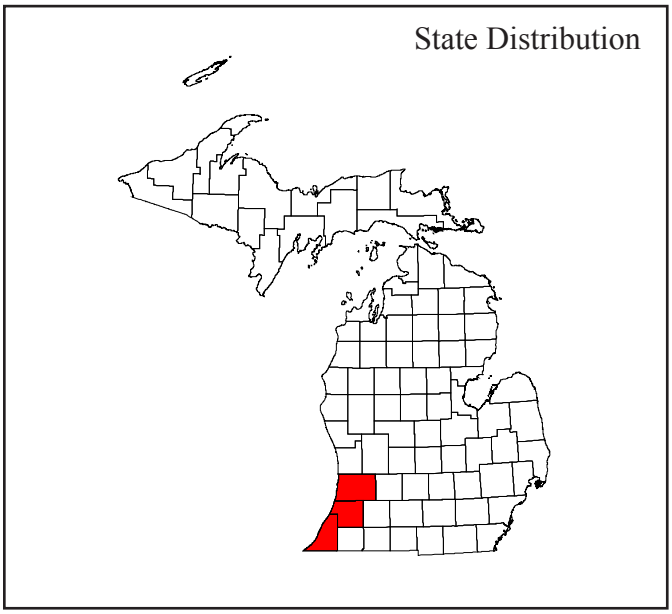
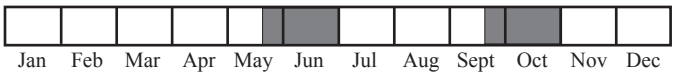
Ambystoma opacum Gravehnorst — marbled salamander

Photo by William Flanagan



Best Survey Period



Status: State endangered

Global and state rank: G5/S1

Family: Ambystomatidae (mole salamanders)

Range: Marbled salamanders are found from southern Vermont south through New England, New York, and Pennsylvania to northern Virginia, southwest through Ohio, Indiana, Illinois, southern Missouri southeastern Oklahoma, and south to eastern Texas and to the panhandle of Florida. There are outlier populations in northern Ohio, northern Indiana, southern Michigan, and central Missouri (Petranka 1998).

State distribution: In Michigan, marbled salamanders occur in the extreme southwestern portion of the state (Harding 1997). There are 3 known counties with records (Allegan, Berrien, and Van Buren) represented by only 4 sites. Although the Michigan range maps usually indicate a fairly widespread distribution at the county level, it is important to note that marbled salamanders occur in specific habitats, and may only occur in a small portion of each of the counties depicted. It also is important to note that this species has not been systematically surveyed throughout the southern portion of the state. The last confirmed record in the state is from 1989 in Allegan County.

Recognition: The marbled salamander is a medium-sized (3.4-5 inches adult length), **thick bodied salamander** with **white or gray bands across a black to dark brown-black body**. The belly may be black or brownish black, occasionally with some light speckling. Newly transformed juveniles are brown or black with scattered light markings which may start out yellowish and become bluish to silvery white once out of the water. The juveniles acquire the crossband pattern of the adults after several weeks or months.

Best survey time: Surveys for marbled salamanders can be conducted during the fall breeding season and during juvenile emergence in late spring or early summer. During late September through October, adults migrate at night to edges of forested, vernal or temporary ponds, which at this time of year are typically receded or dried up, where they breed and/or nest. Visual surveys for adults either migrating to or congregating at breeding areas should be conducted in the fall from late September through October, immediately after rainy evenings or nights. Drift fences, with or without pitfall traps, can also be installed around breeding sites in the fall to survey for adults or in the spring to survey for newly transformed juveniles dispersing from the ponds. For best results, surveys should be conducted on multiple evenings/nights, particularly during rain events, and drift fences and

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pitfall traps, if used, need to be checked daily/nightly or more frequently if possible. Aquatic larval surveys also can be conducted in the fall, late winter, and early spring before the larvae transform into juveniles using aquatic funnel traps (e.g., minnow traps) and/or dip nets. Larvae should be photo documented and verified by a species expert.

Habitat: The marbled salamander is found in moist lowland forests in Michigan, but also occur in drier wooded ridges and rocky hillsides in surrounding states. In Michigan, the only known sites have been described as wooded ravines and bottomland in the vicinity of the St. Joseph River, wet sugar maple and beech woods with some oaks and black cherry, second growth lowland wet woods with seasonal ponding, and lowland hardwoods (oak and aspen) with dense brush with many decaying logs and nearby pond and shallow marsh.

Biology: In Michigan, adult marbled salamanders are active and breed during the fall, typically late September through October. The marbled salamander is the only terrestrial salamander that breeds in the fall in Michigan. By breeding in the fall, the marbled salamander larvae have a head start on spring-breeding salamanders that often share the same ponds (Harding 1997). Adults migrate at night to the edges of woodland vernal ponds (Harding 1997). The female lays from between 50 to 200 eggs in a small cavity beneath leaf mold, moss, fallen bark, a rotted log, or other cover (Harding 1997). Many females brood their eggs until their nests are flooded, but nests are found without brooding females (Petranka 1998). By curling around her eggs, the female probably helps keep the eggs from dessicating, and offering protection from fungal invasion or predation by small predators.

The time from egg laying to hatching is variable and depends heavily on temperature and water levels. The developing eggs can survive for several weeks, or even months, if the rains are delayed (Harding 1997). Eggs tolerate cool temperatures but will be destroyed if frozen. Metamorphosis usually occurs in late spring or early summer when the larvae are from 4.5 to 7.5 cm (1.8 to 3 in.) long. Marbled salamanders can reproduce in their third or fourth year and can potentially live to at least nine years (Harding 1997).

During the active season, marbled salamanders spend a considerable amount of time below cover such as logs, rocks, and leaf litter, or below ground in mammal burrows and are rarely seen outside the breeding season (Harding 1997). Adult salamanders eat small invertebrates such as worms, slugs, snails, and insects. Large larvae sometimes feed on caterpillars that fall from overhanging trees (Petranka and Petranka 1980). Adult salamanders are preyed upon by owls, raccoons, skunks, snakes, small mammals, and other woodland predators (Petranka 1998).

Conservation/management: One of the greatest threats to the marbled salamander is the loss of bottomland hardwoods and associated vernal pools (Petranka 1998). Protecting known marbled salamander sites and maintaining suitable habitat at these sites are essential for conservation of this species. Maintaining and/or constructing a complex of natural and/or artificial vernal ponds in suitable forested habitats would provide breeding, foraging, and dispersal habitat for this species. Ponds should not freeze completely during the winter and hold water until at least May or June. Breeding ponds should remain free of fish. Although marbled salamanders also can occur in drier habitats, maintaining cool, moist, microenvironments and sufficient leaf litter and woody debris on the forest floor is still important for providing cover and foraging habitat for juveniles and adults.

Threats to local populations likely include intensive timber harvesting practices that reduce canopy closure, understory vegetation, uncompacted forest litter, or coarse woody debris in areas surrounding breeding sites (deMaynadier and Hunter 1999). In general, partial harvests and long rotation cycles would benefit salamander populations. Breeding sites are also vulnerable to destruction and degradation through draining and filling, and many area being isolated by habitat fragmentation, which could eventually result in deleterious levels of inbreeding and reduced likelihood of reestablishment of locally extirpated populations (NatureServe 2010).

Research needs: An assessment of the species' current distribution and status in the state is critically needed, particularly since this species has not been confirmed in the state since 1989. Long-term population studies including viability analyses are needed to better understand marbled salamander population dynamics and to identify those parameters that contribute most significantly to population health and viability. This information would be useful for developing effective monitoring protocols and assessing this species' status in the state. Impacts of management

and land use practices such as timber harvest, road construction, residential development, and recreation should be further investigated.

The fall-breeding, competitive advantage mentioned above may be lost in Michigan as small woodland ponds typically freeze completely during the long, cold winters, which in tern leads to high egg and larval mortality. Therefore, it is unlikely that the marbled salamander will be able to expand its range in the Great Lakes basin without a general climatic warming (Harding 1997). This species may be one of the few species benefitting from a warmer climate due to "global climate change" and would make an excellent study organism.

Related abstracts: Smallmouth salamander, floodplain forest, southern hardwood swamp, dry-mesic southern forest, mesic southern forest, Virginia snakeroot, Yellow fumewort, Wahoo, Pumpkin ask, Red mulberry

Selected references

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Abstract citation

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Photo by William Flanagan