

newsletter number four of the forest guild / june 2006





**Ehrhard Frost** is a Forest Guild member, certified ecoforester and New Hampshire Licensed Professional Forester.

**FOREST MANAGEMENT:** 

# Silviculture Prescriptions in an Ecological Context

By Ehrhard Frost

bigtooth or quaking aspen seldom lives more than 100 years, roughly equivalent to the number of years that forestry has been practiced in this county. American silvicultural systems were imported from Europe and applied agricultural models emphasizing simplification and uniformity to forest ecosystems for the primary purpose of commodity production. Rotation ages and diameter objectives were rigidly applied. Regeneration methods focused on commercially important tree species.

As society demands an increasingly intricate array of amenities from the forest, it follows that silvicultural systems must evolve to address both social demands and natural functions. Increasingly, the basis of "traditional forestry" is rendered obsolete by changing demands and increased knowledge of the complexity of all natural systems, including our forests. Yet, foresters and forestry often appear stuck in the past. It is time for a change.

A shift in perspective is the first essential element of implementing ecological forestry. Forest structure, diversity, function, complexity and processes are responsible for creating the commodities and amenities desired and demanded by our society. Forests are therefore managed most appropriately for wholeness and complexity, rather than efficiency and simplicity. Management should be tuned to "the interaction between species and the processes that both create interdependence and define ecosystems" (Kohm and Franklin 1997). The forest itself is the appropriate focus, with emphasis on

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Managing for the Long-Term at Maine's Baxter State Park

Re-Learning Forestry in California's Redwood Country

Slot Harvests as a Guide to Stem Retention in Overstory Removal Harvests



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New Hampshire Ginseng



New Hampshire Spleenwort

#### forest WISDOM

forest guild / june 2006 newsletter number four

#### forest GUILD

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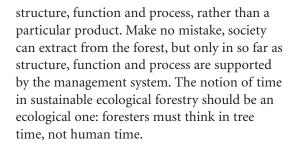
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heila Stalder ssistant to the Directo Silviculture Prescriptions, continued from page 1



Example of a natural white pine overstory and regeneration in Cornish, New Hampshire.



Forest management and applied silviculture, practiced from a humble perspective, acknowledges that prescriptions are nothing more than working hypotheses with uncertain outcomes. An adaptive management approach is therefore critical. Management should enhance learning and awareness, and provide flexibility to adapt to changes in both knowledge and conditions. Management must be as dynamic as the very system it hopes to manage. If nothing in the forest is static, why should management approaches and silvicultural systems remain rigid? Who among foresters can state with absolute certainty that the traditional even-aged and uneven-aged management systems are successful, never mind sustainable? Why do foresters continually experience regeneration "failures" if these systems are so infallible? Only through observation and monitoring can foresters continually hone their management skills and avoid management pitfalls. We will need active, ongoing involvement in the forest, site specific knowledge, and a continual search for better understanding to carry us through.



Post harvest trail in a white pine, red oak forest in Cornish, New Hampshire.

Finally, new nomenclature and terminology will also help us to move beyond the traditional confine of even-aged and uneven-aged forest management. New definitions can broaden perspectives and open up a wider range of options. Expanded definitions and new terminology allow us, as foresters, to move into a new and dynamic role in concert with the forest ecosystem instead of in opposition to it.

I have developed the following basic principles and guidelines as the foundation for my determination of silvicultural prescriptions in the context of ecological forestry. These ideas reflect my initial attempt to define a new paradigm for forest management and silvicultural practices. I draw heavily on my personal beliefs and 28 years of forestry experience and observations, as well as work by researchers and foresters such as Elizabeth Thompson, Eric Sorenson, Bill Leak, Jerry Franklin, Chris Maser, Herb Hammond and others too numerous to mention.

- Maintain a functioning forest first and foremost; all other desired outcomes will follow. Implement treatments that preserve future options and opportunities. Evaluate and modify treatments as necessary to achieve the desired goals and to accommodate an understanding of the site as more information is obtained.
- Design silvicultural techniques and schedules that stimulate the development of species and



Landowner hugging her 40 ft. white ash tree in New Hampshire.

structures that will naturally evolve over time on a site and reflect natural disturbance patterns. Harvest only from the abundance. Generally utilize silviculture to create diversity of species, size and age classes, and forest structures. Utilize silviculture to restore the composition of radically altered stands to a naturally occurring species mix for the site. Thin stands early to emulate the stem exclusion stage and promote development of a complex understory. Maintain higher stocking levels than traditionally recommended for optimum, short-rotation timber production to achieve slow-grown, fine-grained timber. Allow trees to achieve larger diameters than traditionally advocated. Utilize long cutting cycles, generally 15 to 25 years. Occasionally, a 10-year cycle may be appropriate and cycles of greater than 25 years may be necessary.

- Practice multi-aged management, using what is known traditionally as single tree and group selection. Single tree selection mimics individual tree fall. Group selection takes many forms from very small openings to mid-sized patches to large groups, all of which have counterparts in natural disturbance regimes. Visualize regeneration as a continuous wave-like pattern rather than a definitive point in time triggered by age or diameter.
- When harvesting, base the selection process on tree quality and vigor. Retain trees most likely to survive and maintain or improve in



Wind disturbance in a 120 year old white pine forest in New Hampshire.

quality. Harvest those trees that appear least likely to live or improve in quality. Multi-age management requires working at various crown levels within stands. Integrate noncommercial practices, such as cull removal, weeding, thinning and release with the application of commercial treatments.

- Always retain some trees that are not suitable for timber, as these serve essential biological functions. Remember, though it may be natural for a tree to fall, it is not natural for that tree to move off site. Do not harvest decayed trees. Allow them to return to the site. The lifetime of a tree may be far shorter than the time required for it to decompose. There is life in death, and the decomposition process is part of the essential energy flow within the forest. It is death that provides vitality. Perhaps a new definition of life is needed?
- Incorporate perpetual, variable retention of all stand structures and elements to ensure that the entire range of naturally occurring forest structures (i.e., retained organic material, snags and snag replacements, Legacy Trees, mycorrhizal fungi and other forest components) is present in the forest.
- Identify Legacy Trees that will remain for their natural life cycle; they represent the perpetual retention component of the multi-aged retention harvesting system. Strict criteria for the number

As society demands an increasingly intricate array of amenities from the forest, it follows that silvicultural systems must evolve to address both social demands and natural functions.

Silviculture Prescriptions, continued from page 3

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of trees or basal area/acre are not necessary. However, successful implementation depends on recognition of the critical role of Legacy Trees in providing a biological legacy for subsequent cohorts, essential elements of stand structure, and the continued function of the forest.

- Attempt to maintain the naturally occurring species composition of all plants and animals. In particular, identify, manage and protect sensitive, fragile, unusual or rare plants, animals or communities. These are necessary and vital parts of the ecosystem. At the same time, eliminate and prevent the spread of exotic invasive plants.
- Maintain soil structure and productivity. Minimize soil erosion, disturbance and compaction. Protect soil by harvesting only during appropriate weather and seasons. Frozen and/or snow covered ground affords maximum protection. Maintain nutrient cycles by retaining

organic material on the forest floor and above ground as both live and dead trees. Do not interrupt the downslope movement of soil, water and nutrients.

• Relax utilization standards. The cost to harvest pulpwood and whole tree chips exceeds their value and frequently contributes to site and stand degradation. Utilize full cost accounting. Recognize that off site removal of any portion of a tree is not natural. Only those portions of the stem and that portion of the forest that have true economic value are worth harvesting. The remaining biomass should remain on site. Recognize that whole tree harvesting is not biologically based; eliminate this harvesting technique from silvicultural prescriptions and applications.

Photo Credits for this article go to Ehrhard Frost. Front page photo of Ehrhard Frost courtesy of Chris Tilton.

# GETTING TOGETHER Guild Regional Gatherings Spark New Ideas; Renew Old Friendships

#### In the LAKE STATES -

31 participants including Guild members, foresters, ecologists and educators came from five states for this regional workshop, billed as "Well-Managed Forests for Community Well-Being" in Pallisade, Minnesota. This Spring was a season of renewal for the Guild as regional meetings around the country brought members and interested forest stewards together.

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#### In the NORTHEAST -

120 Guild members and other forest professionals turned out for the regional meeting in Keene, New Hampshire to discuss ecologically-based forest management.

#### In the PACIFIC COAST -

20 participants attended the California Member Meeting in Colusa.

#### In the SOUTHEAST -

22 participants from seven states attended the regional meeting and workshop in Cleveland, TN.

#### FOREST MANAGEMENT

# Managing for the Long-Term at Maine's Baxter State Park

By Jensen Bissell



As a trust, our mission cannot be changed. In addition, we cannot be sold, merged or taken over. If you are a forester, this means that applied management can be carried out into the future and you can, and should, think longterm – a critical component to successful forest management. All aspects of our management have reflected this thinking including our planning, our silviculture, and our selection of logging crews. Over the last 20 years, we have worked with two logging companies. The owner of the first company retired due to illness and we mutually negotiated the sale of his SFMA contract to the second. We have worked with only four different harvesting crews on the SFMA, reflecting a high degree of consistency in our management over the years. Among our proudest accomplishments was the spawning of a new logging business after members of our early crews learned the cut-to-length system and set off on their own.



The SFMA forest reflects the site and climate of Maine and is composed primarily of tolerant softwoods such as red spruce, balsam fir and eastern hemlock, and equally tolerant northern hardwoods such as yellow birch and red maple. Our stands are of generally average site quality, but on better drained sites sugar maple and beech can be found. Unfortunately beech, an important producer of nutritious hard mast, may be fading from our landscape due to beech bark disease. Northern white cedar and eastern white pine are ubiquitous throughout the forest related to site and disturbance history. In areas with past fire disturbance, quaking and bigtooth aspen and paper birch dominate. In short, the forests of the SFMA are a diverse and complex mix of species, most of which are substantially shadetolerant. Management of these forests can be complicated and success requires a patient and gentle hand as too much disturbance can quickly convert softwood types to red maple/striped maple/yellow birch forests for 100 years or more.

Our management has maintained a continuous canopy over the forest to provide shade and cover. Partial harvests, utilizing cut-to-length systems, have generally reduced basal areas by 35% or less and are scheduled on a 20-year cycle. While this system has been successful, we've been troubled by the area that must be given to extraction trails and the fact that there are few natural analogues to this type of disturbance. In an effort to address this concern, we began experimenting about 5 years ago with harvesting small patches or gaps as an alternative to general partial harvests. The gaps



#### Jensen Bissell

is a Forest Guild member and Director of the Baxter State Forest in Maine.

Governor Baxter wanted the SFMA to "become a show place for those interested in forestry, a place where a continuing timber crop can be cultivated, harvested and sold: where reforestation and scientific cutting will be employed; an example and an inspiration to others.



#### orest Guild Member hembi Borras

a Registered Professional orester living and working n Mendocino County, CA.

I did not leave college knowing how to practice sustainable forestry. In fact, the type of management that I'm privileged to practice now would not be considered economically viable by my college professors.

#### IN THE FOREST

#### Re-Learning Forestry in California's Redwood Country

By Thembi Borras

did not leave college knowing how to practice sustainable forestry. In fact, the type of management that I'm privileged to practice now would not be considered economically viable by my college professors.

My approach is quite simple. First, I establish a long-range sustained yield goal based on the productive capacity of the site and a reasonable growth rate. After the long range sustained yield goal is established, I build inventory by cutting less than growth until the goal is met. Once the goal is met, incremental growth can be harvested. In addition, I seek to improve stand structure by not cutting the biggest and best trees.

Although short-term profit is not maximized, this approach provides a modest periodic income flow to the landowner and is an effective way to support related forest values. Pre-harvest habitat is the same as post-harvest habitat, so wildlife habitat does not decline. Aesthetics are bolstered by maintaining a continuous forest canopy and encouraging a stand with a smaller number of large stems as opposed to many small stems. Also, this type of forest management can minimize adverse watershed effects by minimizing canopy removal, thus minimizing peak flow and decreasing sediment production.

This type of forest management, which can be described as a light intensity single tree selection, is faced with two frequent criticisms. First, natural regeneration suffers due to lack of adequate light and second, frequent reentry every 10 to 15 years does not allow the land to rest. While these arguments have some validity, they are not insurmountable. Redwood sprout-

ing is usually adequate post harvest but it is sometimes necessary to remove trees in small groups to encourage Douglas-fir seedlings. In addition, seedlings can be interplanted in openings created by the harvest to supplement natural regeneration. Finally, periodic entry every 10 to 15 years is an opportunity to improve a permanent truck road and skid trail network and correct accessible legacy problems.

## Increasing Timber Inventory to a Sustained Yield Goal

A key to my management is developing a sustained yield goal based on site quality. According to the Soil Survey Report for the western part of Mendocino County, the potential annual production from a fully stocked stand can be as low as 245 board feet (bf) per acre per year to as high as 2,050 bf/acre/year. Although different for each soil complex, often the potential annual production from a fully stocked stand of redwood and Douglas-fir is closer to 750 bf/acre/year. The sustained yield goal can be determined given the potential annual production and a long-term annual growth rate of 4%, a rate that can be maintained while protecting related forest values such as water quality.

For example, if the potential annual production on the Jones Family Forest is 800 bf/acre/year and the Jones Family accepts a long-term annual growth rate of 4%, the sustained yield goal is 20,000 bf/acre. This is determined by the following formula: 800 bf/acre/year = (.04/year)\*X; X=20,000 bf/acre. The Jones Family Forest is 200 acres. Therefore, the sustained yield goal is 4,000,000 bf on the entire Jones Forest.

Critical to this exercise is to compare the sustained yield goal to the current standing volume and the current annual growth rate to the long term annual growth rate.

Continuing with this example, based on information from a timber cruise, the Jones Family Forest supports a current standing volume of 2,000,000 bf or 10,000 bf/acre. The Jones Family now knows the starting point, which is 2,000,000 bf, and the goal, which is 4,000,000 bf. At this point, a Potential Harvest Schedule can be developed which will reflect how quickly this goal is reached based on the volume harvested at each entry, the responding growth rate and the frequency of entries.

By cutting less than growth over several cycles, the inventory of the stand will build and eventually the sustained yield goal will be attained, at which point the periodic growth can be harvested without ever depleting the inventory.

The inventory can be viewed as "principle" and the growth as the "interest" earned on that principle. A truly sustainable forest allows the perpetual harvest of the interest without ever having to touch the principal.

#### Marking to Improve Stand Structure

Single tree selection does not imply sustainable forestry as it can easily be corrupted by high grading: taking the biggest and best trees. Tree marking is the most important way a forester translates single tree selection on the ground. Although there are a hundred things that I consider before marking a tree, I use the following core principles – in descending order of priority – to improve stand structure:

- 1. Remove damaged, dying, or diseased trees generally those trees that are likely to die prior to the next harvest. Some dying trees may be retained to become snags, which are important to wildlife. This is a "sanitation" strategy.
- 2. Remove suppressed and intermediate crown class trees. These are trees that are

- not presently contributing growth to the stand nor are they expected to do so prior to the next harvest. This is a "thinning from below" strategy.
- 3. Remove selected larger trees that improve spacing for the higher quality trees, which will be retained. This is a "spacing improvement" strategy.

Target diameters also guide tree marking. For example, at age 50 the largest redwoods in the Jones Family Forest have not yet reached the target diameter of 36" specified in the long term management plan. Therefore, selection leans toward retaining the largest trees.

At age 80, the largest redwoods in the Jones Family Forest have reached the target diameter and selection leans toward removing them to benefit smaller diameter trees. However, not all trees that have reached the target diameter are cut. They are simply preferred if the situation warrants. In a situation where 18" to 24" redwood trees on the north side of the clump would benefit if the 36" tree on the south side were removed, then cutting the target diameter redwood may be warranted. If the removal of the target diameter tree will not benefit surrounding conifer trees because it is out on its own, then retaining it may be warranted.

In conclusion, each harvest is used as an opportunity to upgrade overall stand quality by choosing which trees are retained and how they are spaced.

#### Acknowledgement:

The core concepts set forth in this production were learned from Craig Blencowe and portions of this production were gleaned from an unpublished paper by Craig Blencowe entitled *Craig Blencowe: Building up the Forest.* 

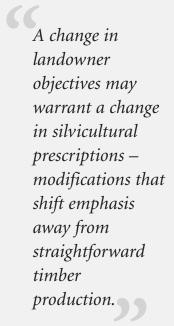
Single tree selection does not imply sustainable forestry as it can easily be corrupted by high grading.



Cable corridor post-harvest.



**Jim O'Malley** is a forester with Huber Resources in Maine.





FOREST MANAGEMENT

#### Slot Harvests as a Guide to Stem Retention in Overstory Removal Harvests

By Jim O'Malley

"Recognize what you have and define your objective."

Le spoke these words clearly, and then repeated them – only louder this time. "Define your objective! Whenever you develop a silvicultural prescription, you must first define your silvicultural objective!!" My silviculture professor would be pleased that, nearly 30 years after this lecture, his words are still with me.

Here in Maine, forestland ownership changes have become fairly common. New owners often bring new expectations, new goals; indeed, new reasons for owning the land. A change in landowner objectives may warrant a change in silvicultural prescriptions — modifications that shift emphasis away from straightforward timber production.

In 1998, The Nature Conservancy (TNC) purchased 185,000 acres from International Paper Company in northern Maine. Following an intensive inventory of the property,

50,000 acres were classified as permanent reserves. These lands have been identified as ecologically-significant and show minimal recent harvest activity. The remaining 135,000 acres is a working forest under sustainable management. Huber Resources Corp. was hired by TNC in 2000 to manage the lands. The ownership became FSC certified in 2004.

While most of the landscape in the working forest is dominated by spruce/fir types, shade-tolerant hardwood stands (northern species – sugar maple, yellow birch, beech) cover approximately 11% of the lands. All of the hardwood acreage has been harvested at least once. Due to market constraints, past treatments were often simple high-grades; diameter limit cuts that removed the higher quality trees were common. In stands where harvesting operations are feasible (typically stands with greater than 40% crown closure of commercially viable stems) basal areas range between 40 - 80 sq. ft. /acre. The stands are predictably stocked with abundant levels of shadetolerant hardwood seedlings and saplings.

Moderately-stocked, low-grade overstories above abundantly-stocked, desirable regeneration is a classic setting for an overstory removal (OSR) when timber value is the principle landowner concern. Increasingly irregular shelterwood treatments – those that retain certain components of the overstory – have gained popularity concurrent with the increased interest in non-timber values such as wildlife habitat.

One of the objectives in TNC's working forest is to increase the percentage of large diameter hardwood stems. This goal serves a dual purpose. In addition to increasing den tree opportunities the owners seek to achieve a more balanced age class distribution across the property. Currently, the forest contains a high proportion of young stands.

A technique called slot harvesting has proven successful in achieving The Nature Conservancy's goals. Commercial fishermen will probably recognize the term immediately. Slot harvesting removes a defined range of intermediate diameter classes while retaining the smallest and largest. Based on pre-harvest stand characteristics, the harvesting guidelines are set with an eye for the future. One of the tenets in setting the slot is that the larger stems will remain in the stand until the smaller stems can begin replacing them, thus the slot range is typically fairly narrow (8" – 20" yes, 6" – 30" no).

It's important to factor skid trails into the equation. On our feller buncher jobs, 15 - 20% of the acreage is consumed by trails. In stands that are lacking an advanced sapling/small pole class, we have modified the prescription to retain all yellow birch. Results have been impressive.

Regeneration has been released. Large diameter trees remain on the land. Logging contractors have been surprised with increased rates of production. The slot harvest is a simple prescription for equipment operators to follow. A useful tip has been to measure a couple dozen trees at the beginning of each job, painting the diameters on the stems. This allows the harvest crew to calibrate their eyes toward the desired diameters.



The system is not without drawbacks. The landowner sacrifices some volume but this is compensated for by the fact that most of the retained volume is pulpwood with inherently lower value. Understory release hasn't been as effective due to shading from larger trees.

We plan to thin these stands in 20 years. While retention of the larger stems will remain important, the next entry will be designed to increase growth rates on the highest quality stems. That's another advantage to leaving additional volume behind – we have more options in the future.

I've used this prescription in a variety of stands. In most instances, the previous harvest had occurred 20 years earlier. As an experiment, I treated a stand which had been harvested only 11 years earlier. While the regeneration was shorter, the results were entirely satisfactory and I've concluded this prescription may benefit others seeking similar objectives.

While retention of the larger stems will remain important, the next entry will be designed to increase growth rates on the highest quality stems.

Managing for the Long-Term, continued from page 5

We believe that global warming has the potential to change our forest over the next couple of centuries and that oak and pine are the likely heirs to the forested landscape of a warmer northern Maine.

are around 1/10 of an acre and correspond in width to the adjacent tree heights. The stands are operated on a 140 year rotation with a 10 year operating cycle – strictly controlled by the area harvested in gaps during each cycle. We are careful to leave a larger "legacy" tree in each gap, and a primary objective is to protect advanced regeneration.

A big advantage to this approach is the 75% reduction in extraction trails compared to our standard partial harvest. To some extent, the gaps mimic natural disturbances, and maintain partial shade for developing regeneration. As a reflection of modern times, the installation of the gaps and extraction trails is accomplished entirely by Global Positioning Systems, utilizing our management GIS to design the trails and gaps and then uploading the plan to the harvesting crew's GPS unit. Another sign of modern times is our growing propensity to

plant some eastern white pine and occasionally some red oak along with the natural regeneration retained in the gaps after harvest. Red oak is at the edge of its natural range in the SFMA and is found in scattered locations - mostly in warmer, drier sites. We believe that global warming has the potential to change our forest over the next couple of centuries and that oak and pine are the likely heirs to the forested landscape of a warmer northern Maine. If we're right, the oak will serve as an advance party to forest change; if we're wrong, it will remain as a welcome guest. Time will tell.

More information: Contact: Jensen Bissell 207.723.9500 Jensen.bissell@maine.gov Or visit the Park's website: BaxterStateParkAuthority.com







Forestry in the Headwaters: Protecting Water Through Excellent Forestry

september 28th - 30th boulder junction, wisconsin

Water has been called the "forgotten forest product", since nearly every aspect of forest stewardship affects our public water resources. Our 2006 Annual Meeting and Conference will be in northern Wisconsin during the peak of the fall season. We'll be in the heart of the northern Great Lakes forest, a landscape that supports one of North America's highest concentrations of freshwater lakes and rivers including the Headwaters of the Mississippi River in nearby Minnesota. As always our meeting will feature high quality and informative presentations, panel discussions and workshops led by national and regional experts, including many of our own Guild members. We'll have field tours in Wisconsin and the nearby Upper Peninsula of Michigan that will showcase excellent forestry both on the ground and on the water. We'll have the exclusive use of a spacious north woods camp facility on Boulder Lake. There'll be plenty of space and plenty of time for exploring, fishing or canoeing (family members are welcome) or just kicking back around the bonfire as we re-kindle the spark that makes the Forest Guild unique. We hope you can join us in Wisconsin in September. Visit www.forestguild.org for more information.





Spring, 2006

#### Dear Supporter:

The progress of the Guild in the months since the December annual meeting has made me feel that we are at last realizing the ambitions expressed by members early in our history. Not long ago, the Membership and Policy Council developed new guidelines for the review of applications. Membership is beginning to climb! We are beginning the full roll-out of our regional programs and member meetings are springing up around the country. Finally, our voice is increasingly being sought on silvicultural and policy issues.

All of this activity has put an increasing burden on my shoulders. For example, managing the activities of three Regional Directors is proving to be a significant, time-consuming task. As a result, I have not been able to devote adequate time to a number of key functions such as fundraising and representing the Guild in some of the venues where its voice needs to be heard.

The Board, at its December meeting in Santa Fe, devoted significant attention to the need to build the staff capacity of the Guild. Thus, the Board and I decided that the time was right to seek a new Executive Director to manage the day-to-day activities of the organization. With this hire, I will pass on many of my present management responsibilities and move to the role of President of the organization, where my skills will be of greatest value.

The Board and staff have developed a job description for an Executive Director that blends membership support responsibilities with management oversight and fundraising. The job description will be found on the employment section of our website, <u>www.forestquild.org</u>.

Your help in identifying an excellent candidate would be greatly appreciated. Needless to say, the ideal person would be an existing Guild member. Please forward to me your ideas or suggestions. I look forward to finding a strong partner to help capture the great new energy around the Guild.

Sincerely,

Henry H. Carey
Executive Director

#### forest GUILD

#### Mission

The Forest Guild promotes forestry that sustains the integrity of forest ecosystems and the human communities dependent upon them. The Guild provides training, policy analysis, and research to foster excellence in stewardship, to support practicing foresters and allied professionals, and to engage a broader community in the challenges of forest conservation and management.

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# date!



forest GUILD 2006 annual meeting and conference

Forestry in the Headwaters:
Protecting Water Through Excellent Forestry

september 28th - 30th

boulder junction, wisconsin