women in NATURAL RESOURCES

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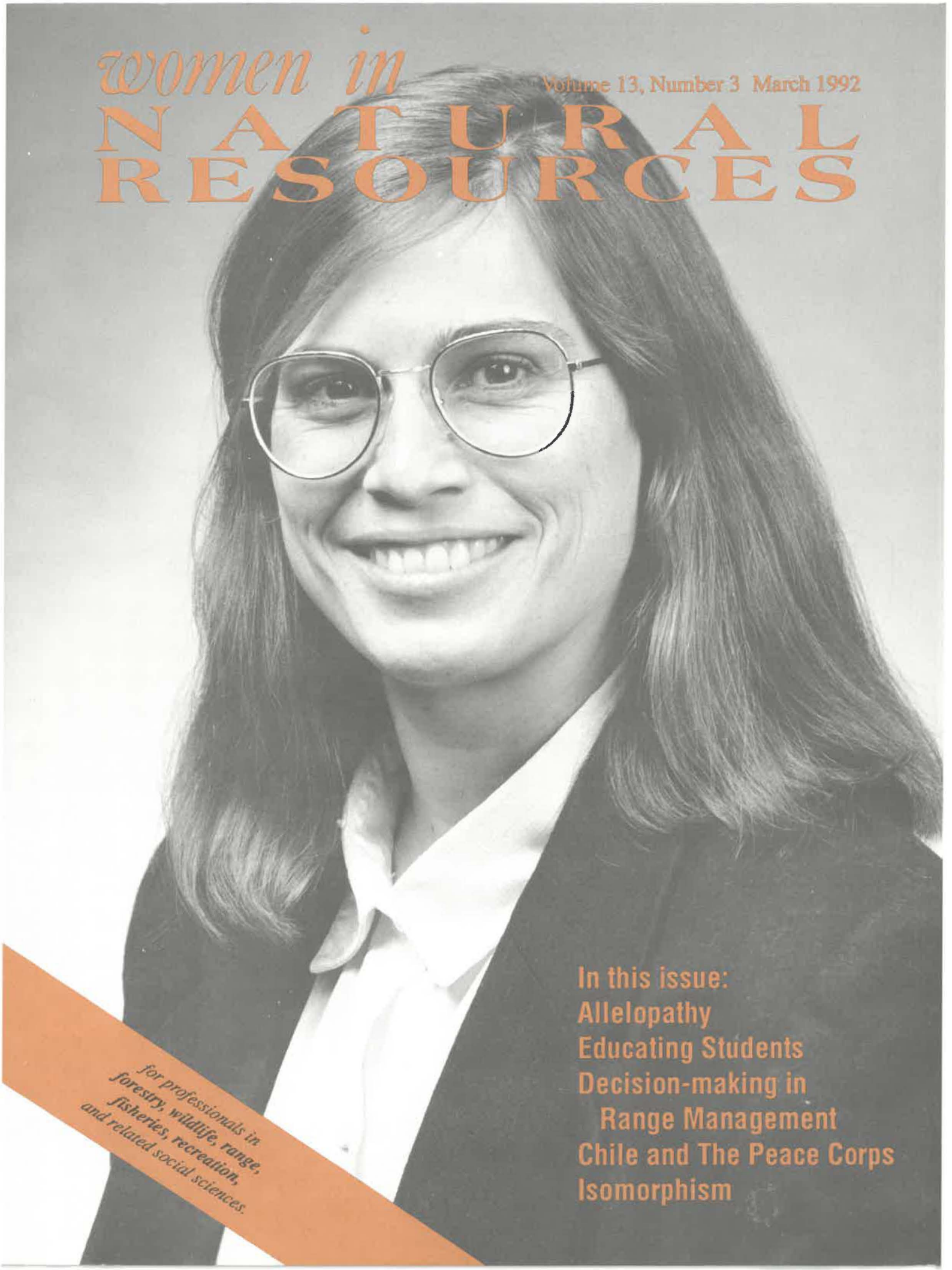

for professionals in forestry, wildlife, range, fisheries, recreation, and related social sciences.

In this issue:

Allelopathy

Educating Students

Decision-making in Range Management

Chile and The Peace Corps

Isomorphism

Editorial

Karen E. Lyman

The one thing that never changes is that everything changes. While students of these changes (historians) work in an old and honored profession, I find that it is even more interesting to watch the things that, in spite of progress and old cliches, manage to remain constant.

Women in Natural Resources, for example. Here we are after nearly 11 years, still hammering away on deadlines, still proofing, still editing, still writing. Still here. All this in a field where publications drop like proverbial flies and where surviving one year is considered a rip-roaring success if not a clear-cut mandate from the people. It's quite an achievement to have flourished for more than one full decade.

While it's true that WiNR has changed–and it's hard not to notice the improvements–plenty of things have remained constant. Me, for instance. I don't get to spend as much time working on WiNR as I'd like, but, hey, I'm here. But then again, with two toddlers I don't get to do much of anything any more.

But WiNR's most significant constant is Dixie Ehrenreich, who has been the solid-as-a-rock editor for the past 11 years. Her title has changed occasionally–she was called Executive Editor when Lei Bammel was on board–as opposed to Co-editor when Molly Stock was also Co-editor in the early years. But all along she has been the steadfast leader, guiding WiNR into a position of influence among natural resource professionals. No small accomplishment for a journal that was born a newsletter in 1978.

Last year I had the unusual opportunity for a time-line look at the journal while building an index of its feature articles. I thought, first, what a long way (baby) we've come from the very beginning.

I've blathered a lot about changes, some in articles in this journal, mostly in private. But I am truly astounded with the interesting developments in WiNR.

As I picked through each issue starting in 1986, I could not help but see enormous growth. Lots of it. There were changes in the articles, the authors, the sizes of issues, the quality of printing, of the typesetting even. Even the name had changed from *Women in Forestry* to better reflect the more diversified readership we'd always had.

Being slightly vain, I noticed first the changes in me. Aside from the obvious transitions of marriage, children, and new jobs (hardly minor life adjustments) there were the less noticeable differences centered around my perceptions as a forester, as a writer, and as a professional. I forced myself to read some of my earliest work and found I wasn't completely humiliated. I used to be unable to read my work in print. I'd figure, once a piece of my writing was out of my hands, I would receive whatever humiliations were due me just fine–without the agony of re-reading it.

Although, I doubt I'll ever relinquish my foolish print phobia, I found the reading didn't kill me. I also discovered that as a writer, I've improved. I seriously doubt this ever would have happened without the caring support of both WiNR editors and readers. I got some irreplaceable encouragement all the way around. And I'm still here, still trying.

But even better, I enjoyed re-reading some of the first feature articles that appeared in the journal. It's hard now to believe, but in the beginning it was not such a simple task to collect good feature work. I know what you may be thinking...but that was over a decade ago and women needed to be encouraged to produce print work. It certainly wasn't as though anyone had been previously beating down women's doors for publishable material. Today it's a different story. At times, the selection process looks more (in number) like a sweepstakes contest. How nice for all of us!

What hasn't changed is that most authors and editors whose work is featured in WiNR are women. That's not likely to reverse in the near future. In the very early years of the journal, I can recall answering this one question more than any other: Why a journal focused on women, when there isn't one for men? Our stock answer in those days was to reply that when women were on equal footing with men in the field of natural resources, had equal opportunities, were reassured of employment free of discrimination and harassment, then there would be no need for *Women in Natural Resources*. Alas, that time hasn't arrived.

Also gone are the days where the journal focused primarily on forestry. Foresters still comprise a significant portion of subscribers, but the variety of professions now represented in WiNR is nothing less than astonishing. It makes sense though. In this interrelated world we ought to know what others in similar fields are thinking and doing.

For some reason, when I was fresh out of school, I thought I surely must be the only woman wearing White's boots for hundreds, if not thousands, of miles. While I may have been the only forester in my neck of the woods, it's obvious there were plenty of other women professionals

(continued on page 25)

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WOMEN IN NATURAL RESOURCES

March 1992

Volume 13, Number 3

FEATURES

DEPARTMENTS

The cover photo is of
Lori Payne
Senior Research Chemist
Merck Sharp and Dohme
Research Laboratories
New Jersey
(See page 12)

FEATURES

LETTERS & OPINIONS

I have referred to (and copied and distributed) several times the Wendy Goldsmith article which concerned bioengineering in your June 1991 issue. This process is gaining more acceptance among the public I work with and the photos and diagrams were most instructive. Robbin Sotir, whose business is bioengineering (and who was on the cover) sounds like somebody I would like to talk to further. Can you give readers her address please?

Rachel Smith-Fourtenay, Miami

Ed. note: The address is Robbin B. Sotir & Associates, 627 Cherokee Street NE, Suite 11, Marietta, Georgia 30060.

I wish Madame Butterfly (Elaine Zieroth) would bring her humor and dedication and work on some of my projects. I really enjoyed that issue on T & E Species.

Thomas Wright, Los Angeles

Vincent Dong's interview of Barbara Weber was excellent and up to WiNRs usual standards. It's clear Weber put in her time and worked her way up and he gave us that picture of her and of her other attributes. Very perceptive questions.

Lori Macauley, Bremerton, Washington

Ed. note: It is our habit at WiNR to have several editors submit questions for the interviewer to use in addition to his or her own. The hard work of organizing and making coherent the interview, however, is on the shoulders of the one whose name appears on the byline.

I am a fish culture biologist for the state of Indiana, and find it interesting to read about how my 'sisters' are making out in other state and federal organizations. The professional viewpoints from other specializations keep you informed about the rest of the world. The personal stories make you aware that maybe you aren't just getting paranoid after all. Keep up the good work.

Lane Theriac, Laporte, Indiana

Last issue someone raised the question about job security and what the future looked like for natural resources. My feeling is that now is not the time to leave a job, any job, especially in natural resources and especially if you are a woman or a minority. I may be a pessimist, but it looks to me like there will be a continued downturn in most parts of our business for some time to come. And we are getting pummeled still because we are women–at least in some sections of this country. This means we have got to do some educating about equity issues right where we are, right now, to make our lives better without leaving current jobs. I suppose our motto could be: I ain't leavin' pal, driving me out ain't in the cards, adjust, or I'm in your face.

Sally Rogers, New Orleans, Louisiana

I want to say that I appreciate your jobs flyers. I can't afford the journal (I'm still in school) but I read it in the university library and our department chair posts the flyers on the bulletin boards

Please be advised that the search for an assistant professor, wood mechanics, at the University of Minnesota (advertised in the March 12, 1992 position announcements flyer) has been put on hold. We regret any inconvenience that this may cause.
Department of Forest Products
University of Minnesota

IN MEMORIAM

Virginia Lilly, who died April 1991, was truly a remarkable woman. She had been an outfitter, a saddlemaker, an artist with leather and the mother of three now-grown children. She was also a conservationist who went beyond the rhetoric to make things happen. Lilly took on the Forest Service in northern Washington state where she lived in the same thorough and tenacious way she did everything. She read the Forest Plan and all the documents she could get her hands on, and then went out to the site of a proposed project and walked it over. She then gave constructive, specific input about the project, including where the raptor nests were located and which stands were old growth.

One friend remembers coming home with her after a long day of riding in the woods when Lilly realized her dog wasn't around. It was late, and getting dark, but time was nothing to Virginia said the friend. The two women searched for the dog until they found it caught in a coyote trap. If they had waited until morning, the dog might not have survived.

Lilly's tenacious spirit contributed to many good deeds, among them the recognition of 400 acres of old growth trees in the Cumberland Hill area. She even hiked in the snow into a proposed timber sale in the middle of winter to be sure that it had been marked according to the environmental assessment. She came down with pneumonia after that hike and when it did not go away, the doctors discovered that she had cancer.

In August 1991, after her death in April, the Forest Service's Tonasket District on the Okanogan National Forest remembered Lilly, dedicating in her name a three-mile trail winding through the area she knew and loved. Twenty volunteers who also knew and loved Lilly gathered to help blaze the trail which will later include interpretative signs for schoolchildren. In time it will make an additional loop through the old growth she discovered.

One District Ranger recalled that Lilly made sure that the Forest Service was making the best decisions and if you "messed up" you heard about it from her. She was known and admired by many for mastering Forest Service guidelines and for her ability to work with Forest Service employees in making sure things were done right.

"She loved to get out in the hills," recalled her friend Rita Reed. "She'd go out by herself with her horses and her dogs and camp. She loved the horse people and the nature people and the Forest Service people–people from all different walks of life."

Alix McNamara, Tonasket, Washington
Elaine Zieroth, Tonasket, Washington

for faculty and students alike. We keep up that way with what's being offered.

Noel Bender, Boston, Massachusetts

I was in the audience at Ohio State University when your editor Dixie Ehrenreich came to deliver a talk to people who came for an open house for potential students at their School of Natural Resources. I haven't enrolled yet–I still might–but her talk about fairness for women and how her fight against discrimination had affected her own life has stayed with me. Has she published anything along those same lines we could send for?

E. E. Burroughs, Columbus, Ohio

Ed. note: No, unless you consider a number of editorials in the journal to be worth sending for. I've been giving the occasional talk to university students (and faculty) around the country about the few numbers of faculty women, why that is the case, how it affects students, and what they could do about it. Maybe I should pull it together so that you "could send" for it.

Dixie Ehrenreich

Assistant/Associate Professor
Forest Ecosystems Ecology
Utah State University Logan
Application reviews begin April 15, 1992; position open until filled.

The Department of Forest Resources and Ecology Center at Utah State University are seeking applicants for a tenure-track faculty position in forest ecosystems ecology. The successful applicant will be expected to conduct research in nutrient cycling and carbon budgets of temperate forest ecosystems, and to teach three quarter-system courses in his or her area of expertise.

Applicants must have: Ph.D. at time of appointment; evidence of research productivity; ability to develop a research program based largely on extramural funding; commitment to interdisciplinary research; and commitment to quality teaching.

Send letter of interest, C.V., transcripts and supporting material, and have three letters of recommendation sent to:
Dr. David W. Roberts, Department of Forest Resources, Utah State University, Logan, Utah 84322-5215 (801-750-2416).
AA/EO employer that strongly encourages applications from women and minorities.

ASSISTANT PROFESSOR OF SILVICULTURE
University of Minnesota St. Paul.
Closes July 1, 1992.

The Department of Forest Resources, College of Natural Resources, University of Minnesota is seeking to fill a full-time (9-month), tenure-track appointment available October 1, 1992. **Qualifications**: Ph.D. by time of appointment, with expertise in silviculture relevant to responsibilities listed below. The ability to communicate with and identify problems significant to field foresters and at least one degree in forestry are required. Background in protection, ecology, and quantitative analysis/modeling preferred. Competence in written and oral communication is required. A desire and ability to work effectively with graduate and undergraduate students is essential. **Responsibilities:** 1) Teach undergraduate and graduate courses in silviculture and participate in other forest resources and/or environmental studies courses, 2) Advise students, 3) Develop and conduct a superior research program in silviculture. Possible research areas include but are not limited to regeneration; silvicultural systems for forests of mixed ages and species; aesthetics in forest management; biodiversity; sustaining productivity; implications of natural and anthropogenic disturbances, etc., 4) Seek/secure research funding, and 5) Participate in research, continuing education, and service activities of the department statewide. **Salary**: commensurate with experience and qualifications. Salary will be supplemented with two months of summer salary for the first five years. **Applications consist of:** resume, brief statement of goals/interest, academic transcripts and applicants should arrange for three letters of reference to be sent to:

Dr. Carl A. Mohn
Chair, Silviculture Search Committee
Dept. of Forest Resources
University of Minnesota
115 Green Hall, St. Paul, Minnesota 55108
(Phone 612-624-7281: FAX 612-625-5212).
An equal opportunity employer

If you would like to contribute funds to assist *Women in Natural Resources* mail approximately 800 volumes it is donating for Peace Corps' Women in Development locations, please send your check made out to:
WiNR Mail, Bowers Lab
University of Idaho
Moscow ID 83843
AND WE THANK YOU!

IF THE "COW-FREE IN '93" SLOGAN IS NOT YOUR IDEA OF HOW NATURAL RESOURCES IDEAS SHOULD BE GENERATED OR TRANSMITTED, THEN HOW DO YOU GO ABOUT COUNTERING IT?

RANGE-LAND POLICIES

DENISE MERIDITH

The environmental movement is having profound impacts on livestock grazing. The passage of the National Environmental Policy Act (NEPA) in 1969 sparked a revolution in public attitude towards natural resources in the United States. There have been a succession of issues—nuclear power, endangered species, wilderness, wildfire, wetlands—which have engaged the imagination of everyone from kindergarten students to senior citizens. Grazing on public lands is another of those issues and grazing has been eliminated or restricted, particularly in response to wilderness area and endangered or threatened species habitat designations. For example, on one of the Bureau of Land Management's largest range districts, the Roswell New Mexico District, the Animal Units Months was reduced by 48,000 during the period 1980 to 1991 as a result of monitoring. Radical environmentalists want to go much further. They have coined the chants "No Moo in '92" and "Cow Free in '93" in Arizona and New Mexico in order to eliminate grazing on public lands. Legal battles will continue throughout the rest of this century and beyond.

Changes in demographics in the U.S. are having direct and indirect impacts on range management. Directly, population increases and urban/suburban expansion are reducing available open lands. As open space becomes scarcer, competition for control of the uses of the land intensifies. Entering into the question of control is the Grazing Administration regulations (43 CFR Subpart 4100) which make reference to "affected interests." The definition of an "affected interest" is at the heart of many of the legal battles today. Is a resident of Delaware "affected" by a decision to increase the number of Animal Unit Months (AUM) allotted to a rancher in Wyoming? Can he or she rightfully file a protest because it is thought grazing will hurt wildlife habitat and diminish his or her chances of bagging an antelope?

On the other hand, some ranchers feel governmental decisions on public lands "affect" their private property rights. Some in Wyoming, for example, are citing such references as Presidential Executive Order 12630, as justification to block government rules, regulations and decisions or to garner compensation for "taking" of their "rights" to public grazing.

Who is really "affected?" Does an environmental group member in California have "standing" in a court case involving a range improvement in Montana? What's a right and what's a privilege? These controversies reflect changing public attitudes towards rangeland policies and are having direct impact on management through administrative and judicial disputes.

The indirect impacts of societal changes can be even more far-reaching. Americans are farther and farther removed from contact with and interest in the land. We have become a nation of city slickers. If you ask five-year-olds where hamburger comes from the response will most likely be McDonalds and not cows. The growing numbers of immigrants have priorities other than considering the ramifications of rangeland reduction: education, employment, housing are among them. Even simple things, such as dietary preferences are changing as demographics change, making us less of a meat and potatoes society and reducing demand for beef. Overall, grazing fees, needs for rangeland improvements, water rights and other range issues pale in competition with S&L crises, homelessness, drugs, racial tensions, and other societal problems. Apathy can be as lethal to attaining necessary funding for rangeland management as active opposition.

Changes in technology are another factor impacting management practices, in this case for the better. Computers are being used by ranchers to facilitate nutritional and genetic studies to improve animal husbandry practices, and by scientists to document and analyze range composition, condition, and trends.

Changes within the range management professions are also causing concern for the future. The average age of range professionals in agencies and organizations is rapidly increasing—now at 40 years of age for range conservationists in BLM with an average of 14 years of service—and there may be difficulty ahead in recruiting young people. Those who do enter the profession do not have the practical experience and background of their predecessors. The country faces a serious skill shortage in this and other natural resource areas. Once committed, professionals then begin to suffer low morale and self-esteem because their recommendations—based on scientific judgements—may not be supported or implemented due to the political wars being waged by environmentalists and ranchers.

How can we best address these societal changes and some of the pessimistic implications they hold for rangeland management? The Bureau of Land Management, the nation's largest public rangelands manager has attacked some of the problems on several fronts.

• BLM has modified manuals, regulations, handbooks and procedures to improve public understanding of rangeland management.

•In order to encourage public participation at the planning stage, BLM solicits public participation during decision-making on allotment management plans, evaluations of monitoring, range improvements, and NEPA processes. BLM is working to improve the consistency and effectiveness of this solicitation throughout the states.

•BLM works more closely with the livestock industry to foster recognition of some of these changes and encourage constructive responses. BLM State Directors of California and New Mexico, for instance, hold regular "roundtables" with groups of ranchers to explain changing BLM policies and address/allay fears and concerns.

•New Mexico has developed range improvement maintenance plans in cooperation with ranchers to agree on management practices before areas are designated as wilderness. Existing allotments are not affected by wilderness designations as they are "grandfathered in." Access to these sites through the wilderness are effected through use of the "cherry stem" corridor.

•Several State Offices, such as California, Idaho, and Oregon, have been very successful in establishing Experimental Stewardship programs which encourage riparian/wetland management projects with local ranchers.

•Internally, BLM is seeking to maintain and improve the skills of its onboard professionals. It encourages membership in professional societies. New Mexico established a Rangeland Excellence program geared at honing the technical skills and self-esteem of range conservationists through training, mentoring by more experienced specialists, and more on-the-ground practice. Range professionals need to be more comfortable speaking before the public and sitting in front of the computer. A series of formal courses will be offered in 1992 beginning with one called Leadership, Communication, and Coordination for Rangeland Managers. Goals for the courses include increasing managers' understanding of technical advances, changing society, the use of management teams, and agency values. The aim is to address BLM's traditional responsibility in new and better ways: how to balance the needs and wants of people with the use capacity of the land.

•BLM needs to work hard on recruitment of new professionals. Cooperative education, the Intergovernmental Personnel Act (IPA) agreements and other initiatives, particularly in conjunction with Historically Black and Hispanic colleges and universities will be needed to fill future employment gaps. Such work is also needed to bridge the lifestyle gaps and improve understanding of various cultures.

•The biggest challenge faced by all agencies and organizations is how to educate a public which is growing more distant from and disinterested in the rangeland issues. Public education will have to come from many fronts. "Cow Free in '93" is the kind of catchy phrase which can easily win popularity and support unless it is countered convincingly.

Much of the news is good about American rangelands, but the news is not being widely distributed nor is it easily recited at the dinner table or in newspapers. For example, BLM collected $18 million in fees last year, and fees have increased 46 percent in the past five years. The trend on 87 percent of the BLM public lands is stable or improving. The trends on the Roswell District in the years 1985 to 1990, for example, were as follows: excellent condition increased from 1.3 percent to 1.8 percent (31,885 acres); good condition increased from 37.5 percent to 44.4 percent (386,989 acres); fair decreased from 53.8 percent to 47.2 percent (269,649 acres); poor decreased from 3.4 percent to 2.4 percent (45,714 acres).

Some 27 percent of counties in 11 western states are heavily dependent on the livestock industry. These geographic areas, agencies, professional societies, and interested organizations will have to find imaginative ways to get out information on the contributions made by the industry if it is to remain viable. Children need to be educated to the fact that if they want to eat hamburgers, their parents and they themselves have to be more involved in the decision-making. The few special interest groups who appear at BLM hearings and meetings are often no longer representative of the community. We have to solicit the interest and support of all types of customers, not just our traditional users. To do this, range managers will have to get out into the community, not wait for people to show up at our offices or expect people to read the *Federal Register* to get notices of government agencies' activities.

Denise Meridith is Director, Eastern States Office for the Bureau of Land Management. Prior to that appointment, she was Deputy Director for California for the BLM. She has worked for BLM in Nevada, Maryland, the Washington Office, and New Mexico. Her Bachelor's degree is in Wildlife from Cornell University. This paper derives in large part from a paper delivered at the SAF convention, in August 1991.

BLM AND RANGE FEES

Under a formula set by Congress, the 1992 grazing fee for the BLM lands in the west will decrease by five cents, from $1.97 to $1.92 per animal unit month. An animal unit month is the amount of forage consumed by one cow and one calf, one horse, or five sheep or goats in one month. The new fee, effective March 1, is derived annually by using a base fair market value of livestock grazing on public lands and adjusting it according to current private land lease prices, beef cattle prices, and the cost of livestock production.

The fee decreased in 1992 because higher costs of livestock production offset slight increases in beef cattle prices and private land lease rates. The fee formula, originally established by Congress in the Public Rangeland Improvement Act of 1978, has been continued since 1986 under Executive Order 12458.

In 1991, about $19 million in public land grazing fees was collected from ranchers. Half of the total collected is used to improve the range and the other half is divided among public land states and the U.S. Treasury. Some 18,000 ranchers and farmers pay for permits to graze livestock on BLM-administered lands. Nearly 90 percent of these ranches are family-run operations with fewer than 500 head.

The BLM manages 270 million acres of federal land in 11 western states and Alaska for range, recreation, timber, minerals, watershed, fish and wildlife, wilderness and natural scenic, scientific and cultural values. About 174 million acres are rangelands that provide watersheds for the major river systems of the west, seasonal forage for domestic livestock, habitat for wildlife, and habitat for wildhorses and burros.

Ed Ciliberti, Oregon State Office USDI BLM

WHILE CONSENSUS DECISION-MAKING TENDS TO BE MORE TIME-CONSUMING AND EXPENSIVE UP FRONT, THE PAYBACK IS THAT DECISIONS CAN BE IMPLEMENTED WITHOUT COSTLY APPEALS, DELAYS, AND CONTROVERSY.

BUILDING BRIDGES BENEFITS THE RANGELANDS

SUSAN T. STOKKE

Introduction

As a girl, I remember one of the challenges my dad faced was to build a bridge that would survive spring flooding across the creek that flows through the main part of our cow-calf ranch in northeastern California. Dad finally solved his problem by purchasing a railroad flat car and keying it into the streambanks. This simple technique was apparently successful because the bridge hasn't washed out once in the 20 years since it was installed.

Like my dad, one of my challenges as a resource manager for the Forest Service has been to build bridges that endure—bridges which span the differences between various interest groups and segments of our public, enabling us to sit down together, share our concerns, talk about solutions to those concerns, and reach agreement about the actions we need to take to achieve our collective goals. During the past seven years, I have had the opportunity to participate in the Experimental Stewardship Program (ESP), first in Montana and now in northeastern California. This program has provided that bridging mechanism, bringing together a variety of interest groups to resolve resource management issues.

Genesis of the stewardship idea

The Experimental Stewardship Program originated because of controversy over the poor condition of our public rangelands. In 1973, charging that uncontrolled livestock grazing was destroying valuable vegetation, wildlife habitats and wetlands, several conservation groups filed a lawsuit in Federal District Court asking the Bureau of Land Management (BLM) to prepare environmental impact statements (EIS) assessing the environmental impacts of its livestock grazing program.

Given the enormity of the task, there was little time for BLM to involve local livestock permittees and other interest groups in the planning process. The court-ordered process went forward nevertheless, and produced grazing EISs on BLMs Challis and Tuledad/Home Camp Planning Units. They were among the first to be completed. Both issued site-specific grazing decisions calling for huge reductions in permitted livestock use. Faced with the prospect of losing their ranches and a way of life handed down for generations, ranchers fought back, appealing the majority of the grazing decisions made. The ensuing controversy prompted Congress to enact the Public Rangelands Improvement Act (PRIA) of 1978.

In PRIA, Congress acknowledged the enormous expense and waste involved in planning efforts which result in decisions that can not be implemented due to appeals and controversy. Congress asked the agencies to develop a public involvement process that would achieve support for and commitment to rangeland improvement.

In order to foster a greater degree of cooperation and coordination between range managers and range users, Section 12(a) of PRIA directed the Secretary of the Interior and the Secretary of Agriculture *to develop and implement, on an experimental basis...a program which provides incentives to, or rewards for, the holders of grazing permits...whose stewardship results in an improvement of the range condition of lands under permit or lease.*

During 1979 and 1980, three Experimental Stewardship Program (ESP) areas, the Challis in east-central Idaho, the Modoc-Washoe in northeastern California and northwestern Nevada, and the East Pioneer in southwestern Montana, were authorized. More than nine million acres of BLM, Forest Service, State, and privately-held rangeland are included.

Although the three ESPs operated independently, each provided for equal participation by a wide variety of individuals, agencies and groups; each appointed a working group of technical experts to address the resource issues within an allotment; and each agreed to reach decisions only by *consensus*, or unanimous agreement.

One decade of ESP implementation. What has been accomplished?

•By seeking alternatives for range improvement other than livestock reductions, most of the original grazing decision appeals were negotiated and resolved. By 1985, project managers reported to Congress that 50 new AMPs were developed calling for a combination of intensive grazing strategies and structural and nonstructural range improvements. In spite of the lack of official sanction from the Congress, all three Experimental Stewardship groups continue to work toward developing consensus solutions to land management issues—a testimony to Stewardship's bridging success.

• Throughout the ESP, many positive changes are evident. Four wildlife habitat and three wildhorse management plans were completed and range condition monitoring was initiated on 25 additional allotments. Riparian areas are slowly being restored; aspen, bitterbrush and Great Basin wild rye are growing again; and watersheds and fisheries habitat are steadily improving.

•As agency resource managers, we have learned that our role is to facilitate the trust and commitment that comes with knowing that "none of us is as smart as all of us." We strongly endorse the first Chief of the Forest Service, Gifford Pinchot's, third maxim which states: *It is more trouble to consult the public than to ignore them, but it is what you were hired for.* In the past two years on the Modoc National Forest, cooperative work with the Modoc-Washoe Experimental Stewardship Program and the Modoc County Cattlemen's Association has resulted in increased awareness and positive action toward improved management on 10 of the Modoc Forest's 88 Allotments.

Problems to be solved

For the first time, the Modoc is facing intense scrutiny by organized environmental

groups opposed to livestock grazing. This could be our next "Spotted Owl" conflict. With 360,000 acres of rangeland and more than 9,000 acres of riparian area in poor condition, we are being challenged to justify continued livestock grazing. At the same time, livestock permittees are being asked to assume increased management responsibility, while accepting equal participation by non-livestock interests in allotment management planning for their allotment—a situation ripe for conflict. A great deal is at stake. On the environmental side is a pervasive sense that livestock are continuing to abuse fragile range and riparian areas. On the industry side, at stake is a way of life, the economic viability of ranching operations and rural communities in a county already hard-pressed. The future of rangeland stewardship on the Modoc is dependent on our ability as resource managers to bridge these differences in viewpoints and to implement rangeland improvements.

Cornerstone planning and implementation

Electing to be pro-active rather than reactive, we developed a Vision for Rangeland Management on the Modoc which implements a "New Perspectives" approach. Its four cornerstones include:

(1) ensuring that the allotment management plans we develop are consistent with Forest Plan direction;

(2) basing our resource management decisions on ecological information and achieving the desired plant communities;

(3) ensuring that our standards for permit administration, compliance, monitoring and evaluation are consistent; and

(4) providing for meaningful public participation throughout the allotment planning process.

Our last step was to plan how to accomplish the cornerstone objectives. For example, in order to achieve the third cornerstone we got back to basics: standardizing the way we measure livestock utilization; establishing 2210 Allotment Case Files using a consistent format; establishing minimum standards for allotment inspections and documentation; and emphasizing a No Surprises philosophy by ensuring good two-way communication with permittees and our public.

A greater challenge for the Forest Service is the need to base our management decisions on ecological information. Our existing range data is over 20 years old and while information about livestock forage availability is provided, limited information is available to address more complex issues such as biodiversity, wildlife habitat and forage values, or the ecological status of our rangelands.

To collect needed ecological information, we implemented an interdisciplinary approach to rangeland inventory in 1991. The 50,000 acre Boles Cattle Allotment is the initial project area. Our inventory objective is to collect the information needed to address habitat conditions for the Shortnose, and Lost River Suckers, Endangered species; habitat and forage for the California/Oregon Interstate Deer Herd, resident pronghorn antelope, and a wildhorse population presently 40 percent above established herd levels. Using ECODATA sampling procedures and ECOPAC analysis programs from the Forest Service's Northern Region, an interdisciplinary team of resource specialists gathered ecosystem data and mapped both existing and potential vegetation on Boles.

Presently, the team is developing a habitat type classification, generating resource values to address the site-specific resource issues of watershed and fisheries habitat conditions, forage availability for livestock, and forage availability and hiding cover for wildhorses, deer, antelope and sage grouse. By contrasting the existing and potential vegetation and comparing the resource values represented, desired plant communities and a preferred grazing strategy will be selected for long-term management of the Boles Allotment.

In 1992, we plan to conduct coordinated inventory of an additional 100,000 acres of rangeland. To achieve our second cornerstone objective of basing resource management decisions on ecological information, our goal is to complete a habitat type classification for the Modoc National Forest's rangelands and to inventory and map about half of the Forest's rangelands by 1996.

Meeting the requirements of NEPA and the Forest Plan

Another enormous challenge for the Modoc is the need to meet requirements of the National Environmental Policy Act (NEPA) of 1969 and the National Forest Management Act (NFMA) of 1976 as we develop our allotment management plans. Our Forest Plan was issued in December, 1991, after nearly a decade of land management planning. At the present time, only seven of our 88 grazing allotments have AMP's which would meet NFMA and NEPA requirements.

Coupled with the need to meet NFMA and NEPA requirements, is the need to ensure that meaningful public participation occurs throughout the allotment planning process. In our Vision for Rangeland Management, we acknowledge that our success ultimately hinges on the understanding, agreement and commitment of our public—our fourth cornerstone objective. Taking the lessons of Stewardship, we have developed an approach to public participation in Forest Plan implementation that is innovative, dynamic, flexible and consensus-building. The approach was adopted by the Modoc-Washoe ESP in February, 1991.

Inviting the public in: the Bear Camp example

The basic premise for the approach is simple. Through a series of consensus building loops, the public is provided with an opportunity to discuss, consider, and reach agreement before moving on in the planning process (see Figure 1). Using the ongoing Bear Camp Allotment planning effort within the Modoc-Washoe ESP as an example of the process, we find three distinct phases of public participation and planning occur.

In the first phase of the planning process or NFMA, the Forest's goal is to identify all possible management practices which could be implemented to improve the allotment's resource conditions. Twenty five possible practices were identified for Bear Camp ranging from more intensive grazing management, to riparian exclosures, to creation of transitory forage through commercial timber harvest. Next, the Forest identified which of the 25 practices were ready for decision (practices which could be implemented within the next three to five year period). "Ready" Practices were then assessed as to potential cumulative effects.

As a checkpoint with the Forest Plan, "ready practices" were also examined for consistency with Plan direction. About 12 of the 25 possible practices were "ready" for decision, consistent with the Forest Plan, and supported the need to improve grazing management. As a result, the 12 practices were Proposed for Action and detailed environmental analysis in the second planning phase or NEPA.

How did the public help with phase one? Our objectives for public participation in this phase were clearcut. First, we identified the public most likely to be interested in or concerned about a grazing management decision for Bear Camp. Included were the livestock permittees, State Water Quality Control Board, California Department of Fish and Game, Sierra Club, and Cal-Trout. This group formed our public working group, or Technical Review Team. Second, we wanted our public participants to reach consensus about the Existing and Desired Resource Conditions for the allotment and to reach agreement about the question: "What needs to be done?" The answers to this question represent the opportunity we have for resource improvement on the Bear Camp Allotment.

To reach agreement about our management opportunities, several allotment visits were scheduled. At specific sites of concern, Forest resource specialists discussed existing and potential conditions from their perspective. Participants discussed and con-

sidered the information presented and summarized the information into opportunity statements. As an example, one opportunity we identified was the need to improve streambank stability to a minimum of 80 percent. With consensus about what actions were needed, we then explored the question: "How can it be done?" Practices identified by the group to improve streambank stability included more intensive grazing management, protective fencing, riparian exclosures, establishing livestock utilization at light to moderate levels (25-40 percent by weight of total forage), and total rest.

Public participation for the NFMA phase was concluded by our working group reaching consensus about the practices to be carried forward into more detailed analysis based on the criteria of readiness for decision, potential for cumulative effect, and connectedness to our primary objective of developing an allotment management plan and improving grazing management.

The Forest's goal in the second planning phase or NEPA, is to conduct an interdisciplinary environmental analysis of the proposed action(s) and to determine the significance of the environmental effects. In this phase, our objectives for public participation focus on identifying specific concerns about the proposed action and its alternatives. On Bear Camp, we conducted additional public scoping to ensure that we had identified *all* the issues pertaining to our proposed activities. Another aspect of public participation was to ensure that we had considered all reasonable alternatives for management. As a result of this public checkpoint, six key resource issues were identified. The working group concurred with the four management alternatives developed by the Forest Interdisciplinary Team and developed one additional management alternative to be considered.

In the NEPA phase, our public group also served as a checkpoint to reach consensus about the indicators of measure to be used to display and compare environmental effects. By reaching consensus about the key issues, the range of alternatives to be analyzed, and the indices of measure, we were able to objectively evaluate and compare each alternative, and are approaching a group consensus about the specific management objectives and preferred strategy for long-term management of the Bear Camp Allotment. Most rewarding is that the entire process has evolved to the point of decision over a six month period, despite controversial issues such as riparian and watershed management, permitted livestock use, sensitive fish and their habitat, and mule deer forage.

The third and final planning phase lies ahead for Bear Camp. During FEEDBACK, the selected alternative from NEPA will be documented in an Allotment Management Plan. Once the AMP is implemented on-the-ground, monitoring and evaluation will be completed to ensure that agreed upon management objectives are achieved. The focus for public involvement in this phase is to invite participation in monitoring and to provide periodic reports of our findings to ensure that there are No Surprises if an adjustment in permitted use or management is needed. We are also placing increased responsibility on the permittees for grazing system compliance and utilization monitoring thereby ensuring that livestock are moved promptly when allowable use has been reached.

Conclusion

The Bear Camp example demonstrates that the Stewardship approach can lead to success. In our experience, success is most easily achieved when agency resource managers are courageous enough to trust in the process and are willing to share their decision-making power equally with the public. We have come to understand that the agency is a full player and has an equal voice. Ultimately, any consensus decision that is reached is our decision.

We also recognize that the benefits outweigh the costs. While consensus decision-making tends to be more time-consuming and expensive up-front, the payback is decisions that can be implemented without costly appeals, delays and controversy—and in the end, if consensus simply can *not* be reached, we can proceed with making a decision based on the very best input the public has to offer.

The keys to successful public participation are perhaps best summarized by Doc and Connie Hatfield, ranchers from Brothers, Oregon. Through their experiences with coordinated resource management planning for their own ranching operation and work with the Orgeon Watershed Coalition, the Hatfields have developed a workshop emphasizing the keys to building trust and communication. They are:

•Invite participation.

•Provide everyone with an opportunity to say what they feel.

•Listen with respect.

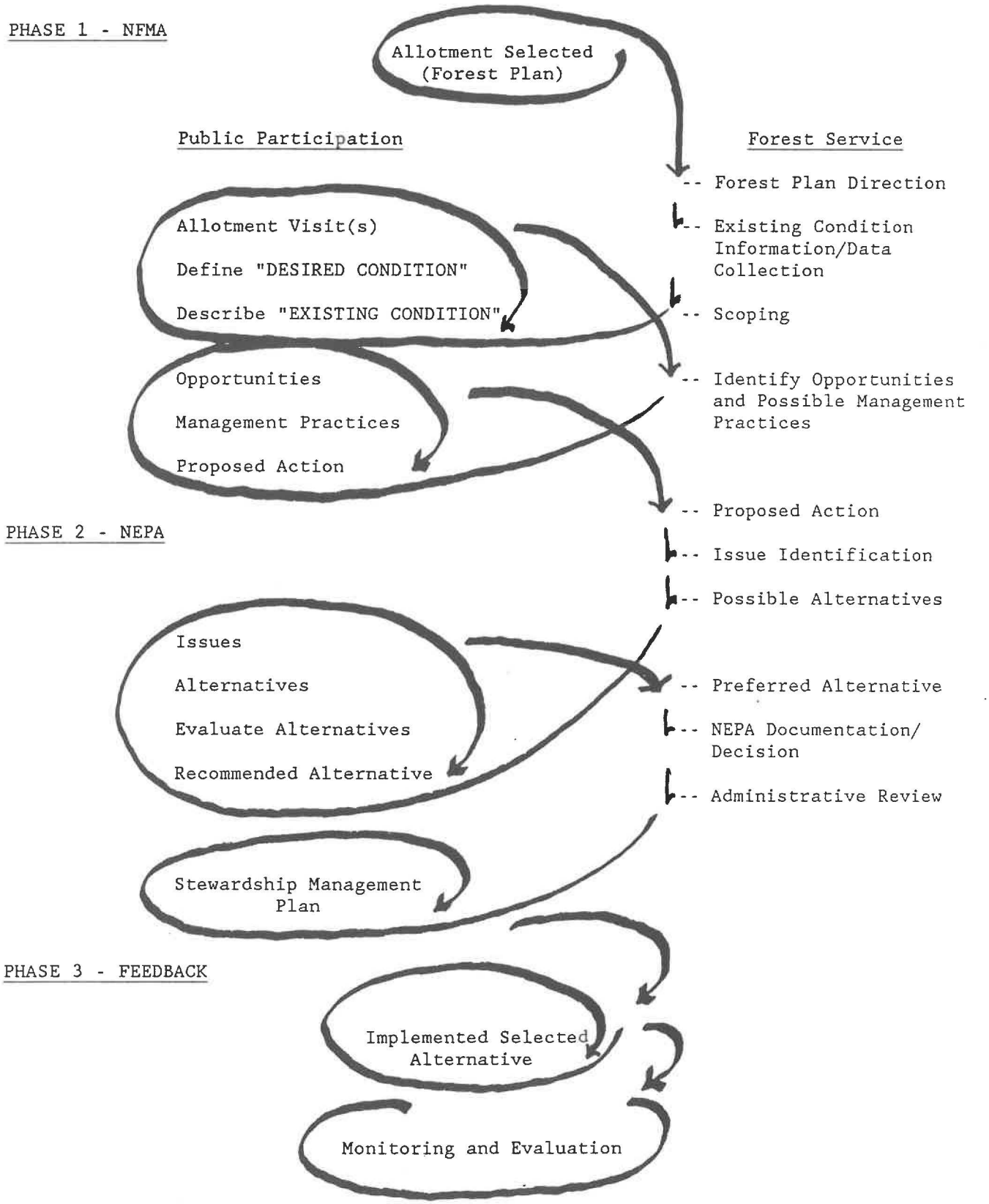
•Get out on the ground. Talk about the existing condition everyone sees and agree on a desired future condition.

•Ask: "What actions can we take?"

The keys to success are straightforward– finding the time is the real challenge. During the past 10 years, Experimental Stewardship has repeatedly demonstrated that we can build trust, provide for effective communication, and achieve tangible improvement in range and riparian conditions. How can we market these achievements to our bigger and sometimes anti-grazing audience? Sharing our successes is an effective tool. Establishing demonstration areas, sharing data that supports tangible improvement, and making objective decisions based on sound ecologic information is essential.

Susie Stokke is Resource Staff Officer for the Forest Service's Modoc National Forest (Alturas, California). She provides leadership for the Forest's range, air, watershed, ecology, and wildlife and fisheries programs. Since coming to the Forest in February 1990, Stokke has completed strategic plans for the range and watershed programs with the goal of implementing a Change on the Range/New Perspectives approach to range and riparian management. From 1984 to 1990, Stokke worked on the Beaverhead National Forest in Montana where she was involved extensively with the East Pioneer Experimental Stewardship Program (ESP). Prior to that work she had range conservationist assignments on the Little Missouri National Grasslands in North Dakota, and on the Humboldt and Umatilla National Forests in Nevada and Oregon. She holds a Bachelor of Science in Range and Wildlands Science from the University of California at Davis. This article is an expanded version of a paper presented at the Range Ecology Working Group session at the Society of American Forester's National Convention held at San Francisco in August 1991.

Figure 1. The Stewardship Model for Public Participation



Jessie A. Micales

Research In Progress

Focus on: Researchers in The Park Service

Increasing the Effectiveness of Park Protection
Christine Schonewald-Cox

The 1980s were a popular time for designing idealized reserves and for modeling self-sustained or minimum viable population size. These were valuable years for measuring species diversity and determining the distribution of biomass among species on islands. Principles from these studies were extended to continental habitats, especially parks which create an island-like reserve. Researchers now know that species presence does not automatically indicate that individuals are reproducing, and thus forming a viable population. The number, diversity, and relative abundance of a species may depend on its isolation, its exposure to outside influences, or a combination or both. A population's demography, its genetics, and its interaction with humans all affect its survival. The task of analyzing what affects the success of protection is now known to be a complex topic that encompasses many fields.

During the last decade, I have focused on increasing the effectiveness of protection. I began to look for answers to species survival in genetics and demography. This led me to evaluate the spatial requirements of viable populations. Can a park or reserve really be considered a homogeneously protected area devoid of outside influences? Is an area that is 1000 square kilometers offering 1000 square kilometers of protection? All practical evidence suggests not. The difficulty of incorporating "practical" and anthropogenic information into models and park designs requires a very flexible paradigm that can incorporate the apples and oranges of biological, physical, and human data. My colleagues and I have depended increasingly on mapping technology and landscape ecology, using empirical, geometric, and cartographic data. We try to superimpose classical ecological factors on the mosaic of human influence and values.

Dr. Kenneth E. Watt and I are currently conducting a project to develop our predictive capabilities for use in planning protection. The project consists of several phases. First we are conducting a historical survey to identify patterns of human dispersal and consumption on rural land and resources. Our computer simulations of human development test the hypotheses we have gathered from historical data. In addition, we are conducting detailed site-specific studies. The first major field test is in the San Francisco Golden Gate National Recreation Area and the Biosphere Reserve that extends north and south of the park. This study will aid the park in deciding which landscape changes should be made in the future. Since this project is in an urban area, the results will be accelerated compared to what would happen in a remote setting. The historical perspective is crucial in forecasting change. We are also examining other older urban centers to decide whether our simulations have a general application.

Whether our interest focuses on urban parks or more remote reserves, the ability to protect natural resources in the future rests on how we anticipate and prepare for the effects of landscape changes on the species in the park and on the ecosystem of the park itself. This is a most challenging and rewarding subject to pursue and should carry our group well through the 1990's.

Christine Schonewald-Cox obtained her M.S. and Ph.D. from the University of Maryland. She joined the Cooperative Park Studies Unit of the U.S. National Park Service at U.C. Davis in 1984. She is also an adjunct faculty member.

Gypsy Moth Management in the National Capital Region
Christine Favre

The gypsy moth, (*Lymantria dispar*), was introduced into North America in the late 1860's by the French scientist Leopold Trouvelot. Trouvelot brought the gypsy moth from Europe to his home in Massachusetts hoping to breed it with a native silk-producing moth. In 1869, several gypsy moths escaped from his lab and became established in the wooded areas surrounding his home in Medford. The gypsy moth has been gradually eating its way south and west ever since.

The gypsy moth was first detected in the National Capital Region (NCR) of the National Park Service in the late 1970's. Geographically, the NCR is the smallest region of the Park Service, although it administers several park units in Washington, D.C., Maryland, Virginia, and West Virginia. These parks range from highly developed landscapes, such as the National Mall and the White House, to more natural areas, including the 17,000 acre Prince William Forest Park in Virginia. Many of these parks have high oak populations—the preferred host species of the gypsy moth.

The first treatment for gypsy moth in the NCR was conducted in 1982 at the

Catoctin Mountain Park in northern Maryland. Over 5000 acres were aerially treated with the biological insecticide *Bacillus thuringiensis* (BT). At the same time, gypsy moth egg masses were appearing farther south in Rock Creek Park in the District of Columbia. The staff at NCR's Center for Urban Ecology (CUE) developed a gypsy moth Integrated Pest Management (IPM) program with guidance and funding from the Forest, Insect, and Disease Management program of the U.S. Forest Service. The management goal of this program was to minimize the amount of acreage treated and to limit tree defoliation and mortality.

The CUE conducts research and provides technical assistance to National Park Resource Managers to further their understanding and improve their management of park resources. The Center employs seven scientists and about 15 support personnel who specialize in soil science, aquatic resources, urban wildlife, plant ecology, plant pathology, and entomology. The Center provides a unique opportunity for many diverse disciplines to work together in providing integrated insight and solutions to park management issues.

As the gypsy moth infestation grew throughout the northeastern area of the United States, other NCR parks were gradually incorporated into the management program. In keeping with an IPM approach, CUE applied a variety of control methods in conjunction with intensive monitoring. Two tactics we explored were mating disruption, using pheromones, and gypsy moth parasite releases. These methods are most effective in isolate, low density gypsy moth populations. Although we noted success with these alternative in the short term, they became impractical as the population increased beyond their range of efficacy.

In the mid-1980's, the NCR became part of what is known as the "generally infested area" with the leading edge of the infestation approaching the southern reaches of Virginia. In order to achieve our management goals, it became necessary for us to rely on BT and a limited supply of Gypchek. Gypchek is an insecticide prepared from gypsy moth larvae that have been killed by the nucleopolyhedrosis virus (NPV), a naturally occurring disease that is specific to the gypsy moth. The insecticide is not in commercial production, but it is produced in limited quantities by the U.S. Forest Service. Gypchek is the insecticide of choice for the National Park Service due to its specificity for the gypsy moth. Since 1982, we have treated over 50,000 acres. The most intensive year was 1989 when we treated 14,000 acres involving 10 different parks.

Just as the gypsy moth population has grown, so have my responsibilities. Starting as a biological technician at CUE in 1987, I worked with a team on project planning and field monitoring. In 1989, as the project reached its peak, I became the Regional Forest Pest Management Assistant responsible for managing the gypsy moth IPM program. I plan for anticipated work needs, coordinate activities between personnel of the National Park Service and the U.S. Forest Service, monitor gypsy moth populations in the field, evaluate field data to determine areas needing treatment, contract for aerial spraying, and plan the budget!

The NCR shares borders with many other federal, state, and county jurisdictions in Maryland, West Virginia, Virginia, and the District of Columbia. In 1987, an ad hoc committee of gypsy moth project managers from these jurisdictions recognized the need to coordinate activities and to cooperate on suppression projects. Since 1987, the resulting Metropolitan Washington Gypsy Moth Coordinating Committee (MWGMCC) has grown to include 15 jurisdictions and over 30 members.

Through the MWGMCC group, the NCR coordinated with adjacent county spray programs in both 1988 and 1989. The peak of cooperation occurred in 1990 when the NCR assumed management of a multi-agency aerial spray contract involving 12,000 acres and participants from seven federal jurisdictions, including the Army Corps of Engineers, Beltsville Agricultural Research Center, NASA-Goddard Space Flight Center, National Arboretum, the Mid Atlantic Region and NCR of the National Park Service, and the Patuxent Wildlife Research Center. Although a project of this magnitude involves numerous organizational and logistical hoops, this cooperative effort actually facilitated project management for all participants. Coordination meant more effective control, safer operating conditions, and cost savings. The project worked so well in 1990 that we developed and coordinated a similar program in 1991 involving six jurisdictions and approximately 8500 acres.

Since 1989, gypsy moth populations in the NCR have gradually declined. In 1992, we targeted treatment for only 1200 acres in five parks. The decline was expected and likely caused by increased natural parasite and predator activity as well as insecticide treatments.

We have been pleased with the foliage protection achieved by both BT and Gypchek. Throughout our management program, we have suffered very little noticeable defoliation in the treated areas. Although not measured directly, public responses to treatments for the gypsy moth in the NCR have been positive. We have thus far avoided any negative public reaction through the use of the media, increased public awareness in the parks, intensive monitoring, and the use of biological insecticides.

Christine Favre received a B.S. in Forest Biology and a B.A. in French from Utah State University Logan. She is also involved with the Dutch elm disease management program in the NCR.

Research in Progress

If you have a research project which would interest our readers, give us a brief overview, your own contributions to the research, and what you expect the outcome to be.
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THIS STUDY OF THE PRINCIPLE PLAYERS IN THEIR ROLES AS GROWTH INHIBITORS IS FASCINATING.

FOREST ALLELOPATHY: A REVIEW OF THE LITERATURE

LORI PAYNE

INTRODUCTION

Allelopathy is defined as the chemical interaction between plants or plants and microorganisms and it is thought to play an important role in plant evolution, succession and adaptation (Whittaker and Feeny, 1971). There have been attempts to exploit these interactions in agriculture as a means of reducing the amount of synthetic pesticides used in commercial agriculture. Some chemical manufacturers have tried to design pesticides based on natural products to selectively inhibit the growth of a target weed species. Because of the large market for herbicides in commercial agriculture and forestry, allelopathy may be important economically as well as ecologically.

Despite the potential of allelopathy, there is much to learn about the specifics of plant-plant or plant-microorganism interactions. The issue is complicated by physical interactions such as light, water and nutrient competition which may occur coincidentally with the chemical interactions. Microbial activity and soil characteristics may mitigate allelopathic effects or exacerbate them. Allelopathy has been implicated in many instances, but it is difficult to demonstrate conclusively. Only in a small percentage of cases has the causal chemical substance(s) been isolated and identified.

The forest ecosystem is complex, both in space and in time. Long-lived forestry species may allow allelochemicals to build up over time, therefore modes of action may be different in forest ecosystems when compared to seasonal agricultural ecosystems. This review endeavors to collate the information available about five groups of forestry species: conifers, *Juglans*, *Eucalyptus*, other broadleaf species, and tropical forest species. The focus of the present review is the allelopathy of forestry species: either the chemical effect of a tree on surrounding plants or the chemical effect of associated plants on trees. An attempt has been made to highlight those studies in which compounds have been isolated and identified. Other studies mentioned demonstrate the widespread role allelopathy may play in forestry. A summary table by species is presented at the end of the article.

ALLELOPATHY IN THE TEMPERATE FOREST AND THE "REPLANT" PROBLEM

Eucalyptus

In some elegant early work in allelopathy by del Moral and Muller (1970), several allelochemicals produced by *Eucalyptus camaldulensis* were identified that were phytotoxic to grasses. The authors were able to eliminate differential grazing, seed removal and competition for light or nutrients as explanations for the observed inhibitory effects. As is frequently the case, the nutrient and moisture levels below the *Eucalyptus* trees and litter was the most favorable. Several terpenes were identified from the macerated leaves by gas-liquid chromatography. These volatile terpenes were absorbed onto the colloidal material of the soil. Even absorbed, they still retained their toxicity. The colloidal material tended to concentrate the toxins. This was exacerbated on poorly drained soils. Ten phytotoxic phenolic compounds from the leaf leachate were detected.

None of the grasses studied invaded the *Eucalyptus* stand although they were abundant in the surrounding area. Only seedlings of *Eucalyptus* itself were observed among the *Eucalyptus* trees, but these survived no more than a year. However, *Eucalyptus* was one of the least sensitive species in the bioassays. The grass species affected were *Avena fatua*, *Bromus rigidus*, *B. mollis*, *Festuca megalura* and *Trifolium hirtum*.

Another study by del Moral and Muller (1969) involved the constituents of *Eucalyptus globulus* fog drip. The concentrations of the phytotoxins identified in the fog drip seemed sufficient to cause the retardation of grasses below the *Eucalyptus* canopy. The grasses tested were the same as those previously mentioned. The only tree species included in the bioassay was *Eucalyptus*.

In further studies by del Moral *et al.* (1978), *E. baxteri* was found to be allelopathic towards the tree *Casuarina pusilla* and the shrub *Leptospermum myrsinoidea* in the field and in the laboratory. *L. juniperinum* and *Xanthorrhoea australis* seemed to be tolerant. The foliar and litter extracts contained phenolics as well as glycosides and terpenoids. No free phenolics were isolated from the soil, yet it maintained allelopathic activity. The authors suggested degradation and polymerization of the phenolics did not alter their toxicity. Indirect evidence pointed to leaching of the crown as being the mechanism of allelochemical transfer. Nutrient or moisture competition was eliminated as a cause of the growth suppression. *E. nitida* was not allelopathic but unfortunately this species was not analyzed for phenolic content.

Al-Mousawi and Al-Naib (1976) observed *Eucalyptus microtheca* grew in pure stands in central Iraq. They identified three volatile terpenes and five water soluble inhibitors in *E. microtheca*.

Eucalyptus can be allelopathic against crops as well as grasses. *Eucalyptus tereticornis* has been implicated in allelopathy against sorghum (Suresh and Vinaya Rai, 1987), *E. camaldulensis* and *E. citriodora* against *Capsicum annuum*, *Lycopersicon esculentus* and *Abelmuschus esculentus* (Igboanugo, 1986), and *E. citriodora* against lettuce (*Lactuca sativa*) and garden cress (*Lepidium sativum*) (Nishimura *et. al.*, 1984). Nishimura *et. al.* (1982) isolated a racemic mixture of a terpene diol from the volatile fraction of *E. citriodora* that seemed to be the cause of the allelopathy towards lettuce, garden cress, green foxtail (*Setaria viridis*) and barnyard grass (*Panicum crus-galli*). However, these chemicals had no affect toward rice or *E. citriodora* itself. Crow *et al.* (1971, 1977) isolated a root inhibitor from the

tissues of *Eucalyptus grandis* that they named grandinol. Grandinol was inhibitory to watercress germination and mung bean rooting. *Eucalyptus* species have been implicated in toxicity to many other crop species (Swami Rao and Chandrashekara Reddy, 1984).

Ten *Eucalyptus* species were tested in bioassays for allelopathic potential by May and Ash (1990). The bioassays included *Lolium perenne* germination test, *Lemna minor* growth bioassay and a growth assay of *Lolium perenne*, *Acacia saligna* and *E. globulus* seedlings. Care was taken to try to mimic natural environmental concentrations. At these concentrations, none of the fresh foliage, root, leaf or bark litter leachates were inhibitory, except for litter leachate from *E. macrorhyncha*, bark litter leachate from *E. rossii*, and leaf litter leachate from *E. rubida*. At higher concentrations, decomposing litter leachate was inhibitory in the following order: *E. mannifera*, E. *blakelyi*, *E. polyanthemos*, *E. globulus*, *E. rubida*, *E. melliodora* and *E. elata* (most inhibitory). Leaf and bark leachates were inhibitory in collected soils whether the leachate was added in concentrated form or concentrated by evaporation in the soils. This data indicates that the allelochemicals were not irreversibly bound to the soil and could be concentrated by evaporation under natural conditions. Leachates added to autoclaved soils were less inhibitory. In addition, the authors suggested that an often overlooked source of allelochemicals is stemflow, especially from fibrous barked trees.

In an interesting twist to the *Eucalyptus* allelopathic story, it has been reported that the frass of an insect is the allelopathic agent. Trenbath and Fox (1976) reported that insect frass and leaves of *E. bicostata* are germination inhibitors. Silander *et al.* (1983) demonstrated that the frass from the chrysomelid beetle which feeds upon *E. globulus,* is allelopathic to grasses at very low levels. This allelopathic phenomenon varies in a dose dependent manner and is species specific. However, Ohmart (1985) has refuted Silander's claims that this phenomenon is ecologically important.

Conifers

Allelopathy has been implicated in forest regeneration problems. Frequently these complications have been attributed to competition for light, water or nutrients. However, only in a few cases has competition been demonstrated conclusively and allelopathy completely ruled out. Unfortunately regeneration problems are rarely documented well enough to discern the exact cause of tree growth failure.

Several foresters have noticed that loblolly pine (*Pinus taeda* L.) is slow to regenerate naturally in areas where seed trees are abundant. Although this phenomenon had been attributed to competition, Gilmore (1980 and 1985) found that water extracts of foxtail (*Setaria* sp.) inhibited loblolly pine germination and radicle elongation when grown in a stair step apparatus where nutrient, light and moisture regimes were identical in control and treatment pots. Potassium uptake was impaired. Gresham (1987) found that loblolly pine seed germination and the above and below ground growth was inhibited by aqueous leaf extracts of the tallowtree (*Sapium sebiferum*) in coastal South Carolina. Tannin content could only partially explain this effect. Inhibition was greater when artificial soil was used as compared to forest soil. Wheeler and Young (1979) at the Southwest USDA Forest Service Branch Station noted that loblolly pine plantations grew better when seedlings were planted in bermudagrass sod versus fescue sod. A water soluble chemical from fescue (*Festuca arundinacea)* was implicated. Hollis *et al.* (1982) demonstrated that foliar leachates from dogfennel (*Eupatorium capillifolium*) and fetterbush (*Lyonia lucida*) reduced the growth of seedlings of loblolly pine and slash pine (*Pinus elliottii*). Growth reduction could be seen in the field one year after the slash pine seedlings were planted into fetterbush debris.

Priester and Pennington (1978) isolated compounds from broomsedge (*Andropogon virgincicus*) that reduced growth, root, needle and crown length and oven dry weights of loblolly pine. Thirteen phenolics were isolated which were inhibitory in a radish seed bioassay. Aqueous extracts of both dead and live leaves were inhibitory and they were also inhibitory to *Rhizobium* sp. The authors suggest that these interactions may be important in successional ecology in the southwest.

Pinus radiata may produce a chemical which is autotoxic or toxic to the mycorrhiza needed for its growth. Aqueous extracts of the inner bark of roots from old *P. radiata* trees caused complete inhibition of the growth of a mycorrhizal fungus, root necrosis and wilting of *P. radiata* seedlings (Chu-Chou, 1978). In Australia, *P. radiata* seedlings growing in grass did not have associated mycorrhizal fungi, but seedlings growing in eucalypt soils did (Theodorou and Bowen, 1971). Leachates from the grass may inhibit mycorrhizal fungi, or alternatively, the lack of a mycorrhizal host in the grassland areas retards its infection of *P. radiata.* Lill and McWha (1976) found that *P. radiata* litter produced volatile ethylene which inhibited the growth of its own seedlings as well as white clover and perennial ryegrass seedlings. The concentration of ethylene produced by incubated litter material in the lab was near maximal inhibitory levels. It was unclear whether the ethylene produced by the litter was due to senescence or the activity of microorganisms.

Inhibition of mycorrhizal fungi growth may be involved in jack pine (*Pinus banksiana*) allelopathy in Finland. Although Brown and Mikola (1974) found that extracts from *Prunus pumila*, *P. serotina*, *Solidago uliginosa*, *S. juncea* and *Salix pellita* severely inhibited the germination of jack pine, they found that soil lichens (*Cladonia* spp.) did not affect germination but severely inhibited jack pine growth. This growth inhibition was due to a lack of associated mycorrhiza. The sensitivity of different species of mycorrhizal fungi varied with *Pazillus involutus* being one of the most sensitive. Interestingly, the *Cladonia* spp. differed in their "allelopathic strength." *C. alpestris* was the most inhibitory. This species is also a climax species. In later studies, Brown and Slavick (1983) demonstrated this same phenomenon in Michigan. Brown (1967) also showed that *Prunus pumila*, *Gaultheria procumbens* and *Solidago juncea* significantly affected the germination of jack pine. Fisher (1979) showed that *Cladonia rangiferina* and *Cladonia alpestris* reduced jack pine and white spruce (*Picea glauca*) growth and ^{32}P accumulation. Some of effects of *Caladonia* may have been from inhibition of mycorrhizal fungi which promote nutrient absorption, especially phosphorus uptake. None of the studies on *Pinus banksiana* resulted in the identification of the causal compound(s).

Monoterpenes and a sesquiterpene from Scots pine (*Pinus silvestris*) inhibited the growth of the mycorrhizal fungi *Boleus variegatus* and *Rhizopogon roseolus* (Melin and Krupa, 1971). The two fungi differ in their sensitivity to the vapor of the terpenes. The terpenes are growth inhibitors only and are not fungitoxic or disruptive to spore germination. Earlier work had shown that pine roots increase production of volatile compounds when they become infected with the fungi (see discussion in Melin and Krupa, 1971). The production of the terpenes by *P. silvestris* may limit the spread of the fungi and probably is important in the ecology of this symbiotic association.

Several researchers have demonstrated that herbaceous species can affect the growth of pines. Rietveld (1975) found that Arizona fescue (*Festuca arizonica*) and mountain muhly (*Muhlenbergia montana*) inhibited the germination and growth of ponderosa pine (*Pinus ponderosa*) even when the grasses were mechanically removed before seeding. A USDA Forest Service report on ponderosa pine identified a glycoside as the responsible allelochemical from the Arizona fescue and mountain mulhy extracts (Schubert, 1974). Yoder-Williams and Parker (1987) found that *Pinus jeffreyi* does not regenerate after fires where *Wyethia mollis* Gray dominates in the Sierra Nevada. Laboratory bioassays confirmed an allelopathic affect on *P. jeffreyi* seedlings by *W. mollis* (Parker and Yoder-Williams, 1988).

Common orange hawkweed (*Hieracium aurantiacum*) inhibited the growth of *Pinus strobus* and *Abies balsamea* in laboratory and greenhouse studies (Dawes and Maravolo, 1973). *Abies* and *Pinus* seeds germinated and grew in sand which previously supported *Hieracium*, but survival was greatly reduced. In the field, only two *Populus* species invaded bracken grasslands where *Hieracium* was present whereas *Betula papyrifera, Abies balsamea, Pinus strobus* and *Pinus resinosa* did not invade the grasslands even though they were present along with the *Populus* species in the surrounding forest.

In contrast pine can be the allelopathic donor species that affects the growth of understory plants. The understory growth in a pine forest is frequently specific and sparse. Jameson and Dodd (1969) reported that herbage production under pinyon-juniper forest differed depending on the soil type. These differences did not appear to be due to soil moisture, nitrogen, or phosphorus and fertilization increased the differences. Lee and Monsi (1963) termed the red pine forest (*Pinus densiflora*) one of the "brightest" due to the sparse vegetative growing beneath the relatively open canopy. In greenhouse experiments, leaf and root extracts greatly inhibited the germination of the weed seeds *Amaranthus* and *Achyranthes* but did not affect the germination of *P. densiflora* itself. Red pine soil inhibited the growth of *Amaranthus, Achyranthes, Phytolacca, Chenopodium, Setaria* and *Galinsoga* which were rarely found growing in the forest, whereas the growth of *Pinus, Miscanthus, Atractylis* and *Paederia* was unaffected by the soil. Jobidon (1986) found that fresh leaf and leaf litter leachates of *Pinus resinosa, P. divaricata, Picea mariana*, and *Thuya occidentalis* inhibited the germination of four weeds, *Phleum pratense, Poa pratensis, Agropyron repens* and *Epilobium angustifolium* in a dose dependent manner. Aqueous extracts of blue spruce (*Picea pungens*) affected the germination and seedling growth of several grass species and lettuce (Thompson, 1974). Idaho fescue (*Festuca idahoensis*) and Sandberg's bluegrass (*Poa sandbergii*) did not grow within the needle litter of the soil under the litter of singleleaf pinyon (*Pinus monophylla*) and juniper (*Juniperus osteosperma*) (Everett, 1986). Several commercial species did not grow under these conditions either. The author suggested that the allelopathic agents of *P. monophylla* may be its monoterpenes.

Pines may also affect the growth of other trees growing near or under them. Leachates from slash pine (*Pinus elliotii*) as well as from hoop pine (*Araucaria cunninghamii*) and crows ash (*Flindersia australis*) inhibited the growth of hoop pine in Australia (Bevege, 1968). Depression of phosphorus levels and uptake in the hoop pine suggested that inhibition of mycorrhizal fungi may be involved. Tobiessen and Werner demonstrated that hardwoods growing under a red pine (*Pinus resinosa*) plantation were not infected by a vesicular-arbuscular fungi whereas the same hardwood species growing under similar conditions under Scots pine were all infected with the fungi. Foliar analyses showed that the hardwoods, particularly red maple (*Acer rubrum*) and ash (*Fraxinus americana*), had lower phosphorus levels. These results were duplicated in the laboratory.

Forest personnel in Oregon noticed interference with Douglas fir (*Pseudotsuga menziesii*) establishment by other tree species in the area in another tree-tree allelopathic situation (Tinnin and Kirkpatrick, 1985). Eleven tree species were evaluated in the laboratory using a cucumber bioassay. The five most potent species were assayed with Douglas fir seedlings in artificial and field soil. Leaf leachates of all five species (*Arbutus menziesii, Arctostaphylos patula, Castanopsis chrysophylla, Ceanothus velutinus, Umbellularia californica*) inhibited germination, radical growth and seedling growth in the artificial soil. Only *Umbellularia* significantly inhibited Douglas fir germination and growth in field soil. The authors encountered problems with the uniformity of germination and growth of the Douglas fir seeds, probably due to genetic variability. Del Moral and Cates (1971) also found that Douglas fir was a species susceptible to allelopathy. Leaf extracts of Pacific madrone (*Arbutus menziesii*), vine maple (*Acer circinatum*), *Symphoricarpos albus*, elderberry (*Sambucus racemosa*), *Rhodendron albiflorum*, sumac (*Rhus ursinus*) and several other scrubs inhibited Douglas fir radicle elongation in the laboratory. Leaf extracts of these species plus *Pinus ponderosa, Alnus rubra, Cornus nuttalli, Vaccinium parvifolium, Sorbus sitchensis*, and several other scrubs were potent inhibitors in the Douglas fir bioassay. Douglas fir is also sensitive to compounds leached from red cedar tow, which has been used as a root packing for forest tree seedlings (Kruegar, 1963).

Mallik and coworkers (Mallik, 1987, Thompson and Mallik 1989) showed that sheep laurel (*Kalmia angustifolia*) is inhibitory to the root development of black spruce (*Picea mariana*). No allelochemical was identified. Raspberry (*Rubus idaeus*) foliar leachates significantly affected the growth of ectomycorrhizal fungi associated with black spruce (*Picea mariana* (Mill.) BSP) in a dose-response manner (Coté and Thibault, 1988). Five ectomycorrhizal species were inhibited by the leachates while two species were stimulated. No allelochemical was identified.

Juglans

Cook (1921) reported that walnut was injurious to other plants and that the toxicity was associated with the roots of the tree. Both old and actively growing young roots were deleterious (Massey, 1925). Subsequently, one of the first allelochemicals was identified and isolated from black walnut, *Juglans nigra* (Massey, 1925). Now, juglone (**12**), 5-hydroxyl-1,4 napthoquinone, is a well known phytotoxin. Juglone is found in the fruit, leaves, litter, bark, and roots of black walnut as hydrojuglone, which must be oxidized by air to be toxic. It has been isolated from butternut (*J. cinerea*), Persian walnut (*J. regia*), Siebold walnut (J. *ailantifolia*), Manchurian walnut (*J. mandshurica*), shaybark hickory (*Carya ovata*), mockernut hickory (*C. tomentosa*), Caucasian walnut (*Pterocarya fraxinifolia*) and pecan (*C. illinoensis*) (Rietveld, 1986). Juglone readily breaks down in aerated soil, but may persist in poorly drained soils. Since walnut is a desirable hardwood and it produces an edible nut, planting walnut is economically attractive. It has been suggested that during establishment walnut could be a nurse crop for an agricultural crop until it became a commercial semi-sustainable crop itself. The long term pay off would be high quality wood. Gordon and Williams (1988) suggested that intercropping black walnut would be a way of diversifying, increasing profitability, decreasing dependence on imported hardwoods, contributing to soil and water conservation and improving wildlife habitat. However, many studies show that black walnut interferes with the growth of other plants as well as its own.

The death of apple trees was correlated with the presence of black walnut (*Juglans nigra*) roots in Virginia (Schneiderhan, 1927). Interestingly, juglone production seems to vary with the species of black walnut. In California, black walnut allelopathy was not seen in areas where the California black walnut species, *J. hindsii* and *J. californica*, were used as root stock for the Persian or English walnut (Schneiderhan, 1927). At the time, 50 percent of the walnut acreage in California was being intercropped with other agricultural crops.

Rietveld (1983, 1986) and coworkers (Rietveld *et al.*, 1983) reported that eighteen species under consideration for intercropping by the U.S. Forest Service were sensitive to black walnut (*Juglans nigra*) allelopathy. The tree species affected were white oak (*Quercus alba*), white ash (*Fraxinus americana*), yellow poplar (*Liriodendron tulipifera*), European black alder (*Alnus glutinosa*), eastern white pine (*Pinus strobus*) and Scots pine (*P. sylvestris*) The pines and the nitrogen fixing alder were especially sensitive to juglone when grown hypotonicly. In

(continued page 16)

PEOPLE

Mary H. Peterson (shown above) is the new Nebraska National Forest Supervisor in Region 2 of the USDA Forest Service. She came there from the Flathead NF in Montana where she was Deputy Forest Supervisor. Her Forest Service career began as a seasonal for the Forest Service on the Challis National Forest in Idaho and the Routt NF in Colorado. She was certified as a silviculturist in the Pacific Northwest Region and worked there for several years. She has a Bachelor's in Forest Resources Development from the University of Minnesota College of Forestry. Her duties will include managing one million plus acres of National Forest and Grasslands, the Bessey Nursery, and the Pine Ridge Job Corps Center.

Noreen K. Clough, former chief of the Branch of Resource Management in the Division of Refuges, is the new Deputy Assistant Director for Fisheries in the Washington Office of the USDI Fish and Wildlife Service. She has been working for the Service for 13 years, having started in Ecological Services in the Office of Environmental Coordination. Much of her professional attention has been focused on implementation of various refuge-related provisions of the Alaska Native Claims Settlement Act and the Alaska National Interest Lands Conservation Act.

Deborah E. Bird, has been named superintendent at USDI Park Service's Devils Tower National Monument in Wyoming. She comes to the position from Yellowstone where she was ranger in charge of the Old Faithful sub-district in the park which attracted more than 2.5 million visitors a year. Devils Tower draws some 450,000 visitors per year and is named for an 865-foot tower of columnar rock, the remains of a volcanic intrusion. Devil's Tower was the first national monument created (September 24, 1906). She has worked for the Service at Glen Canyon National Recreation Area in Utah, Kings Canyon National Park and at Sequoia. Her Bachelor's is in English literature from UC Santa Barbara.

Suzanne Decker is a forestry student at the University of Montana and was the "chief push" of the Forester's Ball—the 75th in the Forestry School's history. She inherited the job of running what *The Missoulian,* the local newspaper, called "the longest-running, rudest, rowdiest party in the country." Schreiber Gymnasium was transformed into a frontier town with a chow hall, a saloon, a jail with a posse, a marriage chapel, and a passion pit. The tickets to the ball have a disclaimer: "Management will not accept responsibility for lost articles of clothing, virtue, conscience, or dates." Decker said that the party raises thousands of dollars for scholarships and loans for forestry students in addition to raising hell. It is held for three straight days, this year attracted some 850 couples, and takes nearly a week to set up.

Northeast Deputy Regional Director **Nancy M. Kaufman** of the US Fish and Wildlife Service and other officials recently presented **Dr. Richard Leakey,** Director of the Kenya Wildlife Service, with a dozen African elephant ivory carvings. The carvings were seized at Newark Airport after being imported in violation of the ban on African elephant ivory and were subsequently forfeited to the government. Leakey said they would be used in a major conservation education exhibit in Kenya.

The University of Pennsylvania's Departments of City and Regional Planning, Landscape Architecture and Regional Planning have joined with Wharton School and are offering a new Master's Degree in Regional Planning. The program will focus on growth management and resource protection for metropolitan areas. Among the 15 faculty are several women: **Ann L. Strong,** a land use and environmental planner/lawyer, author of five books including *Land Banking*; **Anne Whiston Spirn,** Chairman of the Landscape Architecture Department and author of *The Granite Garden*; **Susan Wachter,** Director of Beneficial Corporation, Past President American Real Estate and Urban Economics Association.

Ruby Broadway is program director of the Saturday Science Academy and assistant professor of biology at Dillard University in New Orleans. The academy is funded by the National Science Foundation and has received supplementary support from the Fish and Wildlife Service and the Forest Service. The academy allows third- through eighth-graders to participate in special classes for three hours each Saturday morning for 10 weeks during the fall and spring semesters. Instructors are Dillard faculty members and New Orleans public school teachers.

Ruth Salvaggio is conducting a one-year pilot study of Women in Science at the University of New Mexico. It is funded by the university's College of Arts and Sciences in conjunction with Women's Studies and the Los Alamos and Sandia National Laboratories. The project addresses the issues of recruitment and retention in the sciences for women and other underrepresented groups. Salvaggio is a Visiting Professor from Virginia Polytechnic Institute.

Nancy Woodhull, one of this country's star women executives has quit corporate life to join the wave of women entrepreneurs. She started Nancy Woodhull & Associates Inc., a consulting firm aimed at helping companies enhance profits by increasing their understanding of women as employees and as consumers. Research on women currently available to business generally has at least two problems: it is not in-depth, and it usually represents a point of view, such as that of an advertiser or an interest group. Her decision to start her own company was influenced by the **Anita Hill-Clarence Thomas** controversy. She believed the issue was not sexual harassment, but about control. Women reacted strongly to Hill's charges, she says, because they still feel other people have power over them in the workplace.

Beverly C. Holmes (pictured above) is the new Deputy Regional Forester for the Forest Service in California. She has been working there since 1988 as special assistant to the Associate Chief, Washington Office to be liaison for the Consent Decree. Holmes is a member of the Cherokee Tribe and her government service began in 1968 with the Bureau of Indian Affairs. In 1974 she moved to the Forest Service at the Intermountain Forest and Range Experiment Station in Ogden, Utah. She was then posted to Washington DC as staff assistant to the agency's Deputy Chief for Research. Her Bachelor's degree is from Weber State University in Utah.

a survey of established mixed plantations involving black walnut, many sites with pines or black alder interplanted with walnut were dying after growing well for the first ten years. Rietveld suggested that it takes 12-15 years for the juglone to build up in the soil and symptoms to be seen. He discouraged mixed plantings of walnut with certain hardwood species and pines.

Other studies also have shown juglone is toxic to pines and alder. Vogel and Dawson (1985) showed that juglone affects the nodulation of black alder (*Alnus glutinosa*). *In vitro* growth of *Frankia* isolates were inhibited. Some isolates were more tolerant to juglone than others. Fisher (1978) found that juglone inhibits the growth of white pine (*Pinus strobus*) and red pine (*P. resinosa*) on wet sites but not on dry sites. Other species reported to be sensitive to juglone are *Larix leptolepis* and *Picea abies* (Funk *et al.*, 1979). Rice (1984) cites one study where black walnut killed white pine (*Pinus strobus*) and black locust (*Robinia pseudoacacia).* Another study attributed the death of birch trees (*Betula papyrifera*) in an arboretum to juglone allelopathy (Gabriel, 1975). Red pine and birch mortality was high in a previous black walnut orchard site, but mortality was normal when planted with red oak.

Bruner (1969) pointed out that loblolly pine mortality previously attributed to bark beetles probably was due to black walnut allelopathy which weakened the pine trees. He described specific symptoms of juglone poisoning. They include a whitish pitch flow turning to yellow and then a swelling and bulging of the bark exposing the cambium which then attracted the bark beetles. Ponder (1987) found no affect of juglone on soil *Nitrobacter.* The concentration of juglone was significantly higher in soil where walnut trees were mixed with autumn olive (*Elaeagnus umbellata*) than in pure walnut stands or in stands with walnut mixed with European alder (*Alnus glutinosa*) even though autumn olive is a juglone sensitive species. Perhaps differences in the bacterial population in the soil due to the mixture of trees account for the variability of the juglone concentration.

In an important addition to the juglone story, Schmidt (1988) isolated a soil bacterium which not only degrades juglone , but can use it as its sole energy source. *Pseudomonas* J1 also degraded other aromatic compounds important in allelopathy. This bacterium was isolated only from soil where black walnut trees were growing. Other bacteria tolerant to juglone, but unable to metabolize it, were isolated from soils were no black walnut was growing.

Other broadleaf species

Mountain ash (*Sorbus aucuparia*) produces parascorbic acid which inhibited germination of *Lepidium* species at very low concentrations (Kuhn, 1943). Two aromatic compounds from aspen (*Populus tremula*) benzoic acid and catechol, are inhibitors of mycorrhizal fungi of the *Boletus* genus (Olsen *et al.*, 1971). Quaking leaf aspen (*Populus tremuloides*) litter decreased the growth of several grass species (*Festuca elatior, F. rubra,* and *Poa pratensis*) when incorporated into the soil (Younger *et al.*, 1980). Fescue also affected tree growth. Walters and Gilmore (1976) reported that *Festuca arundinacea* leachates reduced the growth of sweetgum (*Liquidambar styraciflua*). Reduced phosphorus and nitrogen levels were observed in the treated seedlings suggesting that the leachate may somehow impair their absorption from the soil.

In a study that tested 35 species of trees, including 21 species of pine and five species of spruce, *Ailanthus altissima* extracts applied to a cut on the side of the tree seedlings were extremely toxic to 58 percent of the species and at least slightly toxic to all species. When extracts from other tree species were applied similarly, no toxicity was detected (Mergen, 1959).

Several nitrogen fixing trees are adversely affected by other trees and plants. Nitrogen fixing trees are frequently planted in mixed plantations so that their nitrogen fixing capabilities are utilized efficiently. Larson and Schwarz (1980) reported that black locust (*Robinia pseudoacacia*) growth is inhibited by six herbaceous species, but black alder (*Alnus glutinosa*) was not affected. The six allelopathic species tested were goldenrod (*Solidago altissima*), broomsedge (*Andropogon virginicus*), crownvetch (*Coronilla varia*), wild carrot (*Daucus carota*), tall fescue (*Festuca arundinacea*) and timothy (*Phleum pratense*). Aspen (*Populus tremuloides*) decreased the nitrogen fixing rate of *Alnus rugosa* by 56 percent when the two trees occurred together (Younger and Kapustka, 1981).

Nitrogen fixing trees, such as black locust (*Robinia pseudoacacia*) may also be the source of allelopathy. Perry (1932) concluded that black locust exhibited an effect similar to that of black walnut on white pine (*Pinus strobus*) in mixed plantations.

Horsley conducted several studies of hardwood tree growth inhibition by fern, grass, goldenrod and aster (1977a, 1977b and 1987). He noticed that black cherry seedlings (*Prunus serotina)* soon died when the herbaceous species invaded the area. In laboratory studies, *P. serotina* germination and growth was inhibited by root and foliage extracts of bracken fern (*Pteridium aquilimun*), wild oat grass (*Danthonia compressa*), goldenrod (*Solidago rugosa*) and flat topped aster (*Aster umbellatus*). In a field study, the presence of hay scented fern (*Dennstaedtia punctilobula*), New York fern (*Thelypteris noveboracensis*), short husk grass (*Brachyelytrum erectum*) and club moss (*Lycopodium obscurum*) was correlated with reduced numbers of black cherry seedlings. The presence of the grass and ferns was correlated with reduced numbers of red maple (*Acer rubrum*) seedlings and the presence of ferns only was correlated with reduced numbers of sugar maple (*Acer saccharum*) seedlings. There was no effect on birch seedlings. The effects were greatest on acid, imperfectly drained soils. Deer browsing was eliminated as a factor by fencing. Fertilization of the soil had no effect and the seedlings grew ten times as well on sandy soils not associated with the weeds. Weeding improved the regeneration of black cherry in these plantations.

Although in the above study sugar maple (*Acer saccharum*) was a recipient species, it can also be the allelopathic donor. Root exudates from sugar maple significantly inhibited the seedling growth of black spruce (*Picea mariana*), tamarack (*Larix laricina*), jack pine (*Pinus banksiana*), white spruce (*Picea glauca*) and yellow birch (*Betula alleghaniensis*) (Tubbs, 1976).

Hooks and Stubbs (1967) recorded growth retardation of understory species under three species of oak in an area left to regenerate from seed trees. Cherrybark oak (*Quercus falcata*), swamp chestnut oak (*Q. michauxii*) and Shumard oak (*Q. shumardii*) retardation was more pronounced in wet areas and quite variable between different individuals of the same species. The authors likened the effect to that of *Juglans nigra*'s allelopathic affect on agricultural species. DeBell (1971) identified salicylic acid as the leached inhibitor from cherrybark oak (*Quercus falcata*) that affected the growth of cherrybark oak itself and sweetgum (*Liquidambar styraciflua).* Harrington (1987) noticed that there was little regeneration of ponderosa pine under oaks. In the laboratory, Gambel oak (*Quercus gambelii*) leachates inhibited the germination and growth of *Pinus ponderosa.* Postoak (*Quercus stellata*) and blackjack oak (*Quercus marilandica*) also are reported to have a water soluble toxin that inhibits the growth of an understory (Rice, 1984).

Al-Naib and Rice (1971) developed a procedure to isolate and identify phytotoxins that included paper chromatography in selected solvents and spectroscopy. They identified phytotoxins from the leaves and fruits of sycamore (*Platanus occidentalis*). The authors eliminated soil moisture, nutrients and light as causes for the complete lack of growth under the sycamore trees. The chemicals isolated from sycamore inhibited all species tested in the laboratory. Soils collected from the area under the sycamore trees also inhibited all of the herbaceous species tested (*Ambrosia psilostachya,*

Andropogon glomeratus, *A.virginicus*, *Panicum scibnerianum*, *P.virgatum*, *Setaria viridis* and *Tridens flavus*).

In a similar study, Lodhi and Rice (1971) determined hackberry trees (*Celtis laveigata*) were allelopathic. Soil characteristics, soil moisture levels, shade and nutrients were all ruled out as significant causes for the lack of growth under hackberry trees. Decaying leaves, leaf leachate and soil were all toxic to *Andropogon gerardi*, *A. scoparius*, *Panicum virgatum* and *Sorghastrum nutans*.

Further studies were performed with sycamore and hackberry trees plus red oak (*Quercus borealis*) and white oak (*Quercus alba*) using the American elm (*Ulmus americana*) as a control (Lodhi, 1976). The test species were two grass species, *Bromus japonicus* and *Elymus canadensis*. No significant differences in soil pH, N, P, Ca, K, Fe, Zn, Cu or Mn were found between the treatments and the control. Few species grew under the sycamore, hackberry, red oak or white oak trees whereas there was significant understory growth under the elm trees. Light regimes were comparable. Decaying leaves and leachate from the sycamore, hackberry, red oak and white oak trees significantly reduced the germination and growth of the test species. Several phytotoxic phenolic compounds were identified in the aqueous leaf extracts of white oak, sycamore and hackberry. Some of these same compounds were isolated from soil samples.

TROPICAL FOREST SPECIES

There has been relatively little work on allelopathy of tree species in tropical environments. Añaya (1987), Rodríquez-Hahn *et al.* and others worked in Mexico on several scrub species and a tree, *Croton pyramidalis*. They isolated and identified two previously unknown compounds, a diterpene and a flavone, from *C. pyramidalis*.. In bioassays, only the flavone inhibited the germination of the test species, *Mimosa púdica*. This inhibition was less than the inhibition caused by the total extract (Rodríquez-Hahn *et al.*, 1981). The essential oil extract from *C. pyramidalis* was less inhibitory in bioassays than the same fraction from the scrub species tested. A survey of allelopathic effects in agroforestry systems in Mexico by Añaya *et al.* (1987) found that *Alnus firmifolia* cover (litter placed over an area in cultivation) significantly decreased the number of weeds in the plots and increased nodulation of beans. In radicle growth laboratory bioassays, *A. firmifolia* root and leaf leachate did not have any affect on the crops tested, except for a significant stimulation of squash. The leachates of fresh material inhibited radicle elongation in the weed *Echinochloa crusgalli*, but caused a stimulation in two other species. Leachates of dry material caused radicle growth inhibition in *E. crusgalli* and *Amaranthus leucocarpus*.

In another field screening for allelopathy of eleven common tropical forest trees in the Brazilian Amazon, Campbell *et al.* (1989) found that five species were highly toxic in lettuce germination and radicle elongation tests in soil taken from below the canopy of the trees. The species determined to be allelopathic were *Virola* spp., *Rinorea racemosa*, *Protium* spp., *Mabea* spp. and *Duroia hirsuta*. *D. hirsuta* was strongly allelopathic and in the field "gaps" are formed below this species where there is no dense understory and the vegetation present is brown and withered.

A toxic plant growth inhibitor, hydroxyuridine, was isolated from the roots, stem and leaves of the tree *Baillonella toxisperma* (Ohigashi *et al.*, 1989) which is found in the tropical forest of Cameroon. Hydroxyuridine inhibited hypocotyl and root growth of cucumber and radish. It also inhibited rice root growth but it did not affect rice hypocotyl growth or leaf development. The concentration measured in the tissues was sufficient to cause interference. Hydroxyuridine was not found in surrounding soil under *B. toxisperma*. Growth of the weeds *Echinochloa crus-galli*, *Setaria viridis*, *Pharbitis purpurea*, *Abutilon avicennae* and *Cassia tora* sprayed with an aqueous solution of hydroxyuridine was retarded, but the treatment was ineffective against corn (*Zea mays*).

In India, Goel and Sareen (1986) discovered *Cassia siamea* to be allelopathic. Leaf litter and fresh leaf extracts inhibited the germination and radicle growth of *Malvastrum tricuspidatum*, an understory species found in association with most trees in the study area, but not in association with the *Cassia* species. *Thevetia neriifolia* and *Anthocephalus cadamba* trees reduced the growth of *Malvastrum* seedlings, but did not prevent germination.

The establishment of monocultures of *Grevillea robusta*, a non-gregarious tropical forest species, has been unsuccessful. However, mixed plantations of *G. robusta* and *Araucaria cunninghammii* have become established. It was determined that the characteristic die-back associated with *G. robusta* monocultures was due to a water transferable toxin from the roots or rhizosphere of *G. robusta* (Webb *et al.*, 1967). The authors suggested that this phenomenon may contribute to the floristic diversity in unmanipulated tropical forests.

Leucaena leucocephala is an important tropical species due to its versatility and nitrogen fixing capabilities. However, several studies have indicated that *L. leucocephala* is an allelopathic species and may not be suited to certain agroforestry management systems. *L. leucocephala* suppressed *Acacia confusa*, *Liquidambar formosana*, *Casuarina glauca*, and *Alnus formosana* in intercropping studies done in Taiwan (Chou, 1986). It had no effect on *Pinus taiwanesis* or *Miscanthus floridulus*. The allelopathic effects could be mitigated by increasing drainage, flooding, or by crop rotation. The effects were most pronounced when the trees were under environmental stress. In a follow-up study, Chou and Kuo (1986) isolated ten phytotoxins from *L. leucocephala*. Mimosine was the most toxic. The mature leaves of *L. leucocephala* possess 5 percent by weight mimosine. Seed germination and radicle growth of lettuce, rice and rye grass were significantly inhibited at concentrations of 20 ppm of mimosine. The germination and radicle growth of the tree species previously mentioned were inhibited at mimosine concentrations of 500 ppm or above. Extracts of *L. leucocephala* did not affect *L. leucocephala* itself. Aqueous extracts of fresh and dry leaves were effective in inhibiting the growth of susceptible species in greenhouse experiments. This corresponded to field observations where growth under *L. leucocephala* litter was suppressed.

In another study of multi-purpose trees, *L. leucocephala* was again implicated along with *Eucalyptus tereticornis*, and *Casuarina equisetifolia* as injurious trees (Suresh and Vinaya Rai, 1988). The understory was suppressed under these species, especially under *E. tereticornis*, yet the nutrient status of the soil under these trees was considerably higher than the surrounding grassland. The dominant species under *L. leucocephala* was *L. leucocephala* itself.

CONCLUSIONS

There have been numerous reports of allelopathy involving forestry species. However, the strength of the evidence supporting allelopathy has not always been conclusive. Isolation and identification of allelochemicals has often been neglected. It is unfortunate that the early successes of del Moral, Lodhi, Muller and Rice have not generated a substantial amount of work in which allelochemical identification is paramount. Methods and standards are available. Chemistry continues to be the Achilles' heel of research in allelopathy (Putnam and Tang, 1986). However, the development of new analytical instruments should encourage the identification of new and interesting allelochemicals. Several researchers have attempted new isolation techniques from undisturbed systems (Tang and Young, 1982; Lovett, 1986). This approach will be important in providing information on realistic concentrations and mixtures of allelochemicals in nature.

There is an obvious lack of research on tropical forestry species. Most of the world's species diversity and valuable hardwoods come from the tropics, yet this is the very area where research has been deficient. It is reasonable to assume that allelopathic interactions in the tropics will not be the same as in the temperate climates. Differences in rainfall may increase allelochemical leaching from foliage or allelopathic effects may be alleviated by rapidly leaching the soil. The relatively fast turnover rates of organic material in the tropics may mean that litter does not have a chance to accumulate as it does in the temperate climates; on the other hand, the abundant microbial life may metabolize certain allelochemicals into more toxic counterparts. There is a lot we don't know about allelopathy. We know even less about its role in the tropics.

A summary of allelopathic effects on forestry species (Table I), suggest there are a few species that seem especially susceptible to allelopathic affects. Among the pines, *Pinus taeda*, *P. radiata*, *P. banksiana*, *P. silvestris*, and *P. ponderosa* are especially susceptible. Other susceptible coniferous species are *Pseudotsuga menziesii* and *Picea mariana*. The large number of reports of allelopathy in pines may reflect the importance of this genus in commercial forestry. Of the broadleaf species, *Robinia pseudoacacia* seems susceptible.

Several species of trees seem to be especially injurious when combined with other trees. These include *Juglans nigra*, *Eucalpytus* spp., *Quercus* spp., *Ailanthus altissima* and *Leucaena leucocephala*. Allelopathic considerations should be kept in mind when choosing a tree species for a particular site. Allelopathy may be as important as climate and soil conditions to the success of a forestry project.

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Table 1: Reports of Tree Species Sensitive to Allelochemicals

RECIPIENT	ALLELOCHEMICAL	DONOR	REFERENCE
Conifers			
Pinus taeda	unidentified (ws)*	Setaria sp.	Gilmore, 1985
	unidentified (ws)	Sapium sebiferum	Gresham, 1979
	unidentified (ws)	Festuca arundinacea	Wheeler, 1979
	unidentfied (ws)	Eupatorium capillifolium Lyonia lucid	Hollis, 1982
	vanillic acid; coumaric acid, m-hydroxyphenyl-propionic acid	Andropogen virgincicus	Priester, 1978
Pinus elliottii	unidentfied (ws)	Eupatorium capillifolium Lyonia lucida	Hollis, 1982
Pinus radiata	unidentified (ws)	Pinus radiata	Cho-Chou, 1978
	unidentified (ws)	grass	Theodorou, 1971
	unidentified (ws)	Ailanthus altissima	Mergen, 1959
	ethylene	Pinus radiata	Lill, 1976
Pinus banksiana	unidentified (ws)	Prunus pumila, P. serotina,	Brown, 1974
		Solidago uliginosa, S. juncea,	Brown, 1983
		Salix pellita, Cladonia	
	unidentified (ws)	Ailanthus altissima	Mergen, 1959
	unidentified (ws)	Cladonia rangiferina Cladonia alpestris	Fisher, 1979
	unidentified (ws)	Acer saccharum	Tubbs, 1976

* water soluble

RECIPIENT	ALLELOCHEMICAL	DONOR	REFERENCE
Pinus silvestris	α–pinene, ß-pinene, Δ-carene, terpinolene linomene, phellandrene longifolene	Pinus silvestris	Melin, 1971
	juglone	Juglans nigra	Rietveld, 1986
	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Pinus ponderosa	unidentified (ws)	Festuca arizonica Muhlenbergia montana	Rietveld, 1975
	unidentified (ws)	Ailanthus altissima	Mergen, 1959
	unidentified (ws)	Quercus gambelii	Harrington 1987
Pinus jeffreyi	unidentified (ws)	Wyethia mollis	Yoder-Williams
	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Pinus strobus	juglone	Juglans nigra	Rietveld, 1986 Fisher, 1978 Rice, 1984
	phenolics	Hieracium aurantiacum	Dawes, 1973
	unidentified (ws)	Robinia pseudoacacia	Perry, 1932
Pinus resinosa	juglone	Juglans nigra	Fisher, 1978
P. cembroides, clasusa, contorta, echnata, flexilis, griffithi, halepensis, khasya, monticola, mugo, nigra, pinaster, pinea	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Araucaria cunninghamii	unidentified (ws)	Araucaria cunninghamii, Pinus elliotii, Flindersia australis	Bevege, 1968
Pseudotsuga menziesii	unidentified (ws)	Umbellularia californica	Tinnin, 1985
	unidentified (ws)	Arbutus menziesii, Acer circinatum, Sambucus racemosa, Rhdodendron albiflorum, Rhus ursinus, Pinus ponderosa, Alnus rubra, Cornus nuttalli, Sorbus sitchensis, Vaccinium parvifolium	Del Moral, 1971
	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Picea mariana	unidentified (ws)	Kalmia angustifolia	Mallik, 1987
	unidentified (ws)	Ailanthus altissima	Mergen, 1959
	unidentified (ws)	Acer saccharum	Tubbs, 1976
	unidentified (ws)	Rubus idaeus	Coté, 1988
Picea abies	juglone	Juglans nigra	Funk, 1979
Picea glauca	unidentified (ws)	Ailanthus altissima	Mergen, 1959
	unidentified (ws)	Cladonia rangiferina Cladonia alpestris	Fisher, 1979
P. engelmannii, glehnii, jezoensis, stchensis	unidentified (ws)	Ailanthus altissima	Mergen, 1959

RECIPIENT	ALLELOCHEMICAL	DONOR	REFERENCE
Larix leptolepis	juglone	Juglans nigra	Funk, 1979
Larix decidua	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Larix laricina	unidentified (ws)	Acer saccharum	Tubbs, 1976
Thuja occidentalis	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Betula allegheniensis	unidentified (ws)	Ailanthus altissima	Mergen, 1959
	unidentified (ws)	Acer saccharum	Tubbs, 1976
Betula mandshurica, maximowicziana	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Casuarina pusilla	phenolics	Eucalyptus baxteri	Del Moral, 1978
Eucalyptus			
Eucalyptus camaldulensis	pinene, cineole, caffeic, chlorogenic, coumaric, ferulic and gallic acid	Eucalyptus camaldulenis	del Moral, 1970
Eucalyptus globulus	chlorogenic, coumaryl-quinic, and gentisic acid	Eucalyptus globulus	del Moral, 1969
	unidentified (ws)	Eucalyptus macrorhyncha, E. rossii, E. rubida, E. mannifera, E. blakelyi, E. polyanthemos, E. globulus, E. rubida, E. melliodora, E. elata	May, 1990
Other broadleaf species			
Quercus alba	juglone	Juglans nigra	Rietveld, 1986
Quercus rubra	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Quercus falcata	salicylic acid	Quercus falcata	deBell, 1971
Fraxinus americana	unidentified (ws)	Pinus resinosa	Tobiessen, 1980
	juglone	Juglans nigra	Rietveld, 1986
Liriodendron tulipifera	juglone	Juglans nigra	Rietveld, 1986
Alnus glutinosa	juglone	Juglans nigra	Rietveld, 1983 Ponder, 1987
Elaeagnus umbellata	juglone	Juglans nigra	Ponder, 1987
Liquidambar styraciflua	unidentified (ws)	Festuca arundinacea	Walters, 1976
	salicylic acid	Quercus falcata	deBell, 1971
Abies balsamea	unidentified (ws)	Ailanthus altissima	Mergen, 1959
	phenolics	Hieracium aurantiacum	Dawes, 1973
Abies concolor, sachalinensis, nordmanniana, grandis	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Acer rubrum	unidentified (ws)	Pinus resinosa	Tobiessen, 1980
	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Cornus florida	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Liriodendron tulipifera	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Populus tremuloides, trichocarpa	unidentified (ws)	Ailanthus altissima	Mergen, 1959

RECIPIENT	ALLELOCHEMICAL	DONOR	REFERENCE
Salix bebbiana	unidentified (ws)	Ailanthus altissima	Mergen, 1959
Robinia pseudoacacia	unidentified (ws)	Solidago altissima, Andropogon virginicus, Coronilla varia, Daucus carota, Festuca arundinacea, Phleum pratense	Larson, 1980
	juglone	Juglans nigra	Rice, 1984
Alnus rugosa	unidentified (ws)	Populus tremuloides	Younger, 1981
Prunus serotina	unidentified	Pteridium aquilinum, Danthonia compressa, Solidago rugos, Aster umbellatus, Dennstaedtia punctilobula, Thelypteris noveboracensis, Brachyelytrum erectum, Lycopodium obscurum	Horsley, 1977ab
Acer rubrum	unidentified	Dennstaedtia punctilobula, Thelypteris noveboracensis, Brachyelytrum erectum	Horsley, 1977b
Acer saccharum	unidentified	Dennstaedtia punctilobula, Thelypteris noveboracensis	Horsley, 1977b
TROPICAL FOREST SPECIES			
Grevillea robusta	unidentified (ws)	Grevillea robusta	Webb, 1967
Acacia confusa	mimosine, quercetin, and gallic, protocatechuic, *p*-hydroxybenxoic, *p*-hydroxyphenylacetic, vanillic, ferulic, caffeic and *p*-coumaric acid	Leucaena leucocephala	Chou, 1986
Liquidambar formosana	mimosine, quercetin, and gallic, protocatechuic, *p*-hydroxybenxoic, *p*-hydroxyphenylacetic, vanillic, ferulic, caffeic and *p*-coumaric acid	Leucaena leucocephala	Chou, 1986
Casaurina glauca	mimosine, quercetin, and gallic, protocatechuic, *p*-hydroxybenxoic, *p*-hydroxyphenylacetic, vanillic, ferulic, caffeic and *p*-coumaric acid	Leucaena leucocephala	Chou, 1986
Alnus formosana	mimosine, quercetin, and gallic, protocatechuic, *p*-hydroxybenxoic, *p*-hydroxyphenylacetic, vanillic, ferulic, caffeic and *p*-coumaric acid	Leucaena leucocephala	Chou, 1986

ONE GOOD LOOK.

LYNX

DAWN MARIE ZEBLEY

Researcher Gary Koehler holds a captured Meadows Area Lynx equipped with radio collar and antenna.

In June 1991, my partner Mario Parker and I were checking occupancy in boreal owl nest boxes we had put in a place we call the Meadows area. We stopped the truck near box 39, got out, and there it was, not an owl, but a lynx. I had just told my partner earlier the same day that although I'd worked in the Meadows a lot during the year, I'd only been fortunate enough to see tracks, not the whole beast. But there was the whole beast standing about 200 feet behind us on the side of the road. He stood very stiff and looked at us for about 10 seconds, slowly crossed the road as we watched, went to the top of a roadcut, then paused again to watch us for another 10 seconds before disappearing into the lodgepole.

North American Lynx (*Felis lynx canadensis)* are considered a sensitive species here on the Okanogan National Forest in north central Washington state and as such, receive special consideration in our land management activities. Species with sensitive status do not have protection under the Endangered Species Act of 1973, but Forest Service policy requires that a Biological Evaluation be conducted for projects to address the possible impacts to sensitive species and requires that they be managed in such a manner as to prevent the need for placement on a federal list (Okanogan National Forest FEIS 1989).

Lynx are common in the boreal forests of Canada, but here at the southern latitudes of their distribution, habitat is marginal and lynx are less common. It is estimated that 150 lynx live in the state of Washington and of that number, 25 live in the Meadows. In the years 1980 to 1987, Gary Koehler and Dave Brittel conducted several studies on them so most of the information we have on lynx in north-central Washington derives from that body of work.

The Meadows area is thought to contain the highest density of lynx in the continental United States. The site is 95,400 acres in size and is primarily composed of lodgepole pine, Engelman spruce/sub-alpine fir cover types with numerous interspersed meadows. It is bordered by the 626,200 acre Pasayten Wilderness, other national forest land, and small rural communities. The area has had little previous timber harvest, is dissected by only one road, and has been used primarily for dispersed recreation: hunting, snowmobiling, hiking, camping, and horseback riding.

Lynx are similar to bobcats, but can be distinguished by their longer ear tufts, solid black coloring on the end of the tail, longer legs, and much larger feet. Long legs and wide feet aid lynx mobility in the snow which is common most of the year at elevations of 4500+ feet where they prefer to live.

The primary prey of lynx throughout their range is snowshoe hare. In Washington state, habitat for the snowshoe hare is marginal. The highest densities of hare are in six-foot-tall, 20-year-old lodgepole pine thickets. These areas provide forage as well as escape and thermal cover for the hare. Not coincidentally, these are the areas where lynx prefer to hunt. Early successional stands are limited in the Meadows site due to five decades of fire suppression and lack of timber harvest.

In Canada and Alaska, snowshoe hare and lynx populations follow a "boom and bust" cycle. This cyclic population, however, is not seen in the southern extent of lynx range in this part of Washington. Since snowshoe hare populations are low and stable at these latitudes, the lynx populations stay stable and low—with some minor fluctuations. Home range size of lynx in the Meadows area are large, 39 +/- km2 for females and 69 +/- 28 km2 for males. This may be due to the low density of snowshoe hare in the area. (Koehler, 1990).

In addition to the young lodgepole stands lynx forage in, the cats require old stands–250 or more years–of subalpine fir/Engelman spruce or lodgepole in which to raise their kittens. Den sites are generally one to five acres in size, on north or northeast aspects, are within 3.5 miles of prey habitat, and have about 40 downed logs /150 square feet suspended one to four feet above the ground for cover (Koehler and Brittell, 1990).

The goal statement for the Meadows in the Okanogan National Forest Plan is to "provide habitat to support a stable lynx population over the long term while assessing the area for the purpose of growing and producing merchantable wood fiber." Managers want to provide denning habitat in 10 percent of the area, forage, hiding, thermal, and stalking cover on 30 percent of the site, travel cover in another 30 percent, and non-habitat-roads, natural openings, and created openings—in the remaining 30 percent of the area (Okanogan National Forest FEIS). These management goals were developed from Koehler and Brittell's recommendations.

Currently, an Integrated Resource Analysis (IRA) is being conducted for the Meadows. The IRA is not a National Environmental Policy Act (NEPA) document, but does include scoping, public involvement, and data collection. The analysis takes into consideration soil, fish, wildlife, livestock, recreation, rare plants, scenery, timber, wildfire risk, and snowmobile use. IRAs are conducted on a larger scale than most projects and consider a longer time period, which in this case is one rotation of lodgepole pine. The purpose of the IRA is to identify the set of activities that will occur in the Meadows, to assess the general issues, and provide cumulative effects analysis for subsequent Environmental Assessments done for smaller projects within the area.

The IRA is a pilot project for the Geographical Information System (GIS) on the Forest which stores information and then provides an overlay of many types of resource data on one map. GIS will be used as a tool in the Meadows IRA to model and display habitat manipulations over time, so that land managers can decide what management scheme will work best in the Meadows area.

Planning is certainly needed. The Meadows area IRA is very controversial because most of the 95,000 acres is roadless and 90 percent of it has never been harvested. Many conservation groups are opposed to the logging and road building activities proposed for the area in 1993 and 1994. They predict that an increase in road density and decrease in cover will be harmful to lynx and other animals and plants that live in the Meadows. On the other hand, the logging community would like to see the timber program expanded, more harvest in the lodgepole forests, and at the same time, have the Forest Service combat the pine bark beetle attack which is starting to be a problem on the site now. Using the information from Koehler and Brittell's studies, data collected from other resources, GIS, and public input, the Forest hopes to take the middle ground—to improve lynx habitat in the Meadows by developing a mosaic of forest ages advantageous to lynx while providing for other resource needs.

My partner and I got back in the truck the day of the lynx sighting and continued working in the area. We returned to the Meadows many more times in the summer and fall of 1991 but did not see another lynx. I think I'd rather not. That may sound strange, but I'd rather not inadvertently stress another one with such an unexpected encounter. I'm satisfied with the one, GOOD look I got and with the knowledge that there are still a lot of those reclusive beasts out there.

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Dawn Marie Zebley is an assistant wildlife biologist on the Winthrop Ranger District of the Okanogan National Forest. Earlier she worked as a research assistant on wildlife projects on the Tongass National Forest in Alaska, a boreal owl study in the River of No Return Wilderness in central Idaho, and spotted owl inventorying on the Okanogan National Forest. Her Bachelor's in Wildlife Resources is from the University of Idaho.

EDITORIAL (continued from front inside). there. I love to think about all those women mucking around in their field clothes in archaeology, geology, range, wildlife, fisheries, urban forestry, recreation, and the myriad of other natural resources professions.

And judging from the numbers of women rising up through the ranks, and even to the very top, there must have been plenty of women out there in the 70s working their buns off–even when I thought I was the Lone Ranger. I think about that often.

I also think about the women I met through the subscription rolls when WiNR started. There were but 66. Not only could I name them all, but I knew their job titles and where they lived. They never knew it, but I felt as though we were old friends, comrades.

As I mothered those subscriptions along, and the numbers rose considerably, I watched these old friends change jobs, change names, and change addresses. I saw them through times when they decided not to re-subscribe (poor finances, maybe) but reconsidered (new job?) becoming perhaps more loyal than ever.

I am very fond of those memories. To start that small and end up reaching thousands and thousands of women and men around the world is extraordinary. Would you be amazed to learn that most of those original 66 subscribers are still with us, still in the profession, and doing very well?

You shouldn't be too surprised. Those women (and a few men) cared enough about their profession and their careers to look elsewhere for the support they needed (and should have gotten) in the work place. They were and still are very interested in making sure that not everyone else gets the same new-kid-on-the-block treatment they did.

Some folks wonder why women would want to be foresters, range cons, or wildlife biologists when the conditions are tough and the job environment not always friendly or even welcoming. Well, women choose those professions for precisely the same reasons as men yearn for them. When you share that dream, you should understand.

I even get all choked up when I see my old friends succeed. Take Jan Wold, for example. She was one of the original subscribers to WiNR and I feel like I've been tracking her career for almost a decade now. But it's not simply Jan Wold anymore. Now, meet Jan Wold, Forest Supervisor. I feel like a proud mama. Even though this friendship is entirely one-sided (Jan Wold doesn't know me from Smokey the Bear) it gives me a terrific thrill to witness her success.

Supervisor Wold is only one of the many women whose careers have flourished while WiNR has applauded. How many women supervisors, how many park superintendents, how many research scientists were there a decade ago? I rest my case. And if we helped even a teensy bit–and I like to think that's so–it is all worth it.

What has not changed, and what makes these successes in the natural resources profession even more significant, is the overall career picture today for women. Susan Faludi, author of Backlash: The Undeclared War Against Women, paints a rather unpleasant picture of employment for women in the 90s. She asserts that although women gained against occupational segregation in the 70s, progress completely stalled in the 80s, and in fact, the work force actually started to resegregate. Faludi cites the feds as one big culprit, remarking that between 1976 and 1986, the worst paid jobs went from 67 percent to 71 percent female. And the percentage of women appointed to top posts (GS 13 and 14) declined to less than one percent by the early 80s. Outside government, her news gets worse: By the late 80s, professionals in "biological sciences" were less likely to be women than a decade earlier.

Ouch.

While this is truly depressing, it should serve to keep all of us from getting too complacent. No question that there is room for improvement.

So here we sit–in 1992–caught between the terrific professional achievements of dedicated professionals and the hard reality which constantly reminds us that our workplace isn't always fair nor secure.

It's been a genuine education these past years–one which I have appreciated enormously–watching both the changes and the constants through the supportive eyes of the journal. I like to think that in WiNRs case, that old cliche is true: we're here for you. That will never change.

Karen Lyman

IN THE MODERN WORLD, WE KNOW WHERE THE MIND GOES WHEN THE BODY LOSES ITS HEAT FROM ALL OF THE WORK IN THE GARDEN. IT GOES OUT ONTO THE COMPUTER NETWORK. WHAT WOULD DESCARTES SAY?

CASE OF THE MISPLACED MIND

DIANE CALABRESE

Descartes had the right idea. Now, I need to know how to keep my body in the garden and my mind linked to the global information network: the place my PC takes me with just a few keystrokes. As it is, while I try to catch up to the information age, my bedding plants languish, my ponds go dry, and weeds invade every square inch of my yard.

Actually, that's not the precise account of the sequence of events leading to an embedded ecological disaster of the first order: the beloved but dry ponds. In separating truth from fact, I confess that I spawned the crisis that led to the dry holes in my yard. The ponds are dry because they had to be drained. They had to be drained because wrigglers grew so numerous I could have picked them out of the water with a fork.

From the perspective of mosquitoes everything was perfect, of course. Two shallow, quiet, and oxygen-poor bodies of water were the ideal places for demonstrating the capacity to reproduce at an exponential rate.

The visit to my door by two young girls who had spied my ponds forced me to confront reality. The girls wanted to take water samples to their biology class. They did. I fretted.

Certain that the volume of wrigglers exceeded the volume of water, I imagined a teacher less interested in measuring displacement than in reporting the anomaly to the health board. The steps to the health board taking an interest in my ponds were close to parsimony. There was no reason to believe an agency charged with protecting the public from menacing creatures of every size would see the lighter side of the situation. The ponds had to be drained.

What went wrong? How did my accommodating husband find himself the owner of an electric water pump, the unwitting participant in a scheme to quietly divert stagnant water to a vegetable plot? Part of the explanation must derive from my inability to live a dichotomous life.

I should have done more thinking in the garden, or less networking and more gardening. I am not sure which. Perhaps I needed my mind in my garden or needed a way to set my mind free on the global internet while I was in the garden. Why should my mind be constrained while I dug? I tried to immerse myself in green and in technology and I did neither well.

I had dug my way through the last days of winter at a frenetic pace that surely would have satisfied the finest description Descartes or contemporaries made of functioning body as finely tuned machine. Descartes theorized that a matrix of fibers provides the infrastructure for the body; he envisioned them not as permanent structures but as transient ones. The fibers were "secreted" and provided connections for nourishment and reciprocal communication on an as-needed basis. Frantically trying to extract time from the daylight that waned all too quickly in my after day-job hours, I shoveled. I didn't think. My secreted fibers provided no connections. A pond had to be ready for the spring migration of insects, especially waterstriders. It was; they came.

My dogs and I had a few glorious days of strider watching, a soothing way to pass the twilight. We watched them skate and glide and somersault. We got so excited we dug another, smaller pond. The ponds welcomed all aquatic insects that flew overhead. The promise of refuge, a safe haven, held for a few days.

Then, one afternoon, I rolled into the driveway, ready to leap from the car, release my captive dogs, and enjoy the sight of skating bugs in my ponds. My view of the ponds was blocked by a bold avian assemblage. The feathered frolickers ignored the car's engine. There were a hundred odd birds; starlings, grackles, even sparrows, wading, splashing, chasing,...and, it seems, eating my waterstriders. When the birds cleared, all I could see was water, murky and inhabitant-free water.

"You should have dug the sides at least 15 inches deep—straight down," said an amateur ornithologist when I recounted my tale. Even as I went from sympathetic ear to sympathetic ear, I knew the events had been precipitated. Wrigglers would not be long in burgeoning. It was not the thought of pools teeming with mosquitoes that troubled me, however; it was the acknowledgment that the long-legged beauties I'd lured to my yard had become starling bait.

Had I given the process more thought, had my mind and body been acting as one, I'm sure I'd have dug ponds instead of bird baths. But how does a person get her mind into the garden. What did Descartes do? Did he garden? And, do people like astronauts garden? Even as gardening becomes more low-tech, the world speeds on toward voice-activated computer interactions. We compost, we mulch—we do not dispose of refuse or apply herbicides; we mow without gas or electricity; we plant to invite a diverse mix of insects and birds. But when

night comes, we rush indoors to send our minds out to play in distant databases or articulated conferences.

Descartes wondered where the mind goes when the body loses its heat. But in the modern world, we know where the mind goes when the body comes out of the garden and cools down: out onto a computer network. There's the paradox: we don't have much use for our bodies on the internet; we could use, however, a bit of our mind out in the garden.

The act of gardening might be a metaphor for living in the modern world. Even our appropriate methods of meddling with the earth would be more appropriate if we just skipped them altogether. Some of us might contribute our minds to the internet, but the biosphere would be greener without the demands of our energy-craving bodies.

There it is, then. Descartes anticipated post-modern Gaia: the earth as a responsive, pulsating, breathing organism that includes bodies, minds, and the internet. We can't be far from the time when a voice-activated robot will weed my yard, and dig ponds to a depth of 15 inches. There out on that fiber optic network of information Descartes' communication system will finally be realized but on a different scale than his premature concept ever let him imagine.

We'll not be needed in the garden. So, we can use our bodies as a prop for our minds. We can just ignore our dual nature by living only one part of it. And, we can play in virtual reality gardens of the mind. Harmless to the earth, time-saving, and perhaps, if we are lucky, fun.

Postscript: Philosophy and practice often lead us down different paths. I flew away for a week. My gardens were out of sight, but my lap-top was in my hands. The internet was as close as the nearest phone outlet. When I returned, we would start again with the ponds. We would dig them deeper and line them. Next year, we would be ready for the aquatic insect migration.

Not home an hour, I rushed to examine the mud holes and to envision the future. Nature reminded me quickly that she defines equilibrium. We just try to live within it.

I looked into a puddle. A frog looked back at me. It was thriving, eating wrigglers like a six-year-old eats candy.

And there, excavating, building, and nurturing a new generation were black and yellow mud daubers. Seeing the wasps at work, I did what any aquatic entomologist would do: I ran for my camera. The wasps are welcome to rear their young. My ponds can wait. At last, my mind and body were together in the garden, trying to avoid pain.

Diane Calabrese is an entomologist and writer and works for the Missouri Department of Conservation on the Eisenhower Grants program. In addition, she works through her own consultancy PAPILLONS: Diversified Endeavors in Columbia, Missouri. She is an editor for Women in Natural Resources.

News & Notes (continuted from page 48).

within the *Times* itself, "we have undertaken corrective measures...to expand opportunity." Well, sort of. As Nan Robertson's eye-opening new book *The Girls in the Balcony* (Random House) makes plain, the editorial stance of one of the world's pre-eminent liberal newspapers had little to do with the policies in its newsroom. At the time of the editorial, women employees of the *Times* were engaged in a class-action suit charging the paper with systematic sex discrimination, and the evidence was dazzling...Marilin Bender, editor of the Sunday business section, made nearly $15,000 less than her male predecessor. As an assistant metropolitan editor, Grace Glueck had made up to $12,000 less than men holding the same job. Health columnist Jane Brody, one of the best-known writers at the paper, was making $100 per week less than the lowest-paid man in her department. Almost as repellent as the statistics was the day-to-day misogyny....The women's suit was settled out of court in 1978. Since then its record in hiring and promotion has improved, but sexism didn't end. Leslie Bennetts spent nearly 10 years as a *Times* writer before learning in 1987 that a newly hired man in her department was making $11,000 more than she was.

....Laura Shapiro, *Newsweek*, February 10, 1992

Ah yes. Oversimplified ways to uncomplicate your life

•Adjust your attitude. Make a commitment to change by letting go of habits, possessions, and people that are no longer relevant. Take control of problems rather than letting them control you. Control a sense of perfectionism because it can be counter-productive and self-sabotaging especially if you can't delegate or finish tasks quickly. Stop procrastinating because delay causes problems for others and can be mitigated by hiring someone else or dividing up the job.

•Prioritize and plan. Identify your life mission, goals and priorities by rethinking your purpose in life in regard to what you want to be remembered for. List your goals on paper and give each a realistic deadline and then make a "to do" list of all unfinished business and projects. Plan and schedule regularly. Transfer errands and daily obligations to your calendar and schedule time for work on your top-priority projects. Continue to review weekly to see whether your goals, priorities and schedule mesh.

•Eliminate the extraneous. Prioritize people and learn to say no. Reevaluate your possessions and see if you aren't taking too much time taking care of your "stuff" than you are taking care of yourself. Get rid of stuff and be ruthless, especially if it was accumulated from one of your "past" lives.

•Organize what is left. Establish a convenient place for everything once and for all. Maintain these systems at home and at the office.

....Stephanie Culp, *Streamlining Your Life: A Five-point Plan for Uncomplicated Living*. In *Bottom Line Personal*, January 30, 1992

EARLY RECYCLING PROGRAMS FROM GOD ARE RECALLED.

BROWN WATER

HILDRETH FROST

"Do you remember when we had brown water in the crockery pitchers?" I asked my friend, also a longtime Star-Islander. We were sitting on the front porch of the Oceanic, waiting for the breakfast bell. While younger folks were engaged in Yoga or other fitness exercises, we were content to sit in the rocking-chair lineup and devote a few moments to reminiscence. I remember indeed. And I miss it. My feeling is that something vital has been extracted not only from the water but from Shoals life itself.

In recalling the bygone era, we quoted the explanation the associate manager gave to each newly arrived conference group during the orientation period. Salt water to supply the sanitary system was simple enough. Well water *could* be drawn from the old source of supply beneath the small house on the front lawn. Converter water, forthcoming in 1960, had made possible the first showers on the island. Drinking water from Portsmouth added a note of remoteness from civilization. For the fastidious, Poland Spring water was available at the Snack Bar.

But Brown Water—that was something else again. Brown water had more than a use of its own. It had a *history* before it ever got into the pitcher on the washstand.

In the first place, it was locally God-given. It accumulated in several ways during the spring weeks before the opening of the hotel and the cottages late in June. It fell from the heavens onto the granite rocks and trickled into the ponds by the old Diesel Shack, carrying with it the verdant green of algae, the rich red of oxidized iron, and a deeper tint suggestive of diesel oil. Or it drenched the weathered shingles of the cottages and splashed along the gutters to the cistern in the field. It pattered on the asphalt roof of the Oceanic and traveled through conduits to the cistern beneath the old building.

My friend and I, having retraced the paths of the brown-water supply, seemed to sink with it to subterranean depths. I said, "Now, of course, the larger boat brings all the water we need from Portsmouth. It's almost as if someone had set out to destroy our traditions. We used to know, before we plunged into our quart-and-a-half of washing water, that it had touched nearly every spot on this island before it touched us. It made bathing a kind of sacrament."

We both realized, of course, that progress must always take its toll and that at Star Island the many improvements have taken much of the adventure out of the experience. The electric lines from the Diesel Shack to the main building, for example, no longer come down during a bad storm. They came down for the last time when the new power house was built behind the hotel. The old Diesel Shack is now an Art Barn and Child Care Center.

"I wonder if they ever have any trouble with the generator these days," I mused. "Not that I'm aware of," said my friend. I recalled the exciting days when our family had spent the summer as members of the staff. "We could tell, even in the middle of the night when all our lights were off, whether the diesel had conked out. We'd hear this herd of engineers thundering past our cottage, heading east, and a few minutes later Rozzie Holt racing after them with a pot of hot coffee."

My friend and I bemoaned the fact that we could not possibly communicate the depth of our nostalgia to the new white-water, shower-treated generation, and–as my friend concluded solemnly–there would be countless hundreds of Shoalers who would never be *properly* baptized.

Hildreth Frost, is an established writer and long-time resident of Massachusetts. Star Island is one of the Isles of Shoals, 10 miles out by boat from Portsmouth, New Hampshire, but only six or seven miles, as the gull flies from Rye, New Hampshire. Star Island is owned and operated by the Star Island Corporation, which is made up of Congregational and Unitarian-Universalist lay persons. Since 1897 it has been the site for week-long educational and religious summer conferences. Frost's husband was manager of the facility for seven years in the 1950s and she and her children worked there also. Cornell University and the University of New Hampshire run marine biology summer schools on adjoining islands and college students —called Pelicans—make up most of the staff on Star Island. Hildreth Frost writes the Senior Citizen column for the Wellesley Townsman *and is a frequent contributor to* TAB, *a paid weekly that circulates in the greater Boston area.*

PUBLICATIONS

The Fish and Wildlife Service's recovery efforts for 581 listed species are summarized in *Endangered and Threatened Species Recovery Program,* a recently released 400-page report to Congress. The report, required by a 1988 amendment to the Endangered Species Act, represents the first time the Service has compiled a summary of recovery activities. The Service is required to prepare the report every two years and this first effort covers US species appearing on the list as of October 1, 1990. Each species' status is described as improving, stable, declining, or unknown, and a brief synopsis of past recovery actions and future plans is provided for each plant or animal. The report is being distributed through the Government Printing Office.

Two documentaries about wilderness and forests are available from Florentine Films, (company that produced the Ken Burns documentary about the Civil War). They are called The Wilderness Idea (about Muir and Pinchot) and Wild by Law (about Leopold and others) and have been shown on public television.

Women into the Unknown: A Sourcebook on Women Explorers and Travelers is by Marion Tinling (Greenwood Press 1989). The book is comprised of short treatments of 42 women—most from upper-class backgrounds—who sought out the wilderness for reasons that were different from men. The women of the 19th century wanted to get away from Victorian strictures , forget politics and cultural put-downs, and they wanted to experience different cultures and people intimately. There is a bibliography which indicates that the literature on women explorers is vast and unique.

Women of Color in Mathematics, Science, and Engineering: A Review of the Literature was prepared by the Center for Women Policy Studies. It can be obtained from them at 2000 P Street NW Ste 508, Washington DC 20036 (202-872-1770).

One of the "old girls" in American higher education has a new name and an expanded focus. Earlier this year, the National Association for Women Deans, Administrators, and Counselors (NAWDAC) announced a new name: National Association for Women in Education (NAWE). Its primary mission has been to support the personal and professional growth of all women, offering a wide range of programs in professional development, scholarly research, and advocacy. A new newsletter, About Women on Campus, will cover women's issues, policies, laws and litigation, resources, and information. The editor is Bernice Resnick Sandler, Senior Associate at the Center for Women Policy Studies, who was formerly director of the Association of American College's Project on the Status and Education of Women which she founded in 1971. She had a long and distinguished career as the editor of that organization's newsletter. To subscribe to the new one, send $20 for a personal subscription to NAWE 1325 18th Street NW, Suite 210, Washington DC 20036-6511.

In *Academe*, Special Issue, March-April 1991, there is a study about salary, rank, and tenure differences between men and women at universities. Males earn about 13 percent more at the full professor level, and eight and nine percent more for assistant and associate professors. Men are still more likely to hold the rank of full professor and have tenure (47 percent of men, but only 14 percent of women).

Photographer Anne Noggle wrote *For God, Country, and the Thrill of It: Women Airforce Service Pilots in World War II* (Texas A&M University Press). In 1979 Congress retroactively determined that women pilots like Noggle had actually been in active military service in World War II (1941-45). The book contains interviews and photos of the veterans.

Back issues of WiNR are available for $6 each prepaid. Request by volume and number. Send to address on back cover.

ONE WRITER RECOGNIZED EARLY THE INEFFICIENCIES OF ISOMORPHISM–MEANING A SIMILARITY IN THE APPEARANCE OR STRUCTURE OF ORGANISMS OF DIFFERENT SPECIES–AS IT RELATES TO HIRING WOMEN IN WILDLIFE WORK.

A DIFFERENCE OF A MERE 16 YEARS

ROBERT H. GILES, JR.

I recently uncovered a manuscript begun in 1971 that later appeared in my now out-of-print textbook, *Wildlife Management* (W.H. Freeman Co. 1978). I was particularly intrigued by the section on the need for accommodation toward women within the field of wildlife management. I re-read the section with some amazement because I believe that many of the needs I listed have been achieved or started. Surely many of the needs still exist, but the degree seems to have changed.

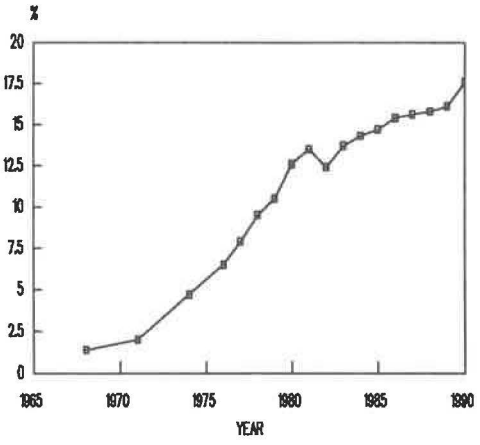
For several reasons I want to share parts of that 1971 text with readers of *Women in Natural Resources* and reflect a bit on the changes and on past conditions. These, hopefully, will provide insight into the present, and, as I believe to be a function of history, predictive power. And last, looking back at my early thoughts and writing may offer topics for discussions that might lead to improved resource management.

Background

In 1971, when I wrote the section on the potential role of women professionals in wildlife management–I am now embarrassed to admit–I had just had the personal revelation, the coming-to-awareness, that there was a role for women in wildlife management. My expanded view came about because of my own reading, television, the women's movement, and because I had two daughters entering their teens. I was aware, of course, of the women who almost ran the state wildlife agency and was grateful to and for them. But I had never worked closely with a woman professional, never had a personal secretary or assistant. Earlier, I had attended a largely-male undergraduate school, and had not one natural resource class with a female in my entire university career. I had worked in the 1960s for a state wildlife agency that finally in the 90s hired its first woman biologist. I had worked in a department–as I did from 1964 to 1971–without a female faculty member (and they still didn't until the 80s). And that was my experience with female colleagues when I came to write the section on providing opportunities for women in wildlife professions.

My concerns at the time of writing (and they remain today but with reduced intensity due to seeing lower probability) were for significantly improved wildlife resource decision making, intensive use of computers and data bases, computer-aided education of wildlife resource managers, and vitalized work on a *theory* for what we were doing. I saw more clearly than ever my personal limitations. I remembered my Ph.D. colleagues at Ohio State University and sensed the capabilities of competent people in other parts of the university responding to human needs which could have been enlisted in the cause of well-managed wildlife resources.

There was work ahead that could then be done; real invention was not needed. Brute strength was not needed. I saw isomorphism on all sides. Answers for some problems could be found not with the typical male hermit entering forestry-wildlife schools or with someone who "wants to work outdoors" –but with intelligent, caring, enthusiastic people interested in improved resource decision making.



Percentage of women by year in the Wildlife Society.
(Data courtesy Harry E. Hodgdon, Executive Director, The Wildlife Society.)

Leopold's (1949) land health image held my attention: the land doctor was the diagnostician and prescriber, not the hospital grounds-keeper. Rather than address males to seek a transformation, I exhorted females to natural resource professions: "Most aspects of research seem suitable. Physiological and nutritional studies of wildlife, mathematical and computer-based ecological modeling, developing aids to management decision making, and pathology and epidemiology seem appropriate for those uninterested in field work" (Giles, 1978).

In Retrospect

Much has changed in the 16 years since I wrote the section on the potential role of women in the chapter "Administration and the Agency" for my text. The two percent of the Wildlife Society that was female then is now 17.6 percent (Table 1). Graduate programs everywhere are now well populated with women. The U.S. Fish and Wildlife Service has a sufficient number of females employed so that *extra* efforts are no longer expended to recruit them. In contrast, state wildlife agencies (in my opinion—without survey) have hired few women as wildlife resource specialists who have master's degrees and manage a field-oriented program.

Enrollments of women at my own university have increased and now (1992) in our current graduate program of 54, there are 30 percent who are women. In 1971 when I first arrived things were very different—there were *no* female graduate students. I had taught the previous four years at the University of Idaho where I recall there being very few female students.

A female graduate student who was reviewing the 1971 manuscript commented on my sentence which included: "many women have no pressing financial need to work." She noted in the margin: "Boy, that's changed. Many more single parent homes are headed by women as well as single women who need to work. They work also for psychological/development reasons and to make a valuable contribution and to be recognized for it..." I had at the time no insight into the coming family-role revolution. I was commenting only on finance circa 1971, however, because I was very mindful of the other needs.

I still encourage women to enter wildlife management. But all of the battles are not yet won. I (and I know others do also) still struggle with the differences in human sexuality, no matter how it may be suppressed or denied in the work place. Along with their basic natural resource coursework, I am

concerned about how to offer or enhance an educational program for women that provides them the 10,000 small idiosyncrasies they need for fieldwork without which (1) they are prevented from achieving social dominance in groups where such knowledge or experience provides status or allows leadership; (2) they are prevented from appearing naive (at an advanced age); or (3) they are prevented from making resource decision errors usually labeled "impractical."

Finally, I am encouraged by the numerical successes and by the evidence of superior performances by individual women in the profession. I suspect the state natural resource agencies and universities will increase employment of females because they will be, in many cases, the most competent people available. I hope we may all labor cooperatively to achieve an effective wildlife resource system.

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Giles is currently writing Forest Faunal Systems, a textbook with computer diskettes.

Wildlife Management by Robert H. Giles Jr.

An Excerpt. Written 1971, published 1978. (W.H. Freeman Co.)

Whether the opportunities that exist will be engaged by women is yet to be decided. This opportunity is a decision and little more. It involves whether a male-controlled, relatively closed shop will open its doors to allow the best people available within the population, male or female, to gain an education and then to apply their minds and skills creatively to wildlife resource problems. Often the decisions to employ women seem to be more based on the employer's plumbing than on the prospective employee's merit. The feminists assert that because of built-in prejudice in employment circles, a woman must be twice as good as a man in a similar position. They joke bitterly that it is not too hard to do. I think the constructive impact that such minds could have on the wildlife resource would be spectacular. The influence on the agency and its wildlife managers would also be spectacular—but in a much different sense! The tensions would be great. The reader has only vaguely to perceive what these tensions would be to gain new insight into the nature of the wildlife agency and its willingness to do everything possible for the wildlife resource.

There are real problems for women who would do graduate work in wildlife management. Using rough figures from the research of Jean A.M. Taylor (National Institute of Health 1968) there are about 140,000 women bachelor-level graduates a year. About 17 percent of these were enrolled in natural and social sciences. Only about 42 percent enroll in graduate school; only 9 percent complete graduate work. There are thus only about 900 women graduates a year in fields somewhat appropriate to wildlife management. The study showed finance to be the major barrier to graduate study. Only one-fourth of the women, compared to almost half of the men, enrolling in graduate school received a stipend. The other major barrier was family responsibilities.

It is my opinion that it is irrational to restrict one half of the population from participation in wildlife management on the basis of sex. It seems wasteful of available human resources to fail to bring to bear on wildlife problems all possible intellect and skills. It seem inappropriate to perpetuate outmoded sexual and work ethics within a public agency of a modern secular society. To limit a professional community by any method—to *tend toward monoculture* in the ecologist's phrase, is to reduce community viability and health. I do not advocate, necessarily, that women do the same work as men, though they should be allowed to if they wish. I contend that their work contribution should be as significant to the public's or agency's general well-being as that of men. The situation for women is not now favorable in wildlife management. It can be changed. Indeed it will be changed, by a combination of the forces now working in society and by the following changes among wildlifers:

1. Public wildlife agencies must open their doors to qualified women university graduates in wildlife management. They must let this policy be known to the universities.

2. Universities must cease to discriminate against women graduate students in wildlife management. Part, but only part, of their reluctance to enroll women is the belief that there are no employment opportunities. Women must be encouraged to enroll for part-time matriculation in graduate programs. Campus-linked self-study or programmed learning opportunities should be made available.

The modern university must seek to serve the general public in ways other than granting a degree. Women, now relieved from many hard but very meaningful labors, and yet largely excluded from the dynamics of society, have found *tedium vitae* set in. Relief from an empty and frustrated existence can be provided by the university. There is no reason to perpetuate a split between family and study, or work and study. Part-time educational efforts seem essential.

3. Wildlife agencies, universities, and organizations must provide opportunities for part-time employment for women graduates. Many tasks such as computer programming of ecological problems and taxonomic work do not require full-time employees. Teaching on a part-time basis is now done and can provide opportunities for women with responsibilities for children. Planning is an effective role of women with great skills who also have family responsibilities.

Many women have no pressing financial need to work but are aware of both the practical and emotional rewards that come from keeping up in their field and fully using their talents. Part-time work with conservation agencies is a major answer. An atrocious human resource waste occurs when women *get educated*, develop brilliant intellectual resources, but then allow them to lie fallow.

4. The Wildlife Society, universities, and other resource organizations could provide information on opportunities by which women may deal meaningfully with problems of the wildlife resource.

5. Evident discrimination in the granting of graduate support or stipends to women must cease. *Additional* special stipends and special allocation of funds need to be sought to help overcome past imbalances and injustice. It is instructive that continuous graduate enrollment for women is more than twice as likely to occur when they receive a stipend as when they do not. Special funds are needed to enable mothers to complete their graduate programs. If university child care centers are not provided, allowances are needed. These funds will tend to prevent the high drop-out rates of graduate student mothers.

The clearly exciting and needed role of women in wildlife management is now only dimly seen. For awhile, it will take brave women to venture into the land of male feudal attitudes and it will take supportive male colleagues. Changes will occur among sophisticated wildlifers who will welcome new companions in a task they cannot do alone.

ONE MIGHT ASSUME THAT AFTER QUANTIFYING THE DIVERSITY IN EACH PLOT, CHIDREN WOULD SEE THAT MOWING DIMINISHES HABITAT, AND THAT ALTERNATIVES TO MOWING MIGHT PRESERVE HABITAT. SOUNDS CLEAR TO US, BUT TO AN EIGHT-YEAR OLD?

TO MOW OR NOT TO MOW: A SCHOOL EXERCISE IN ECOLOGY AND SITE DESIGN

RUTH PARNALL

INTRODUCTION

A family builds a house and attached garage on a wooded hillside and is surprised and distressed to see how much tree cutting and earthmoving result when the job is finished. A garden shop happily sells burning bush euonymus, known to be highly invasive in woodlands. A town highway department stores its winter sand and salt in uncovered piles at the edge of a wetland.

What are the similarities of these situations? Two things. First, in each case there is no common sense about human impact on the land. Second, each of these has touched my professional life. I am a landscape architect who has seen more than she wants of people whose ownership of land, chain saws, and bulldozers bestows the right to feel qualified to make decisions about changing the order of nature. As an environmentalist, my job is to be an advocate for the land, which can only speak for itself by eroding, flooding, burning, or toppling ecologically insensitive human works. It is disheartening to encounter not once in a while—but almost always—ignorance about preserving native plant communities, conserving non-renewable resources, and the logic of using a light touch in site development.

THE CONCEPT

My own certainty has grown over the last few years that ecological awareness at an early age may be the only solution to the ignorance I witness, if it is true that awareness brings appreciation. I see how many schoolyards might become classrooms, especially those in our region (the Northeast) which often are connected to woodlands or wetlands. Children could learn to open their eyes to natural forces, flora and fauna by walking out the school building door or even looking out the classroom window. It seems an absurdity to bus classes out of town to learn about nature, as if what is around us daily does not count...or to be talking about the habitat loss due to tropical rainforest destruction without equating it to the habitat loss from development of our own residential yards.

This is not a new idea. John Brainerd's book, *Nature Study for Conservation* (Macmillan, 1971), points out the ecological lessons to be learned in every schoolyard, even those which appear to be only asphalt. It is clear to me that analysis of the school site for its lessons about the natural world and human effect upon it, combined with design of the school site for enriching these lessons would be a way to foster an ecological conscience in future construction industry workers, homeowners, town board members, voters.

THE SETUP

My search for a way to put thoughts into action began about a year ago, when I called on friends at the Greenfield Center School, a private elementary school with a developmental curriculum. Originally, I wanted to volunteer to work on a design for the school grounds in the typical client/designer relationship. Ruth Charney, a teacher of the older children, helped me expand the concept by suggesting that the students be part of site design process as an application of their math and communication skills—surveying, plotting and drafting topography, evaluating existing site attributes; interviewing teachers, staff, and students for program development; learning about native plant communities, problem-solving to deal with program conflicts; calculating shadow patterns, learning about zoning, wetlands, etc., regulation; presentations for public agencies—the list goes on. Similar student participation is the core of the "Ecolands" program of Shirley Griffin, a high school teacher in Ashburnham, MA, who has used actual land planning projects to involve juniors and seniors as environmental apprentices.

With plans for a year-long project taking shape in my mind, I offered to try a short exercise: developing ecological awareness by observation and comparison. Ellen Doris, a GCS teacher and author of *Doing What Scientists Do: Children Learn to Investigate Their World* (Heinemann, 1991) suggested a study of mown and unmown plots in the GCS schoolyard. My purposes would be a) testing the assumption that people who understand the habitat qualities of unmown grass will make design decisions to avoid mowing, and b) seeing how a Greenfield Center School teacher would do this exercise. Ellen arranged for me to work with teacher Bob Strachota and the Upper Primes (seven- and eight-year-olds). Bob decided that he would need the first six weeks of school to build up to outdoor observation. He also felt that the exercise should be scaled down from comprehensive observation (plants, animals, insects, soil quality, temperature, etc.) to a focus on plants alone.

THE EXERCISE

Over thirteen school days this class of 21 students went out in the schoolyard with their sit-upons, drizzle or shine, studying first the unmown edge of a marsh. Each one had an area of about a square foot, marked off by surveyor's tape. They drew their whole plot; they drew, named, and quantified individual

plants in the plot; they compiled all of this into "field guides." Then they studied and drew similar-sized plots in the mown grass right next to the wetland. Subsequently, what was meant to be one day of discussion of the results turned into two, and the outcome was more than we could have planned.

During the first discussion session, Bob asked the children to describe what they found in each area. The list for the unmown plots was longer, and included insects. Bob asked, "What is different about your two plots?' Among other answers was that the unmown plot was "lots more interesting."

Bob asked, "How did they get different?" (he had never described these plots as "mown" or "unmown."). After a few other suggestions, one child finally said that one was mown, one was not, and there was a bit of discussion about whether the plots might really be the same composition, one simply shorter.

Isaac wanted to know, "Why do they cut it down?" Emily offered that "they are just weeds, and we don't need them." There were some logical suggestions about use related to the adjacent playing fields, which led Steven to the conclusion that perhaps too much was cut, perhaps they could just cut where people needed to be, like around the spectator benches. BINGO! And the remaining discussion was electrifying.

Bob asked, "Why would you *not* cut?"

"Because there's enough room already."

"Because there's a wall (stone retaining) in the tall grass that makes it hard to cut."

"Because it's marshy."

"Because you will cut the bugs in half."

"Because you don't want to destroy nature."

Rachel's dad had told her that the wall and the marsh had been part of a town outdoor skating rink when he was a boy. Bob mentioned that this was a subject of heated debate among faculty members—to mow and flood the marsh for skating or not, since skating at an indoor rink had been part of the winter sports program for years.

Colin: "But this is a school, not a park." Isaac and Steven got excited about getting money for the school by operating a skating rink for a fee. Apparently, the collective vision of "skating rink" for a while was something like the indoor rink, not a pond. Anna: "If it costs money to build a skating rink, and there is already one in town, why wreck this nice place?"

At this point it was time to go out to practice soccer. Bob decided to continue the subject the next day, because he thought everyone had more to say. As they lined up to move out, the kids were still in animated discussion among themselves about the pros and cons of putting a skating rink in the marsh.

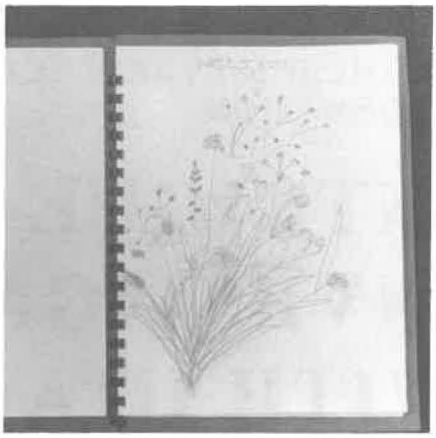
After soccer practice the next day, we all lined up next to the marsh and talked about what we could hear and see and what it would look like in summer. Then we went in to talk more. Bob started by saying that after their discussion, everyone would vote on the issue of making the marsh into a skating rink. At first the talk centered around "weeds"—what they are, and "If people don't need weeds, does anybody need them?" Eventually, a list of weeds and their value emerged, and seemed to include everything except lawn and tended garden plants. "Bees need flowers for honey." "We need wood for houses." "Grass-hoppers use them for food." "If we destroy nature, it starts to destroy the world, and if the world is destroyed, we have no air."

Some began to try solving the conflicts: "The skating rink won't be a problem, because there are no trees where the skating would be." "Let's make something else that wouldn't kill the bugs, like a soccer field." Rachel began to think about the complications and said, "Using the marsh might not be possible. Let's use someplace that's already cut down."

At Bob's request I joined in a brief discussion about wetlands and why they are important. After a few more group comments about the skating rink in general, Bob said, "Assume voting position!" Everyone went prostrate on the rug, face down, eyes closed. Bob explained the choices: Build (the skating rink in the marsh); Leave (the marsh alone and find another way to go skating). The vote: Build - 0. Leave - 21.

CONCLUSION

There are now three members of this class who are appointed to explain the reason for and results of the vote to the parent/student planning group. My exercise is over, but I can see how perfectly ready they were to move right into site planning: making a base map, finding out physical requirements for a skating rink, analyzing the site to find appropriate places, thinking of off-site possibilities, suggesting design alternatives. They



had done the basic ecological work of quadrat study, which had led them to sensitivity about a site and the need to explore design alternatives.

As far as the resulting vote is concerned, the children had no problems with the logical conclusion...in the end there was no question that the desire for convenient skating could take a back seat to preserving the habitat value of the marsh. Bob said that this was a very strong experience for beginning thinkers, and that further exposure would be very influential in forming their ecological awareness. He recalled one of his classes having worked on pond ecology for two years. Their teachers in later classes remarked how often those children drew upon the learnings from the pond work. The signs are hopeful that my assumption holds true: (to rework an old phrase) Familiarity breeds compassion.

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IN ORDER TO TEACH THE NEXT GENERATION OF STUDENTS AN APPRECIATION OF THEIR HISTORY, TEACHING TEACHERS IS AN EFFICIENT CONDUIT FOR INFORMATION.

INTRIGUE OF THE PAST: INVESTIGATING ARCHAEOLOGY WITH UTAH'S TEACHERS

SHELLEY J. SMITH

There are not many places you can go on public lands in the western United States and not encounter traces of past lifeways. North America has been home to humans for at least 12,000 years, but the saga of most of this vast time period is not recorded in history books written by those people. Rather it is chronicled by human artifacts and sites—the things they used and the places they lived.

The accessibility of public lands to most Americans means that this rich record is available for anyone to discover, contemplate, and enjoy. It also means that the fragile evidence of the past is vulnerable to thieves and vandals. A thriving illegal market in antiquities leads to the mining of sites for artifacts. Avid artifacts collectors, tourists, and recreationists erode our legacy by slipping a few pottery sherds, bottles, or arrowheads into their pockets. Vandals have been known to paint over ancient rock art panels or carve their initials in the logs of an historic cabin. Some archaeologists who have witnessed this attrition of the past estimate that if current trends continue, there will be very few sites left undisturbed as we enter the next millennia.

The majority of people are unaware of the consequences of their actions–and the issues and laws–regarding preservation of the past. Some of the theft and vandalism, however, is deliberate and will remain within the purview of law enforcement. To distinguish between the deliberate wrongdoers and the casual collector, and to reach the last group with some kind of intervention to stop unthinking destruction has puzzled archaeologists and managers of sites for years. Educating the public has been traditionally the agreed upon solution–and the education of young people especially–to assist them to formulate values. The difficult part has been to find the education vehicle to carry the message consistently and authoritatively.

Utah's Teacher's Program: Fourth Through Seventh Grades

In April 1988, the Utah Interagency Task Force on Cultural Resources signed a Memorandum of Understanding, agreeing to cooperatively address the problem of vandalism to archaeological sites. The Task Force is comprised of the Utah divisions of the Bureau of Land Management, U.S. Forest Service, National Park Service, and the State of Utah. Public Education is one of the four emphases of the Task Force. In June 1988, I submitted a proposal for implementing an education program to my BLM representative on the Task Force. With modification and input from other BLM archaeologists, the Task Force accepted the proposal. BLM was assigned lead responsibilty; I directed the program. The U.S. Forest Service allocated funding to hire an educator; Danielle Paterson initially filled this position, succeeded by Kelly Letts. A third member of the team was Jeanne Moe, an archaeologist working in the Utah BLM State Office who also had training in the field of education.

We began our task in January 1990. Initially we defined our goals and intentions for the education program, identified who our interested parties were, and whose experience could benefit us. Interested parties included archaeologists, members of the Task Force, American Indians, teachers, those working in environmental education, amateur archaeologists, and education specialists. Their affiliations ranged from universities to the State Office of Education and a variety of government agencies.

The primary goal of the education program was to enable students to be informed about cultural resources issues, so that they can take thoughtful and responsible actions. What should be done when an historic site is in the path of a planned development? Even if no one will see me take this arrowhead, is it the right thing to do? How can conflicts between Native Americans and archaeologists over the excavation and scientific study of human burials be resolved? How much public money should go towards preserving the past?

It was not a prudent use of energy and resources for archaeologists to attempt to contact students themselves; the daunting task of visiting each classroom even once would consume the time of many full-time employees. Besides, one hour in twelve years is not enough to give students the understanding they need to act responsibly toward archaeological issues. After doing some simple computations, we decided that the most efficient and effective strategy to reach Utah's 445,000 school-aged children was through their teachers. Our first two questions, then, were "What resources do teachers already have?" and "What do teachers need?"

We compiled a collection of archaeology education programs nationwide, and a listing of organizations providing training to teachers and students, and resources such as films and teaching kits, speakers, and opportunities for involvement in archaeology. All were measured against two criteria: is the program being *widely* and *effectively* used?

We determined that each of the programs had some merit, and most were reaching some fraction of their intended audience. Many of the teacher training programs were costly, and all required a good deal of preparation for the teacher to implement. Characteristically, training programs enriched the teacher personally, but a good framework of important concepts to teach and exciting ways to teach them are lacking. Only a very motivated teacher will tackle new subject material in a comprehensive way, and teacher understand-

ing is still one step removed from students' understanding. We also realized that these programs probably do not reach more than one-tenth of one-percent of Utah's 18,000 teachers. Conclusion: the currently available archaeology education programs won't meet our need to teach basic concepts about the past and about site conservation to every future jury-sitting, taxpaying, recreating adult. These ideas take time to develop as the student matures, and they require repetition. Teachers equipped with the resources they need to teach these ideas are the rare exception.

Our challenge then, was to co-opt teachers into allocating enough time in the classroom for teaching concepts about cultural resources. Additionally, we need the majority of teachers to participate, not just that fraction who have a keen interest in archaeology.

A second limitation is that most teachers have little, and more frequently, no background in archaeology or anthropology, both of which are seen as esoteric specialties. Almost everyone feels intimidated to take on a discipline that is completely new to him or her, to wade through volumes of professional literature and sieve out–and translate for kids–the essential concepts.

The Utah State Office of Education has no requirement that archaeology be taught, although they have agreed to endorse the materials we developed. The seemingly straightforward approach of mailing material to teachers rarely results in the material being used. Teachers already receive stacks of unsolicited materials on myriad subjects, and archaeology is a new subject that for most that would require a focused effort to teach.

The limitations were formidable. Where were our opportunities? We looked at teachers' needs as our opportunities, and discovered three primary areas where archaeology could capture some time on a teacher's schedule. The first area we analyzed was the state core curriculum which mandated the topics teachers must teach for each grade level. We designed lessons to help teachers teach the core requirements and compiled a correlation of the lessons with the state core requirements.

Second, what constitutes "teacher-friendly" materials? Teachers work from lesson plans; a good lesson includes clearly-stated and measurable objectives, background information in layman's terms, and readily-available materials and teaching aids. In short, lessons that do not require a lot of preparation are most likely to get used.

Finally, we looked at the prevailing concerns of educators today. Current trends include a regard for developing higher-order thinking skills, scientific inquiry, problem solving, cooperative learning, citizenship skills and community action. An integrated curriculum is another concern of educators—how can students be taught to think holistically, to link information from different subjects?

We concluded that a thoughtfully-constructed archaeology program could meet educators' concerns and teachers' needs very well because one of the greatest strengths of archaeology is that it is an integrative, interdisciplinary field. Archaeologists take a scientific approach to studying human behavior. The questions archaeologists ask are rooted in the social sciences, and the methods used to answer those questions are largely scientific. Archaeological problems are good vehicles for problem-solving using information from several topics.

The interdisciplinary nature of archaeology also means that there are many opportunities to infuse archaeology into the entire curriculum. Science, art, math, language arts, and history are all topics that archaeology can address. Problems in site preservation and different viewpoints on how sites and artifacts are to be managed provide excellent means to teach citizenship skills and problem analysis.

Perhaps the biggest asset of teaching with archaeology is that almost everyone seems to have a curiosity about the past, kids especially. Archaeology intrigues kids, and this makes it an exciting topic to teach, since teachers can easily capture their attention.

Well-designed lesson plans can help teachers teach what they have to teach anyway without preempting other topics. Archaeology can offer a fun and motivating alternative way of teaching it, or can provide an application of something they're studying. For example, when learning about plants and plant parts, a lesson on pollen analysis and its value to archaeologists shows an interesting and real-life application of understanding plants. Concrete examples help kids cement and remember what they've studied.

The model

Another step in developing the archaeology education program was looking for a successful model. We wanted to know if there were supplementary education programs that were already successful in getting used in classrooms. Could they be modified for our use? We discovered that Project WILD has been exceptionally successful; in 1989 in Utah, over 1100 teachers attended WILD workshops. We contacted the local Project WILD coordinator, Daphne Sewing, at the Utah Division of Wildlife Resources (DWR) and the national coordinator, Dr. Cheryl Charles, in Boulder, Colorado.

We learned that Project WILD was an interdisciplinary supplementary environmental and conservation education program emphasizing wildlife for educators of kindergarten through high school age students. *The Introduction to Project Wild* (1986) noted that the goal is *to help people develop awareness, knowledge, skills and commitment to result in informed decisions, responsible behavior, and constructive actions concerning wildlife and the environment.* I believe their goal to be parallel to that of what we wanted to accomplish with the archaeology program, and "archaeology" could be comfortably substituted for "wildlife and the environment." Our education efforts are not aimed at trying to create more wildlife biologists or archaeologists, but rather to educate future advocates for responsible management of a particular resource.

An especially important element in Project WILD's success is its credibility, achieved in large measure because it was developed collaboratively by educators and wildlife biologists (Daphne Sewing, personal communication, 1989). Lessons were first tested in classrooms, and the overall program was formally evaluated for effectiveness.

Teachers get the WILD books for free, but must attend a workshop, for which they can earn credit useful in pay scale advancement and certification. WILD insists on workshop attendance because they have found that workshops help teachers overcome intimidation they have at teaching a subject new to them. They can practice what they have learned in a safe supportive environment; they can ask questions of professionals; and they build a network of support among themselves. Utah Project WILD sustains teachers' interest and network links by publishing a newsletter several times a year. The newsletter includes information of local interest, current discoveries and projects, and activity adaptations or extensions. Teachers have the opportunity to submit their own ideas and activities to the newsletter. This supports a tremendous interest in Project WILD, and keeps teachers using the lessons in their classrooms.

Implementing our project

Based upon what we learned from our colleagues, the needs assessment, analysis of limitations and opportunities, and the proven elements of success of the Project WILD program, we developed an archaeology education program with three components. The first is the teacher's activity guide *Intrigue of the Past: Investigating Archaeology* for 4th through 7th grades, and second, a delivery system of teacher training workshops, and third, a support system consisting of a newsletter and teacher-archaeologist partnerships.

Two characteristics of the archaeology education program especially deserve mention: American Indian perspective and values development. We felt very strongly that teaching the prehistory of Utah is also teaching the cultural heritage of American Indians. We

wanted to be sensitive to their concerns and offer them the opportunity to have their perspective presented. We acquired a contact in each of Utah's seven Indian tribes, and had discussions with others prominent in the Indian community. We asked these people to help us present their viewpoints correctly, and to assure that our materials wouldn't be offensive to Indian students. We had planned, for example, to prepare lessons using traditional Navajo stories. We did not know that it is appropriate to tell certain stories only in winter; recommending storytelling to teachers would have violated tradition and could have made some Navajo students uncomfortable. American Indians have strong feelings about archaeology, especially where human burials are concerned. They often have interpretations of the past and viewpoints on the use of sites and artifacts that are radically different from those of archaeologists. We decided that students should be aware that there is more than one perspective on an issue, and we would attempt to present both sides fully and neutrally. While it is too soon to know for certain, I believe we have built a more positive relationship with Indian people because of our desire to give them a voice in our program. Additionally, teachers with Native American students in their classrooms have told us that these students seem to "stand a little taller," that they are proud and pleased that their past is being taught too.

In developing our program, we wanted to know how people form values, so we researched work on values development. Students of different ages must be approached differently when working with values, but kids are never too young to be thinking about issues. After students are sufficiently informed about an issue, they need to be given an opportunity to clarify and examine their beliefs about it. And finally, the best education programs model affirmative responsible actions toward a problem or issue. For example, it is not effective to simply teach kids about environmental problems; they can easily become pessimistic and overwhelmed. Modeling a way to personally address the problem, such as starting a school recycling center, teaches kids that they can have an impact and be part of a solution to a problem.

Our research showed that a thoughtfully arrived at opinion requires a good understanding of the facts and time to think about them. Strategies such as role play, guided imagery, simulated experiences, ethical dilemmas, and debate can facilitate values clarification. Think of all the information you are flooded with daily. How many of us take time out to gather more data, analyze it, and form an opinion about every issue? Lessons in the final section of the activity guide give students that opportunity. Also included is a procedure for solving real-life problems involving archaeological resources. The model guides students and their teachers to use creative and critical thinking skills to find and implement solutions to current and future problems.

Some teachers are hesitant to "teach values." Our response is that students form their own values; the teacher gives them the information and means to do that. We strived to be balanced in our presentation of information, for example, showing the difference between what is obtained when a site is illegally dug to recover artifacts, and what is gleaned when a site is dug scientifically and legally. Most teachers have taught the values clarification lessons, and the following are typical remarks:

I was hesitant to do ethical/values-type lessons with my fourth graders. I thought that these types of activities might be too sophisticated for them, but I decided to try it and see what would happen. We had completed a unit on archaeology, and I chose to have them do the ethical dilemmas. I was amazed and pleased with their enthusiasm for the activity, and with the insights and conclusions they reached. They enjoyed the lesson and I think they appreciated being asked their opinions about a real issue they care about.

Kathleen Atkinson, Midvale Elementary

I love activities where there are no right or wrong answers. Students think more deeply about why they chose the answer they did—not just because it was right or wrong. Everyone becomes a winner. These lessons are adaptable to many subjects where discussion of values is involved.

Laura Copeland, West Lake Junior High

The activity guide

The activity guide consists of 34 lesson plans, including activity sheets, quizzes, illustrations, and teaching aids. Each lesson has measurable objectives, background information, stage setting, procedure, closure, and evaluation. Some lessons have extensions and links to other lessons. A key lists the subjects each lesson addresses, skills learned, strategies used to teach the skills and concepts, duration, and class size. Lessons incorporate activities which appeal to a variety of learning styles.

The guide is organized into four sections, and is designed to be flexible. Teachers can choose to combine lessons in any number of ways. We do provide suggested "menus" for various emphases, such as social studies, interdisciplinary studies, and science and math. Also included are lesson cross-references by skills and teaching strategies, a core curriculum correlation, a resource directory for teaching archaeology, and a glossary.

Section One is an introduction to the basic concepts of archaeology: culture, chronology, context, observation and inference, scientific inquiry, and classification. This section is the only one recommended to be taught as a whole since it provides the foundation of the program. Section Two is a series of essays, written at the fifth grade reading level, about Utah's native cultures, prehistoric to modern. Lessons on the process of archaeological study comprise Section Three, including such topics as tree-ring dating, cross-dating, math applications, gridding a site and experimental archaeology. Section Four, Issues in Archaeology, is the capstone to the guide and we recommend that teachers use this section to culminate their study of archaeology. Several lessons give students an opportunity to draw together their knowledge and feeling about archaeological issues, and to clarify their values.

Workshops and the Institute

Teachers can only receive the activity guide by attending a 10 hour workshop, for which they receive one credit hour. The Utah Museum of Natural History hosted several of our first workshops, and teachers received additional credit for formally pilot testing the lessons. The 75 teachers who did test and give us feedback on the lessons provided us with invaluable advice and creative improvements. An element of the testing was to poll students and ask them what they liked and didn't like, and what they believed they had learned.

Workshops at the Museum enabled us to attract many Salt Lake City teachers, but one of our initial aims was to have students all around the state learning about their archaeological heritage. Deedee O'Brien, Teacher Workshop Coordinator at the Museum, proposed creating an institute as a way to achieve this end. BLM and the Museum applied for and received a $10,000 grant from the Utah Humanities Council to conduct a four-day Archaeology Summer Institute, followed by two fieldtrips. Other donations and proceeds from a lecture fundraiser were used as matching for additional UHC funds.

In June 1991, 70 teachers, representing almost every school district in the state, attended the Summer Institute. *Intrigue of the Past: Investigating Archaeology* was the centerpiece of the Institute, along with several guest lectures and other hands-on activities, like flintknapping, laboratory analysis, and pottery making. Part of the requirement for participating in the Institute and receiving a substantial five credits was that teachers return to their home districts and, together with a trained archaeologist, cooperatively teach a 10-hour workshop to their fellow teachers. Eighteen local workshops

should result. By April 1992, nearly 500 teachers will have been trained in using the *Intrigue of the Past* materials.

Four facilitator workshops have been held around the state and we have trained 35 archaeologists to use the program materials and work with teachers. These archaeologists are the ones teachers request to help them conduct their local workshops, and they also form nodes in the support network. We have found that teaming an archaeologist and a teacher is a powerful alliance, as each strengthens the other's teaching and allows the availability of expertise in both fields at a workshop. Archaeologists with federal and state agencies and private contracting firms have participated with enthusiasm, and most employers have been accommodating in providing overtime or compensatory leave and recognition in performance appraisals.

We look at this initial round of local workshops as a scattering of seeds—some will germinate and grow and others will not. Some teachers dislike teaching their peers, and people have varying talents for leading workshops. Our goal is to nurture those with the desire and ability to become permanent Intrigue facilitators and conduct regular local workshops. Constant evaluation and communication will show us where in the state we need to focus and sow some more seeds. We will have attended portions of most of the local workshops, and conducted an additional session for effective and interested teacher leaders by March 1992.

New program aspects

Funding for the program has continued to come from the Interagency Task Force and the BLM Washington Office. The Intrigue program forwards the goals of BLM's newly-launched heritage education program. We are still seeking means of formally establishing regular funding for the program team.

Currently several other program aspects are being developed. BLM is producing four short videos to be used as teaching aids. An awards recognition system for exemplary and creative use of the Intrigue materials is underway. A major effort is focused on preparing a secondary level activity guide, and we are working to be responsive to requests from other states for the program.

Another goal is to move the program into the curriculum for older students. Developing the secondary level materials requires a different tactic than did the primary level. Students are not in one classroom with one teacher, and the fact that teachers are specialized by subject in secondary level schools means that we cannot attract any one of them to more than a fraction of a program that is meant to be cross-curriculum. Working with educators and our contacts is greatly assisting us in devising the best strategy to appeal to secondary level teachers and students.

The price of success

We have received numerous requests for the activity guide, which poses a dilemma for us. The Intrigue program has three legs; it will not stand with two of the legs removed. Our guiding philosophy all along has been to build and sustain a program: teacher training workshops and a support network are essential to program success. At the same time, we want to share what we have learned about effective education programs, and what we have had the fortune of time and support to develop.

Our solution to the dilemma is to offer the entire program to other states. Idaho, Nevada and Colorado are in varying stages of initiating an Intrigue of the Past program. We will train interested archaeologists and teachers in establishing a network, connecting with their State Offices of Education, using the Intrigue activity guide, conducting teacher workshops, developing state-specific materials and resources, and sustaining their state program. Meanwhile, we are preparing program standards and guidelines, and will revise the activity guide to be generic and not referenced to Utah archaeology. Within a year, with adequate funding, we hope to be in the position of offering the program nationwide.

Personal rewards

Whether you are an archaeologist or not, I recommend becoming involved in outreach education about your resource specialty. The rewards are enormous, both personally and to your agency. Community involvement, being a good neighbor, and enriching local schools are positive outcomes of agency education efforts.

I think that a public informed and caring about myriad resource values and issues will help agencies achieve balanced multiple-use management. Our interest groups will become broader in their advocacy, from single issue or resource, to overall sound management of all resources. An informed and caring public won't necessarily always agree with us, but they will understand various concerns better, and perhaps dialogue between adversaries will become more productive.

Public education has been rejuvenating for me. Building kids' interest in archaeology reminds me of what excited me about the subject years ago–archaeology lives for me again. Also, I feel I am giving back some of what public funds have allowed me to enjoy doing as an occupation. Finally, it has been personally enriching to learn more about the field of education, and to create a fusion of education and archaeology.

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Shelley Smith is the Cultural Resources Program Leader in the Bureau of Land Management's Utah State Office, a position she has held since May 1991. Her Bachelor's in anthropology is from Pennsylvania State University and Master's in anthropology is from Washington State University. She was a Volunteer for the Peace Corps and has worked for a cultural resources consulting firm in Colorado and as a crew chief for excavations on the Navajo Reservation in Arizona. Prior to her present position, she worked for three years in the Salt Lake District of the BLM.

Know your audience. Clearly define your target group and know how to best reach them. Generally speaking, children under the age of about seven think in concrete terms, and have difficulty understanding differing viewpoints. Children from seven through 11 are beginning to develop empathy and a sense of right and wrong based on laws, but are not adept at processing many different factors at once. Students from ages 13 through 18 are beginning to be concerned with social issues, beliefs, and values (Woolfolk 1987: pp. 435, 108-109).

Have a clear message and repeat it often. Choose two or three clearly-stated messages that you want to convey and then build your lesson or presentation around them. Don't weaken your points by trying to share too much at one time.

Give your audience an experience, not just information. People of all ages learn and remember more when many senses are involved in an experience. Listening is probably the least exciting way to learn about a topic. Utilize many stimuli, such as sounds, taste, feel, and smell, and build activities so people actually do something. For example, Joseph Cornell (1989) describes how he awakens people to use all their senses out-of-doors by having them walk barefoot down a forest path. Project WILD also has lessons built around sharpening perception and imagining how the world is experienced by other living things.

Include your audience, don't just lecture to them. Kids get plenty of talking to. Your presentation will be more effective if you establish interaction with them, let them at least partially define the flow of the experience, and respond to what they want to know and do. Ask them lots of questions and guide them to discover their own solutions. It is difficult to establish this kind of rapport with a large group, and I prefer to do a presentation twice to two groups of 25 rather than once to a group of 50.

Inspire ownership. People care about what they feel a sense of pride and ownership for. Make your topic relevant to their lives. Let them know that the resources in their own area are special, and are valued. Providing an opportunity for people to participate in and experience an aspect of your profession builds a feeling of ownership. Also let people know that as an agency employee, you work for them managing resources for the benefit of everyone.

Be fair. Try to present all sides of a controversy in an unbiased way. A thoughtful neutral explanation of an issue preserves your credibility. Keep in mind that it can be confusing for younger children if more than two or three viewpoints are expressed.

Move from the known to the unknown. Establish a common point of departure with your audience by understanding what they already know about your topic. Find something in their everyday lives that relates to your topic if they haven't studied it specifically. I often introduce how an archaeologist works by asking students what I would learn about them if I went into their bedroom before I ever met them. Even first graders relate to this game of clues, and can tell me that I would know if they were a boy or girl and how old they were, if they were messy or not and if they shared their room. I then explain that this is how archaeologists work–we look for clues about people in their things.

Do not tolerate rudeness. Most teachers will attend to discipline problems for you, and most students want to pay attention to you. In my experience, I have encountered very few instances of outright disruption or rudeness by students. The most common disruptions are high school students talking. Younger children are generally well behaved. Stop whatever you are doing until the offenders take notice, and explain that you cannot all be talking at once. Peer disapproval usually will take over to keep the offenders in line, but another strategy is to walk over and stand next to them while continuing your presentation. Once a particularly energetic third grader would not let his neighbor pay attention to anything but him, and I continued showing slides while I led him to another seat.

Have fun! Your enthusiasm for a topic will win your audience's attention every time. If you are enjoying yourself, you generate more excitement and interest.

Shelley Smith

Are you going to be presenting workshops or seminars to schoolchildren? Developing an effective education program boils down to good communication skills. Here is a summary of key points to remember.

WHAT ARE THE BARRIERS AND BENEFITS TO TEACHERS TO TEACH A NATURAL RESOURCES CURRICULUM TO THEIR STUDENTS? THIS STUDY LOOKS AT CHICAGO TEACHERS.

URBAN TEACHERS' PERSPECTIVES ON TEACHING NATURAL RESOURCES

CHARLOTTE YOUNG
DEBORAH SIMMONS

Introduction

Teachers play a potentially powerful role in helping increase youth's awareness of environmental and natural resource issues by providing opportunities for students to interact with natural areas. Natural areas as used in this paper are defined broadly: city parks, local streams, woods, vacant lots, school yards, forest preserves. Yet the degree to which teachers play this role varies from school to school and class to class. Teachers may or may not get involved in teaching environmental topics for a variety of reasons. While teachers may often feel teaching about nature and environmental topics is important (Simmons, 1988), they face many other barriers. These barriers include lack of time and funding (Ham and Sewing, 1988), and concern about their skill levels (Ham, et al., 1988). On the other hand, teachers appear to support the concept of teaching students about environmental and natural resource topics (Simmons, 1988) and feel that their students gain a great deal from participating in environmental programs (Simmons, 1986).

To increase the likelihood that environmental and natural resource topics are actually taught to students, the reasons teachers may or may not teach these topics must be explored. This study examined the various aspects or dimensions of urban teachers' perceptions of the barriers and benefits of providing nature experiences for their students.

The Study

Questionnaire Development and Pilot Testing

To examine factors that might relate to why teachers take the responsibility to incorporate nature experiences into the curriculum, a questionnaire was developed, field tested, revised, and distributed to randomly selected teachers within the Chicago metropolitan area. The draft questionnaire was pilot tested with approximately 40 teachers attending a one day Project WILD training workshop. It was revised based on both peer review comments from eight environmental educators, and the results gathered from the pilot test. In its final version, the questionnaire included 139 items. Respondents rated items on a five-point Likert-type (Likert, 1932) scale (1 representing a negative response and 5 a positive response).

Sampling Approach

Given the increases in population in urban areas, and this population's frequently indirect experience with natural environments, teachers from the Chicago metropolitan area were sent the questionnaire. In this study an effort was made to include teachers with widely varying types of students, and diverse experiences with providing educational experiences in natural settings. Elementary school teachers were sampled from the mailing lists of a Chicago nature center, a Federally sponsored science enrichment program, and a residential outdoor/environmental education field center. These teachers were presumed to represent relatively high levels of actual participation in providing nature experiences. (Nature experiences as defined here are any experiences where a person can in some way interact with natural environments such as forest preserves, city parks, small wood lots, or vacant fields. It may also include experiences one might have in places such as zoos, nature centers and aquaria.) Finally, a list of Chicago Public School teachers was utilized to gain access to those teachers who may not have previously provided some type of nature experiences for their students.

A postage paid envelope was provided to facilitate response. Postcards were also sent as reminders to non-respondents approximately four weeks after the initial questionnaire was mailed. Of the 779 questionnaires distributed, 226 (29 percent) useable responses were received.

Study Participants

Since teachers were sampled from mailing lists where teachers had gone with their students (e.g., nature center, residential center), these respondents are likely to have had a higher level of participation in providing nature experiences for students than the "average" teacher. Respondents had a broad range of backgrounds (Table 1) and for the most part were quite experienced teachers. Although a number of respondents were new to teaching, the vast majority have been teaching for at least five years, and over half had 16 or more years of teaching experience. Furthermore, the majority had completed at least some graduate work. Most grew up in urban areas with less than 10 percent growing up in a rural setting.

Data Analysis

Data were analyzed using cluster analysis and factor analysis. Both of these techniques reduce the data into a smaller, more manageable number of dimensions or factors. Each of the resultant factors can be seen as a coherent idea or set of issues. As such, they provide an indication of core concerns and attitudes held by respondents.

Results

Four general categories of barriers and benefits were identified: Importance of Providing Nature Experiences, Comfort Level in Nature, Training and Preparation, and Logistical Barriers. Each of these four general categories consisted of multiple factors or dimensions, for a total of thirteen distinct barriers and benefits (Tables 2-5) that respondents viewed as relevant to teaching their students about environmental topics. In general, respondents were similar on all 13 dimensions regardless of their gender or ethnic/racial background. On only two of 13 dimensions were men different than women, and on only two of 13 dimensions were minorities different than whites.

Importance of Providing Nature Experiences

Since teaching about environmental topics and providing nature experiences is not legislated in the state of Illinois it is reasonable to assume that something more than the coercion of mandates determines whether teachers provide these experiences. Understanding teachers' perspective on the role nature experiences play in the school curriculum provides some idea of why teachers might choose to incorporate these types of experiences into their curriculum. Consequently, examining teachers' views more closely concerning the perceived importance of environmental education as well as their own sense of responsibility toward providing these experiences draws a more complete and complex picture of their reasons for being involved.

Three factors (Table 2) concerned respondents general attitude toward the relative value of incorporating nature experiences into the school program. Overall, respondents expressed a strong sense of the importance and relevance of providing nature experiences for their students. With a mean score of 4.4, respondents highly endorsed the factor *Student Receptivity*, expressing the sense that "my students would think going out to natural areas would be fun" (mean = 4.6), "it is important to provide nature experiences for students" (mean = 4.4), and "in general, my students would be receptive to learning about the environment" (mean = 4.1). Although related to *Student Receptivity* (r=.40)—but significantly less strongly endorsed than *Student Receptivity*—respondents also supported the *Importance of Nature Experiences* (overall mean = 4.1). (In this paper, r is the standard abbreviation for a correlation coefficient, which is a measure of linear relationship between variables. It ranges from -1 to +1, with a -1 meaning a perfectly negative linear relationship between variables, and a +1 meaning a perfectly positive relationship.)

Respondents agreed that providing nature experiences for their students "is an important part of the curriculum" (mean = 4.3) and "is really relevant to my teaching" (mean = 4.2). To a somewhat lesser extent, however, respondents supported the notion that providing nature experiences "is my responsibility as a teacher" (mean = 3.9). These findings are similar to those reported elsewhere (Ham and Sewing, 1988; Simmons, 1988), where participating teachers were supportive of the overall importance of environmental education, but were less enthusiastic in endorsing their own role ("environmental education is my responsibility as a teacher," mean = 3.9).

Finally, respondents showed some disagreement with the single item factor, *Back to the Basics* (mean = 2.4), with it being significantly less supported than both the other factors in this category (Table 2). This factor addressed the notion that providing nature experiences "is not as important as spending time on the basics." With the vitality of the back to basics movement, it is perhaps not too surprising that nearly 20% of the study participants agreed with this statement.

Comfort Level in Nature

Although teachers may believe that providing nature experiences is important, relevant, and something their students would enjoy, they may not feel comfortable personally spending time in natural areas. Individuals have varying tolerances for dirt, bugs, and the vagaries of weather. Consequently, it is important to gain some sense of how teachers, in general, feel about spending time in natural areas (Table 3). The high endorsement of *Personal Comfort in Nature* (mean = 4.2) shows that respondents were generally at ease spending time in natural areas with family or friends (mean = 4.5) and feel that they would enjoy spending time in natural areas ("spending time in natural areas is something I would like to do" mean = 4.2). It is interesting to note, however, that respondents were less certain about spending time in natural areas by themselves ("I would feel comfortable spending time by myself in natural areas," mean = 3.9). It may be that the emphasis on a solitary expe-

rience is the key factor here. In fact, the relatively high mean score of a related questionnaire item (one that did not group with any of the other factors), "I would feel comfortable spending time in natural areas with my students" (mean = 4.2), was far more consistent with the other items that center on personal comfort with nature.

It is interesting to note, that even though these respondents feel comfortable in natural areas, for most, this comfort probably did not come from experiences shared with a special person while growing up. (In contrast, women who work in natural resource fields have emphasized mentoring at this stage in their lives. Mentoring here was less strongly endorsed for women educators who participated in this study.) The single item factor, *Nature Mentor* ("I had a special person who took me under his/her wing to learn about nature," mean = 2.6), was significantly less well supported than and independent of *Personal Comfort in Nature* (r=.14). Nearly 60 percent of respondents disagreed with this item, while less than 25 percent indicated they agreed with the statement.

Training and Preparation

Providing nature experiences for students requires a unique set of skills and knowledge: teachers must teach outside the classroom, and be able to provide an interdisciplinary perspective to their teaching. Even though teachers may feel personally comfortable in natural areas, if they consider themselves to be poorly trained or are afraid of not knowing the answers to students' questions, they may be unwilling to participate. In determining the factors that relate to whether teachers incorporate nature activities into the school curriculum, it is important to establish their assessment of their skills and areas of knowledge (Table 4). Three factors were found under this general category.

The factor *Desire Training* (mean = 3.7) reflected respondents' enthusiasm for increasing their knowledge base ("I'd like to find out about how to get training in teaching about the environment," mean = 4.1, and "I would like to receive more information on teaching about the environment," mean = 4.2). Even with this expressed enthusiasm, however, they were less likely to believe that they will act upon this desire for more training within the near future ("it is likely that in the next six months I will participate in training in teaching about the environment" mean = 2.8).

On the other hand, respondents expressed some doubt about their skill and knowledge (overall mean = 2.8) with the factor, *Level of Preparation*. It was significantly less endorsed and independent of Desire Training (r=-.14); ("I do not need more training in teaching about the environment," mean = 2.3; "I have a strong science background," mean = 2.9, and "I am well trained to teach about the environment," mean = 2.8). They did feel, however, that "adequate lesson plans concerning the environment are available" (mean = 3.2).

Related to their concerns about *Level of Preparation* was a dimension named *Level of Confidence* (r=.39), although this dimension was significantly less supported

Table 1: Respondents' Background

	N	%
Grade Level Taught:		
K - 3	62[a]	30.5[b]
4 - 6	68	33.5
7 +	11	5.4
multiple grades	62	30.5
Number of Years in Teaching:		
0 - 5	24	11.0
6 - 10	34	15.7
11 - 15	34	15.7
16 - 20	61	28.1
21 +	64	29.5
Ethnic Background:		
Minority	51	24.5
White	157	75.5
Gender:		
Male	19	9.5
Female	180	90.5
Age:		
20 - 29	18	8.4
30 - 39	45	20.9
40 - 49	101	47.0
50 - 59	47	21.8
60 +	4	1.9
Education:		
College Graduate	30	13.7
Some Graduate Work	76	34.7
Graduate Degree	113	51.6
Where They Grew Up:		
Urban	112	52.1
Suburban	51	23.7
Small Town	32	14.9
Rural	20	9.3

[a] number of respondents in the category;

[b] percent of respondents in the category

Table 2: Factors Relating to the Importance of Providing Nature Experiences

Factor	Mean	Standard Deviation	Number of Items
Student Receptivity	4.4	.593	3
Importance of Nature Experiences	4.1	.666	3
Back to the Basics	2.4	1.18	1

than *Level of Preparation*, with an overall mean of 2.6. Respondents generally disagreed that they "do not know what teaching techniques to use" (mean = 2.5), would "be afraid I wouldn't know all the answers" (mean = 2.6), and that they "need a strong science background" (mean = 2.6). Even if teachers have sufficient training, and levels of competency, however, their ability to teach environmental and natural resource topics may be hampered by other factors.

Logistical Barriers

It is important to remember that teaching does not occur in a vacuum. Teachers must deal with a host of potential barriers, including finances, time, and the availability of various other resources (Table 5). The least serious obstacle respondents identified was *Class Management* (mean = 2.2). They slightly disagreed with the statements: "my class is too large to take to natural areas for instruction" (mean = 2.2), and "my students are too unruly to take outside" (mean = 2.2). Moreover, few respondents expressed a concern surrounding issues of *School Support* (mean = 2.3). In general, respondents did not feel that taking their students to natural areas was "hard to justify to the administration" (mean = 2.2) or lacked the "support of other teachers" (mean = 2.4).

A significantly greater, and somewhat related concern to *Class Management* (r=.32) and *School Support* (r=.21) was potential *Hazards*. Respondents worried somewhat about *Hazards* (mean = 2.7) when planning a nature experience. Respondents felt that they would "worry about safety" (mean = 3.2), "worry about poisonous plants" (mean = 2.8), and to a far lesser extent "worry about the threat of animals" (mean = 2.2).

Another dimension to emerge with about equal intensity with *Hazards* was *External Impediments*. With the exception of funding, *External Impediments* (mean = 2.8) seemed to form a moderate barrier to providing nature experiences: "my students would have inappropriate clothing to spend time in natural areas" (mean = 2.4), "there is too much crime to take my students to natural areas near by school" (mean = 2.5), and "lack of funding would make providing nature experiences difficult" (mean = 3.4).

Respondents felt the most serious logistical barrier was reflected in a sense that needed *Resources are Not Available* (overall mean = 2.9), which had a significantly higher mean than all four other dimensions found in this category (*Class Management, School Support, Hazards, External Impediments*). Respondents felt that incorporating nature experiences into their school program "requires a lot of extra lesson plan preparation" (mean = 2.9), "requires special equipment" (mean = 2.8), and "involves too high a transportation cost" (mean = 3.0).

Conclusions

Respondents indicated that many factors may be associated with whether they do or do not incorporate environmental and natural resource topics into their curriculum. Respondents overall attitude toward environmental education seemed to be positive and relatively strong, and they seemed to express a positive relationship with nature, which is essential if we are to nurture a true love for the environment among children. More specifically, even though respondents taught intercity students where there may be limited opportunities for providing nature experiences, they believed that providing them was important, and something their students would enjoy. Likewise, they were personally comfortable about spending time in natural areas both with family and friends as well as with their students. Furthermore, they were quite interested in increasing their knowledge base with more training.

These encouraging results must be tempered, however, by respondents' hesitance to accept personal responsibility for delivering environmental programs. Respondents did not see providing nature experiences as important as the basics, and were only moderately

Table 3: Factors Related to Comfort Level in Nature

Factor	Mean	Standard Deviation	Number of Items
Personal Comfort in Nature	4.2	.677	3
Nature Mentor	2.6	1.21	1

Table 4: Factors Related to Training and Preparation

Factors	Mean	Standard Deviation	Number of Items
Level of Preparation	2.8	.773	4
Level of Confidence	2.6	.786	3
Desire Training	3.7	.708	4

comfortable with their levels of preparation and confidence in teaching. Moreover, they identified several logistical barriers that may hinder their implementation of providing nature experiences including such issues as safety, transportation, and costs.

The complex reasons why teachers may or may not teach environmental topics and provide nature experiences for their students suggests additional teacher training on environmental topics is needed. Training is

Table 5: Factors Related to Logistical Barriers

Factors	Mean	Standard Deviation	Number of Items
Resources not Available	2.9	.851	3
External Impediments	2.8	.892	3
Hazards	2.7	.854	3
School Support	2.3	.591	2
Class Management	2.2	.796	2

needed to help teachers learn how to reduce the barriers they face, and focus on providing them with a powerful rationale for providing nature experiences for students—one that addresses their concerns about teaching the basics as well as one that defines their own vital role as teachers of environmental and natural resource topics. The next step will be to carefully evaluate existing training programs to assess whether they help teachers learn how to reduce the barriers they face.

It will also be necessary to work with teachers to overcome their reluctance to attend training sessions. Issues such as promotional and advertizing strategies, and scheduling should be examined so we can reduce teachers' hesitance to attend these training sessions. If we can achieve these goals we can move one step closer to helping teachers pass on vital information about environmental and natural resource topics to urban audiences.

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Deborah Simmons is an Assistant Professor of Outdoor Teacher Education and Director of Resident Programs at the Lorado Taft Field Campus, Northern Illinois University DeKalb. Her research centers on issues of encouraging responsible environmental behavior, and teachers' perceptions of environmental education. Simmons earned a Ph.D. from the University of Michigan, a Master's from Humboldt State University, and a Bachelor's from the University of California Berkeley.

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Reinee Hildebrandt

QUERY:

In your state of Illinois, what do you do in the urban forestry field?

What did you do to prepare for it?

How is urban forestry faring in your state?

Meg Bushnell
Northern Illinois Coordinator
***PLANT ILLINOIS*, Ogle County, Illinois**

In 1983, I was appointed to the Illinois Commerce Commission (ICC) a state agency charged with regulating investor owned utility services and intra-state transportation. In 1985, I was selectd by the Governor of Illinois to be Chair of the ICC. Energy conservation, clean air policy, and fuel choice have been and will continue to be issues before state regulatory bodies due to the passage of the Clean Air Act by Congress in 1991.

Early in 1989, I began to advocate carbon dioxide mitigation through extensive reforestation. Upon leaving ICC, I developed a public-private partnership program under the Illinois Department of Conservation called *PLANT ILLINOIS–a growing concern.*

PLANT ILLINOIS promotes tree planting in rural and urban areas of the state with emphasis on the planting of native species. The goal of planting 11 million new trees annually, while stressing proper maintenance of growing and mature trees, has been met and continues.

The *PLANT ILLINOIS* program encourages volunteers 1) to advocate and promote tree planting through demonstration projects; 2) to educate; 3) to develop tree ethics on the local level; and 4) create a local political climate which will cause planting, protection and the maintenance of trees to be recognized as an important segment of a municipality's infrastructure.

The Illinois Department of Conservation and the University of Illinois Department of Forestry in conjunction with Cooperative Extension Service is compiling a data base of volunteers throughout the state who are currently carrying out tree planting activities. Once identified, the volunteers can access information, financial help and technical assistance through state or Federal agencies.

As cities and their volunteers develop new policies and programs impacting the urban forest, each is realizing the need for enhanced technical assistance. It is not enough to plant a few trees on public property and declare the problem solved. Each municipality must realize that their urban forest is dependent on long term programs with a foundation rooted in knowledge and commitment to the whole of their urban forest—not just public trees, but trees growing on *private* property as well. Municipalities that have strong public tree programs set the tone and encourage private property owners in planting proper species for specific soils in proper locations.

Trained neighborhood volunteers can serve as first source information providers for private land owners. The first program of this type was recently initiated by OpenLands Project in the city of Chicago, funded through the Illinois Department of Conservation and the US Forest Service. Using instructors from the public and private sectors, OpenLands is providing a highly intensive and technically correct short course on tree identification, species choice, insect and disease identification, and tree planting ethics. The graduates promise to be a "forestry force" on the streets and within neighborhood organizations throughout the city.

Dedicated, educated and enthusiastic volunteers can be the professional foresters best friends in the promotion and implementation of quality programs. Volunteers can not do the job alone, but they can help set the course and ensure success in partnership with the urban forester of today and tomorrow.

Karen Nowacki
Assistant Commissioner,
Department of Environment
and Director, GreenStreets, Chicago

Fresh out of the University of Illinois with a degree in Ornamental Horticulture in 1977, I returned to my native Chicago to start work as a Forester for the City of Chicago. At that time, forestry operations—parkway tree planting, trimming, and removal—were taken for granted as a city service readily available to the homeowner.

However, in 1979, a newly elected Mayor cut the Bureau of Forestry, a division of the massive Department of Streets and Sanitation, by 52 percent. Personnel, equipment, and materials and supplies all took the hit. The feeling at the top was that Forestry was a luxury the City could not afford. This attitude prevailed for years; whenever cuts had to be made, Forestry was the first place people looked. After a decade of this mindset, Forestry was barely alive.

In 1989, Chicago elected a tree-loving new Mayor, Richard M. Daley. One of the first things the Mayor did was to bring Forestry to the forefront—this time, however, not just as the provider of a routine City service but as the keeper and nurturer of Chicago's valued urban forest, so essential to the livability of the city and the health of residents.

The Bureau of Forestry is now back in full force with a budget of $12.3 million in 1992, with new personnel (318 employees) and equipment, and is hailed as a leader in urban forestry nationwide. Training is a top priority in the invigorated Bureau, which now boasts well over 100 newly schooled Certified Arborists. New techniques and equipment are tried every day. The species list has been broadened extensively and now includes both new cultivars of familiar species and some more exotic experimental trees. Parkway plantings, which had fallen to an all-time low of 5,000 per year, is now back to a robust 15,000 citywide. The 100-plus

acre nursery the city owns cultivates some 20,000 trees for such uses.

Mayor Daley also has created an innovative new program, Mayor Daley's GreenStreets, which I head. GreenStreets promotes tree planting by all city agencies and through partnerships. We now have wonderful relationships with so many different public and private groups, including the Chicago Park District, Illinois Departments of Conservation and Transportation, U.S.D.A. Forest Service, Chicago's Openlands Project, Friend of the Parks, and Chicago Gateway Green Committee. The difference in the past few years is amazing.

I believe that the attitude that prevailed in Chicago during the last 15 years closely paralleled that of the nation. Unfortunately I still hear, far too often, about how forestry programs continue to be cut back. I also realize that many large municipalities have not yet been able to catch up with the sudden new focus on the importance of city trees.

In the coming years, the idea of professionalism which we stress in Chicago will become even more essential. Environmental education will become more necessary and available, and those working in the field will be expected to be well informed. Chicago's Bureau of Forestry has an intensive employee continuing education program featuring guest speakers from universities, arboretums, nurseries, as well as classes taught by Forestry's training agents and degreed foresters. The Bureau is accredited as a Forestry Department by the Society of Municipal Arborists, making Chicago the largest city to receive this recognition.

This impetus is strong, and growing stronger. It is not a passing fad. Trees will play a crucial role in the salvation of our urban areas as we know them. The year 2000 is only eight years away. We can, and will, plant a lot of trees and educate people to their importance in that time.

Suzanne E. Malec
Urban Forestry Manager
OpenLands Project, Chicago

I joined the ranks of the Openlands Project as Urban Forestry Manager two years ago. Although my previous experiences in past jobs was not directly focused on urban forestry, they were affiliated with the urban forest. Many people do not realize that, when working on projects outdoors, there is a good chance you are impacting tree resources.

In the not-for-profit world, involvement in the urban forest alone has increased dramatically. "Plant a Tree, Cool the Globe" was the philosophy only five years ago. Today at Openlands Project, we are still involved in policy analysis and advocacy in some form. But until the importance of a well-managed urban forest became evident, there was far less interest and cooperation among all the players in the urban forest. The research scientists, politicians, municipal employees, and citizens worked together, but often formed their concepts in a vacuum.

With the recent large amounts of funding available, urban forestry has become a more forceful issue. Instead of just planting trees, people are looking at other important aspects of urban forestry management, including employee training, citizen education, inventories, and the concept of urban heat islands. All involved are carving out their niche, and trying to participate in a way that will help the urban forest to flourish.

The urban forestry profession has also evolved by leaps and bounds in the past decade. But there are still too many people asking what urban forestry means. Recruitment of students is low, and that has to change. More curricula need to be devoted to urban forestry. And, most importantly, there needs to be a more concentrated effort in recruiting those who have grown up in the urban environment to enter the field—it is disturbing how few minorities are involved.

I am wary of the large numbers of dollars that are being thrown our way. I am afraid that urban forestry (tree planting) is being seen as the easiest "fix-it" for all the ills of our environment, when that is certainly not the case. We need to educate our politicians and the public about the importance of the urban forest—about what it can do and cannot do for a city—and make it a *realistic* priority on their agendas and for funding. Many cities across the United States lost the majority of their budgets in past years for urban forestry. Luckily, Chicago is currently doing well in that regard.

We need to develop sound programs for urban forestry. We need to help institutions develop more practical curricula and involve the urban community. And we need to continue to work together as a team. Should this happen, the year 2000 will be much greener.

Peggy Young
Forestry Superintendent
Village of Glen Ellyn, Illinois

In 1982, when I graduated from Western Illinois University with an Urban/Municipal Forestry degree, I envisioned that I would immediately find my dream job as forester for a municipality. Unfortunately, professional forestry positions in those places were not in abundance and neither were women foresters. Out of the 18 municipalities in the Chicagoland area that had staff professional foresters only one of those was a woman.

In 1984, I went to work for the Palatine Park District, but my duties centered around park equipment maintenance rather than tree maintenance, so in 1987 I took a job as Assistant Forester for the City of Park Ridge (population 27,000). Although the position only paid $15,500, it was the smartest move of my career because Park Ridge had an exemplary Municipal Forestry program. I then went to the Village of Glen Ellyn (population 25,000) in 1989 as Forestry Superintendent. Today, our village is one of 30 municipalities in the Chicagoland that have professional foresters and five are women.

Just during the 10-year period of my career, there has been an increased awareness on the part of the public about urban forests; they are being considered as important to the municipal infrastructure as streets, sewers, water mains. We use computerized tree inventories to manage the urban forest and obtain daily information. We work at educating citizens on maintenance and an important part of my job is to inspect parkway trees for disease and insects and then relate to citizens about what can be done to remedy a specific problem. This can take three or four hours every day in the summer. I also give talks to garden clubs, church groups, and others about maintenance and our Forestry program.

Another important evolution in municipal forestry is in ordinance development to regulate activities in and around, not only parkway trees, but private trees as well. We review a variety of plans with potential problems: should a driveway be installed near a 20-year-old sugar maple?; should a major housing development be allowed to destroy hundreds of oak trees on private property?

The strength of any ordinance depends on both the municipal foresters' suggestions and the concern of residents. Once there is a concern, it is then up to the municipal board to adopt it.

Without the guidance of trained urban foresters, many problems were created in the past: trees under lines, weak species creating maintenance headaches. We now plant with species, location, and longevity in mind—low growing crabapple, serviceberry and Hawthorn under utility lines, for example. No more problem trees such as Siberian Elm, Boxelder, Cottonwood, and Silver Maple will be allowed on the parkways. In hard clay soil we plant Hackberry, Green Ash, or Gingko because we can be assured of success.

In the past, it was not a priority to have educated employees on staff to maintain the trees. Many municipalities now request that their employees be foresters and be certified arborists through the International Society of Arboriculture. This is an important certification program which helps citizens identify educated contractors to work on their trees.

Recently I viewed a commercial that stated: Recycle, it's the "in" thing to do. I hope this is a passing attitude. Caring for our environment isn't a fad. It isn't the "in" thing—it's something we *must want* to do.

FOR THE FIRST TIME IN OVER A DECADE, VOLUNTEERS WILL BE GOING TO WORK IN CHILE. THOSE WHO HAD INVESTED MANY YEARS THERE ARE NOW GOING BACK TO DO NATURAL RESOURCES WORK UNDER VERY CHANGED CIRCUMSTANCES.

FORESTRY IN CHILE AND THE PEACE CORPS

BRUCE B. BURWELL

People have called Chile "the country of crazy geography." Looking at the map it is easy to see how Chile got this name; it is 2600 miles long but only 150 miles wide, even at its widest point. Being such a long strip and bordering the Pacific Ocean, Chile has a wide range of climates. In the north there are hot deserts where some weather stations have never recorded any rainfall. In the south there are areas with a yearly rainfall of over 200 inches. One can probably best visualize Chile's climatic range by relating it to the coastal strip from Baja California to Alaska. The north of Chile with its deserts is similar to arid Baja California; the Chile Central Valley with its intensive farming and "California" climate is similar to the Central Valley of California; the "lake region" of Chile with its temperate rainforests is similar to coastal Oregon and Washington; and the southern part of Chile with its fjords is similar to Southeast Alaska.

Chile's Forests

Chile's forests are a reflection of its diverse climatic zones. In the northern regions the vegetation consists predominantly of arid land species such as *Prosopis spp.* and *Acacia spp.*; in the central regions the native forests have been mostly replaced with plantations of exotic species, principally of Monterrey pine (*Pinus radiata*) and eucalyptus (*Eucalyptus golobus*); and in the southern regions the native forests are principally *Nothofagus spp.* and related hardwoods.

Historically, Chile went through a period similar to that experienced in the United States when the forests were cut to provide lumber or to clear land for agricultural use. It was during the 1800's and early 1900's that much of the extensive land clearing took place, principally to expand pasturelands or wheat production. (Before the Panama Canal was opened, Chile enjoyed a very profitable wheat export trade with California.) Much of this "newly cleared" agricultural land was in the central region, and in particular, in the coastal range where there is high rainfall and soil types very susceptible to erosion. Due to poor soil conservation techniques and overgrazing, many of these lands eventually became eroded and unproductive.

Reforestation and Forest Industry

Although tree planting can be traced back to the 1930's, most of the large scale reforestation was initiated during the 1950-1960 era. It was also during this period that Chile began a small but profitable forest products export market. To insure having raw material for this expanding market, the Chilean government embarked on large scale reforestation of the highly eroded, unproductive agricultural lands in the coast range of the central region. This effort was expanded even further by the forest products industry when the government offered a monetary incentive for reforestation.

Chile's "free market" economy of the recent military government contributed to the expansion of the forest industry by fostering foreign investment. Corporations from the United States, Spain, Japan, Korea, New Zealand and Sweden became partners with Chilean companies and invested in sawmills and pulp and paper plants.

Currently the industry has directed its efforts toward further expanding the forest products export market through utilization of more species. Originally the forest industry manufactured its products solely from Monterrey pine, but in the 1980's they started to incorporate the use of eucalyptus. Within the last few years, the industry has set up operations in the southern native forests for the production of high grade lumber for furniture and chips for pulp and paper.

Recent statistics indicate that Chile exports approximately 1 billion dollars of forest products per year. Although Chile exports forest products worldwide, its big markets are Japan, Korea and China for logs and the Middle East for sawn lumber. The value of Chile's export of forest products to the United States last year totaled approximately 50 million dollars. Thus, Chile can justifiably feel proud of having developed this dynamic market within the last 30 years and having become a world leader in the export of forest products.

Environment

As with most developing countries, Chile did not initially concern itself with the impact that industrial development would have on the environment; after all, the important thing at first was to develop more employment. This development has caused a multitude of environmental problems which are just starting to be addressed. Santiago, a city of almost four million people and an industrial center, has serious air pollution problems; many of the cities near mining centers have pollution problems caused by chemicals used in refining and processing the ore; pollution with agricultural chemicals and pesticides has occurred in some areas of intensive farming; and many of the cities in Chile do not have adequate waste disposal plants.

Last year, an environmental conference held in Chile focused on a means for addressing such problems. As part of this conference, an environmental problem atlas was published with regional maps locating specific problems areas, the severity in different areas, and the potential for addressing the problems. Several new environmental agencies have been formed and Peace Corps has received requests from some of these organizations for Volunteers to assist them meeting their goals.

Forestry Schools

For years, Chile has had the reputation of having the best forestry schools in South America. A forestry degree in Chile requires five years and a thesis. For this reason, many of the Chilean foresters consider their forestry degree equivalent to a master's degree from a university in the United States. In spite of this, a considerable number of Chil-

ean foresters have continued their studies in the United States and Europe and also have advanced degrees.

Political changes in 1969, 1973, and 1990 saw the Chilean government move from an elected leftist government, to a military dictatorship, and finally to a democratically elected "centralist" government. These political changes have impacted on the availability of foresters in Chile because after these radical political changes many foresters were "encouraged" to seek employment in other countries. Due to the reputation enjoyed by Chilean foresters, many received offers of employment in other Latin American countries and left. At the same time, within Chile there was a shift in employment from positions with the universities and government to more lucrative opportunities with the expanding forest industry. The result of these changes is that universities lost a considerable number of highly qualified professors, which in turn left the universities unable to maintain the high level of professional education for which they have been noted.

Forest Research

Forest research has primarily been carried out by two different organizations: the Chilean Forestry Institute and the universities. The Chilean Forestry Institute flourished from 1950 to 1970 and was considered to be the largest and most effective forest research agency in South America. The Institute was initially set up with the assistance of FAO and had a staff of over 300 people. The Institute survived the changes in government but has been considerably reduced in size and scope of activities.

Forest research at the universities has primarily been done by professors or students, as part of their thesis program. The universities generally split the focus of their research: the Universidad de Chile focussed on Monterrey pine plantation forestry and the Universidad Austral focussed on the native forests. The Universidad de Talca and the Universidad de Concepcion at Chillan are considerably smaller but also carry out research in the Monterrey pine plantations located nearby.

A Chilean agronomist examining a plant specimen for insects or disease.

The same shifting of employment that was experienced by foresters working as university professors also was experienced by forest researchers. Further, the government's privatization program shifted the responsibility for these types of services from government to private industry and ended funding for most forest research.

Peace Corp's Role

Peace Corps (PC) was active in Chile between 1963 and 1981. One of Peace Corps/Chile's largest programs was the forestry program which had up to 80 Volunteers at one time. In this program, Peace Corps worked with the Chilean Forest Service, the Chilean Forestry Institute and the universities. Peace Corps Volunteers (PCVs) worked in projects ranging from developing management plans for a national park to teaching and conducting research in forest entomology. To cope with an anticipated sizeable budget cut in 1981, Peace Corps decided to close its entire Chilean program along with programs in two other countries. In 1991, Chile's newly elected democratic government made a formal request to Peace Corps for Volunteers to assist them with environmental/natural resources projects.

Most of the Chilean foresters are familiar with Peace Corps since many of them had PCV counterparts with whom they worked and developed personal relationships. The work done by these PCVs was generally highly regarded by the Chilean foresters and included the first studies on the threat of the European pine shoot moth and the silvics of *Nothofagus procera.* The first management plans for some of the national parks and forest reserves were also prepared with the assistance of PCVs.

The previous PC forestry program assisted Chile in meeting its needs during the 1963-1981 period. However, Chile's needs have evolved and now are different. Today they need highly qualified foresters to work with them to prepare the next generation of foresters. They also need people who can assist them in confronting the multitude of environmental problems which Chile is currently facing. The first Peace Corps group to take up this challenge will be the twelve natural resources/environment Volunteers who will initiate their two years of service at the end of January 1992.

Jaime Antonio Lopez Martinez, son of Co-op member Jaime Lopez Pena, works in his father's nursery. Photo by Miguel Sayago. Photos on this page courtesy of the Peace Corps.

Women in the Peace Corps

Of all the Peace Corps Volunteers currently serving overseas, 53 percent are women. Of those currently working in natural resource/environment projects, 47 percent are women. In the case of the new program in Chile, only three of the new Volunteers are women. Of these, two have been assigned to the Chilean Forest Service to work with environmental impact statements and one has been assigned to the Chilean Forestry Institute to conduct research on the native forests of Southern Chile.

Bruce B. Burwell received his Bachelor of Science degree in Forest Engineering from Oregon State University in 1961 and his Master's of Science degree in Forest Management from the University of Washington in 1974. He worked in Oregon, Washington, California and Alaska for various forestry consulting firms on forest inventory, surveying and forest road design and location projects. As a Peace Corps Volunteer in Chile, he worked with the Forestry Division of the Chilean Cattle Service and the Chilean Forestry Institute from 1967 to 1972. He was Chief of Operations for Georgia-Pacific's log export operations in Chile from 1979 to 1981. From 1981 to present he has been a Natural Resource Specialist with Peace Corp's Environment Sector. In March 1992, he will be joining Peace Corps/Chile staff as Associate Peace Corps Director.

Peace Corps is currently recruiting for 216 environmental and forestry Volunteers. For information on the benefits of service and what the application procedures are, call 800-424-8580 Ext. 2293.

NEWS & NOTES

They are talking about us, too

One obstacle to improved diets may be that many men think that eating better involves mainly giving up things. Of those men in one survey who had made changes in their diets, the largest group said they were reducing their intake of fat or cholesterol. Men may change their diets, but most eat *less* of what they perceive as harmful, rather than more of something healthful. Few say they are eating *more* vegetables or fruits.

....Phyllis M. Barrier, *Nation's Business*, January 1992

Automobiles as polluters

The automobile is a significant source of pollution in the United States. Just think of all the automotive products that can end up in your drinking water. Gasoline, motor oil, brake and transmission fluid, antifreeze, battery acids, tire residue, and a host of solvents, waxes, and cleaning chemicals are common water pollutants. Many people rinse these pollutants from their driveways into the street gutter. Or leave them on the ground for the rain to wash away, or to seep into the groundwater. A single pint of oil can create a glistening slick on water the size of a football field. A single quart is enough to pollute 250,000 gallons of water. One part oil to one million parts water is detectable to taste and smell. Average estimates indicate 240 million gallons of used crankcase oil find their way into the nation's lakes, rivers, and streams each year—22 times more oil than the Exxon Valdez spilled in Alaska.

....Texas Water Commission in *Idaho Clean Water*, Fall/Winter 1991

BLM researchers get into saving-the-yew business

While Bristol-Myers Squibb extracts taxol from the Pacific yew trees of the Pacific northwest, USDI Bureau of Land Management foresters are concentrating on the yew's viability. Taxol, derived from the bark of the yew, is a chemical successful in combatting some forms of cancer. Native to the woodlands of northern California and west of the Cascades in the Pacific northwest, the Pacific yew for decades was largely ignored by timber purchasers. Now, the value of the Pacific yew may exceed that of all other trees because of the life-saving properties. Seeds destined for a research project on the Medford District of BLM are in cold storage at the agency's Charles A. Sprague Seed Orchard (CASSO) near Merlin, Oregon.

The yew, unlike other evergreens, propagates itself in three ways: by resprouting after harvesting, by layering (when a branch lies on soil long enough to root itself) and by seed. Propagating the species through research on seed stratification, however, is the focus at CASSO. One plan is to speed up germination by roughing up the seed coat, and another is to feed yew seed to domestic wildfowl such as chickens, ducks and geese to allow the peristaltic action of the birds' gizzards and stomach acids to accomplish seed stratification.

....Kurt Austermann, *BLM News*, Oregon & Washington, January 1992

Japanese working women have fewer ties to their workplace, want to travel

According to a 1990 survey of Japanese women's career goals by Recruit, Co., 57 percent of metropolitan working women aged 20-39 expressed an interest in earning enough money to cover their living expenses. The most-given answer in a similar 1989 survey—to earn money for leisure and hobbies—fell to fourth place. Part of the reason for this is the dwindling of the leisure boom, but it is also because it is no longer unusual for women to have careers; working women have become a normal part of everyday life. Women are more interested in going abroad to study than men because they are naturally curious about new paths of intellectual pursuit now opening up to them. Another reason is that women do not feel as attached to their companies as men do, which results in more women changing jobs than men. In addition, many career women want to specialize in a certain field rather than rise through a company's ranks, because corporate society is still discriminatory toward women.

....Akwi Seo, *Look Japan*, January 1992

Exercise bashing

Exercise addiction follows the course of all addictions. It begins with a belief system that might be expressed in this way: "The most important need in my life is to acquire and maintain good looks and physical fitness, without which I am defective." Out of such a belief comes a kind of mental obsession with outlining a plan of action, organizing time for it, and performing the requisite amount of exercise. Where I live, it's not uncommon to see someone running at 11 o'clock at night. Or at the crack of dawn. Or on bitterly cold days....People become so entranced by this activity, so involved in it and excited by it that they begin to use it for mood alteration. They find that when they're running, they don't have to deal with feelings of sadness, depression, and loneliness. However, an addiction to exercise is similar to other addictions: As time passes, the high diminishes and the abuser needs increasing amounts of the substance (or activity) simply for purposes of maintenance.

....John Bradshaw, *Lear's*, January 1992

Being a liberal organization does not necessarily mean that women are treated better there

In the winter of 1977, *The New York Times* ran an editorial called "The Complaints of White Men." The law had long favored white males, the editorial stated, but now, in the era of affirmative action, the law was at last bending to favor women and minorities. The editorial applauded the change, and noted that

(Continued on page 27)

KIOSK

There is a new booklet out whose title is very descriptive of the content: Careers with the US Fish and Wildlife Service. It describes efforts to save endangered species, manage refuges, restore depleted fisheries, and enforce wildlife laws. It also explains which professions are needed for the work and has information on seasonal and volunteer positions, and job requirements. It can been obtained from USF&WS Publications Unit, 130 ARLSQ 1849 C St NW, Washington DC 2040 (703-358-1711).

The Summer Institute for Women in Higher Education will be held June 28 through July 24 1992 on the Bryn Mawr College campus. The institute offers women faculty and administrators intensive training in educational administration. Participation is limited and the cost is $4500. For more information, write HERS, Mid-America, Colorado Women's College Campus, University of Denver, Denver, Colorado 80220 (303-871-6866).

Clemson's Department of Forest and Recreation Resources has a number of continuing education courses offered this spring including aerial photography interpretation, timber cruising, forest finance, quantitative methods, and others. For information, contact Jacqueline Haymond at Lehotsky Hall, Clemson University, South Carolina 29634-1003 (803-656-3302).

The Third World Organization for Women in Science, established in 1989, is a non-profit, non-governmental organization which publishes a newsletter. They are creating a database and directory of Third World women scientists and are seeking information about potential members. Write TWOWS, c/o Third World Academy of Sciences, PO Box 586, Strada Costiera 11, 34136 Trieste ITALY.

Eight artists have been commissioned by Liz Claiborne, Inc., to participate in three pilot projects in "Women's Work" the fashion company's recently announced national program of community-based public art projects. The program is aimed at increasing awareness of, and encouraging positive social change on, issues of particular concern to women. For more information contact Patrice Tanaka & Co., Inc., 141 5th Ave, New York, New York 10010 (212-505-9332).

University of California Davis is holding a stormwater permitting and compliance technical course in two parts May 26-27 1992. Call 916-757-8777 for fee and enrollment information.

North Central Station of the Forest Service has a color 18 x 24 inch poster showing 15 kinds of plants and insects that northern black bears live on and the months when these foods are eaten. The poster was derived from the work of Lynn Rogers and Tom Nicholl's wildlife and fish habitat project. To get one, write them at One Gifford Pinchot Drive, Madison Wisconsin 53705-2398 (608-231-9237).

The National Society for Minorities in Agriculture, Natural Resources and Related Sciences (MANRRS) is a non-profit organization composed of students and educators with chapters and affiliates at about 30 campuses across the US. The organization, which started in 1985, promotes the educational and professional development of underrepresented ethnic groups in the ag sciences and related fields. For information write the President of MANRRS: William Henson, Assistant to the Dean, Minority Affairs, and Assistant Professor of agricultural economics, 1101 Ag Admin Bldg., Penn State, University Park, Pennsylvania 16802 (814-865-7521).

Yale's School of Forestry and Environmental Studies, along with staff and scientists from other universities, has started a new databank and clearinghouse for problem solving in the environmental arena. Called Horizon Solutions, the databank can put together a package of ideas, patent applications, film records, and other information tailored to reach a solution. Staff are anxious to hear from those who have solutions or who need solutions. The address is 205 Prospect Street, New Haven, Connecticut 06511 (203-432-5113).

Several organizations need books to rebuild libraries. They welcome donations. Contact (1) Christian Ekenezie, St. John Bosco Memorial Library, PO Box 179, Agbani State, NIGERIA; (2) Albanian Humanitarian Aid, 492 East Broadway, Suite 181, South Boston, Massachusetts 02127 (617-268-1275).

The National Wildlife Federation offers Resources Conservation Internships for graduate students and recent graduates to work in Washington DC in its Resources Conservation and International Affairs Departments. The next one starts in July. For application and stipend information contact Nancy Hwa at the NWF, 1400 16th St. NW, Washington DC 20036-2266.

Should you buy used electronic equipment for your home or office? Yes, if you're shopping for hardware. Used computers tend to either work well or not at all. Two companies that offer published price indices and have buyer-protection/test policies are BCE at 800-262-6399 and Nacomex at 800-622-6639. Local retailers sometimes have trade-ins, too.

The Equal Opportunities Section of the American Fisheries Society is sponsoring a special symposium titled Affirmative Action: Different Perspectives. It will take place at the 1992 annual meeting of the AFS to be held September 13-17, 1992 in Rapid City, South Dakota. Speakers are: Barbara Milne, USFWS, Assistant Regional Director, Region 3; Susan Shipman, Chief of Marine Fisheries, Georgia Department of Natural Resources; Hiram Li, Oregon Cooperative Fish and Wildlife Research Unit; Barbara Knuth, Cornell University; Jennifer Harker, M.M. Dillon Associates, Willowdale, Ontario; Bradford Brown, National Marine Fisheries Service, Miami; Effie Duffie, National Marine Fisheries Service, Miami; Earl Chilton, Texas Parks and Wildlife; Nancy Foster, National Marine Fisheries Service, Washington DC; Patricia Fiebbe, USDA Forest Service, Blacksburg, Virginia.

For further information contact Dr. Bruce Vondracek, University of Minnesota, Department of Fisheries and Wildlife, 200 Hodson Hall, 1980 Folwell Avenue, St. Paul, Minnesota 55108 (612-624-8748) or the AFS office at 301-897-8616.

The Society of American Foresters Wilderness Management Working Group is co-sponsoring, with several federal agencies, a technical conference on threats to wilderness May 4-6 1992 in Portland, Oregon. For further information, contact Richard Reid at 301-897-8720.

The Heartwood Owner-Builder School is offering Site Planning and Landscape Design (April 20-24, 1992) and Carpentry for Women (July 15-19 1992). For information on fees contact Michele Beemer, Director, Johnson Hill Road, Washington Massachusetts 01235 (413-623-6677).

WiNR
Women in Natural Resources

Information for Contributors

Women in Natural Resources provides information and ideas for, from, and about women who work in natural resources. Topics covered in the journal are those of forestry, wildlife, range, fisheries, recreation, arboriculture, ecology, and the social sciences as they relate to natural resources. We address issues of administration and personnel, gender related topics, educational resources, and support mechanisms. Technical articles suitable for reading by professionals in varied natural resource fields are also featured. Our contributors effectively integrate the factual, the personal, and the philosophical aspects of the working professional.

To Submit Full Length Manuscripts: Because of the variety of professions represented, the journal solicits full length manuscripts in the style dictated by the leading journal in your own profession, or the *Chicago Manual of Style*. Clarification of style is the prerogative of the editors. Manuscripts should be sent on disk formatted in Microsoft Word, (unless arrangements have been made with the editor), but should include hard copies as well. All graphs should be camera-ready. Average manuscript length is 5 to 15 pages (space and a half). Include non-returnable black and white photos (action shots, please), and a short biographical sketch similar to those included in this issue.

Women in Natural Resources will provide letters confirming refereeing as needed.

To Submit Short Department Items: Copies or originals with author, source, date, and submittee are all that is required.

For more information: Call 208-885-6754/FAX 208-885-5878.

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