Managing Disturbance-adapted Ecosystems: an Information and Education Challenge

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Abstract: The Florida Ocala National Forest's sand pine scrub supports 26 species of endangered, threatened, or sensitive wildlife and plants as well as a thriving population of white-tailed deer. Scrub is adapted to a cycle of burning and regrowth, and scrub wildlife benefits from clearcutting and fire. Clearcutting in sand pine scrub is a successful and profitable method for ecosystem management because it simulates the effects of fire. Disturbances are negatively perceived by many in the general public. This perception is a challenge in management of ecological communities which are adapted to disturbance. An open forum including interested people from federal agencies, universities, and conservation groups was held to review management practices with a view to improvement of scrub habitat while sustaining an economically viable forestry program in the Ocala National Forest.

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The purpose of this paper is to present an example of the development of an ecosystem approach to management through the cooperative efforts of resource managers, scientists, and the conservation community. We thank Donald Palmer of the U.S. Fish and Wildlife Service who suggested the process and facilitated the meetings, and we thank everyone who participated. We thank Dean Beyer and others who reviewed the manuscript and gave suggestions. We thank Oscar Diaz and Beth Adams who supplemented the authors' scrub jay data with many records.

Sand pine scrub is an ecological community unique to peninsular Florida. Scrub occurs in coastal Florida and on the central ridge of the peninsula. The largest remaining block of sand pine scrub habitat is in the Ocala National Forest and totals nearly 81,000 ha. The mature sand pine forest has a dense canopy of twisted trees with an understory of scrubby vegetation, and very little herbaceous ground cover. Sand pine scrub is characterized by the sand pine (*Pinus clausa*); several species of evergreen scrubby oaks including sand live

oak (*Quercus geminata*), Chapman's oak (*Q. chapmanii*), and myrtle oak (*Q. myrtifolia*); and by Florida rosemary (*Ceratiola ericoides*), saw palmetto (*Serenoa repens*), and rusty lyonia (*Lyonia ferruginea*) (Myers and Ewel 1990).

The Ocala National Forest's sand pine scrub supports 8 species of endangered, threatened, and sensitive plants and 18 species of threatened and sensitive wildlife. The scrub has many endemic species, including the Florida scrub jay (*Aphelocoma c. coerulescens*), Florida scrub lizard (*Sceloporus woodi*), scrub morning glory (*Bonamia grandiflora*), scrub milkwort (*Polygala lewtonii*), and scrub buckwheat (*Eriogonum floridanum*) to name a few.

The scrub supports a large population of the gopher tortoise (*Gopherus polyphemus*), which has many commensal species including the gopher frog (*Rana capito aesopus*), Florida mouse (*Podomys floridanus*), and several scarab beetles (*Onthophagus polyphemi* et al.). In the Ocala National Forest rare scrub species inhabit early seral stages of scrub which do not have a canopy of mature sand pine forest.

From the standpoint of information and education, one of the scrub's best representatives is the Florida scrub jay, considered a disjunct subspecies of the western scrub jays. Scrub jays are attractive, curious, and easily spotted, and are listed as threatened by the U.S. Fish and Wildlife Service. The Ocala National Forest has recorded 682 active scrub jay territories including 1,951 birds. The Ocala National Forest has one of the largest scrub jay populations, approaching the Merritt Island National Wildlife Refuge's estimated population of 2,500 (Breininger 1989). In the Ocala National Forest 98% of scrub jay territories are in regenerating scrub and sand pine stands aged 2 to 12 years. These young stands are the result of timber cutting or wildfire, followed by regeneration.

Young stands are valuable to the white-tailed deer (*Odocoileus virginianus*), the Ocala National Forest's most popular game species. There are about 8,000 deer, or 1 per 20 ha (Abbott 1994). The most valuable deer foraging areas in the Ocala National Forest are sand pine and scrub oak stands aged 3 to 10 years, based on mast availability and forage selection studies (Brooks and Abbott 1984).

The scrub community is adapted to periodic natural fires which burn all vegetation above ground. Historical records indicate that stand replacing crown fires occurred frequently in Ocala sand pine scrub on a cycle of 10 to 100 years, with an average frequency of 35 to 50 years (W. F. Hill, deputy forest supervisor, Fla. Natl. For. unpubl. rep. 1916). On a windy day in spring 1935 an intense scrub fire consumed 14,000 ha in 4 hours (J. W. Cooper, ranger, Ocala Natl. For. unpubl. rep. ca. 1938). A burning stump in the flatwoods community started a fire which was driven 26 km in 3 hours, burning 4,000 ha. The wind then shifted, driving the 26 km wall of flame through 10,000 ha during the next hour. The fire was extinguished by heavy rain.

If the 1935 fire occurred today there would be serious loss of life and property. There are about 30,000 residents in the Ocala National Forest today. The best defense against large fires is scattered openings, which lack tree crowns to

carry fire. In an average year the Ocala National Forest has about 100 small scrub wildfires which affect a total of about 600 ha. However, dry windy conditions can still produce impressive scrub fires. On 17 May 1985 there were 4 fires which burned about 5,300 ha. The fires could have rivaled the 1935 fire were it not for the scattered openings in the sand pine canopy from timber harvest.

Wildlife of the Ocala National Forest's sand pine scrub is adapted to the early seral stage which was historically maintained by fire. Stand replacing fires on the historical scale are too dangerous to be used for habitat maintenance today.

One of the important aspects of ecosystem management is increased awareness of ecosystem processes and functions. When modern realities place constraints on natural processes, management practices can be used which most closely mimic their effects. The scrub responds in similar ways to timber harvest as to natural disturbance through fire or wind storms. Sand pine harvest is a safe and profitable alternative to wildfire. Along with its value for wildlife, the sand pine scrub has tremendous timber value. Sand pine is a renewable resource which provides wood and paper products and employment in the local area. The Ocala National Forest sustains an annual sand pine harvest of about 50 million board feet from about 1,200 ha. Proceeds from the harvest are about $1,800 per hectare, while regeneration costs average about $185 per hectare. The Ocala National Forest's sand pine timber harvests generate about $2 million each year. Sand pine is a short-lived tree, and dies at about age 60 if not harvested, burnt, or blown over before then. When mature sand pine dies and falls over, thick scrubby oaks dominate the site. This does not provide the appropriate structural conditions for the scrub jay. Areas of thick mature scrub oak lack the open sand which is a key habitat feature for scrub jays and rare scrub plants. Without harvests, we would need to maintain young scrub for the scrub jay by mechanical means or prescribed burning. It would cost about $37 per hectare to perpetuate scrub jay habitat by prescribed burning or about $160 per hectare for brush removal with heavy equipment. The choice is a net profit to taxpayers of about $1,615 per hectare for sand pine harvest.

In the Ocala National Forest clearcutting is the primary management tool for preservation of habitat for the threatened Florida scrub jay and many other species of scrub endemic wildlife and plants. Clearcutting in National Forests is controversial due to effects on species of old-growth communities such as the spotted owl. There is a risk of losing this management tool in the Ocala National Forest due to controversies concerning management of other ecological communities which are not as adapted to disturbance.

The Florida scrub jay is a territorial bird which engages in cooperative breeding. It lives in families with a mated pair, male and female subadult helpers, and young of the year. Families range in size from just a pair to 10 birds or more (Woolfenden and Fitzpatrick 1984).

The Ocala National Forest is a constantly changing mosaic of habitat suitable for scrub jays (Cox 1987). In the Ocala National Forest, the Florida scrub

jay occupies regenerating sand pine scrub from about 2 to 12 years post-harvest. About 28,000 ha are age 2 to 12, and theoretically suitable for scrub jays. About 12,000 ha are occupied. Almost all of the presently occupied areas will be unsuitable in 12 years, but scrub jays will occupy many new sites.

With a seemingly ideal situation, a threatened species and game species favored by profitable harvests or wildfires, one might think the Ocala National Forest would have little controversy to deal with in regard to timber and fire management. Despite the importance of forest openings for wildlife habitat and public safety, many people perceive disturbance as having a negative effect on ecosystems.

In a 1994 poll, 47% favored timber harvest on federal lands and 44% opposed it. Results were similar for prescribed fire, with 49% supporting and 42% opposing. A majority (52%) supported forest management, rather than letting nature take its course (40%). A large majority, 74%, said the Forest Service should be given more management flexibility, while 17% favored closer regulation by Congress (Smith and Clark 1994).

We hope the residents of Florida and the Ocala National Forest have a more favorable impression of forest management as compared with the national average. Forest residents who remember the 1985 fire seem to appreciate the public safety benefits of forest openings; however, Florida is growing by about 1,000 residents per day who primarily come from urban areas and northern states. It is a continual challenge to reach these new residents. The Ocala National Forest has developed materials for school children based on scrub ecology, displays at 3 Visitor Information Centers, portable displays for use at open houses and public meetings, a program of weekly bus tours in the winter and spring, and a slide program on the scrub ecosystem.

Information and education efforts for the general public have been supplemented by efforts to confer with our peers in the resource management profession. In 1991 an open forum including interested people from federal agencies, universities, and conservation groups was held to review our harvest and regeneration practices with a view to improving habitat for the scrub jay and other scrub endemic species. Participants included an interdisciplinary staff from the Ocala National Forest and our Supervisor's Office including wildlife, fire, silviculture, and management; and representation from the U.S. Forest Service Southeastern Forest Experiment Station, U.S. Fish and Wildlife Service, Florida Game and Fresh Water Fish Commission, Archbold Biological Station, University of Florida, Florida Defenders of the Environment, and the Florida Chapter of the Sierra Club.

The participants reviewed information about areas presently occupied by scrub jays and areas available for future habitat. The Ocala National Forest has GIS (Geographic Information System) products displaying information which guides decision making in timber sale planning for scrub jay habitat. The products show currently suitable scrub jay habitat, which includes scrub and sand pine areas aged 2 to 12 years; areas to be suitable in the near future, which

includes areas prescribed for harvest; and areas potentially suitable for future decades, which includes poletimber sand pine stands not yet old enough to harvest. The process for estimating scrub jay habitat over time is similar to that used by foresters to calculate sustained yield and distribution of timber sales. When combined with field observations of scrub jay occurrence, the GIS product is a powerful yet inexpensive tool for planning future timber sales to perpetuate the scrub jay. The group also reviewed age class distribution data for sand pine in the Ocala National Forest and discussed historical records which document the pre-management conditions of the forest.

After the group reviewed the information and evaluated the situation in the field, several ideas emerged. Individuals suggested a few adjustments to methods of harvest and regeneration of sand pine stands and the establishment of special scrub jay emphasis areas. Scrub jay management areas are under consideration in the pending revision of the National Forests in Florida Land and Resource Management Plan. Most of the other ideas for adjustment of timber management practices were within the District Rangers' authority to implement immediately.

One adjustment was to leave small patches of scrub to provide nesting areas for scrub jay. Harvest and site preparation by chopping do a thorough job of flattening vegetation. The scrub oaks and palmettos sprout quickly, and provide enough acorns and fruits to support scrub jays within 2 years post-treatment. However, it generally takes another year for scrub to be thick enough to shield a scrub jay nest from predators. Scrub jays at Archbold Biological Station, the best-studied population, generally have a territory of about 10 ha (Woolfenden and Fitzpatrick 1984). We presumed that scrub jay density in the Ocala National Forest could potentially approach this figure. In areas where chopping is the site preparation method, we leave an area of about 0.2 ha of scrub for each 10 ha to provide denser nesting cover. This patch of more advanced scrub may enable the jays to nest a year sooner than would otherwise be possible, and may improve nesting success.

The group supported the use of fire in the sand pine community whenever possible. Where fuels loads are adequate, site preparation will be through prescribed fire rather than chopping.

Another suggestion was to facilitate colonization of new areas by placing harvests next to presently occupied areas. As canopy closes in sand pine stands at about age 12, they are no longer suitable for scrub jays. Placing new openings by presently occupied areas gives opportunity for the jays or their offspring to easily move to the new areas. In the past, prescribers tried to place new clearcuts so as to leave older trees between the new opening and other young stands. This was primarily to avoid the visual effect of large openings. However, the practice fragmented habitat for scrub jays. It was also contrary to the natural condition of large openings which resulted from massive wildfires. All that was required to adopt this suggestion was a change in philosophy, while assuring that the legal limit of 48 ha (120 acres) per opening was not violated.

Another suggestion was larger clearcuts. Though jays are territorial, it is advantageous for them to have near neighbors and large areas of suitable habitat. This helps the subadult birds to promptly fill vacancies in the ranks of the breeding birds, and enhances opportunities for colonization of new areas. Assuming a requirement of 10 ha per family (Woolfenden and Fitzpatrick 1984), a regeneration area >40 ha could potentially support 4 families. In the Ocala National Forest, scrub jay territories average 16 ha. This may be an artifact of average stand size rather than an indication that scrub jays in the Ocala National Forest require a territory this large. Our average stand size is 19 ha, which may be slightly under the area required to support 2 families. As openings increase in size, number and density of birds may possibly be enhanced. Hence the support for larger clearcuts.

Many participants supported establishment of special scrub jay management areas of at least 400 ha. This suggestion is under consideration in the pending revision of the National Forests in Florida Land and Resource Management Plan. Some ecologists believe that clearcutting is not an adequate substitute for the catastrophic fires that once swept through the sand pine forest. In the scrub jay management areas, fire would be used as the primary tool for setback of the seral stage. The fire cycle would be 3 to 5 times as frequent as the average sand pine harvest cycle, every 12 to 15 years as compared to every 45 to 60 years. There would be one last harvest of sand pine from the designated areas. There would be no sand pine regeneration through silvicultural methods. The areas would regenerate naturally until reaching a condition which was no longer suitable for scrub jays. The areas would then be burned in large blocks to create conditions favorable for endemic scrub species. The areas would be kept in suitable condition for scrub endemics almost continually.

Prescribed burning in sand pine scrub will present challenges. Usually scrub does not burn adequately except on hot dry days with wind to carry a crown fire. Firebreaks will need to be large to contain the fires. The best firebreak is an adjacent open stand of several hectares or a large body of water. There are at least 30,000 people living in the Ocala National Forest whose lives and property must be protected from escaped fire. The location of the proposed scrub jay areas were selected to minimize these difficulties.

Cooperation in research was a significant result of the scrub jay meetings. The Ocala National Forest entered a 2-year agreement with Archbold Biological Station for scrub jay research in the Ocala National Forest. Selected families of scrub jays have been color banded. The project was established to assess nesting success, local population size, population dynamics, colonization, and other questions. The genetics of the Ocala National Forest's population is being compared with that of scrub jays throughout the rest of Florida. Our population has great potential to serve as a donor population for recovery in areas where the Florida scrub jay has been extirpated or is in decline. The agreement with Archbold Biological Station has expired, but we are continuing to monitor color-banded birds.

Besides the research efforts, monitoring of scrub jays and their occupation of managed areas is a continuing effort. All suitable habitat in the Ocala National Forest has been surveyed. The initial survey has been supplemented by annual checks of the youngest and oldest potentially suitable stands. Habitat suitability is dynamic, with older sites being abandoned and younger ones colonized. Our population estimate before the 1995 breeding season was 682 scrub jay families including 1,951 birds. We will continue to locate more families, correct the data base for colonization and abandonment dynamics, monitor banded birds, and add to our knowledge of local factors affecting populations.

In spring 1993, the Seminole Ranger District did a prescribed stand replacement burn of 11 ha of mature sand pine forest. This was the Ocala National Forest's first attempt at intentionally replicating a catastrophic fire in sand pine forest through prescribed burning. It has provided new opportunities for research. Sand pine logs in stands burned by wildfire are generally salvaged except where fires occur in Wilderness Areas. Before this effort, there were few easily accessible areas of unsalvaged burn which were available for ecological research. Presently there are research projects on plant succession, seedling survival, persistence of snags, use of snags by wildlife, scrub lizard population, and scrub jay colonization going on in this site. Results will be compared with timber harvest units to assess the extent to which harvest replicates the effects of fire in the sand pine scrub community.

Involvement of key individuals from the conservation and resource management community is a strong tool for land management decision making. It lends credibility and a base of support for land management decisions when used in addition to general public involvement efforts. It is an example of a new and effective approach for ecosystem management of National Forests.

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