Tree Planting in Idaho

Chris Schnepf and Anthony S. Davis

Professor, University of Idaho, Coeur d'Alene, ID, and Area Extension Educator—Forestry, Boundary, Bonner, Kootenai, and Benewah Counties, ID; Associate Professor and Tom Alberg and Judith Beck Chair in Natural Resources, Department of Forest, Rangeland, and Fire Sciences, University of Idaho, Moscow, ID

Abstract

Idaho has more than 21.4 million ac (8.6 million ha) of some of the most diverse forests in the Rocky Mountains. The largest part (76 percent) of Idaho's forests is managed by the U.S. Department of Agriculture (USDA), Forest Service, but, progressing north, forests owned by families, the State of Idaho, and forest product companies are increasingly more prominent. Most ownerships seek to reduce stand density and shift species composition to reduce fire risk and insect and disease issues. Idaho has a strong tree improvement program, originating from efforts to develop blister rust-resistant western white pine seedlings. Idaho has two USDA Forest Service seedling nurseries, a nursery managed by the University of Idaho (UI), and a few private seedling nurseries. Highly varied sites present likewise varied challenges to Idaho tree planting. Common threats to seedling survival include seedling moisture stress; rodents (particularly pocket gophers); deer, elk, and moose; and white pine blister rust.

Idaho Forests

Idaho's more than 21.4 million ac (8.6 million ha) of forested land (Witt and others 2012) comprise roughly 40 percent of the State's land area (figure 1). Most of Idaho's forests are located in three "ecoprovinces" (Bailey 1995):

- Northern Rocky Mountain Forest—Steppe-Coniferous Forest Alpine Meadow Province in the northern portion of the State.
- Middle Rocky Mountain Forest—Steppe-Coniferous Forest Alpine Meadow Province in the central portion of the State
- Southern Rocky Mountain Forest—Steppe-Coniferous Forest Alpine Meadow Province in the southeast portion of the State.

Some of the most diverse forests in the Rocky Mountains occur in Idaho. Northern Idaho has a mild maritime influence, which brings significantly more moisture to the northern end of the State than is found in southern Idaho. In general, the most productive and actively managed forest lands are found in the Northern Rocky Mountain Forest—Steppe-Coniferous Forest Alpine Meadow Province.

Idaho's exceptionally rugged topography means elevation and aspect have a large influence on volume of precipitation and its availability to trees. In general, more moisture is available throughout the growing season at higher elevations and on north- and east-facing aspects than at lower elevations and south- and west-facing aspects.

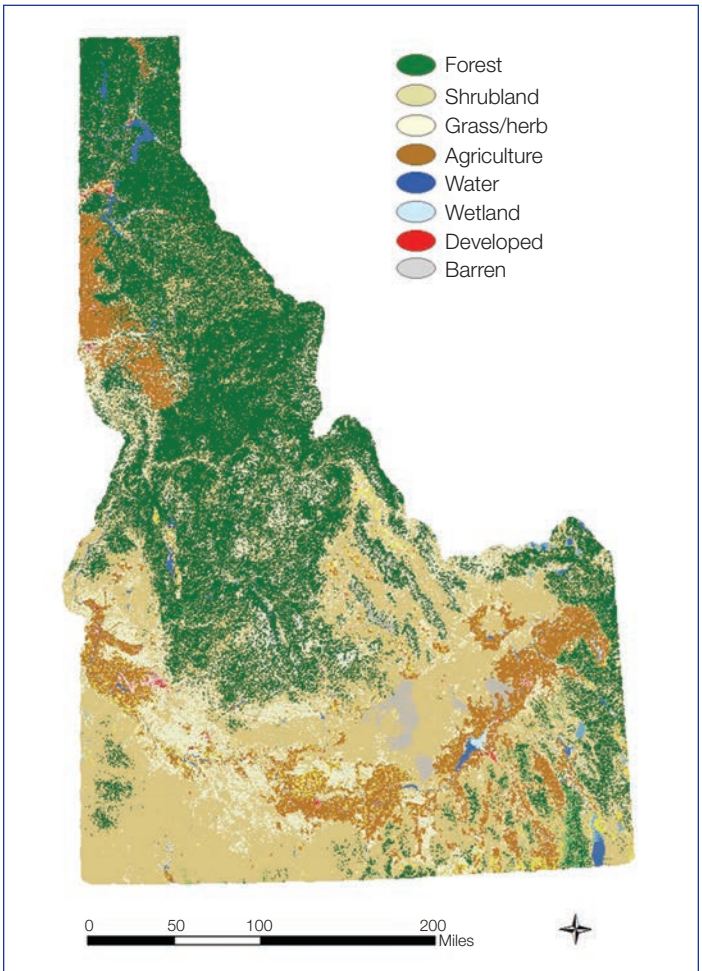

Figure 1. Roughly 40 percent of Idaho is forested. (Source: National landcover dataset, U.S. Geological Survey; map developed by Eva Strand, Assistant Professor, Department of Forest, Rangeland, and Fire Sciences, University of Idaho, Moscow, ID, for this article)

Soils and their underlying parent materials affect Idaho's forest diversity. For example, many of the soils in the central and northern parts of the State have a significant component of volcanic ash, which adds considerably to those soils' ability to retain moisture through the growing season (Garrison-Johnston and others 2007). Soil parent materials are also correlated with forest nutrition on many sites (Moore and Mika 1997).

Commercially harvested coniferous tree species in Idaho include the following:

- Douglas-fir (*Pseudotsuga menziesii* var. *glauca* [Mayr] Franco).
- Engelmann spruce *(Picea engelmannii* Parry ex Engelm.).
- Grand fir (*Abies grandis* [Douglas ex D. Don] Lindl.).
- Lodgepole pine (*Pinus contorta* var. *latifolia* Engelm. ex S. Watson).
- Ponderosa pine (*Pinus ponderosa* var. p*onderosa* Douglas ex P. Lawson & C. Lawson).
- Subalpine fir (*Abies lasiocarpa* [Hook]) Nutt.).
- Western hemlock *(Tsuga heterophylla* [Raf.] Sarg.).
- Western larch (*Larix occidentalis* Nutt.).
- Western redcedar (*Thuja plicata* Donn ex D. Don).
- Western white pine (*Pinus monticola* Douglas ex D. Don).

Other Idaho tree species are not commonly used for wood products, but have important ecological values. Conifers that fall into this category include white bark pine (*Pinus albicaulis* Engelm.), limber pine (*Pinus flexilis* E. James), alpine larch (*Larix lyallii* Parl.), mountain hemlock (*Tsuga mertensiana* [Bong.] Carrière), and western juniper *(Juniperus occidentalis var. occidentalis* Hook.). Common hardwood species include quaking aspen (*Populus tremuloides* Michx.), black cottonwood, (*Populus trichocarpa* Torr. & A. Gray ex Hook.), and paper birch (*Betula papyrifera* Marshall). Idaho also has dozens of shrub species, including many willow species (*Salix* spp.) (Brunsfeld and Johnson 1985).

Fire has a significant influence on Idaho forests. Many Idaho forests, depending on the site, historically experienced stand-replacement fires every 50 to 500 years and surface fires every 2 to 50 years. Many fire events were a mixture of these two fire types. These fires tended to keep forests in earlier stages of succession (e.g., more pine and larch) than is often seen in many Idaho forests today. The USDA Forest Service national Forest Inventory and Analysis (FIA) program's most recent report on Idaho forests (Witt and others 2012) listed the following top six forest cover type groups in Idaho:

1. Douglas-fir forest cover type.
2. Fir/spruce/mountain hemlock group (includes Engelmann spruce, Engelmann spruce/subalpine fir, grand fir, subalpine fir, and mountain hemlock (*Tsuga mertensiana* [Bong.] Carrière) forest cover types).
3. Lodgepole pine forest cover type.
4. Ponderosa pine forest cover type.
5. Hemlock/sitka spruce (*Picea sitchensis* [Bong.] Carrière) group (includes western hemlock and western redcedar forest cover types).
6. Aspen/birch group (includes quaking aspen, paper birch, and balsam poplar [*Populus balsamifera* L.] forest cover types).

Idaho Forest Ownership

The USDA Forest Service manages the largest part (76 percent) of Idaho forests. Private owners, including forest product companies and family forest owners, hold the second largest portion, roughly 13 percent, of the forest land in Idaho. The State government is the third largest forest owner, with 6 percent (Witt and others 2012). The relative proportions of land in different ownership types vary considerably across the State. Federally managed forests dominate southern Idaho, but progressing farther north into the State's most productive forests, family, State, and industry-owned lands become a larger portion of the mix. For example, in the four northernmost counties of Idaho, 44 percent of the forests are owned by family forest owners (Bundy 1972).

More than 34,000 family forest owners manage timberland in Idaho (Butler 2008). Changes in farming practices (e.g., fewer farmers with livestock) and farm programs, such as the USDA Conservation Reserve Program (CRP), have resulted in former pasture lands or marginal croplands either actively being planted back to trees or passively reverting to forest through old-field succession. Family forest ownerships are also increasing in proportion in some areas of the State, as forest product companies sell their lands and rely on the open market for timber supply.

Idaho also has significant forest land owned and managed by tribal governments. For example, the Coeur d'Alene and Nez Perce tribal governments have forest management staff members in Idaho and active tree planting programs.

Idaho Forest Values and Benefits

Idaho has 340 active forest products manufacturing facilities (IFPC 2013). For many years, harvests from Federal lands provided the largest portion of Idaho's timber volume, but in the past decade, private and State lands provided the largest portion of the harvest. For example, in 2012, private lands and State lands provided 58 and 33 percent of the timber harvested, respectively (Morgan and others 2013).

Forest products are a vital part of Idaho's economy. The total impact in Idaho of converting timber into consumer products (with wood products markets still at a low ebb) is more than $3.2 billion (Morgan and others 2013).

Forests are also critical to water, wildlife, and many other shared values. In addition to their intrinsic values and importance to ecosystem functioning, in 2011, Idaho forests helped support expenditures of $540 million in fishing, $590 million in hunting, $600 million in wildlife viewing, and $350 million in other outdoor recreational activities (Wendland and O'Laughlin 2013).

Forestry Assistance

The USDA Forest Service; the U.S. Department of the Interior, Bureau of Land Management; and other Federal agencies have active tree-planting efforts in Idaho. For the most part, their professional staffs manage their lands, as is the case with forest product companies and some other large forest ownerships. Regarding family forests, a variety of State agencies and nongovernmental organizations support tree planting:

- The Idaho Department of Lands (IDL) manages State-owned lands, provides technical assistance for family forest owners, and administers Idaho's State forest practice laws. These laws focus primarily on reducing fire risk and maintaining forest water quality, but they also include minimum stocking requirements after timber harvests. The IDL employs eight foresters and some seasonal employees who inspect logging jobs for compliance with these State laws and provide assistance to forest owners. Idaho does not currently have any State-level cost share programs, but the IDL works closely with the USDA Natural Resources Conservation Service on federally funded cost share programs that support tree planting, such as the Environmental Quality Incentives Program.
- UI Extension offers multifaceted, research-based information and education programs that help family forest owners, loggers, and foresters manage forests and other natural resources. In addition to providing a variety of workshops, field days, publications, and web offerings for forest owners, UI Extension trains, certifies, and manages Idaho Master Forest Stewards—volunteers who receive 70 hours of training to provide educational assistance to peer forest owners and others interested in forestry.
- Private consulting foresters are also involved in tree planting and other silvicultural practices. Most of this work is with family forest owners, but some consulting foresters also work with forests owned by forest products companies.
- The Idaho Forest Owners Association is the primary organization representing family forest owners in Idaho, both in the State legislature and in a variety of other settings. The association also provides a forum for peer-to-peer learning among forest owners.
- The American Tree Farm System has certified more than 565 forest owners in Idaho.

Idaho Silviculture

Idaho forests are managed for a variety of different benefits, depending on the site and ownership. On many ownerships, fire exclusion and partial harvesting have created denser forests, with a much higher percentage of shade tolerant species (e.g., Douglas-fir, grand fir, western redcedar, and western hemlock) than would have been typically found historically on these sites. This higher density and altered species composition has led to some serious problems with fire risk, insects, and diseases that take advantage of these conditions. For example, root diseases, such as Armillaria (*Armillaria ostoyae*) and laminated root disease (*Phellinus sulphurascens*), and defoliating insects such as tussock moth (*Orgyia pseudotsugata*) and western spruce budworm (*Choristoneura occidentali)* are an issue on many Idaho forests that have become dominated by tree species, such as Douglas-fir and grand fir, most vulnerable to these diseases and insects. On higher elevation forests, many acres of lodgepole pine have been killed during the past 10 years by mountain pine beetle (*Dendroctonus ponderosae* Hopkins, 1902).

Most forest managers' response to these conditions is to reduce stand density and shift species composition to more seral (intermediate) species (figure 2). Habitat types are a land classification system based on the potential climax vegetation for a given site (Cooper and others 1991). The most commonly targeted species for reforestation in Idaho tend to be species that are seral for a site's habitat type and those that will not seed-in naturally. For example, foresters often plant

Figure 2. Western larch is commonly planted in northern Idaho because of its root disease tolerance. (Photo by Chris Schnepf)

ponderosa pine on sites where ponderosa pine or Douglas-fir are climax species; ponderosa pine and western larch on sites where grand fir is the climax species; and progressively more western larch and western white pine, and less ponderosa pine on sites likely to climax in western redcedar or western hemlock. Douglas-fir, lodgepole pine, Engelmann spruce, and western redcedar are occasionally planted, but on most sites, foresters rely on naturally regenerated ingrowth of these and other species.

Tree Improvement

Idaho has a strong tree improvement program, owing in part to white pine blister rust (*Cronartium ribicola* A. Dietr.). Western white pine once dominated moist, midelevation forests in northern Idaho. It is also Idaho's State tree, and was the impetus for the beginning of Idaho's wood products industry, as loggers moved to Idaho for western white pine after depleting eastern white pine (Fins and others 2001). White pine blister rust began to infect Idaho western white pine in the 1920s and quickly invaded white pine sites throughout the State. Fire exclusion, mountain pine beetle, and preemptive harvesting of white pine in the face of blister rust also contributed to the species' decline.

Initial efforts to combat blister rust focused primarily on removing the alternate host (gooseberries and currants; *Ribes* L.) the fungus needs to complete its life cycle. Idaho has at least four *Ribes* species that occur on or near forests. Blister rust fungicides were also attempted. None of these efforts ultimately were very effective at managing the disease.

In the 1950s, USDA Forest Service scientists began noticing trees that seemed to be surviving blister rust, so they began an intensive program to breed blister rust-resistant white pine. That program now produces white pine seedlings that resist blister rust using a variety of mechanisms. White pine still regenerates naturally on many sites in Idaho, but most naturally regenerated trees do not survive. In general, where western white pine is desired, seedlings from the breeding program are planted (figure 3). Breeding efforts to further increase and diversify blister rust resistance are ongoing.

Figure 3. Western white pine is a popular species to plant on moist sites in northern Idaho. (Photo by Chris Schnepf)

An additional fruit of the white pine breeding efforts was the formation of the Inland Empire Tree Improvement Cooperative (IETIC) in 1968. The IETIC is a diverse group of agencies, universities, and forest product companies from northern Idaho, eastern Washington, and western Montana. It is administered through an office at the UI in Moscow. In addition to continuing work on western white pine, the cooperative has breeding programs to produce genetically improved tree seed for ponderosa pine, western larch, Douglas-fir, and lodgepole pine. Since 1974, the IETIC has established more than 120 field tests with more than 1 million seedlings, supported by thousands of parent tree selections in the region's forests. Members have access to IETIC seed and other genetic materials.

Idaho Tree Seedling Nurseries

UI Center for Forest Nursery and Seedling Research

UI began producing seedlings in Moscow in 1909, and since 1926, has functioned as Idaho's defacto State tree nursery. In its early years, the nursery focused exclusively on bareroot seedlings. In 1982, the nursery shifted to container seedling production. The production component of the facility, now known as the Franklin H. Pitkin Forest Nursery, in honor of a former manager of the facility, produces tree and shrub seedlings in a variety of sizes for reforestation, Christmas trees, windbreak plantings, and other conservation efforts. Under the guidance of Dr. David Wenny, the nursery program expanded beyond seedling production under the umbrella of the Center for Seedling and Nursery Research.

In addition to providing seedlings, the center also provides employment and training for students and others interested in tree seedling production (figure 4) and implements research that supports the State's nursery and reforestation industry. The center operates in consultation with an advisory committee that includes representatives of Idaho's nursery industry. In February 2013, the center received a $3.3 million endowment to establish a new classroom and support graduate and faculty research.

Conservation Districts

Many Idaho soil and water conservation districts, particularly in the northern end of the State, sell tree seedlings for reforestation and conservation plantings. Typically, tree seedlings are grown by contract with private nurseries, then seedlings are sold and distributed through local conservation district offices.

Figure 4. Idaho Master Forest Stewards learning about seedling production at the University of Idaho Center for Seedling and Nursery Research. (Photo by Chris Schnepf)

The USDA Forest Service Coeur d'Alene and Lucky Peak Nurseries

The USDA Forest Service nursery in Coeur d'Alene (figure 5) grows a variety of nursery stock types for planting on publicly owned lands in the region. Most of these are conifer tree seedlings for reforestation, but the nursery also grows a variety of other native plants for habitat restoration efforts (e.g., grass and sedge plugs and rooted cuttings). The nursery can produce more than 16 million seedlings from 130 ac (53 ha) of irrigated seedbeds and an additional 4 million container seedlings in 25 controlled-environment greenhouses. The nursery also cleans, tests, and stores seeds, and it provides seedling quality testing.

Located near Boise, the Lucky Peak Nursery has produced seedlings since 1959. It stores seed and grows seedlings for national forests and other publicly owned lands in the Intermountain West Region. One of its specialties is producing bareroot desert shrubs, such as sagebrush (*Artemisia* L.) and bitterbrush (*Purshia tridentata* [Pursh] DC.). Annual production ranges from 2 to 6 million trees on 60 ac (24 ha) of land. The nursery produces both container and bareroot seedlings.

Figure 5. The USDA Forest Service nursery in Coeur d'Alene grows a variety of nursery stock types for planting on publicly owned lands in the region. (Photo by Chris Schnepf)

Private Tree Seedling Nurseries in and Near Idaho

Idaho has a handful of private nurseries that grow seedlings for reforestation or conservation plantings. Idaho also has a sizeable woody ornamental nursery industry, located primarily in the northern end of the State, that grows a variety of trees, shrubs, and groundcovers for the retail and wholesale nursery trade.

Tree Planting Challenges in Idaho

Idaho's varied topography, climate, and soils likewise bring varied challenges to tree planting in the State:

Seedling Moisture Stress

The lack of available soil moisture limits growth in most Idaho forests. Methods used to mitigate this condition include—

- Prescribed burning, scarification, scalping, and herbicide treatments to reduce competing vegetation
- Robust seedlings with a good shoot-to-root ratio.
- Microsite shade, primarily using materials on site, such as pieces of logs, or stumps (figure 6). Stumps are usually avoided on planting sites with a recent history of aggravated root disease, however. Shingles or shade cards are sometimes used on especially difficult sites.

Figure 6. Microsite shade is commonly used to reduce seedling moisture stress in Idaho. (Photo by Chris Schnepf)

Rodents

Pocket gophers *(Thomomys talpoides* [Richardson 1828]) can cause significant seedling mortality in Idaho reforestation efforts, especially where the habitat is ideal for this rodent. Meadow voles (*Microtus pennsylvanicus* [Ord 1815]) can also cause notable seedling mortality, particularly on afforestation efforts on former farm fields. Toxicants placed underground are the most common method of dealing with pocket gophers. Porcupines (*Erethizon dorsatus* [Linnaeus 1758]) can be an issue on some sites, but in Idaho, they are more commonly a problem on sapling or larger trees.

Deer, Elk, and Moose

White tail deer (*Odocoileus virginianus* [Zimmermann 1780]), mule deer *(O. hemionus* [Rafinesque 1817]), elk (*Cervus elaphus* [Linnaeus 1758]), and moose *(Alces americanus* [Clinton 1822]) all frequently browse on Idaho tree seedlings, especially on sites that coincide with winter range for these animals. The most common methods used to help seedlings survive browse damage are rigid plastic mesh tubes (figure 7) and repellents. As trees grow older, individual saplings are occasionally damaged by ungulates rubbing the velvet from their antlers, though sometimes trees survive this activity. Western red-cedar and hardwood species, such as aspen, often cannot be successfully established without protection from ungulates.

Figure 7. Animal damage protection can be critical in some Idaho reforestation efforts. (Photo by Chris Schnepf)

White Pine Blister Rust

While planting western white pine from the IETIC breeding program has brought considerable progress in reestablishing this valued species, blister rust must be monitored in white pine plantations (Schnepf and Schwandt 2006). Blister rust has its greatest effect on young trees because they have more green branches close to the ground, where higher humidity increases infection risk. While blister rust-resistant seedlings have a good chance of surviving the fungus, resistance varies considerably by site. Pruning the bottom 10 feet of young trees (figure 8) can reduce blister rust mortality of naturally regenerated western white pine by 50 percent (Schwandt and others 1994). Even blister rust-resistant trees increasingly are being pruned to enhance survival, especially on sites with a high blister rust hazard (e.g., high humidity and *Ribes* density).

Figure 8. Pruning western white pine can cut blister rust mortality in half. (Photo by Chris Schnepf)

The Future

A variety of challenges and opportunities are on the horizon for tree planting in Idaho. It is not yet clear what climate change may bring to local sites, but landowners and managers are discussing potential climate scenarios and management responses. Species recommendations and seed transfer zones have not yet been revised in anticipation of climate change.

With lumber mills' growing capacity to use smaller diameter trees (figure 9), the incentive to plant trees has increased because planting costs are not held as long. Better sites in northern Idaho can produce small diameter saw logs in as little as 25 years. In addition, a great deal of research is underway in the region regarding new uses of forest biomass, both with native species and with hybrid poplars. If these markets develop, they will also provide an opportunity to use trees from precommercial thinning activities, or even plant trees with biomass as the primary end product.

Figure 9. Inland Northwest lumber mills' growing capacity to use smaller diameter logs increases the incentive to plant trees. (Photo by Chris Schnepf)

Address correspondence to:

Chris Schnepf, Professor/Area Extension Educator—Forestry, University of Idaho Extension—Kootenai County Office, 1808 North 3rd Street, Coeur d'Alene, ID 83814–3407; e-mail: cschnepf@uidaho.edu; phone: 208–446–1680.

References

Bailey, R.G. 1995. Descriptions of the ecoregions of the United States. 2nd ed., rev. and expanded. Misc. Pub. No. 1391. Washington, DC: U.S. Department of Agriculture, Forest Service. http://www.fs.fed.us/land/ecosysmgmt. (May 2013).

Brunsfeld, S.J; Johnson, F.D. 1985. Field guide to the willows of east-central Idaho. Bul. 39. Moscow, ID: University of Idaho, College of Forestry, Wildlife, and Range Sciences Experiment Station. 96 p.

Bundy, R. 1972. Timber resources on State, private, and industrial commercial forest lands in north Idaho. Coeur d'Alene, ID: Idaho Department of Lands. 21 p.

Butler, B.J. 2008. Family forest owners of the United States, 2006. Gen. Tech. Rep. NRS-27. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 72 p.

Cooper, S.V.; Neiman, K.E.; Roberts, D.W. 1991. Forest habitat types of northern Idaho: a second approximation. Gen. Tech. Rep. INT-236. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 143 p.

Fins, L.; Byler, J.; Ferguson, D.; Harvey, A.; Mahalovich, M.; McDonald, G.; Miller, D.; Schwandt, J.; Zack, A. 2001. Return of the giants: restoring white pine ecosystems by breeding and aggressive planting of blister rust-resistant white pines. Sta. Bul. 72. Moscow, ID: University of Idaho, Wildlife and Range Experiment Station. 21 p.

Garrison-Johnston, M.T.; Mika, P.G.; Miller, D.L.; Cannon, P.; Johnson, L.R. 2007. Ash cap influences on site productivity and fertilizer response in forests of the inland Northwest. In: Page-Dumroese, D.; Miller, R.; Mital, J.; McDaniel, P.; Miller, D., tech. eds. 2007. Volcanic-ash-derived forest soils of the inland Northwest: Properties and implications for management and restoration. 9–10 November 2005; Coeur d'Alene, ID. Proceedings RMRS-P-44; Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 137–163.

Idaho Forest Products Commission (IFPC). 2013. Where do Idaho's wood products go? Boise, ID: Idaho Forest Products Commission. http://www.idahoforests.org/destinat.htm. (May 2013).

Moore, J.A.; Mika, P.G. 1997. Influence of soil parent material on the nutrition and health of established conifer stands in the inland Northwest. In Haase, D.L. and Rose, R. (Eds.) Symposium proceedings: forest seedling nutrition from the nursery to the field, Corvallis, Oregon, Oct. 28–29, 1997. Nursery Technology Cooperative, Department of Forest Science, Oregon State University, Corvallis: 144–153.

Morgan, T.A.; Keegan, C.E.; Hayes, S.W.; Sorenson, C.B.; Shook, S.R.; Wagner, F.G.; O'Laughlin, J. 2013. Idaho's forest products industry: current conditions and 2013 forecast. Sta. Bul. 100. Moscow, ID: University of Idaho, College of Natural Resources, Idaho Forest, Wildlife, and Range Experiment Station. 4 p.

Schnepf, C.C.; Schwandt, J. 2006. Pruning western white pine: a vital tool for species restoration. Pacific Northwest Ext. Pub. No. 584. Moscow, ID: University of Idaho Extension. 63 p.

Schwandt, J.W.; Marsden, M.A.; McDonald, G.I. 1994. Pruning and thinning effects on white pine survival and volume in northern Idaho. In: Baumgartner, D. M.; Lotan, J. E.; Tonn, J. R., comps. Symposium Proceedings: Interior Cedar-Hemlock-White Pine Forests: Ecology and Management; 2–4 March 1993; Spokane, WA. Pullman, WA: Washington State University, Department of Natural Resource Sciences: 167–172.

Wendland, K.; O'Laughlin, J. 2013. Economic contribution of Idaho's natural resources. Fact Sheet Number 7. Moscow, ID: University of Idaho Policy Analysis Group. 1 p.

Witt, C.; Shaw, J.D.; Thompson, M.T.; Goeking, S.A.; Menlove, J.; Amacher, M.C.; Morgan, T.A.; Werstak, C. 2012. Idaho's forest resources, 2004–2009. Res. Bul. RMRS-RB-14. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 134 p.