

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Two Kinds of Northern Flying Squirrel

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: The Service determines endangered status for two kinds of northern flying squirrel found in the Appalachian Mountains of North Carolina, Tennessee, Virginia, and West Virginia. Both are evidently very rare and jeopardized by habitat loss, human disturbance, and competition with, and the transfer of a lethal parasite from, the more common southern flying squirrel. This rule implements the protection of the Endangered Species Act of 1973, as amended, for these two kinds of northern flying squirrel.

DATE: The effective date of this rule is July 31, 1985.

ADDRESS: The complete file for this rule is available for inspection, by appointment, during normal business hours at the Service's Office of Endangered Species, Suite 500, 1000 N. Glebe Road, Arlington, Virginia.

FOR FURTHER INFORMATION CONTACT: Mr. John L. Spinks, Jr., Chief, Office of Endangered Species, U.S. Fish and Wildlife Service, Washington, D.C. 20240 (703/235-2771 or FTS 235-2771).

SUPPLEMENTARY INFORMATION:**Background**

The so-called flying squirrels do not actually fly, but are capable of extensive and maneuverable gliding by means of a

furred, sheetlike membrane along the sides of the body, between the fore and hind limbs. There are 35 species, most of them in the forested parts of Eurasia (Nowak and Paradiso 1983). Only two species occur in North America: the southern flying squirrel (*Glaucomys volans*), found in extreme southeastern Canada, the eastern half of the United States, Mexico, and Central America; and the northern flying squirrel (*Glaucomys sabrinus*), found mainly in Canada, Alaska, and the western and northern parts of the conterminous United States (Hall 1981).

Until well into the 20th century, *G. sabrinus* was not known to occur in the eastern United States to the south of New York. Then Miller (1936) described the subspecies *G. s. fuscus*, based on specimens collected in the Appalachian Mountains of eastern West Virginia, and Handley (1953) described *G. s. coloratus*, from specimens taken in the Appalachians of eastern Tennessee and western North Carolina. Subsequently, *G. s. fuscus* was found also in the southwestern part of Virginia (Handley 1980). For purposes of convenience, *G. s. coloratus* may be referred to as the Carolina northern flying squirrel, and *G. s. fuscus* as the Virginia northern flying squirrel.

According to Handley (1953), seven specimens of *G. s. coloratus* averaged 286 millimeters (11¼ inches) in total length and 134 millimeters (5¼ inches) in tail length, and five specimens of *G. s. fuscus* averaged 266 millimeters (10½ inches) in total length and 115 millimeters (4½ inches) in tail length. The coloration of both subspecies is generally brown above and buffy or orange white below. *G. s. coloratus* is the darker of the two, but both are considerably darker than the subspecies of *G. sabrinus* found farther to the north in the eastern U.S.

There has long been recognition that *G. s. coloratus* and *G. s. fuscus* are rare and that their survival might be in jeopardy. Since their original discovery, only about 30 specimens are known to have been collected, dead or alive, and at only about 8 localities. Recent efforts have failed to find these squirrels at most of these same localities. There are numerous actual or potential problems. Both subspecies may have been declining since the Pleistocene, along with the contraction of suitable boreal forest habitat. They now have relictual distributions in widely scattered areas at high elevations. Their decline has probably been accelerated through clearing of forests and other disturbances by people. They apparently are being displaced in at least some areas by the more adaptable and

aggressive southern flying squirrel (*G. volans*). In addition, there is growing evidence that the nematode parasite *Strongyloides*, which is carried without obvious harm by *G. volans*, is being transferred to *G. sabrinus* with lethal effect.

Handley (1980) classified *G. s. fuscus* as "endangered" in Virginia. The West Virginia Department of Natural Resources includes this subspecies in its list of animals of special concern, and refers to it as being of "scientific interest." Weigl (1977) classified *G. s. coloratus* as "threatened" in North Carolina. Kennedy and Harvey (1980) indicated that *G. s. coloratus* is considered to be "deemed in need of special management" by the Tennessee Wildlife Resources Agency and to be of "special concern" by the Tennessee Heritage Program. In a report published by the U.S. Forest Service, Lowman (1975) stated that *G. s. coloratus* and *G. s. fuscus* are "threatened" in Virginia, North Carolina, and Tennessee.

In its Review of Vertebrate Wildlife in the Federal Register of December 30, 1982 (48 FR 58454-58460), the U.S. Fish and Wildlife Service placed both subspecies in category 2, meaning that a proposal to list as endangered or threatened was possibly appropriate, but that substantial data were not then available to biologically support such a proposal. Subsequently, the Service received a report from Dr. Donald W. Linzey (1983), who had been contracted more than 3 years earlier to investigate the status of the two flying squirrels. The data in Dr. Linzey's report, along with other new information assembled by the Service, showed that a proposal to list both squirrels as endangered was warranted. Such a proposal was published in the Federal Register of November 21, 1984 (49 FR 45880-45884).

Summary of Comments and Recommendations

In the proposed rule of November 21, 1984, and associated notifications, all interested parties were requested to submit information that might contribute to development of a final rule. Appropriate State and Federal agencies, county governments, scientific organizations, and other concerned parties were contacted and requested to comment. Newspaper notices, inviting public comment, were published in the *Asheville Citizen Times* on December 15, 1984, the *Elizabethton Star* on December 14, 1984, the *Elkins Inter-Mountain* on December 19, 1984, the *Virginian* on December 15, 1984, and the *Gatlinburg Mountain Press* on December 17, 1984.

Eight responses were received. The Board of Supervisors of Smyth County, Virginia, indicated that it had no comment. The National Park Service, the Tennessee Department of Conservation, the West Virginia Department of Natural Resources, The Nature Conservancy, Professor Lawrence R. Heaney of the University of Michigan, and Professor J. Edward Gates of the University of Maryland expressed support for the proposal. Professor Gates added that he has been carrying out a limited search for *G. sabrinus* in West Virginia. The effort has not been successful so far, but on November 4, 1984, three *G. volans* were captured in one of the nest boxes that had been installed. This event might possibly contribute to the view that *G. volans* is replacing *G. sabrinus* (see factor "E" in the following section).

The only opposing comment was from the Tennessee Wildlife Resources Agency, which indicated that endangered status is not yet justified for *G. sabrinus* in Tennessee, because adequate documentation has not been found to differentiate the subspecies in that State from those in other parts of the nation. In response, the Service would point out that the subspecies found in Tennessee (*G. s. coloratus*) was formally described in a relatively recent publication by a reputable mammalogist (Handley 1953), that his conclusions have been accepted in the standard comprehensive reference on the systematics of North American mammals (Hall 1981), and that no challenge to this situation is known. The Service therefore considers continued recognition of the subspecific distinction of *G. s. coloratus* to be warranted.

Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, the Service has determined that the Carolina and Virginia northern flying squirrels should be classified as endangered. Procedures found at section 4(a)(1) of the Endangered Species Act (16 U.S.C. 1531 *et seq.*) and regulations promulgated to implement the listing provisions of the Act (50 CFR Part 424) set forth the procedures for adding species to the Federal lists. A species may be determined to be endangered or threatened due to one or more of the five factors described in section 4(a)(1) of the Act. These factors and their application to the Carolina (*Glaucomys sabrinus coloratus*) and Virginia (*G. s. fuscus*) northern flying squirrels are as follows:

A. *The present or threatened destruction, modification, or curtailment*

of its habitat or range. According to Professor Peter D. Weigl of Wake Forest University (1977, and pers. comm., March 2, 1984), *G. s. coloratus* and *G. s. fuscus* occur primarily in the ecotone, or vegetation transition zone, between the coniferous and northern hardwood forests. Both forest types are used in the search for food, while the hardwood areas are needed for nesting sites. As these squirrels are adapted to cold, boreal conditions, their range has probably been contracting since the end of the Pleistocene (Ice Age). They now have a relictual distribution, restricted to isolated areas at high elevations, separated by vast stretches of unsuitable habitat. In these last occupied zones, the squirrels and their habitat may be coming under increasing pressure from human disturbance, such as logging and development of skiing and other recreational facilities. Handley (1980) stated that while the range of *G. s. fuscus* had probably already been fragmented prior to the arrival of European settlers, its decline has undoubtedly been accelerated by the clearing of forests during the past 200 years, and that it must be on the verge of extinction in Virginia. Lowman (1975) considered both subspecies to be threatened "due to reduction of habitat by logging and other land use."

Available evidence indicates that *G. s. coloratus* and *G. s. fuscus* are rare and that their historical decline is continuing. The two subspecies are represented by only 28 specimens in museum collections (Linzey 1983; West Virginia Department of Natural Resources, pers. comm., April 25, 1984). A few other individuals have been captured alive and then released. The museum specimens were taken in seven separate areas of North Carolina (Yancey County), Tennessee (Carter and Sevier Counties), Virginia (Smyth County), and West Virginia (Pocahontas and Randolph Counties). Weigl (1977), in a paper prepared for a symposium in 1975, stated that in the previous 10 years the two subspecies had been captured only in two of these areas—the Roan Mountain vicinity of Carter County, Tennessee, and Whitetop Mountain, Smyth County, Virginia. He noted that 8 weeks of trapping in 1965–1966 in the Mount Mitchell area of Yancy County, North Carolina, the type locality of *G. s. coloratus*, had failed to find a single individual. Weigl (pers. comm., March 2, 1984) added that during the past few years he had failed to find *G. s. coloratus* in the Roan Mountain area.

Linzey (1983) reported the results of a 40-month search for *G. s. coloratus* and *G. s. fuscus* throughout their range.

During this investigation, he placed 490 nest boxes at 35 sites in Maryland, North Carolina, Tennessee, Virginia, and West Virginia, including six of the seven areas in which the subspecies had been previously collected. The boxes were checked at regular intervals, and any occupants were captured and identified. Only three individual northern flying squirrels were found in the course of the study. In April 1981, a pair *G. s. coloratus* was caught in the Mount Mitchell area of North Carolina, and in May 1981 an adult female *G. s. fuscus* was taken in an area of Pocahontas County, West Virginia, from which the subspecies was not previously known. All three individuals were marked and released. This investigation thus showed that both subspecies still exist, but that they are very rare and perhaps no longer present in much of their former range.

B. *Overutilization for commercial, recreational, scientific, or educational purposes.* The subject subspecies are not known to be jeopardized by human utilization. Nonetheless, flying squirrels are highly desirable as pets to some persons, and collecting for such purposes is at least a potential threat to the already rare *G. s. coloratus* and *G. s. fuscus*.

C. *Disease or predation.* Weigl (pers. Comm., March 2, 1984) suggested that increasing human recreational use of northern flying squirrel habitat might result in predation on *G. s. coloratus* and *G. s. fuscus* by pets, especially cats.

D. *The inadequacy of existing regulatory mechanisms.* Not now known to be applicable.

E. *Other natural or manmade factors effecting its continued existence.* According to Handley (1980), logging and other clearing activity has not only reduced the original habitat of the northern flying squirrel (*G. sabrinus*), but resulted in an invasion of this zone by the southern flying squirrel (*G. volans*). Regrowth in cleared areas, if any, tended to be deciduous forest favored by *G. volans*, and hence the way was open for the spread of that species.

Weigl (1978) pointed out that originally there was apparently little overlap between the ranges of the two species, with *G. sabrinus* found in the higher elevations of the Appalachians and *G. volans* in the lower. When *G. volans* began to expand into the habitat of *G. sabrinus*, however, it seems to have successfully competed with and displaced the latter species. Weigl's studies of captive animals have demonstrated that *G. volans* though smaller than *G. sabrinus*, is more

aggressive, more active in territorial defense, and dominant in competition for nests. When the two species meet in an ecotone between coniferous and deciduous forest, *G. volans* would be expected to force *G. sabrinus* out into the purely coniferous zone, which lacks favorable nesting sites, and thus the breeding level of the latter species would be reduced.

In addition to its success in direct confrontations, *G. volans* has evidently employed a more subtle, but deadly, biological mechanism against *G. sabrinus*. Weigl (1975, and pers. comm., March 2, 1984) maintained captive colonies of the two species in adjacent outdoor aviaries. All the *G. sabrinus* weakened and died within three months, and this mortality was associated with heavy infestations of the nematode parasite *Strongyloides*. All the *G. volans* also carried the parasite, but they remained in apparent good health and continued to breed. Subsequently, *Strongyloides* was found in five wild populations of *G. volans* in North Carolina, but never in wild *G. sabrinus*. Experiments in captivity, however, demonstrated that *Strongyloides* could be transferred from *G. volans* to *G. sabrinus*. Apparently, *G. volans* is the natural host of this parasite and has developed an immunity to its ill effects. Under original conditions, with the two squirrel species occupying largely separate ranges, there would have been little interchange. When contact between the two was increased through habitat disruption, *Strongyloides* could spread to *G. sabrinus*, which lacked any immunity, and thus could serve as a powerful competitive weapon for *G. volans*.

Because of its ability to displace *G. sabrinus* by the means described above, *G. volans* seems to have taken over much of the former's range in the Appalachians. Handley (1980) report that in Virginia *G. volans* now occurs at the tops of the highest mountains and occupies the best remnants of habitat that is suitable for *G. sabrinus*. Weigl (pers. comm., March 2, 1984) stated that he has failed to trap *G. sabrinus* at Roan Mountain, Tennessee, during the past few years, but at the same time has found *G. volans* to be more abundant at higher elevations in this area. As noted above, Linzey (1983) captured only three specimens of *G. sabrinus* during 40 months of study, and yet an effort had been made to place the nest boxes in areas that appeared to have habitat suitable for the species, including most of the localities from which it had previously been recorded. In these same

nest boxes, Linzey captured at least 29 individual *G. volans*.

The decision to determine endangered status for the Carolina and Virginia northern flying squirrels was based on an assessment of the best available scientific information and of past, present, and probable future threats to the species. A decision to take no action would exclude the two flying squirrels from needed protection pursuant to the Endangered Species Act. A decision to determine only threatened status would not adequately express the evident rarity and multiplicity of problems of these animals. Critical habitat is not being designated, for the reasons discussed in the following section.

Critical Habitat

Section 4(a)(3) of the Endangered Species Act, as amended, requires that "critical habitat" be designated, "to the maximum extent prudent and determinable," concurrent with the determination that a species is endangered or threatened. The Service finds that designation of critical habitat for the Carolina and Virginia northern flying squirrels is not prudent at this time. Flying squirrels in general are popular as pets (see, for example, Lowery 1974). Although the two subject subspecies are not now known to be collected for this purpose, publication of a precise critical habitat description and map could expose these rare and vulnerable animals to increased disturbance and taking. Moreover, the nest boxes placed during the recent status survey are still present and being used for study. These boxes are readily visible and flying squirrels may be easily trapped therein during their diurnal period of inactivity. Any publicity regarding the location of these boxes should be avoided.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened pursuant to the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Act provides for possible land acquisition and cooperation with the States, and requires recovery actions. Such actions are initiated by the Service following listing. The protection required of Federal agencies, and prohibitions against taking and harm, are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate

their actions with respect to any species that is proposed or listed as endangered or threatened, and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR Part 402, and are now under revision (see proposal in Federal Register of June 29, 1983, 48 FR 29990). Section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service. No specific Federal activities that may be affected in this regard, with respect to the listing of the Carolina and Virginia northern flying squirrels, are known at this time. Much of the region that these squirrels may inhabit, however, is within national forest land. Therefore, certain actions by the U.S. Forest Service, such as timber sales, establishment of recreation facilities, and spraying of insecticides, may become subject to consultation.

The Act and its implementing regulations found at 50 CFR 17.21 set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take, import or export, ship in interstate commerce in the course of a commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It also is illegal to possess, sell, deliver, transport, or ship any such wildlife that has been illegally taken. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered wildlife under certain circumstances. Regulations governing such permits are codified at 50 CFR 17.22 and 17.23. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and/or for incidental take in connection with otherwise lawful activities. In some instances, permits may be issued during a specified period of time to relieve undue economic hardship that would be suffered if such relief were not available.

National Environmental Policy Act

The Fish and Wildlife Service has determined that an Environmental Assessment, as defined by the National

Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to Section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the **Federal Register** of October 25, 1983 (48 FR 49244).

References

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Author

The primary author of this rule is Ronald M. Nowak, Office of Endangered

Species, U.S. Fish and Wildlife Service, Washington, D.C. 20240 (703/235-1975 or FTS 235-1975).

List of Subjects in 50 CFR Part 17

Endangered and threatened wildlife, Fish, Marine mammals, Plants (agriculture).

Regulation Promulgation

PART 17—[AMENDED]

Accordingly, Part 17, Subchapter B of Chapter I, Title 50 of the Code of Federal Regulations, is amended as set forth below:

1. The authority citation for Part 17 reads as follows:

Authority: Pub. L. 93-205, 87 Stat. 884; Pub. L. 94-359, 90 Stat. 911; Pub. L. 95-632, 92 Stat. 3751; Pub. L. 96-159, 93 Stat. 1225; Pub. L. 97-304, 96 Stat. 1411 (16 U.S.C. 1531 *et seq.*).

2. Amend § 17.11(h) by adding the following, in alphabetical order under "MAMMALS," to the List of Endangered and Threatened Wildlife:

§ 17.11 Endangered and threatened wildlife.

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 (h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
Mammals:							
Squirrel, Carolina northern flying	<i>Glaucomys sabrinus coloratus</i>	U.S.A. (NC, TN)	Entire	E	198	NA	NA
Squirrel, Virginia northern flying	<i>Glaucomys sabrinus fuscus</i>	U.S.A. (VA, WV)	do	E	198	NA	NA

Dated: June 13, 1985.
J. Craig Potter,
Acting Assistant Secretary for Fish and Wildlife and Parks.
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