

Marvelous Marbled Migration

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Marbled salamanders (*Ambystoma opacum*) are chunky, medium-sized salamanders in the mole salamander family (Ambystomatidae). These salamanders can get up to five inches in length and spend much of their adult life underground, coming to the surface in early fall to breed in large masses. Marbled salamanders occur from Florida to southern New Hampshire.

Marbled salamanders are carnivorous. As adults, they feed on small insects, worms, slugs and snails. Marbled salamander larvae feed on zooplankton until they become large enough to hunt, and their diet sometimes includes larvae of other salamander species.

Marbled salamanders typically breed from September to October in the northern parts of its range and from October to December in the southern parts of its range. On warm, rainy nights during the breeding season, marbled salamanders migrate en-masse to dry, **vernal pools** (aka temporary wetlands) to breed and lay eggs. Following breeding, the female will lay 50-200 eggs in areas that should fill with water when it rains. These spots can include a depression under a log, under leaf litter, or in a clump of vegetation.

Often, the female will curl her body around the eggs to protect the eggs and to keep them moist until rainwater fills the area. Once covered with water, the larvae will hatch a few days later. If there is not enough rain, then larvae will not hatch until spring! Typically, the larvae will undergo **metamorphosis** and turn into salamanders in about three to six months. The young salamanders will then travel to their adult habitats to live underground.

Generally, it will take 1-5 years for a young salamander to reach sexual maturity and return to their natal (nursery) vernal pools. Migration to vernal pools typically takes a night or two, but many hazards can be found along the way, both human and natural. Human-caused hazards can include roads, loss of habitat, and barriers to migration. Natural hazards can include weather, predators, and disease.

This activity will introduce students to migration and adaptations of marbled salamanders.

Grade Levels: Grades 3-8

- **3-LS4-3** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
- **MS-LS2-1** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Objectives:

Following the activity, students will be able to:

- Define the terms migration and limiting factor.
- Describe the migration of marbled salamanders and list limiting factors that affect the population.
- Predict the effects of habitat loss and degradation on populations of salamanders.

Materials:

- Printouts of stations
- Large foam dice for activity stations
- Markers for Station #6
- Chart for survived vs died
- Pictures of Marbled Salamanders (optional)

Directions:

1. Open the activity asking students to define migration. *What is migration?* (It is the seasonal movement from one area to another). *What are some examples of animals that migrate?* (Birds, bats, whales, eels, fish (like striped bass), butterflies like monarchs, dragonflies, and more). *Why do you think animals migrate?* (To find a better climate, more food, and/or breeding grounds).

2. Ask students if they can list any local salamanders. Ask them if any of those species can migrate. Tell them that many local species of salamanders migrate to temporary wetlands known as **vernal pools** to breed and lay their eggs. Some species only travel a few feet, but others can travel a longer distance.
3. Provide background information on the marbled salamander life cycle and general migration information.
 - a. *Optional:* Show the [video on Marbled Salamanders from Life in the Cold Blood](#). This video includes some of the migration information, breeding, and development of the young.
4. Explain the concept of **limiting factors**, aka a resource or environmental condition which limits the growth, distribution or abundance of an organism or population. Ask students what factors might limit marbled salamanders.
5. Tell students they will now get a chance to experience the migration of a marbled salamander and will go through a series of tasks to see if they can survive long enough to breed.
6. Setup the migration activity stations.
 - a. Stations with dice: 1, 8, 9, 14, 17
 - b. Other supplies: Station 6 needs markers; a chart w/ survival needed for end
7. Have students go through the activity and calculate who survives, who dies, and what they experience.
8. After the activity, calculate the survival rate percentage and then go over the following questions:
 - a. How many 'salamanders' survived? If you survived, did you run into any hazards that slowed down your migration? If so, what were they?
 - b. How many 'salamanders' died? What limiting factors affected you? Could your death have been prevented?
 - c. What hazards were caused by humans? What hazards were natural?

Discussion:

1. Have students summarize what they have learned about the factors that affect marbled salamander migration. Categorize the limiting factors into natural and human-caused.
2. Discuss what kinds of actions can be done to protect and restore habitats for migrating salamander populations. Discuss potential trade-offs related to any recommendations for humans and other amphibians.

Extensions:

1. Have students research other animals that migrate in their area. Compare and contrast migration routes, reasons for migration, and other information to learn about that organism.
2. Have students write a 'diary' entry detailing their journey as a migrating marbled salamander. What hazards did they meet along the way? What helped them with migration?
3. Have students research if marbled salamanders occur in your area. What threats exist to your local marbled salamander habitat?

Resources:

1. Marbled Salamander Picture Pack