Talking High-Tech Turkey

USDA Uses New Software to Analyze Habitat Management Scenarios

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As owners and managers of forestlands, you are being challenged as never before to produce an increasingly complex set of benefits as a variety of costs increase. Getting the most money from your forestland through timber harvesting is, by itself, a very challenging goal.

But a growing number of private landowners want much more than money from their Tree Farms. You may want to create or maintain certain desirable ecological conditions such as a grove of "old-growth" trees or a scenic, park-like environment. You may want to restore portions of your property to more natural conditions in order to enhance a diverse animal habitat well into the future.

There is no simple answer to what is right, proper and best for ourselves and for the land in our care. There is, however, a process — called the NED Decision Support System — that can be followed to ensure that:

- All relevant goals are considered;
- The character of the forestland and its current condition is known;

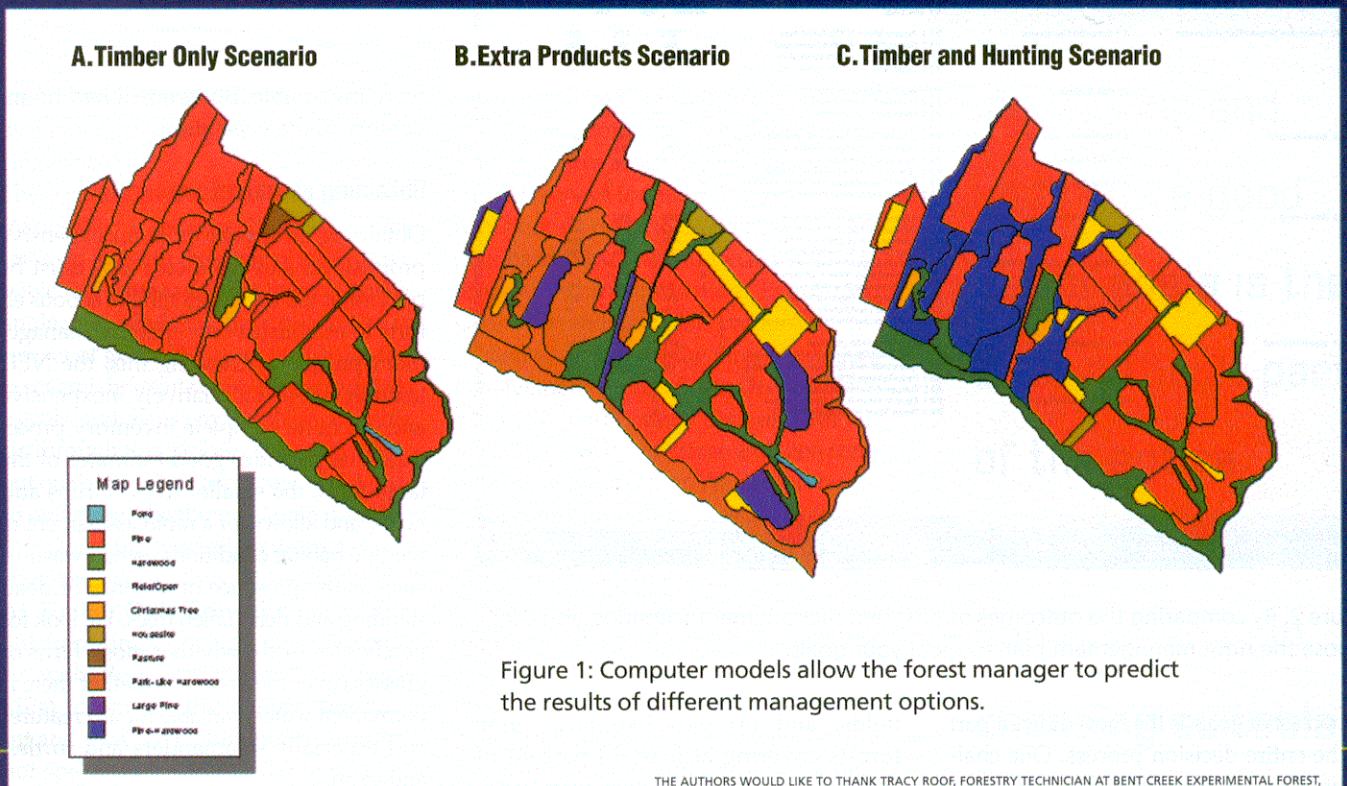

Figure 1: Computer models allow the forest manager to predict the results of different management options.

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- Different ways (management scenarios) to manage the land are designed and tested;
- The way the forest will look in the future, given each management scenario, are simulated;
- The actual management scenario selected will achieve the landowner's goals, if at all possible.

Transition to Tree Farming

Researchers at the USDA Forest Service, Northeastern and Southern research stations, with many collaborators, have been developing a computer software product called the NED Decision Support System. This software program is designed to help forestry consultants and their private landowner clients develop goals, assess current and potential conditions, provide a way to study and select from different scenarios, and produce management plans for their forest properties.

This NED process has recently been applied to Deer Hill Tree Farm in Gourdin, South Carolina.

Deer Hill Tree Farm can best be described as a family farm in a sportsman's paradise. It has been a family-operated farm for more than 50 years, first by the late T. Vaughan Ligon and then by Mary Rebecca (Ligon) and her husband, John E. Spearman Jr. Under the careful stewardship of Mr. Ligon, Deer Hill was managed to provide diversified income. About 500 acres were managed as a traditional row-crop and livestock operation and the remaining 500 acres were devoted to timber and wildlife production.

In 1989 things changed dramatically. Hurricane Hugo devastated virtually the entire acreage of mature pine timber that had been so carefully nurtured. This catastrophic natural event, along with the long-term decline in traditional farm income, prompted the family to convert from row-crop farming to Tree Farming.

The pine-hardwood forests were harvested to remove the hurricane-damaged trees and the area was treated to create well-stocked, pine-hardwood forests. Most of the fields and pastures were successfully placed into the Conservation Reserve Program (CRP) and planted to loblolly pine. Wherever possible, large, mast-producing hardwoods were retained to provide food for wildlife.

These aggressive management practices have set Deer Hill Tree Farm firmly on the road to regaining financial profitability over the long term. They have also earned the Spearman family local and statewide recognition, first as the South Carolina District 7 Tree Farm of the Year for 1993 and, more recently, as the South Carolina State Tree Farm for 1999.

Field Testing the Technology

In 2000 the Deer Hill Tree Farm was enrolled in the USDA Forest Service's technology transfer program as a case study to field test the NED system.

The purpose of modern forest management is to achieve diverse goals defined for the property by the landowner. It cannot be overemphasized that without goals, *reasoned* management cannot be practiced.

Surprisingly, identifying and choosing

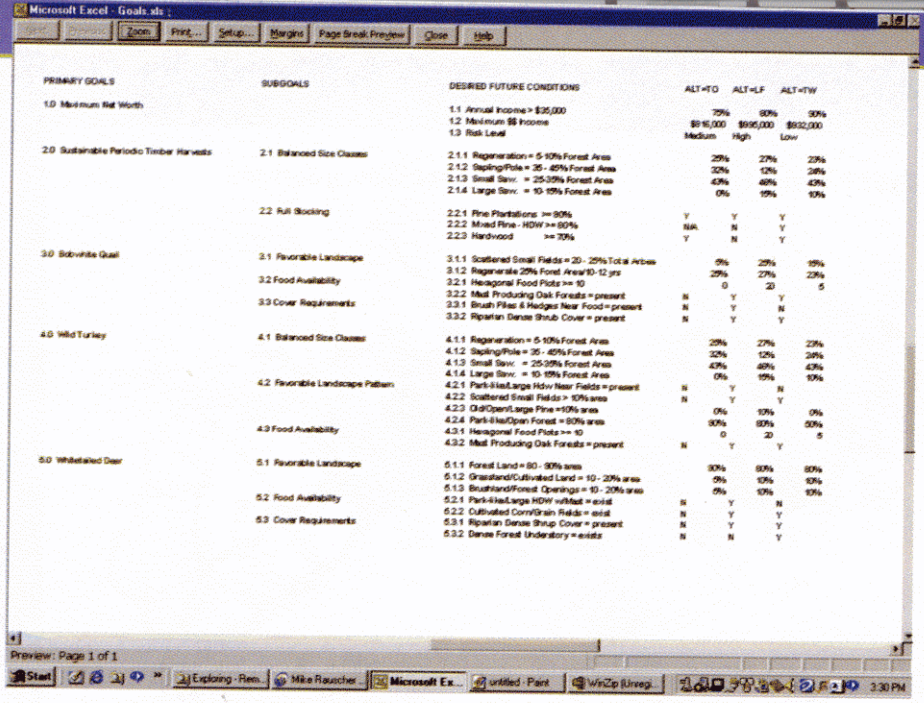

Figure 2: By comparing the outcomes of different management scenarios, you can choose the right management plan to meet your goals.

a good set of goals is the most difficult part of the entire decision process. One challenge in choosing suitable goals is that you have to be able to tell whether you have achieved them.

For example, one of the goals for Deer Hill was to focus on producing wild turkey habitat. Well, you can't just walk into the forest, pull out your wild-turkey-habitat measurement gauge, swing it around and get a reading on it. There is, of course, no such gauge and that's because wild turkey habitat is an abstract concept that unifies many factors about the birds and their needs. So how do we measure it? Well, first we have to further define what we mean by wild turkey habitat.

We talked with turkey management experts and decided that we needed three things for good turkey populations: (1) a favorable landscape pattern, (2) forestland with all sizes of trees represented and (3) turkey food. That list certainly helps, but we are still not able to go out and measure any one of these three general concepts. So what do we do? We define what we mean by each of the three subdivisions.

With that method, a favorable landscape pattern for turkey is defined as: (1) park-like, open forests covering at least 80 percent of the area, (2) scattered small fields making up more than 10 percent of the area, (3) park-like large hardwood forests present near small fields, and (4) park-like large pine forests covering at least 10 percent of the area. So now, finally, we have something specific we can measure in our forests. By going through this process, we create a list of goals in sequence with unmeasurable but valuable top-level goals at one end and measurable conditions that define the top-level goals at the other end of the hierarchy.

Having defined our goals, we next need to learn about our property. Most private landowners do not possess an inventory of the trees on their land and have only a general idea of the mix of vegetation, soil and topographic features on their land. Few of them have mapped out their units of management such as fields, pastures, young oak forests, old pine forests, etc., so that it's possible to know how much area each unit occupies and what its average characteristics are.

Fortunately, the forestry consultant for Deer Hill, Preston Fout of Shaw, McLeod, Belser, and Hurlbutt Inc. of Sumter, South Carolina, had a digitized forest stand map available in the ArcView GIS format. (For more on GIS and ArcView applications, see story on page 38). An aerial photograph of Deer Hill taken one year following Hurricane Hugo was also available. These aids to learning about the Deer Hill property were invaluable. But we still had no inventory of the vegetation.

Obtaining an Inventory

Obtaining an inventory is an expensive proposition and it's a cost that must be paid for at the very beginning of serious efforts to establish a cost effective management program. Knowing this, the NED team developed a relatively inexpensive and yet quite complete inventory procedure that provides good estimates of the large trees, the smaller trees, shrubs and herbs, and allows for a rapid assessment of wildlife habitat conditions using measures such as the presence or absence of dead standing and dead fallen trees. We look for perches for birds, whether moss, ferns or grasses cover the ground, whether there is permanent water available for all creatures and especially salamanders and turtles, and so on.

Although we look for many things, we have designed a process that takes approximately half an hour per forest stand. Deer Hill contains 35 units of management covering about 1,000 acres; 28 forest stands and seven non-forest areas such as fields, house sites and a pond. We were able to put one NED inventory plot in each of the 28 forest stands in four days. Granted, one plot per stand seems small, but it was affordable and it provided a sufficiently accurate description of each forest stand to support the NED decision process.

Using only one plot per stand prevented us from assessing statistically how well our estimates actually fit the conditions in each stand, but by choosing to place the plots carefully in representative areas, we believe we achieved a good characterization. This inventory process includes future improvements and adjustments. The owners of Deer Hill can afford to measure additional plots in the future, so the inventory will improve over time.

Designing Management Scenarios

Given the set of goals and an understanding of the current forest conditions, we can turn our attention to figuring out what we might do to our land (if anything) so that it can better achieve the goals. We want to

create a small number of very different strategies for managing our land while satisfying the goals.

These strategies are called management scenarios (Fig. 1, see page 7). Each is a different road to get to the same place. In sustainable forest management there is rarely a single, best road to follow to achieve a given set of goals. What we can do is design several different ways (roads) to get to our goals, and then compare them. At each cycle through this process, we learn more about our own values and goals, about our land and about the things we can do with it. For Deer Hill, we designed three management scenarios:

A) Timber Only Scenario: Maximum profit from timber operations consistent only with Best Management Practices (BMPs) for sustainable timber management and the CRP requirements. Wildlife is not specifically addressed and no revenue from wildlife operations is expected. All open areas will be planted to loblolly pine, the pine-hardwood stands will be commercially chipped and converted to loblolly pine plantations as soon as feasible, loblolly pine plantations will have two thinnings (ages 10-12 and 20-25) and a final harvest at age 30-40, and the plantation size-class distribution will be spread out to get a more even flow of income.

B) Timber and Extra Products Scenario: Maximum profit from non-timber, non-extractive human use of the land. Leave 400 acres of existing pine plantations alone and continue to manage for maximum timber. Take 100 acres of pine plantation and manage for big pine over long rotations. The pine-hardwood stands will be turned into park savannahs with large hardwood trees spread out over a 30-by-30-foot grid. Islands of regenerating hardwoods will be created in these open forests. Wildlife food plots will be established in all open fields and the wildlife row-crop planting (corn) will continue. Many camping, nature education, hunting and other sporting activities will be developed to produce income. A full description of the related "Lasting Forests" scenario can be found on the Internet at <www.LastingForests.com>.

C) Timber and Hunting Scenario: Maximum profit from timber and hunting operations. Leave all pine plantations as they are and manage for maximum production. Rent hunting rights to highest bidder. Thin pine-hardwood and hardwood stands to promote acorn production. Keep open fields open and food plots productive.

Having developed the three alternative management scenarios for Deer Hill, we had to pretend to carry each of them out over our 40-year timeframe and then compare them to each other. We did this by using a forest growth forecasting software program called the Forest Vegetation Simulator (FVS). FVS was created and is maintained by the USDA Forest Service forest management service center in Ft. Collins, Colorado. This system covers all forest types in the United States. It can be obtained free of charge. It is, however, fairly complicated to use and requires a one-week training session before users feel comfortable with the software. NED integrates FVS, but only for regions east of the Mississippi. FVS is available on the Internet for downloading, free of charge, at <www.fs.fed.us/fmsc>.

Comparing Goals to Future Forests

To recap: We set our goals; learned about the current condition of our property; figured out some alternative ways we could manage our land; and projected those alternatives over a 40-year horizon to figure an estimate of how the forest is likely to look for each scenario 40 years in the future. Now we can go back to our goals, find our measurable conditions and evaluate them against each of our simulated future forests (Fig. 2, see page 8).

For example, in the wild turkey habitat goal, we needed park-like hardwood forests with large trees near small fields. By evaluating the three simulated scenarios, we can determine that only the Timber and Extra Products Scenario (B) will provide us with that condition. Mast-producing oak forests, on the other hand, are found in both the Timber and Extra Products Scenario (B) and the Timber and Hunting Scenario (C). Comparisons were continued for each of the

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measured conditions. It is then a simple matter to rate each scenario against each measurement condition and then determine which scenario does better in satisfying the top-level goals.

Shifting Goals, Changing Decisions

We usually learn a lot from this process. We may find that a goal that we selected at the beginning turns out to be unrealistic. We learn this because no matter what we do in any scenario, we simply cannot achieve this particular goal given the resources we are willing to spend and the time we are willing to commit. We then may wish to change our goals or maybe see if we can achieve them in 60 years instead of 40, and thus leave a legacy for our grandchildren. We may also discover through discussions some other ways to manage our property, thus creating another alternative scenario. Such changes are fine, because now it's inexpensive to look at different futures and different goals until we are comfortable with our "final decision."

This final decision is, of course, only tentative. It is likely that next year or the year after, we, as well as our world, will have changed enough that our "final decision" may be outdated. But because we have done our homework, know our land and have increased our understanding, we can go through the NED process again pretty quickly and efficiently.

The NED team has worked out how to execute the decision process we have just described. The Deer Hill case study is our first formal case study. We have learned much and realize we have yet much to learn.

The NED team is currently starting formal case studies with the Maryland Department of Natural Resources in Baltimore; the Nature Conservancy in Georgia; Paul Smith's College in New York; Casey & Co. Forestry in Wilkesboro, North Carolina; and others. We are currently seeking other forestry consultants, state and private forest managers and private landowners willing to work with us to test NED.

If you are interested in NED or wish to see more detailed descriptions of the decision process, contact H. Michael Rauscher at USDA Forest Service, 1577 Brevard Road, Asheville, NC 28806; (828) 667-526, ext. 102; <mrauscher@fs.fed.us>; or Mark J. Twery at USDA Forest Service, P.O. Box 968, Burlington, VT 05402; (802) 951-6771, ext. 1040; <mtwery@fs.fed.us>.

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