Ranking migratory areas around vernal pools for the spotted salamander (*Ambystoma maculatum*) based on spatial metrics

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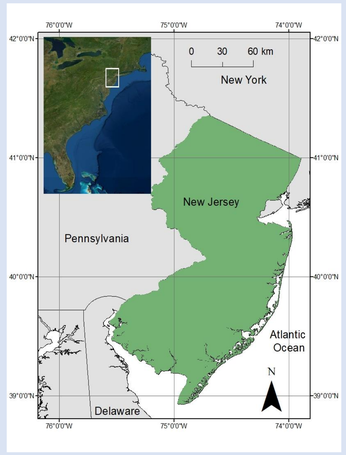
Introduction



Terrestrial amphibians like the spotted salamander (*Ambystoma maculatum*) rely on temporary vernal pools for critical breeding habitats.

- They migrate from upland forests surrounding the vernal pools.

Upland forests are often fragmented by roads, posing a major threat to migrating amphibians.

Throughout New Jersey, few vernal pools are legislatively protected.

- New Jersey Department of Environmental Protection (NJDEP) confirmed 1,453 vernal pool locations.

Conservation priority rankings were assigned to each of the 1,453 vernal pools in New Jersey based on:

1. The distance of roads in the migratory area.
2. The size of the area immediately surrounding the vernal pool, not fragmented by roads.
3. The percent coverage of upland forest in the area adjacent to the pools not fragmented by roads.

Methods

Migratory areas were defined as a biological buffer of 164.3 m surrounding a vernal pool.[1]

Vernal pool categorization maps were made based on defined characteristics.

- Each value was calculated as a z-score to ensure each characteristic has the same units.

Vernal pool kernel density distribution map weighted based on the sum of z-score values for each pool.

[1] Semlitsch, RD. 1998. Biological Delineation of Terrestrial Buffer Zones for Pond-Breeding Salamanders. Conservation Biology 12:1113-1119.

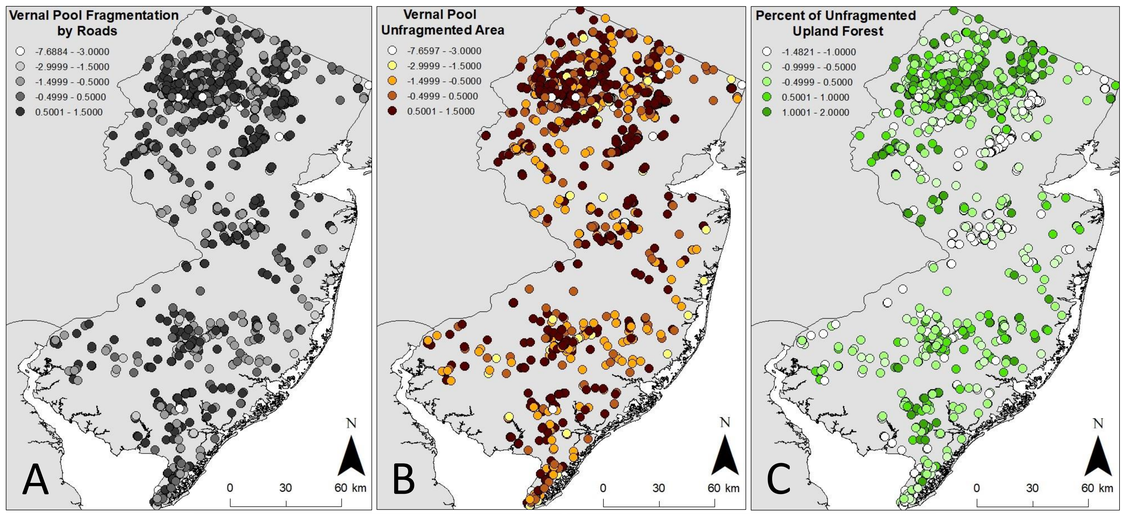


Figure 1. Categorization of vernal pools based on amount of fragmentation by road infrastructure within the 164.3 m buffer zone (A), the area of unfragmented land immediately adjacent to the vernal pools (B), the percent of unfragmented upland forest immediately adjacent to vernal pools (C), and the total sum of the three z-scores from meters of road, unfragmented area, and percent of unfragmented upland forest (D). Kernel density distribution of vernal pools throughout New Jersey weighted based on conservation score (E). Light points or areas indicate low conservation priority while dark points or areas indicate high conservation priority for each map.

Results

Vernal pools with higher conservation priority are concentrated in the north western part of New Jersey.

- Vernal pool buffers were less fragmented by roads (A).
- Buffers had larger unfragmented areas (B).
- Greater percentage of unfragmented upland forests were present (C).

Hot spot areas of high priority conservation areas were identified using the kernel density distribution (E).

- Hot spots were concentrated in the north western part of the state.
- Cold spots, or areas of low conservation priority, were defined in the north east and central parts of New Jersey.

Discussion

Areas of conservation need to be defined to protect the critical vernal pools within New Jersey.

- Amphibians, including the spotted salamander, rely on these pools as breeding habitats.

Spotted salamanders are listed as a species of special concern in New Jersey.

- Protecting their breeding habitats could help to improve population recruitment and recovery in New Jersey.

Concentrated areas of high conservation priority vernal pools are in areas of larger green spaces with less human development than the defined cold spots with lower conservation priority.

- Defining conservation priority could help to create regulation in areas that have the most environmentally valuable land areas.
- Additionally, defining priority based on human disturbances within ecological buffers of designated species can help to visualize and compare ideal habitat areas.

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