

Vernal Pools at the Middlesex Fells



Matt Burne
Vernal Pool Association

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Matt Burne is the Vice President and co-founder of the Vernal Pool Association, a non-profit organization that promotes the study, appreciation, and protection of vernal pools. He is also the Conservation Director for the Walden Woods Project, a land trust in Lincoln, MA. He spent ten years with the Natural Heritage & Endangered Species Program, working to protect vernal pools and educate the public about this resource.



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Vernal pools are typically small basins unconnected to other bodies of water. In the northeast, they usually fill in the fall and hold water through the winter.



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In early spring, vernal pools are usually at their fullest, and are primed for the start of the amphibian breeding season as soon as the ice melts.



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Vernal pools are especially important for the life cycles of a number of amphibian and invertebrate species that have adapted to the temporary aquatic, fish-free habitat. Spotted salamanders are a common animal that breeds almost exclusively in vernal pools.



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The spotted salamander, blue-spotted salamander...



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...and marbled salamander are all species of “mole salamanders” that spend the vast majority of their lives under ground, and that are dependent on vernal pools for breeding.



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Wood frogs are a common frog in the northeast that are solely dependent on vernal pools for breeding. Their eggs and larvae can not withstand predation by fish.



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Fairy shrimp are beautiful, delicate crustaceans that have a life cycle uniquely adapted to vernal pools. Eggs require a drought period to trigger hatching when water returns. Fairy shrimp, like wood frogs and mole salamanders, are direct indicators of vernal pools: when these species are found, you know you have a vernal pool. In Massachusetts these species are known as vernal pool Obligates.



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Vernal pools provide important breeding, feeding, migration, and shelter habitat to a wonderful diversity of animals, including invertebrates, amphibians, reptiles, birds, and mammals.



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Many vernal pools are home to unusual and very rare species, such as the American Clam Shrimp...



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...and the Marbled salamander, both of which are known from the Middlesex Fells. Marbled salamanders are state-listed Threatened species, and breed in the fall, overwintering as larvae, which is an unusual approach for vernal pool-breeding amphibians.



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When spring arrives, Marbled salamander larvae are big and are able to out-compete other salamander larvae that breed that breed in the same pool.



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There are a great many vernal pools in the Middlesex Fells. Most are relatively small, and completely isolated from other surface waters.



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In the early spring, they can be quite deep – this pool is over six feet deep some years,



© VPA – Matt Burne

And they can be rather shallow, such as this pool that doesn't get much deeper than two feet.



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Most vernal pools in the Fells do not have much vegetation growing in them,



© VPA – Matt Burne

But there are examples of pools with dense shrub growth throughout the basin.



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Not all vernal pools are natural basins, such as this CCC-built back-water pool on Spot Pond Brook. This is a popular spot to see a lot of salamander breeding activity in the early spring.



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Spotted salamanders gather in mass congresses, doing a beautiful mating dance and depositing spermatophores in the shallow parts of the breeding pool.



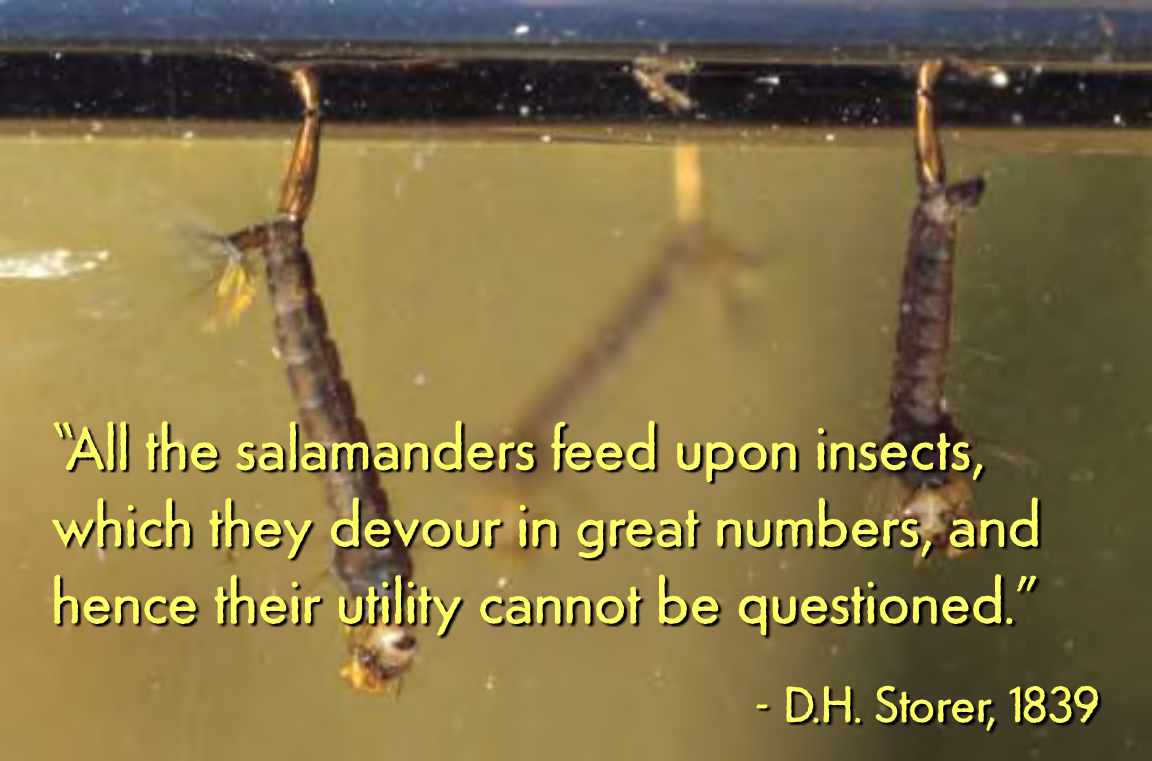
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A few days after fertilization, females deposit a mass of eggs, ranging in size from 50 to 200 embryos. Masses are either clear or cloudy-white, depending on the genetics of the female laying them.



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Larvae hatch from the eggs with a wide head, brushy gills on either side of the head, and quickly form four legs. Their tail is flattened for swimming. They are predatory, and will develop over the course of two or three months, depending on environmental conditions.

A photograph showing two salamanders hanging upside down from a horizontal wire in a tank of water. The water is a murky, yellowish-brown color. The salamanders are dark-colored with lighter spots. The background is a dark, possibly black, surface.

“All the salamanders feed upon insects,
which they devour in great numbers, and
hence their utility cannot be questioned.”

- D.H. Storer, 1839

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It's been noticed that vernal pools with healthy amphibian populations often are basically free of mosquitoes and other pests. Maintaining healthy ecosystems directly benefits humans by keeping mosquito and biting fly populations in check.



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Sometime in late summer or early fall, spotted salamander larvae metamorphose, turning into an air-breathing, terrestrial juvenile. They find shelter near the pool's edge and wait for an opportunity to migrate away from the pool to begin the adult phase of their lives, which may last as many as twelve years in the wild.



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Vernal pools are intimately linked with the surrounding landscape because most of the amphibians that breed in vernal pools are terrestrial and spend their lives in the surrounding woods.



Suzanne Niles

© Suzanne Niles

Most of the amphibians produced in a given year wind up feeding snakes, birds, and mammals in the surrounding area.



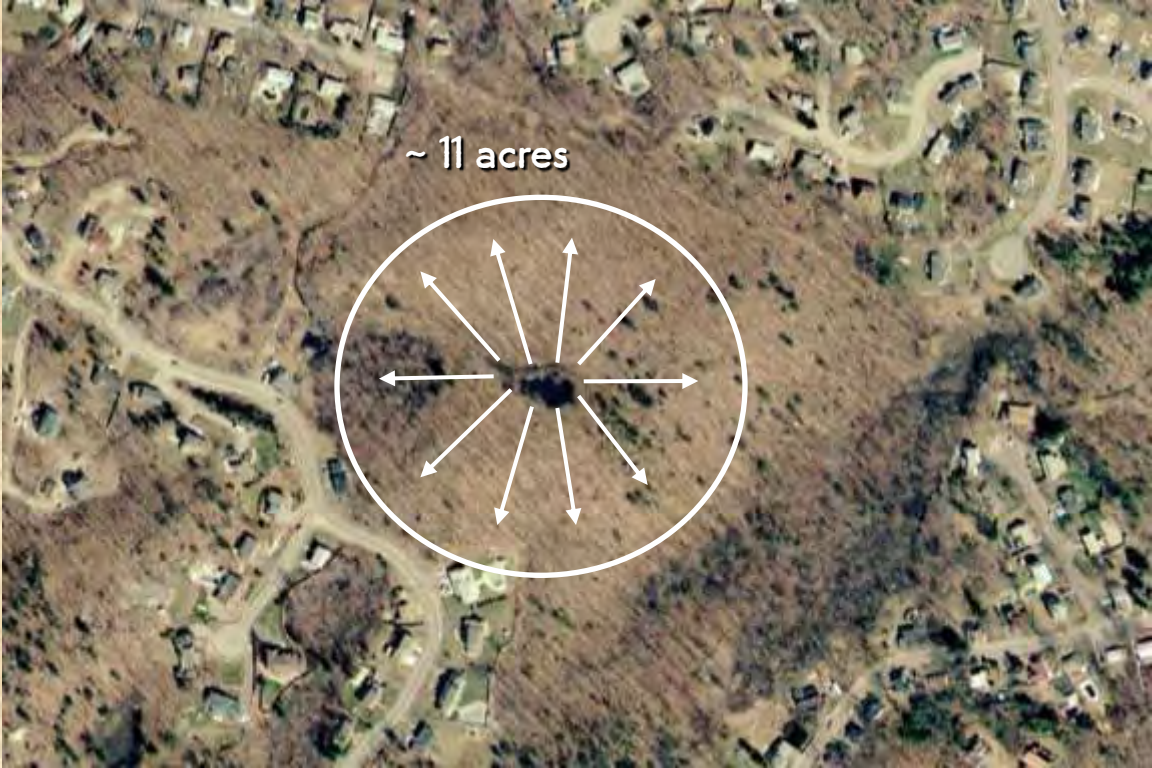
Spotted
Salamander

390 feet

100 feet

© VPA

On average, salamanders travel nearly 400 feet from their breeding pool to their upland, non-breeding habitat.



© VPA

Amphibians are not randomly distributed around their breeding pool,



Deciduous canopy

Well-drained soils

South-facing slopes

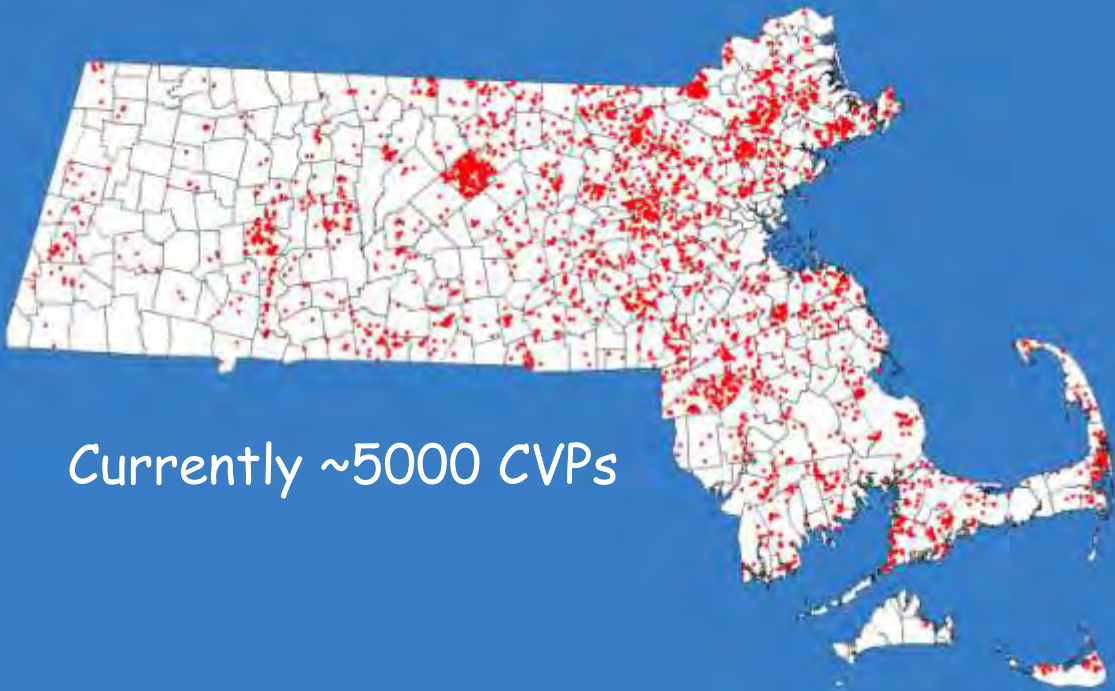
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...but rather have specific preferences for non-breeding habitat characteristics. This gives managers an opportunity to increase the effectiveness of management decisions by better understanding the habitat preferences of animals likely to use a particular vernal pool.



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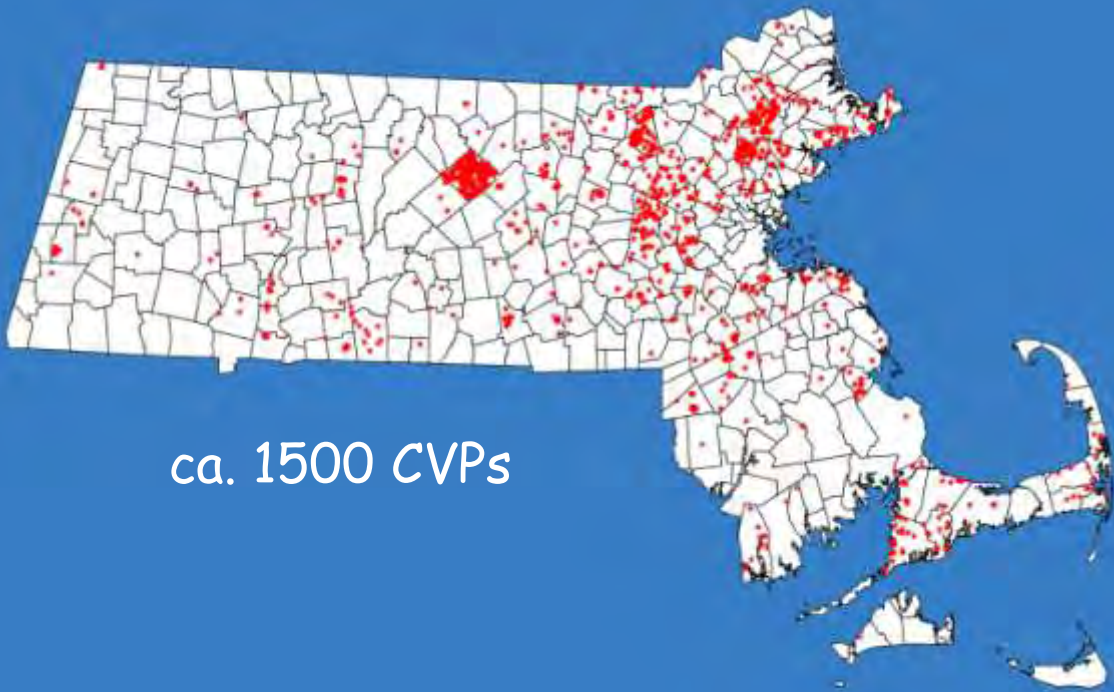
Massachusetts has a process allowing citizens to document and officially certify vernal pools through Mass Wildlife.



Currently ~5000 CVPs

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While this process provides managers an effective tool to identify vernal pools on a parcel, it is far from a complete picture of the number and distribution of vernal pools in the state.

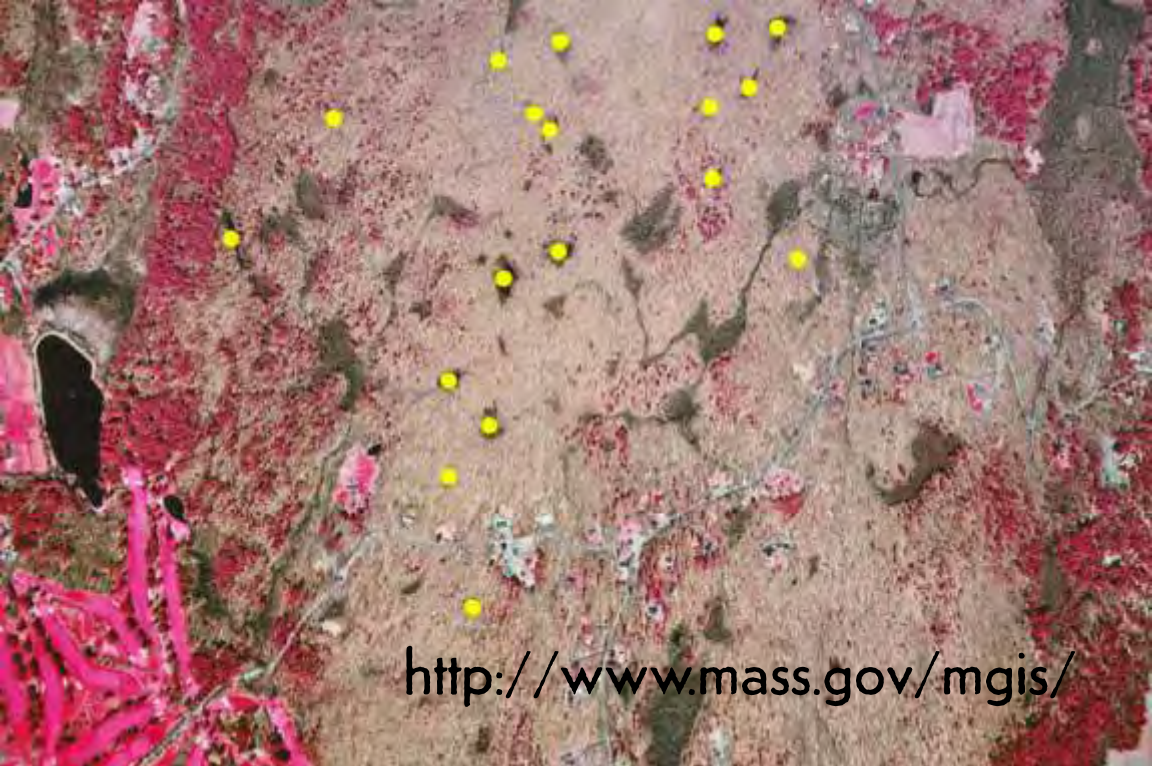


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In the late 1990s, when there were many fewer certified vernal pools, Mass Wildlife undertook an effort to identify vernal pools from aerial photographs.



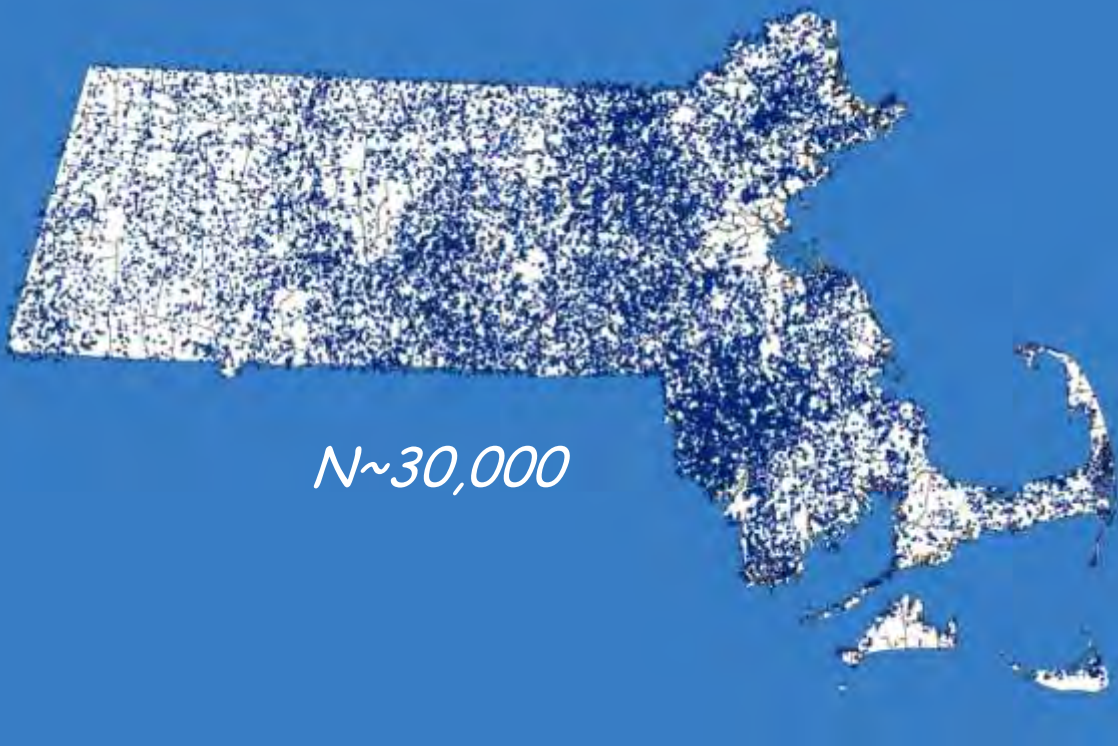
Photos of the state taken in the spring and using Color Infra-Red were used to identify Potential Vernal Pools.



<http://www.mass.gov/mgis/>

© VPA

And the data are now available through the Massachusetts GIS office.



N~30,000

© VPA

Approximately 30,000 Potential Vernal Pools were identified using this technique, which provides a more realistic picture of the number and distribution of vernal pools in the state. These data represent the best available information for managers to use in protecting our common wealth of vernal pool resources.



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In thinking about how best to manage the vernal pool resources in the Middlesex Fells,



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DCR should, of course, rely on the Certified Vernal Pool data. However, that presents a very incomplete picture of the actual number of vernal pools in the Fells.



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As an example, this is a site a few miles north of the Fells. If the Certified Vernal Pool data were relied on, the conclusion would be that there are no vernal pools to worry about on the site.



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The PVP layer, though, shows 11 vernal pools. PVPs are a good resource, but are just that – not an end point.



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After extensive field work, we discovered a total of 50 vernal pools on the site. So PVPs give a much better sense of vernal pool locations than the Certified data, but it is still a conservative accounting of these important habitats.



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In the Fells, there are about 110 Potential Vernal Pools, and almost 30 Certified. The RMP process should focus on pools that don't show up on either of these data sets, and be concerned with ensuring that a PVP is actually a water body, as opposed to focusing on converting PVPs to CVPs.



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A quick analysis of vernal pools in close proximity to existing trails has turned up a sub-set of 34 that should be evaluated for trail impacts, and we will be working with DCR to evaluate management decisions that benefit these pools.



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...with on-the-ground field work this spring.



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Vernal pools are a great natural resource of the Middlesex Fells, enjoyed by a lot of people,



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...and should be protected to ensure that they are enjoyed by generations to come.



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