Southern Fox Squirrel

Sciurus niger

Photograph by Michael Landwehr.

Species Overview

Status: Removed from Florida's Endangered and Threatened Species List.

Current protections:

- 68A-4.001, F.A.C., General Prohibitions and Requirement – Prohibits the take, transport, sale, and possession of wildlife.
- 68A-1.004, F.A.C., Take – The term take shall include taking, attempting to take, pursuing, hunting, molesting, capturing, or killing any wildlife or freshwater fish, or their nests or eggs by any means whether or not such actions result in obtaining possession of such wildlife or freshwater fish or their nests or eggs.
- 68A-29.002(1)c, F.A.C., Regulations Relating to the Taking of Mammals – Prohibits take, transport, sale, purchase or possession of fox squirrels (*Sciurus spp.*) unless authorized by 68A-9, F.A.C or unless authorized in Commission-approved guidelines.

Biological Background

This section describes the biological background for this species and provides context for the following sections. It focuses on the habitats that support Southern fox squirrels, and the threats faced by the species.

New analysis conducted in 2014 and 2015 determined that the Sherman's fox squirrel is not genetically distinct from other fox squirrels in north and central Florida, making it appropriate to group all fox squirrels north of the Caloosahatchee River as Southern fox squirrels (*Sciurus niger niger*) (Greene et al. 2015). The Southern fox squirrel has a distinct connection to mature, open, mixed pine-hardwood forests that historically were naturally maintained by regular fires and as a result have shrub and groundcover vegetation that is relatively open (Weigl et al. 1989, Perkins and Connor 2004, Greene and McCleery 2017*b*). In those forests, longleaf pine (*Pinus palustris*), or other pine species, typically dominate the tree cover, but turkey oak (*Quercus laevis*), or other hardwood trees, are scattered throughout the habitat (Moore 1957, Kantola and Humphrey 1990, Kantola 1992, Florida Natural Areas Inventory [FNAI] 2001, Greene and McCleery 2017*b*). However, Southern fox squirrels occur in multiple land cover classes that are structurally similar to the historic pine savannas (Greene and McCleery 2017*a*, Tye et al. 2017). Regular, typically frequent, application of management practices such as frequent fire is essential to maintain the proper structure (i.e., reduce the woody understory and groundcover vegetation and maintain appropriate hardwood tree canopy cover) and heterogeneity within forest communities and across landscapes (Greene and McCleery 2017*a*). Conserving a hardwood component, particularly retaining mature hardwoods trees, is important for food and cover resources (Conner and Godbois 2003, Prince et al. 2016, Greene and McCleery 2017*b*). Perkins et al. (2008) found that in longleaf pine forests, canopy cover of 11.8% hardwood was important for occupancy by Southern fox squirrels.

Southern fox squirrels can be more resilient to habitat modifications than previously thought (Greene and McCleery 2017*b*). Greene and McCleery (2017*b*) found that the amount of suitable habitat available to fox squirrels did not affect occurrence at the landscape scale. They found that Southern fox squirrels occurred in

a range of pine-dominated habitats including some pine plantations as well as pastures, croplands, and other agricultural lands. Southern fox squirrel also can occur in more urbanized areas such as parks and golf courses. Urbanized areas and agricultural lands can often mimic the structure of pine savannas or similar natural communities when mature, overstory pines and hardwoods are retained along with open, low groundcover. Although Southern fox squirrels do not appear to need large swaths of forest, as has been previously suggested (Greene and McCleery 2017*b*), tracts of high-quality, well-managed natural habitat, particularly on conservation lands will be important for long-term conservation of the subspecies.

Southern fox squirrels make nests of Spanish moss, pine needles, twigs, and leaves, while a few nests are within tree cavities (Kantola and Humphrey 1990). Nest trees have been found in multiple different species of trees, including longleaf pine, laurel oak, live oak, and turkey oak (Kantola and Humphrey 1990). At the Ordway-Swisher Biological Station in north central Florida, the predominant tree species found to contain nests was the turkey oak (68.6%); longleaf pines were the second most commonly used (17.7%). The Southern fox squirrel typically has 2 breeding seasons each year. The winter breeding season runs from October to February and the summer breeding season runs from April to August (Wooding 1997). Southern fox squirrels use multiple nests, and all nests can serve as a source of refuge and shelter, in addition to raising young. Adult female Southern fox squirrels defend mutually exclusive core areas, averaging 41 acres (Kantola and Humphrey 1990, Wooding 1997). Male fox squirrels may have overlapping home ranges, averaging 105 acres, and a single female core area may intersect multiple male home ranges. Male and female fox squirrels construct nests, and any given area may contain the nests of more than one fox squirrel, even when no fox squirrels are observed.

Threats

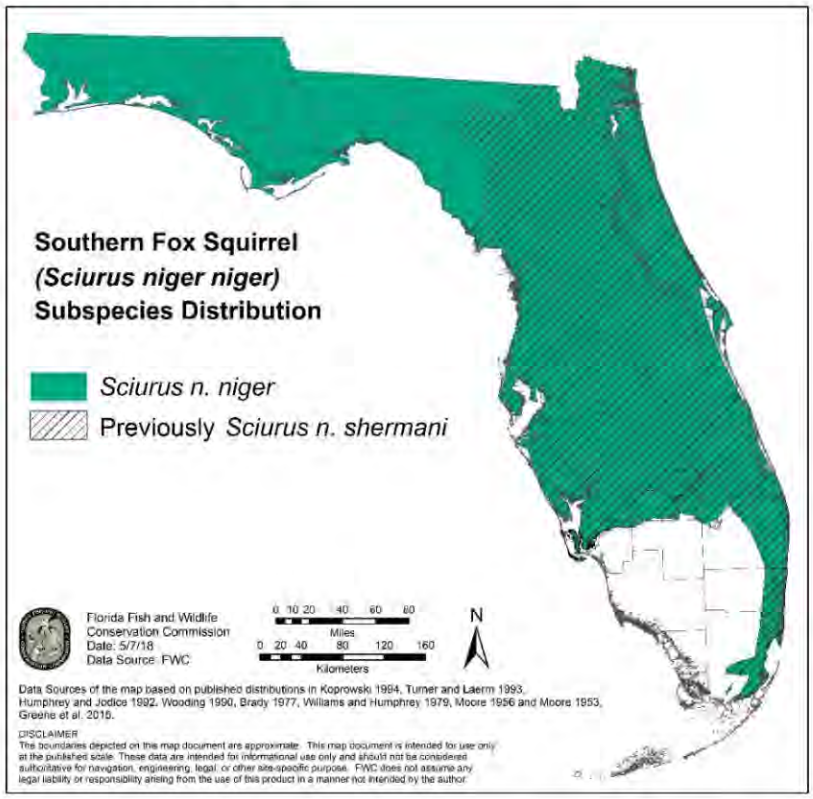
Photograph by Steve Glass, FWC.

Southern fox squirrels can be more resilient to habitat modifications than previously thought (Greene and McCleery 2017*b*), but habitat loss, fragmentation and degradation, resulting from conversion for development and other uses, continue to create threats for the long-term conservation of the Southern fox squirrel (Kantola and Humphrey 1990, FWC 2005, FWC 2017). Florida's longleaf pine forests were reduced by 88% between 1936 and 1986, to the extent that by 1987 only 380,000 ha (939,000 ac) remained (Wooding 1997). By 2000, the estimate was that only 2.2% of the historic longleaf pine forest in Florida was still intact (Frost 2006). Land acquisition programs such as Preservation 2000 and Florida Forever have secured habitat and reduced the rate of habitat loss for Southern fox squirrel and other species by setting aside significant areas of potential habitat. However, the condition of this habitat and the ongoing potential for degradation of habitat quality remain conservation concerns cited in the Sherman's fox squirrel Biological Status Review (FWC 20117). In 2017, a biological review group (BRG) was convened by the FWC to review the status of the Sherman's fox squirrel. When the BRG evaluated the species, they accounted for new analyses that found no genetic structure among fox squirrel populations in north and central Florida, indicating that *S. n. niger* is not genetically distinct from *S. n. shermani* or *S. n. bachmani* in Florida (Greene et al. 2015). Therefore, it is appropriate to group all fox squirrels in Florida north of the Caloosahatchee River as the Southern fox squirrel, *S. n. niger*.

During the 2017 Biological Status Review (BSR) the Biological Review Group concluded from their assessment that the Sherman's/Southern fox squirrel did not meet any listing criteria and, as a result, staff recommended that the Sherman's/Southern fox squirrel be removed as a Species of Special Concern from Rule 68A-27.005, F.A.C (FWC 2017).

Distribution and Survey Methodology

The shaded area of range map (right) represents the designated management unit for *S. n. niger*, the area encompassing all observations of individuals of the species, including intervening areas of unoccupied habitat. This map is for informational purposes only and is not for regulatory purposes.



Counties: Alachua, Baker, Bay, Bradford, Brevard, Broward, Calhoun, Citrus, Charlotte, Clay, Colombia, DeSoto, Dixie, Duval, Escambia, Flagler, Franklin, Gadsden, Gilchrist, Glades, Gulf, Hamilton, Hardee, Hernando, Hendry, Highlands, Hillsborough, Holmes, Indian River, Jackson, Jefferson, Lafayette, Lake, Lee, Leon, Levy, Liberty, Madison, Manatee, Marion, Martin, Miami-Dade, Nassau, Okaloosa, Okeechobee, Orange, Osceola, Palm Beach, Pasco, Pinellas, Polk, Putnam, Santa Rosa, Sarasota, Seminole, St. Johns, St. Lucie, Sumter, Suwannee, Taylor, Union, Volusia, Walton, Washington, and Wakulla.

Recommended Survey Methodology

Surveys can be used to determine if Southern fox squirrels are present in an area. Surveys are not required but if conducted in accordance with the methodology described below and the species is not detected, no further coordination with FWC is needed. Surveys to determine presence of Southern fox squirrel should be limited to the areas identified on the map in green.

- Habitat types for surveys include mature, open, upland mixed pine-hardwood forests and other areas of pine forests where hardwood patches are embedded or there are ecotones with hardwood patches (e.g., upland mixed woodland, upland pine, and sandhill [Florida cooperative land cover, v3.2, 2016]). The Southern fox squirrel also inhabits pine savanna, mature pine forests, cypress domes, pastures, the ecotone between bayheads and pine flatwoods, and other open habitats where mixed pines and oaks occur (Endries et al. 2009). In addition, surveys for Southern fox squirrels should considered in a range of rural, agricultural lands including some pine plantations, pastures and croplands, along with more urbanized areas such as parks and golf courses. Those urbanized areas and agricultural lands can often mimic the structure of pine savannas or similar natural

communities when mature, overstory pines and hardwoods are retained along with open, low groundcover (Greene and McCleery 2017*a*, Tye et al. 2017). Sites that do not encompass these habitat types but have preferred habitat components adjacent to the site should be surveyed because Southern fox squirrels have the ability to move relatively long distances (Perkins and Connor 2004).

- Transect surveys are not reliable – they are unlikely to detect Southern fox squirrels when they are present (Greene et al. 2016). Transect surveys may detect nests, or other signs that Southern fox squirrels are present, and so may be somewhat helpful as an initial step for project planning or to locate nests in advance of activities that may cause a take of nests. However, it is recognized that transect surveys likely underestimate the presence of fox squirrels (Greene et al. 2016).
- Survey techniques for Southern fox squirrels based on live trapping generally have low success and low overall capture rates due to the naturally low densities and inherent shyness of those squirrels, making them unreliable measures of occupancy and relative abundance (Weigl et al. 1989, Greene et al. 2016). That combination of factors generates uncertainty about the status of the surveyed populations. Further, live capture methods can cause significant disturbance to the fox squirrels that are trapped.

Southern fox squirrel nest in longleaf pine. Photograph by Terry Doonan, FWC.

- Camera trap-based protocols are recommended for surveys of fox squirrels in Florida. Camera trapping is better than live trapping for Southern fox squirrels to achieve many objectives, including detecting individuals (Greene et al. 2015, Tye et al. 2015, Greene and McCleery 2017*a*). Camera traps detect higher numbers of individuals and generate a greater overall number of observations, which leads to more precise estimates of abundance (Greene and McCleery 2017*a*). And, camera-trap-based surveys provide the most effective way to determine habitat occupancy rates and long-term population trends for fox squirrels (Greene and McCleery 2017*a*, b). And camera trap-based protocols are expected to prevent most risk of harm to the squirrels, which is one problem associated live-trapping (Tye et al. 2015). Camera trap-based protocols should be combined with live-trapping only when handling of live animals is needed to accomplish other objectives (Greene and McCleery 2017*a*). Camera trap-based protocols are expected to be more economical, in the long-term. Camera-traps can be set and left in place for long periods with only periodic checks by personnel required.

Recommended Conservation Practices

Recommendations are general measures that could benefit the species but are not required.

- Preserve and restore large areas of high-quality, well-managed fox squirrel habitat, particularly on conservation lands, when possible (Kantola 1992).
- Habitat patch size may not be critical (Greene and McCleery 2017*b*), but the quality of the habitat available is important. At the landscape fox squirrels appear to favor habitat with increased heterogeneity and low tree cover (i.e., low basal area). At a local or patch scale, the amount of hardwoods present, is important. And a reduced understory with a diverse but open groundcover

also are key.

- Maintain landscape connectivity for fox squirrels – retain or enhance conditions that facilitate movement of individuals across the landscape. The physical spacing and arrangement of landscape elements and the condition or quality of the habitat present in those elements will affect the relative ability of individuals to move through or among them.
- Retain/maintain mature oak trees on site for daytime refuge sites (Connor and Godbois 2003), nesting sites (Edwards and Guynn 1995) and mast production (Humphrey and Kantola 1990).
- Retain/maintain a variety of pyrophytic oaks with varied mast production by different species may vary seasonally and year to year (Kantola and Humphrey 1990, Lee et al 2009).
- Sites with ecotones between pine uplands and oak forests can be priorities for conservation because of their importance to fox squirrels by providing both types of resources (Kantola and Humphrey 1990).
- Maintaining single large hardwood trees and small patches of oaks within pine uplands creates the highest quality fox squirrel habitat. One study recommended 6 hardwood patches with a basal hardwood area of .5 meters squared for every hectare of pine savanna (Perkins and Conner 2004, Perkins et al. 2008).
- Maintain and enhance longleaf pine stands. Timber harvest using uneven-aged stand management and single tree selection is recommended to better maintain mature oaks and patchy areas within pine uplands (Connor and Godbois 2003, Perkins et al. 2008).
- Prescribed fire is an effective and efficient tool for managing habitat for the Southern fox squirrel. Suggested frequency varies in literature with 2 to 3 years reported by Perkins et al. (2008) and intervals of up to 5 years reported by Kantola and Humphrey (1990).
- Varying the intensity, frequency, and spatial coverage of fire creates and maintains mature oak coverage, and mimics natural and historical fire regimes in Florida (Greenberg and Simons 1999).

Prohibitions and Permitting

Southern fox squirrels are protected by the general prohibitions outlined in Rule 68A-4.001, F.A.C.: no wildlife or freshwater fish or their nests, eggs, young, homes, or dens shall be taken, transported, stored, served, bought, sold or possessed in any manner or quantity at any time except as specifically permitted by these rules nor stall anyone take, poison, store, buy, sell, possess or wantonly or willfully waste the same except as specifically permitted these rules. They are also protected by 68A-29.002, F.A.C. which states that no person shall take, buy, sell, transport or possess fox squirrels, their nests, or young. Take is defined in Rule 68A-1.004, F.A.C., as pursuing, hunting, molesting, capturing, or killing (or attempting to do those things). A permit is required for any other activity that involves the possession, capture, sell, purchase, transport, hunting or killing of Southern fox squirrels. These permits are issued for justifiable purposes as outlined in Rule 68A-9.002, F.A.C. Justifiable purposes are scientific, educational, exhibition, propagation, management or other justifiable purposes.

No Permit Needed

The following activities could cause take, but are authorized in rule to be conducted without a permit:

- If there are signs that a fox squirrel is injured or has suffered recent trauma, individuals are authorized to temporarily possess the squirrel in order to transport it to a licensed wildlife rehabilitator. If you encounter a fox squirrel and need assistance, please contact Wildlife Alert at 888-404-FWCC. This "Good Samaritan" provision applies to one-time, irregular, or highly infrequent occurrences,

otherwise a permit is required to possess fox squirrels. Linear utility vegetation maintenance activities that do not involve removing or destroying nests, squirrels, or their young is not expected to cause take.

- In accordance with local, state, and federal regulations (including, but not limited to, Federal Electric Reliability Council (FERC) Electric Reliability Standard FAC-003-4, National Electrical Safety Code (NESC) section 218, and Florida Public Service Commission (FPSC) mandates), routine vegetation maintenance activities within existing power line rights of way that will avoid heavy take of known or visibly apparent fox squirrel nests (i.e., the nest trees) do not require a permit authorizing take.
- In cases where there is an immediate danger to the public's health or safety, including imminent or existing power outages that threaten public safety, or in direct response to an official declaration of a state of emergency by the Governor of Florida or a local governmental entity, power restoration activities and non-routine removal or trimming of vegetation within linear right of way in accordance with vegetation management plan that meets applicable federal and state standards does not require a take permit from FWC.
- Southern fox squirrels may be taken as nuisance wildlife without a permit if following the methods outlined in Rule 68A-9.010 (2) and (3), F.A.C.
- Aversive Conditioning - In urban areas, fox squirrels can become acclimated to human presence and in some situations may pose a safety issue. No permit is required for the following FWC-approved aversive conditioning activities that do not result in the death of a Southern fox squirrel.
  - Documented intervention measures should take place before aversive conditioning can occur. Intervention measures may include posting signs to discourage feeding, having community meetings to address living with wildlife, and removing feeders.
  - Acceptable non-harmful aversive conditioning methods include, loud noises, use of low-powered water guns, visual deterrents, or similar non-harmful activities.

Permits for Justifiable Purposes - Scientific Collecting and Educational Use

Any survey methodology that requires handling or capture of a Southern fox squirrel will require a scientific collecting permit. Keeping Southern fox squirrels in captivity for educational use also requires a permit.

- Trapping may impact the wild population's ability to forage, rest, and rear young. The trapping protocol must be included with the permit application, with sufficient detail to allow evaluation, and should identify measures to minimize mortality to Southern fox squirrels and non-target species.
- Applicants for scientific collecting permits should identify if trapping will occur on lands owned by other entities. Coordination with county land managers, state foresters, and national parks should be addressed in the scientific collecting application.
- Permit applications for educational use should include an educational purpose plan, the location of the educational facility and provide details on housing for Southern fox squirrels.
- A summary of the applicant's expertise relative to the proposed work must be included in the application.
- Applicants should have met all conditions of previously issued permits for fox squirrels or other species. Camera-based and walking transect surveys do not require a scientific collecting permit.
- A summary of any survey data collected at each study site should be reported to the FWC.
  - Standard data should include numbers captured by species, location information (GPS coordinates, county, property/site name), and habitat type.
  - Report standard data for every Southern fox squirrel collected or observed.
  - Any mortality should be reported immediately to the FWC. Specimens should be provided to the FWC or deposited in the collection of the Florida Museum of Natural History in Gainesville.

- Data gathered should be provided to the agency in the specified format.

Other Permits

For any other justifiable purpose permit that does not fall under scientific collecting or educational use, please submit your request to WildlifePermits@myfwc.com. Fox squirrels may not be maintained as a personal pet without a permit (Rule 68A-4 and 68A-29, F.A.C.). Take of individuals from the wild for this purpose is not authorized.

Additional information

Information on the economic impacts assessment of the Species Conservation Measures and Permitting Guidelines for the Southern Fox Squirrel can be found at http://myfwc.com/wildlifehabitats/imperiled/managementplans/.

Contact

For more species-specific information or related permitting questions, contact us at (850) 921-5990 or WildlifePermits@myfwc.com. For regional information, visit http://myfwc.com/contact/fwc-staff/regional-offices.

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Applicant Guidance:
Scientific Collecting Permits for State-Listed Species

The following information is provided as guidance to assist applicants in submitting a complete and sufficient application that includes all information necessary to determine whether the application meets criteria to issue a permit. Submitting a complete and sufficient application can expedite the permitting process by preventing delays triggered by missing information.

Permit Application Checklist

You will need to gather or have access to the information below in order to complete and submit the application in the Online Permit System.

To register as a new user, you will need:

- ☐ To determine if you are registering as an Individual or Non-Individual (business or other entity) Applicant.
- ☐ Applicant's contact information including name, physical and mailing addresses, phone and fax numbers and email address.
- ☐ Applicant's social security number or driver's license state of issuance and number. If applying as Non-Individual, you will need the organization's FEIN/FEID number and name of contact person.
- ☐ To also apply for a self-issuing Registered Agent permit in the Online Permit System (this only applies to those applications requesting to designate sub-permittees). Once issued, you can manage sub-permittees who have delegated approval to work under the permit in your absence.

To apply for a scientific collecting permit, you will need:

- ☐ Your user name and password (created when registering as a new user).
- ☐ Project name, description, address, and driving directions.
- ☐ To identify project activity as either: bird banding, live possession, salvage, scientific collecting (multi-purpose or undefined activity), or voucher.
- ☐ To list the project county/counties, township, range and section, latitude, longitude and parcel identification number (if applicable).
- ☐ A summary of research/educational scope and objectives, target species, methodology, final disposition.
- ☐ Information from previous state-issued permits.

You will need the following attachments:

- ☐ A research plan detailing the purpose, scope, objectives, methodology and disposition of the proposed scientific work, or an educational plan and documentation of the facility's wildlife conservation program (*required*).
- ☐ Benefit to Survival Potential (*required;* see next page).
- ☐ Copies of current or former state-issued permits (*if applicable; outstanding reports for prior permits must be provided before permits will be issued.)*
- ☐ A wildlife acquisition form/letter, and supporting documentation such as photographs, brochures, published research material, (*required* to document listed species legally obtained).

Attachments may be uploaded as part of the online application. The following file types are accepted: *.doc, *.docx, *.xls, *.xlsx, *.pdf, *.txt, *.ppt, *.png, *.tif, *.gif, .jpg, and *.jpeg. There is no limit to the number of attachments; however, the online system will only accommodate attachments that are each 20 megabytes or less.

Factors considered when issuing permits

Intentional take permits (including scientific collecting and educational use) for state-Threatened species may be issued for purposes that further the conservation or survival of the species. FWC staff considers the factors outlined in Rule 68A-27.003(2), F.A.C., when determining if an application will benefit the survival potential of the species. These factors are presented below with additional information to assist applicants in submitting a complete application.

Species Conservation Measures and Permitting Guidelines (Guidelines) can inform applicants about species-specific permitting considerations. Guidelines include sections on intentional take and scientific collecting. Consulting the Guidelines is strongly encouraged as a first step in preparing your application. For species that do not yet have Guidelines developed, refer to the Species Action Plan.

Benefit to Species' Survival Potential:

Please respond to each of the following questions. Responses should be submitted as an application attachment in the online permit system. The attachment should be titled "Benefit to Survival Potential".

1. Is the project's purpose adequate to justify removal of specimens?
   If specimens will be removed from the wild, outline the consistency with the goals and objectives of the Species Action Plan to justify removal.

2. What probable direct or indirect effect will the project have on the wild population?
   If proposed activities may affect the wild population, explain what the probable effects are, and if the effect furthers conservation and survival. If it does, explain how. Explain any measures that will be taken to minimize potential effects to the wild population.

3. Does the project conflict with any programs intended to enhance the survival of the species?
   Refer to the Guidelines or Species Action Plan for the species to determine if any proposed activities in the application conflict with the conservation actions identified for the species.

4. Will the project likely reduce the threat of extinction?
   Explain how the proposed activities in the application will provide a conservation or scientific purpose that addresses the threat of extinction. Refer to the Biological Status Review Report for the species for factors contributing to risk of extinction. The Species Action Plan also outlines threats to the species and conservation actions to address those threats.

5. What are the opinions and views of experts?
   Opinions of those with species expertise will be considered during application review. Include any known relevant opinions, along with the individual or organization from which they originate.

6. Are the expertise, facilities, and resources available to the applicant adequate to accomplish the project objective?
   Document the experience, knowledge, and capability of all individuals listed on the permit application (if you are a Registered Agent, please upload this information for yourself and anyone authorized to work under the permit to your account). Document the adequacy of facilities and equipment available to you to conduct the proposed activity.

7. Is there a concern for human safety?
   If applicable, document any relevant risk to human safety posed by the species, and demonstrate that available deterrent methods have been exhausted.