

APPENDIX 1. Procedures for Listing, Delisting and Reclassifying Endangered, Threatened and Species of Special Concern

Rule 68A-27.0012, Florida Administrative Code (F.A.C.)

- (1) Petition to list, delist, or reclassify a species in Rules 68A-27.003, 68A-27.004 or 68A-27.005, F.A.C.
 - (a) Persons wishing to add, delete or reclassify species in Rules 68A-27.003, 68A-27.004 or 68A-27.005, F.A.C., shall submit a written petition to the Commission.
 1. Petitions shall be clearly identified as such, and must contain the following in order to be considered complete:
 - a. The rule to which the species is proposed to be added, removed from or reclassified to,
 - b. The name, address and signature of the petitioner, and
 - c. Sufficient information on the biology and distribution of the species to warrant investigation of its status using the criteria contained in definitions of endangered, threatened or species of special concern in Rule 68A-1.004, F.A.C.
 - (b) Incomplete petitions will be returned to the petitioner with insufficiencies clearly noted in writing. Corrected petitions may be resubmitted for consideration.
 - (c) Complete petitions will be evaluated in accordance with the provisions in subsection (2).
 - (d) If, in the opinion of the Executive Director, immediate inclusion of a species in Rule 68A-27.003(1), F.A.C., is essential to prevent imminent extinction, such listing may be effected on a temporary basis not to exceed 240 days. Such emergency listings shall be approved by the Commission at the next scheduled meeting. The Commission shall conduct the evaluations prescribed in (2) and (3) of this subsection to determine the appropriate final classification of the species.
- (2) Review of petitions to determine biological status; Phase 1.
 - (a) The Commission shall establish a deadline for completion of the biological review of each complete petition.
 - (b) The Commission shall provide notice by mail to parties who request such notification and shall publish in the Florida Administrative Weekly a solicitation of information on the biological status of the petitioned species. Written comments regarding biological status shall be accepted by the Commission for a period of no less than 45 days following public notice.
 - (c) The Commission shall summarize information provided in the petition, information obtained from the public and other available biological data on status of the petitioned species into a preliminary biological status report. The preliminary biological status report shall contain a recommended classification for the petitioned species consistent with the available biological data and based on the criteria established in 68A-1.004, F.A.C.
 - (d) The Commission shall designate a biological review panel with a minimum of three scientists with demonstrated knowledge and expertise pertaining to species conservation and

management. This panel shall independently evaluate information compiled on the petitioned species' biological status relative to its proposed classification in Rules 68A-27.003, 68A-27.004 or 68A-27.005, F.A.C.

- (e) The biological status report and the information referenced in subparagraph (c) shall be provided to members of the panel of scientific experts for the review mandated in (d) of this subsection. Panel members shall have no fewer than 45 days to review the document and provide recommendations to the Commission.
 - (f) The Commission shall consider the final biological status report, biological recommendations from the panel of scientific experts and public testimony regarding biological status in making a final determination whether addition, deletion or reclassification of the petitioned species in Rules 68A-27.003, 68A-27.004 or 68A-27.005, F.A.C., is warranted.
 - (g) If the petitioned species is determined by the Commission to warrant inclusion in Rules 68A-27.003, 68A-27.004 or 68A-27.005, F.A.C., the Commission shall:
 - 1. Specify the appropriate listing category for the species based on biological status.
 - 2. Establish a deadline for completion of Phase 2 for the species as described in subsection (3) below, considering the recommendation of Commission employees and other interested parties.
 - 3. If the species is not already listed in Rules 68A-27.003, 68A-27.004 or 68A-27.005, F.A.C., it shall be added to the list of candidate species in Rule 68A-27.0021, F.A.C., and the protective provisions therein shall apply to the species.
- (3) Development of management plans, regulations, permit requirements for candidate species; Phase 2.
- (a) Within 45 days following designation of a candidate species, the Commission shall provide notice by mail to parties who request such notification and shall publish in the Florida Administrative Weekly a solicitation of information on the conservation needs of the species, and any economic and social factors that should be considered in its management.
 - (b) The Commission shall use information obtained from the public and other available information to develop a draft management plan for each candidate species that addresses:
 - 1. Biological status as determined in Phase 1,
 - 2. Conservation objectives,
 - 3. Recommended management actions,
 - 4. Recommended Commission regulations and incentives,
 - 5. Anticipated economic and social impacts of implementing or not implementing the recommended conservation actions.
 - (c) The Commission shall provide notice by mail to parties who request such notification and shall publish in the Florida Administrative Weekly a notice of the availability of the draft management plan. Written comments regarding conservation recommendations and expected economic and social impacts of implementation of the management plan shall be accepted by the Commission for a period of no less than 45 days following public notice.
 - (d) Final Commission action on the petition shall include:

1. Deletion of the species from 68A-27.0021 if appropriate, and addition to and/or deletion from Rules 68A-27.003, 68A-27.004 or 68A-27.005, F.A.C., in accordance with the determination made in (2) of this subsection.
2. A determination on any proposed regulations in the management plan.

Specific Authority Art. IV, Sec. 9, Fla. Const.

Law Implemented Art. IV, Sec. 9, Fla. Const.

History--New 6-23-99, Formerly 39-27.0012.

APPENDIX 2. Definitions of the Florida Fish and Wildlife Conservation Commission Relative to Listed Species

Rule 68A-1.004, Florida Administrative Code (F.A.C.)

The following definitions are for the purpose of carrying out the provisions of the rules of the Fish and Wildlife Conservation Commission relating to wild animal life and freshwater aquatic life. As used herein, the singular includes the plural. The following shall be construed respectively to mean:

- (18) Candidate species — A species, subspecies, or isolated population of a species or subspecies, which has been determined by the Commission to warrant listing under Rules 68A-27.003, 68A-27.004 or 68A-27.005, F.A.C., but for which actual listing in the aforementioned rules is pending development of a management plan.
- (25) Direct take — Intentionally pursuing, hunting, capturing, killing, or destroying fish or wildlife or the nests, eggs, homes or dens of fish or wildlife.
- (26) Endangered species — As designated by the Commission, a species, subspecies, or isolated population of a species or subspecies which is so few or depleted in number or so restricted in range or habitat due to any man-made or natural factors that it is in imminent danger of extinction as determined by (a), (b), (c), (d) or (e) below:
 - (a) Population reduction in the form of either:
 - 1. An observed, estimated, inferred or suspected reduction of at least 80% over the previous ten years or three generations, whichever is longer, based on, and specifying, any of the following:
 - a. Direct observation
 - b. An index of abundance appropriate for the species
 - c. A decline in area of occupancy, extent of occurrence or quality of habitat
 - d. Actual or potential levels of exploitation
 - e. The effects of introduced species, hybridization, pathogens, pollutants, competitors or parasites
 - 2. A reduction of at least 80%, projected or suspected to be met within the next ten years or three generations, whichever is longer, based on, and specifying, any of 1.b., 1.c., 1.d. or 1.e. above.
 - (b) Extent of occurrence estimated to be less than 40 square miles or area of occupancy estimated to be less than 4 square miles, and estimates indicating any two of the following:
 - 1. Severity fragmented or known to exist at only a single location.
 - 2. Continuing decline, observed, inferred or projected, in any of the following:
 - a. Extent of occurrence

- b. Area of occupancy
 - c. Area, extent and/or quality of habitat
 - d. Number of locations or subpopulations
 - e. Number of mature individuals
3. Extreme fluctuations in any of the following:
- a. Extent of occurrence
 - b. Area of occupancy
 - c. Number of locations or subpopulations
 - d. Number of mature individuals
- (c) Population estimated to number fewer than 250 mature individuals and either:
- 1. An estimated continuing decline of at least 25% within three years or one generation, whichever is longer, or
 - 2. A continuing decline, observed, projected or inferred, in numbers of mature individuals and population structure in the form of either:
 - a. Severe fragmentation (that is, no subpopulation estimated to contain more than 50 mature individuals).
 - b. All individuals are in a single subpopulation.
- (d) Population estimated to number less than 50 mature individuals.
- (e) Quantitative analysis showing the probability of extinction in the wild is at least 50% within ten years or three generations, whichever is longer.
- (73) Species of special concern — As designated by the Commission, a species, subspecies, or isolated population of a species or subspecies which is facing a moderate risk of extinction in the future, as determined by (a), (b), (c), (d) or (e) below:
- (a) Population reduction in the form of either:
- 1. An observed, estimated, inferred or suspected reduction of at least 20% over the last ten years or three generations, whichever is longer, based on, and specifying, any of the following:
 - a. Direct observation
 - b. An index of abundance appropriate for the species
 - c. A decline in area of occupancy, extent of occurrence and/or quality of habitat
 - d. Actual or potential levels of exploitation
 - e. The effects of introduced species, hybridization, pathogens, pollutants, competitors or parasites
 - 2. A reduction of at least 20%, projected or suspected to be met within the next ten years or three generations, whichever is longer, based on, and specifying, any of 1.b., 1.c., 1.d. or 1.e. above.
- (b) Extent of occurrence estimated to be less than 7,700 square miles or area of occupancy estimated to be less than 770 square miles, and estimates indicating any two of the following:
- 1. Severely fragmented or known to exist at only a single location.

2. Continuing decline, observed, inferred or projected, in any of the following:
 - a. Extent of occurrence
 - b. Area of occupancy
 - c. Area, extent and/or quality of habitat
 - d. Number of locations or subpopulations
 - e. Number of mature individuals
 3. Extreme fluctuations in any of the following:
 - a. Extent of occurrence
 - b. Area of occupancy
 - c. Number of locations or subpopulations
 - d. Number of mature individuals
- (c) Population estimated to number fewer than 10,000 mature individuals and either:
1. An estimated continuing decline of at least 10% within ten years or three generations, whichever is longer; or
 2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
 - a. Severely fragmented (i.e., no subpopulation estimated to contain more than 1,000 mature individuals).
 - b. All individuals are in a single subpopulation.
- (d) Population very small or restricted in the form of either of the following:
1. Population estimated to number fewer than 1,000 mature individuals
 2. Population is characterized by an acute restriction in its area of occupancy (less than 40 square miles) or in the number of locations (fewer than 5)
- (e) Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.
- (77) Threatened species — As designated by the Commission, a species, subspecies, or isolated population of a species or subspecies which is facing a very high risk of extinction in the future, as determined by (a), (b), (c), (d) or (e) below:
- (a) Population reduction in the form of either of the following:
1. An observed, estimated, inferred, or suspected reduction of at least 50% over the last ten years or three generations, whichever is longer, based on, and specifying, any of the following:
 - a. Direct observation
 - b. An index of abundance appropriate for the species
 - c. A decline in area of occupancy, extent of occurrence and/or quality of habitat
 - d. Actual or potential levels of exploitation
 - e. The effects of introduced species, hybridization, pathogens, pollutants, competitors or parasites

2. A reduction of at least 50%, projected or suspected to be met within the next ten years or three generations, whichever is longer, based on, and specifying, any of 1.b., 1.c., 1.d. or 1.e. above.
- (b) Extent of occurrence estimated to be less than 2,000 square miles or area of occupancy estimated to be less than 200 square miles, and estimates indicating any two of the following:
 1. Severely fragmented or known to exist at no more than five locations
 2. Continuing decline, observed, inferred or projected, in any of the following:
 - a. Extent of occurrence
 - b. Area of occupancy
 - c. Area, extent and/or quality of habitat
 - d. Number of locations or subpopulations
 - e. Number of mature individuals
 3. Extreme fluctuations in any of the following:
 - a. Extent of occurrence
 - b. Area of occupancy
 - c. Number of locations or subpopulations
 - d. Number of mature individuals
- (c) Population estimated to number fewer than 2,500 mature individuals and either:
 1. An estimated continuing decline of at least 20% within five years or two generations, whichever is longer; or
 2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
 - a. Severely fragmented (i.e., no subpopulation estimated to contain more than 250 mature individuals)
 - b. All individuals are in a single subpopulation.
- (d) Population estimated to number fewer than 250 mature individuals.
- (e) Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is longer.

APPENDIX 3. Petition to List the Flatwoods Salamander (*Ambystoma cingulatum*) on the State of Florida Threatened Species List

Introduction

By this petition, the Florida Fish and Wildlife Conservation Commission (FWC) is requested to list the flatwoods salamander (*Ambystoma cingulatum*) as a threatened species in the State of Florida (Rule 39-27.004, Florida Administrative Code). This action is warranted because of population declines due to decreases in population numbers, area of occupancy, extent of occurrence, and quality of habitat.

This petition is in response to the recent U.S. Fish and Wildlife Service final rule action adding the flatwoods salamander to the federal List of Endangered and Threatened Wildlife as a threatened species under the authority of the Endangered Species Act of 1973, as amended.

Biological Information

The U.S. Fish and Wildlife Service undertook an extensive review of the biological status of the flatwoods salamander in response to a petition to list the salamander as endangered or threatened. Much of that information was published in the Federal Register (LaClaire 1999) as part of the final rule action listing the salamander as threatened. That information is the basis for this petition, and the final rule as published in the Federal Register is included as an appendix to this petition. Following is a brief summary of the information presented in the USFWS final rule. The final rule information included addresses for obtaining the source information.

The flatwoods salamander occurs in isolated populations in pine flatwoods habitats of the lower Coastal Plain of South Carolina, Georgia, and Florida. Most known populations are in Florida. The primary threat to this salamander is the loss of flatwoods habitat and the isolated, seasonal ponds within the flatwoods required for breeding. Conversion of flatwoods to pine plantations, other agriculture, and urban development have eliminated as much as 80% of originally occurring flatwoods, and loss of flatwoods habitat is continuing. At present rates of loss, nearly all natural flatwoods in Florida will be destroyed within 25 years.

LaClaire (1999) noted that recent surveys had found flatwoods salamanders at only eight percent (8%) of 1,303 potential sites surveyed throughout the species' range. In Florida, 530 sites considered potential flatwoods salamander habitat were surveyed. Salamanders were found at only 15% of the sites.

Additionally, clear-cut harvesting and forest management activities commonly used on pine forests contribute to the degradation of flatwoods salamander habitat. Activities such as soil-disturbing site preparation, lower fire frequencies, high seedling stocking rates, and use of herbicides result in a forest that is not favorable for flatwoods salamanders. Wetland breeding sites are degraded by such practices as ditching ponds, harvesting cypress, and using ponds for slash disposition or firebreaks.

Loss of flatwoods habitat and the isolated seasonal ponds within flatwoods due to conversions to other uses, silvicultural practices, and altered fire cycles have significantly reduced the number of flatwoods salamanders and their area of occupancy, extent of occurrence, and the quality of habitat the salamander requires. Remaining populations of flatwoods salamanders are likely to decline in numbers and extent as suitable habitat continues to be destroyed or degraded, and the USFWS concluded the species was likely to become endangered in the foreseeable future if no actions were taken to change the current situation. Based upon the information presented in the USFWS final rule, the flatwoods salamander meets several of the criteria of a threatened species as defined in Rule 39-1.004 and, therefore, should be added to the State of Florida Threatened Species List.

Literature Cited

LaClaire, L. V. 1999. Endangered and threatened wildlife and plants; final rule to list the flatwoods salamander as a threatened species. Federal Register 64:15691-15704.

Petitioner Information

Bradley J. Gruver, Ph.D.
Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, FL 32399-1600
(850) 488-3831, SunCom 278-3831
gruverb@gfc.state.fl.us

Signature: _____

Date: _____

APPENDIX 4. Final Biological Status Report

INTRODUCTION

The U.S. Fish and Wildlife Service ([USFWS] 1999) listed the flatwoods salamander (*Ambystoma cingulatum*) as threatened effective May 3, 1999, under provisions of the Endangered Species Act of 1973, as amended. This listing prompted Fish and Wildlife Conservation Commission (FWC) staff to develop a petition to list the flatwoods salamander as a threatened species in Florida under rule 68A-27.004, Florida Administrative Code (F.A.C.). The following assessment is intended to evaluate the status of the flatwoods salamander in Florida under the criteria embodied in rule 68A-1.004 F.A.C. In order to warrant inclusion on a state list as an endangered species, threatened species, or species of special concern, the flatwoods salamander, on a range-wide scale, must meet at least one of the criteria in 68A-1.004 F.A.C. for one of the listing categories. Because the vast majority of the flatwoods salamander's extant range and populations are in Florida (USFWS 1999), status considerations are not greatly affected by data from other portions of the range. Accordingly, herein we focus on the species' status in Florida.

BIOLOGICAL INFORMATION

Population reduction

No data exist to evaluate numerical population change during the recent 10-year period. However, Palis (1997b) revisited 31 (70.5%) of 44 Florida sites from which flatwoods salamanders had been collected over a period of approximately 50 years prior to 1990. The 13 sites he did not include in his survey were either inaccessible or could not be located based on the available locality data. Palis was able to confirm occurrence at only 11 (35.5%) of these historic collection localities. These data suggest a possible occurrence decline of 64.5% during the 50-year period.

Means et al. (1996) and Palis (1997b) have suggested that flatwoods salamanders may be adversely affected by intensive silvicultural activities. Means et al. (1996) reported an estimated 98% decline in a resident flatwoods salamander metapopulation on private lands adjacent to Apalachicola National Forest following bedding and conversion of the area to slash pine plantation. The USFWS (1999) indicated that more than 80% of the original pine flatwoods habitat within the range of the flatwoods salamander has been lost due to agriculture, urbanization, and silvicultural practices, but no figures were provided specifically for Florida. A similar 60-80% decline in flatwoods habitat in Florida could infer a similar 60-80% long-term reduction in flatwoods salamander populations. Data from a forest industry survey suggest that this inference is not unreasonable. Wigley et al. (1998) sampled 444

ponds on industrial forest lands in south Alabama, south Georgia, and north Florida but found flatwoods salamanders at only 3 ponds (all in Florida).

Ongoing habitat conversion and degradation would have been anticipated to result in a minimum 20% reduction within the next 10 years in area of occupancy, habitat availability, and habitat quality prior to federal threatened listing (USFWS 1999) of the flatwoods salamander. It is difficult to assess the effect that federal listing will have on reducing rates of habitat conversion and degradation. Conversion of flatwoods to pine plantation may be slowed, but habitat degradation will likely continue.

Conversion of mesic pine flatwoods to slash pine plantations on private lands has occurred steadily during recent decades. It is likely that the flatwoods salamander has sustained a decline in habitat availability or quality in the last 10 years at least as great as the 20% required for listing as a species of special concern. It is not likely that the flatwoods salamander has sustained a decline as great as the 50% required for listing as threatened. Therefore, under this criterion listing the species as a species of special concern is supported.

Distribution

Palis (1997b) reported the occurrence of 33 known breeding populations of flatwoods salamanders in Florida. Twenty-four (73%) of these were believed to be restricted to single breeding ponds isolated by at least 3.2 km (2 mi) from any other breeding site. Only Liberty County (Apalachicola Ranger District, Apalachicola National Forest [NF]) and southern Okaloosa County (Eglin Air Force Base [AFB]) are known to support populations with more than 3 available breeding sites. Overall, populations are severely fragmented in Florida, although large metapopulations occur on Apalachicola NF and Eglin AFB.

The Florida distribution of the flatwoods salamander includes 2 separate regions, a northeastern and a western (Palis 1997a, Petranka 1998). The northeastern region includes Alachua, Baker, Bradford, Duval, and Marion counties. Flatwoods salamanders were historically known (prior to 1990) from 10 identifiable localities in this northeastern region, but Palis (1997b) was unable to confirm occurrence at any of these 10 sites. Palis did identify a single population with three breeding sites in Osceola NF, Baker County. This is the only known, remaining population in the northeast Florida region and it likely occupies no more than 5 square miles.

The western region includes the Panhandle from southern Jefferson County west to Escambia County (Palis 1997a, Means 1998). Flatwoods salamanders have been reported from 13 counties within this region. Palis (1997b) was unable to confirm the occurrence of flatwoods salamanders in Escambia County, but the species is known to still occur in at least one locality in each of the remaining western counties from which the species has been reported. This western region covers a total area greater than 2000 square miles but less than 5000 square miles. Thus, the flatwoods salamander's

extent of occurrence exceeds the threshold for threatened classification (<2000 square miles) but falls within the criteria for listing as a species of special concern (2000-7700 square miles).

The flatwoods salamander appears to have been extirpated from most of its former range in northeast Florida. The species also appears to have been extirpated from Escambia County in the Panhandle, and many historic sites in Calhoun and Jackson counties are believed to no longer support flatwoods salamanders. Continuing declines in habitat availability and quality will likely continue to reduce the area of occupancy, the number of occupied locations, and the number of mature individuals throughout the current range.

Mobility of flatwoods salamanders is low, and they have little capacity for naturally recolonizing sites from which they have been extirpated. Trends in extent of occurrence, area of occupancy, habitat quality, and number of subpopulations are likely to continue downward. Numbers of mature individuals likely fluctuate greatly, but this is normal for amphibian populations.

The flatwoods salamander's current extent of occurrence, fragmented occurrences, and declining extent of occurrence, area of occupancy, habitat availability, and habitat quality meet the criteria to list the salamander as a species of special concern.

Population size and trend

It is very difficult to estimate the total Florida population of the flatwoods salamander. Palis (1997b) estimated that Florida supports a minimum of 33 breeding populations, with a minimum total of 82 breeding ponds. Palis also estimated that 24 (73%) of the 33 populations were restricted to single breeding ponds. Numbers at many of these sites are likely small. One population on Eglin AFB, on the other hand, utilized 21 breeding ponds, and 2 populations on Apalachicola NF each utilized 10 breeding ponds. Each of these 3 populations likely includes at least 1000 mature individuals.

Most amphibian populations are thought to fluctuate greatly over time as a function of fluctuations in volume and timing of rainfall and the associated effects on reproductive success, although no specific information is available for flatwoods salamanders. Palis (1997a) sampled one pond for 2 years and caught 198 salamanders the first year but only 59 the second.

It is reasonable to conclude by extrapolation from the available quantitative data that the total population of mature individuals for known sites certainly exceeds 2500 individuals and, therefore, does not support listing the salamander as threatened. However, the available data indicate that the total population of mature individuals is likely less than the 10,000 individuals required for listing as a species of special concern. Additionally, populations in Florida have likely declined, based on considerations discussed in the previous section, by at least the 10% over the last 10 years that also is required for

listing as a species of special concern. Therefore, the population size criterion for listing the species as a species of special concern appears to be met.

Quantitative analyses

Available data are not sufficient to permit estimation or modeling of the probability of extinction of flatwoods salamanders in the wild.

BIOLOGICAL REVIEW PANEL

A preliminary biological status report with a staff recommendation to list the flatwoods salamander as a species of special concern and the information used to develop that report and recommendation were evaluated by a biological review panel. This panel was appointed by the Florida Fish and Wildlife Conservation Commission at its October 1999 meeting, and was composed of the current chairmen and co-chairmen (or their designees if the chair or co-chair were FWC employees) of the Florida Committee on Rare and Endangered Plants and Animals special committees on fishes, amphibians and reptiles, invertebrates, and birds. Only one of the two co-chairmen of the bird subcommittee was included on the panel. The chairman of the mammal subcommittee withdrew from the panel after appointment. The remaining panel members independently evaluated the preliminary report and information.

Two of the panel members supported the staff recommendation to list the flatwoods salamander as a species of special concern. One of these indicated he also could argue that the species be listed as threatened.

Three of the panel members indicated that they believe the flatwoods salamander should be listed as threatened. However, none of these panel members provided information indicating that the salamander better met the criteria for listing as threatened rather than that for listing as a species of special concern. One panel member indicated that there was little evidence to differentiate between a recent 50% population decline (a threatened criteria) and a recent 20 % decline (a species of special concern criteria). The remaining arguments for listing as threatened were based on experience and philosophies rather than application of the criteria as they are currently defined in Rule 68A-1.004, F.A.C. Therefore, staff did not alter the recommendation to list the flatwoods salamander as a species of special concern initially made in the preliminary biological status report.

PUBLIC COMMENTS ON BIOLOGICAL STATUS

One public comment on the biological status of the flatwoods salamander was received in response to a notice published in the Florida Administrative Weekly (Volume 25, Number 42:4898) on October 22, 1999. This comment suggested there were gaps in the available data regarding flatwoods salamander populations and population trends, and that further inquiry is needed to determine the need for a listing action. FWC staff reviewed the comment and agreed there are some data gaps. However, staff concluded that there was enough credible information to evaluate the biological status of the flatwoods salamander according to the criteria defined for endangered species, threatened species, and species of special concern in Rule 68A-1.004, F.A.C., and that the information presented in the comment was not sufficient to warrant altering the recommendation to list the flatwoods salamander as a species of special concern initially made in the preliminary biological status report.

CONCLUSIONS

The flatwoods salamander was federally listed as threatened in May 1999. As a result, the FWC initiated a petition to list the salamander as threatened in Florida under Rule 68A- 27.004 F.A.C. In order to warrant listing, the flatwoods salamander must meet at least one of the listing criteria in rule 68A-1.004 F.A.C. for a listing category. The flatwoods salamander does not meet any of the criteria established by the FWC for being listed as threatened, as those criteria are currently defined. However, it does meet several of the criteria for listing as a species of special concern. Therefore, staff recommend that the FWC list the flatwoods salamander as a species of special concern under Rule 68A-27.005 F.A.C.

LITERATURE CITED

- Means, D. B. 1998. *Ambystoma cingulatum* (flatwoods salamander). Herpetological Review 29(1):47.
- Means, D. B., J. G. Palis, and M. Baggett. 1996. Effects of slash pine silviculture on a Florida population of flatwoods salamander. Conservation Biology 10(2):426-437.
- Palis, J. G. 1997a. Breeding migration of *Ambystoma cingulatum* in Florida. Journal of Herpetology 31(1):71-78.
- Palis, J. G. 1997b. Distribution, habitat, and status of the flatwoods salamander (*Ambystoma cingulatum*) in Florida, USA. Herpetological Natural History 5(1):53-65, 321-330.

Petranka, J. W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington.

U.S. Fish and Wildlife Service. 1999. Endangered and threatened wildlife and plants; final rule to list the flatwoods salamander as a threatened species. Federal Register 64(62):15691-15704.

Wigley, T. B., J. M .Sweeney, and J. A. McGlincy. 1998 .The flatwoods salamander: What in the world is going on? Forest Landowner 57(4):50-52.

Prepared by:

Mr. Paul Moler, Florida Fish and Wildlife Conservation Commission, 4005 South Main St.,
Gainesville, Florida 32601

Dr. Brad Gruver, Florida Fish and Wildlife Conservation Commission, 620 South Meridian St.,
Tallahassee, Florida 32399-1600.

APPENDIX 5. Federal Permitted and Non-permitted Actions for Flatwoods Salamanders from Federal Listing Packet

The following are verbatim excerpts from the federal listing notice (USFWS 1999) that officially lists the flatwoods salamander as a federally threatened species.

List of actions that “are not likely to result in a violation of section 9, provided these activities are carried out in accordance with existing regulations and permit requirements” (USFWS 1999, p.15703):

1. Possession of legally acquired flatwoods salamanders
2. Lawful hunting activities
3. Lawful burning of habitat where the flatwoods salamander is known to occur, including winter burning
4. Federally approved projects that involve activities such as discharge of fill material, draining, ditching, tilling, bedding, diversion or alteration of surface or ground water flow into or out of a wetland (i.e., due to roads, impoundments, discharge pipes, etc.), when you conduct the activity in accordance with any reasonable and prudent measures given by the Service in accordance with section 7 of the Act
5. Conversion of pine flatwoods habitat where the flatwoods salamander does not occur
6. Timber harvesting in pine flatwoods habitat within a 450-m (1,476-ft) radius buffer zone surrounding a known flatwoods salamander breeding pond, in accordance with the following guidelines:
 - a. Use selective harvest, only during dry periods and at a minimum of 10-year intervals, within an inner primary zone extending 164 m (538 ft) out from the edge of the breeding pond. Maintain a basal area of 4.2 to 4.7 square meters (sq m) per ha (45 to 50 square feet (sq ft) per ac) in the primary zone
 - b. Use a mix of clear-cutting and selective harvest, only during dry periods and at a minimum of 10-year intervals, in an outer secondary zone extending from 164 m (538 ft) to 450 m (1,476 ft) out from the edge of the breeding pond. Clear-cut up to 25 percent of this secondary zone at any given time, as long as you maintain 75 percent of the secondary zone in pine flatwoods habitat at a basal area of 4.2 to 4.7 sq m per ha (45-50 sq ft per ac). Do not separate the primary and secondary zone from each other by cleared or inappropriate habitat (e.g., non-pine flatwoods habitat such as agriculture, urban development or other forest types).
 - c. Minimize skid trails and their effects through the use of prescription planning and techniques such as pallets and bridges. Locate skid trails parallel to, rather than perpendicular to, the wetland edge to reduce alterations in wetland hydrology. Locate all log landings outside the primary and secondary zones.

- d. Keep soil disturbance to a minimum. Do not conduct intensive mechanical site preparation (i.e., root-raking, discing, stumping, bedding) or any other actions that cause significant soil disturbance.
- e. Prescribed fire should be the preferred method for site preparation and control of woody vegetation. Limit herbicide use to manual application, following BMPs, when fire cannot be employed.
- 7. Timber harvesting (including clear-cutting) in pine flatwoods habitat where the flatwoods salamander does not occur or outside the 450-m (1,476-ft) buffer zone described above
- 8. Bait harvesting for crayfish in ephemeral ponds

List of activities that would “be likely to result in a violation of section 9; however, possible violations are not limited to these actions alone” (USFWS 1999, p.15703):

- 1. Unauthorized collecting, handling, or harassing of individual flatwoods salamanders;
- 2. Possessing, selling, transporting, or shipping illegally taken flatwoods salamanders;
- 3. Unauthorized destruction or alteration of wetlands used as breeding sites by flatwoods salamanders. These actions would include discharge of fill material, draining, ditching, tilling, bedding, clear-cutting within the wetland, diversion or alteration of surface or ground water flow into or out of a wetland (i.e., due to roads, impoundments, discharge pipes, etc.), and operation of any vehicles within the wetland;
- 4. Discharge or dumping of toxic chemicals, silt, or other pollutants (i.e., sewage, oil, and gasoline) into isolated wetlands or upland habitats supporting the species;
- 5. Unlawful destruction or alteration of suitable pine flatwoods habitat within a 450-m (1,476-ft) radius surrounding a known flatwoods salamander breeding pond. These actions would include, but are not limited to, conversion of habitat to agricultural or urban use, or ditching and draining a site; and
- 6. Use of pesticides or herbicides in violation of label restrictions.

APPENDIX 6. Federal Prohibitions and Exceptions for Flatwoods Salamanders from Federal Listing Packet

The following are verbatim excerpts from the federal listing notice (USFWS 1999) that officially lists the flatwoods salamander as a federally threatened species.

Prohibitions (USFWS 1999, p.15703):

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all threatened wildlife. The prohibitions, codified at 50 CFR 17.31 for threatened wildlife, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these), import, export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

Exceptions (USFWS 1999, p.15703):

We may issue permits to carry out otherwise prohibited activities involving threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.31 for threatened species. You may obtain permits for scientific purposes, to enhance the propagation or survival of the species, and/or incidental take in connection with otherwise lawful activities. For threatened species, you may also obtain permits for zoological exhibition, educational purposes, or special purposes consistent with the purposes of the Act.

APPENDIX 7. Recent Flatwoods Salamander Sites in Florida

County ^a	Palis (1997b) ^b Historic (H); extant sites ^c (populations)	Cox and Kautz (2000) FNAI occurrence records	LaClaire (2000) ^d extant sites ^c ; populations (public land/private land)
Escambia	2 H	1	–
Santa Rosa	3 H; 5 sites (3 pops.)	7	9 (3 public/6 private) sites; 2/5 ^e pops.
Okaloosa	24 (2 pops.)	2	24 (24/0); 2/0 pops.
Walton	1 (1 pop.)	1	2 (1/1); 1/1 pops.
Holmes	1 (1 pop.)	1	1 (0/1); 0/1 pop.
Washington	1 H; 3 (2 pops.)	4	3 (½); ½ pops.
Bay			
Jackson	7 H; 3 (3 pops.)	6	3 (0/3); 0/3 pops.
Calhoun	6 H; 4 (4 pops.)	6	4 (0/4); 0/3 pops.
Gulf	1 H	1	–
Gadsden			
Liberty	11 H; 36 (14 pops.)	12	33 (33/0); 11/0 pops.
Franklin	2 H; 1 (1 pop.)	3	2 (2/0); 2/0 pops.
Leon			
Wakulla	1 H; 1 (1 pop.)	2	3 (2/1); 2/1 ^e pops.
Jefferson		1	1 (0/1); 0/1 pop.
Madison			
Taylor			
Hamilton			
Suwannee			
Lafayette			
Dixie			
Columbia			
Gilchrist			
Levy			
Citrus			
Baker	1 H; 3 (1 pop.)	2	4 (3/1); 1/1 pops.
Union			
Bradford	2 H	1	–
Alachua	4 H	4	–
Marion	1 H	1	–
Nassau			
Duval	2 H	2	–
Clay			
Putnam			
St. Johns			
Flagler			
Volusia			
TOTALS	44 H; 82 (33 pops.)	57 records	89 (69/20); 22/18^e pops.

^aall 38 North Florida counties shown on Palis (1997b) map are listed, in approximate west to east and north to south order

^bdefined as pre-1990 records

^csites are occurrence records for salamanders, most but not all of which are at breeding ponds

^dUSFWS records, current as of November 6, 2000 (L. LaClaire pers. commun.)

^etotal number of populations is 38; 1 population each in Santa Rosa and Wakulla counties is distributed on both public and private land

APPENDIX 8. Distribution of Extant Flatwoods Salamander Sites in Florida, by Public Versus Private Ownership and County^a

PUBLIC LAND

Federal/US Forest Service

- **Apalachicola National Forest** (Liberty Co.: 33 sites^b in 11 populations)
Apalachicola National Forest (Franklin Co.: 1 site in 1 population)
- **Osceola National Forest** (Baker Co.: 3 sites in 1 population)

Federal/US Department of Defense:

- **Eglin Air Force Base** (Okaloosa Co.: 24 sites in 2 populations)
- **Hurlburt Field** (Santa Rosa Co.: 1 site in 1 population)
- **Holley OLF** (Santa Rosa Co.: 1 site in 1 population)

Federal/US Fish and Wildlife Service

- **St. Marks National Wildlife Refuge** (Wakulla Co.: 2 sites in 2 populations)

State of Florida/DACS/Division of Forestry:

- **Pine Log State Forest** (Washington Co.: 1 site in 1 population)
- **Point Washington State Forest** (Walton Co.: 1 site in 1 population)
- **Tate's Hell State Forest** (Franklin Co.: 1 site in 1 population)

PRIVATE LAND (by county)

- **Baker** (1 site in 1 population)
- **Calhoun** (4 sites in 3 populations)
- **Holmes** (1 site in 1 population)
- **Jackson** (3 sites in 3 populations)
- **Jefferson** (1 site in 1 population)
- **Santa Rosa** (6 sites in 5 populations, 1 of which is shared by public land)
- **Wakulla** (1 site in 1 population that is shared by public land)
- **Walton** (1 site in 1 population)
- **Washington** (2 sites in 2 populations)

^aFrom US Fish and Wildlife Service records, current as of November 6, 2000 (L. LaClaire pers. commun.)

^bsites are occurrence records for salamanders, most but not all of which are at breeding ponds

APPENDIX 9. Derivation of the Conservation Objective

FWC staff arrived at the proposed conservation objective after careful consideration of the Species of Special Concern listing criteria. To be considered a Species of Special Concern, a species needs to meet only 1 of the 5 alternative criteria, listed as (a) through (e) in Appendix 2. However, to exceed the threshold for designation as a Species of Special Concern, it would have to be ascertained that the flatwoods salamander met or exceeded all of the criteria. Discussion of the scientific basis for this approach and its feasibility is presented with respect to each of the 5 listing criteria (numbers 1 through 5 below correspond to (a) through (e) in Appendix 2).

1. **A population reduction of less than 20% either over the last 10 years or projected within the next 10 years.** The Final Biological Status Report emphasized that, although data on population numbers for flatwoods salamanders are lacking, there is a suspected decline in area of occupancy, extent of occurrence and/or quality of habitat that could be inferred from apparent loss of flatwoods habitat. Moreover, prior to the federal listing (USFWS 1999), the trend in habitat conversion and degradation would have been anticipated to result in a decline of at least 20%. If it could be demonstrated that quality flatwoods habitat available to flatwoods salamanders is stable or increasing such that known population numbers are stable or increasing, Species of Special Concern status could be exceeded for this criterion.
2. **Distribution.** This criterion has both a numerical, area-based, component and a distribution component. The alternative (i.e., only one or the other needs to be achieved) numerical components, extent of occurrence and area of occupancy estimates, are considered separately under 2a and 2b below. The distribution component requires estimates that indicate 2 out of 3 additional measures: **severely fragmented** or known to exist at only a single location, **continuing decline** in any of the following (extent of occurrence; area of occupancy; area, extent, and/or quality of habitat; number of locations or subpopulations; number of mature individuals), and **extreme fluctuations** in any of the following (extent of occurrence; area of occupancy; number of locations or subpopulations; number of mature individuals). Due to its dependence on isolated wetlands in a landscape that has already been fragmented, it is apparent that the flatwoods salamander's distribution range-wide is highly discontinuous, and could be defined as "severely fragmented." Even with the protection of known populations and the discovery of additional ones, it seems likely that the flatwoods salamander's distribution will continue to be "severely fragmented." Until more comprehensive, long-term data on population numbers are available, determining the population trends of the flatwoods salamander range-wide will rely heavily on indirect measures such as presence or absence of larvae and availability of appropriate quality habitat. Documented increases in the amount of such habitat, locating additional populations while maintaining known populations, documented year-to-year persistence of larvae at given breeding sites, and documentation of increased numbers of adults would be important evidence suggesting the decline is no longer continuing. It is to be expected

that amphibian population numbers fluctuate dramatically from year to year due to differences in amount and duration of precipitation. In addition, natural succession throughout the landscape would be expected to result in the periodic creation and loss of the isolated wetlands upon which flatwoods salamanders depend for reproduction. Against this background of natural fluctuations, it may be possible to “hedge our bets” and prevent the extirpation of populations. For example, the 22 populations on public lands in Florida utilize at least 69 identified breeding sites (LaClaire pers. commun., Appendix 7), for an average of 3.14 known breeding sites per population. As an arbitrary signpost indicating a reduced likelihood that extreme fluctuations will cause local extinction, one could define a “robust” population as one known to be using 3 or more breeding sites, and a conservation objective could be to attain this level for all populations.

- 2a. **An extent of occurrence of greater than 7,700 square miles range-wide** (i.e., including other states as well as Florida). This area would equal a square about 88 miles on the side, or about 13% of Florida’s total area of 58,560 square miles. According to the map in Conant and Collins (1991), the flatwoods salamander’s extent of occurrence covers well over this amount of area. The Florida range maps given in Ashton (1992) and in Petranka (1998) show a suspected gap in distribution between Panhandle and Northeast Florida populations, but the implied total geographic range on each of those maps would still exceed 7,700 square miles. Therefore, it appears that this numerical criterion is already met.
- 2b. **An area of occupancy exceeding 770 square miles range-wide** (i.e., including other states as well as Florida). This area would equal a square about 28 miles on the side, or about 1.3% of Florida’s total area. The amount of habitat actually used by a flatwoods salamander population includes the breeding pond or ponds and the associated surrounding flatwoods. Data on terrestrial habitat use are mostly lacking; Ashton (1992) reported on individuals that traveled up to 1 mile from their breeding pond, although other biologists dispute the meaning of such relatively long-distance movements (see Appendix 11). Assuming that such movements commonly and naturally occur in most flatwoods salamander populations, a population’s minimum habitat requirements could be defined as that area around the pond extending 1 mile from the wetland edge. Therefore, a population using only 1 breeding pond would need a minimum of 3.14 square miles (the area of a circle $A = \pi r^2$ with radius $r = 1$ mile), if the pond area is represented by a point. As pond area increases, the idealized occupied habitat (based on pond radius added to the distance moved from the pond edge) would increase correspondingly. One could postulate that a population using 2 ponds would need less than double the amount needed for 1 pond, say 5 square miles; 3 ponds - 7 square miles; 10 ponds - 12 square miles; 21 ponds - 15 square miles. Using these conventions (Moler pers. commun.), the total area of occupancy for the 53 known populations range-wide is 231 square miles. At an average of 4.36 square miles per population (231 divided by 53), the minimum target area of occupancy of 770 square miles would contain 177 populations.

(It is worth noting that Species of Special Concern area of occupancy is defined as less than 770 square miles but greater than 200 square miles range-wide. The postulated range-wide area of occupancy of 231 square miles [see above] is very close to the minimum value for this category. Based on the postulated area occupied by an average population [see above], the loss of only 7 of the known extant populations [occupying an estimated 31 square miles], whether in Florida or in another state in the species' range, would be sufficient for the flatwoods salamander to fall below the minimum value for Species of Special Concern and meet the criteria of Threatened.)

It should be emphasized that this discussion is based on several successive assumptions, the most fundamental being the distance moved by individual flatwoods salamanders from their breeding site pond and the corresponding area of habitat required to support the average population using a given pond or set of ponds. As more data are acquired on these topics, biologists will be better able to quantify the relationship between salamander habitat use and area of occupancy.

Until such data are available, however, and as long as the assumptions are recognized, one can continue the above line of reasoning with respect to an area of occupancy conservation objective. Therefore, using the postulated average area occupied by a population as a "unit" of area of occupancy, and the number of populations as a coarse and indirect measure of the total area occupied, in order to exceed the criterion for Species of Special Concern, a minimum of 124 additional populations (covering 539 square miles) need to be found or restored range-wide. Florida has about 73% of the known populations (38; Appendix 7). If it is reasonable to assume that other *A. cingulatum* states (Georgia, South Carolina, Alabama) will implement comparable survey and management efforts, then to achieve its share of the target area of occupancy, Florida should have a total of 129 populations (0.73×177), and thus needs to find or restore 91 more populations. Based on the previous discussion, these 91 additional populations would occupy about 397 square miles, and complete Florida's area of occupancy objective of 562 square miles.

3. **Population Size and Trend.** Like the previous criterion, this criterion has a numerical component (discussed in 3a below) and a trend component. The trend criterion requires either an estimated continuing decline of at least 10% within 10 years or a continuing decline in numbers such that either no population contains more than 1,000 mature individuals or all individuals are in a single population. The latter 2 population criteria are apparently already exceeded (see below), but the Final Biological Status Report suggests that the flatwoods salamander may be expected to undergo at least a 10% decline based on current information. As discussed previously, documenting the reversal of such a continuing decline would require the collection of long-term data from populations across the species' range.

- 3a. **More than 10,000 mature individuals range-wide.** It is not known how many mature flatwoods salamanders would constitute a viable (stable, self-sustaining) population, and it is difficult to census them. The Final Biological Status Report suggested that the sum of all populations range-wide is less than 10,000 (but more than 2,500) mature individuals, but that the 3 largest populations known (all in Florida: 1 using 21 ponds on Eglin Air Force Base [AFB], 2 using 10 ponds each on Apalachicola National Forest [NF]) probably contain at least 1,000 mature individuals each, although supporting data are lacking at present. Means et al. (1996) captured as many as 36 mature individuals in 1 hour migrating across a 4.3-km stretch of highway in the early 1970s, and estimated that nightly migrations then involved 200-300 adults per night (compared to less than 1 per night in the early 1990s). Palis (1997a) used a drift fence encircling a 0.8 ha wetland in Eglin AFB to intercept immigrating and emigrating salamanders; he caught 67 non-yearlings one year and 53 the next. Similarly, Palis and Aresco (2000) captured 21 adults migrating to and from a 0.2 ha isolated wetland in Apalachicola NF (where, apparently due to water level fluctuations, they did not successfully reproduce that year; the low number of migrants probably reflect the poor conditions and the adult population is likely much larger than indicated). If the target threshold of 10,000 individuals were distributed evenly among the 177 populations postulated above, the average population would contain 56 mature salamanders. Although it is unknown whether this number could constitute a viable population, in order to exceed a range-wide population estimate of 10,000 adult flatwoods salamanders, a conservation objective could be to count a minimum of 56 adults per population. This would be a highly impractical objective, however; the long-term investment of equipment and personnel would make this prohibitively expensive to pursue at more than a handful of populations.
4. **Population Very Small or Restricted.** Current information on flatwoods salamander population estimates and distribution suggest that this criterion is already exceeded.
5. **Quantitative Analysis.** As indicated in the Final Biological Status Report, available data are not sufficient to permit estimation or modeling of the probability of extinction of flatwoods salamanders in the wild.

APPENDIX 10. Flatwoods Salamander Proposed Conservation Zones

Designate 5 conservation zones for Florida flatwoods salamanders:

1. Populations in 5 western Panhandle counties (Escambia, Santa Rosa, Okaloosa, Walton, Holmes), including Eglin Air Force Base
2. Populations in 5 central Panhandle counties (Washington, Bay, Jackson, Calhoun, Gulf) west of Apalachicola River
3. Populations in 6 eastern Panhandle counties (Gadsden, Liberty, Franklin, Leon, Wakulla, Jefferson), including Apalachicola National Forest and St. Marks National Wildlife Refuge
4. Populations in 10 “gap” counties in central North Florida where salamanders have not yet been recorded (Madison, Taylor, Hamilton, Suwannee, Lafayette, Dixie, Columbia, Gilchrist, Levy, Citrus)
5. Populations in 12 northeast Florida counties, some of which have historic or extant populations, including Osceola National Forest (Baker, Union, Bradford, Alachua, Marion, Nassau, Duval, Clay, Putnam, St. Johns, Flagler, Volusia)

Zone 1: Complete surveys of Eglin; implement conservation actions to ensure long-term health of Eglin populations; monitor populations on annual basis; cooperative agreements with private landowners for long-term management of populations on their land; resurvey Escambia and other counties, especially Blackwater River State Forest, for additional populations

Zone 2: Complete surveys of Pine Log State Forest and Point Washington State Forest; implement conservation actions to ensure long-term health of those populations; monitor population(s) on annual basis; cooperative agreements with private landowners for long-term management of populations on their land; resurvey Bay, Gulf, and other counties for additional populations

Zone 3: Complete surveys of Apalachicola National Forest (including searching Franklin, Wakulla, and Leon portions for additional populations), St. Marks National Wildlife Refuge, and Tate’s Hell State Forest; implement conservation actions to ensure long-term health of those populations; monitor populations on annual basis; resurvey Franklin, Wakulla, and other counties for additional populations

Zone 4: Implement surveys of all potential habitat in “gap” counties; ascertain likelihood of past and present occupancy by flatwoods salamanders

Zone 5: Complete surveys of Osceola National Forest; implement conservation actions to ensure long-term health of Osceola populations; monitor populations on annual basis; cooperative agreements with private landowners for long-term management of populations on their land; resurvey all counties in region for additional populations

APPENDIX 11. Flatwoods Salamander Movement and Home Range Information

- Two of 4 radioactively tagged adult salamanders moved over 1,700 m, and a third moved over 1,560 m, from the breeding pond and into surrounding pine flatwoods at edge of planted slash pine (Ashton 1992, pers. commun.); Ashton's (1992) suggestion of large home range size needs more data to substantiate (Ashton pers. commun.).
- A group of salamander biologists (Jensen 1998) "felt that Ashton's distance represented only an extreme incident and a buffer with radius 1.7 km is far too much to ask and probably unnecessary to protect a population." Instead they (Jensen 1998) recommended adopting a buffer based on Semlitsch (1998), wherein 164.3 m from the wetland edge was the average movement for several *Ambystoma* spp. (but not including *A. cingulatum*). Semlitsch (1998) admitted that his value may be an underestimate for *A. cingulatum*, but he suggests (Semlitsch pers. commun.) that the long-distance movements reported by Ashton (1992) represent movements important for connectivity between populations, but not for local population persistence.
- Migrating individuals move up to 500 m or more from breeding ponds (Means et al. 1996).
- although yearling males may be physiologically mature, evidence suggests that yearlings are not normally members of the breeding population (Palis et al. 1995, Palis 1997a)
- Most migrating salamanders entered ponds from open-canopy, mesic longleaf pine-wiregrass and longleaf/slash pine-wiregrass flatwoods, rather than xeric (longleaf/slash pine scrubby) flatwoods (Palis et al. 1995, Palis 1997a).
- Flatwoods salamanders display emigration orientation in direction of immigration to breeding pond, suggesting ability to home to and from a particular terrestrial retreat (Palis et al. 1995, Palis 1997a).
- Adults emigrating from breeding pond apparently moved nocturnally, and were not observed to leave the cover of pine duff. They were last encountered using 18- to 22-mm smooth-sided burrows under the leaf litter, where they remained at an apparent depth of more than 0.5 m below the surface. When excavated, these burrows were found to be connected with a series of burrows of unknown origin and at different levels in the soil, and neither the salamanders nor their radioactive tags could be successfully relocated (Ashton pers. commun.).
- Metamorphs may stay in pond basin if a dry year, and not emigrate until fall (Palis 1997a, Palis and Means in press).

APPENDIX 12. Reviewers of Flatwoods Salamander Draft Management Plan

Listing Process Stakeholders

Mr. Sam Ard, Florida Cattleman's Association, P.O. Box 10406, Tallahassee, Florida 32302-2406

Dr. Gian Basilli, Florida Audubon Society, 1331 Palmetto Avenue, Suite 110, Winter Park, Florida 32789

Mr. Dennis Emerson, Florida Farm Bureau, P.O. Box 147030, Gainesville, Florida 32614-7030

Dr. Todd Engstrom, Tall Timbers Research Station, Route 1, Box 678, Tallahassee, Florida 32312

Mr. Manley Fuller, Florida Wildlife Federation, P.O. Box 6870, Tallahassee, Florida 32399-0700

Mr. Greg Galpin, Florida Forestry Association, The Timber Company, P.O. Box 157, Gulf Hammock, Florida 32635-0157

Ms. Susan George, Defenders of Wildlife, P.O. Box 40709, Albuquerque, New Mexico 87196

Mr. Steve Godley, Florida Home Builders Association, 3910 U.S. Highway 301 North, Suite 180, Tampa, Florida 33619

Ms. Laurie MacDonald, Sierra Club, 103 Wildwood Lane, St. Petersburg, Florida 33705

Ms. Barbara J. Powell, Everglades Coordinating Council, 22951 SW 190 Avenue, Miami, Florida 33170

Mr. Doug Rillstone, Florida Chamber of Commerce, 101 East College Avenue, Tallahassee, Florida 32301

Expert Reviewer Contacts

Mr. Ray E. Ashton, Jr., Ashton Biodiversity Research and Preservation Institute, Inc., 14260 W. Newberry Road, #331, Newberry, Florida 32669

Mr. Steve Bennett, South Carolina Wildlife and Marine Fisheries, P.O. Box 167, Cola, South Carolina 29202

Mr. Hildreth Cooper, U.S. Fish and Wildlife Service, 1612 June Avenue, Panama City, Florida 32405

Mr. John B. Jensen, Georgia Department of Natural Resources, Nongame - Endangered Wildlife Program, 116 Rum Creek Drive, Forsyth, Georgia 31029-6517

Ms. Linda LaClaire, U.S. Fish and Wildlife Service, Jackson Field Office, 6578 Dogwood View Parkway, Jackson, Mississippi 39213

Dr. D. Bruce Means, Coastal Plains Institute, 1313 North Duval Street, Tallahassee, Florida 32303

Mr. Paul E. Moler, Florida Fish and Wildlife Conservation Commission, Wildlife Research Lab, 4005 South Main Street, Gainesville, Florida 32601

Ms. Jane Monaghan, U.S. Fish and Wildlife Service, 6620 Southpoint Drive, South, Suite 310, Jacksonville, Florida 32216-0912

Mr. John G. Palis, P.O. Box 387, Jonesboro, Illinois 62952

Mr. David J. Printiss, Florida Natural Areas Inventory, 1018 Thomasville Road, Suite 200-C, Tallahassee, Florida 32303

Ms. Carrie Sekerak, U.S. Forest Service, Seminole Ranger District, 40929 State Road 19, Umatilla, Florida 32784

Dr. Ray D. Semlitsch, University of Missouri, Division of Biological Sciences, 212 Tucker Hall, Columbia, Missouri 65211

Mr. Dirk J. Stevenson, Fort Stewart Fish and Wildlife Branch, Bldg. 1142, Directorate of Public Works, 1113 Frank Cochran Drive, Fort Stewart, Georgia 31314-4940

Others Who Requested Copies and/or Submitted Comments

Mr. Mike Branch, Smurfit-Stone Container Corporation, Forest Resources, P.O. Box 457, Fernandina Beach, Florida 32035

Ms. Gail A. Carmody, U.S. Fish and Wildlife Service, 1612 June Avenue, Panama City, Florida 32405-3721

Mr. Jeremy Craft, 1211 Spring Haven Road, Tallahassee, Florida 32321

Mr. Bruce DeGrove, Florida Phosphate Council, 215 South Monroe Street, Suite 703, Tallahassee, Florida 32301

Mr. Philip Gornicki, Florida Forestry Association, P.O. Box 1696, Tallahassee, Florida 32302-1696

Ms. Judy Hancock, P.O. Box 2436, Lake City, Florida 32056

Ms. Holly Jensen, 11714 SW 89 Street, Gainesville, Florida 32608-6289

Mr. Sydney Maddock, Biodiversity Legal Foundation, P.O. Box 1359, Buxton, North Carolina 27920

Mr. Dan Pearson, Florida Department of Environmental Protection, Division of Recreation and Parks, Bureau of Parks District 2, 4801 SE 17th Street, Gainesville, Florida 32641-9299