Flatwoods Salamander
Ambystoma cingulatum

This profile is a short summary of information to introduce the species and does not summarize all available information on the species.

Listing status: USFWS = Threatened
FWC = Species of Special Concern

Trend: The 1999 Biological Status Report conducted to support the listing as a species of special concern indicated that no data exist to evaluate numerical population change during the 10-year period preceding the report. 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. Habitat loss on private lands due to conversion of pine flatwoods to pine plantations or other land uses has continued since the development of the 2001 management plan. Flatwood salamander populations are severely fragmented, with 52 isolated populations known range-wide, including 38 populations from 12 counties in Florida. The total range-wide population of flatwoods salamanders is estimated to number fewer than 10,000 mature individuals.

Threats: The primary threat to flatwoods salamanders in Florida is habitat destruction, fragmentation, and degradation due to intensive silvicultural practices such as ditching, bedding, broadcast herbicide applications, mechanical site prep activities and piling of slash in ephemeral wetlands. Other threats include lack of prescribed fire, illegal trash dumping, off-road vehicle use, conversion of flatwoods to other land uses and road construction in roadless areas.

Notes: Over the last several years, FWC staff coordinated an extensive survey for flatwoods salamanders across the species' Florida range to investigate potential breeding ponds and get a better picture of the status of the species in Florida. The results of these searches were mixed. Several well-established populations of flatwoods salamanders were confirmed to be thriving on some public land. However, most of the areas surveyed in the vicinity of historic sites, on both public and private lands, were determined to be unsuitable due to many years of fire suppression and soil disturbance.

In August 2008, the USFWS advertised their intent to split the previous species into 2 species, and declare critical habitat. This document is available at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2008_register&docid=fr13au08-31.

Prioritization information:

PLCP PVA proportion of pops modeled to persist on public lands = **0.22**
PLCP PVA probability of a 50% decline on public lands = 0.00
Millsap biological score = 24.3
Millsap supplemental score = **16**
Legacy population trend = **declining**
Legacy population status = **low**
Summary: Four of 6 parameters are triggered for this species, making this species a moderate to high priority. This species has a management plan that calls for action on state lands, and this might influence prioritization. Further, the biological score may increase with the recent publication that individuals west of the Apalachicola River are actually a different species. **Note**: the above scores are based on information available prior to the splitting of the species into 2 species. As such, these scores would likely be different if each species were evaluated separately.

Life History: The flatwoods salamander is a management responsive species that can be an indicator of properly managed pine flatwoods and associated wetland habitats. Management of habitat for flatwoods salamander requires frequent prescribed fire and protection of the hydrological integrity of ephemeral wetlands essential to breeding. The maintenance of continuous herbaceous groundcover from the uplands through the ecotone and into the wetland is especially important.

Breeds October - January, with adults moving overland to and from ponds at that time. These movements often coincide with rain. Eggs are attached to vegetation in small clumps of 1 to 35 eggs. A female may lay more than 225 eggs in a season. Eggs hatch within two days and young are fully metamorphosed three months later.

Adults and juveniles seek refuge underground, sometimes in crayfish burrows. Aquatic larvae remain in ponds for 2 - 3 months, usually January - March. Fire is an important component for maintaining breeding ponds. Activities that alter the hydrology can have negative impacts on this species. Breeding ponds should not be stocked with fish.

Crustaceans, primarily isopods and amphipods, make up the majority of the larval diet. The adult diet consists of insects and earthworms.

Home range has been estimated as 0.37 acres (1500 m^2). Adults have been known to move as far as 1 mile (1.7 km) from breeding sites.

Preferred Habitat parameters: none provided

Minimum Habitat Requirement:

From PVA: populations with at least 20 females.
From Literature: No estimates found.

Best management Practices: See Flatwoods Salamander Management Plan, FWC 2001. (link below)

- 2-3 year fire return interval in flatwoods including potential breeding ponds

- Maintain herbaceous ecotone around potential breeding ponds
- Do not install firebreaks around potential breeding ponds

Monitoring Protocol:

See Flatwoods Salamander Management Plan, FWC 2001. (link below)

PVA Summary: The Wildlife Habitat Conservation Needs in Florida project created a PVA (http://research.myfwc.com/features/view_article.asp?id=29815) for flatwoods salamander under two statewide scenarios; one considerate of all potential habitat and one that only considered managed (i.e., public) lands. The all potential habitat model consisted of 234 populations and 174 populations for the managed lands habitat model. Based upon demographic data from related *Ambystoma* species two-stage model was developed to reflect differing survival between juvenile and adult salamanders and reproduction beginning at age 2. Adult fecundity was calculated as 0.96 based on conservative estimates of egg production and survival of eggs to metamorphosis. The baseline growth in the model was calculated as 1.078. An estimate of carrying capacity of 0.035 females per hectare was used for modeling and initial abundance was estimated at on half of carrying capacity.

The probability of extinction was zero for both the all potential habitat and managed habitat models. There was a no probability of decline but the abundance was reduced on the managed habitat. Adult survival was the most influential parameter. Risk of extinction remained zero but chances of decline increased (14% probability of 50% decline) when adult survival was reduced 5%. Only the largest populations ($\geq$ 20 females) persisted for 100 years. Dispersal between smaller populations may be critical to maintaining them in the long-term.

As this model was based on parameters for closely related species the results should be used with caution. The assumption that all potential habitat is equal and occupied is problematic for this species and likely impacted the reliability of the results. For these reasons, these results should be used with caution.

2003 Landcover used for model:

Mixed Pine-Hardwood Forest
Pinelands
Freshwater Marsh and Wet Prairie
Shrub Swamp
Bay Swamp
Cypress Swamp
Cypress/Pine/Cabbage Palm
Mixed Wetland Forest
Shrub and Brushland
Bare Soil/Clearcut

FNAI Natural Communities used:

Mesic Flatwoods
Wet Flatwoods
Depression Marsh
Dome Swamp

FNAI field guide description of habitat: Pine flatwoods (longleaf or slash) communities with wiregrass groundcover and scattered wetlands often dominated by cypress or

gum. Usually breeds in ponds that lack predatory fish and which usually have some emergent herbaceous vegetation.

Important Links:

FWC Management Plan: http://myfwc.com/imperiledspecies/pdf/Flatwoods-salamander.pdf

FWC Biological Status Report: http://myfwc.com/imperiledspecies/reports/FlatwoodsSalamanderBSR_final.pdf.

Nature Serve: http://www.natureserve.org/explorer/servlet/NatureServe?searchSciOrCommonName=flatwoods+salamander&x=9&y=6.

USFWS species profile: http://ecos.fws.gov/speciesProfile/SpeciesReport.do?spcode=D013

Pertinent Documents/Literature:

Ashton, R.E., Jr. 1992. Flatwoods salamander. Pp. 39-43 *in* P.E. Moler, ed. Rare and endangered biota of Florida. Vol. III. Amphibians and reptiles. University Press of Florida, Gainesville.

Whiles, M.R., J.B. Jensen, J.G. Palis, and W.G. Dyer. 2004. Diets of larvalFlatwoods Salamanders, *Ambystoma cingulatum*, from Florida and South Carolina. Journal of Herpetology 38:208–214.

Bishop, D. C., J.G. Palis, K.M. Enge, D.J. Printiss, and D.J. Stevenson, 2006. Capture Rate, Body Size, and Survey Recommendations for Larval *Ambystoma cingulatum* (Flatwoods Salamanders). Southeastern Naturalist 5: 9–16.

Means, D.B., J.G. Palis, and M. Baggett. 1996. Effects of slash pine silviculture on a Florida population of Flatwoods Salamander. Conservation Biology 10:426–437.