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Managing forests for wildlife and biodiversity

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Managing for Rare Butterflies in Western Oregon

by Mark Miller and Al Kitzman

In 2004 the Parks and Natural Areas Department in Benton County, Oregon, learned that meadows on their Beazell Memorial Forest supported a rare local butterfly, the Taylor's checkerspot (*Euphydryas editha taylori*). The county soon embarked on a journey to discover why the butterfly loved their forest, to learn how they could protect and improve the butterfly's habitat, and to encourage others to do the same. Little did they suspect this journey would lead to groundbreaking new work linking forest restoration, ecological research, and regional habitat protection policy.

The Taylor's checkerspot is a small orange, white, and black butterfly found in native upland prairies in Oregon's Willamette Valley and Washington state's Puget Trough. Abundant until the 1970s, the Taylor's checkerspot had become increasingly rare by the 1980s, mostly due to habitat loss and modification. In 1999 and 2004, new Taylor's populations were identified on several sites in Benton County; at that time, these represented 75 percent of the world's known Taylor's individuals. Because Taylor's checkerspot abundance is currently small and geographically distant, they are now a candidate species for protection under the Endangered Species Act.

It All Begins with Habitat

Any forester worth his or her salt knows that forests provide multiple habitats, and that often habitats considered "minor" for timber production are highly productive in terms of biodiversity and wildlife. The importance of meadows, rocky outcrops, springs, pools, and seeps is often much greater than their representation across the landscape suggests. Our ability to recognize these unique habitats and manage them effectively determines how well we protect biodiversity.

Longtime Guild members Scott Ferguson and Mark Miller became involved with Benton County early in 2000, leading a public involvement process for the county to develop a stewardship plan for the recently acquired 586-acre Beazell Memorial Forest, bequeathed by Fred Beazell as a memorial to his late wife Dolores. Together, the Beazells had enjoyed the property's hills, meadows, and streams for years. Fred personally and lovingly nurtured the property—which the previous owner had heavily logged—by planting hundreds of acres, thinning young forests, and correcting erosion problems.

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At top - Char frog.
Photo by Garrett Meigs

On Wildlife and Forestry

Dear Forest Guild members and friends,

For many landowners, particularly non-industrial private owners or land trusts, wildlife habitat is more important than income from timber sales. However, harvests are still important as a means of paying for habitat improvements, removing invasives, or restoring early seral conditions. As this issue of *Forest Wisdom* shows, the excellent forestry practiced by Guild members integrates well with wildlife concerns because our holistic view includes more than just trees. We recognize the value of bogs, vernal pools, meadows, sinkholes, caves, and low-productivity stands that may be ignored when timber production is the main focus.

In the cover story, Mark Miller and Al Kitzman recognize the value of restoring meadows within the forest to help keep at-risk species from disappearing. Jerry and Sharyn Becker write about the wildlife benefits of paying attention to dead wood, another often-neglected part of the forest (page 6). As they point out, dead wood is crucial to soil productivity and provides unique habitat. Even forest "pests" and pathogens play an important role in supporting wildlife, as Julian Hutchinson explains in his story of how root rot, a disease detrimental to timber production, re-introduced biodiversity to his red pine plantation.

By using management that emulates nature, Guild members help protect the animals that depend on the forest for food and shelter. For example, the article by Bob Williams (page 8) shows that species preservation must include preservation (or emulation) of the disturbances that maintain their habitat. His work to restore periodic fire to New Jersey's Pinelands will benefit northern pine snakes, timber rattlesnakes, and may help to re-introduce ruffed grouse.

Guild members who put the forest first and think about it as a whole generally do the right thing for wildlife, but of course there is always room for new ideas and techniques. Rob Bryan presents a strategy for bringing wildlife concerns to the fore through Focus Species Forestry (page 4). As one would expect of a technique developed by a Guild member, Bryan's approach to wildlife management is holistic and helps place even small ownerships within the larger natural landscape. Focus Species Forestry uses a small group of species that are representative of a wide range habitat conditions to ensure that the habitat needs of many species are met across the forest.

Bryan and the other authors in this issue represent a key strength of the Forest Guild. They are able to plan and use timber harvests to protect and enhance habitat for wildlife. It is this kind of forestry that will be increasingly in demand in the U.S. as land conservation, climate change, and environmentalism drive more land management decisions, and as the dominance of timber production continues decline. I hope that as the Guild grows, more wildlife managers and experts will join and help us identify new ways (and popularize old ways) of integrating habitat improvements that support forest wildlife into our land stewardship.

Sincerely,

Zander Evans, Research Director

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Close-up view of an adult Taylor's checkerspot.
Photo by Michael Durham
Courtesy of the Oregon Zoo

Benton County's new stewardship plan recognized the importance of protecting remaining meadows and managing Fred's many plantations for diversity, forest products, and education. A new road and trail system was developed for timber management and public recreation, and a sustainable forestry demonstration area was created. Meadow restoration prescriptions included conifer removal, invasive species control, native plant seeding, and ongoing meadow monitoring and maintenance.

Foresters, Loggers, and Nectar Plants

Douglas-fir (*Pseudotsuga menziesii*) is an aggressive invader of open meadows wherever sufficient soil and water exist. Early settlers complained about the fir "brush" taking over their pastures, and they

An excavator is a quick way to remove Douglas-fir from a native upland prairie.

continually cut, burned, or mowed to keep trees out. Today's remnant meadows are often found on wet or rocky soils that are poorly suited to fir, but where rare meadow species historically thrived. Fred had tried, with limited success, to plant these meadows, having not fully recognized their unique habitat values.

We mapped historic meadows using old aerial photos and tree cores. Restoration began with tree removal. Seedlings and saplings were either mowed, hand slashed, or girdled. Poles were stump-cut flush with the soil to allow future mowing. Larger trees were problematic, since high stumps would confound mowing maintenance, but log removal and slash treatment could create excessive soil disturbance.

Our logger, Tom Brown, was a creative professional who understood our objectives and appreciated a good challenge. Returning on a Monday morning, we found one meadow cleared of all trees and stumps—Tom had used his log loader to topple the trees and pull them, with roots attached, from the soil, and then "tucked them" expertly between trees at the stand edge so that they all but disappeared. This approach was his idea, and showed the value of landowner, forester, and logger all being on the same page and willing to explore new ideas.

Once encroaching firs were controlled, the work of reseeding began. A variety of methods were explored. In some areas, existing herbs and grasses shot up once trees were removed. Bare ground sites required a more proactive approach to ensure that desired plants got the jump on invasive blackberry (*Rubus* sp.) and Scotch broom (*Cytisus scoparius*). Native seed collected on-site was broadcast along with native seed obtained from local vendors. While there was more soil disturbance than we initially hoped for, this meadow has grown to become the most productive butterfly habitat on the property, due to natural reseeding and release of the English plantain (*Plantago lanceolata*) and wild strawberry (*Fragaria vesca*) that had lain dormant under the young tree crowns.

Challenges to Checkerspot Restoration

Loss of habitat is the primary factor leading to decline in butterfly abundance. Native upland prairies contain the nectar forbs and host plants which Taylor's depends on for survival. Upland prairies represent less than 3 percent of historic range, with loss from development,

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Mark Miller

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Al Kitzman

Al has a BS in horticulture and manages the field operations for Benton County Natural Areas and Parks, based in Corvallis, Oregon. With restoration ecology experience in upland prairie ecosystems, he is actively improving habitat for the two largest Taylor's checkerspot populations in Oregon.
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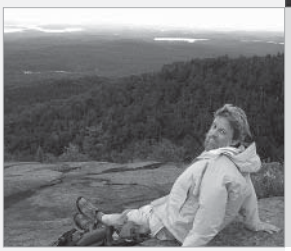
Maine forest vista.
Photo by Dave Hobson



Managing for Habitat Diversity at the Ownership and Landscape Scales in Maine

by Robert Bryan

Robert Bryan

A founding member of the Forest Stewards Guild, Robert Bryan, MS, LF, is owner of Forest Synthesis LLC in Harpswell, Maine, which specializes in forest certification services and forest management systems that integrate timber and biodiversity objectives. Contact Rob for a pdf with updated guidance for adapting Focus Species Forestry to other Northeastern states.
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Conservation of biological diversity within a managed forest is a primary goal for many forest owners and managers. For others, whose primary interest is financial return from timber production, it may be a secondary but nonetheless important consideration. Information is generally available on how to apply ecological practices at the site level for different forest types within the United States and Canada. This article describes how to integrate conservation of biological diversity with timber objectives across an ownership and to understand its role in the landscape.

Applicability to Small Ownerships

A landscape includes a mosaic of ownerships and land-use patterns, and understanding the landscape context is important on small ownerships as well as large. For example, an ownership may be part of a large forest block crossing multiple property boundaries that provides interior forest habitat, or a significant riparian corridor, or it may incorporate other landscape-scale habitat features. Being aware of those patterns and the contribution that the ownership makes to the overall landscape is important for the forest manager. If communicated to the landowner, it will help build a deeper appreciation of the ecological value of the property. For example, a landowner may only own 40 acres, which by itself is insufficient to support the territory of a single fisher or barred owl. However, viewed in the landscape context, this same woodlot may contribute to a forested mosaic that supports healthy populations of fishers (*Martes pennanti*), barred owls (*Strix varia*), and other species with large territories. It may also support species such as wood thrush (*Hylocichla mustelina*), whose breeding territory averages about seven acres but is most likely to be found in forest blocks that are greater than 200 acres in size.

Ownership-Scale Habitat Assessment

A primary tool for assessing the current habitat conditions at the ownership scale is to calculate the area and percent of forest by forest type and relative maturity. This is done by classifying each stand and then summarizing the data across the ownership. Forest type is usually best categorized by relatively broad classes, including several related cover types or natural plant communities. For example, in the Northeast, stand typing that recognizes the difference between beech-red maple and sugar maple-basswood-ash stands is important for site-scale timber management and ecological

considerations. However, a classification of both stands as "northern hardwoods" is more useful for ownership- and landscape-scale planning.

Depending on the information available to the land manager, relative maturity classification systems could include successional stage, stand-development stage, stand-size class, or age class. The goal is to place a stand somewhere along a continuum from regeneration to old growth in a manner that incorporates changes in tree size and ecological complexity (see Table 1 below).

Developing Ownership-Wide Goals

The ownership data, a review of aerial photos of the surrounding area, and any available assessment data applicable to the landscape (e.g., from state or federal conservation agencies and non-profit groups like the Nature Conservancy's eco-regional plans) can then be used to develop an overall assessment of habitat conditions, including habitat for species that are:
1. early successional forest specialists;
2. mature forest specialists;
3. forest interior specialists, species with large territories or home ranges, and/or species at risk from habitat fragmentation; and
4. forest understory species.

Focal Species as a Habitat Planning Tool

The large number of plant and wildlife species that may be present in any one area can make planning for biological diversity a daunting task. To simplify that task, a small group of

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Table 1. Generalized stand development stages for Northeastern forests.[1]

Ecological Development Stage		Typical Characteristics[2]
Early Successional	Regeneration and Seedlings	• Most trees <1 inch DBH. • Typically 0–10 years, even-aged, or with a residual overstory.
	Saplings and Small Poles	• Trees 1–5 inches DBH occupy more of the forest than smaller or larger trees. • Typically 10–30 years old, even-aged, or with a residual overstory.
Intermediate		• Trees 5–12 inches DBH (5–9 inches for spruce-fir) occupy more of the forest than other sizes. • Overstory typically 30–70 years old, even-aged or multi-aged. • Limited understory development, except in areas subject to partial harvesting.
Maturing		• Trees >12 inches DBH (>9 inches for spruce-fir) occupy more of the forest than other sizes, but do not meet the definition of "late successional." • Overstory typically 70–100+ years depending on forest type, even-aged or multi-aged. • Increasing complexity of understory, stand structure, and species composition.
Late Successional		• Roughly 30 or more trees >16 inches DBH (northern hardwoods and upland spruce-fir in Maine).[3] Other species and sites will vary. • Large dead/downed wood accumulating, structurally complex, with late successional species common. • Transition from mature to late successional is generally in the 100–125-year age range, typically multi-aged.
Old-Growth		• Generally >150 years old.

[1] Adapted from *Focus Species Forestry: A Guide to Integrating Timber and Biodiversity Management in Maine*, Bryan 2007.
[2] Diameters and ages are general guidelines only and will vary based on species, site characteristics, stand history, and forest type.
[3] See Manomet Late Successional Index: www.manometmaine.org/LSForest.html

Barred owl.
Photo by Michael McDowell

"A landowner may only own 40 acres, which by itself is insufficient to support the territory of a single fisher or barred owl. However, viewed in the landscape context, this same woodlot may contribute to a forested mosaic that supports healthy populations of fishers, barred owls, and other species with large territories."

The Future of Wildlife: An Ecological Approach to Managing Forests in the New Jersey Pine Barrens

by Bob Williams

Bob Williams

Bob began his career in Washington state in 1974 with the U.S. Forest Service and Scott Paper Company. A certified forester, Bob currently consults with a wide range of private and public landowners for their forest planning, primarily in New Jersey. He is a member of the Pinelands Forest Advisory Committee within the Pinelands National Reserve.
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Since 1978, when the U.S. Congress created The Pinelands National Reserve, the Pine Barrens of New Jersey have been under the regulatory jurisdiction of the New Jersey Pinelands Commission, which is charged with its protection. Spanning 1.1 million acres, the reserve is the largest open space on the eastern seaboard between Boston, Massachusetts, and Richmond, Virginia. It lies next to the most concentrated highway, rail, and air-traffic corridors—and the most densely populated region—in America. But if you stand on Apple Pie Hill, the highest spot (209 feet) in the Pinelands, what will you see? Not turnpikes, not trains, not airports, not people; only forests—a canopy of trees that stretches as far as the horizon.

The primary trees are pitch pine (*Pinus rigida*) and oak (*Quercus* sp.), along with Atlantic white-cedar (*Chamaecyparis thyoides*) that trace forest streams. Cranberry bogs, tea-colored rivers, a few meadows, and white sand roads punctuate this landscape. Pine and pine-oak forests are home to thousands of animals and plants, like the common yellowthroat warbler (*Geothlypis trichas*), turkey beard (*Xerophyllum asphodeloides*) with its striking white flower, and the blue Pine Barrens gentian (*Gentiana autumnalis*). While there are no natural lakes, wetlands (including streams, bogs, and cedar swamps) cover more than 385,000 acres, or 35 percent of the reserve. Historically, these natural resources gave rise to important industries. People used bog iron for cannonballs and household goods, sand for glass, and wood for shipbuilding, charcoal, lumber, paper, and fuel. Its dense pine and oak forests, cedar and hardwood swamps, pitch pine lowlands, bogs, and marshes give the region its essential and distinctive character.

When adopted in 1979, the *Pinelands Comprehensive Management Plan* (CMP) recognized the unique vegetation of the Pinelands more than any other feature. The CMP also acknowledged that proper forest management of the Pinelands forests would increase their economic value and, simultaneously, preserve and sustain the overall ecological character of the Pinelands. The CMP had it right 30 years ago, yet since then little forest management has occurred on the landscape. Lack of periodic disturbance—combined with extensive fire exclusion policies—has dramatically reduced habitat suitability to sustain several threatened and endangered species, such as the northern pine snake (*Pituophis melanoleucus*), timber rattlesnake (*Crotalus horridus*), and once- common species such as ruffed grouse (*Bonasa umbellus*). Ruffed grouse, classified as "common to all woodlands" in the Pinelands region in 1979, are now all but extinct there. This will be the second grouse extinction in the Pine Barrens since the loss of the heath hen (*Tympanuchus cupido cupido*) there in 1870, and should be an alarm that something is wrong in this fire-adapted, disturbance-dependent forest ecosystem.

A protectionist interpretation of the public policy to "preserve" the Pinelands has all but eliminated active management of the forest resources. In addition, fire suppression policies have further diminished the beneficial effects of fire in this highly fire-dependent forest ecosystem. On private lands, an ecological approach to forest management has allowed some forest management to move ahead. Land Dimensions, the company

Ruffed grouse.

Northern pine snake.

Hessel's hairstreak.
Photo courtesy of Jeffrey Pippin

I work for, has implemented and completed projects throughout the Pinelands that clearly demonstrate how forest management can be a crucial tool for sustaining critical habitat for a wide range of both common and rare species.

The Pinelands Region supports several globally threatened forest ecosystems. The pitch pine/shrub oak forests are highly dependent upon frequent fire events, yet most stands have been fire excluded for 40 to 60 years. Fire exclusion has eliminated critical habitats for several rare or endangered moth species and has degraded habitat for northern pine snakes. Mechanical forest thinning has both enabled the safe return of fire and demonstrated the great potential for an ecological forestry approach. These thinnings mimic the top-killing effect of fire that results in a more open habitat needed by many rare or endangered plant and animal species. These projects have also reduced wildland fire concerns and have mitigated the public's health-and-safety concerns with regard to catastrophic fire.

For example, on the Zemel Forest, a 1,600-acre, privately owned woodland located in the heart of the pitch pine-shrub oak forest type, the ecological approach to forest management that we have used shows promising results. This woodland had been fire excluded in excess of 50 years. The pitch pine was thinned to remove 70 to 90 percent of the dense overstory, retaining trees of varying sizes in a random pattern across the project site. The dense overstocked shrub oak under the pine overstory was mechanically severed at ground level to enable it to re-sprout, similar to the effect of fire. The purpose of this treatment was to restore the open barrens structure in order to allow the regeneration of the native herbaceous and shrub plant communities. Several rare species of Lepidoptera require this open habitat to feed on oak. Additionally, species such as northern pine snake utilize these critical open habitat areas for foraging, basking, and/or nesting. The result of this silvicultural treatment after 15 years has been to restore and maintain native forest community types, and create a condition to

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> *"Lack of periodic disturbance —combined with extensive fire exclusion policies— has dramatically reduced habitat suitability to sustain several threatened and endangered species."*

Successfully Managing for Wildlife and Biodiversity in the Pacific Northwest

by Jerry and Sharyn Becker

Jerry and Sharyn Becker

Owners of Becker Ecoforestry, they travel the Pacific Northwest performing endangered-species surveys and forest-health exams. Founding directors of Friends of Elk River and the Elk River Land Trust, they were instrumental in establishing the Grassy Knob Wilderness and the Copper Salmon Wilderness, which protect the headwater areas of Elk River. elkriverlandtrust@wildblue.net

Here along America's Wild Rivers Coast in the Pacific Northwest, when we talk about managing for wildlife habitat and biodiversity, our thoughts may turn to 50-pound king salmon (*Oncorhynchus tshawytscha*) powering upstream through raging white water or marbled murrelets (*Brachyramphus marmoratus*) flying a mile a minute toward their nests in the tops of tall ancient trees.

In our ecoforestry consulting business, the first thing we teach our clients is that to have a healthy forest they need healthy soil—no exceptions.

In our ecoforestry consulting business, the first thing we teach our clients is that to have a healthy forest they need healthy soil—no exceptions. The top foot and a half of forest soil is the most important habitat that stewardship foresters manage. To flourish, soil needs two things: wood fiber (the base of the food chain) and oxygen. The fungi and soil-dwellers that help create our soil depend on a steady supply of wood. Their other need—oxygen—is available automatically as long as we don't allow the soil to become compacted. Compaction brings about an anaerobic, disease-oriented condition that's difficult to work with and slow to turn around.

We believe retaining dead wood in the forest is perhaps the most important thing we can do to enhance forest health, biodiversity, and wildlife habitat. Did you know that an old-growth forest contains as much dead wood as live wood? We all know well-intentioned woodlot owners who think they're doing the right thing when they gather firewood by taking all their dead or fallen trees. They don't foresee that their park-like forest is probably heading for an ecological crash.

Large down wood and standing dead wood (snags) have similar ecological functions: they both hold moisture, become soil as they're

consumed, and host all types of creatures. For example, resident woodpeckers, while dining on the termites that devour snags, leave behind abandoned holes that become nests for songbirds who return from Central America every spring to feast on the insects in Northwest rainforests.

Snags are so important to forest health that, when they're missing, we might propose to our clients that we can create a few by girdling large-diameter conifer trees. Likewise, if down wood is lacking, we recommend leaving a number of trees in the forest after a thinning operation. To limit wildland fire hazard, our cutters buck the limbs so the log drops into contact with the ground.

Restoring Forests for Wildlife

That homeward-bound king salmon we referred to at the beginning of the article needs clear water, fine spawning gravel, and deep pools. To ensure that the returning salmon has suitable spawning and rearing habitat, we avoid logging in erosion-prone areas, and we need properly built, well-maintained forest roads that acutely reduce the sediment entering our streams. Our focus is often on riparian areas; however, to be effective we must use best practices, from the headwaters' tallest

peak to the estuarine bottomlands. For the river to dig those cold, deep pools where old salmon rest and newly hatched fingerlings feed, we need massive amounts of wood in our streams. When wood isn't present, we replace it using blow-downs (roots and all) from coastal wind events. The same thing goes for wood along stream banks and gravel bars—we either leave it there or put it back.

Small mammals and birds rely on structural diversity in a forest's live trees, too. If there are no multiple-topped trees in a landowner's second-growth forest, we can create them by removing tops from apt specimens. Big craggy trees with features that some foresters may consider defects are what the elusive, fast-flying marbled murrelets we mentioned earlier are looking for. These rare, threatened seabirds live on offshore waters but fly into coastal ancient forests to nest. Once every second year, a female murrelet lays her egg on a wide, mossy branch hidden in a huge weather-beaten tree. In an unusual parenting technique, three days after her egg hatches the mother bird leaves her fuzzy hatchling alone atop that flat branch and heads back to sea. For the next month, the female or her mate flies miles through foggy summer dawns, carrying fish to their woodland offspring. Clearly, murrelets need unfragmented forest landscapes, because jays and ravens, their main predators, thrive in brambleberry openings.

An Easy How-To

We hope you are beginning to picture how we manage for wildlife and biodiversity. When helping landowners guide their forests toward a healthier condition, we use plain words: "We like to see managed forests look as much as possible like abundant old-growth forests." That means we want to see three fundamental components of ecosystem health on each acre. We want to find 10 snags, 30 tons of down wood (envision one log-truck load), and two wildlife trees. Above all, we want negligible soil compaction and no mud in the streams.

From our vantage point, the most important forest product is clean, clear water. And we find that when we attempt to anticipate and recreate the requirements of a king salmon returning from Alaska, we also meet the needs of charismatic megafauna and humankind worldwide.

Summing Up Our Stewardship Practices

We protect soil, we harvest trees by recurrent thinning, and we don't create unnatural openings. All equipment stays on the road system at all times. By using long-lining to get the logs to the road, skid trails and forest roads can occupy less than 5 percent of the land area. Via these basic practices, soil compaction is dramatically reduced and forest vitality is enhanced.

You may have detected our passion for salmon, marbled murrelets, and soil organisms. We believe that when we respect all life forms, our work enhances the entire biosphere—the global sum of all ecosystems. ■

About the Elk River Land Trust:
A tax-exempt charitable organization, the trust is dedicated to promoting the principle of land stewardship and fostering the voluntary protection of the open space, scenic beauty, and natural resources of our farms, our forests, and our world-class salmon rivers. It assists landowners wishing to sell or donate land for conservation purposes, designs and holds conservation easements, and provides current information about forests, wetlands, and watersheds.

Above center - Marbled murrelets.
Photo by Ron LeValley Photography. www.LeValleyPhoto.com

"Clearly, murrelets need unfragmented forest landscapes, because jays and ravens, their main predators, thrive in brambleberry openings."

At right - Original section of the red pine plantation. Note lack of ground vegetation and diversity. At far right - Opening caused by the pine pocket decline. Photos by Julian Hutchinson

Fixing a Biological Desert: Mother Nature at the Reins

by Julian Hutchinson

Julian "Hutch" Hutchinson

Hutch is a Forest Guild professional member. He describes himself as a 78-year-old dirt forester with 50-plus years of experience who recognizes the "common thread which binds and governs all natural resources."

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Through the years, I've mulled over the terms "conservation," "multiple use," "biodiversity," and, most recently, "sustainability." After all this time, I'm still not sure that our research, field experience, and high-tech inventions have added much to the knowledge gained by observing the natural world we live in, work with, and love. Why do I say that? About 40 years ago, I bought a box of old books for five dollars. At the bottom of the stack were two small, green hardcover books by Gifford Pinchot. One was a second edition, dated 1900, entitled *A Primer of Forestry: Part One—The Forest.* The second, *A Primer of Forestry: Part Two—Practical Forestry*, was a first edition, dated 1905. I realized, while reading through these small, glossy-paged gems written over 100 years ago, that Pinchot had already combined what we now call conservation, multiple use, biodiversity, and sustainability into what he referred to as "Practical Forestry." It still seems to me that the forest management practices he so eloquently described are the same simple, basic rules set forth by "Mother Nature," a term recognizable to both fifth-graders and PhD candidates.

In 1958, I began my forestry career in Monroe County, Wisconsin. Located south of the northern boreal forests and west of old glacial-lake Wisconsin, it consists of a mixture of prairies, oak savannas, northern hardwood, white pine, and oak-hickory forest types. At that time, the soil was generally sand, sandy loam, and loamy sand with ridge tops and valleys grading to clay loams and silt loams. A high water table existed in many places along with adjacent highly dissected terrain. It is in a driftless area—that is, it has never been glaciated.

One "conservation" focus of those days was the conversion of unproductive sand farms to plantations for growing a crop of trees—mostly red pine (*Pinus resinosa*). The primary opposition to planting red pine was based on the prediction that the crown-cover growth would reach a point at which it provided so much shade that very few plants or animals could exist. Just as predicted, these plantations—hundreds of thousands of acres of them—became "biological deserts." At the time, however, foresters—myself included—rationalized that the pine plantations' productive wood-fiber value, plus most of the other benefits common to forestland, far outweighed the loss of a few plants and critters.

My Own "Biological Desert" Evolves

In 1992, my sons and I purchased a parcel containing 22 acres of red pine plantations which were a tad over 30 years old. The land had been farmed until being planted to trees under the federal Agricultural Conservation Program in 1958 and 1962. As with many sand farms in that era, only stunted corn stocks, sandburs, and blow sand existed until planted to trees. I have been told that prior to its reforestation, wind erosion on occasion was so bad that township snowplows had to be used to clear the sand dunes from adjoining roads.

The forest we bought provided pulp and logs, contained no erosion, supplied clean water, sported quiet nature trails, pumped pure oxygen into the atmosphere, and was scenic beyond description. However, except for a few pine squirrels, chipmunks, nuthatches, and chickadees, other wildlife common to our part of Wisconsin was absent. Also, a disease called red pine pocket decline (annosum root rot, caused by the fungus *Heterobasidion annosum*) was developing, as evidenced by my discovery of a group of about 15 dead or dying trees. I learned that the disease progresses much like oak wilt (*Ceratocystis fagacearum*). The pathogen travels down roots of the dying tree and through root grafts to infect healthy trees, and in this manner the dead zone spreads. Thus, Mother Nature had already taken the 22-acres of land in her firm grip and was changing it.

Through the years, the opening has enlarged, like tree rings progressing outward, as dead, diseased, and live trees have been removed around the perimeter. Presently, it is a circle an acre in size, filled with multi-aged vegetation—the oldest being in the center—that provides a fawning area, winter browse, wildlife habitat for all kinds of critters, and scenic beauty. In other words, BIODIVERSITY was created! Probably, the plantations enhanced the process by converting sandburs and failed corn crops into the diverse forest now created when additional sunlight became available. Obviously, 40 years of needle drop and soil protection have resulted in a more productive site.

A factor I have not mentioned, but which could play an important role in converting patches of red pine plantations into more diverse sites, is the degree of advanced regeneration present. When my plantation was about 20 to 25 years of age, I noticed that scattered red and white pine and oak seedlings were beginning to appear in some portions of the plantation. I assumed that advanced regeneration occurred after a good cone crop or during favorable moisture periods. However, this "re-gen" never developed past the seedling stage (except for an occasional white pine), due to lack of sunlight. If the patch cuts had been made while advanced re-gen was available, more biodiversity might have resulted and developed sooner. In another example, a wind blew in from the northwest in June of 1998 and destroyed or damaged more than 150,000 acres of Wisconsin forestland. Our land did not receive a fatal blow (no pun intended), but, like giant footsteps, four elongated openings appeared—not over the space of many years as with the pine pocket decline, but within the course of a few minutes, or seconds. After the downed trees had been salvaged, sunlight brought the openings back to life. Over the last 10 years, a diversity of plant and animal life has appeared where once there were only red pines and dead needles.

Note the diversity of vegetation in this wind-created opening.

A naturalist surveys diversity in another wind-created opening.
Photos by Julian Hutchinson

A partial list of vegetation identified within the areas in a 2009 inventory includes various thistles, mosses, lichens, and mushrooms; wild lettuce, asters, ferns, clump grasses, and goldenrod; mullen, nightshade, raspberries, wild strawberries, and little bluestem.

Following Mother Nature's Lead

As a result of Mother Nature taking me by the hand and leading me down the path of natural succession, I started to speculate as to how I might mimic this phenomenon. Perhaps biodiversity could be created and

continued

Fixing a Biological Desert, from page 11

duplicated on purpose, just as Mother Nature had accomplished it accidentally. Or did she know what she was doing all the time? Could I intentionally produce openings in a red pine plantation? A neighboring landowner hired me to administer the first thinning in 10 acres of his red pine plantation. After a tour of my land, he approved my design to clearcut a half-acre in his plantation. Marking is now complete and harvesting is soon to follow. Depending upon the outcome, future red pine "biological deserts" may become more biodiverse! ■

Above -
Prescribed burn in pure pitch pine/scrub oak forest, NJ.
Photo by Bob Williams

Ecological Forestry in Red Pine Forests

The red pine cover type covers nearly 1.9 million acres in the Lake States and can be managed in an ecological way. It is the most commonly planted species, in part because people know how to grow it and it has relatively few problems in terms of insects, diseases, wind, or snow. Although red pine plantations can be biological deserts, red pine-dominated forests (of planted or natural origin) can be managed for increased habitat value and species biodiversity through greater use of ecological forestry techniques such as legacy retention, mixed-species and multi-age management, variable density thinning, and extending rotations.

Wildlife habitat varies considerably with stand age, density, and mix of other tree species. Dense, young stands provide thermal cover, protection, and nesting habitat for wildlife. In contrast, older and more open stands allow for understory development, native species richness, and increased overall habitat benefits. Longer rotations, which can be longer than 150 years, increase fiber yield as well as habitat and biodiversity values, though economic rotations are roughly 60–90 years. Legacy retention should focus on single trees, groups of trees, large snags, and designated live trees that will be left for snag recruitment, and tree species other than red pine. Look for opportunities to protect large dead logs, intact patches of forest floor, and understory plant communities, usually associated with aggregate patches of leave trees.

During regeneration harvests, it is possible to develop a two-cohort stand in red pine by retaining a significant number of trees while allowing a new cohort to establish through natural regeneration. Additional future regeneration harvests, with partial overstory retention, could lead the stand to a multi-cohort (multi-aged) structure. Caution should be exercised when attempting to regenerate new red pine under or near mature overstory red pine due to potential problems with shoot blights diseases. Consider alternation of pine species dominance (e.g., regenerating white pine near mature red pine) to minimize shoot blight infection. ■

Adapted from the U.S. Forest Service North Central Research Station's Red Pine Management Guide, which is included in the Forest Guild's regional guides to ecological forestry.
www.forestguild.org/efi-regional-guides.html

NJ Pine Barrens, from page 7

allow fire to be returned to these stands in a safe fashion. Without fire, these stands will gradually regenerate back to the overstocked fire-excluded condition they were in previous to treatment. Fire will set back significant areas of pine regeneration. It will also sustain the plant community as a whole, thus sustaining this globally threatened forest system.

Another globally threatened forest ecosystem found in New Jersey's Pinelands region is Atlantic white-cedar, important both ecologically and economically for sustaining a viable forest management program in the Pinelands. Atlantic white-cedar provides habitat for several endangered or threatened species, such as Hessel's hairstreak (*Callophrys hesseli*), Pine Barrens tree frog (*Hyla andersonii*), timber rattlesnake, and several endangered plants, including swamp pink (*Helonias bullata*). Dr. George Zimmermann of Stockton College has been engaged in a long-term (18-year) research project on the ecology, management, and regeneration of Atlantic white-cedar, a project that enabled the New Jersey Forest Service to establish the New Jersey Atlantic white-cedar Initiative Steering Committee (ISC). Comprised of a wide range of professionals and stakeholders, ICS developed the *Atlantic White-Cedar: Ecology and Best Management Practices* manual for the New Jersey Department of Environmental Protection.

One of the primary objectives of this cedar initiative is to have a net gain of cedar forest type on the landscape. Atlantic white-cedar continues to be lost to uncontrolled wildfire, beaver flooding, natural tree succession, wind storms, and what appears to be insect damage. Another objective of this cedar initiative is to sustain a wide range of age-class structures across the landscape. Presently, most cedar stands are in the 60 to 80 year age class with few older age-class stands and minimal acres of younger stands. Tens of thousands of acres of this forest type are in need of management and treatment. To sustain the crucial spatial heterogeneity of this landscape, treatments have to be economically feasible. Since Atlantic white-cedar grows in wet soil conditions, operations are difficult and expensive, but they can be done. The landowner of the Ruggeri Stewardship Forest has successfully restored 15 acres of red maple to a healthy, fully stocked stand of Atlantic white-cedar along the wild and scenic Great Egg Harbor River by blending these young groups of white-cedar with several older remnant groups in his forest. Atlantic white-cedar is an early successional species and prefers full sunlight to optimize seed germination and tree growth. Additionally, cedar does not tolerate competition from woody shrubs or hardwood overstory; thus, brush control measures must be ongoing. Lastly, cedar does not tolerate over-browsing by high populations of white-tailed deer. Deer fencing is a typical post-harvest treatment. One landowner quickly moved from electric fencing to coated metal deer exclusion fencing for greater success.

The range of natural variability of Atlantic white-cedar forest stands is significant. It can grow in dense monoculture stands, as well as stands of open wetland savanna types supporting many rare and endangered plants. In open savannas, many herbaceous plant species are being lost to tree succession. Again, lack of fire is the likely cause. An ecological approach to managing these areas through the judicious removal of cedar timber in defined time frames has saved many rare plant populations. We have successfully restored Atlantic white-cedar on more than 17 privately owned forestlands, and operations are underway with many more. Anyone who visits New Jersey and sees one of these magnificent forests remains impressed.

Our forest management projects within the Pinelands National Reserve are required by regulation to "preserve native Pinelands forest types." This goal can be difficult and expensive to achieve. However, after 20 years of managing forests in this unique landscape, I believe that successful economic utility is not mutually exclusive with protecting and sustaining the unique biodiversity of this forest system. It's now clear to me that an ecological approach is essential to sustaining our nation's first national reserve, the Pine Barrens of New Jersey. ■

MISSION

The Forest Guild promotes ecologically, economically, and socially responsible forestry — **"excellent forestry"**— as a means of sustaining the integrity of forest ecosystems and the welfare of 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.

Above -
Arcata Community Forest, Arcata, CA.
Photo by Michael McDowell

Managing for Rare Butterflies, from page 3

Native upland prairie is critical habitat for Taylor's checkerspot.

agriculture, invasive species, succession, and lack of disturbance. Disturbance regimes, including prescribed fires, girdling, or whole-tree removal, help to maintain open-meadow conditions.

Tall fescue (*Festuca arundinacea*) and orchard grass (*Dactylis glomerata*) also pose a threat to butterflies by creating an impenetrable overstory. Field strawberry, the primary nectar species, has reduced vigor from this competition. An annual mowing in the fall reduces competition, allowing adults butterflies access to nectar flowers the following spring, increases the vigor of the strawberry, and stimulates the flowering response of other nectar forbs. Increased access to nectar resources typically equates to improved egg laying response by the butterfly.

Preferred site characteristics of Oregon populations of Taylor's are small pocket meadows, 3–5 acres, with southwest aspect and good vertical structure along the meadow fringe. Meadows absorb afternoon heat, creating convection currents that help give loft for flight. Consequently, most butterfly concentrations are located in the upper portions of a meadow. Good edge structure protects butterflies from wind buffeting and helps retain heat. Timber management strategies include tree retention along this critical band.

Restoration Is an Ongoing Process

Multifaceted restoration projects with several phases that require a certain amount of trial and error represent adaptive management at its best. There was no "book" written on how to restore checkerspot habitat. We relied heavily on information, advice, and assistance from others in the form of physical labor, funds, and supplies. The project benefited from our engaged community, Oregon State University (a top-notch research institution in Corvallis), and numerous nearby resource experts who were eager to assist.

Restoration strategies are informed by understanding the life cycle of Taylor's checkerspot. Eggs are laid on the host, English plantain, in late April or early May. Larvae feed on plantain leaves until the second or third instar or stage, going into diapause in late July and August. By February, larvae resume their active development, pupating in late March and emerging as adults in April. Most restoration work occurs during diapause, a state of dormancy when larvae are burrowed under duff and less susceptible to impacts such as crushing from mowing, herbicide treatments, or foot traffic.

As we have come to understand how unique these Benton County checkerspot populations are and how acute their sensitivity is to environmental changes, a more integrated and proactive approach has evolved. In 2006, Benton County and numerous partners and stakeholders began a three-year Habitat Conservation Plan process to protect some of the highest quality remaining prairie and oak savanna remnants in Oregon. This project is allowing the county to accomplish the following:

- Expand upon current conservation efforts by increasing restoration opportunities on County and other private lands.
- Provide long-term protection of sensitive species and habitats.
- Develop a more economical and ecological approach to species conservation and mitigation.

Conclusion

Non-forest habitats are clearly important for biodiversity. While such habitats may be "minor" in size or scope in a typical forested area, they are often critically important to wildlife, or in this case critical to the survival of Taylor's checkerspot. Maintaining a variety of habitat types within any managed area provides ecosystem services in support of a wide range of wildlife. Foresters are often in a key position to identify biodiversity values and restoration opportunities that may be achieved through property planning and operations. Successful restoration requires more than just effective and adaptable prescriptions, and thus engages partners and the public in outreach, education, funding, and hands-on opportunities. ■

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Greenbelt Land Trust
provided invasive species control.
www.greenbeltlandtrust.org

Oregon Watershed Enhancement Board
administers a grant program for restoration of aquatic and upland habitats.
www.oregon.gov/OWEB

U.S. Fish and Wildlife Service
provides technical assistance and HCP funding.
www.fws.gov

Xerces Society
provided literature review, butterfly inventories, and management recommendations.
www.xerces.org

Focus Species Forestry, from page 5

focal species representative of the range habitat conditions described above can be used to help guide management. These are generally what conservation biologists refer to as "umbrella species." Providing the habitat conditions for the focal/umbrella species also provides habitat for species that share similar habitats.

Armed with knowledge of the habitat requirements of a few focal species, forest managers can make specific management recommendations that will provide suitable habitat for a much greater number of species while also managing for other objectives. For example, a guidebook called *Focus Species Forestry* has been developed; it includes management guides for more than 20 focal species that are characteristic of widespread Northeastern forest types and special habitats. In most, cases six to ten focal species can address upland forest habitat diversity on a given ownership (see Table 2 below).

Table 2. Simplified Focus Species Matrix for Northeastern Northern Hardwood/Spruce-Fir*

Development Stage & Condition	Northern Hardwoods	Spruce-Fir
Early successional forest	ruffed grouse, chestnut-sided warbler	snowshoe hare
Maturing, late successional, and large cavity tree	barred owl	black-backed woodpecker
Forest interior	wood thrush, northern goshawk	American marten
Forest understory	black-throated blue warbler northern redback salamander	magnolia warbler northern redback salamander

*Adapted from ***Focus Species Forestry: A Guide to Integrating Timber and Biodiversity Management in Maine***. Bryan, 2007.

Not all landowners will want to or be able to manage for all development stages and conditions (especially small-forest owners), but these guides provide a range of management options for consideration, and knowledge of what species or species groups can be attracted to the ownership or may be at risk if their habitat needs are not addressed. Focal species provide a means to objectively develop property-wide management goals and site-specific prescriptions based on the species habitat needs. In addition, focal species are an excellent tool for communicating with landowners and the public, as people respond to wildlife more readily than more abstract concepts such as "early successional forest."

An example of how Focus Species Forestry has been applied can be seen on the management plan for a forested property owned by the Blue Hill Heritage Trust, a land trust on the Maine coast that had not previously engaged in any active forest management. Spruce grouse (*Dendragapus canadensis*) and snowshoe hare (*Lepus americanus*) were selected as focal species for early successional conifer habitat. Approximately 15 percent of the forest will be maintained in this habitat type by using large-group selection harvests and patch cuts up to 3 acres in size. Hermit thrush (*Catharus guttatus*) and northern goshawk (*Accipiter gentilis*) were chosen as focal species for older forest conditions; approximately 50 to 60 percent of the forest will be maintained in older development stages by using single-tree and small-group selection harvests. The plan integrates timber management with ecological objectives, and the harvesting will provide periodic timber income while achieving habitat objectives. Private forestland managers are using the tool as well. For example, a consulting firm has integrated Focus Species Forestry into its management to address the ecological concerns of some of its clients and to meet FSC certification requirements for plant and wildlife habitat diversity.

Conclusion

Forest type and development stage classifications provide a means of assessing ownership-wide habitat conditions and evaluating the landscape context of a management unit. Focal species that represent the range of forest types and development stages can be used to assess current conditions, identify desired future conditions, and develop silvicultural strategies and operation plans that integrate timber and biodiversity objectives. Ownership-wide and landscape assessments can be combined with management of site-specific features such as rare species habitats, riparian zones, and management for large dead and decaying trees and coarse woody debris, yielding a comprehensive approach to biodiversity management that is compatible with timber and other management objectives.

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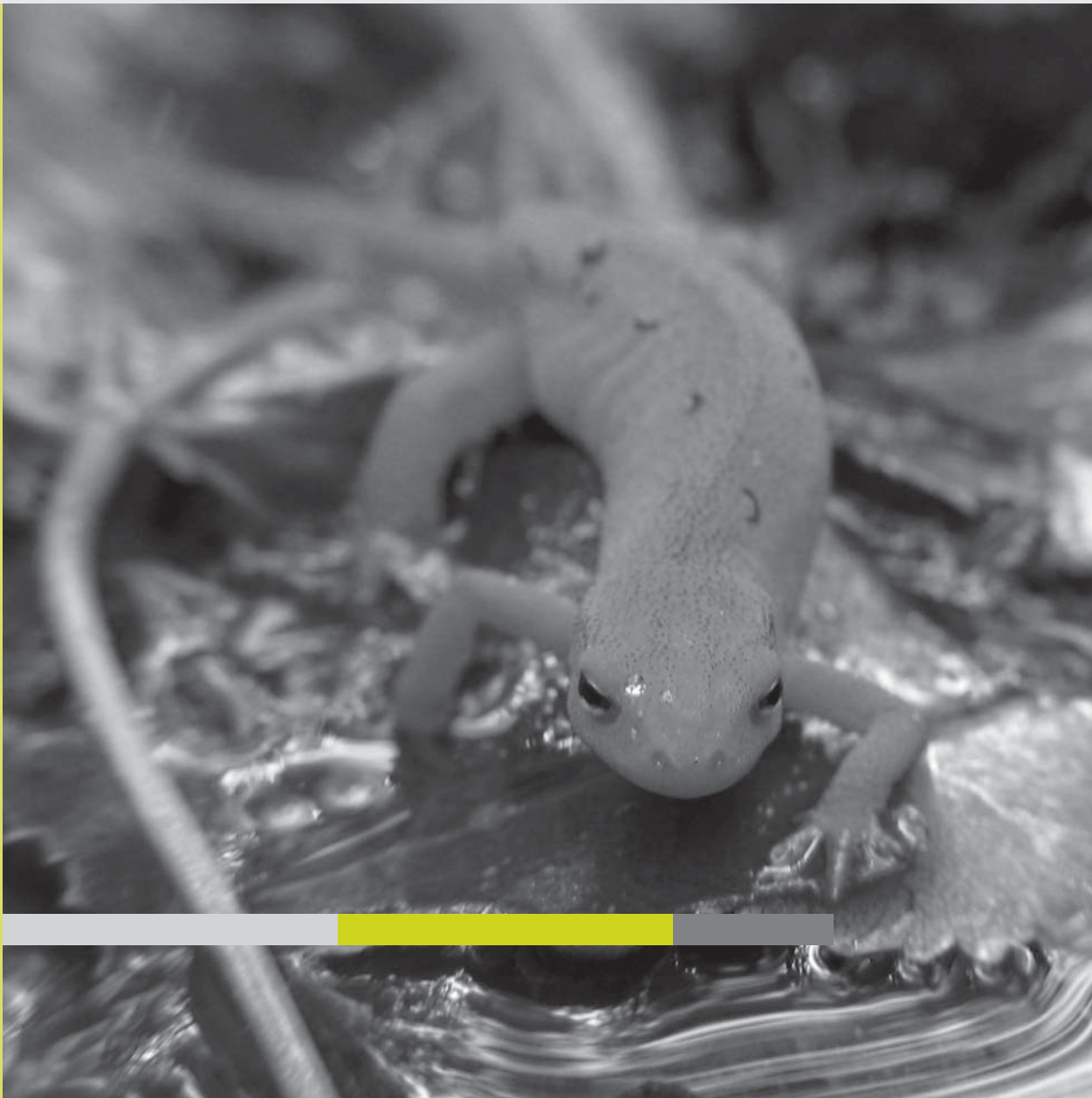

Red eft on the Jerusalem Trail in Vermont. Photo by Karen Dearborn