ECONOMICS OF PRIVATE FORESTRY:  
THE OPPORTUNITY COST OF 
RED-COCKADED WOODPECKER MANAGEMENT

Steven P. Meyers  
Graduate Research Assistant  

Warren A. Flick  
Attorney and Associate Professor

Ralph Meldahl  
Assistant Professor

School of Forestry  
Auburn University, Alabama

ABSTRACT

The impact of Red-cockaded woodpecker Guidelines on the profitability of timber management concerns both industrial and non-industrial private forest owners. The US Fish and Wildlife Service (USFWS) has unpublished but widely used guidelines for red-cockaded woodpeckers (RCW). They specify necessary critical habitat for RCWs on private lands, which helps avoid a "take" under the Endangered Species Act. Within these guidelines several forest management approaches are available for land owners, including sustainable uneven-age management of the entire tract and even-age management of individual stands. The question to be answered is which approach minimizes the opportunity cost associated with guideline compliance.

The study uses data from a tract of private industrial land in central Mississippi that has four active colonies (16 birds). The study compares the income from forestry with woodpeckers to the income from forestry when there are no woodpeckers.

INTRODUCTION

The Endangered Species Act may require private landowners to protect listed species. The red-cockaded woodpecker (RCW) was listed in 1970 and occurs on private and public land in the South. The bird lives in open, mature stands of southern pine. To protect the bird, landowners must refrain from cutting their mature timber. From a landowner's viewpoint, this requirement may impose large opportunity costs. If a mature stand of southern pine is worth, say $2,500 per acre, and if a landowner wants to harvest but is forbidden, the opportunity cost of maintaining habitat for the bird is large.

Landowners have been organizing among themselves and protesting about the costs of restrictions on their land-use alternatives. They argue that if the public, acting through government, wants endangered wildlife protected, and if the burden of that protection is high, then that burden should be borne by all in the form of compensation to private owners required to harbor the
wildlife (Yandle 1995). A policy of compensation has it roots in the 5th Amendment to the U.S. Constitution, which says in relevant part, "... nor shall private property be taken for public use, without just compensation." Since 1922, when the Supreme Court ruled in Pennsylvania Coal v. Mahon, (260 U.S. 393 (1922)), excessive public regulation of private land has been treated as a "taking" of that land.

If compensation becomes due, landowners and others need to know the fair market value of the cost of regulation. That is an appraisal problem. Because the issue is new and occasional, there is not widespread knowledge of the economic impact of endangered species regulations on private landowners. There is apparently one existing study (Cleaves et al. 1994) on the economic impact of the recently published procedures manual for private lands (hereafter, Manual) (U.S. Fish and Wildlife Service 1992).

Cleaves et al. related opportunity costs as the difference between the returns expected from timber harvesting and management regimes with and without the RCW manual. They used data from the Alexander State Forest in central Louisiana. Stand volumes ranged from 10 to 19 MBF (Scribner) per acre and averaged 16 MBF per acre. They constructed a model and tested various size private ownerships from 60-300 acres with RCW clusters from 3-80 acres. Using a 5% interest rate, they found opportunity costs ranging from $143 to $1,486 per acre. Perhaps the principal limitation of their approach is that few private landowners carry such large volumes of timber on their lands.

The Manual is 13 pages of requirements and suggestions for managing private lands when RCWs are present. The most important restrictions are on cutting timber and other economic developments. For each cluster of birds, landowners must maintain a minimum of 60 acres of foraging habitat containing a minimum of 3,000 sq. ft. of pine basal area. The basal area must be greater than 10 and less than 80 sq. ft. on each acre. To be considered foraging habitat, the stands must be "open," though this term is not precisely defined. RCWs will apparently not live in areas with significant understories of hardwoods or other small trees reaching 20 or 30 feet in height. Readers are referred to the Manual for additional requirements.

**METHODS**

The approach of the study reported here is similar to Cleaves et al. (1994). It differs significantly in the source of data—this study uses data from private lands in central Mississippi. The tract is 714 acres with mostly shortleaf pine, even-aged, approximately 65 years old, averaging 52 sq. ft. of merchantable basal area, and containing four RCW clusters. The tract was last thinned 20 years ago, at which time the RCWs were discovered. Since then the tract has been burned and bush-hogged to keep it "open." The tract is in relatively poor health and is reportedly losing volume at about 4% per year (Hubbard 1994). Beyond financial maturity, the tract will continue to decline if left alone. As older trees die, natural hardwood succession will develop (Lawson 1991).

The opportunity cost of managing for RCWs is defined as the difference between the present discounted values of all future incomes and costs, with and without RCWs. This amounts to using Land Expectation Values (LEV). With RCWs, the LEV is smaller because the current inventory is not harvested and future timber growth is less.

The analysis was done using a real interest rate of 6 percent, pulpwood prices of $26.50 per cord, chip'n saw prices of $67.60 per cord, and sawtimber prices of $340 per thousand board feet Doyle. These prices are an average of prices from Timber Mart-South for 1993 and 1994 for the appropriate area in Mississippi.

Management costs included stand establishment ($105/acre), burning ($11/acre), and an annual property tax plus management ($6/acre). These costs are appropriate to the tract in central Mississippi. The burning and management costs were increased to $15/acre and $8.50/acre in the cluster.
areas to reflect the more intensive efforts required to monitor the birds, establish boundaries, and ensuring hardwood control.

If no RCWs were on the tract, the landowner would clear-cut and plant loblolly pine, which was modeled with the North Carolina State University Managed Pine Plantation Growth and Yield Simulator (Version 3.1) (Hafley and Smith 1989). Forest management would consist of thinnings at age 15 and 25, with a clear cut at age 36. This approach is the base case.

With RCWs, forest management differs between cluster areas and foraging areas. In cluster areas, it is difficult to predict what the results of forest management. The areas must be maintained in an “open” condition, eliminating understory plants that may grow to heights of 10, 20, or more feet. Yet without provision for reforestation of pines and their subsequent maturing, the cluster areas will eventually deteriorate as old pines die. We assumed single-tree selection within the cluster areas, which will eventually transform the stands to all aged. Given the existing volumes and basal areas in the cluster areas, we assumed one thinning in 20 years, leaving 50 sq. ft. of basal area. After that, we assumed no additional yields from the cluster areas. Given that clusters are small and that additional future yields would be far in the future, the present value of them would be quite small. Therefore, we believe our ignorance about what may happen in the cluster areas does not substantially affect the economic results.

The foraging habitats were modeled differently. The aim was to manage the foraging habitats as economically as possible, and that the drift toward uneven-aged pine management used in the cluster areas did not appear economically attractive. Three alternate management plans were considered: first, spreading the required foraging timber over as many acres as possible, maintaining a minimum basal area but maximum acres (minimum basal area approach); second, managing the clusters and their foraging habitats independently, rotating foraging areas around each cluster in successive rotations (independent groups approach); and third, managing for a common foraging area of larger size used jointly by all birds in the four clusters (dependent groups approach). Specifics concerning these forest management alternatives can be obtained from the authors.

Of the three approaches, the minimum basal area approach proved to be the most problematic. Shortleaf pine is intolerant and grows slowly when young (Lawson 1986). It is not at all clear how, as in the cluster areas, foraging areas containing 10-15 sq. ft. of pine basal area can be simultaneously regenerated and kept open. Probably the only way is to break the area up into many interspersed “micro” areas, controlling fires in some to allow regeneration, deliberating burning in others to control understory. Mature pine basal area may be reduced below 10 sq. ft. where reforestation is being encouraged, and held at 15 or a little more in areas that were being intensively burned. The timber growth associated with such forestry is not easily predicted. The income generated from this approach is assumed to be that from one thinning to 10 sq. ft. per acre. There may be merchantable volumes in the future, but they will likely be well in excess of 30 years out, and probably more than offset by the accumulated costs of the special management efforts to ensure “micro” area management.

In summary, management for RCWs is complex. First, the areas not needed for the birds were identified and management separately. Second, the cluster areas were identified and management separately. Third, foraging areas were identified under three alternative foraging area management plans. Separate financial calculations were done for each different type of forest.

RESULTS

The results reported here are preliminary. The research is continuing. Table 1 shows the preliminary results. Without RCW considerations, the tract would have a value of $938,151, or $1,377 per acre. With RCWs, the values of the tract are lower. The minimum basal area approach is the most costly, reducing the value of the tract to $462,898. Although this type of management
is the most costly, it is also much dependent on the assumed high costs of managing "micro" areas and the slow growth of shortleaf pine reproduction under or nearly under residual seed tree.

The least costly RCW management strategy is the dependent group approach, with a common foraging area. The principal advantage of this approach is that it is easy to manage. Instead of managing several foraging areas, this approach concentrates all of the RCW foraging habitat in one area, allowing unencumbered forest management in the remaining part of the tract. The value of the tract is reduced to $639,910, a 35% reduction in value.

While the dependent area approach is the least costly, it may not accommodate the territorial needs of RCWs. Fish and Wildlife Service personnel may not allow this approach because they may fear that constant competition among different groups for the one foraging area will stress the birds and reduce long-term survival. Should that policy be adopted, then larger tracts with multiple colonies may be forced into managing for separate foraging areas, realizing less timber revenue, and greater costs of management.

<table>
<thead>
<tr>
<th>Management Approaches</th>
<th>LEV</th>
<th>LEV/acre</th>
<th>Cost/acre</th>
<th>Loss</th>
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<td>Base case</td>
<td>$983,151</td>
<td>$1,377</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum basal area</td>
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<td>648</td>
<td>$729</td>
<td>(53%)</td>
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<tr>
<td>Independent groups</td>
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<td>790</td>
<td>587</td>
<td>(43%)</td>
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<tr>
<td>Dependent groups</td>
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<td>481</td>
<td>(35%)</td>
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</table>

The values in Table 1 are dependent on tract size. Similar calculations were done for a hypothetical 60-acre tract with one colony. The value of the 60-acre tract was reduced to $82 per acre, representing a 94% reduction in value. And that calculation did not include additional transactions costs associated with learning and complying with the private lands manual.

CONCLUSIONS

Private landowners with RCWs on their property will incur substantial costs to protect the bird. Those costs include both increased transactions costs (not completely modeled here) and reduced income from timber growing. As tract size becomes smaller, the relative costs increase. If a tract is 60 acres, which is the minimum number of acres necessary for RCW protection under the private lands manual, income from timber management is virtually eliminated.

These results and conclusions are preliminary. The research is continuing.

LITERATURE CITED


Hubbard, P. 1994. Personal communication, December. Mr. Hubbard is the forest manager of the Wildwood tract.
