

# Forest Management Guidelines for the Protection of Four-toed and Spotted Salamander Populations

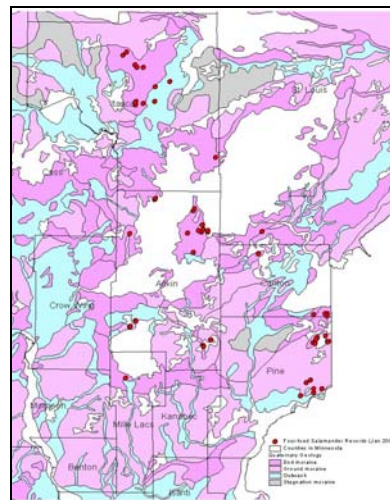
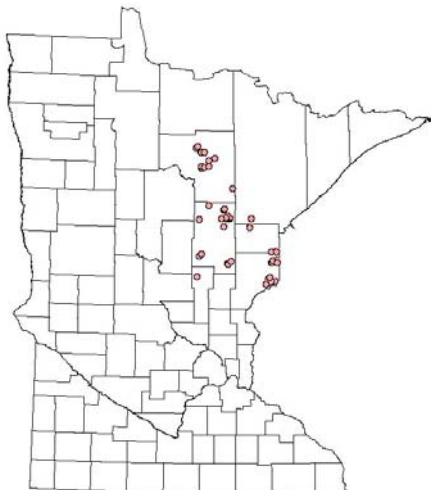
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## Salamander Natural History

### Four-toed Salamanders:



The Four-toed Salamander, *Hemidactylium scutatum*, is a Species of Special Concern in Minnesota. Currently, the MN DNR's Rare Features Database contains 58 Four-toed salamander records from six counties. While its known extent in Minnesota has increased since it was originally documented in 1994, little information is available regarding home-range size and dispersal distances. Throughout their range they are typically found in small, isolated colonies, consequently local populations are vulnerable to catastrophic events or drastic habitat alterations. More research pertaining to movements and habitat use in Minnesota would be valuable to forest management and other land-use decisions.



Four-toed Salamanders typically occupy mature upland deciduous or mixed deciduous-coniferous forest habitat. These salamanders occur most frequently in forests of glacial moraine landscapes where isolated wetlands are abundant. Breeding activity, egg deposition, and larval development occur in fishless wetland habitats within or adjacent to the forest. Upland forests provide cover, foraging sites, and overwintering habitat for juveniles and adults. The distribution and abundance of salamanders within the forest is influenced by temperature, moisture, and presence of woody debris for cover. Elimination or reduction of the forest canopy increases the temperature of the forest floor, reducing soil moisture and suitable cover. While it is important to protect the terrestrial habitat in which these animals spend the bulk of their time, protection of known and potential nesting sites is critical.

Four-toed Salamanders breed in upland forest habitat in the fall. In late April or early May, gravid females move from winter retreats to nest sites just prior to egg-laying. Wetlands utilized during the nesting season range from small seasonal ponds to perimeters of large conifer swamps. Females lay approximately 30 eggs in moss hummocks near the edge of fishless wetlands and remain with the egg cluster until hatching. Important habitat features of nest sites include moss hummocks adjacent to open pockets of water, alders along the wetland margin, and adjacent mature forest habitat. Upon hatching, larvae emerge from the moss and wiggle into adjacent shallow pools. Optimal water depth is at least 0.5 meters at the time of hatching to provide adequate moisture necessary during the six weeks of larval development. Juveniles disperse into the adjacent forest 2 to 3 weeks after transformation.

#### Spotted Salamanders:



In Minnesota, the Spotted Salamander, *Ambystoma maculatum*, was initially documented in 2001 and is currently known to occur in Pine and Carlton counties. Although this species is not listed, it is tracked in the MN DNR's Rare Feature's Database and its status will be reviewed in the upcoming list revision.



Spotted salamanders breed in late April or early May, typically in fishless seasonal ponds nested within upland forest habitat. Females deposit firm, gelatinous egg masses 2-3 days following breeding, after which they return to upland forest habitat. Egg masses are attached to sticks or aquatic vegetation and contain approximately 100 eggs. The embryos develop within 4-7 weeks, hatching into larvae that transform within 2-4 months. Transformed salamanders remain near the outer perimeter of the pond for 2 to 3 weeks before dispersing into the surrounding forest in late August or September. In some populations, slow-growing larvae may overwinter, transforming the following spring.

#### **General Forest Management Recommendations for Sites with Documented Locations & Good Potential for Rare Salamanders.**

- To protect migrating adults and dispersing juveniles, harvest activities should not take place between March 15<sup>th</sup> and September 30<sup>th</sup>.
- Recommend all timber harvest and site preparation activities (trail construction, etc.) take place only on frozen soil.
- Recommend that salamander stands be appraised and marked for harvest during the spring and early summer when temporary wetlands and shrubby wetland fringes with moss hummocks are most easily identified and located.
- Logging roads and trails should be minimized and located in a manner that prevent run-off from entering wetlands. Wide, heavily traveled forest roads can become barriers to salamander movement and can cause direct mortality.
- Areas impacted by soil compaction and rutting should be minimized. Salamanders utilize burrows that can become blocked due to soil compaction.
- Slash should be distributed throughout the harvested area. Large slash piles can block migration routes to and from breeding ponds, reduce cover-objects throughout the stand, and potentially alter the flow of localized surface run-off.
- Use of herbicides is not recommended in any stand with documented or good potential for rare salamanders.
- In stands with documented or good potential for rare salamanders, use the MN DNR's "Field Guide to the Native Plant Communities of Minnesota – The

Laurentian Mixed Forest Province,” to classify the stand during the initial stand examination and apply management techniques that maintain or restore the native plant community. Contact DNR Ecological Services or DNR Forestry’s ECS Program for assistance.

## **Protection of Sites with Documented Salamander Use**

### Wetland protection at sites with documented salamander use

- No timber harvest activities should be allowed in wetlands with a history of use by rare salamanders. The MN DNR’s Rare Features Database will have records of sites with documented use.
- Wetlands with a history of salamander use should not be crossed with mechanized equipment, used as landing sites, slash pile areas, or as stand entry points. Moss hummocks utilized by female Four-toed Salamanders are fragile components of nest site habitat and do not recover as quickly as the shrub component often does.
- 50-foot no-cut zone into the wetland, regardless of the harvest prescription, around known locations.
- Ideally, no-cut corridors would be left connecting known locations together, or link known locations with wetlands that have good potential for rare salamander use. If this isn’t possible look for 80% residual basal area in these corridors and minimize other physical alterations to the site within these corridors.

### Forest protection adjacent to wetland with documented salamander use

#### No-harvest Zone:

- Terrestrial habitat within 50 feet of wetlands with a history of salamander use should have no harvest. Equipment should not be allowed within this zone. This would protect the integrity of the pond, provide cover for dispersing juveniles and protect the terrestrial habitat for a portion of the adult salamander population.
- Use of herbicides is not recommended in any portion of a stand with documented rare salamander locations.

#### Limited-harvest Zone:

- An additional 50 to 150-foot (100 to 200 feet out from the wetland) limited-harvest zone is recommended that retains 80% residual basal area. Residual live trees spaced across the cut would provide shade after the harvest and dead, woody cover in the future stand.
- Use of herbicides is not recommended in any portion of a stand with documented rare salamander locations.

## **Habitat Protection of Potential Sites**

- Leaf-off aerial photography is a good resource for locating temporary wetlands with good potential for rare salamander use.
- Timber harvest activities should be avoided in wetlands with suitable habitat.
- In even-aged harvests, look for secondary species that can be left standing, especially surrounding wetlands, within corridors linking wetlands, and on slopes immediately adjacent to wetlands. 80% residual basal area within these areas is recommended.
- In hardwood thinnings, apply the 50-foot no-cut buffer around a selection of wetlands that are connected by no-cut corridors or with corridors that have at least 80% residual basal area. Retain 80% residual basal area as much as possible throughout the rest of the stand.
- Residual live trees spaced across the cut would provide shade after the harvest and dead, woody cover in the future stand.
- Use of herbicides is not recommended in any portion of a stand with good potential for rare salamanders use.

## **Reference Sites**

Identification of high quality nesting sites within mature forest communities for set-aside is recommended within each DNR Forestry Area that contains documented locations of rare salamanders. Look for ways to combine salamander reference sites with other rare features, old growth stands, old growth special management zones, riparian management requirements, Scientific & Natural Areas, and/or other features that could add to the conservation value of the stand. Good quality reference sites are invaluable to any monitoring that may take place for rare species.

## **Inventory, Monitoring, and Research**

Monitoring and research into the relationships between forest management techniques and rare salamander viability is needed to better refine these guidelines. Ideas and assistance in initiating such monitoring and/or research are encouraged. Through a state wildlife grant or other funding, the Department should conduct an intensive inventory to document locations of four-toed and, particularly spotted salamanders, on DNR administered lands.

## **Selected References**

deMaynadier, P.G., and M.L. Hunter, Jr. 1995. The relationship between forest management and amphibian ecology: a review of the North American literature. *Environmental Reviews* 3:230-261.

Dodd, K.C. Jr. and B.S. Cade. 1998. Movement patterns and the conservation of amphibians breeding in small, temporary wetlands. *Conservation Biology* 12(2) 331-339.

- Faccio, S.D. 2003. Postbreeding emigration and habitat use by Jefferson and Spotted salamanders in Vermont. *Journal of Herpetology* 37(3) 479-489.
- Houlahan J.E., C.S. Findlay, B.R. Schmidt, A.H. Meyer and S.L. Kuzmin. 2000. Quantitative evidence for global amphibian population declines. *Nature* 404: 752–755.
- Petranka, J.W. 1998. *Salamanders of the United States and Canada*. Smithsonian Institution Press, Washington D.C., 587 pp.
- Semlitsch R.D. and J.R. Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. *Conservation Biology* 17(5) 1219-1228.
- Vogt, R.C. 1981. *Natural History of Amphibians and Reptiles of Wisconsin*. The Milwaukee Public Museum. Milwaukee, Wisconsin. 205 p.