

Does deicing salt runoff affect blue-spotted salamander population size?

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Figure 1: adult blue-spotted salamander (Photo from NH Fish and Game Department)

Background

Blue-spotted salamanders, *Ambystoma laterale*, are a type of mole salamander that rely on vernal pools for reproduction every spring. The breeding period only lasts a few days to weeks. After mating, females will lay up to 500 eggs in one large egg cluster or smaller cluster in leaf litter. Within a month the eggs hatch into aquatic larvae that live in the pools. Eventually, they will metamorphosize into fully terrestrial adults (Heilferty).

Expected Outcomes

I predict that there is a relationship between blue-spotted salamander population size and amount of deicing salt runoff in their habitat. I expect that as road salt concentration increases, the population of blue-spotted salamanders will decrease. Habitats near roads that are more heavily salted will have fewer/smaller egg masses and fewer larval individuals than habitats near roads with limited salting (Turtle 2000). It has been observed that amphibian larvae are less tolerant of saline waters (Turtle 2000). Amphibians must stay moist in order to breath and they are highly susceptible to absorbing chemicals through their skin, they may be able to absorb toxic elements through their skin.



Figure 2: A. laterale distribution in northern America (Image from the AR MI Atlas, Ohio Amphibians)

Importance

Road salt is composed of more than just sodium and chlorine. It contains other elements that may cause harm to both the ecosystem and individual organisms. Blue-spotted salamanders are endangered in New Jersey and Connecticut, which make up a large part of their distribution in New England. The increasing amounts of roads being built and amount of salt needed may pose a threat to this at-risk species. In addition, they are killed by cars during their mating migration back to vernal pools. Interbreeding with Jefferson salamanders and the low rate of male Blue-spotted are a leading threat to both these species (NH Fish and Game Department).

Methods

- ❖ Locate two sets of 10 sites in ideal habitats for *A. laterale* where there is salt runoff in the same temperature, latitude, ecosystem type, prey and predator species.
- ❖ The first set of habits will have high salinity (above $100 \text{ mg} * \text{liter}^{-1}$) from runoff and the second set will have low salinity (below $100 \text{ mg} * \text{liter}^{-1}$) (Graanto et al. 1999, Jackson and Jobbagy, 2005).
- ❖ The low salinity would serve as a control group, as there is natural salt runoff
- ❖ Measure the population based on the amount of eggs and larval salamanders present. The amount of eggs present in an egg mass will be determined with a formula to calculate eggs based on volume.

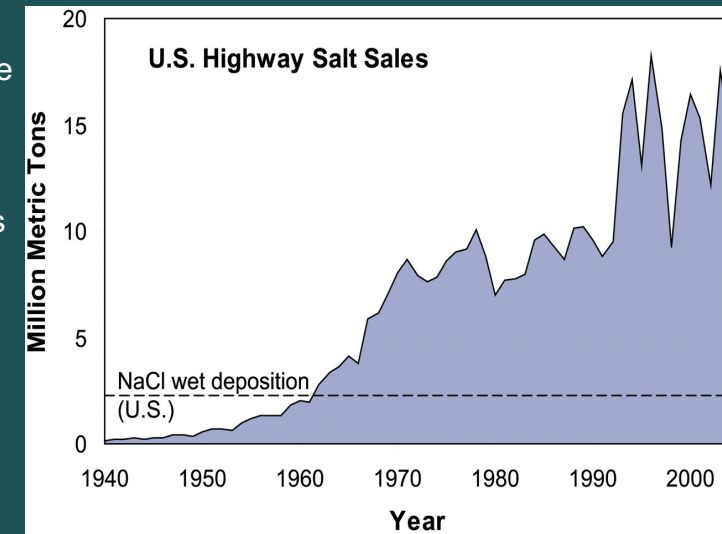
Explanation of Methods

While some studies counting amphibians only count the adult phase (Tanadini et al., 2011), the sheer number of sites to be surveyed during the short interval where adults are out is roughly March to November (Taylor 2010). Furthermore, they are more difficult to identify in their native woods instead of on roads and urban areas (Taylor 2010) and highly secretive. It has been observed that chronic toxicity occurs to freshwater species over $250 \text{ mg} * \text{liter}^{-1}$ (Jackson and Jobbagy, 2005).

Intended Analysis

I would preform a t-test to determine if the results of the study are significant. Because there will be 20 sites total, there will be less impact if the results from one location are skewed. The results of the analysis could lead further studies about how salt impacts amphibians and what amount of salt impacts blue-spotted salamanders.

Figure 3: Amount of salt sold for highways in the US between 1940 to 2004 in million metric tons. The dashed line represents annual natural deposition of salt.



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