



Natural Heritage & Endangered Species Program

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Vernal Pool Cores *BioMap2 Components*

Core Habitat: **Vernal Pool Cores**
Critical Natural Landscape: **NA**

VERNAL POOL CORES: CONNECTING EPHEMERAL HABITATS

Vernal pools are unique wildlife habitats best known for the amphibians that use them to breed. Vernal pools, also known as ephemeral pools, autumnal pools, and temporary woodland ponds, typically fill with water in the autumn or winter due to rising ground water and rainfall and remain ponded through the spring and into summer. Vernal pools dry completely by the middle or end of summer each year, or at least every few years. Occasional drying prevents fish from establishing permanent populations. Many amphibian and invertebrate species rely on breeding habitat that is free of fish predators.

Vernal pools are common in Massachusetts and occur in almost every town in the state. Vernal pools are found across the landscape where small woodland depressions, swales, or kettle holes collect spring runoff or intercept seasonally high groundwater tables. Although many people associate vernal pools with dry woodland areas, vernal pools also occur in meadows, river floodplains, interdunal swales, and large vegetated wetland complexes. Vernal pool habitat can occur where water is contained for more than two months in the spring and summer of most years and where no reproducing fish populations are present.

Because Vernal Pool habitats are so dynamic over time, populations of Vernal Pool species have greater likelihood of persistence in settings that allow individuals to move among multiple breeding pools.

The Massachusetts Natural Heritage & Endangered Species Program and The Nature Conservancy's Massachusetts Program developed *BioMap2* in 2010 as a conservation plan to protect the state's biodiversity. *BioMap2* is designed to guide

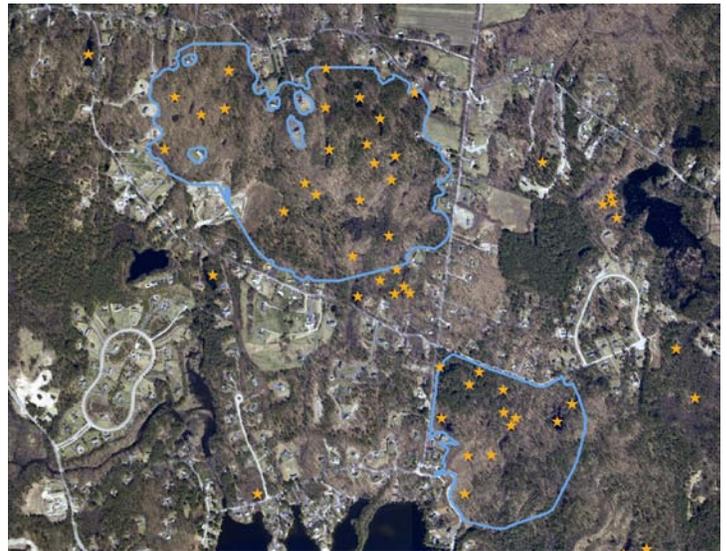


Figure 1: *BioMap2* Vernal Pool Cores include clusters of potential vernal pools, as well as the uplands surrounding and between the individual pools

strategic biodiversity conservation in Massachusetts over the next decade by focusing land protection and stewardship on the areas that are most critical for ensuring the long-term persistence of rare and other native species and their habitats, exemplary natural communities, and a diversity of ecosystems.

COMPONENTS OF *BIOMAP2*: *BioMap2* Core Habitat identifies specific areas necessary to promote the long-term persistence of rare species, other Species of Conservation Concern, exemplary natural communities, and intact ecosystems. *BioMap2* Critical Natural Landscape was created to identify and prioritize intact landscapes in Massachusetts that are better able to support ecological processes and disturbance regimes, and a wide array of species and habitats over long time frames. *BioMap2* uses specific data and sophisticated mapping and analysis tools to spatially define each of these components, calling on the latest research and understanding of species biology, conservation biology, and landscape ecology.

VERNAL POOL CORES: Vernal pools are small seasonal wetlands that provide important wildlife habitat, especially for amphibians and invertebrate animals that use them to breed. The persistence of populations of vernal pool-breeding species, such as the Blue-spotted Salamander, relies not only on the presence of the vernal pool itself, but also on adjacent upland forest habitat for foraging, overwintering, and successful migration of individuals among pools. Individuals breeding at the different pools interact over time and maintain the overall population as breeding success shifts among pools with changing environmental conditions. For this reason, *BioMap2* analyzed not only the vernal pools, but also the quality of the habitat surrounding the pools and the connections among them. There is no map of all vernal pools in the state, but NHESP biologists have created a Potential Vernal Pool database, systematically locating potential vernal pool habitat from aerial photographs. The creators of *BioMap2* used a GIS model developed by the University of Massachusetts Landscape Ecology Program to identify the top 5 percent most interconnected clusters of these Potential Vernal Pools. Each cluster of pools was then buffered to create vernal pool habitat areas to target for conservation that include the pools themselves and the surrounding habitat to allow for successful breeding, dispersal, overwintering, foraging, and migration. Targeting clusters of pools, rather than individual pools, will maximize the resistance and resilience of vernal pool habitats and their resident species in the context of climate change.



Figure 2: Blue-spotted Salamander, a 'Special Concern' vernal pool-breeding species

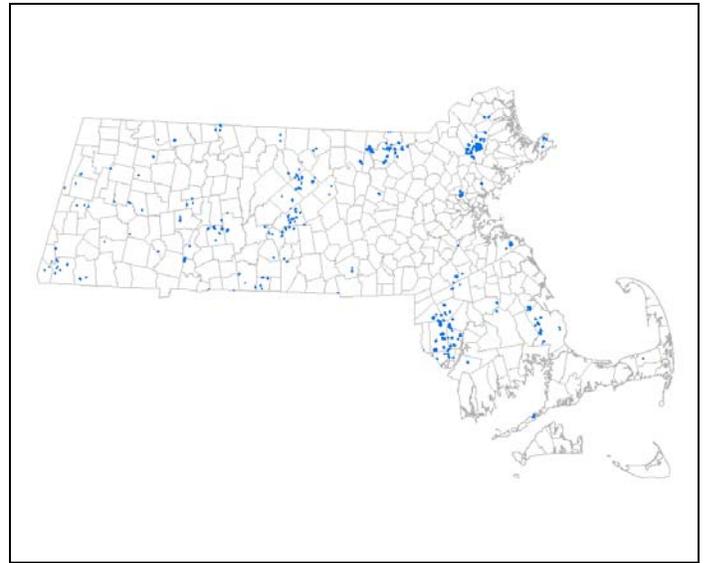


Figure 3: *BioMap2* Vernal Pool Cores across Massachusetts

ACHIEVING STRATEGIC CONSERVATION WITH *BioMap2*: In *BioMap2*, the Core Habitat and Critical Natural Landscape are complementary and overlapping, and were delineated based on separate criteria. Each represents a different scale of biodiversity in Massachusetts, yet the protection of both is important to conserve the full suite of biodiversity in the state.

Vernal Pool Cores have been selected using an analysis that combines the locations of Potential Vernal Pools in proximity to one another, and the quality and connectivity of the surrounding landscape and habitat between pools. They therefore represent the areas in which land protection and stewardship will contribute most significantly to the conservation of specific elements of biodiversity.

Both land protection and stewardship may be necessary to protect the biodiversity represented by the *BioMap2* Vernal Pool Cores. For example, protection from changes in hydrology (e.g., water withdrawals) may best be achieved by land protection in the vicinity of the pools, such as within the clusters of pools. But invasive species control may be necessary to maintain the structure and diversity of the vegetation in the uplands surrounding the individual pools.