University of Idaho Extension

# Woodland NOTES

www.cnr.uidaho.edu/extforest

UI College of Agricultural and Life Sciences and UI College of Natural Resources
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## 2006-2007 Strengthening Forest Stewardship Skills

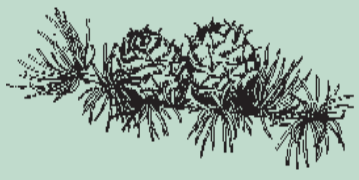
The 2006-2007 *Strengthening Forest Stewardship Skills* program offers a new field day this year as well as the return of some of our most popular programs.

*Adaptive Silviculture on the McGovern Forest* features Dr. Karol Stoszek (emeritus professor, Department of Forest Resources, University of Idaho), who has long advocated approaches to silviculture that maximize flexibility in response to small scale variations in stand and site conditions. Dr. Stoszek has been experimenting with these approaches on the McGovern Forest, a property donated to the University of Idaho, to demonstrate family forest management alternatives. This field day will be spent in the woods with Karol observing and discussing adaptive silvicultural treatments.

Returning this year are:

- Inland Northwest Wildland Urban Interface Conference
- Backyard Forests
- Forestry Shortcourse
- Current Topics in Forest Health
- Family Foresters Workshop
- An Introduction to Conservation Easements
- Landscaping for Fire Prevention
- Loggers Education to Advance Professionalism (LEAP) Update
- Using your GPS
- Family Forest Landowners Workshop
- Loggers Education to Advance Professionalism (LEAP)
- Thinning and Pruning Field Day
- Pruning for White Pine Blister Rust
- Managing Forest Organic Debris
- Forest Insect and Disease Field Day

Look inside for the details and we'll see you there!



## Silvicultural Decisions XII: Considering Climate Change in Silvicultural Prescriptions

*Ron Mahoney*

Forest ecosystems are complicated and ever changing. Landowners and managers must consider a vast array of information to meet either specific stand objectives and/or the broader goals of landscape level management. In many situations, land management objectives integrate measurable products such as timber and forage, and less tangible assets, often collectively described as aesthetics. On other lands, production of timber or other products may be primary, but a broad consideration of ecosystem functions and processes is still required for sustainable success.

Managers and landowners with years of experience in evaluating forest conditions and applying management can consistently predict results and achieve silvicultural objectives. Forests have always been dynamic and variable and are a constant challenge to understand and manage. But, with collective experience, basic and applied research, and the modern tools of computerized data collection, interpretation, and modeling, silviculture has advanced to sometimes more of a science and less of an "art" in the 40 years since I made my first timber cruise and marked my first harvest. However, because of the complexities of increasing social concerns, landscape-level management, emphases on uneven-aged and mixed species management, and our unfulfilled ability to measure and analyze more intricate environmental factors with new methods and equipment, silviculture may actually be more "artful" than ever.

The reliability of silvicultural predictability and achievement of objectives has greatly diminished with climate change. While the specific climatic impacts of human activities are still open for debate in some respects, there is no longer any doubt in my own mind, or for most in the scientific community, that climate change is real and a serious factor in nearly every aspect of our lives and economy. There are many credible, scientifically validated measures of how the climate has changed dramatically in regard to global warming, but many other aspects of climate change other than temperature are still under investigation or are not yet on the radar screen of all scientists and funding agencies.

Forest and agricultural scientists and managers are beginning to develop basic models to predict the factors that determine the health and productivity of forest vegetation and agricultural crops in a changing climate. These frameworks will require many years of substantial research to achieve reliability. The most dramatic ecosystem responses to climatic changes are occurring at the poles, where the average global change is magnified by a factor of 3…..a global change in mean annual temperature of 2 degrees averages 6 degrees in the arctic, and about 4 degrees in much of the boreal forest. More locally, where our temperate forests are somewhat below the average global temperature change, some puzzling declines in some tree species on specific sites, such as Alaska yellow-cedar described below, are now being explained in terms of climatic impact. One reason the global average temperature has not shown a more dramatic increase is because several regions within the tropics have actually decreased in average annual temperature, and also because of the heat sinks provided by the vast waters of the ocean and by melting glaciers and ice caps at the poles. Consequently, scientists and managers need to look at a broader spectrum of climate changes than just temperature.

To conceive how climate change can and is affecting temperate and boreal forests, it is necessary to first understand how different species in these ecosystems relate to each other (synecology) and how individual species relate to their environment (autecology). Additionally, we all need to understand that many of the fundamental ecological principles we have learned and accept were developed from research and experience in more tropical ecosystems. About 65 million years ago the dinosaurs and an estimated 70% of all other species on earth became extinct due to, according to most authorities, a cataclysmic meteor impact. Since that time, the earth and its organisms have experienced many additional geologic and atmospheric changes, with corresponding climate changes that challenged current vegeta-

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# Forest Fire Risk Reduction Alternatives for Slash

*Chris Schnepf*

Leaving more slash in the woods may be good for forest fertility, but there is a fire hazard associated with slash, particularly on drier sites, where woody material decomposes more slowly. Most western states have rules to keep fire risk within acceptable limits. In Idaho, logging slash must be reduced to an acceptable level to release the landowner or operator from liability for any forest fires that start on or move through the property.

Slash is often broadly described as branches and tops from logging or accumulated from a storm, but this article focuses primarily on material smaller than three inches in diameter. Material larger than three inches in diameter (coarse woody debris) is often best left in place, as it is much less of a fire hazard and benefits wildlife and soil health.

**How high is the hazard?**

Before reducing slash, you must determine how high the hazard is. The most fundamental measure of slash hazard is in tons/acre, but slash hazard is more than weight. Idaho Department of Lands (IDL) fire wardens typically determine the potential fire hazard based on a number of factors, including:

- Number, size, and species of trees to be cut and resulting slash load (tons/acre)
- Size of unit (larger units are more hazardous)
- Slope and aspect (steep south or southwest facing slopes are most hazardous)
- Condition of the unit and adjoining areas prior to activity
- Proximity to structures, etc. (e.g. campgrounds, home sites, etc.)
- Presence of snags and cull trees
- Deterioration rate of slash
- Time of year activity takes place (May-June is most hazardous)

Before deciding on a slash reduction strategy, contact your local IDL fire warden to determine how much of a slash hazard you have (or are likely to have, if before the harvest). Presuming you have enough slash to warrant further treatment, there are many methods to reduce fire risk to acceptable levels. These methods may be used alone or in combination.

**Pile and Burn**

The most common approach to reduce slash hazard on family forests is to pile it and burn it. Piles can be created by hand or by using a bulldozer or other equipment. Typically, a piece of plastic or roofing paper is placed on top of each pile to keep a good portion of it dry. Piles are usually burned in the fall, to lessen the chance that the fire will spread or that any embers continue smoldering into the next wildfire season. For more information on constructing and burning piles, see the publications cited in the reference section of this article.

Piling and burning effectively reduces slash hazard, but it does have disadvantages. First, it costs time and money (especially hand piling), though these costs are usually figured into a logging job that removes sawlogs. Second, there is some risk associated with burning piles, both to trees on the site, if the piles are constructed too close to standing trees, and to surrounding forests, if they are not burned carefully. Finally, immediately piling fresh slash concentrates nutrients in a few piles and removes some nutrients when they are burned.

One way to reduce nutrient loss is to let the slash sit for 6 months before piling and burning, to allow more of the nutrients to leach into the soil. Most states have some kind of grace period (e.g., a year or two) in which to treat the slash before the landowner is held liable for any fire that moves from their property to another. In some cases, you may also be able to get an extension of this time period from your local state forestry office. There will be some extra expense however, if you have to re-locate equipment back to the site to pile slash.

**Lop and scatter**

Relatively small amounts of slash can be cut into smaller pieces (so they lay flatter to the ground) and scattered about the forest floor. This method, commonly referred to as “lop and scatter”, is fairly standard with pre-commercial thinning slash, but it can be used for logging slash as well. The objective is to reduce the slash to a depth of 24 inches (preferably less).

For the first few years after the treatment there will be some elevated fire risk (and it may not be too visually appealing either) but after one good winter’s snow, the material is typically compressed, needles fall off, and it is mostly out of sight. The slash will decompose more quickly on wetter sites.

**Chipping**

Chipping has been around for a long time but hasn’t been used much because of the cost. However, there is a lot of renewed interest in chipping and related technologies for biomass fuels. Many people also like the way chipping looks. Local air quality ordinances also sometimes forbid burning, and chipping on site may be cheaper than hauling slash to a dump.

There may or may not be a viable market for the chips. The quantity and quality of the chips and the distance to the site that uses the chips play into whether chip removal is economically viable. There is also a potential nutrient loss issue if chipped fresh slash is removed from the site.

If you decide to chip and leave the chips on the site, disperse the chips around so they are less than one inch deep. Chips will also help retain soil moisture, but chips piled uniformly deeper than that can interfere with air and water movement into the soil and other soil functions as they buffer soil temperature. Try not to bury or mix the chips in with the soil, as fungi take nitrogen out of the soil to decay buried chips.

Chips can also interfere with the growth of new or sprouted understory plants, which may be good or bad, depending on the species of plants and your management objectives.

**Busting/Crushing/Shredding/Mulching/Masticating/Grinding**

A lot of terms are used to describe different practices that use power equipment to reduce the size and stature of slash and brush into smaller pieces that lay flatter on the ground. Interest in these tools has peaked recently as groups look for lower-cost mechanized methods to create and maintain lower fire risk around homes and communities.

There are many different machines for reducing slash hazard. Typically they involve some type of attachment to an excavator, a bobcat, caterpillar, or similar machine. All of these machines vary in their maneuverability in tight stands (some can be used on sites with trees spaced as close 12-15 feet), ability to work on slopes, and degree of rutting, compacting and other forms of soil disturbance. Most forest owners will probably hire a contractor to do this work, but some forest owners may be interested in purchasing a machine, particularly those machines that can do multiple tasks, such as move snow or skid logs. The USDA Forest Service Technology and Development Program has an excellent publication reviewing many of these tools, titled “Small Scale Forestry Equipment” (see references at end of this article).

If you do bust slash into smaller pieces, be careful not to break up older or larger material. Again, Idaho fire wardens do not count pieces larger than three inches as slash hazard. Changing material that is “three-inch-plus” to “three-inch-minus” un-necessarily increases your fire hazard.

**Soil disturbance and compaction**

Using heavy equipment for piling and burning, slash busting, or chipping can compact soils. Compaction can be reduced by using equipment with lower ground pressure (e.g. smaller cats, tracks instead of tires), working during drier seasons when soils are less likely to compact, and limiting the surface area covered by cabling or carrying slash to the machine. Machines mounted on an excavator arm also help reduce the area covered by tracks.

**Prescribed fire**

There are many types of prescribed fire. After a clearcut, slash is typically burned in a *broadcast burn* that consumes the finer fuels and chars coarse woody debris. A *prescribed underburn* takes place under a canopy of trees and burns up material in the understory without killing overstory trees. With prescribed burning there is always a balance between choosing the time of the year when the fire is most controllable (e.g., when there is a certain amount of current or anticipated rain and snow), versus conditions that are dry enough to get a good burn. Air conditions and location of the site have a bearing as well. Most areas have guidelines to minimize impacts to air quality from forest burning.

Ideally “cool” burns - prescribed burns where temperature is high enough to reduce slash hazard but not so high as to volatilize most of the nutrients - are desirable. Burning when the lower duff layers are moist helps retain nutrients. Typically this has meant burning in spring or fall.

One down side of burning in the spring is for birds that nest on the ground that time of the year. The impact of prescribed burning on ground-nesting birds has not been studied formally, but as long as a relatively small percentage of a watershed is burned in any one year, bird populations should not suffer too greatly.

Obviously, prescribed burning has risks. If the fire gets away, a landowner can be held responsible for damage to others’ properties and the cost of suppressing the escaped fire. Professional foresters who are trained and experienced with assessing the risks associated with prescribed fire and implementing appropriate safeguards, are indispensable to family forest owners wishing to prescribe fire on their forests.

**Customize a strategy for your property**

All of the fire risk reduction strategies referred to thus far are ways of directly reducing or modifying slash fuels from logging or thinning. There are other ways to reduce fire risk that should be used together with these methods. If fire risk is

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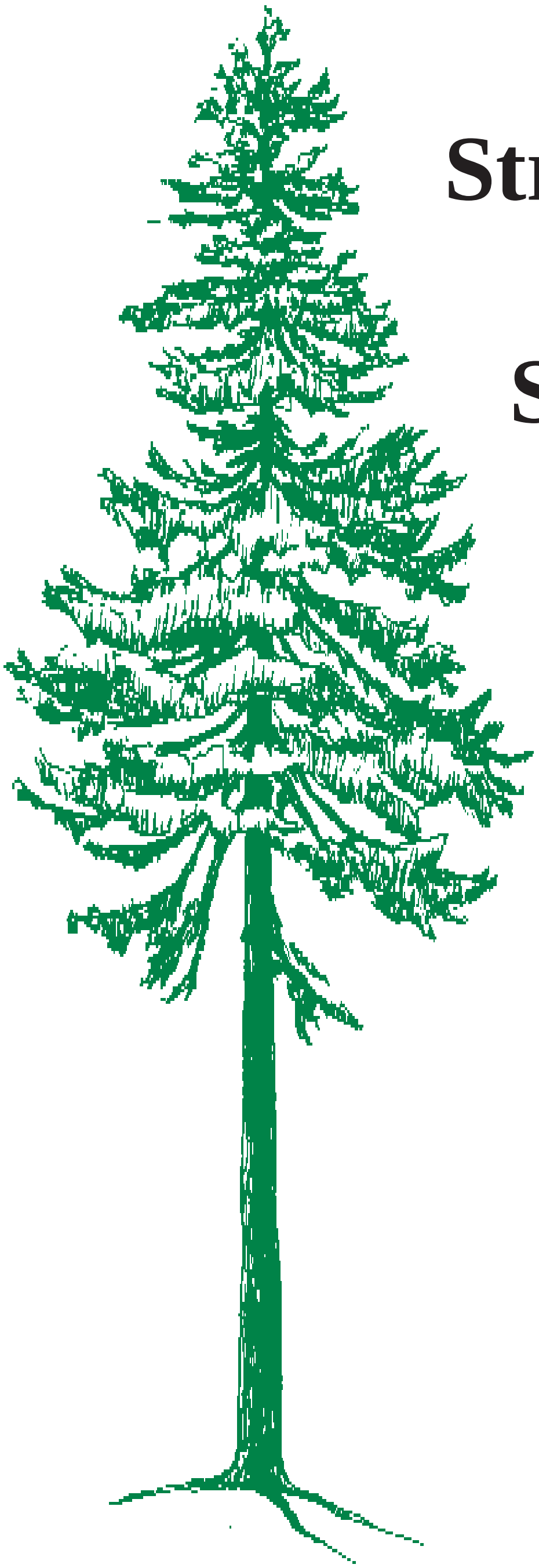

# Strengthening Forest Stewardship Skills 2006-2007

University of Idaho Extension

FOREST STEWARDSHIP

University of Idaho Extension

# Strengthening Forest Stewa

## Inland Northwest Wildland Urban Interface Conference

This program, offered jointly by UI Extension and WSU Extension, is designed to give rural policy makers, local agency staff, contractors, realtors, foresters, and rural residents an opportunity to learn about current research and experience related to fire, growth, planning, rural infrastructure, and other topics, and apply them to policies and activities in the wildland urban interface.

**Spokane Valley**, October 18-19, 2006

## Backyard Forests

This program will help landowners with less than five acres of forestland apply basic forest management concepts to "home landscape" forests.

**Sandpoint**, Wednesday, November 1, 2006 (6:00 pm to 8:00 pm)
**Coeur d'Alene**, Monday, February 5, 2007 (6:00 pm to 8:00 pm)

## Forestry Shortcourse

This multi-session program enriches private forest owners' basic understanding of forest ecology, silviculture, insects, disease, goal setting, record keeping, and other forest stewardship issues. In the process, participants work on a management plan for their forest (2 UI credits available).

**Hayden,** Thursdays, November 2 - December 14, 2006
(6:30pm to 9:30 pm)
**Sandpoint,** Wednesdays, June 13 - July 18, 2007
(9:00 am to 12:00 pm)
**Orofino**, Wednesdays, January 17 - February 21, 2007
(1:00 pm to 4:00 pm)

## Current Topics in Forest Health

Animals, plants, insects, and fungi can sometimes impede forest stewardship goals. This annual program updates forest owners, operators, and natural resource professionals on methods to manage these organisms. Pesticide recertification credits will be available.

**Orofino,** Thursday, December 14, 2006 (8:00 am to 3:30 pm)
**Coeur d'Alene,** Friday, December 15, 2006 (8:00 am to 3:30 pm)

## Family Foresters Workshop

This annual program, offered jointly by the UI and WSU Extension systems, updates consulting foresters, state-employed service foresters, and other natural resource professionals on emerging technology and knowledge applicable to family forests.

**Coeur d'Alene,** Friday, January 19, 2007 (9:00 am to 4:30 pm)

## An Introduction to Conservation Easements

This 2-hour evening program will feature a short introduction to conservation easements followed by a panel of representatives from public and private institutions that set up conservation easements and at least one landowner who has enrolled in one.

**St. Maries,** Saturday, February 10, 2007 (1:00 pm to 3:30 pm)

## Landscaping for Fire Prevention

This program helps forest homeowners make their homesites less likely to burn and easier for firefighters to access in the event of a local forest fire.

**Coeur d'Alene,** Monday, February 26, 2007
(6:00 pm to 8:00 pm)
**Additional sessions of this program can be scheduled for interested groups of 10 or more.**

## LEAP Update

This program is designed to deepen and expand the training provided in Logger Education to Advance Professionalism (LEAP). LEAP updates are co-scheduled with spring first aid training, so participants can get all 16 credits required by the Idaho Pro-Logger program within 2 days. Specific program details will be announced this winter.

**Orofino,** February 28 - March 1, 2007
**Coeur d'Alene,** March 6-7, 2007
**Troy,** March 8-9, 2007
**St. Maries,** March 13-14, 2007
**Bonners Ferry,** March 20-21, 2007
**Emmett,** TBA

**For more specific information on these and other UI Extension Forestry programs in your l**


***Benewah, Bonner, Boundary, Kootenai, & Shoshone counties:***

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Coeur d'Alene, ID 83814-2277
*Phone*: (208) 446-1680 *Fax:* (208) 446-1690
*E-mail:* cschnepf@uidaho.edu

***Latah, Clearwater, NezPerce, Lewis, & Idaho counties:***

**Randy Brooks**
Extension Educator - Forestry/4-H/Agriculture
UI - Clearwater County Extension Office
2200 Michigan Ave.
Orofino, ID 83544-9010
*Phone:* (208) 476-4434 *Fax*: (208) 476-4111
*E-mail*: rbrooks@uidaho.edu

# rdship Skills - 2006-2007

## Using your GPS

A Global Positioning System or GPS unit is becoming as common to work and play in forests as a compass. This one day program will introduce participants to the science underlying GPS, and feature field exercises to acquaint them with basic tasks that can be done with a GPS, such as measuring acreages and distances.

**Post Falls,** Thursday, March 29, 2007 (9:00 am to 4:30 pm)
**Orofino**, Thursday, May 10, 2007 (9:00 am to 4:30 pm)
**Bonners Ferry**, Saturday, May 19, 2007 (9:00 am to 4:30 pm)

## Family Forest Landowners Workshop

This 2-day program, held annually in Moscow, features presentations and exhibits on a variety of topics of interest to private forest owners.

**Moscow,** March 26-27, 2007

## Logger Education to Advance Professionalism

Logger Education to Advance Professionalism (LEAP) is a nationally acclaimed Extension program that helps loggers improve their skills related to forest ecology, silviculture, and water quality through presentations, discussion, videos, and other learning experiences.

**Orofino,** April 18-20, 2007
**Coeur d'Alene,** April 25-27, 2007

## Adaptive Silviculture on the McGovern Forest

Dr. Karol Stoszek is an emeritus professor with the University of Idaho Department of Forest Resources who has long advocated approaches to silviculture that maximize flexibility in response to small scale variations in stand and site conditions. He has been experimenting with these approaches on the McGovern Forest, a property donated to the University of Idaho to demonstrate family forest management alternatives. This field day will be spent in the woods with Karol observing and discussing adaptive silvicultural treatments.

**Coeur d'Alene,** Friday, May 25, 2007 (8:00 am to 4:00 pm)

This program will feature 2-3 hours indoors discussing basic concepts of thinning and pruning, followed by a hands-on field tour to learn about thinning, pruning, forest genetics, and chainsaw safety firsthand.

**Bonners Ferry,** Saturday, June 16, 2007 (8:00 am to 4:00 pm)
**Orofino**, Thursday, June 28, 2007 (8:00 am to 4:00 pm)

## Pruning for White Pine Blister Rust

This indoor/field program will help you reduce white pine mortality from blister rust. It will cover blister rust disease cycles, blister rust hazard assessment, canker identification, and blister rust pruning methods.

**Sandpoint,** Friday, June 22, 2007 (8:00 am to 4:00 pm)

## Managing Forest Organic Debris

There is growing discussion about leaving more material in the woods for forest nutrition. But how do you minimize fire or insect hazards? This program will feature cutting-edge science on forest organic debris, followed by a tour of slash treatment experiments on the historic Priest River Experimental Forest.

**Priest River,** Friday, July 13, 2007 (8:00 am to 4:00 pm)

## Forest Insect & Disease Field Day

This program will feature a full day giving participants first-hand contact with a variety of insects and diseases that can affect forest growth and health, integrated with discussions of related management strategies.

**Moscow,** Thursday, July 19, 2007 (8:00 am to 4:00 pm)
**St. Maries,** Friday, July 20, 2007 (8:00 am to 4:00 pm)

## Thinning and Pruning Field Day

**ocale, dial www.cnr.uidaho.edu/extforest on the World Wide Web, or see the contacts listed below:**


***All other Idaho counties:***

**Ron Mahoney**
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***accommodations need to contact these individuals at least one week prior to these programs.***
**sity of Idaho, U.S. Department of Agriculture, and Idaho Counties cooperating.**
*ual opportunity/affirmative action employer and educational institution.*

# Strengthening Forest Stewardship Skills 2006-2007

Idaho has abundant forest land. Many people do not realize that over 2 million acres (11% of Idaho's forests) are owned and managed by thousands of **family forest owners**.

Each landowner has unique goals for his or her forest property, ranging from timber income to simply "a place to get away from it all". However, one goal common to most forest landowners is to **steward** their forest land, for their own goals and future generations.

The educational programs listed herein are designed
**to help private forest owners and those who work with them strengthen their forest stewardship skills.**

All programs require pre-registration (including a small fee to off-set program costs). To register for a program, contact the UI Extension office in the county where that program will be held. For specific program information, dial **www. cnr.uidaho.edu/extforest** on the World Wide Web, or see the contacts listed inside this flyer.

FOREST STEWARDSHIP

These educational programs are being supported in part by the **Idaho Forest Stewardship Program**, a cooperative effort of the following agencies and organizations:

University of Idaho Extension
Idaho Department of Lands
Idaho Department of Fish and Game
U.S.D.A. Forest Service
U.S.D.A. Natural Resources Conservation Service
U.S.D.I. Fish and Wildlife Service
Consulting Foresters
Idaho Association of Soil Conservation Districts
Idaho Forest Owners Association
Idaho Riparian Cooperative
Idaho Nature Conservancy
Idaho Tree Farm Committee
Idaho Association of RC&D Councils
Intermountain Forest Association
Nez Perce Tribal Forestry
Idaho Native Plant Society
Idaho Forest Products Commission
Idaho Sustainable Forestry Initiative State Implementation Committee
Associated Logging Contractors of Idaho

# Selecting the Right Equipment for Your Forestland Management Needs

*Randy Brooks*

A good friend of mine just moved from the city and bought some land with timber on it. He wanted to become a "hobby" logger/farmer. He told me he wanted to purchase a piece of equipment that could serve several purposes, including some light log skidding and snow plowing, among other things. He didn't think he could afford a new piece of equipment, and was in the market for a good used 4WD tractor or cat. After giving it some thought, I did a little research for him and here is what I came up with.

To properly select equipment, you must predetermine a number of factors, including size and/ or number of machinery/ equipment needed, features needed, and where to buy equipment. You should also be aware of some of the pitfalls you may encounter when purchasing equipment.

The advantages of buying new machinery include income tax considerations and new technology (resulting in increased efficiency, productivity, etc.). Financing also may be easier to obtain on new purchases.

Small operations might find advantages in buying used equipment if the owner wishes to maintain control over certain functions but finds that a new purchase is not economically viable. Used equipment would also be appropriate when buying a back-up unit. Used tractors are useful for small scale logging jobs or to tow equipment during harvest when the tractor will run a few hours seasonally. Used equipment can also be used for less-critical and/or low annual usage tasks.

When you purchase used equipment, you are buying the remaining, unused service life of the apparatus. All equipment is designed with a certain number of hours in it. Depending upon how it is used, maintained, and repaired, the equipment will use up these hours at a faster or slower rate. Some typical machinery wear-out life is as follows: tractors, 12,000 hours; crawlers, 16,000 hours; combines, 2,000 hours; drills, 1,000 hours; planters, 1,000 hours; swathers, 2,000 hours, tillage equipment, 2,000 hours. Wear out life is the point at which it is not typically economically feasible to continue repair of the equipment.

What's going on before the wear-out life of a tractor? Engine overhauls. A minor overhaul would generally consist of new rings, grinding the valves, etc. A major engine overhaul would consist of new pistons, new sleeves (liners), new bearings, new injectors, etc. New tires are necessary approximately every 2,000 to 3,000 hours, depending upon use and soil/ground/road conditions. Batteries should be replaced approximately every three to four years.

Be cautious of smaller utility tractors that have been used with front-end bucket loaders. These types of tractors generally perform a lot of stop-and-go usage that is hard on the transmission and clutch mechanisms. Front-end loaders also are hard on front axles and front tires.

Beware of farm tractors that have been previously used for logging or in the construction industry. Farm tractors usually are not built to withstand the rigors of heavy skidding or for construction.

Stay away from fire, water, flood, or accident damaged machinery unless it is being bought solely to sell for parts. It is difficult to determine the extent of damage of such equipment, as the damage may be hidden. For example, seals (as in sealed bearings) that keep oil in won't necessarily keep water out. Internal components (bearings, gears, etc.) can be overheated and distorted from a fire and will be difficult, if not impossible, to see. Machinery that has experienced serious accidents (such as rollovers) also can have serious damage or distortion to internal components that cannot be seen.

Beware of buying any equipment from manufacturers that have gone out of business. The price may be right, but parts may be a problem. Also, later trade-in value will be much less.

Generally speaking, buy equipment powered by diesel engines. Diesel engines are more fuel efficient and more economical than equally sized gasoline engines. This, coupled with durability make them more appealing to some buyers.

Some equipment makes, models, and sizes hold their market value better than others. This means that you might expect to pay more when compared to a similar item from another manufacturer. In return, you would also expect more on the trade-in when that time comes. Much of this is due to durability and brand name marketing.

Many "new" models of equipment are really not that different from last year's model. Look closely at technical specifications between model years. It is not uncommon to find that the old model will give you similar performance specifications at a fraction of the cost of the "new" model.

Different models from the same manufacturer (particularly tractors) may not be substantially different. For example, the same engine may be used in several different tractor models, but the horsepower is increased by using turbochargers, intercoolers, etc. The same extends to other components such as transmissions, frames, final drives, etc. This means models at the low end of the family may be over designed and should give longer service life with less trouble from major components.

The machine's age and its hour meter should be reasonably in balance. Guidelines for typical average annual usage in hours are as follows: tractors, 1,000 hours (400 to 1,600 hours annually); crawlers, 1,200 hours (600 to 2,000); and combines, 300 hours (200 to 350). Bear in mind these are typical values.

Machinery averaging annual usage far in excess of the typical values given above should be priced lower than the going rate for the same equipment. Machinery with average annual usage far lower than the typical values given above should be priced higher than the going rate for the equipment with more use. There are several "Blue Book" resources on the internet for equipment (equivalent the automobile blue book). Try typing "farm equipment blue book values" in your search engine, and you will find a variety of web sites to choose from.

In general, the used equipment market tends to weight the age of equipment more than accumulated hours of usage of the equipment, so the lower hour machine is usually the better buy.

When you have narrowed your choice down to a particular unit, the first thing to find out is the asking price. It is no use going to the trouble of mechanically evaluating the equipment if the asking price is too high. However, be cautious of deals that are drastically below market value. Dealerships know the real value of machinery. If equipment is below market value, there is probably a good reason.

Keep financing separate from the purchase decision. Great financing terms will not make your equipment run any better. Before buying used equipment, contact the previous owner if possible. Determine characteristics of machine operation that would be advantageous or disadvantageous to your position. And, whenever possible, bring the equipment home for a trial run.

Getting back to my friend. After much thought, discussion and weighing all the pros and cons, he decided to purchase a new 4WD tractor with a front end loader, as he liked the great financing terms the dealer gave him and the fact it came with a warranty and a new ball cap. My friend did appreciate my efforts however, and I was rewarded with a ride on his new tractor.

*RISK REDUCTION CONTINUED*

low and slash loads are relatively small, some of these approaches may be sufficient in of themselves. They include:

- making water available;
- limiting access (e.g., gating roads); and
- creating fuel breaks, fire trails, or fire lines to isolate the slash into smaller subunits and break up the continuity.

No strategy will eliminate fire risk completely, especially when fire danger is extreme. But looking at a combination of different strategies for each site, gives you the best chance of reducing fire risk and meeting other objectives, such as forest nutrition. For on-site help in devising a strategy to reduce fire hazards from slash, check with your local Idaho Department of Lands Fire Warden.

**For more information**

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tion, animals, and other organisms, including humans. But for millions of years, the tropics have had little climate change or large-scale disturbance impact. As a result, tropical species have co-evolved to extreme specialization with highly developed adaptations to specific ecological niches and a finely-tuned interdependence. Thus, the widely accepted principle that, as John Muir often said, everything on earth is "hitched to everything else" is an accurate description of tropical ecosystems.

As you move north (and I presume south) more regular and dramatic disturbances occurred. The plants and animals of the Inland Northwest have only been associated for less than 10,000 years, and in boreal and arctic regions far less time. Consequently, the synecology of these plant and animal communities is much less developed. Most species are linked more by competition and adaptation to disturbance than by the refined interdependence we see in tropical ecosystems. Some of our pathogen/host interactions in this temperate region would seem to be a result of co-evolution, but many of these pathogens show the ability to infest diverse hosts, such as the white pine weevil infecting mostly spruce and lodgepole pine, the mountain pine beetle's success in several pines, and the spruce budworm shifting from grand fir to Douglas-fir to hemlock depending on availability and host condition. Another factor operating here is that there may be more selection pressure for "generalist" pathogens and other opportunistic adaptations of many plants and animals because of more frequent and dramatic disturbances.

As we go from temperate to boreal to arctic forest ecosystems, we find an increasing ability of organisms to adapt to change, but also more dramatic disturbances and their effects on species survival, often evident in epidemic pathogen outbreaks with some species being reduced or eliminated. Other species in these changing situations may greatly increase their range, vigor, and percent of the population. Rather than the current focus on seeing any species decline as a result of human activity that must be countered, we need to look at the bigger picture and understand and accommodate changes in species and environments. While we can, and in some cases should, modify human impacts on climate change, there are many interrelated but inevitable changes we must understand and plan for to reduce, as far as possible, the undesirable effects of climate change. In silvicultural decisions, this is a challenging, but not impossible, task when we consider the life spans of trees and forests.

These generalizations about climate change effects on large-scale ecosystems are only part of a very complex and dynamic interaction of the physical and biological environments. However, they can guide our decisions on how specific sites may be affected, and how these changes may affect silvicultural objectives and the prescriptions we make to achieve them. Many of these changes in climate are not directly manifest in warming, but in when and where precipitation occurs, particularly in having rain instead of snow during winter, and in very early or late severe cold. ***It is the species with narrow ecological amplitude (they require very specific ecological conditions to succeed) and those with wide amplitude (they are adaptable to a wide range of conditions) where these wide-ranging species are at the fringes of their tolerance, that will show the first and most dramatic climate change impacts***. For example, subalpine fir has a rather narrow ecological amplitude or tolerance to temperatures, requiring the more constantly cool conditions at night found both in alpine and lowland frost pockets. The Palouse fringe around Moscow Idaho, and areas east of there were notable locations for subalpine fir at elevations of only 2,200 to 2,600 feet. During the last 10 years, most of those locations no longer support living subalpine fir, and I believe the circumstantial evidence is strong for climate change as the cause. Some might contend that it is an introduced pest, balsam wooly adelgid, responsible for this decline, but this insect has been found in the same localities for about 30 years and only recently became a cause of subalpine fir mortality, probably because of tree stress related to environmental changes on these sites.

This past winter, I and several other resource professionals I have spoken with experienced winter kill on western larch trees of all sizes, a species with relatively wide ecological amplitude. Larch has always been one of the species recommended for frost pockets and other colder sites where late spring frosts damage other conifers. However, I do not believe frost is the culprit. Rather, I think the cause was the "unseasonably" warm winter conditions of December, 2005 and January and early February, 2006, followed by a dramatic drop in temperature to minus 20°F in mid-February that killed these larch trees. Western larch is easily "roused" from deep dormancy by prolonged warmer temperatures regardless of day length, and then it is vulnerable to freezing damage, both to roots and cambium. This process is further accelerated by the absence of snow cover that can protect root systems from sudden and unusual cold. Another complication is the probability of drought from lack of precipitation coupled with transpiration demand from the "wakened" trees. These presumptions are, of course, just that until scientific research can verify or reject them. However, a similar situation has now been scientifically documented as the cause of the dramatic decline of Alaska yellow-cedar throughout southeast Alaska, western Canada, and the northwestern United States. In this case, the lack of protective snow cover combined with rapid temperature drop has been determined to be the cause of this problem which was thought to be a pathological (insect or disease) puzzle for several decades. Another Intermountain West species, aspen, is in severe, recent decline across much of it wide range. A conference of forest experts met recently to share scientific and observational information on aspen decline but failed to reach any conclusions. The cause of mortality is definitely physiological as no pathogens have been discovered in any part of the trees, and climatic effects on the ecosystem are the most likely, but undocumented, cause.

Silviculture deals with management decisions in ecosystems dominated by trees. But, other organisms and ecosystem components besides trees are affected by climate change. Trees, however, can be the barometer of change and because they are usually the dominant organisms in forests, changes in trees have many ecological as well as economic consequences. Most temporary, as well as long-term, changes are beneficial to some organisms and detrimental to others.

To incorporate climate change into silvicultural prescriptions, research must be broadened and intensified. Some of this is already being done, such as the work on snowpack and watershed hydraulics at the Mica Creek Watershed (http://www.cnr.uidaho.edu/micacreek/). However, the examples I gave for subalpine fir, western larch, aspen, and Alaskan yellow-cedar do provide some current insights that can be considered. We may need to rethink the stand densities we manage for in particular, as well as what species we favor. Snowpack is highly affected by interception and melt rates. Stand densities that allow more snow to reach the ground yet still provide some shade to regulate melting should be beneficial to water budgets as well as root protection. Orientating the long axis of patch cuts or clearcuts east to west can also preserve snowpack by maximizing the shade on the north side of the cut from the spring sun. Stand density also affects the water budget and the impact of warming on both tree's transpirational demand and on the amount and effectiveness of precipitation. Less dense stands allow more precipitation to reach the ground and percolate more deeply into the soil rather than being intercepted and evaporated off dense crown cover.

Species selection in regard to climate change is more complicated. The generalization that the most shade tolerant species on the site is the most susceptible to stress still holds, but some sites don't leave much choice. Drier sites will only support ponderosa pine, perhaps in combination with Douglas-fir, so there is not much we can do there unless we trend towards exotics. The wettest sites, those that support western redcedar and/or western hemlock, have lots of species options and we should make sure we are not at the drier end of these habitats in making species selections. Where we are, we should select among more drought tolerant species such as Douglas-fir, western-larch, western white pine, grand fir and lodgepole pine. This, of course, only covers the drought effects of warming. For species such as Engelmann spruce and subalpine fir that require the coolness found on some of these cedar/hemlock sites, we may have additional concerns that favor removal and discouragement of these species depending on the silvicultural objectives and integrated site factors.

Silviculturists, other natural resource professionals, and landowners need to think through the entire site and stand data they have gathered as part of the prescription process and understand how these factors may interact with climate change. In the future, I expect to see more exact science developed that provides more specific guidelines. As a final note, we need to recognize that "art" is an even stronger component of silviculture, and that many of the potential adaptations and ecological amplitudes of species of trees, other plants, and many animals have not been adequately studied and defined. I have bald cypress trees growing in Moscow, and while they are not thriving, they are surviving conditions unknown in their native range and growing quite well. There are many tolerances in plants and other organisms that have not been tested in current environments and a few surprises may be in store for all of us. Certainly, we may need to research and redefine seed transfer zones. Equally important, we need to place more emphasis on thresholds of response: for example, ponderosa pine has a threshold of low temperature that limits its presence on higher elevations even though other factors are suitable. Ultimately, climate change will be diverse across the landscape, and some areas my actually become cooler and wetter.

***Most landowner objectives do not include surprises, and climate change poses a real challenge for silvicultural prescriptions that avoid or accommodate the unexpected, especially given the long life of trees and even greater longevity of managed ecosystems.***