Challenges of Avian Conservation on Non-Federal Forests in the Pacific Northwest[1]

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Abstract

Conservation of species associated with mature forest habitats remains an important objective for non-federal lands in the Pacific Northwest. With few exceptions, state forest practices rules, a Washington state pilot landscape planning program, and federal Habitat Conservation Plans provide little functional habitat for species, like the Pileated Woodpecker (*Dryocopus pileatus*), that are associated with mature forest structures such as large-diameter snags and defective trees. At the beginning of the new millennium, millions of hectares of non-federal forest lands in western Washington and Oregon will be managed on 50-year rotations with no emphasis on using "new forestry" or adaptive management principles to benefit avian conservation. The economic philosophy of managing forests on relatively short rotations, is a major impediment to Partners in Flight conservation planning in the Pacific Northwest, and likely elsewhere. Solutions to this forest bird conservation dilemma may involve regulation, economic incentive programs (potentially including concepts like carbon sequestration and green certification), corporate and stockholder outreach and education regarding conservation needs, and alternatives to modern-day forest management practices (including ecologically-based forest management trusts). PIF should convene a national committee to work with non-federal land managers and stakeholders to identify the impediments to successful conservation, and develop and implement a strategic plan designed to bring about meaningful bird conservation on non-federal forests.

Key words: conservation, *Dryocopus pileatus*, forest management, implementation impediment, Pacific Northwest, Pileated Woodpecker.

Introduction

Conservation of species associated with mature forest habitats remains an important, but elusive, objective for non-federal lands in the Pacific Northwest. Managed forests in the region provide important habitats for many species, ranging from Neotropical migrants to state and federally listed species such as the Spotted Owl (*Strix occidentalis*) and Marbled Murrelet (*Brachyramphus marmoratus*). However, existing conservation provisions and forestry regulations generally do not fully address the needs of many species associated with mature coniferous forests. These provisions and regulations included, among others, forest practices rules in Washington and Oregon, Habitat Conservation Plans (Beatley 1994), and a pilot program in Washington, completed in 2000, that offered regulatory "protection" to forest landowners in exchange for retention, enhancement or creation of wildlife habitat for certain species (DeMoss et al. 2000).

The potential value of such management efforts is considerable because a substantial portion of the region is comprised of non-federal lands. Of the 8.5 million ha landbase within the range of the Spotted Owl in Washington, 53.4 percent, or 4.6 million ha, is non-federally-owned (Washington Department of Natural Resources 1997). Similarly, over 2.8 million ha out of 6 million ha (47 percent of the landbase) in western Oregon is owned by state or private entities (Oregon Department of Forestry 1998). Although portions of these non-federal areas in both states have been permanently converted to non-forest conditions, substantial areas remain forested. Importantly, significant portions of some species' ranges include private lands (Cassidy and Grue 2000), a common pattern across North America (Scott et al. 2001). Consequently, management of non-federal lands can greatly influence the distribution and abundance of forest bird species in the Pacific Northwest and elsewhere. This is particularly relevant given that many forest birds use snags, a limited resource in managed forests, for breeding habitat (Bunnell and Kremsater 1990).

Evaluation of the conservation and management conditions resulting from state forest practices regulations and the aforementioned planning processes provided a unique opportunity to understand some of the challenges associated with implementing Partners in Flight (PIF) conservation planning for forest bird species on non-federal lands. To better illuminate this challenge, I assessed the value of the regulations and proposed or adopted management strategies relative to the habitat requirements of the Pileated Woodpecker (*Dryocopus pileatus*) as indicated in the scientific literature and recommendations made in the regional PIF conservation plan (e.g., Altman 1999). This species was used in the

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assessment because (a) it is a keystone species (Aubry and Raley 2002a), a species whose presence on the landscape influences the presence or abundance of other species (Mills et al. 1993); (b) it uses habitat attributes—large-diameter defective trees and snags—that have generally become limiting resources in managed forest landscapes (Spies and Cline 1988); and (c) it has declined in abundance over substantial portions of intensively managed forest landscapes (Raphael et al. 1988). The assessment concludes with recommendations for a strategy to improve conservation benefits on non-federal forestlands in the Pacific Northwest.

The Pileated Woodpecker

In western Washington and Oregon Pileated Woodpeckers are strongly associated with mature and old-growth coniferous forests. They are generally more abundant in forests of older age classes due to the greater abundance of large diameter snags and defective trees in those forests (Mannan et al. 1980, Nelson 1989, Carey et al. 1991, Ralph et al. 1991, McGarigal and McComb 1995). Pileated Woodpeckers use large snags and cavity trees for nesting, roosting and foraging (*table 1*). On the Olympic Peninsula in Washington, 88 percent of nests were in snags or live trees with dead tops and the majority of nest (96 percent) and roost locations (66 percent) were situated in or above the canopy, with a mean height to nest and roost cavities of 35.3 m and 23.0 m, respectively (Aubry and Raley 2002b).

Pileated Woodpeckers have very large home ranges that contain large numbers of snags. In the Oregon Coast Range, Pileated Woodpecker *summer* home range size was 478 ha, of which 65 percent (310 ha) was considered suitable habitat (Mellen et al. 1992). On the Olympic Peninsula, Washington, mean *annual* home range size was 863 ha for breeding pairs (Aubry and Raley 1995, 1996). These home ranges contained an average of 23.0 snags/ha (≥20 cm dbh) and 6.9 live trees with dead tops/ha (Aubry and Raley 1996), which equates to 25,804 snags or cavity trees per 863-ha home range.

Partners in Flight Recommendations

The PIF conservation plan for west-side coniferous forests in Washington and Oregon contained a number of conservation and management recommendations for the Pileated Woodpecker. The plan called for a population target of about 9 pairs per township (9.7/100 km^2), based on an average breeding-season home range of 600 ha (Altman 1999:36-37); using the annual home range size of 863 ha for the Olympic Peninsula (Aubry and Raley 1996), a comparable target could be adjusted to about 6 pairs per township (6.4/100 km^2) on the Olympic Peninsula. Habitat objectives included providing forest stands with specific structural conditions, with the following targets for snags of varying size classes, on a per ha basis: ≥18 that were 25-50 cm dbh, ≥8 that were 50-75 cm dbh, and ≥5 that were >76 cm dbh (Altman 1999).

Snags in Younger Forests

Managed second-growth conifer forests typically contain many fewer snags than older forests (Ohmann et al. 1994), particularly when the latter have regenerated following forest fires (Spies and Franklin 1991). The primary reason for this general age-related difference in snag abundance was that damaged trees and snags were carried over from a burned stand to the regenerated stand (Spies and Franklin 1991) whereas few snags and defective trees carry were retained in subsequent stands following timber harvest (Spies and Cline 1988). Most modern timber harvest practices include pre-commercial and/or commercial thinning, which are designed to increase tree vigor by reducing competition for sunlight and water; thinning generally reduces suppression mortality. These practices, as applied in 45-55-year harvest rotations, reduce the likelihood that large snags will be retained for the entire rotation or to successive stands (Wilhere 2003). Remaining snags often are removed for safety, operational, or economic considerations (Wilhere 2003).

Table 1— *Mean diameter at breast height (dbh) of trees and snags used for nesting, roosting, or foraging by Pileated Woodpeckers in the western portions of Washington and Oregon*

Dbh (cm)	Activity	Sample size	Location	Reference
101	Nest	25	Western Olympic Peninsula, Washington	Aubry and Raley 2002b
149	Roost	144	Western Olympic Peninsula, Washington	Aubry and Raley 2002b
103	Forage	31	Oregon Coast Range	Mannan et al. 1980
78	Nest	7	Oregon Coast Range	Mannan et al. 1980
69	Nest	15	Oregon Coast Range	Mellen 1987
112	Roost	15	Oregon Coast Range	Mellen et al. 1992
67	Nest	7	Oregon Coast Range	Nelson 1989

Forest Practices Rules

There currently are no forest practices rules for the Pileated Woodpecker in Washington or Oregon. Forestry regulations in Washington address snag retention to some extent, but these rules do not directly address the ecological requirements of the Pileated Woodpecker. In western Washington, for example, operators must retain 3 wildlife reserve trees and 2 green recruitment trees for every 0.4 ha in a harvest unit; wildlife reserve trees must be ≥3 m in height and ≥30 cm dbh, and green retention trees must be ≥25 cm dbh, ≥9.1 m tall, and with a crown ≥⅓ of the height of the tree (Washington Administrative Code 222-30-020 [11 (b)(c)]; Washington Department of Natural Resources 2002). In Oregon, an average of 2 snags or 2 green trees/0.4 ha that were ≥9.1 m tall and ≥28 cm dbh must be retained per 0.4 ha of harvest for those harvests over 10 ha in size (Oregon Revised Statutes 527.676 [1 (a)]; Oregon Legislative Counsel Committee 2001). New forest practices rules in Washington provided wider buffers along most forest streams (Washington Department of Natural Resources 2002). These rules did not specifically protect snags, and although some snag retention is likely, snag removal will occur for safety reasons. Additional snag retention may occur in unstable slope areas.

Planning Processes

Management for Pileated Woodpeckers under two non-federal planning processes, described here, will be evaluated below. Habitat Conservation Planning is a provision under the Endangered Species Act that allows non-federal landowners or land managers to legally impact, or “take,” federally threatened species in exchange for a legally binding mitigation strategy (Bean et al. 1991, Beatley 1994, Noss et al. 1997). Although the Habitat Conservation Planning (HCP) process is controversial (Kareiva et al. 1999), a review of HCP issues is beyond the scope of this paper.

The other major planning initiative in the Pacific Northwest was the Landowner Landscape Planning pilot program in Washington (LLP). This program, enabled by Substitute House Bill 1985, allowed three state agencies—Natural Resources, Fish and Wildlife, and Ecology—to negotiate and approve landscape-level conservation plans with up to seven industrial forest landowners between 1997 and 2000. Resource management agencies, the wood products industry, and other stakeholders in the region supported the enabling legislation. The key component of the legislation was the stipulation that formal approval of a landowner’s negotiated strategy to protect, enhance, or create habitat for specifically identified “species of special consideration” would provide the landowner with regulatory certainty—the conditions agreed to in the negotiated strategy—such that future state forest practices regulations for the particular species or its habitats would not apply in the pilot landscape for up to 50 years. The program was an incentive-based approach to encourage landowners to provide meaningful and proactive solutions to wildlife habitat management issues (DeMoss et al. 2000).

Results of Recent Planning Processes

Almost without exception, the multi-species HCPs proposed or approved for coniferous forests in the Pacific Northwest were based on strategies that would likely provide little, if any, functional habitat for Pileated Woodpeckers (*table 2*). Each HCP contained language indicating a willingness by the landowner to protect a certain number of snags or cavity trees when this could be done safely although secondarily to timber removal operations. Nearly all plans allowed for the removal of any snags that posed a safety hazard or interfered with harvest operations. In most plans, far fewer and smaller snags and/or cavity trees were recommended for retention than were thought to be appropriate for the Pileated Woodpecker, although incidental take permits were granted (or sought) for this species in each plan.

Most HCPs allowed substitution of green retention trees (GRTs) for unmet snag or cavity tree targets (*table 2*). Moreover, GRTs in all but one HCP could be smaller than the size of trees or snags used by the Pileated Woodpecker (*table 2*). Implementation of a GRT strategy for cavity-using species may be problematic because of uncertainty about future GRT functionality. This uncertainty is due to the possibility that (a) GRTs could be lost to windthrow, (b) GRTs could remain healthy live trees for decades or centuries, or (c) GRTs could be harvested after the term of the HCP had expired. Consequently, it is not clear whether passive attempts to compensate for snag shortages by retaining GRTs would be an effective conservation strategy.

Although there were no completed plans at the end of the LLP pilot project, three of the plans from western Washington had been negotiated to the point where the landowner’s perspectives on habitat provisions for the Pileated Woodpecker were evident. One of the three landowners chose to shift from the LLP to the HCP process. A second landowner abandoned the LLP process during the negotiation phase. The third landowner committed to maintain 569 ha of woodpecker habitat, or 1.3 percent of the 42,898 ha planning area, in small patches distributed across the landscape.

Table 2— *Summary of habitat provisions proposed in or implemented according to multi-species Habitat Conservation Plans developed for state or private industrial timberlands in the western portions of Washington and Oregon.*

Habitat Conservation Plan	Location and size of planning area	Proposed or implemented conservation measures
Crown Pacific*	34,274 ha in the northwestern Cascade Mountains, Washington	Protect all snags ≥38 cm dbh where safe; retain 6 green trees at harvest (3 that were ≥25 cm dbh and 3 that were ≥38 cm dbh); one can be a hardwood tree. At year 20 snags would be created from the retained green trees (one ≥38 cm dbh and two ≥51 cm dbh per 0.4-ha). In Landscape B (about 1/5 of the planning area), retain 6 green trees of ≥38 cm dbh; at year 20 create ≥3 51 cm snags per 0.4 ha of harvest.
Longview Fibre*	8,903 ha in mid-Columbia Gorge, Washington	Retention of 3 wildlife reserve trees (≥3 m tall and ≥30 cm dbh) and 2 green trees (≥9 m tall and ≥25 cm dbh) per 0.4 ha of clearcut harvest. These would not be harvested during duration of HCP.
Murray Pacific	21,662 ha in the west-central Cascade Mountains, Washington	Retention of ≥4 live trees and 4 snags (if present) per 0.4 ha. All 4 trees ≥25 cm dbh; ≥2 of ≥46 cm dbh, and one dominant tree in stand that was harvested. If trees of these sizes not present, then largest trees present would be substituted. Snags will be ≥30 cm dbh and ≥3 m tall. Live trees ≥30 cm dbh may substitute (on a 1:1 basis) for any snags less than the target of 4.
Plum Creek	53,097 ha on east- and west-slopes of the central Cascade Mountains,Washington.	Retention of ≥3 snags or defective live trees ≥30 cm dbh and ≥3 m tall, 2 green retention trees ≥25 cm dbh and ≥9 m tall. Primary habitat would increase from 39% in 1996 to 46% in 2045.
Port Blakely	3,030 ha in southwestern Washington.	When present, maintain ≥4 hard snags/0.4 ha >38 cm dbh, of which 2 would be >51 cm dbh. Two green recruitment trees >15 or >22 cm dbh (for the snag target) would be substitute for each missing snag.
Simpson Timber Company	105,859 ha in western Washington	Retain snags within riparian buffers and certain forested wetlands that total about 12,950 ha. Retain 8 green trees/0.4 ha (4 dominant/codominant trees or snags and 4 others ≥10 cm dbh) after harvest on units within a Supplemental Wildlife Tree Conservation Program area of about 14,569 ha.
Washington Department of Natural Resources	a) Olympic Experimental State Forest = 107,474 ha on western Olympic Peninsula, Washington; b) five planning units in western Washington = 477,546 ha.	a) Average amount of submature and old forest habitat in 11 planning units would increase from 25% in 1996 to 36% in year 50 and 53% in year 100; b) 33,032 ha of forest with ≥3 snags or cavity trees/0.4 ha that were ≥51 cm dbh; dominant and co-dominant trees ≥26 m tall; ≥70% canopy closure; retention of an unspecified amount of marbled murrelet habitat; no entry or limited entry to 23,473 ha of riparian forest buffers.
Weyerhaeuser Willamette*	about 161,880 ha in central-western Oregon	Retain 3 green trees or snags per 0.4 ha of harvest (≥31 cm dbh or the largest available in stand); retain one 81+ cm dbh tree/8.1 ha (if unavailable, substitute more smaller green trees); retention in riparian reserve areas acceptable; no more than 244 m distance between any snag or green tree; removal of unsafe green trees without replacement.

Notes: Two HCPs completed for municipal watersheds in Washington were not included in the table. HCPs with asterisks were not implemented. References for HCPs, in the order of presentation, are as follows: Biota Pacific Environmental Services 1999, Longview Fibre Company 1995, Beak Consultants Incorporated 1994, USDI and USDC 1999, Beak Consultants Incorporated 1996, Simpson Timber Company 2000, Washington Department of Natural Resources 1997, Hampton Communications 1996.

New Forestry and Adaptive Management

New forestry and *adaptive management* are two concepts that were widely believed to be central to an impending change in modern forest management. For the purposes of this discussion, *new forestry* is broadly defined as *forest management practices that provide for a greater diversity of forest age classes and structural conditions than currently exist in managed forest landscapes* (see Franklin 1989 DeBell and Curtis 1993). It is commonly held that new forestry should be practiced at landscape levels to facilitate creation of a full range of habitat conditions at ecologically relevant spatial scales (McComb et al. 1993). New forestry may not account for all ecosystem processes and, therefore, additional management may be required to address any such shortcomings. *Adaptive management*, a process of using experiments and "feedback loops" to make improvements to management activities (Holling 1978, Walters 1986, Walters and Holling 1990), was envisioned as the primary means for making new forestry work (Irwin et al. 1989, Irwin and Wigley 1993).

How have new forestry and adaptive management changed the way that forest management is conducted on non-federal lands in the Pacific Northwest? Unfortunately, there has been negligible use of these concepts in management of non-federal lands in western Washington and Oregon. Discussions and negotiations with forest landowners and review of proposed or implemented HCPs indicated that millions of acres of non-federal forest lands in the region would continue to be managed on 45 to 55 year rotations (McComb et al. 1993), with almost no emphasis on using "new forestry" or adaptive management principles to benefit avian conservation where it is most needed—the habitat needs of snag-dependent species and those species associated with mature and older forests. Although adaptive management was mentioned in many HCPs, most "adaptive management" was little more than obligatory monitoring that typically lacks the requisite mechanism for altering management practices in response to new information (Buchanan 1997). Furthermore, other than a few small-scale experiments, there has been no implementation of snag-creation programs of any significance.

The Outlook for Future Forest Management

There appears to be a lack of consensus within the wood products industry as to the role of the industry in conservation of wildlife on private lands. An optimistic perspective from the wood products industry was reflected in the statement, based on the results of a survey of forest managers, that "protection of threatened and endangered wildlife constituted a proper role for private forestland owners" (Irwin and Wigley 1992). Conservation planning has been viewed as a valuable process, particularly if conducted at landscape or ecosystem scales and if flexibility was incorporated to address constraints imposed by forestry activities (Haufler and Irwin 1993, Irwin and Wigley 1992). On the other hand, a segment of the forest industry maintained that conservation of resource-limited wildlife on private lands was an unfair burden (see Loehle et al. 2001). The latter perspective appears to reflect present day forest management. A similar dilemma exists for state forestlands, where forest trust responsibilities have been debated.

The modern forest management paradigm in west-side forests of Washington and Oregon has changed little over the last half-century (DeBell and Curtis 1993). Forestry practices during this period have emphasized short rotations, clearcut harvesting, and replanting. Use of short rotations was a means to maximize the economic value of trees and to ensure adequate stocking needed to respond to changes in market conditions. For several decades, the predominant perspective was that trees should be harvested at a time when trajectories reflecting mean annual increment (MAI) and periodic annual increment intersected; this was thought to occur at relatively early stages of forest development (*fig. 1*; McArdle et al. 1961). These modeled values of MAI have been used, along with economic factors and policy considerations (Curtis and Marshall 1993), as the basis for modern harvest schedules. Recent information, however, indicated a later culmination of MAI in the forest development process, as trees continued to put on substantial growth beyond 50 years of age (*fig. 2*; Curtis 1995, Curtis and Carey 1996, Curtis and Marshall 1993,). Consequently, it has been argued that forest stands can be retained for greater time periods prior to final harvest while realizing substantial timber value.

Extending rotations and retaining or creating snags for nesting birds are not simple tasks. Of primary concern to landowners is the influence on short-term cash flow of extending rotations. Also, placing buffers around snags is expensive because the buffer must be large enough to meet logging safety standards, and this forest retention would result in reduced harvest volume. In the near term, recruitment of snags or defective live trees in an intensively managed forest would involve a snag creation program, at a 1997 cost of approximately $600 to $1200/ha for 12 snags/dead-topped trees/ha (Lewis 1998). Despite efforts to retain snags, providing this resource for Pileated Woodpeckers in managed forests will be difficult because natural snag decomposition and loss would necessitate either ongoing snag management or recruitment of large live trees that would function as habitat in future stands. In addition, a buffer-based approach may not be a flexible, sustainable, landscape-level strategy.

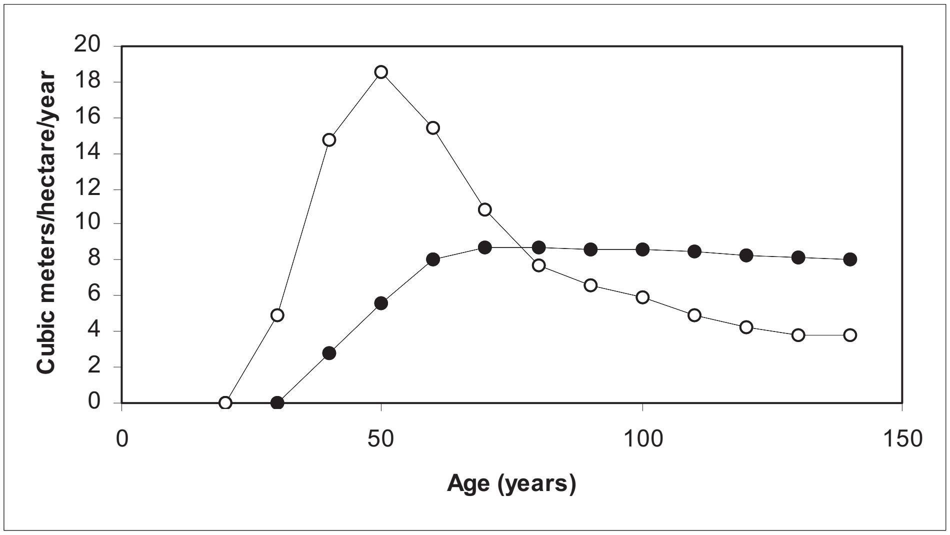

Figure 1— Generalized relationship between mean annual increment (●) and periodic annual increment (○) in Douglas-fir forests of the Pacific Northwest (McArdle et al. 1961; from Curtis and Carey 1996).

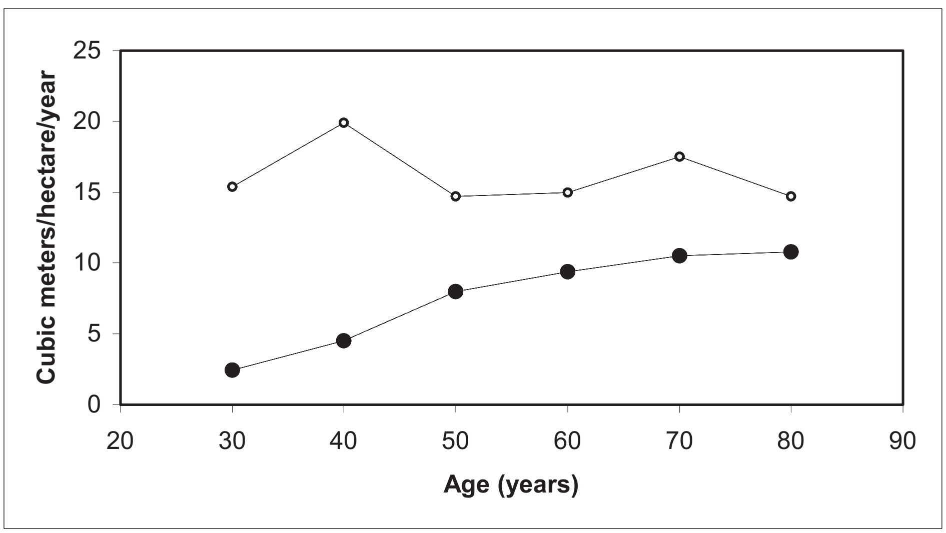

Figure 2— A more recent model of the relationship between mean annual increment (●) and periodic annual increment (○) in Douglas-fir forests of the Pacific Northwest (from Curtis and Carey 1996), indicating continued tree growth beyond 50 years.

Regulations that provided riparian buffers for salmon conservation were recently established in Washington (Washington Administrative Code 222-30-021; Washington Department of Natural Resources 2002). The value of these buffers for Pileated Woodpeckers in the near-term will likely be negligible because many buffers were intensively managed in the decades prior to the new regulations and would be snag deficient. As the forests in these buffers develop, snags will be recruited and the forests will provide habitat for some cavity users. The future value of these riparian buffers, particularly for a species with a very large home range, like the Pileated Woodpecker, is unknown. However, the highly linear nature of the riparian areas (*fig. 3*) suggests that high energetic costs associated with territory defense, foraging activities, and providing for young could be substantial. Additionally, landscapes with low stream densities will have less cumulative buffer and less potentially suitable habitat.

Improving Prospects for Conservation on Non-Federal Lands

Solutions to this wildlife habitat management quandary will not be easy and likely will involve a combination of numerous approaches. Some of these approaches may emphasize elements that deviate from the traditional economic view that holds the production of wood fiber as the only value derived from forest management.

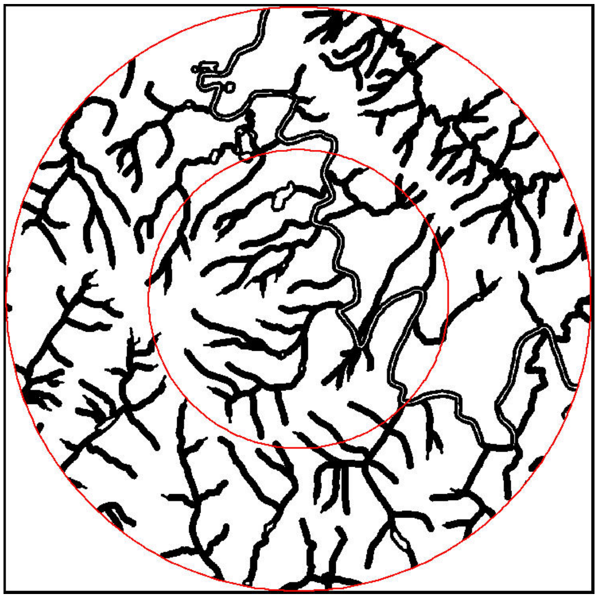

Figure 3— Conceptual riparian buffer areas that would be protected under new forest practices rules in Washington. The inner circle represents the area of a Pileated Woodpecker home range (863 ha) in western Washington. The outer circle represents the amount of landscape (3228 ha) required to capture 863 ha within riparian buffers.

Alternative elements to consider include ecosystem function and resiliency, wildlife habitat, water quality, management of other forest products, aesthetics and recreation, and carbon sequestration. Recent studies indicated there are considerable profits associated with managing landscapes to meet a greater range of forest age-classes and ecological conditions (Lippke and Oliver 1993; Lippke et al. 1996; Marzluff et al., in press). Moreover, ecological resiliency, defined as the ability of an ecological system to maintain its inherent functions following a substantial disturbance (Holling and Gunderson 2002), more likely will be retained by managing forests on longer rotations. Stands managed on longer rotations will contain more trees of larger size and will undergo successional processes (Carey et al. 1999) that produce and retain snags and defective trees for Pileated Woodpeckers and other species. Processes for achieving a more functional landscape by altering site preparation practices (including maintenance of snags and other legacy features), using "biodiversity" thinnings to accelerate growth and development of the stand, and extending harvest rotations have been described (Carey and Curtis 1996, Carey et al. 1999). Potential reductions in present net value resulting from extended rotations (Lippke et al. 1996) could be minimized or offset by realizing greater value of larger-diameter trees available in future stands and "the enhancement of associated nontimber values" (Carey and Curtis 1996:617).

A new, effective forest management paradigm designed to provide wildlife value and ecological resiliency may build from a base of regulatory responsibility by the landowner, which might result in corporate and stockholder costs. Alternative tools that might be applied to enhance prospects for forest management include (1) economic incentives, (2) environmental assurance bonds in MCPs (Wilhere 2002), (3) implementation of carbon sequestration programs (Harmon et al. 1996), and (4) ecologically based green certification. Ecologically based forest management trusts, such as the New England Forestry Foundation (www.neforestry.org), may become an effective means to manage landscapes to provide greater ecosystem function.

The general lack of meaningful conservation value being provided for species associated with mature forest structures on non-federal lands is an impediment to Partners in Flight conservation planning in the Pacific Northwest and elsewhere. Partners in Flight should convene a national committee, with regional representation, to work with stakeholders to more clearly identify the impediments to successful conservation implementation on non-federal lands. This committee should develop a strategic plan that identifies, evaluates and implements a comprehensive suite of scenarios, including corporate and stockholder outreach, that may be applied to bring about meaningful bird conservation on non-federal lands.

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