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Title: **Scrub Management Guidelines for Peninsular Florida: Using the Scrub-Jay as an Umbrella Species**

D.O.: Division of Habitat and Species Conservation
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Note: This document is subject to update after further review.

SUMMARY:

This document provides management guidelines using Florida scrub-jay habitat requirements as the basis for the restoration and management of scrub habitats in the Florida peninsula (defined as the mainland south of an imaginary line from Cedar Key on the Gulf Coast to Jacksonville on the Atlantic Coast). The Florida scrub-jay can serve as an umbrella species (see Appendix 1) for Florida's peninsular scrub because the scrub-jay's habitat requirements encompass those of a majority of scrub-specialized plants and animals, which require a patchy mosaic of low vegetation heights and open patches of bare sand. If followed, these guidelines should benefit most scrub plant and animal species. Many scrub habitats in Florida have experienced fire exclusion or unnaturally infrequent fire regimes. Restoration of scrub habitats to a condition most beneficial to scrub-jays and most other scrub plants and animals will require re-establishment of the historical fire regime.

FULL TEXT:

These guidelines for the management of scrub habitats in peninsular Florida use the Florida scrub-jay (*Aphelocoma coerulescens*) as an umbrella species. Management actions that create the low, open structure of scrub favorable for scrub-jays likely benefit most other scrub-associate species such as the Florida scrub lizard (*Sceloporus woodi*), the threatened southeastern beach mouse (*Peromyscus polionotus niveiventris*; Suazo et al. in press; US Fish and Wildlife Service, 1989) more than 100 species of arthropods (Mark Deyrup, pers. comm.), and many species of plants (Menges 2007). These recommendations also will benefit more widely distributed species such as gopher tortoises (*Gopherus polyphemus*; Diemer 1986, Breininger, et. al 1994, Ashton and Ashton 2008), white-tailed deer (*Odocoileus virginianus*; FWC 2007), wild turkey (*Meleagris gallopavo*; David Nicholson, Florida Fish and Wildlife Conservation Commission [FWC], pers. comm., Brian Zielinski, National Wild Turkey Federation, pers. comm.), and various declining bird species (MacAllister and Harper 1998, FWC 2005). In the absence of compelling reasons to do otherwise such as alternative management objectives, we

recommend that managers of scrub habitats in peninsular Florida aim to create conditions that meet general requirements for the Florida scrub-jay, even if scrub-jays are absent from a property.

These guidelines provide general information for planning and goal-setting. Though management for scrub-jays creates the low, open habitat suitable for a majority of scrub species, these guidelines are not intended to replace local knowledge of other effective management strategies or to override management for other rare species or native habitats. Managing for pyrodiversity (defined in Appendix 1) provides a bet-hedging strategy to ensure benefits for the maximum number of species (Menges 2007). Given regional variation in scrub habitats, we recommend that land managers network and discuss management experiences, particularly with regard to specific requirements of rare plants and methods for restoring long-unburned scrub. Regional working groups provide one forum for addressing these topics with neighboring land managers and other experts.

Types of Scrub

There are various types of scrub habitats in peninsular Florida, including oak scrub, yellow sand (or oak-hickory) scrub, sand pine scrub, coastal scrub, and rosemary scrub (FNAI 2008). However, all of these scrubs usually contain one or more species of shrubby oaks, including sand live (*Quercus geminata*), myrtle (*Q. myrtifolia*), Chapman's (*Q. chapmanii*), and on the central ridge, scrub oak (*Q. inopina*; Woolfenden and Fitzpatrick 1996).

USING POTENTIAL SCRUB-JAY TERRITORIES TO GUIDE MANAGEMENT

We recommend that, in the absence of other ecologically justified conservation goals such as the maintenance of red-cockaded woodpecker (*Picoides borealis*) clusters, vegetation be managed to promote optimal (see Table 1) scrub-jay habitat within potential scrub-jay territories (see Appendix 1), regardless of whether the birds currently occupy those areas. These conditions replicate what was most likely the historical condition of the landscape and provide good habitat for the majority of other scrub-adapted species.

Scrub-jays maintain territories averaging 25 acres in optimal habitat (Breininger 2004). In addition to scrub habitats, optimal scrub-jay territories often incorporate a variety of other habitats including scrubby flatwoods, sandhills (high pine), prairie, wetland margins, and open mesic flatwoods. Scrubby flatwoods, which may constitute all or the majority of scrub-jay territories in some areas, usually contain a higher percentage of saw palmetto (*Serenoa repens*), fetterbush (*Lyonia lucida*), and wiregrass (*Aristida stricta*) and often have a sparse overstory of slash (*Pinus elliottii*) or longleaf pine (*P. palustris*). Scrub-jays may occur in areas that completely lack scrub or scrubby flatwoods, but scrub-jays are unlikely to persist long term in these areas without immigration from habitat that contains at least some scrub or scrubby flatwoods (Breininger 2004).

Visualizing a grid overlay of 25-acre cells is a useful way to estimate the number of potential territories at a site. On a given property, the goal would be to maintain 70% of these potential territories in optimal condition (see Table 1). The remaining 30% would be too short (i.e., average shrub height < 4ft and < 1 acre of optimal height shrubs) due to recent management or slightly too tall (i.e., average shrub height slightly above 5.5 feet). We recognize that especially on some larger properties it may not be feasible to achieve this 70% to 30% ratio of optimal versus suboptimal territories due to the size of burn units and other management constraints; every site is unique.

Optimal Florida Scrub-Jay Habitat Overview

Optimal scrub-jay habitat is that in which scrub-jays achieve maximum demographic performance, in other words, maximum combined survivorship of adults, juveniles, nestlings, and eggs. This habitat consists of mostly treeless open expanses of low shrubs interspersed with bare sandy patches. Oaks and other shrubs are generally low enough that a person approximately 6 feet tall can see over most of the landscape (Figure 1). Table 1 describes these habitat conditions in more detail. The vegetation characteristics outlined in Table 1 benefit the maximum number of scrub-endemic plant and animal species, as well as many widespread species. We acknowledge that more research is necessary to determine many Florida scrub-jay habitat specifics such as maximum number of snags per territory and maximum number and size of tall scrub oak patches.

Figure 1: Optimal scrub at Savannas Preserve State Park. Note low structure, sandy openings and sparse tree cover (photo by Chris Vandello).

See this website for more habitat photos:
http://share2.myfwc.com/scrubjay/Habitat%20Photos/Forms/AllItems.aspx

Table 1. Optimal Florida scrub-jay habitat characteristics per territory. Adapted from Breininger (2004), Breininger et al. (1998) and, Burgman et al. (2001).

Vegetation height	Optimal height of shrub layer averages 4 to 5.5 feet tall to provide cover and produce acorns for scrub-jays. Optimal arrangement of shrub heights within each potential territory includes: • At least 10% of the territory in optimal height • The rest of the vegetation in optimal height or shorter • No more than 1 acre of vegetation taller than 5.5 feet
Tree (>15 foot tall) overstory	If present at all, less than 1 tree per acre
Distance to forest edge	Maintain a 1,000 foot non-forested (<1 tree per acre) buffer between a scrub-jay territory and forest (Burgman et al. 2001)
Open ground	10-50% bare sand or sparse herbaceous vegetation

Vegetation Heights

Vegetation height within a territory is one of the most important factors influencing demographic success of scrub-jays (Breininger and Carter 2003, Breininger and Oddy 2004, Breininger et al. 2006). The optimal average height of the shrub layer for scrub-jays is 4 to 5.5 feet (Breininger and Carter 2003). This average shrub height also provides appropriate habitat for the majority of other scrub-adapted species. Scrub-jay numbers, as well as numbers of scrub-endemic plants, quickly decline in areas where the shrub layer averages taller than 5.5 feet (Breininger et al. 1998). When average vegetation height becomes too tall, managers can reduce the height of the shrub layer using fire or a combination of mechanical means and fire. Ideally, all jay territories will have access to some optimal scrub, even when portions of their territory have been burned or mechanically treated. Options include treating only a portion of each jay territory or leaving small patches of oaks (4 to 5.5 feet tall) within each territory that can provide escape and roosting cover, nesting sites, and acorns. Given that the ecological role of taller scrub (taller than 5.5 feet) is not well understood, it may be beneficial to leave a small percentage of taller scrub (see Table 1) on the landscape (Kevin Enge, FWC, pers. comm.). Historic fire shadows (Appendix 1), for example, provide an opportunity to maintain some taller patches on a property.

Tree Overstory

Scrub-jays generally avoid heavily forested areas and do best in areas with no more than one tree per acre (Breininger 2004). A thick overstory also results in less light reaching the ground, resulting in reduced habitat suitability for most scrub-adapted species. In areas managed for scrub-jays and other scrub associate species, thinning of dense pine through frequent burning and mechanical removal may be necessary to restore scrub. Moreover, thinning in adjacent non-scrub habitats maximizes available space for scrub-jays, which incorporate seasonal wetlands and pine flatwoods into their territories provided these habitats have a sparse pine canopy. Most dense stands of pine today occur in areas where fires have been unnaturally excluded for decades.

For scrub-jay territories that occur entirely in non-scrub habitats and for non-scrub lands within the 1,000 foot buffer (Table 1), the amount of tree thinning is ultimately at the discretion of the land manager. Managers must weigh the benefits to scrub-jay population survival at a site against the habitat needs of other species in non-scrub areas considered for thinning.

Distance of Scrub-Jay Territory from Forest Edge

Areas of otherwise suitable habitat within 1,000 feet of a forest may constitute lower quality habitat for Florida scrub-jays (Burgman et al. 2001, D. R. Breininger, Dynamac Corporation, pers. comm.). For example, scrub-jay daily nest survival rates showed a declining trend as far as 800 yards from dense forests during a 20 year period at a study site on Merritt Island in Brevard County (G. C. Carter, Dynamac Corporation, unpublished data). Scrub-jays may avoid these ‘tree shadows’ (see Appendix 1) because potential predators such as hawks pose a threat in these areas. Thinning of patches of pinelands to <1 tree per acre within 1000 feet of scrub patches will maintain maximum habitat suitability for scrub-jays within these areas (Burgman et al. 2001). However, we do not recommend the compromise of natural non-scrub habitat of other rare species.

In some cases, the ability of scrub-jays to disperse across a landscape (the ‘permeability’ of the landscape – see Appendix 1) may be enhanced by thinning trees to produce a more open forest (i.e., to pre-fire exclusion tree densities). Scrub-jays may be reluctant to disperse through thick, tall forest (tree curtains – see Appendix 1) as narrow as 100 yards wide (D. R. Breininger, Dynamac Corporation, pers. comm.). Isolated optimal habitat patches surrounded by dense upland forests may remain unoccupied permanently, especially in areas with low numbers of dispersing scrub-jays. We recommend managers

view their site's scrub-jay population within a regional context and coordinate with their neighbors to maximize permeability of the upland landscape.

Open Ground

Many scrub plant and animal species depend on maintenance of open areas where sunlight reaches the ground (Campbell and Christman 1982, Hawkes and Menges 1996, Menges and Kimmich 1996). Optimal scrub-jay habitat contains 10% to 50% open ground with either bare sand or grass ≤6 inches tall (Breininger 2004). Scrub-jays use these open areas to cache acorns and search for insects; individual scrub-jays buried an average of 6,500 to 8,000 acorns during one fall in a study at Archbold Biological Station (DeGange et al. 1989). Endemic scrub herbs, especially in the Lake Wales Ridge scrub, and other scrub associate species (e.g., lichens and sand skinks) also require bare sand patches.

APPROACHES TO SCRUB MANAGEMENT

Fire

Historically, scrub habitats were maintained in conditions suitable for scrub associate species by low frequency, high intensity fires occurring under extreme burning conditions with high wind, low humidity, and low fuel moisture (Myers 1990). Repeated applications of lower intensity fires (such as many winter burns) may not achieve the same ecological function as a more natural burn regime. Whenever possible, we recommend the application of growing season burns, the season when most fires naturally occurred. However, low intensity fires are better than none at all; when weather conditions prohibit a planned growing season burn, it may be beneficial to conduct a winter burn rather than waiting for optimal conditions during subsequent growing seasons. Varying the season, frequency, and spatial extent of burns helps to create diverse landscapes that benefit a large number of species. While mechanical treatments do not have the same ecological effect as fire (Menges and Gordon in preparation, Suazo et al. in press, Weekley et al. 2008), they could be used in combination with fire to manipulate vegetation stature and create a similar structural effect as fire.

We recommend managers use vegetation height to determine when to burn. To maintain a low, open scrub structure, fires must be frequent enough to keep average shrub height generally below 5.5 ft, but leave vegetation heights variable enough to allow continuous acorn production within a territory. Scrub oaks generally begin producing acorns three years after being top-killed by a severe burn (Fitzpatrick et al. 1991), but this may vary among sites. Allowing prescribed fires in adjacent flatwoods or sandhills or other habitats to burn into scrub may achieve this desired mosaic (see Appendix 1) if fires burn into the scrub far enough to create openings and low vegetation, but not so severely that all vegetation at optimal height is lost (Breininger et al. 2002). However, if a site is severely fire-suppressed and unsuitable for most scrub-associate species, managers may wish to use extensive 'restoration' burns (see Appendix 1) to restore the entire area as quickly as possible.

We do not recommend a fixed prescribed fire return interval because of the high degree of variation in scrub types and site conditions, including an individual site's burn history. For example, fire return intervals between 8 and 15 years have been recommended as optimal for maintaining Florida scrub-jay populations in *Quercus inopina*-dominated scrub (Woolfenden and Fitzpatrick 1996). An 8 to 15 year fire return interval may be too long on central Florida's Atlantic coast, where openings in scrub disappear within 3 to 5 years (Schmalzer 2003, Schmalzer and Hinkle 1992, Breininger et al. 2002). Menges (2007) recommended a 5 to 12 year fire return interval for oak-hickory scrubs for scrub plants, and he notes that some scrubby flatwoods and oak-hickory scrubs may be ready to burn as soon as 3 years post fire. By contrast, rosemary scrub has a minimum fire return interval of 15 years (Menges 2007). Some species associated with rosemary scrub, such as Florida rosemary (*Ceratiola ericoides*)

and some invertebrates, respond poorly to frequent fire. Therefore, patches of rosemary scrub may need special consideration during management activities. Even when burned infrequently, rosemary scrub maintains the low structure optimal for scrub-jays.

Scrubby flatwoods burn more readily than scrub and may recover more quickly as a result of a higher vegetation density (USFWS 1999). Long unburned scrub may resprout with great vigor and require more frequent burning in the initial stages of restoration to maintain optimal conditions (Schmalzer and Hinkle 1992, Schmalzer et al. 1999, Schmalzer and Adrian 2001).

Burning Occupied Scrub-Jay Habitat

The strategy for burning in occupied scrub-jay habitat will depend on the size of the area and how many occupied territories it contains. If the property is large and contains many occupied territories, an entire territory may be burned at once. On smaller properties with limited habitat, care should be taken to avoid burning entire territories at once. Conducting a mosaic burn in an occupied territory should ensure that some optimal habitat remains for resident scrub-jays. However, in some instances, it may be logistically desirable, necessary, or unavoidable to burn entire territories that are occupied. Ideally, in these instances, adjacent lands should offer suitable habitat to which birds can relocate.

Mechanical treatments (see Appendix 2)

While the goal of management should be to restore fire to scrub habitats, mechanical treatments prior to burning may be useful to speed up restoration, create ignition strips, reduce fuel height to maintain prescribed fire safety, or maintain fuel height in areas where fire is not possible. However, mechanical treatments do not provide an ecological substitute for fire and should be followed by prescribed fire if possible (Menges and Gordon in preparation, Suazo et al. in press, Weekley et al. 2008). Mechanical treatments are usually more expensive than burning alone and often involve heavy equipment that may result in soil disturbance and ecological damage such as harming fossorial animals and introducing exotic plant material. Mechanical equipment and tools that have minimal soil disturbance are preferable. Examples of those types of equipment include chainsaws, track vehicles, and single pass empty roller drums.

If mechanical treatments use heavy equipment to prepare a site for fire, we recommend management techniques and operating methods that minimize soil disturbance and foster mosaic burns. The use of ‘sloppy’ (see Appendix 1) methods of treatment produce an uneven and more natural landscape after fire (J. Hinchee, U.S. Forest Service, pers. comm., Kevin Enge, FWC, pers. comm.). Alternatively, treating strips through a unit may achieve a more complete but still mosaic burn. The use of tracked vehicles usually results in less soil disturbance than using vehicles of a similar weight that have tires (Stefanie M. Nagid, City of Gainesville Nature Operations Division, pers. comm.). An empty roller drum pulled by a track vehicle in a single pass method will push vegetation down instead of digging into the soil. If the goal is to create the desired safety conditions for a burn, it may be possible to mechanically treat only the perimeter of a unit (Doren et al. 1987). These methods can reduce the potential negative impacts of mechanical treatments while providing enhanced opportunity to control prescribed burns.

Effects of mechanical treatments on lichens, soil crusts, and many focal species have not been adequately studied. If gopher tortoises are present, mark and avoid burrows during mechanical treatments where possible, and consider treating areas during winter, when animals are most likely to be underground and out of harm’s way, then following up with a spring/summer burn. Consider the effects on rare plants and other localized special features in the mechanical treatment footprint.

Managers using mechanical treatments have reported the possibility that these treatments caused infestations of invasive plants, such as Natal grass (*Rhynchelytrum repens*). These infestations may result from neighboring exotic plant populations spreading into areas with disturbed soil, from severe fires in deep mulch created by mechanical methods (E. Egensteiner, Florida Park Service, pers. comm., K. Main, Archbold Biological Station, pers. comm.), or from seed brought in on equipment. To minimize the chance of spreading invasive seeds, wash equipment (or ensure contractors have washed equipment) before and after each use. Treatment of nuisance and exotic vegetation within a manager's control surrounding the area prior to mechanical restoration may reduce the possibility of wind blown seeds dispersing into the restoration area.

While mechanical treatments are often useful to restore vegetation, these areas should still be burned, preferably less than three months following treatment. Beyond six months, the mulch layer starts breaking down and the increasing shrub height retards wind and creates shade, all of which decrease the flammability. Mechanically treated scrub may not carry fire well after more than a year without a follow-up burn (S. Morrison, The Nature Conservancy, pers. comm., Weekley et al. 2008). There is no ecological substitute for fire – it is essential for the maintenance of plant species richness in scrub habitat and likely has other benefits as well (Menges and Gordon in preparation, Weekley et al. 2008, Williges et al. 2006). Mechanical treatments are best used sparingly, preferably only initially to start the prescribed burning cycle or as one component of the burn process. The results of mechanical treatments should be monitored.

Assess Results

These guidelines should improve the structure of scrub on a given property, thereby benefiting rare species such as the Florida scrub-jay and other scrub associate plants and animals. However, only by monitoring the responses of native and rare species will a manager know whether or not the treatments are beneficial. Habitat management is the first step in the stewardship of Florida's scrub resources; monitoring of target species can provide the appropriate feedback to land managers as to the success of their program.

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Appendix 1: Terminology used in this paper

Fire shadow: An area that remains unburned for long periods of time while the surrounding landscape is burned. Usually due to fire behavior associated with a landscape feature such as a wetland.

Mosaic burn: A burn that results in a landscape of variable burn intensities and vegetation heights, with some patches left unburned.

Permeability: Used to describe the degree to which a scrub-jay may pass through a landscape.

Pyrodiversity: The temporal and spatial variation of fire on a landscape that results in fires of different intensities and burn areas and maintains optimal habitat requirement for a large variety of species. Managers can increase pyrodiversity on a property by varying seasonal ignition times, time since fire, and methods of ignition while conducting mosaic burns.
Tree curtains: Heavily forested landscapes surrounding more open habitats. Tree curtains may decrease permeability and provide cover for predators such as raptors.
Tree shadow: An area of reduced survival or reproductive success adjacent to a forested area in otherwise suitable habitat. Alternatively, an area of otherwise suitable habitat that remains unoccupied due to proximity to a forest edge.
Scrub-jay territory: The area defended by a scrub-jay family group. Scrub-jay family groups defend areas that average 25 acres, but the size of any one territory is highly variable and depends on site characteristics and each individual territory's history. In areas with a low density of scrub-jays, individual scrub-jay families may defend very large areas
'Sloppy' treatment: a means of mechanically treating an area in which some small patches are left untreated to give the resulting landscape a diversity of shrub heights. Sometimes referred to as the sloppy chop if a rollerchopper is involved.
Restoration burn: An intense, complete burn across the entire area of unoccupied habitat, or of occupied habitat provided there is ample optimal unoccupied habitat nearby. A restoration burn is often necessary in long unburned areas.
Umbrella species: A species whose habitat requirements are also requirements of a wide range of other species; managing for an umbrella species will create habitat conditions that will also benefit many other species.

Appendix 2: Mechanical methods for vegetation reduction
For all of mechanical methods, minimize soil disturbance and opportunities for invasive plant intrusion, and maximize the mosaic burn effect by utilizing 'sloppy' cuts. The goal of all these treatments should be, when possible, to return fire to the landscape ideally from 3 months to a year after the mechanical treatment.

Chain Saw: The least damaging method to reduce vegetation due to minimal soil disturbance and chance of invasion by exotic plants. Trees and/or tall shrubs should be cut at or near ground level to reduce the chance of vehicles getting caught on stumps. Piling felled trees creates hotspots during subsequent burns and can be used to promote openings.
Cutting/Chopping/Grinding: Used to reduce shrubs and trees by various methods of cutting, chopping, or grinding vegetation. Examples include the Brown Tree Cutter, Gyro-Trac, Kershaw Klearway, Fecon Bull Hog, and Brontosaurus. Using a coarse cut or only cutting the tops of vegetation will reduce the amount of mulch generated and create more desirable conditions for burning. Finer fuels may be hard to burn or may burn too severely due to long smoldering time.
Roller Chopping: The number of drums, number of passes, and weight of drums will vary between sites, but the most appropriate selection will include only the minimum needed to reduce vegetation height while causing the least amount of soil disturbance. Vehicles towing drums should avoid sharp turns that create rutting.
Root Raking: Causes substantial soil disturbance and should only be used where there are no other vegetative reduction methods available due to the possibility of invasive plant introduction and other potentially negative consequences of soil disturbance.
Timber Harvest: May be a suitable management approach for reducing or eliminating some canopy trees.