The French Perspective

A 125-Year-Old Restoration Program in Haute Provence

By Daniel Vallauri, James Aronson, and Christophe Chauvin

The afforestation of the Saignon experimental watershed in Haute Provence, in the southwestern Alps of France, is one of the oldest afforestation programs ever undertaken for erosion control in Europe. It was initiated in 1876 as part of a national program to restore some 60,000 hectares of mountain "badlands"—sensitive black marls between 600 and 1,200 meters above sea level. No preference was given to native trees in the selection of species; the French forest service planted Austrian black pine (Pinus nigra) together with black locust (Robinia pseudoacacia) and seeded native shrubs (such as Ononis fruticosa and Hippophae rhamnoides) and native grasses (especially Achnatherum calamagrostis).

Those efforts proved effective in stopping the erosion. Now, although the badlands have been reforested, the forests lack spontaneous tree regeneration and host a severe infestation of the mistletoe Viscum album ssp. austriacum. The nonnative, senescent pines that dominate the 125-year-old forest stands are nearly monocultural and even-aged in the top canopy. Some stands have never been thinned and have as many as 5,000 trees per hectare.

One problem is finding a native forest to serve as reference ecosystem for evaluating the success of restoration efforts. After centuries of degradation, such a reference no longer exists in the Haute Provence region.

Furthermore, full soil restoration after erosion, starting from raw marls, is expected to take at least a few more centuries, which makes the choice of a reference forest ecosystem somewhat moot except in broad terms of desired ecosystem trajectories. However, a regional ecological survey (including paleoecological and historical data) clearly indicates that the predegradation forests were characterized by downy oak (Quercus pubescens) as the dominant tree species, together with other broad-leafed trees and a small percentage of native pines (Pinus sylvestris). For now, this is sufficient to orient restoration efforts.

Going Native

Our research focuses on the ways and means to restore the native forest and, on a long-term basis, establish viable forest ecosystems in the study area. Within a dynamic conceptual framework for achieving true restoration, various functional indicators and restoration success criteria have been used to assess the ecosystems afforested in the Saignon experimental watershed, including soil fertility, soil biological activity (earthworms), plant diversity, forest stand growth, pest dynamics, native tree seed dissemination, and tree seedling establishment.

Most of the marly soils have recovered part of their total depth, with layers of fragmented and altered material equal to 50 centimeters, but their structure and chemical fertility are still poor. Autogenic soil restoration is proceeding, however, largely engineered by earthworms (up to 49 individuals and 27 grams per square meter). Two dominant earthworm species are presumed crucial: Lumbricus terrestris and Octolasion cyaneum.

Clearly, the reestablishment of indigenous tree species is apparently not inhibited by site fertility or by any lack of nearby seed pools. Nevertheless, 125 years after the first tree plantings, the plant communities remain mostly early seral assemblages, with Austrian black... (continued on next page)
pine occurring alone in the canopy. We hypothesize that excessive stand density is responsible for poor regeneration of native plants because it limits direct light for germination and early development and discourages the birds and rodents that disseminate seed. Mortality of pines due to infestation by mistletoe is now creating large openings where native species may be reestablished; these areas will need to be specially managed to prevent the mistletoe from spreading.

Specific management rules are being reviewed and revised by the French forest service but are complex to implement because of pest dynamics and forest stand age. The main forest-management goal remains erosion control, but the new strategy will rely on natural processes (soil and water processes, wind and bird dissemination of propagules) to ensure the reintroduction of native biota. To speed things up, however, careful thinning of the existing pine stands must be undertaken soon to provide more open patches suitable for native tree seed dissemination, germination, and growth.

Forest restoration is a long-term responsibility and an ecologically based process. The strategy to establish a pioneer stage of the ecosystem (with nurse species, native shrubs, and so on) to boost the natural resilience of the degraded ecosystem is appropriate and desirable. In contrast, the tactics commonly adopted in forestry today are often shortsighted, seeking to establish tree monoculture of an adapted tree species, including exotics, but underestimating long-term goals and ecological necessities.

Restoration forestry should better integrate and regularly assess the intrinsic long-term viability of the forest ecosystem under manipulation. This can be done using a wide range of success criteria and ecosystem attributes adapted to the current successional stage. Assessment implies a need for the early and continual monitoring of reintroduced native organism diversity and reestablished functions and services provided by healthy forest ecosystems, such as clean water, erosion and watershed control, recreation, and conservation of indigenous biodiversity.

The authors’ research was made possible by a grant from France’s Ministry of the Environment. For more information, contact Daniel Vallauri, World Wide Fund for Nature-France, Forest Conservation Department, 188 rue de la Roquette, 75011 Paris, France; e-mail: dvallauri@wwfnet.org; James Aronson, Functional and Evolutionary Ecology Centre (CEFE), 1919 route de Mende, F-34293 Montpellier cedex 5, France; e-mail: aronson@cefe.cnrs-mop.fr; Christophe Chauvin, Cemagref Mountain Forestry Department, 2 rue de la papeterie, BP 76, F-38402 Saint-Martin-d’Hères, France; e-mail: christophe.chauvin@cemagref.fr.

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A Challenge: Protect Biodiversity and Produce Wood

**Forest Practices**

*By Patrick Moore*

There is a tendency among foresters to believe that strategies to increase wood production will automatically result in a loss of biodiversity. As we move from forests that are naturally regenerated to those managed by planting, weeding, fertilizing, thinning, and pruning, we select in favor of the trees and against other species. Biodiversity certainly is lost when the traditional agricultural model is simply borrowed and adapted to forestry. It is my belief, after many years of field observations around the world, that biodiversity protection and high-yield wood production need not be mutually exclusive.

In the traditional model, wood production is increased by creating a fast-growing monoculture over a wide area, eliminating competition through the application of herbicides, and focusing entirely on the trees as an agricultural crop. There is no doubt that this approach works from the perspective of maximizing wood production, but it is nearly always at the expense of biodiversity and the habitat required by many species. By adopting creative strategies, at both the level of the individual stands of trees and at the level of the larger landscape, this apparent conflict between production and biodiversity can be overcome.

In many areas of central Europe, private forest owners have found that planted spruce monocultures provide the best financial return for their families. These forests tend to be very simplified and, in particular, they have few potential nesting sites for birds that need holes in dead trees. In Austria there is a regulation requiring that private forest owners provide 20 wooden birdhouses per hectare, nailed to the sides of the spruce trees. Even though this is a very easy and inexpensive obligation, it results in a tremendous increase in bird populations and breeding success in these forests.

Consider a typical pine plantation such as those found in many regions of the world today. Following harvesting, usually by some form of clearcutting, the site is commonly disc plowed and planted with genetically improved nursery stock in neat rows. An herbicide application is often used to reduce competition from herbs and shrubs, and at age five to 10, a precommercial weeding and thinning establishes the desirable number of stems per acre. Other tree species such as pioneer hardwoods that regenerate from native seed are removed in favor of the pines. If the trees are grown close together to maximize production, not much sunlight gets through to the ground. Not many plants can survive in the deep shade, so biodiversity is reduced to those that can. While not all plantation forests are this extreme, there is a tendency to move in this direction with a number of species including pines, spruce, eucalyptus, and poplar.

One of the keys to maintaining a high level of biodiversity is the recognition that in a given ecosystem there are usually some species that have evolved to take advantage of all the successional states in that ecosystem. The best way to make sure that all features are present in an ecosystem at any given time is, in the words of wildlife ecologist Fred Bunnell: “Don’t do the same thing everywhere.” If forests are managed by blanket prescription, some habitats and structures will tend to be lost. This can result in considerable loss of biodiversity at the (continued on page 3)
local or even regional level. There are a number of strategies to avoid the loss of biodiversity that can result from intensive plantation management over large tracts of land. These can be accomplished both at the stand level and at the landscape level.

At the stand level, the key to creating higher biodiversity without much compromise to wood production involves the retention of key structural elements in the stand. Some examples are:

- Where herbicides are used to reduce competition from shrubs, it is possible to establish small areas in the stand that are avoided during herbicide application. Even if this is as low as 2 to 5 percent of the total area of the stand, it will allow for shrubs to become established and for shrub-nesting birds and other species dependent on shrubs to remain in the stand.
- Small patches of forest can be designated as reserves within the stand to maintain living and standing dead trees throughout the growing cycle. These mini-reserves can be established around small wetlands that are naturally low in productivity but high in biodiversity.
- During weeding and thinning operations, a small percentage of nonplantation species of trees can be retained to provide a wider variety of habitat. These trees may be commercially valuable in the future and they will increase bird and insect biodiversity in the stand.
- Individual dead or dying trees can be retained in the stand for cavity-nesting birds and mammals. Even one standing dead tree per hectare can result in a considerable increase in biodiversity.
- During site preparation, woody debris can be piled or windrowed to provide habitat for birds, mammals, and reptiles. This kind of structural diversity on the land can make a big difference to biodiversity without affecting productivity.

The key to creating higher biodiversity at the landscape level is to treat the landscape so that all elements of the forest are retained at all times. Some examples are:

- The streamside reserve zone or streamside management zone is perhaps the most important landscape level strategy for protecting biodiversity. A "reserve zone" is an area where no active management occurs, whereas a "management zone" is an area where management does occur, but with special consideration for the stream or river.
- Permanent reserves can be established for the protection of native species of wildlife. This is particularly effective when exotic species of trees are used for production plantations. In Brazil, where eucalyptus is used for fast-growing monoculture pulp plantations, it is common to establish a network of streamside reserve zones and one large core reserve zone where native plants and animals can flourish.
- Corridors of native forest can be used to join streamside reserve zones by connecting them over higher land. A network of streamside reserves and corridors can result in a mosaic of plantations surrounded on all sides by native forest. During the growing cycle of the plantation species, native plants, animals, and birds will disperse into the plantation.

It is impossible to manage forests intensively for timber production without having some impact on biodiversity. By adopting strategies like those recommended above, it is possible to minimize negative impacts on biodiversity while maintaining a high level of wood production. To a considerable degree, we can have our cake and eat it when it comes to sustainable forestry.

This article is excerpted from Green Spirit—Trees Are the Answer, by Patrick Moore (US$15, ISBN 0-9686404-0-0). The book will be in bookstores this fall but is currently available from the author, 4068 West 32nd Avenue, Vancouver, BC V6S 1Z6, Canada; (604) 221-1990; fax (604) 222-9353; e-mail: patrickmoore@home.com.

Patrick Moore is chair, forest practices committee of the Forest Alliance of British Columbia (www.forest.org) and head of Greenspirit, a Vancouver environmental policy and communications consultancy (www.greenspirit.com).
One of the thorniest issues facing natural resource managers is how to deal with invasive alien plants. The sheer magnitude of the problem is itself daunting. According to the Plant Conservation Alliance, a consortium of 10 federal agencies and more than 160 state and private groups, 4,000 species of exotic plants are established in the United States.

Invasive alien plants can cause a variety of problems:
- Loss of habitat for native plants, wildlife, and insects.
- Reductions in biodiversity.
- Changes to natural ecological processes, such as plant community succession.
- Changes in the frequency and intensity of natural fires.
- Disruption of such native plant-animal associations as pollination, seed dispersal, and host-plant relationships.

The alliance’s Alien Plant Working Group reports that each year the US Fish and Wildlife Service spends $10 million on controlling invasive plants, and the National Park Service spends about $2 million. Invasive plants cause great economic losses in agriculture, forestry, rangelands, and roadways management, and these losses are measured in billions of dollars a year. In 1999 President Clinton signed an executive order establishing the National Invasive Species Management Plan, designed “to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.”

Among the troublesome alien species are the following:
- Black locust (Robinia pseudoacacia). Although it is native to the Southeast, black locust poses a serious threat to native vegetation in dry and sand prairies, oak savannas, and upland forest edges outside its historic range. It has been planted in many temperate climates and is naturalized throughout the United States.
- Garlic mustard (Alliaria petiolata). Once known only in Europe, garlic mustard poses a severe threat to native plants and animals in forest communities from eastern Canada, south to Virginia and as far west as Kansas and Nebraska. Once introduced to an area, garlic mustard outcompetes native plants by aggressively monopolizing light, moisture, nutrients, soil, and space.
- Japanese knotweed (Polygonum cuspidatum). A native of East Asia...
Japanese knotweed is now found in 36 states, from Maine to Wisconsin and south to Louisiana, and in scattered midwestern and western states. It poses a significant threat to riparian areas, where it can survive severe floods and is able to rapidly colonize scoured shores and islands. Once established, populations are extremely persistent.

- **Kudzu** (*Pueraria montana var. lo-bata*). This native of Asia has spread throughout most of the Southeast and has been found as far north as Pennsylvania. It kills or weakens native plants by smothering them, by girdling stems and trunks, and by breaking branches or uprooting entire trees and shrubs.

**Battlefield Earth**

Parks, reserves, and other public natural areas are focal points for efforts to remove invasive species. Marc Imlay, chair of the invasive exotic plants committee for the Maryland Native Plant Society, says that organizing citizen volunteers is the key to effective removal projects. Volunteers perform critical work that would otherwise not get done, such as manual removal, application of herbicides and biological controls, preventing the introduction in alien species, and planting native ones. “It seems that almost every day I learn about a newly formed group of volunteers and successful projects across the country,” says Imlay, who has organized volunteers in Hawaii and Maryland.

According to Imlay, 5 percent of all endangered plant species on the national list are native to Kokee, Waimea Canyon, and Na Pali Coast state parks in Hawaii. Imlay helped organize volunteers to prevent these species from being smothered by strawberry guava, Kahili ginger, melaleuca, black wattle, silky oak, and privet. “We had been advised that it was impossible to control these species,” he says. “Nonetheless, in 12,000 person-hours of work over 18 months, the volunteers have converted more than 500 acres from 50 percent or so native species to over 95 percent native species.”

Imlay says weed-control strategies involve manual and mechanical methods where practical, such as the pulling of seedlings in areas of new infestations and the judicious use of herbicides. For weed tree species, such as strawberry guava and fire tree, methods such as notching and thinline drizzle application of selective herbicides are effective.

Although the use of herbicides in parks is often unpopular with the public, Imlay recommends low-volume applications of weed-specific chemicals, which allow time for native species to take over the niche as the weed plants die slowly in place. For the control of Japanese stilt grass in Ruth B. Swann Memorial Park in Maryland, for instance, Imlay and his volunteers applied Round-Up with a backpack sprayer and carefully avoided native plants. Says Imlay, “Round-Up at 2 percent solution does not migrate, and it biodegrades.”

In the past, most people simply assumed it was too difficult to remove invasive species. “Given the scope of the problem,” says Imlay, “we have no choice. Fortunately, a few individuals and groups have shown us the way. All we have to do is do it.”

For more information, contact Imlay at the Maryland Native Plant Society, PO Box 4877, Silver Spring, MD 20914, (301) 283-0808; e-mail: ialm@erols.com.

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**Invasive Plant Information**

_Animal and Plant Health Inspection Service (APHIS), US Department of Agriculture, 12th and Independence Avenue SW, Washington, DC 20250; e-mail: APHIS.Web@usda.gov; website: www.aphis.usda.gov/ppq/weeds/weedhome.html.

_Center for Aquatic and Invasive Plants and Aquatic, Wetland and Invasive Plant Information Retrieval System (APIS), 7922 NW 71st Street, Gainesville, FL 32653; (352) 392-1799; fax (352) 392-3462; e-mail: varamey@nerps nerdc ufl.edu; website: http://aquatl.ifas.ufl.edu/welcome.html.


_Invasive Plants of Canada Project. National Botanical Services, 604 Wavell Avenue, Ottawa, ON, Canada, K2A 3A8; e-mail: ehaber@magi.com; website: http://infoweb.magi.com/~ehaber/ipcan.html.

_National Biological Information Infrastructure. NBII National Program Office, 302 National Center, Reston, VA 20192; (703) 648-4205; fax (703) 648-4224; e-mail: nbii@nbii.gov; website: www.nbii.gov/invasive/.

_The Nature Conservancy’s Widalnd Invasive Species Program. The Nature Conservancy, Weed Sciences Program, Robbins Hall, University of California-Davis, Davis, CA 95616-8733; e-mail: bazza@ucdavis.edu; website: http://ncneccos.ucdavis.edu/.

_Plant Conservation Alliance, Alien Plant Working Group. Bureau of Land Management, 1849 C Street NW, LSB-204, Washington, DC 20240; (202) 452-0392; e-mail: olivia_kwong@blm.gov; website: www.nps.gov/plants/alien/.

_US Fish and Wildlife Service Invasive Species Program. 4401 North Fairfax Drive, Room 840, Arlington, VA 22203; (703) 358-1718; e-mail: michael_ielmini@fws.gov; website: http://invasives.fws.gov/.

_Weed Science Society of America. 810 East 10th Street, PO Box 1897, Lawrence, KS 66044-8897; (800) 627-0629 or (785) 843-1238; fax (785) 843-1274; e-mail: wssa@allenpress.com; website: http://ext.agn.uiuc.edu/wssa/index.html.

_World Weeds Database. Oxford Forestry Institute, Department of Plant Sciences, University of Oxford, South Parks Road, Oxford, OX1 3RB, UK; website: www.plants.ox.ac.uk/olf/wwd/pweeds.htm._
Proposed changes to pollutant regulations for silvicultural operations have increased foresters’ awareness of watershed and water-quality assessment and analysis. If adopted by the Environmental Protection Agency (EPA), the rules could require that such operations as site preparation, reforestation, prescribed burning, harvesting and thinning, and road construction and maintenance be treated as point sources of pollution. These operations have historically been nonpoint sources. (A detailed explanation of how the proposed water quality rules could affect silvicultural activities is on the Society of American Foresters website at www.safnet.org/archive/epa1299.htm; SAF’s official comments on the rules are at www.safnet.org/policy/psst/tdmlpos.htm.)

To aid land managers in performing water quality analyses, the EPA offers free computer software called Better Assessment Science Integrating Point and Nonpoint Sources (BASINS). The software works in conjunction with ArcView GIS software and is designed to help watershed managers examine data about watersheds and water quality, provide an integrated watershed and modeling framework, and analyze point and nonpoint source management alternatives.

BASINS helps managers calculate total maximum daily loads (TMDL), the maximum permitted amount of a pollutant that a body of water can receive. This requires a watershed-based approach that integrates both point and nonpoint pollution sources. BASINS allows the analysis of a variety of pollutants at multiple scales.

The program can work with a range of data types:

- Spatially distributed data about land uses and land cover, roads, soils, digital elevation models, regulatory and ownership boundaries, and other characteristics.
- Environmental monitoring data, such as water quality observation data and monitoring station summaries, information from US Geological Survey gauging stations, and National Sediment Inventory data.
- Point source data, such as from permit compliance system sites and computed loadings, toxic release inventory sites, and Resource Conservation and Recovery Act sites.

BASINS is free and in the public domain; version 2.01 of the program and associated environmental assessment and modeling tools and data can be downloaded from the EPA website, www.epa.gov/ost/BASINS/ (23 megabytes for the BASINS program file alone; downloading the files takes a long time without a fast Internet connection). You can also request a free copy of the program software and regional GIS watershed data on CD-ROM.

In addition to the BASINS software, these supporting products may also be downloaded from the agency website:

- BASINS GIS data.
- Meteorological data required to run the nonpoint-source model.
- The metadata for BASINS 2.0 spatial datasets.

- The BASINS user’s manual, as a PDF file.
- Two supporting software tools are also available: WDMUtil, a Windows-based program for creating and editing Watershed Data Management (WDM) files, which contain meteorological data used in BASINS; and HSFPParm, a Windows-based database of model input parameter values for more than 40 projects using the EPA’s Hydrologic Simulation Program Fortran (HSPF), public-domain software for the simulation of watershed hydrology and water quality for both conventional and toxic organic pollutants. HSPF is available from the EPA’s Center for Exposure Assessment Modeling (www.epa.gov/CEAM/).

The developers of BASINS plan to release version 3.0 of the software later this year. The new version will allow users to use either of two watershed models: the hydrological simulation program or the soil and water assessment tool (SWAT).

SWAT is a river-basin scale model for quantifying the impact of management decisions on water, sediment, nutrient, and pesticide yields on large, ungauged river basins. This public domain model was developed by the Agricultural Research Service at the Grassland, Soil and Water Research Laboratory in Temple, Texas (www.brc.tamus.edu/swat/). SWAT simulates hydrology, pesticide and nutrient cycling, bacteria transport, and sediment transport. It is designed to predict the effects of climate and vegetative changes, agricultural practices, reservoir management, groundwater withdrawals, water transfer, and other land-management activities on water, sediment, and chemical yields from river basins. Both SWAT and HSPF are spatially distributed, lumped-parameter models that can be used to analyze watersheds and river basins by subdividing the area into homogenous parts.

BASINS runs on Windows 95, 98, and NT. The EPA recommends using a PC with a 200-MHz (or better) Pentium processor with 64 megabytes of RAM plus 64 megabytes of permanent virtual memory swap space; the agency says the program will run on a 133-MHz Pentium machine with 32 megabytes of RAM plus 32 megabytes of swap space.

BASINS training courses at the Center for Research in Water Resources at the University of Texas at Austin are scheduled for October 2–6; March 5–9, 2001; and May 14–18, 2001. The courses are sponsored by the EPA and presented by the university’s Center for Lifelong Engineering Education and are open only to private, nonfederal participants. The course costs $500, including all educational materials. You can register online at http://lifelong.engr.utexas.edu/shortcourse/basins/ or by contacting Sharon Campos at (512) 232-5168; e-mail: scampos@mail.utexas.edu.

For technical information on BASINS, contact Paul Cocca, EPA Office of Science and Technology, Mailcode 4305, 401 M Street SW, Washington, DC 20460; (202) 260-8614; fax (202) 260-9830; e-mail: cocca.paul@epa.gov.
Forest Production and Utilization

Poplar and Willow Culture: Meeting the Needs of Society and the Environment. 21st International Poplar Commission Conference. September 24–28, Portland, Oregon. Contact Kathy Heise, Forestry Sciences Laboratory, 5985 Highway K, Rhinelander, WI 54501; (715) 362-1157; fax (715) 362-1166; e-mail: kheise@ls.fed.us; website: www.ncfes.umn.edu/IPC2000/.

15th Annual North American Forest Products Conference. October 18–20, Cambridge, Massachusetts. Contact Resource Information Systems, 4 Alfred Circle, Bedford, MA 01730; (781) 271-0030; fax (781) 271-0037; e-mail: thompson@resourceinfo.com; website: www.resourceinfo.com/events_risi.html.

Inventory

Variable Probability and 3-P Sampling. September 25–29, Moscow, Idaho. Contact Frieda Ryan, Western Forestry and Conservation Association, 4033 SW Canyon Road, Portland, OR 97221; (888) 722-9415 or (503) 226-4562; e-mail: frieda@westernforestry.org; website: www.teleport.com/~wfca/VariableProbability.htm.

Land-Use Planning, Management, and Organization

Multifunctional Landscapes: Interdisciplinary Approaches to Landscape Research and Management. October 18–21, Roskilde, Denmark. Contact the Centre for Landscape Research University of Roskilde, DK-4000 Roskilde, Denmark. +45-4674-2601; fax +45-4674-3032; e-mail: vlb@ruc.dk; website: www.gee.ruc.dk/vlbconference.htm.

Remote Sensing and Photogrammetry

Remote Sensing of the Atmosphere, Environment and Space. October 9–12, Sendai, Japan. Contact the International Society for Optical Engineering, 1000 20th Street, Bellingham, WA 98225-4705; (360) 676-3290; fax (360) 647-1445; e-mail: marlae@spie.org; website: www.spie.org/web/meetings/calls/ae00/.

Remote Sensing 2000: From Laboratory Spectroscopy to Remotely Sensed Spectral Observation. October 22–25, Corpus Christi, Texas. Contact the Blackland Research Center, 720 East Blackland Road, Temple, TX 76502-9622; fax (254) 774-6001; e-mail: rs2000@brc.tamus.edu; website: www.brc.tamus.edu/rs2k/rs2000.html.

Technology Assessment and Future Analysis

Symposium on Systems Analysis in Forest Resources. September 27–30, Aspen, Colorado. Contact Greg J. Arthaud, Yale University, School of Forestry and Environmental Studies, 360 Prospect Street, New Haven, CT 06511; (203) 432-5800; fax (203) 432-3809; e-mail: greg.arthaud@yale.edu; website: www.for.msue.edu/e4/ssaf2000.htm.

Water Resources

Runoff Generation and Implications for River Basin Modeling. October 9–12, Freiburg, Germany. Contact Stefan Uhlenbrook, University of Freiburg, Fehnbergplatz, D-79098 Freiburg, Germany; +49/761-203-3330; fax +49/761-203-3594; e-mail: uhlenbro@uni-freiburg.de; website: www.uni-freiburg.de/hydrology/aktuell/ws2000.htm.

First International Conference on Wood in World Rivers. October 23–27, Corvallis, Oregon. Contact Stan Gregory, Department of Fisheries and Wildlife, Nash Hall, Room 104, Oregon State University, Corvallis, OR 97331-3803; (541) 737-1951; fax (541) 737-3590; e-mail: stanley.gregory@orst.edu; website: http://riverwood.orst.edu/.

Wildlife and Fish Ecology

Changes in Wildlife Damage Management for the 21st Century: Ninth Eastern Wildlife Damage Management Conference. October 5–8, State College, Pennsylvania. Contact Gary J. San Julian, Conference Chair, 28 Ferguson Building, University Park, PA 16802; (814) 853-0401; e-mail: jgs9@psu.edu; website: http://wildlife.cas.psu.edu/.

Looking for practical information? Have some advice you'd like to share?

We welcome articles and suggestions from those who are seeking or have found solutions to professional challenges in the broad field of forestry and natural resources. Information that appears here has not been peer reviewed or tested by the Journal. Contact Steve Wilent, swilent@compuserve.com; (503) 622-5499.
The following articles appear in the July 2000 issue of the Western Journal of Applied Forestry

Juvenile Height Development in Interior Spruce Stands of British Columbia
G.D. Nigh and B.A. Love
Years to breast height and green-up age models were developed with data generated from a juvenile height model. Forecasts from these models indicate that the time to reach breast height and green-up age is less than previously expected. The juvenile height model, years to breast height model, and green-up age model should be used for site indices above 14.2 m. In addition, the height model should only be used up to total age 20.

Spruce Beetle Population Suppression in Northern Utah
B.J. Bentz and A.S. Munson
We describe a project that was initiated to suppress an endemic spruce beetle population in an isolated area of spruce in northeastern Utah. Techniques used included baited pheromone traps, selective harvesting and burning of infested trees, and trap trees. The treatments played a major role in decreasing the trend of spruce beetle-infested trees during the study period.

Cold Hardiness Testing for Douglas-Fir Tree Improvement Programs: Guidelines for a Simple, Robust, and Inexpensive Screening Method
T.S. Anekonda, W.T. Adams, and S.N. Aitken
We present a detailed description of one procedure for screening improved coastal Douglas-fir seedlings and saplings for cold hardiness, based on research results of the Pacific Northwest Tree Improvement Research Cooperative. Artificial freeze testing of detached shoots from genetic tests, followed by visual scoring of injury, has proved to be an efficient, reliable, and cost-effective method of screening large numbers of genotypes.

Riparian Management Area Condition for Timber Harvests Conducted before and after the 1994 Oregon Water Protection Rules
A.B. Hairston-Strang and P.W. Adams
The 1994 Oregon Water Protection Rules introduced new and expanded requirements for streamside timber harvesting. Postharvest conditions in Riparian Management Areas (RMA) were evaluated on 21 harvests throughout Oregon in 1995 and compared to results of 22 harvests from a study completed in 1993. Average conifer retention in these RMAs increased from 35% in 1993 to 75% in 1995, a desirable change for long-term supplies of large woody debris for fish habitat.

Estimating Large Snag Recruitment Needs in Regeneration Timber Harvests
R.B. Harris
A simple simulation model was used to investigate potential dynamics of snags for 80 to 120 years following timber harvest. Parameters resulting in recovery of the initial number of snags at rotation length are presented. Equilibrium depended on three parameters usually beyond management control: annual mortality rate of live trees; snag fall rate; and transition rate from smaller to larger retention trees.

Effectiveness of Repeated Manual Cutting and Glyphosate for Release of Engelmann Spruce from Mixed-Shrub Herb Vegetation
P.G. Comeau, B.S. Biring, and G.J. Harper
This study, initiated in 1992, examined the effectiveness of repeated cutting for controlling vegetation in a mixed-shrub-herb community to release planted Engelmann spruce seedlings. Eight treatments were compared.

The Influence of Weeding on Growth of Browsed Seedlings in Douglas-Fir Plantations
M.E. O'Dea, M. Newton, E.C. Cole, and M. Gourley
Large Douglas-fir transplants were exposed to heavy browsing pressure under various weeding regimes in two experiments. Browsing had relatively little effect on seedlings that did not receive weed control because potential growth was modest. Intensive weeding after planting appears to be a useful and integrative method of protecting seedlings from browsing losses.

Technical Note—Why Quadratic Mean Diameter?
R.O. Curtis and D.D. Marshall
Quadratic mean diameter is the measure of average tree diameter conventionally used in forestry, rather than arithmetic mean diameter. The historical and practical reasons for this convention are reviewed.

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