anglers in Idaho, USA, and Norway and understanding Consumptiveness: Conceptual, measurement, and analytical considerations. N. Sanyal

Angler market segmentation, angler satisfaction, and activity persistence among Idahoans. N. Sanyal, W.J. McLaughlin

Venture 20—Integrating habitat and population management. N. Sanyal, W.J. McLaughlin

Idaho bicycle and walking study. N. Sanyal, W.J. McLaughlin

Statewide comprehensive outdoor recreation plan. N. Sanyal, W.J. McLaughlin, J.D. Hunt

Policy Analysis Group (PAG)

Endangered species prospects and implications for Idaho. J. O'Laughlin, D. Goble, T. Merrill, S.J. Brunsfeld

Scientific basis for Best Management Practices for managing grazing animals in riparian areas. J.C. Mosely, J. O'Laughlin, R.L. Mahler

Idaho's sustainable timber harvest level. J. O'Laughlin, F.G. Wagner, K.P. Reese, C.M. Falter

Theses and Dissertations

Master's Theses 1993

- Chandler, James A. Consumption rates and estimated total loss of juvenile salmonids by northern squawfish in Lower Granite Reservoir, Washington. *Major professor: D.H. Bennett*
- Chavez, Todd. Socio-demographics, beliefs, and attitudes of residents toward tourism development of two rural Idaho communities. *Major professor: C.C. Harris*
- Curet, Thomas S. Habitat use, food habits, and the influence of predation on subyearling chinook salmon in Lower Granite and Little Goose Reservoirs. *Major professor: D.H. Bennett*
- de Silva, P.M. Anura. A financial analysis of the Taungya system and its incentives in Sri Lanka. *Major professor: E.L. Medema*
- Engebretson, Regginal. Composting a combined RMP/CMP pulp and paper sludge. *Major professor: A.G. Campbell*
- Erixson, John A. Estimating shrub production and utilization in northern Idaho. *Major professor: J.L. Kingery*
- Fagan, Colleen E. Palatability and pharmacokinetics of erythromycin administered to juvenile chinook salmon. *Major professor: C.M. Moffitt*
- Folliard, Lee. Nest site characteristics of northern spotted owls in managed forests of northwest California. *Major professor: K.P. Reese*
- Garrison, Mariann T. Tree and herbage production under fire densities of *Pinus radiata* in the central Ecuadorian highlands. *Major professor: D.L. Adams*
- Gomben, Peter C. Treatability of lodgepole pine laminated veneer lumber (LVL) with Pentachlorophenol. *Major professor: T.M. Gorman*
- Halbrook, Lee R. Using Landsat thematic mapper spectral data for selecting potential replication sites on the Priest River Experimental Forest. *Major professor: D.L. Verbyla*
- Iqbal, Muhammad. Estimation of crown biomass production of *populus nigra* "Italica" Muench. in Pakistan. *Major professor: J.A. Moore*
- Mantas, Maria. Ecology and reproductive biology of *epipactis gigantea* Dougl. (orchidaceae) in northwestern Montana. *Major professor: S.J. Brunsfeld*
- Maranto, Joseph C. Reponse of Douglas-fir advance regeneration to overstory removal in central Idaho. *Major professor: D.L. Adams*
- Nedoma, Joseph O. Modelling thinning regimes in three north-central Idaho Douglas-fir plantations. *Major professor: J.A. Moore*
- Neuenschwander, Bob. A computer-aided expert system for the identification and treatment of urban tree diseases in the Inland Northwest. *Major professor: A.D. Partridge*
- Okello, Moses M. Pocket gopher (*Thomomys talpoides*) food preferences, habitat relationships, and damage prevention. *Major professor: E.O. Garton*
- Philbin, Michael J., Jr. The influences of landscape and stream characteristics on large woody debris frequency in Clearwater National Forest headwater streams. *Major professor: G.H. Belt*
- Raja, Rajiv G. An evaluation of tree and shrub plantings in the Palouse region of southeastern Washington. *Major professor: H.L. Osborne*
- Riggers, Brian W. Habitat alterations and planktonic community responses to aquatic macrophyte rotovation strategies in Box Canyon Reservoir, Washington. *Major professor: C.M. Falter*
- Robisch, Elena E. Natural regulation in U.S. national parks: Fact or fiction? *Major professor: R.G. Wright*
- Scialfa, Michael A. An ethnographic analysis of poachers and poaching in northern Idaho and eastern Washington. *Major professor: G.E. Machlis*
- Whittlach, Heidi L. Evaluation of adaptive forestry techniques in the Inland Northwest. *Major professor: D.L. Adams*
- Yoo, Ki-Joon. The feasibility of VIM (Visitor Impact Management) in a Korean national park: An approach for technique transformation. *Major professor: G.E. Machlis*

Ph.D. Dissertations 1993

- Fahsi, Ahmed. Modelling topographic effects on digital remotely sensed data. *Major professor: J.J. Ulliman*
- Fischer, Richard A. The effects of prescribed fire on the ecology of migratory sage grouse in southeastern Idaho. *Major professor: K.P. Reese*
- Keerio, Ghulam Rasool. Soil fertility and economic studies of *Acacia Nilotica* Hurry agroforestry system in Sindh, Pakistan. *Major professor: J.H. Ehrenreich*
- Khan, Ghulam Sarwar. Effect of trees on crop yields in cultivated fields of Punjab, Pakistan. *Major professor: J.H. Ehrenreich*
- Koehn, Anita C. Ecophysiology of *Pseudotsuga menziesii* var. *Glauca*: Seasonal response of O₂ evolution, chlorophyll fluorescence, and growth parameters to shade environments. *Major professor: D.L. Adams*
- Unsworth, James W. Elk mortality, habitat use, and home range in the Clearwater drainage of north-central Idaho. *Major professor: E.O. Garton*
- Whiteman, Michael R. An assessment of management strategies for public natural resource conflict. *Major professor: J.E. Force*

Theses and Dissertations

Master's Theses 1994

- Achana, Francis T. Preferences and characteristics of selected U.S. residents interested in visiting Costa Rica on vacation. *Major professor: J.D. Hunt*
- Adams, Susan B. Bull trout distribution and habitat use in the Weiser River drainage, Idaho. *Major professor: T.C. Bjornn*
- Avila, Roberto A. An integrated management system for hardwood forests in Honduras. *Major professor: C.W. McKetta*
- Biltonen, Thomas. Recovery of logging residue using a tractor-mounted skidding winch. *Major professor: H.W. Lee*
- Bonneau, Joseph L. Seasonal habitat use and changes in distribution of juvenile bull trout and cutthroat trout in small, high gradient streams. *Major professor: D.L. Scarnecchia*
- Bucha, Charlene. A descriptive analysis of potential forest type and structural land cover components of the Selway-Bitterroot Wilderness. *Major professor: L.F. Neuenschwander*
- Bucher, John C. A field test of the effectiveness of Ani-Pel™ products for protecting ponderosa pine (*pinus ponderosa*) seedlings from pocket gopher (*Thomomys talpoides*) predation. *Major professor: A.D. Partridge*
- Corrau, José. The creation of the National Service of Conservation Areas in Costa Rica: Perceived positive and negative outcome, and institutional barriers. *Major professor: E.E. Krumpe*
- Crane, Kenneth J. Effects of prescribed sheep grazing on elk and white-tailed deer forage in northern Idaho. *Major professor: J.C. Mosley*
- Danner, George R. Behavioral, physiological, and genetic differences among anadromous and resident *Oncorhynchus nerka* populations. *Major professor: E.L. Brannon*
- Deal, Jerry W. An analysis of breeding bird population trends in the western United States, 1968-1991. *Major professor: E.O. Garton*
- DuPont, Joseph M. Fish habitat associations and effects of drawdown on fishes in Pend Oreille River, Idaho. *Major professor: D.H. Bennett*
- Fredericks, James P. Distribution, abundance, and feeding ecology of young-of-the-year paddlefish in Upper Lake Sakakawea, North Dakota. *Major professor: D.L. Scarnecchia*
- Green, Gerald I. Use of spring carrion by bears in Yellowstone National Park. *Major professor: J.M. Peek*
- Hallisey, Judy E. Relationships between particle movement and channel morphology in some north Idaho streams. *Major professor: G.H. Belt*
- Hamanishi, Craig. Idaho's present and future sawtimber harvest: A survey of public and private resource managers. *Major professor: F.G. Wagner*
- Harvey, M. Jeannie. Perceptions of tourism development in Idaho: An assessment by gender and level of community tourism dependence. *Major professor: J.D. Hunt*
- Henkel, William D. Lessons from environmental writing, A writer's portfolio. *Major professor: C.C. Harris*
- Himawan, Singgih. An economic study of controlling log exports in Indonesia. *Major professor: C.W. McKetta*
- Hurley, Mark A. Summer-fall ecology of the Blackfoot-Clearwater elk herd of western Montana. *Major professor: J.M. Peek*
- Isaak, Daniel J. Movements and distributions of northern squawfish downstream of a lower Snake River dam in relation to the migration of juvenile salmonids. *Major professor: T.C. Bjornn*
- Jain, Theresa B. Carbon storage and carbon-to-organic matter relationships of three forested ecosystems of the Rocky Mountains. *Major professor: D.L. Adams*
- Kim, Yongha. The attitudes of Korean Forestry Administration employees toward the new environmental paradigm and forest resource management issues: Do they differ from the United States Forest Service? *Major professor: W.J. McLaughlin*
- Koch, Leslie. Genetic variation in wood-specific gravity from progeny tests of ponderosa pine in northern Idaho western Montana. *Major professor: L. Fins*
- Lepla, Ken B. White sturgeon abundance and associated habitat in Lower Granite Reservoir, Washington. *Major professor: D.H. Bennett*
- Lewinsohn, Dalia. Blue-stain fungi and their transport structures on the Douglas-fir beetle (*dendroctonus pseudotsugae*, Coleoptera: scolytidae). *Major professor: A.D. Partridge*
- Muhammad, Syed G. Herbaceous vegetation control in a ponderosa pine plantation: Economic and silvopastoral implications. *Major professor: J.J. Ulliman*
- Perin, Susan R. On-site visitor information: A 1992 study of the Riggins/Lower Salmon River Area of Idaho. *Major professor: W.J. McLaughlin*
- Peters, K. Kenneth. Dose titrations of erythromycin thiocyanate against acute infections of *renibacterium salmonarum* in yearling chinook. *Major professor: C.M. Moffitt*
- Qi, Jingan. High ambient soil carbon dioxide concentrations inhibit root respiration of one-year-old seedlings of Douglas-fir (*pseudotsuga menziesii*). *Major professor: J.D. Marshall*
- Rasmussen, Daniel L. The strength of laminated veneer lumber (LVL) made from second growth grand fir. *Major professor: T.M. Gorman*
- Schneider, James W. Winter feeding and nutritional ecology of Columbian sharp-tailed grouse in southeastern Idaho. *Major professor: K.P. Reese*
- Shapiro, Natalie R.M. The social world of grocery shopping. *Major professor: G.E. Machlis*
- Volsen, David P. Habitat use of a grizzly bear (*Ursus arctos*) population in the Selkirk Mountains of northern Idaho and southern British Columbia. *Major professor: J.M. Scott*

Ph.D. Dissertations 1994

Balatsos, Panayiotis C. Pyrogenic heat flow into soils and heat-induced tissue damage of *agropyron spicatum* during simulated fire. *Major professor: S.C. Bunting*

Charpentier, Claudia. Barriers to environmental education in Costa Rican state universities: Theory, analysis, and recommendations for intervention. *Major professor: W.J. McLaughlin*

de Souza, Mario R. Durability of cement-bonded particleboard made conventionally and with carbon dioxide injection. *Major professor: A.A. Moslemi*

Gibson, C.C. Evaluation of changing range nutritional resources and cattle response over time and space. *Major professor: J.H. Ehrenreich*

Hurley, Mark A. Summer-fall ecology of the blackfoot-clearwater elk herd of western Montana. *Major professor: J.M. Peek*

Keane, Robert E. The decline of whitebark pine in the Bob Marshall wilderness complex of Montana, U.S.A. *Major professor: P. Morgan*

McGown, Mary Grunewald. The influence of organizational variables on environmental management by county governments. *Major professor: G.E. Machlis*

Peters, Erin F. Use of *Sitanion Hystrix* as a revegetation species to promote succession. *Major professor: S.C. Bunting*

Tear, Timothy H. Foraging strategies, social system, and viability analysis: The development of reintroduced Arabian oryx population. *Major professor: E.D. Ables*

Tynon, Joanne F. Qualitative analysis of quality Idaho elk hunting experiences. *Major professor: W.J. McLaughlin*

Welsh, Thomas L. Interactive dominance: Chinook salmon and eastern brook trout. *Major professor: E.L. Brannon*

Zack, Arthur C. Early succession in western hemlock habitat types of northern Idaho. *Major professor: P. Morgan*

Zhang, Jianwei. Population variation in photosynthetic gas exchange, water-use efficiency, and carbon isotope discrimination of three conifer species in western North America. *Major professors: L. Fins, J.D. Marshall*



Continuing Education

Faculty in the College of Forestry, Wildlife and Range Sciences conduct continuing education programs for natural resource professionals and outreach programs for the public on campus, at the Clark Fork and McCall Field Campuses, and throughout Idaho and the West. The college offered the following continuing education and outreach programs during fiscal 1993 and 1994. Unless otherwise noted, courses took place in Idaho.

More information is available from Continuing Education, College of Forestry, Wildlife, and Range Sciences, University of Idaho, Moscow, Idaho, 83844-1142, (208) 885-6441.

1993

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|------------------------|--|---------------------|--|
| July 7-13 | Fish and Wildlife Ecology Workshop—McCall | October 3-4 | Getting Published—Clark Fork |
| July 8 | History and Archeology of Warren's Chinese Occupation—McCall | October 5-9 | Aerial Photography/Remote Sensing Workshop—Kellar, Washington |
| July 11 | Nature Photography—Clark Fork | October 9 | Building With Trees Workshop—Newport Beach, California |
| July 12-18 | Elderhostel: Wild Country Botanizing—Clark Fork | October 9-11 | Interpersonal Communication Skills for Natural Resource Professionals, Range Workshop—McCall |
| July 23-24 | We Grow Full Circle—McCall | October 13 | Building With Trees Workshop—Sacramento, California |
| August-December | Natural Resource Tourism—Boise | October 14-18 | Twelfth Annual Inland Empire Dry Kiln Workshop—Moscow |
| August-December | Range Communities—Boise | October 15 | Building With Trees Workshop—Seattle, Washington |
| August-December | Natural Resource Tourism (Graduate level)—Boise | October 15-16 | Intermountain Container Seedling Growers Association Meeting—Polson, Montana |
| August-December | Range Communities (Graduate level)—Boise | October 17 | North Idaho Folklore—Clark Fork |
| August 1-2 | Watercolor Painting from Nature—Clark Fork | October 18 | Native American Culture and Myths—Clark Fork |
| August 2-8 | Advanced Project Learning Tree—Clark Fork | November 8 | The Fascinating World of Rocks and Minerals—Clark Fork |
| September 17-18 | Public Involvement and Meeting Facilitation Skills—McCall | November 12 | Building With Trees Workshop—Chicago, Illinois |
| September 19 | Fossil Collecting and Geologic Tour of the Lake Pend Oreille Area—Clark Fork | November 16 | Building With Trees Workshop—Orlando, Florida |
| September 20 | Fossil Collecting and Geologic Tour of the Lake Pend Oreille Area—Clark Fork | November 16-20 | Wood Products Academy—Moscow |
| September 20-25 | National Urban Forestry School, Session I—Nebraska City, Nebraska | January-May | Natural Resource Policy Issues—Boise |
| September 27-October 2 | National Urban Forestry School, Session II—Nebraska City, Nebraska | January-May | Limnology—Boise |
| September 28-30 | 3rd International Inorganic Bonded Wood and Fiber Composite Materials Conference—Spokane, Washington | January-May | Natural Resource Policy Issues (Graduate level)—Boise |
| | | January-May | Limnology (Graduate level)—Boise |
| | | January 4-7 | National Urban Forestry School, Session I—Stillwater, Oklahoma |
| | | January 25-28 | Building With Trees Workshop—Nagadoces, Texas |
| | | February 21-26 | National Urban Forestry School, Session II—Nebraska City, Nebraska |
| | | February 28-March 1 | National Urban Forestry School, Session I—Nebraska City, Nebraska |
| | | March 2-3 | 10th Annual Inland Empire Forest Engineering Conference—Moscow |
| | | March 11 | Inland Empire Tree Improvement Cooperative Annual Workshop: Ecosystem Stability, Ge- |

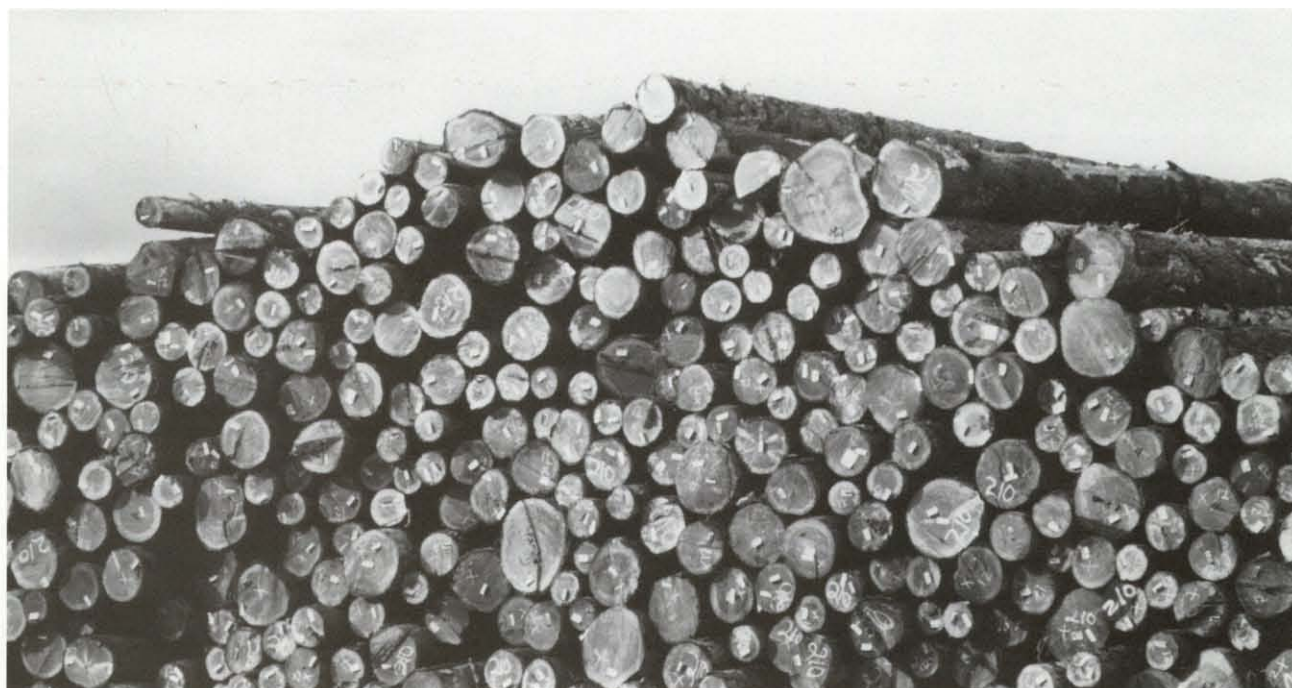
Continuing Education

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|----------------|--|-----------------------|--|
| | netic Diversity, and Other Sacred Cows—Post Falls | June 24-25 | We Grow Full Circle, A Field Tour of Working Forests—McCall |
| March 23 | Building With Trees—Milwaukee, Wisconsin | | |
| March 27 | Fishing for the Big Ones—Clark Fork | | |
| April 2 | Building With Trees—Winchester, Virginia | | |
| April 2-4 | Interpersonal Communication Skills for Natural Resource Professionals, Range Workshop—Clark Fork | July 11-17 | Fish and Wildlife Ecology Workshop—McCall |
| April 5-9 | Aerial Photography/Remote Sensing Workshop—Moscow | July 12-16 | Wood—A Remarkable Fiber—Clark Fork |
| April 6-8 | Vegetation Management Workshop: Monitoring Rangeland Vegetation for Multiple Uses—Boise | August-December | Fundamentals of Research—Boise |
| April 8-9 | Timber Harvesting Academy: Silviculture for Loggers—Moscow | August-December | Fundamentals of Research (Graduate level)—Boise |
| April 10 | Fishing for the Big Ones—Clark Fork | August 8 | Wolf Behavior and Ecology—Clark Fork |
| April 12-13 | Timber Harvesting Academy: Water Quality—Moscow | September 11 | Fossil Collecting and Geologic Tour of the Lake Pend Oreille Area—Clark Fork |
| April 15-16 | Timber Harvesting Academy: Silviculture for Loggers—Sandpoint | September 12 | Fossil Collecting and Geologic Tour of the Lake Pend Oreille Area—Clark Fork |
| April 19-20 | Timber Harvesting Academy: Water Quality—Sandpoint | September 18 | Backyard Bird Feeding—McCall |
| April 25 | History of North Idaho—Clark Fork | September 26 | Flora of North Idaho—Clark Fork |
| April 26-27 | Timber Harvesting Academy: Silviculture for Loggers—McCall | October 2 | Fall Mushrooms—Clark Fork |
| April 29-30 | Timber Harvesting Academy: Water Quality—McCall | October 11-15 | Thirteenth Annual Inland Empire Dry Kiln Workshop—Moscow |
| May 8-9 | For Bird Lovers Only (Beginning)—Clark Fork | October 17 | Kalispell Culture—Clark Fork |
| May 15 | For Bird Lovers Only (Intermediate and Advanced)—Clark Fork | October 18 | Native American Culture and Myth—Clark Fork |
| May 16 | For Bird Lovers Only (Intermediate and Advanced)—Clark Fork | October 18-November 5 | CEFES: Continuing Education in Forest Ecology and Silviculture—Moscow |
| May 17-18 | Modern Arboriculture—Indianapolis, Indiana | November 5 | Dynamic Dinosaurs—Clark Fork |
| May 17-21 | Satellite Remote Sensing for Natural Resource Management—Moscow | November 14-20 | Assessing Forest Health in the Inland West—Sun Valley |
| May 21 | Modern Arboriculture—Springfield, Illinois | January-May | Wildland Fire Management and Ecology—Boise |
| June 1-3 | Forest Health Symposium—Boise | January-May | Riparian Ecology—Boise |
| June 5 | Native Flowers, Trees, and Shrubs—Clark Fork | January-May | Conflict Management and Mediation—Boise |
| June 7-12 | Natural Resources Workshop—Ketchum | January-May | Wildland Fire Management and Ecology (Graduate level)—Boise |
| June 7-July 16 | Land Use Planning for Community Forestry and Natural Resource Development—Moscow | January-May | Riparian Ecology (Graduate level)—Boise |
| June 14-18 | GIS for Natural Resource Managers: A Hands-On Workshop—McCall | January-May | Conflict Management and Mediation (Graduate level)—Boise |
| June 19 | Tree Identification, Tree Diseases, and Insects that Invade Trees—Clark Fork | February 16-17 | Economics of Lumber Manufacture—Moscow |
| | | March 1-2 | 11th Annual Inland Empire Forest Engineering Conference—Moscow |
| | | March 7-11 | Forest Products Academy, Level I—Moscow |
| | | March 10 | Inland Empire Tree Improvement Cooperative Annual Workshop: Nimbyism, Genetic Improve- |

1994

Continuing Education

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|-------------|---|-------------|---|
| | ment, and Plantation Forestry—Post Falls | | Professionalism)—Sandpoint |
| March 19 | Home Landscape Design—Clark Fork | April 19-21 | Vegetation Management Workshop—Boise |
| March 22-23 | Regional Non-Industrial Private Forestry (NIPF) Woodland Marketing Workshop—Moscow | April 21-22 | Water Quality for Loggers (LEAP: Logger Education to Advance Professionalism)—Orofino |
| April 5-15 | Leadership and Communications Workshop—Moscow | April 28 | LEAP Workshop (Logger Education to Advance Professionalism)—McCall |
| April 8-10 | Interpersonal Communication Skills, Range Workshop—Clark Fork | April 30 | LEAP Workshop (Logger Education to Advance Professionalism)—McCall |
| April 11-12 | Silviculture for Loggers, (LEAP: Logger Education to Advance Professionalism)—Coeur d'Alene | May 1 | Selling the Great Northwest: Steamboats, Railroads, and Tourism—Clark Fork |
| April 13 | LEAP Workshop (Logger Education to Advance Professionalism)—Moscow | June 4 | Wildflowers and Shrubs of North Idaho—Clark Fork |
| April 14-15 | Water Quality for Loggers (LEAP: Logger Education to Advance Professionalism)—Coeur d'Alene | June 5 | Floral Biodiversity—Clark Fork |
| April 15 | LEAP Workshop (Logger Education to Advance Professionalism)—Sandpoint | June 11 | Home Landscape Design—Clark Fork |
| April 16 | Fishing for the Big Ones—Clark Fork | June 12-17 | Conservation of Natural Resources—Ketchum |
| April 18-19 | Silviculture for Loggers, (LEAP: Logger Education to Advance Professionalism)—Orofino | June 12-18 | Conservation of Natural Resources—Harrison |
| April 18-21 | Quality Control in Lumber Manufacture—Moscow | June 18 | North Idaho Conifers, Tree Diseases, and Insects that Invade Trees—Clark Fork |
| April 19 | LEAP Workshop (Logger Education to Advance Professionalism)—Moscow | June 20-24 | Wood—A Remarkable Fiber—McCall |
| April 19 | LEAP Workshop (Logger Education to Advance Professionalism)—Moscow | June 23-24 | We Grow Full Circle, A Field Tour of Working Forests—McCall |
| | | June 20-29 | Land Use Planning for Community Forestry and Natural Resource Development—Moscow |



Director's Score Card

Productivity: 1990-1994

| | Departments | | | | | Policy Analysis Group (PAG) | TOTAL |
|-----------------------------|------------------------------|--------------------|---------------------|--------------------|-------------------------------------|-----------------------------------|-------|
| | Fish & Wildlife Resources | Forest Products | Forest Resources | Range Resources | Resource Recreation & Tourism | | |
| 1990 | | | | | | | |
| Research FTE's ¹ | 3 | 1.9 | 6.9 | 1.5 | 1.3 | | 14.6 |
| Books | 0 | 2 | 3 | 0 | 0 | | 5 |
| Chapters in Books | 1 | 0 | 2 | 1 | 2 | | 6 |
| Refereed Publications | 26 | 13 | 34 | 4 | 8 | | 85 |
| Other Publications | 31 | 23 | 72 | 10 | 25 | 6 | 167 |
| 1991 | | | | | | | |
| Research FTE's ² | 4.85 | 3.62 | 9.99 | 4.27 | 2.88 | | 25.61 |
| Books | 2 | 2 | 3 | 0 | 0 | 0 | 7 |
| Chapters in Books | 16 | 6 | 19 | 4 | 6 | 0 | 51 |
| Refereed Publications | 23 | 21 | 23 ³ | 3 | 3 | 2 | 75 |
| Other Publications | 32 | 7 | 44 | 3 | 25 | 9 | 120 |
| 1992 | | | | | | | |
| Research FTE's | 4.85 | 3.62 | 9.99 | 4.27 | 2.88 | | 25.61 |
| Books | 2 | 2 | 4 | 0 | 4 | 1 | 13 |
| Chapters in Books | 21 | 2 | 12 | 3 | 11 | 1 | 49 |
| Refereed Publications | 21 | 8 | 10 | 3 | 9 | 3 | 54 |
| Other Publications | 17 | 6 | 47 | 6 | 20 | 8 | 104 |
| 1993 | | | | | | | |
| Research FTE's | 4.85 | 3.62 | 9.99 | 4.27 | 2.88 | | 25.61 |
| Books | 0 | 2 | 1 | 0 | 0 | 0 | 3 |
| Chapters in Books | 8 | 8 | 13 | 3 | 5 | 1 | 38 |
| Refereed Publications | 14 | 8 | 21 ³ | 2 | 3 | 2 | 50 |
| Other Publications | 37 | 6 | 49 | 38 | 15 | 8 | 153 |
| 1994 | | | | | | | |
| Research FTE's | 3.85 | 2.71 | 10.17 | 2.91 | 2.48 | 1 | 23.12 |
| Books | 0 | 1 | 2 | 0 | 0 | 0 | 3 |
| Chapters in Books | 9 | 2 | 19 | 13 | 2 | 4 | 49 |
| Refereed Publications | 10 | 3 | 12 | 5 | 2 | 3 | 35 |
| Other Publications | 23 | 3 | 48 | 5 | 12 | 12 | 103 |

¹ FTE = the equivalent of one full-time faculty employee paid from CFWR Experiment Station and special program state funds.

² Starting in 1991, these figures will reflect budget book numbers, not figures found in faculty activity reports, as previously.

³ The CPSU's publications have been added to forest resources totals starting in 1992--1 book, 6 misc.; 1993--1 refereed, 10 misc.; 1994--1 refereed, 7 misc.



Since its inception in 1909, the College of Forestry, Wildlife and Range Sciences at the University of Idaho has become one of the oldest and most highly regarded natural resource schools in the United States. As part of the state's land grant institution, the college serves the state through teaching, research, and service. College research is administered through the Idaho Forest, Wildlife and Range Experiment Station, established by the Idaho legislature in 1939 to conduct research on the state's renewable resources.

The experiment station has the equivalent of 25.61 full-time researchers funded by the state of Idaho. However, all 70 of the college's faculty members conduct research, as do most of its 212 graduate students. The faculty spend about one-third of their time on research, much of it paid for through outside grants and contracts.

The college consistently draws more research funding from grants and contracts than from state funds. For every dollar appropriated by the state for experiment station research during fiscal 1993, faculty grants and contracts brought in \$2.50. For every dollar appropriated by the state for experiment station research during fiscal 1994, faculty grants and contracts brought in \$1.67.

Agency and Funding Support 1993 & 1994

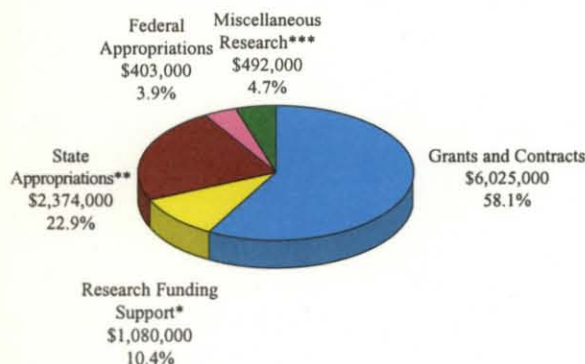
Agency for International Development
Agriculture Research Service
Alaska Fish and Game Department
American-Scandinavian Foundation
Bennett Lumber Company
Curt and Adele Berklund
Blue Mountain Elk Cooperative
Boise Cascade Corporation
Boise National Forest
Bonneville Power Administration
Champion Timberlands
Clearwater National Forest
Clearwater-Potlatch Timber Protective Association, Inc.
Clearwater Resource Conservation and Development Council
Colorado State University
Colville Confederated Tribes
Consortium for International Development
Cooperative State Research Service
Energy/Development International
Environmental Protection Agency
Evergreen Forest Products
Flathead National Forest
Foundation for North American Wild Sheep
Fremont Forest
Glacier National Park
Government of Honduras
Mr. Roger Guernsey
Hoff Companies
Idaho Department of Commerce
Idaho Department of Fish and Game
Idaho Department of Health and Welfare
Idaho Department of Lands
Idaho Department of Parks and Recreation
Idaho Forest Industries

Idaho National Engineering Laboratory
Idaho Nuclear Energy Commission
Idaho Research Foundation, Inc.
Idaho Travel Council
Idaho Water Resources Board
Idaho Water Resources Research Institute
Inland Empire Paper Company
Inland Empire Tree Improvement Cooperative
Inland Northwest Growth and Yield Cooperative
Intermountain Forest Industries Association
Jefferson National Expansion Historical Assoc., Inc.
Konkolve Lumber
Latah County
Martin Marietta
Monsanto
Montana Fish and Wildlife
Montana State University
National Aeronautics and Space Administration
National Association of Home Builders
National Council of the Paper Industry
National Fish and Wildlife Foundation
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
National Rifle Association of America
National Science Foundation
National Wildlife Federation
North Atlantic Treaty Organization
North Dakota Fish and Game
North Idaho Forestry Association
Northwest Area Foundation
Oregon Department of Fish and Wildlife
Oregon Hunters Association
Oregon State University
Pacific Northwest Power Company
Pack River Lumber Company
Payette National Forest
Pheasants Forever
Potlatch Corporation
PUD #1, Pend Oreille County
QB Corporation
Riley Creek Lumber
Rocky Mountain Elk Foundation
Shearer Lumber

Simpson Timber Company
South Idaho Forestry Association
Stillinger Trust
TJ International
U.S. Army Corps of Engineers
USDA Cooperative Research
USDA Extension Service
USDA Forest Service, Intermountain Forest and Range Experiment Station
USDA Forest Service, Northeastern Forest Experiment Station
USDA Forest Service, Pacific Northwest Forest and Range Experiment Station
USDA Office of International Cooperation and Development
U.S. Department of Commerce
U.S. Department of Energy
U.S. Department of Navy/Naval Undersea Center
U.S. Office of Naval Research
USDI Bureau of Indian Affairs
USDI Bureau of Land Management
USDI Bureau of Reclamation
USDI Fish and Wildlife Service
USDI National Park Service
University of Alaska
University of Arizona
University of Idaho Experimental Forest
University of Idaho Forest Research Nursery
University of Maine
University of Michigan
University of Minnesota
University of Montana
University of Washington
Washington State Department of Natural Resources
Washington State University
Washington Water Power Company
Western Forestry and Conservation Association
West One
Weyerhaeuser Company
WILD Foundation
The Wilderness Society
Wildlife Management Institute
The Wildlife Society
Winema Forest
Winrock International Institute

Financial Picture

FY 1993



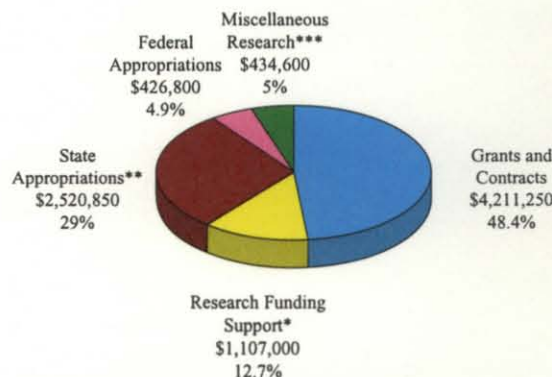
Research income, shown by funding source, totaled \$10,374,000 for fiscal year 1993

*Includes overhead allowances, external matching, outside federal unit support, and external cooperative research support

**Includes FWR Experiment Station, Wildlife, Wilderness, and Forest Utilization Research

***Includes Forest Research Nursery, Experimental Forest, Idaho Research Foundation, Taylor Ranch, and Clark Fork Field Campus

FY 1994



Research income, shown by funding source, totaled \$8,700,450 for fiscal year 1994

*Includes overhead allowances, external matching, outside federal unit support, and external cooperative research support

**Includes FWR Experiment Station, Wildlife, Wilderness, and Forest Utilization Research

***Includes Forest Research Nursery, Experimental Forest, Idaho Research Foundation, Taylor Ranch, and Clark Fork Field Campus



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Idaho Forest, Wildlife and Range Experiment Station
College of Forestry, Wildlife and Range Sciences
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