

Appendix A
Seasonal Pool Site Reports

Vernal Pools of Vermont
Vermont Agency of Natural Resources, 2002

SITE NAME: Arms Grant Vernal Pool

TOWN: Burlington

MAPS: Colchester, VT 7.5' U.S.G.S. topographic map

LOCATION: West side of North Avenue, opposite intersection with Route 127

SOURCE OF INFORMATION: Site visits on 4/6/00, 5/10/00, 9/28/00, and 10/17/00

OWNERSHIP: Private. No access without permission of landowner.

SIGNIFICANCE:

1. This site has a moderate quality vernal pool, showing some signs of disturbance.
2. Population of the uncommon grass, short-awn foxtail (*Alopecurus aequalis*).
3. This pool supports a large amount of wood frog breeding, as well as more limited spotted salamander and potential Jefferson salamander hybrid breeding.
4. This pool supports a diverse community of macroinvertebrates including fairy shrimp (Order: Anostraca).

PHYSICAL SETTING: This 600 square meter vernal pool is located on deltaic sands near the mouth of the Winooski River. These sands were deposited thousands of years ago when this area was the shallow-water margin of a much larger Lake Champlain. The flat sand deposits are underlain by Dunham Dolomite, a calcium-rich bedrock type which surfaces as outcrops to the west of the vernal pool. This vernal pool is at the lowest elevation of any of the 28 pools visited – only 60 meters above sea level.

The vernal pool's watershed is 11,300 square meters and lies mostly west of the pool. After heavy rains in early May 2000, two small temporary streams were observed flowing into the pool and one flowing out. The area of the open water pool was 600 square meters on April 6, 2000, 528 square meters on May 10, and the pool was empty by the September visit. The depth of the pool was near one meter in May and early June. It is not known when during the summer the pooled dried out completely. There is only a trace of an organic layer at the top of the soil profile in the vernal pool. Below this is 25 cm of dark brown very fine sand with some orange mottles. From 25 cm to greater than 75 cm, the very fine sand is gray with abundant orange mottling. This soil profile indicates that the vernal pool is only seasonally inundated and that the soils are also only seasonally saturated. The shallow organic layer reflects rapid decomposition of organic matter. The pool water pH ranged from 7.32 – 7.34, the mean alkalinity was 146 mg/l CaCO₃, and the dissolved calcium concentration was 32 mg/l. These values are all high, reflecting the influence of the calcium carbonate rich dolomite in the underlying bedrock. The water was slightly tannic.

SURROUNDING LANDSCAPE CONDITION: The dominant natural community to the west and south of the vernal pool is pine-oak-heath sandplain forest. This is a rare community type in Vermont, and this rather young example is dominated by red maple (*Acer rubrum*), big-toothed aspen (*Populus grandidentata*), red oak (*Quercus rubra*), black oak (*Quercus velutina*), and white pine (*Pinus strobus*). Canopy closure is 70 percent. Low heath shrubs such as lowbush blueberry (*Vaccinium angustifolium*), black huckleberry (*Gaylussacia baccata*), and hillside blueberry (*Vaccinium pallidum*) occur beneath the

canopy. This example of pine-oak-heath sandplain forest needs to be examined further to determine its size and significance. There are also small areas of dolomite outcrop within the vernal pool's watershed to the west on which the herbs common sweet cicely (*Osmorhiza claytonii*) and sticky tick-trefoil (*Desmodium glutinosum*) occur – both species that thrive in calcium-rich habitats. There is abundant downed wood in this forest that should provide habitat for amphibians.

To the north and east of the Arms Grant Vernal Pool the landscape is highly developed. The buildings, lawns, and parking lots along North Avenue and Route 127 all fragment this approximately 30 hectare area of forest from the wetlands and forest in the Intervale to the east.

The vernal pool is somewhat disturbed, primarily because it has been used as a disposal area for trash. The pool contains a shopping cart, an old wooden boat, cans, bottles, and other garbage.

POOL VEGETATION: This vernal pool has a relatively open canopy, with only 30 percent of the vernal pool covered by overhanging tree branches. The open canopy is likely the result of the pool's large size in combination with its depth and duration, which exclude trees from most of the 600 square meter pool area. Unlike most of the vernal pools visited that have a sharp transition to surrounding upland forest, this pool has several tree species at its margin that are common wetland species and are adapted to tolerate seasonal flooding, including silver maple (*Acer saccharinum*), black willow (*Salix nigra*), and red maple. White ash (*Fraxinus americana*) is also an important part of the canopy, but occurs outside the area of seasonal flooding.

Herbaceous cover in the vernal pool was 70 percent at the time of the late September visit. The uncommon annual or short-lived perennial grass short-awn foxtail (*Alopecurus aequalis*) is the most abundant species, covering 20 percent of the seasonally exposed soil area. Of the other 18 herbaceous species identified in the vernal pool, the most abundant are false nettle (*Boehmeria cylindrica*), marsh fern (*Thelypteris palustris*), and frondose beggar's-ticks (*Bidens frondosa*). Woody debris is abundant and during the September 2000 visit, 15 percent of the vernal pool substrate was unvegetated leaf litter.

AMPHIBIAN USE: This large pool supports a large amount of wood frog reproduction, while its use by spotted salamanders appears more limited. Given the large amount of terrestrial habitat available, the limited observation of spotted salamander use is likely due to either the unusually dry spring experienced in 1999 or to normal drying of the pool prior to spotted salamander larval metamorphosis. Jefferson salamander hybrids were also reported using the pool, although no egg masses were observed during this study.

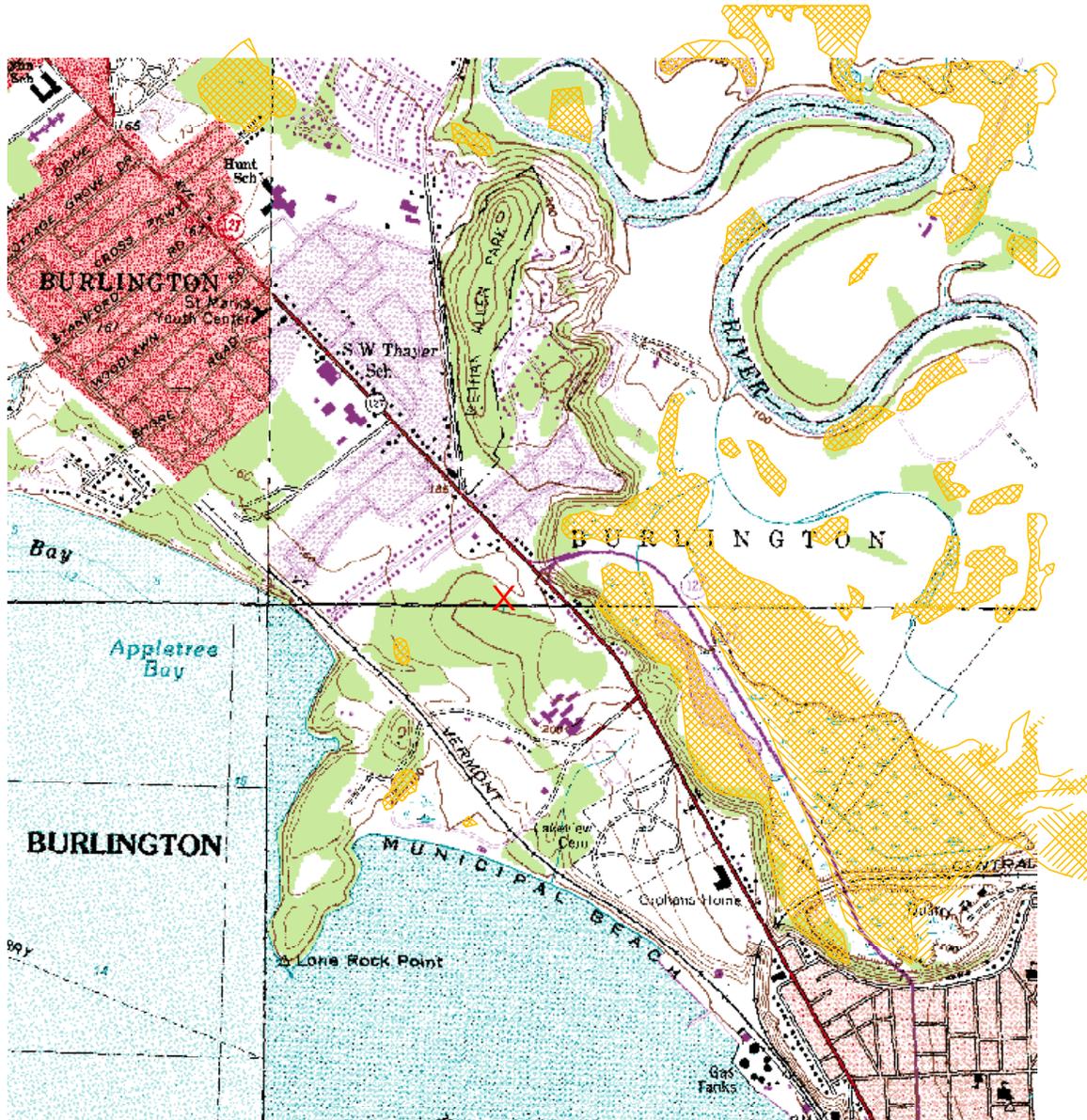
MACROINVERTEBRATE USE: In the early spring the three dominant taxa were fairy shrimp (*Eubbranchipus* sp.), tolerant Enchytraidae worms, and the snail *Gyraulus parvus*. Primarily immature and difficult to identify fairy shrimp were found, but some adults were identified as *E. bundyi*. Both *G. parvus* and the fingernail clam *Pisidium casertanum* were common indicating the well-buffered waters. Mosquitoes were abundant. By late spring the community had changed with the decline of fairy shrimp. The pool was then dominated by Enchytraeidae, the commonly encountered phantom midge *Mochlonyx* sp., and *G. parvus*. There was a large diversity of predaceous diving (Dytiscidae) and water scavenger (Hydrophilidae) beetles. Sixteen taxa were observed, but usually only one of each species was collected. Another indicator of periodic drying was the presence of the clam shrimp, *Lynceus brachyurus*. Their eggs are drought resistant like the encysted eggs of their fellow crustaceans, the fairy shrimps.

Arms Grant pool. April 6, 2000. First visit of season



Arms Grant pool. May 10, 2000. Second visit of season.





 Pool Location
 NWI Wetlands



Ar m's Grant Vernal Pool Burlington, Vermont

200 0 200 400 600 Meters



Vernal Pools of Vermont
Vermont Agency of Natural Resources, 2002

SITE NAME: Bald Mountain North Vernal Pool

TOWN: West Haven

MAPS: Whitehall, NY 7.5' U.S.G.S. topographic map

LOCATION: On the northern, lower summit of Bald Mountain

SOURCE OF INFORMATION: Site visits 4/10/99, 4/22/99, 5/25/99, 4/25/00, 5/30/00, and 10/19/00

OWNERSHIP: The Nature Conservancy. Public access permitted, but vernal pool is not located along existing trail system.

SIGNIFICANCE:

1. This site has a high quality vernal pool, showing little sign of disturbance.
2. Jefferson salamanders make limited use of this pool for breeding, while spotted salamanders and wood frogs make moderate use of it. Other amphibians may also experience successful reproduction here.
3. This pool is moderately acidic, but this does not appear to limit its sizeable diversity of macroinvertebrates including the intolerant snails and fingernail clams.

PHYSICAL SETTING: This 65 by 10 meter vernal pool is located in an elongated depression on the northern summit of Bald Mountain. The underlying bedrock is generally acid and is exposed in numerous outcrops. More calcareous bedrock is found nearby. The thin blanket of till that covers most of the area is likely a mixture of rock from these two local bedrock sources. The vernal pool's watershed is approximately 6,000 square meters and lies primarily to the north the pool. The watershed is entirely forested. There is a 2 to 3 meter high cliff rising above the entire eastern edge of the vernal pool. About 100 meters west of the vernal pool there is large open cliff, dropping about 40 meters.

The maximum depth of standing water in this pool was only 30 cm in April and May of 1999, but was nearly 100 cm in the same months in 2000. There were 10 cm of standing water in the vernal pool in mid October 2000, and the standing water covered almost 80 percent of the maximum pool area. There is an intermittent stream channel draining the pool to the southwest. The soil profile in the vernal pool supports the idea that standing water is lacking during the drier summer months. There are only 10 cm of well decomposed organic matter as a surface layer. This is underlain by 15 cm of dark brown, high organic content silt-loam, over a dense, nearly impervious, gleyed and mottled silt to greater than 60 cm depth.

The springtime pH during the two years ranged from 5.72 – 6.19 with a mean alkalinity of 8.04 mg/l CaCO₃. The color was moderately tannic.

SURROUNDING LANDSCAPE CONDITION: The landscape condition surrounding this pool is excellent, with generally mature forests, undisturbed natural communities, and no roads or trails. This is one of five pools visited that were assigned the lowest overall disturbance rating (0 out of 10) and is considered to be reference quality.

The vernal pool is surrounded by a hemlock-oak forest that occurs in rocky basin and on the steep, rocky, west and northwest facing slopes to the north and west of the vernal pool. Eastern hemlock (*Tsuga canadensis*) is the dominant tree in this dark, closed canopy forest, with red oak (*Quercus rubra*) accounting for less than 25 percent of the canopy. White pine (*Pinus strobus*) is a minor component of this forest, and there are practically no shrubs or herbs. Bald Mountain South Vernal Pool is located 100 meters south of Bald Mountain North Vernal Pool. There is a small buttonbush basin swamp located about 50 meters north of Bald Mountain North Vernal Pool, and another small vernal pool located another 50 meters northeast of this buttonbush swamp. On the east facing slope to the east of Bald Mountain North Vernal Pool is an extensive dry oak-hickory-hophornbeam forest. Red oak and hophornbeam (*Ostrya virginiana*) are the dominant trees, although total canopy cover is only 65 percent. There are lesser amounts of white oak (*Quercus alba*), shagbark hickory (*Carya ovata*), hemlock, and white pine. Herbaceous cover is 60 percent and is dominated by Pennsylvania sedge (*Carex pensylvanica*), a characteristic species of this community type. There has been a minor amount of logging in this forest. There are also charred stumps and other evidence of a 1982 fire in this forest. A closely related dry oak forest occurs on the rocky ridge to the north of the vernal pool. Red oak, white oak, and white pine co-dominate this open canopy forest. Lowbush blueberry (*Vaccinium angustifolium*) is an abundant low shrub, and the herbaceous layer (70 percent cover) is dominated by Pennsylvania sedge, poverty grass (*Danthonia spicata*), and whorled loosestrife (*Lysimachia quadrifolia*). To the west of the vernal pool is the dramatic cliff, which forms a clear barrier for amphibian movement to and from the west.

POOL VEGETATION: This pool has a relatively open canopy (60 percent cover), with hemlock dominating and lesser amounts of red oak, red maple, and chestnut oak (*Quercus prinus*). Shrub cover is sparse (8 percent cover), with only winterberry holly (*Ilex verticillata*) growing in the vernal pool. Herbaceous cover is also sparse (3 percent cover), made up of blue flag (*Iris versicolor*), common water-horehound (*Lycopus uniflorus*), sensitive fern (*Onoclea sensibilis*), water parsnip (*Sium suave*), and northern manna grass (*Glyceria borealis*).

AMPHIBIAN USE: Amphibians only appeared to take moderate advantage of this pool for breeding. Less than 50 egg masses each were observed of wood frogs and spotted salamanders in 2000, the wetter of the two observation years. Numbers were far fewer in 1999. The pool appears to contain excellent breeding habitat and water quality. The vegetation, macroinvertebrate and soil profile information also indicate that, although the pool dries late in the summer, it likely holds water for several months during the period critical for amphibian use. Jefferson salamanders also use this pool for egg-laying, although apparently to a lesser extent than the other two species. The presence of eastern newts, green frogs, and spring peepers was also observed. Metamorphosis of peepers from this pool is likely, and may occur for eastern newts during years when the pool does not dry completely.

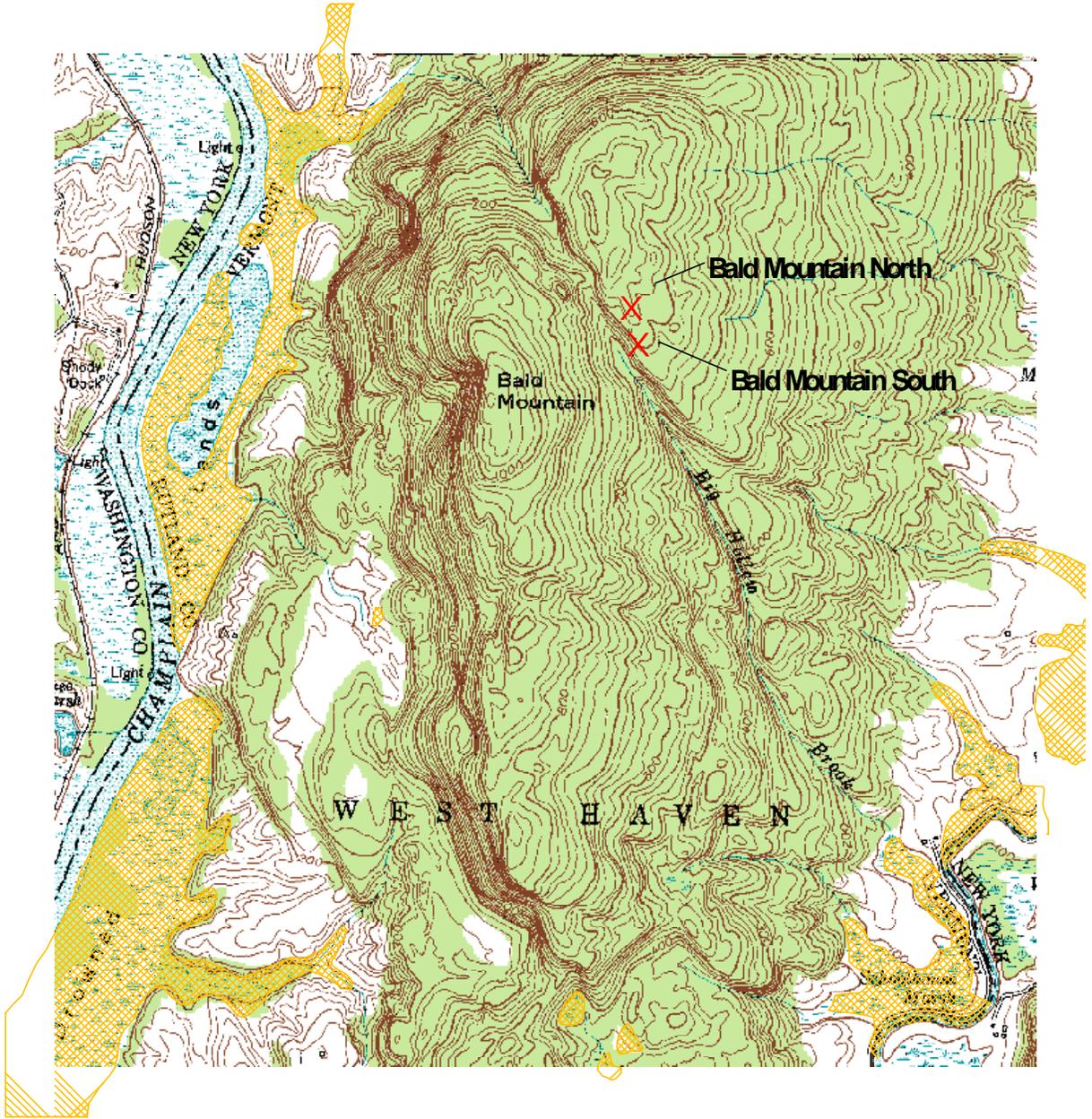
MACROINVERTEBRATE USE: This pool was surveyed in both 1999 and 2000. For the most part, the three dominant macroinvertebrate taxa changed between years and from early to late spring. In 1999, the early spring was dominated by an Isopod *Asellus communis*, a non-biting midge *Chironomus plumosus* group, and a fingernail clam *Pisidium casertanum*. In 2000, *P. casertanum* remained a dominant taxa as was *Mochlonyx sp.* and the mosquito *Aedes provocans*. Eight beetles and three snails were also noted including two snails from the Family Lymnaeidae. *Stagnicola elodes* and *Fossaria*

modicella are often, but not exclusively associated with vernal pools. Young *S. elodes* survive drying by migrating up into the terrestrial vegetation, where they remain sealed in their shell. With the arrival of autumn rains, and the filling of the pools, the young migrate back to the pools where they hibernate until spring (Jokinen 1978a).

In late spring 1999, the three dominant taxa were the phantom midge *Chaoborus trivittatus*, the non-biting midge *Chironomus sp.* and the worm *Lumbriculus variegates*. In 2000, *C. trivittatus* remained a dominant macroinvertebrate, as was *Mochlonyx sp.* and *P. casertanum*.

Bald Mountain North. April 22, 1999. First visit of season





 Pool Location
 NMI Wetlands



Bald Mountain Pools West Haven, Vermont

200 0 200 400 600 Meters



Vernal Pools of Vermont
Vermont Agency of Natural Resources, 2002

SITE NAME: Bald Mountain South Vernal Pool

TOWN: West Haven

MAPS: Whitehall, NY 7.5' U.S.G.S. topographic map

LOCATION: On the northern, lower summit of Bald Mountain

SOURCE OF INFORMATION: Site visits 4/10/99, 4/22/99, 5/25/99, 4/25/00, 5/30/00, and 10/19/00

OWNERSHIP: The Nature Conservancy. Public access permitted, but vernal pool is not located along existing trail system.

SIGNIFICANCE:

1. This site has a high quality vernal pool, showing little sign of disturbance.
2. This site provides high quality habitat for spotted salamanders and wood frogs, although breeding habitat is limited.
3. This pool is moderately acidic with limited populations of the less tolerant macroinvertebrate fauna including snails and beetles. *Hymenella retenouva*, an indicator of temporary waters was collected.

PHYSICAL SETTING: This 20 by 6 meter vernal pool is located in a slight depression on the northern summit of Bald Mountain. The underlying bedrock is generally acid and is exposed in numerous outcrops. More calcareous bedrock is found nearby. The thin blanket of till that covers most of the area is likely a mixture of rock from these two local bedrock sources. The vernal pool's watershed is approximately 4,500 square meters and lies primarily to the north the pool. The watershed is entirely forested. Low rocky ridges rise to the east and west of the pool. About 30 meters west of the vernal pool there is open cliff, dropping about 40 meters.

The maximum depth of standing water in the pool varied between 47 cm and 67 cm to solid substrate in April and May of 1999 and 2000. There were 10 cm of standing water in the vernal pool in mid October 2000, but the standing water only covered about 20 percent of the maximum pool area. It appears that standing water disappeared during the dry summer months. The soil profile in the vernal pool supports the idea that standing water is lacking during summer months. There are only 10 cm of well decomposed organic matter as a surface layer. This is underlain by 15 cm of dark brown, high organic content silt-loam, over a dense, nearly impervious, gleyed and mottled silt to greater than 60 cm depth.

The springtime pH ranged from 5.72 – 6.19 during the two years with a mean alkalinity of 14.5 mg/l CaCO₃. The color was highly tannic, especially in the late spring samples.

SURROUNDING LANDSCAPE CONDITION: The landscape condition surrounding this pool is excellent, with generally mature forests, undisturbed natural communities, and no roads or trails. This is one of five pools visited that were assigned the lowest overall disturbance rating (0 out of 10) and is

considered to be reference quality.

The vernal pool is surrounded by a small (0.5 hectare) hemlock-oak forest that occupies the rocky depression in which the vernal pool occurs and the steep west facing slope to the southwest of the pool. Eastern hemlock (*Tsuga canadensis*) is the dominant tree in this dark, closed canopy forest, with red oak (*Quercus rubra*) accounting for less than 25 percent of the canopy. A much larger area of similar hemlock-northern hardwood forest occurs on the steep, rocky, west and northwest facing slopes to the north of Bald Mountain South Vernal Pool. White pine (*Pinus strobus*) is a minor component of this forest, and there are practically no shrubs or herbs. Bald Mountain North Vernal Pool is located 100 meters north of Bald Mountain South Vernal Pool within this hemlock-oak forest. On the east facing slope to the east of Bald Mountain South Vernal Pool is an extensive dry oak-hickory-hophornbeam forest. Red oak and hophornbeam (*Ostrya virginiana*) are the dominant trees, although total canopy cover is only 65 percent. There are lesser amounts of white oak (*Quercus alba*), shagbark hickory (*Carya ovata*), hemlock, and white pine. Herbaceous cover is 60 percent and is dominated by Pennsylvania sedge (*Carex pensylvanica*), a characteristic species of this community type. There has been a minor amount of logging in this forest. There are also charred stumps and other evidence of a 1982 fire in this forest. To the west of the vernal pool is the dramatic cliff, which forms a clear barrier for amphibian movement to and from the west.

POOL VEGETATION: This vernal pool has an 85 percent closed canopy, strongly dominated by overhanging hemlocks from the adjacent uplands. Red maple (*Acer rubrum*) accounts for 20 percent of the canopy, with these trees occurring along the slightly wetter margins of the pool. Shrubs cover 20 percent of the vernal pool area, with winterberry holly (*Ilex verticillata*) occurring along the pool's margins and buttonbush (*Cephalanthus occidentalis*) occurring in the central, wettest portion of the vernal pool. The only herb present is blue flag (*Iris versicolor*) (1 percent cover) and the only bryophyte is *Sphagnum palustre* (2 percent cover). The sparse herbaceous and bryophyte layer is primarily due to the dense shading canopy of the surrounding hemlock forest.

AMPHIBIAN USE: Only light use of this pool for breeding by wood frogs and spotted salamanders was observed. The pool appears to contain excellent breeding habitat and water quality. The vegetation, macroinvertebrate and soil profile information also indicate that, although the pool dries late in the summer, it likely holds water for several months during the period critical for amphibian use. The limited use of the pool for breeding may be a result of its small size. Eastern newts and green frogs were also observed within the pool. Breeding success for these two species at this site is unlikely. Although no evidence of Jefferson salamander use was detected, the proximity to the other pool where egg masses were found should caution one not to rule it out at this site.

MACROINVERTEBRATE USE: This pool was surveyed in both 1999 and 2000. The three dominant taxa in the early spring of 1999 were the phantom midge *Mochlonyx* sp., the worm *Lumbriculus variegatus*, and the drought resistant caddisfly *Limnophilus indivisus*. In the early spring of 2000, *Mochlonyx* sp. remained dominant and two other species became dominant. These were the worm *Tubifex tubifex* and the midge *Pseudosmittia* sp.

In the late spring of 1999, *L. variegatus* and *Mochlonyx* sp. were dominant as was observed earlier. However, the third dominant macroinvertebrate was the marsh beetle, *Cyphon* sp. Interestingly, *Cyphon*

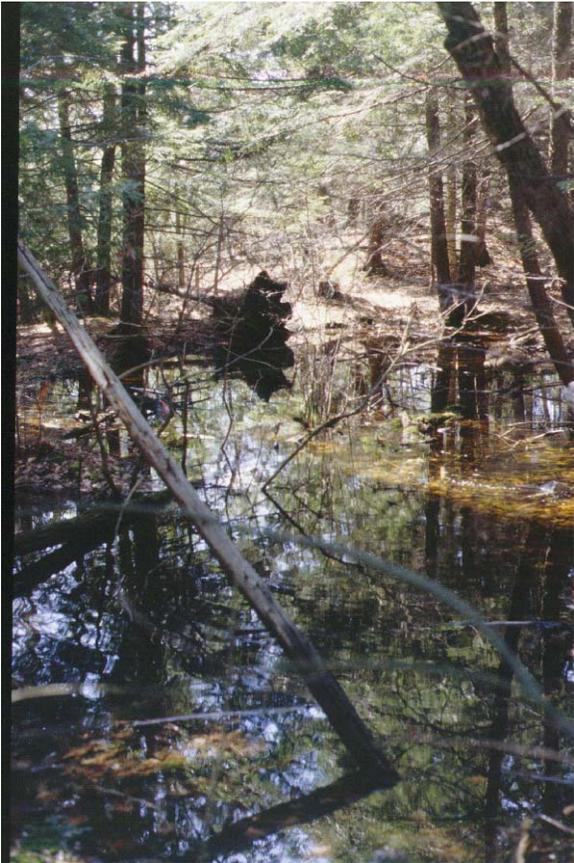
sp. was not collected in 2000. In the late spring of 1999, *Mochlonyx sp.* and *Pseudosmittia sp.* continued to dominate the sample as they did in the late spring of 2000. The third most dominant was the flatworm *Dugesia tigrina* that was not collected in 1999.

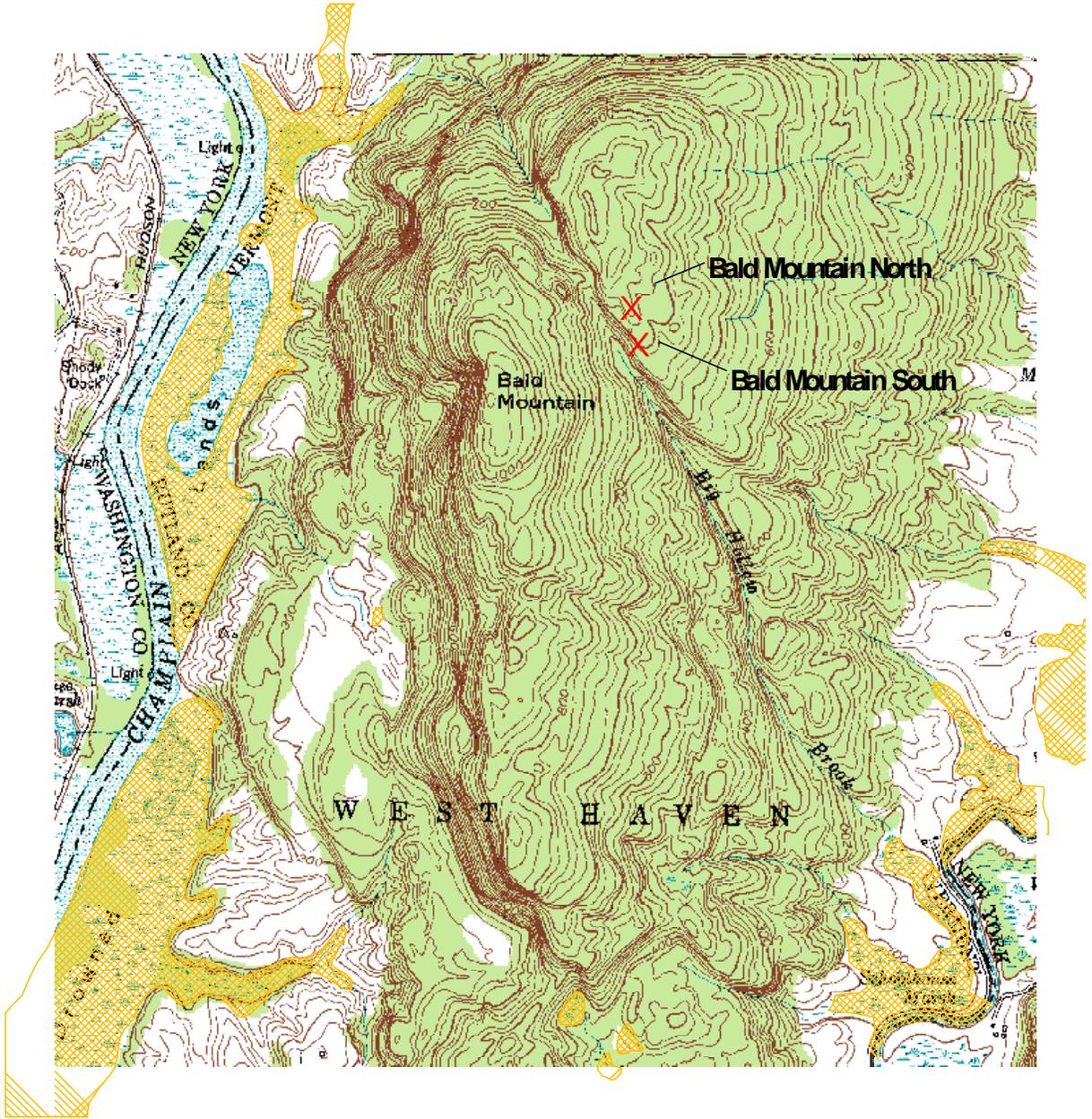
A few of the rather common and cosmopolitan Planorbidae snail *Promenetus exacuous* were found both years. This snail prefers high calcium waters which this pool lacks. Its limited population and that of another snail *Stagnicola elodes*, and the complete absence of fingernail clams may suggest relative unsuitability for the crustacea fauna. Low pH and the possibility of a limited wetting period may explain this.

Bald Mountain South. April 22, 1999. First visit of 1999.



Bald Mountain South. April 25, 2000. First visit of 2000.



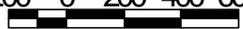


 Pool Location
 NMI Wetlands



Bald Mountain Pools West Haven, Vermont

200 0 200 400 600 Meters



Vernal Pools of Vermont
Vermont Agency of Natural Resources, 2002

SITE NAME: Ball Mountain

TOWN: Jamaica

MAPS: Londonderry, VT 7.5' U.S.G.S. topographic map

LOCATION: From Winhall Brook Campground proceed south along the west side of the West River until road ends. Park and follow the West River Trail.

SOURCE OF INFORMATION: Field visits 4/22/99, 4/27/99, 6/1/00 and 9/29/99

OWNERSHIP: Public. U.S. Army Corps of Engineers, Ball Mountain Dam

SIGNIFICANCE:

1. This site has a high quality vernal pool, showing little sign of disturbance.
2. Spotted salamanders and wood frogs make limited use this pool for egg laying. Due to its shallowness, it is likely to be a reliable producer of metamorphs only during normal to above average rainfall years.
3. The acidic conditions limit macroinvertebrate diversity.

PHYSICAL SETTING: This is a small pool (approximately 6 meters by 17.5 meters) sitting in a saddle within an upland forest setting. It is set in the Southern Green Mountains biophysical region embedded in glacial till over non-calcareous bedrock. The pool, at an elevation of 310 meters, sits about 50 meters back from a steep slope leading down to the West River. It contains neither an inlet nor outlet. During the spring breeding season most of the pool was greater than 20 cm. deep, and the maximum depth was 41 cm. The pool was also full in the fall, having a water depth of 31 cm. The substrate of the pool is a 22 cm. deep layer of muck over bedrock. The watershed of the pool is estimated to be 4100 square meters.

This pool was one of the most acidic surveyed with a pH ranging from 5.28 – 5.32 and a mean alkalinity of 1.2 mg/l CaCO₃. The water color was highly tannic.

SURROUNDING LANDSCAPE CONDITION: The pool is included within an intact forested matrix with minimal evidence of disturbance. There is evidence of past logging but nothing recent, and a footpath passes within 10 meters of the pool's east side. Although the trail is up gradient on a 30 degree slope, it is only 1.5 meters wide with a forested canopy and covered with litter and fallen wood.

Three natural community types occur within 100 meters of the pool with hemlock – northern hardwood forest being the predominant. As would be expected eastern hemlock (*Tsuga canadensis*) is most abundant with red and sugar maples (*Acer rubrum* and *A. saccharum*) and beech (*Fagus grandifolia*) also occurring. The canopy typically attains or exceeds 95% cover. A mesic northern hardwood community occurs at 100 meters to the south of the pool on the other side of a small stream filled ravine. This same community also occurs at 50 meters beyond the pool on the north side. Here the hemlock is replaced by yellow birch (*Betula alleghaniensis*) which joins the maples and beech. At 50 meters to the east of the pool the terrain begins to slope abruptly down to the river, and here a hardwood talus community occurs. The canopy, consisting of yellow birch and occasional hemlock, is more open (only 60% cover), and boulders cover the ground. Two additional pools were located within 50 meters of the primary pool.

Although both of these were smaller, they still held water during the fall visit.

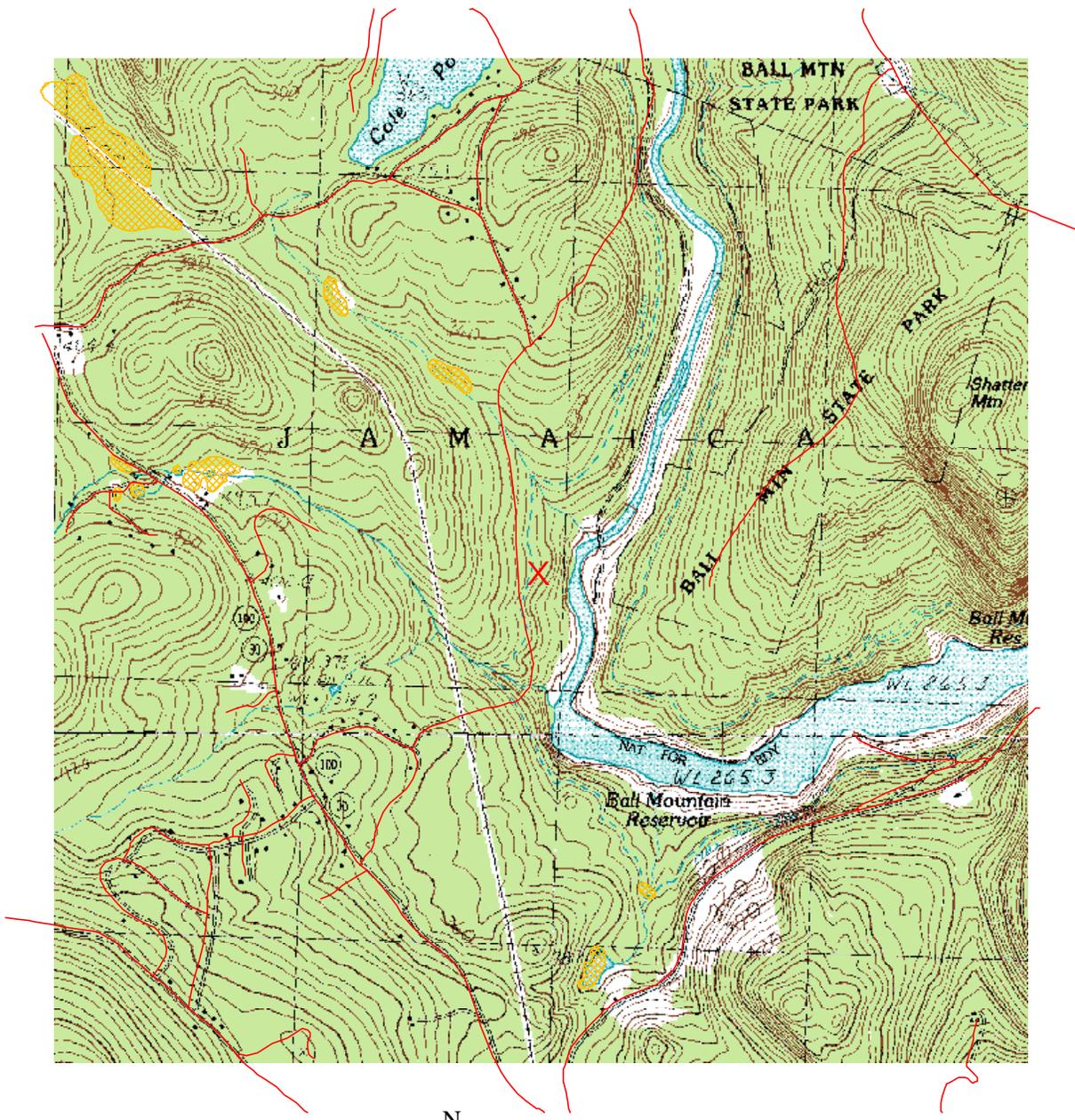
POOL VEGETATION: The pool itself is completely unvegetated . This would indicate that the hydrology fluctuates drastically from being fully inundated to completely dry so that little vegetation can get established. The total canopy cover of the pool exceeds 95% and consists primarily of hemlock, yellow birch and red maple. There are few rocks in the pool but a fair bit (7% cover) of woody substrate.

AMPHIBIAN USE: The small size and apparent hydrologic fluctuations are the greatest limiting factors for the use of this pool for amphibian reproduction. A few wood frog egg masses were observed, while adults were heard calling from nearby areas. Only three spotted salamander egg masses were seen. However, there was an abundance of fresh spermatophores scattered on the bottom, indicating that breeding for this species was just beginning and the pool could have received many more egg masses that spring. Other nearby pools were of a similar size, although most were more shallow. Although this pool may dry prematurely in some years, it likely provides important, albeit limited, breeding habitat for the local populations of these two species, particularly the spotted salamander. These are both acid-tolerant, and are not likely inhibited by the low pH observed during this study.

MACROINVERTEBRATE USE: The acidity of the water limits macroinvertebrate diversity and is an additional stressor beyond the apparent fluctuating hydrologic conditions. Only the most tolerant organisms to these conditions exist here. The three dominant taxa found in the early spring were all mosquitoes. By late spring the mosquitoes no longer dominated the community and were replaced by the Phantom Midge (*Mochlonyx cinctipes*) and other non-biting midges (*Chironomidae*). *Hymanella retenouva*, a triclad worm restricted to temporary waters was also observed.

Ball Mountain April 27, 1999. First visit of season.





-  Pool Location
-  Rds 911
-  NWI Wetlands



Ball Mountain Vernal Pool Jamaica, Vermont



Vernal Pools of Vermont
Vermont Agency of Natural Resources, 2002

SITE NAME: Boyer Wetland Pool

TOWN: Berlin

MAPS: Barre West , VT 7.5' U.S.G.S. topographic map

LOCATION: West of I-89 2.5 km on Crosstown Road; park at Howard Cemetery; follow northern boundary of Boyer State Forest east-southeast up hill approximately 500 meters; pool is on boundary.

SOURCE OF INFORMATION: Site visits 4/22/99, 4/29/99, 6/3/99, 9/24/99

OWNERSHIP: Public. Boyer State Forest, Vermont Department of Forests, Parks, and Recreation.

SIGNIFICANCE:

1. This site has a moderate quality wetland pool, showing significant signs of disturbance.
2. Excellent breeding habitat is provided for the rare Jefferson salamander, which lays great numbers of eggs in this pool. Wood frogs and probably spotted salamanders use the pool as well.
3. This is a well-buffered pool, with a diverse population of macroinvertebrates.

PHYSICAL SETTING: This 28 by 20 meter wetland pool is located on a step in north-facing slope of the "Howard Farm Lot" of Boyer State Forest. The hills in this area are in the Northern Vermont Piedmont biophysical region and are composed of calcareous bedrock (schists and phyllites) of the Waits River formation. Glacial till blankets the entire area.

The pool's watershed is approximately 4,000 square meters and is located primarily to the south and east of the pool. There is an intermittent stream channel that drains the pool to the north. The pool contained a relatively constant 30 to 35 cm of standing water at the time of all four site visits in 1999. The soils are deep (90 cm) organic muck, underlain by gleyed silt-loam and bedrock. Together, these observations indicate that the wetland basin has permanently saturated soils and contains a pool of standing water for much of the growing season. The presence of large, abundant wood fragments in the organic soil layer further indicate that a wetland has occupied this basin for hundreds or thousands of years, and that this wetland was forested for much of this time. Several standing dead trees now emerge from the standing water of the wetland, revealing that water levels in the wetland have been raised in the past 5 to 10 years, killing the trees that once grew here.

The springtime pH ranged from 6.92 – 7.18 with a mean alkalinity of 62.9 mg/l CaCO₃. There was little change in pH between early and late spring, but the alkalinity increased by 36%. The color went from slightly tannic to highly tannic.

SURROUNDING LANDSCAPE CONDITION: Hemlock-northern hardwood forests surround this wetland pool. Dominant tree species include eastern hemlock (*Tsuga canadensis*), sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), American beech (*Fagus grandifolia*), and basswood (*Tilia americana*). The forest on State-owned land (west of the wetland pool) has been selectively logged and is in good condition with a forest canopy closure of 75 percent. Although adjacent private properties to the north, south, and east were not surveyed, it is apparent that the forests on these lands have been

heavily logged, and the canopy cover has been significantly reduced. A skid trail at the north end of the pool has altered drainage from the pool and is likely responsible for the recent change in the wetland from forested swamp to open pool. Due to the expected adverse effects of adjacent logging and skid roads on the hydrology of the wetland pool, the water quality of runoff entering the pool, and the increased sunlight reaching the pool, this pool was assigned one of the three highest overall disturbance rankings (8 out of 10) of the 28 pools visited.

POOL VEGETATION: Trees from the surrounding upland forest provide a 20 percent canopy cover for the pool, with hemlock most abundant and lesser amounts of several hardwood species. Herb cover is 60 percent, with vegetated areas on the pool margins and on shallower areas within the pool. These shallow areas may correspond to previous hummocks in what was a forested swamp. The dominant species, accounting for a combined cover of 25 percent, are rice cutgrass (*Leersia oryzoides*) and beggar's-ticks (*Bidens* sp.). Both of these species produce abundant seeds that will quickly germinate and become established on seasonally exposed mucky soils. Other herbs present include mad-dog skullcap (*Scutellaria lateriflora*), spotted touch-me-not (*Impatiens capensis*), and royal fern (*Osmunda regalis*). The presence of common duckweed (*Lemna minor*) indicates that portions of the pool are permanent. As mentioned above, standing dead trees in the wetland indicate that water levels have been raised in recent years.

AMPHIBIAN USE: This pool is heavily used for egg-laying by Jefferson salamanders. Between 150 and 200 egg masses were observed in 1999. This was the greatest number of egg masses of this species observed in any pool in this study. The majority of eggs were laid on leaves of grass, likely rice cutgrass, from the previous year's growth. Twigs were also used for egg attachment. The presence of an adult spotted salamander adjacent to the pool indicated that it is likely also used at some level by this species for breeding, although observations occurred prior egg-laying. At least 200 wood frog egg masses were also present in 1999. It is likely that other common species, such as spring peepers, eastern newts, and gray treefrogs breed here as well. Although data indicates this pool may retain year-round open water in some years, it appears to provide excellent breeding habitat for amphibians. The predominantly forested surrounding landscape, albeit disturbed, provides adequate upland habitat to sustain these species.

MACROINVERTEBRATE USE: In the early spring the three dominant taxa were one species of mosquito (*Aedes communis*) and two species of non-biting midge (*Monopelopia* sp. and *Ablabesmyia* sp.). The tolerant non-biting midge, *Chironomus* sp. was also well-represented. The community in late spring was dominated by two non-biting midge (*Ablabesmyia* sp. and *Chironomus* sp.) and the snail *Gyraulus parvus*.

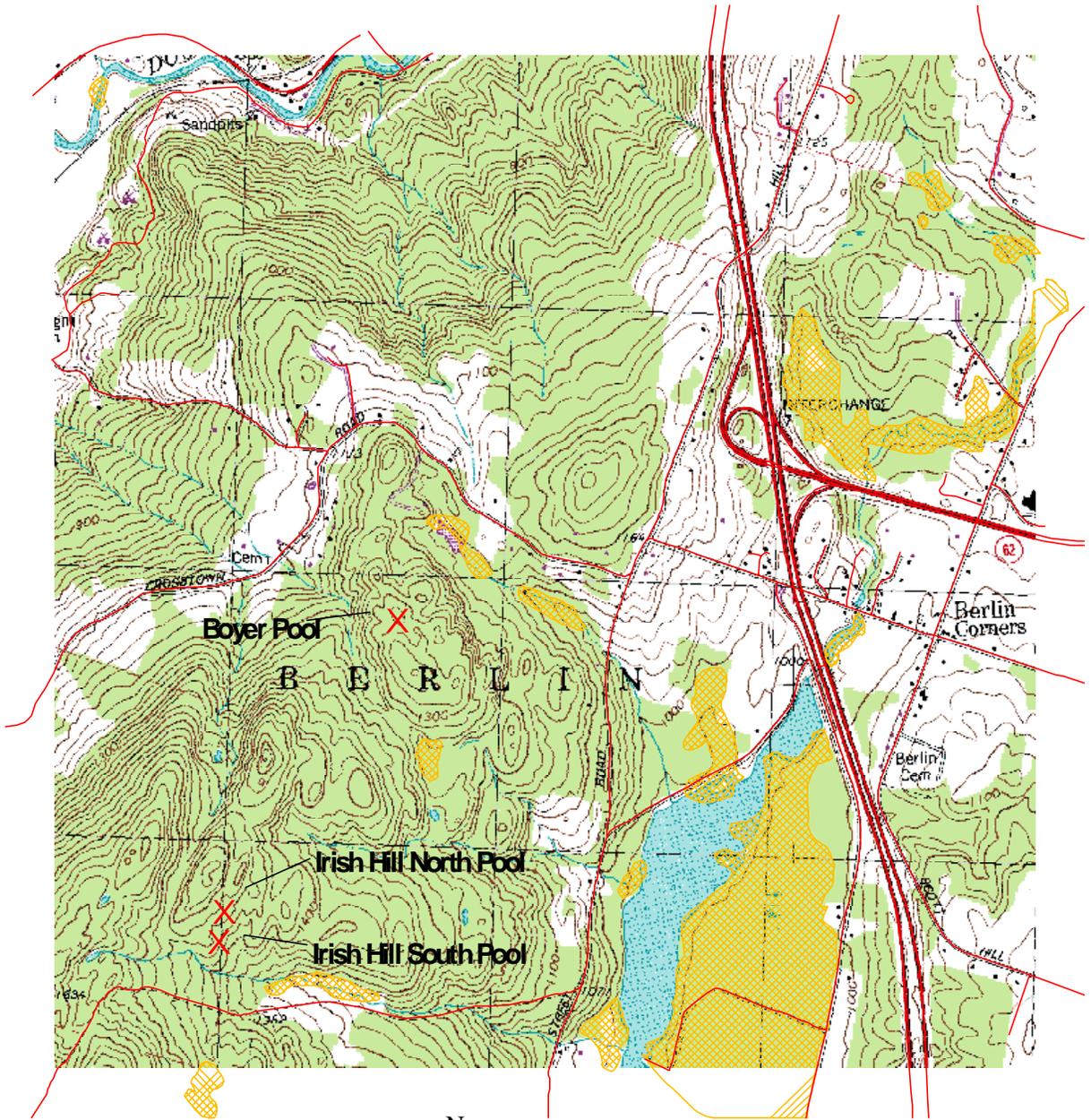
This pool had a large population of larval and adult beetles indicating that some species were not only using the pool for feeding, but also for breeding. Very temporal pools generally do not have a diverse predaceous diving beetle population, as these species prefer pools that typically hold water for extended periods. The pool's robust beetle population suggests that at least a portion of this pool may remain permanently flooded. It also had two species of snails (*Stagnicola elodes* and *Gyraulus parvus*) and two fingernail clams (*Pisidium casertanum* and *Sphaerium occidentale*). All of these mollusca have adapted to existence in temporary habitats, but *S. occidentale* does require a period of complete drying. Its occurrence in this pool means that at least a portion of this pool dries up every year.

Boyer April 29, 1999. First visit of season.



Boyer. June 3, 1999. Second visit of season.





-  Pool Location
-  Rds 911
-  NWI Wetlands



**Boyer Pool
Berlin, Vermont**



Vernal Pools of Vermont
Vermont Agency of Natural Resources, 2002

SITE NAME: Carlton Hill Road Vernal Pool

TOWN: Woodstock

MAPS: Woodstock South, VT 7.5' U.S.G.S. topographic map

LOCATION: East of and adjacent to Carlton Hill Road, 600 meters north of Church Hill Road.

SOURCE OF INFORMATION: Site visits on 4/18/00, 5/25/00, and 9/20/00

OWNERSHIP: Private. No access without permission of landowner.

SIGNIFICANCE:

1. This site has a low quality vernal pool, showing significant signs of disturbance.
2. This pool provides limited, but reliable habitat for spotted salamander and wood frog reproduction.
3. This pool supports a community of macroinvertebrates typically observed in a well-buffered roadside ditch.

PHYSICAL SETTING: This 6 by 22 meter pool on the east side of Carlton Hill Road was likely created by the construction of the road. Carlton Hill Road forms an effective dam approximately 1.5 meters above the bottom of the depression. There is not a culvert in the road to drain the depression. The pool's 3,000 square meter watershed lies primarily on the forested hillside to the east of the pool. The bedrock here is crystalline limestone of the Waits River formation, but till covers most of the bedrock.

This small artificial depression appears to hold water permanently. The pool area was relatively constant during the April, May, and October visits. Shrubs and herbaceous vegetation that are emergent from the pool indicate that water levels do drop during the dry summer months, but the presence of a large crayfish indicates that the pool does not dry out completely. There is a 15 cm layer of loose organic material in the bottom of the pool, underlain by gleyed sandy loam.

The springtime pH ranged from 7.14 – 7.40 with a mean alkalinity of 71.4 mg/l CaCO₃. There was considerable sedimentation with high base cations and specific conductance, much of this resulting from its location next to a dirt road.

SURROUNDING LANDSCAPE CONDITION: The dominant landscape feature of this pool is the adjacent gravel road and roadside pull off. The pool is created by the road embankment and also receives sediment-laden runoff from the road. During the April visit, a sheen of oil or gasoline was observed on the pool surface. There are many bottles, cans, and other trash in and around the pool. As there are no trees between the road and the pool; the pool is not shaded from afternoon sunlight. Vehicle traffic on the road is likely a significant source of amphibian mortality during seasonal migrations. As a result of the disturbed nature of this site, Carlton Hill Road Vernal Pool was assigned the highest overall disturbance rank (10) of the 28 pools visited during this study.

To the east of the pool and Carlton Hill Road is a slope covered in dense hemlock forest with a 95 percent canopy closure. There are several woods roads used by all-terrain vehicles in this forest and large white pine have been selectively removed in recent years. In general, this forest is in good condition. Approximately 40 meters to the south of the pool and to the east of Carlton Hill Road is a rich fen that occupies the elongate north-draining valley. Sedges, herbs, and mosses dominate in this peaty wetland fed by calcium-rich ground water discharge. To the west of the pool and across Carlton Hill Road are two interesting and high quality forested communities. In the lowlands adjacent to a small brook flowing north to Carlton Reservoir is a northern hardwood seepage forest. The overstory of this forest is dominated by upland tree species: sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), yellow birch (*Betula alleghaniensis*), and basswood (*Tilia americana*). The herbaceous layer is dominated by wetland species: sensitive fern (*Onoclea sensibilis*), cinnamon fern (*Osmunda cinnamomea*), spotted touch-me-not (*Impatiens capensis*), and large-leaved avens (*Geum macrophyllum*). Further to the west is a mature hemlock-northern hardwood forest with many trees over 50 cm in diameter and abundant woody material on the forest floor.

POOL VEGETATION: The 25 percent canopy cover over the pool is provided primarily by balsam poplar (*Populus balsamifera*) and eastern hemlock (*Tsuga canadensis*) adjacent to the pool. The 30 percent shrub cover is primarily by woolly-headed willow (*Salix eriocephala*), which grows along the margins of the pool. Herbaceous cover is low due to the permanent nature of the pool, and vegetation is limited to the shallow pool margin. The dominant species are common bluejoint grass (*Calamagrostis canadensis*) and sensitive fern.

AMPHIBIAN USE: This pool appears to support a very limited amount of successful amphibian reproduction, supported by the presence of a few wood frog and spotted salamander egg masses in early spring and the presence of water and live larvae in the fall of 1999, which was particularly dry. There is abundant high quality terrestrial habitat surrounding the pool, although the adjacent dirt road represents a potential risk to migrating amphibians. Limiting factors for the pool include its small size and the high potential for pollutants to enter the water. Trash was observed in the pool, as was an oily surface sheen in some spots.

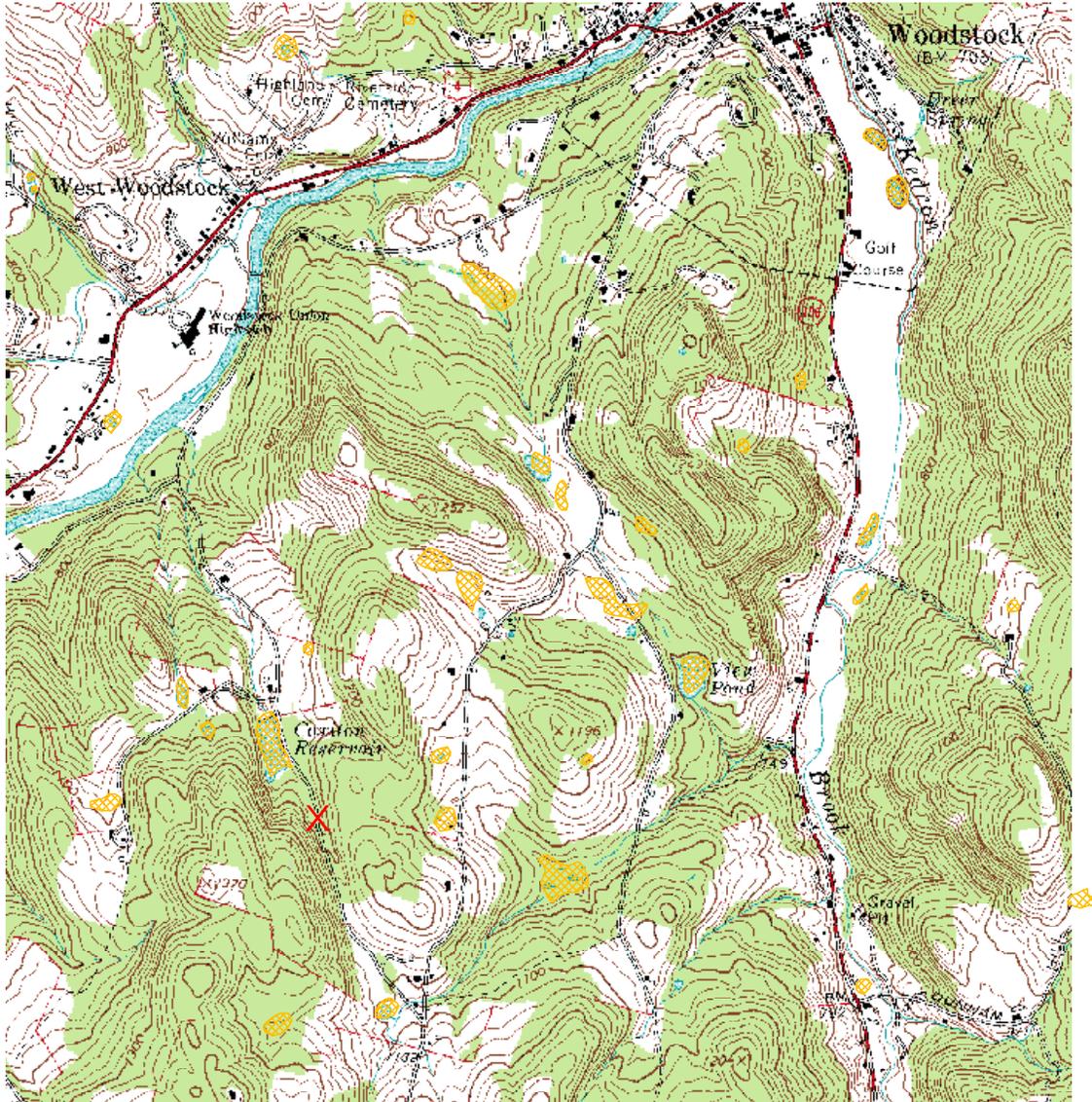
MACROINVERTEBRATE USE: The three dominant taxa in the early spring were the phantom midge *Mochlonyx sp.*, the fingernail clam *Pisidium casertanum*, and the worm *Ilyodrilus templetoni*. It remained pretty much the same in the late spring except the non-biting midge *Polypedilum trigenus* replaced *I. templetoni* as the third most abundant. The community is represented by tolerant macroinvertebrates including four species of caddisflies typically found in temporary pools and marshes. With the high alkalinity and pools longevity, it should have supported greater diversity and density levels than observed. This diminished community is likely due to its poor condition. A crayfish was also observed in this pool.

Carlton Hill. April 18, 2000. First visit.



Carlton Hill. May 25, 2000. Second visit.





 Pool Location
 NWI Wetlands



Carlton Hill Pool
Woodstock, Vermont

200 0 200 400 600 Meters


Vernal Pools of Vermont
Vermont Agency of Natural Resources, 2002

SITE NAME: Dana Hill East

TOWN: Waitsfield

MAPS: Waitsfield, VT 7.5' U.S.G.S. topographic map

LOCATION: From the intersection of Rtes. 100 and 17, head south on the first dirt road off of Rte. 17. Drive approximately 1.1 miles, park and follow mountain bike trail to the east.

SOURCE OF INFORMATION: Field visits 5/13/99, 6/15, and 10/08/99

OWNERSHIP: Public. State of Vermont, Camel's Hump State Forest

SIGNIFICANCE:

1. This site has a high quality vernal pool, showing little sign of disturbance.
2. Spotted salamanders make moderate use of this pool for breeding, as do wood frogs to a lesser extent. The potential for the pool to dry before metamorphosis makes it of low to moderate quality for amphibian use.
3. The acidic conditions limit macroinvertebrate diversity.

PHYSICAL SETTING: This is among the larger of the pools visited with a basin, albeit poorly defined, of approximately 11.4 meters by 80 meters. The pool is situated on a step in the slope at an elevation of 456 meters. It resides in the Northern Green Mountains biophysical region embedded in glacial till over non-calcareous bedrock. The pool was holding water during the early spring and fall visits, but only 8 and 12cm. respectively, and it was dry in late spring. The substrate of the pool is a deep muck that extends down 70 to 85 cm before reaching bedrock. This is evidence that the pool has probably been here for many years. The pool contains neither an inlet nor an outlet and has a watershed estimated at about 3,000 square meters.

This pool was the one of the most acidic surveyed with an early spring pH of 5.13 and an alkalinity of 0.1 mg/l CaCO₃. This was the only pool with a negative alkalinity meaning the source of buffering for this vernal pool is not derived from carbonate. The specific conductance was 15 umhos/cm and the water was tannic.

SURROUNDING LANDSCAPE CONDITION: The pool is included within an intact forested matrix with minimal evidence of disturbance. There is evidence of past logging but nothing recent, and an unofficial mountain bike trail about 50 meters away. The terrain slopes gradually uphill from the pool in all directions with occasional low rock outcrops scattered throughout the area.

The pool is surrounded on all sides by hemlock-northern hardwood forest with the canopy generally exceeding 90% cover. For the most part sugar maple (*Acer saccharum*) dominates with beech (*Fagus grandifolia*), hemlock (*Tsuga canadensis*), and red maple (*Acer rubrum*) being next in abundance. To the east beyond 40 meters the ground levels out on a ridge top dominated by hemlock with only a few included hardwoods. To the north additional softwoods other than hemlock begin to appear. These include red and white spruce (*Picea rubens* and *P. glauca*) and white pine (*Pinus strobus*).

POOL VEGETATION: The canopy cover of the pool itself is about 65%, but it is quite variable. The northern third of the pool is heavily shaded with cover of 95% while the remaining portion barely reaches 50% cover. The canopy is dominated by hemlock at the northern end with sugar and red maple, yellow birch and white ash comprising the remainder of the cover. The tall shrub layer is dominated by red spruce, perhaps an indication that this will ultimately be a spruce-northern hardwood forest community.

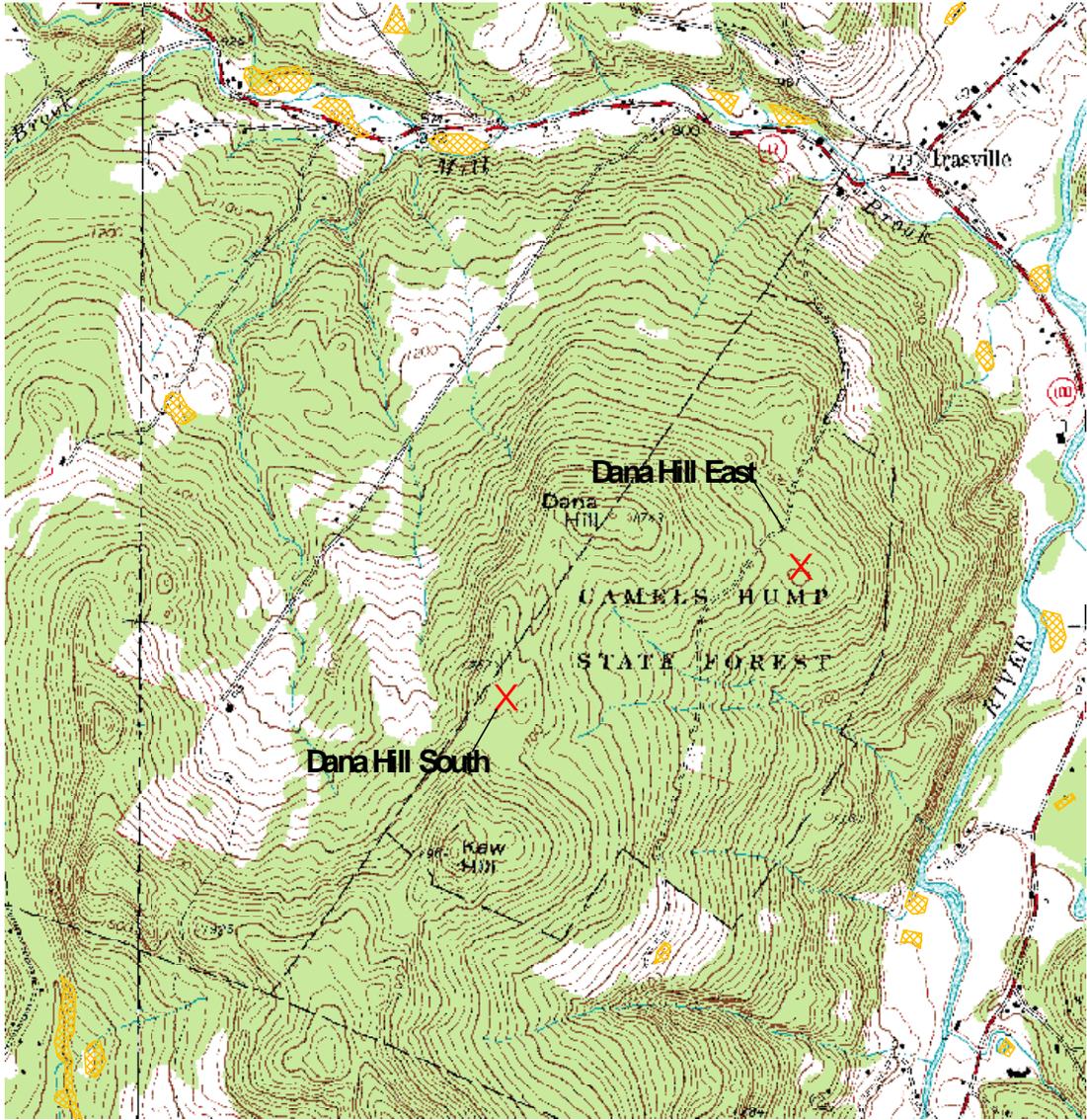
The herbaceous cover varies from very sparse in the more shaded northern portion to fairly dense in the remainder. The dominant herbs include royal fern (*Osmunda regalis*), three-seeded and retrorse sedge (*Carex trisperma* and *C. retrorsa*), beggar's ticks (*Bidens cernua*), water whorehound (*Lycopus* sp.), and smartweed (*Polygonum punctatum*). A small mat of *Sphagnum angustifolium* and a small emergent wetland area both occur just outside the basin on the east side of the pool. Woody debris is quite high within the pool basin. The wetland vegetation and deep organic soils in this pool indicate that the pool's soils are permanently saturated.

AMPHIBIAN USE: Spotted salamanders made moderate use of this shallow pool for egg-laying, while wood frog reproduction appeared more limited. Water depth appeared to be the most limiting factor, with egg masses being restricted to a few locations where there was sufficient depth to allow for submersion. Judging by the soil characteristics of the site and the moderate use by spotted salamanders even during extremely shallow conditions, this pool may provide high quality amphibian breeding habitat during a normal rainfall year. The majority of eggs were dead in several spotted salamander egg masses.

MACROINVERTEBRATE USE: . The lack of carbonate buffering and subsequent low pH limits macroinvertebrate diversity. This was compounded by the fact that this vernal pool had little standing water by the early spring. These considerable stressors permit only the most tolerant organisms to exist. The three dominant taxa found in the early spring were marsh beetles (*Cyphon* sp.), mosquitoes (*Aedes excrucians*) and non-biting midges (*Phaenopsectra* sp.). As the name aptly describes, the marsh beetles, while still in the larval life stage, commonly reside in vernal pools and other wetlands. By late spring the marsh beetles and mosquitoes were completely absent from this pool and the three dominant taxa were all non-biting midges from the genera *Chironomus*, *Psectrotanypus*, and *Procladius*. The most dominant macroinvertebrate from the late spring sample was the *Chironomus* sp. accounting for 94.8 % of the community. This extremely tolerant macroinvertebrate is often indicative of low dissolved oxygen, acidic conditions.

Dana Hill East. May 13, 1999. First visit.





 Pool Location
 NWI Wetlands



Dana Hill Pools Waitsfield, Vermont



Vernal Pools of Vermont
Vermont Agency of Natural Resources, 2002

SITE NAME: Dana Hill South

TOWN: Waitsfield

MAPS: Waitsfield, VT 7.5' U.S.G.S. topographic map

LOCATION: From the intersection of Rtes. 100 and 17, head south on the first dirt road off of Rte. 17. Drive approximately 1 mile until intersect trail. Park and follow the trail to the right and turn right after passing through a Norway spruce plantation. Pool is just beyond a camp

SOURCE OF INFORMATION: Field visits 5/13/99, 6/15, and 10/08/99

OWNERSHIP: Public. State of Vermont, Camel's Hump State Forest

SIGNIFICANCE:

1. This site has a good quality vernal pool, showing some recent signs of disturbance.
2. This pool provides low to moderate quality breeding habitat for spotted salamanders and wood frogs, and is likely to produce juveniles only in years with average rainfall or above.
3. The macroinvertebrate community was dominated by a fingernail clam, *Pisidium casertanum*.

PHYSICAL SETTING: This pool occupies a shallow basin of about 47 meters by 11 meters with an estimated watershed of approximately 4,500 square meters. It is situated in a small saddle at about 537 meters in the Northern Green Mountains biophysical region. The pool resides in glacial till over non-calcareous bedrock. The water level ranged from 15 cm in the early spring to 21 cm in the fall, but was dry during the late spring visit. There is no inlet or outlet to the pool. The substrate consists of a 25 cm thick layer of muck over a 9 cm layer of silty clay. There is a 1 cm layer of fine gravel and sand before bedrock occurs at about 35 cm.

This pool had an early spring pH of 6.70 and an alkalinity of 16.9 mg/l CaCO₃. The water is tannic.

SURROUNDING LANDSCAPE CONDITION: The pool resides within a forested matrix that has been heavily logged in the recent past including some nearby clearcuts. There is a camp approximately 50 meters away to the north of the pool and an old jeep trail that is 3 meters wide, about 70 meters to the east. In spite of these fragmenting feature, canopy coverage generally attains 80% of the ground.

The pool is surrounded by northern hardwood forest with sugar maple (*Acer saccharum*) as the clear dominant. None of the additional species are ever abundant and include other hardwoods, especially white birch (*Betula papyrifera*) and ironwood (*Ostrya virginiana*) and a few softwoods, including red spruce (*Picea rubens*) and hemlock (*Tsuga canadensis*). The surrounding area has lots of apparently recent snaps, tip-ups, and blowdowns, probably the result of the previous year's ice storm. There are a number of other wet areas and small pools in the vicinity although most of these were completely dry during the visits.

POOL VEGETATION: The canopy surrounding the pool is rather sparse, attaining only about 40%

cover. This consists primarily of hemlock, red maple (*Acer rubrum*), and yellow birch (*Betula alleghaniensis*) with lesser amounts of sugar maple and white birch. Both the understory tree layer and tall shrub layer is dominated by red spruce, perhaps an indication that this is really a spruce-northern hardwood community.

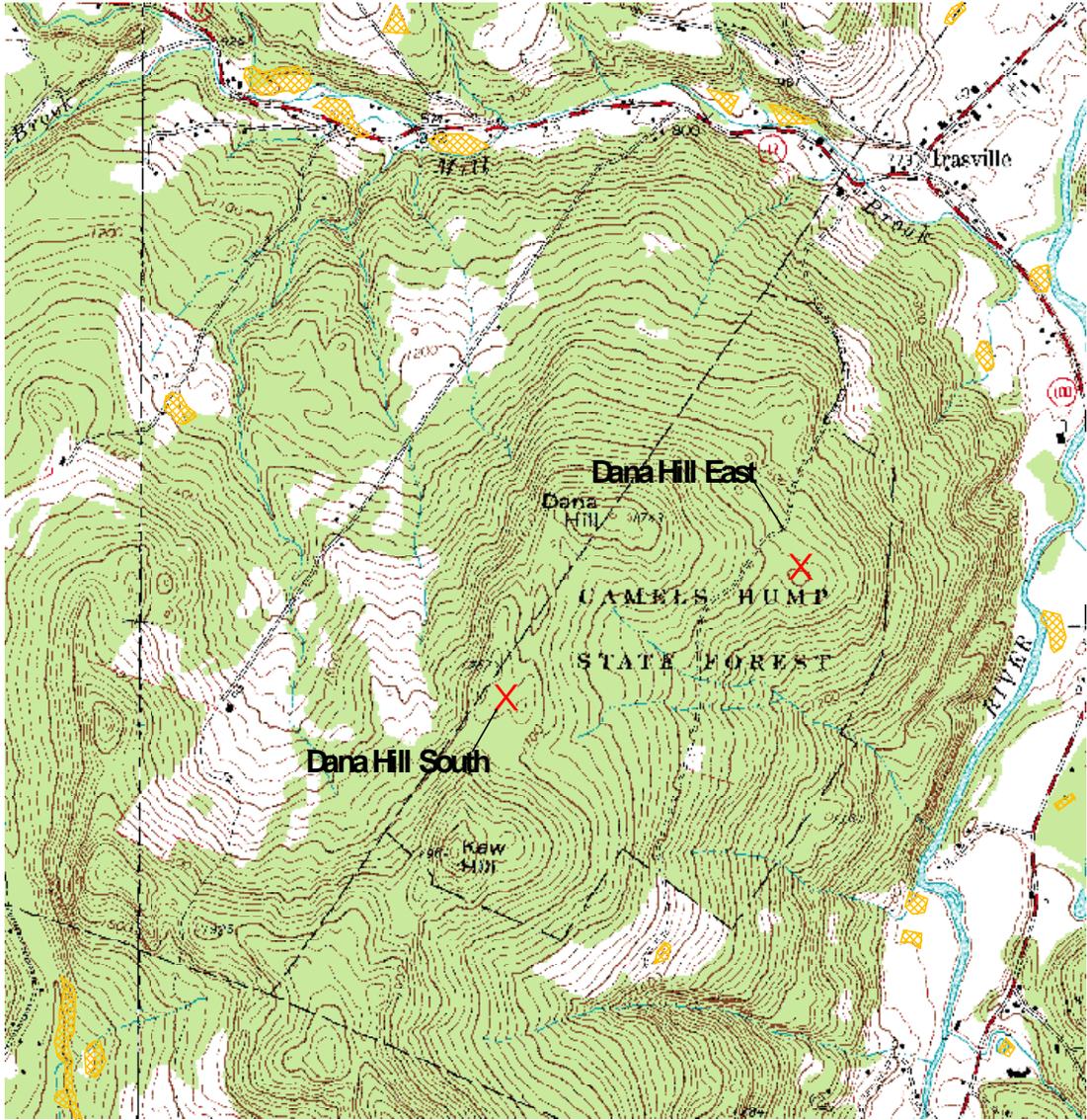
As would be expected with a sparse canopy the herbaceous layer is fairly dense, covering about 50% of the pool. The dominant species include sensitive fern (*Onoclea sensibilis*), smartweed (*Polygonum punctatum*), beggar's ticks (*Bidens* sp.), retrorse sedge (*Carex retrorsa*), and bulrush (*Scirpus* sp.). Also common in the pool are cinnamon fern (*Osmunda cinnamomea*) and bittercress (*Cardamine pensylvanica*). Mosses covered an additional 8% of the pool and woody debris was abundant.

AMPHIBIAN USE: Egg-attachment sites were limited in this pool, evidenced by several egg masses seen lying on the bottom, without attachment. The extreme shallowness of the pool would make successful amphibian reproduction unlikely during a dry year such as 1999. However, both wood frogs and spotted salamanders use this pool for egg laying in at least moderate numbers. This pool may support successful larval metamorphosis during normal rainfall years. Many of the spotted salamander egg masses contained high numbers of dead eggs. Red efts (eastern newt) were also observed in the pool, although this pool would not support successful breeding for this species.

MACROINVERTEBRATE USE: The three dominant taxa during the early spring sampling were *Pisidium casertanum*, and two *Chironomidae* non-biting midges, *Procladius* sp. and *Chironomus* sp. *P. casertanum* is the most common and cosmopolitan species of fingernail clam in Vermont. This amphibious species is frequently found in the moist leaf litter of dry vernal pools. The moderate alkalinity and circumneutral pH allows for a dominant mollusca presence, although it is a single species.

Dana Hill East. May 13, 1999.





 Pool Location
 NWI Wetlands



Dana Hill Pools Waitsfield, Vermont

200 0 200 400 600 Meters



Vernal Pools of Vermont
Vermont Agency of Natural Resources, 2002

SITE NAME: Dartmouth Vernal Pool

TOWN: Corinth

MAPS: West Topsham, VT 7.5' U.S.G.S. topographic map

LOCATION: Unnamed summit west of Leech Hill.

SOURCE OF INFORMATION: Site visits 5/2/00, 6/6/00, and 10/5/00

OWNERSHIP: Private. No access without permission of landowner.

SIGNIFICANCE:

1. This site has a moderate quality vernal pool, showing significant signs of disturbance from adjacent logging.
2. This pool supports high numbers of breeding spotted salamanders and wood frogs. However, the disturbed surrounding upland will not be able to sustain these populations in its current condition. Use of the pool is expected to decrease over the next few years.
3. This pool supports a limited community of beetles, true bugs, fingernail clams, and fairy shrimp.

PHYSICAL SETTING: This 13 by 49 meter wetland basin is located in a small depression in the summit of a 615 meter hill. All the hills in this portion of the Northern Vermont Piedmont biophysical region are composed of crystalline limestone of the Waits River formation and are blanketed in glacial till.

Being located on the summit of a small hill, this vernal pool has a very small watershed, only 2,500 square meters. There is an intermittent stream that flows out of the pool to the north and into a small wetland 25 meters to the northwest. The size of the open water pool was 9 by 30 meters in May and early June 2000, but there was no standing water during the October visit. There is a one cm layer of leaf litter and duff at the top of the soil profile in the vernal pool, over a 30 cm layer of dark brown, moist, high-organic content mineral soil. This is underlain by gleyed, fine sandy loam. This indicates that the vernal pool is seasonally inundated, but that ground water levels drop to 30 cm below the soil surface in most years.

This moderately buffered pool had a springtime pH range of 6.52 – 7.18 and a mean alkalinity of 15.3 mg/l CaCO₃. The water is highly tannic.

SURROUNDING LANDSCAPE CONDITION: All the northern hardwood forest within several hundred meters of this vernal pool were clearcut in 1998 or 1999. Stumps show that the trees cut were 40 to 50 cm diameter sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), and American beech (*Fagus grandifolia*). There were also scattered large red spruce (*Picea rubens*) cut from the ridgeline just south of the vernal pool. Woody regeneration is dominated by choke cherry (*Prunus virginiana*), red raspberry (*Rubus idaeus*), white ash, sugar maple, and red spruce. Field and disturbance species dominate the herbaceous layer, including grasses, goldenrod (*Solidago* sp.) and common mullein (*Verbascum thapsus*).

No forested buffer was left around the vernal pool, and less than one percent of the surrounding forest canopy remains, mostly small, poorly formed trees. This intensity of cutting adjacent to the pool is expected to have the following effects: increased sunlight reaching the pool resulting in warmer water temperatures, more rapid drying of the pool, and increased herbaceous growth; increased amount of sediments and nutrients reaching the vernal pool by surface water runoff, resulting in changes in hydrology and species composition; and loss of shade cover for amphibians migrating to the vernal pool in spring.

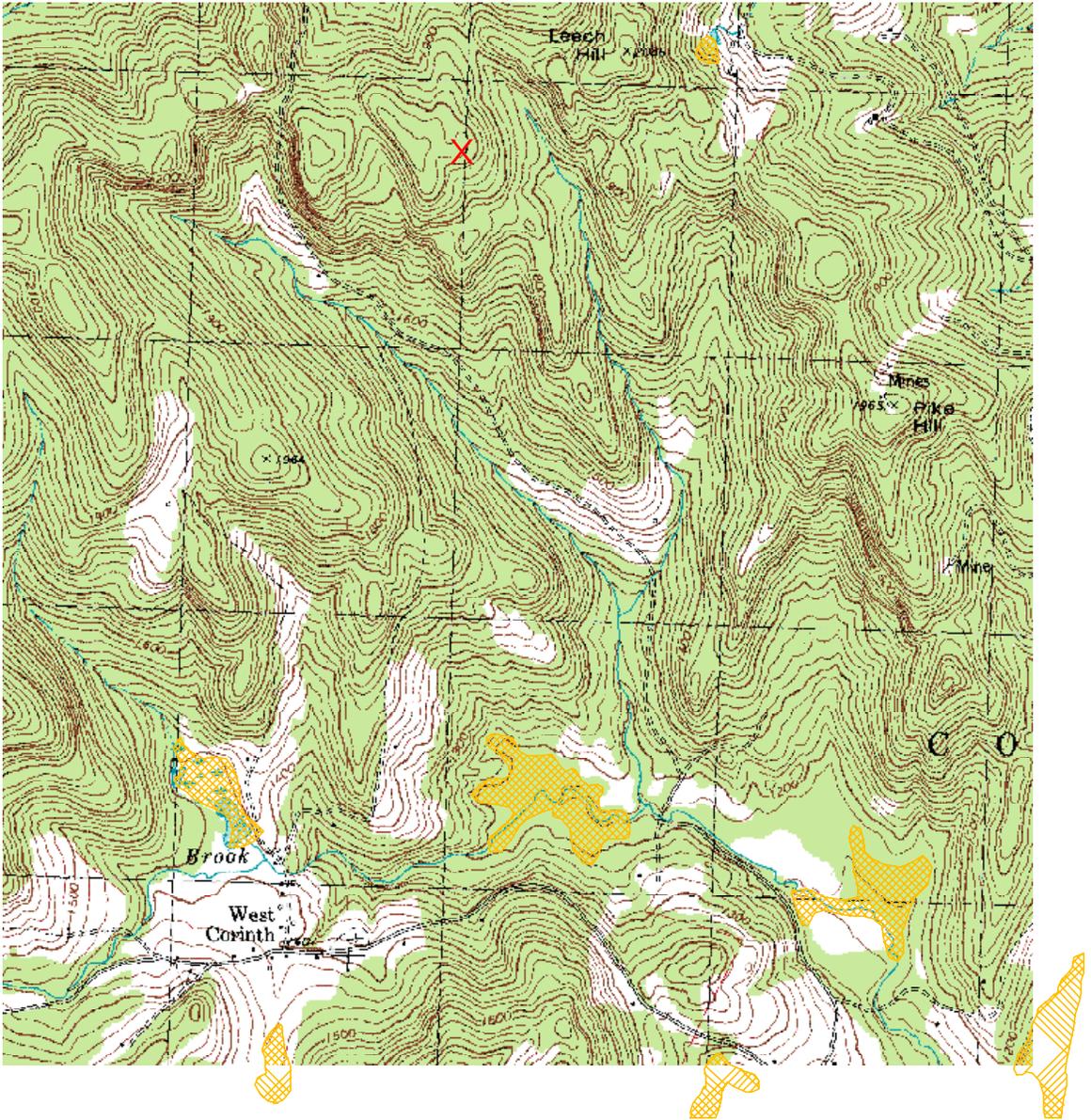
POOL VEGETATION: This pool has practically no shading canopy due to the adjacent forest clearcut. Given the narrowness of the vernal pool and the size of the tree stumps adjacent to the vernal pool, it is expected that canopy cover prior to the recent logging was greater than 90 percent. Herbaceous plant cover in the vernal pool basin was 90 percent during the early October visit. Two species account for 65 percent of the cover: blunt spike-rush (*Eleocharis obtusa*) and nodding beggar's-ticks (*Bidens cernua*). Both of these species are annuals and have apparently colonized the altered habitat at this pool. Although it is common to have annual plants as part of the vegetation in vernal pools, the abundance of these two species at this pool reflects the recent dramatic change in conditions. Other herbaceous species present in low abundance include sensitive fern (*Onoclea sensibilis*), fowl mannagrass (*Glyceria striata*), and marsh fern (*Thelypteris palustris*). The floating aquatic, common duckweed (*Lemna minor*), covered 20 percent of the pool in early June but was stranded on moist soil and covered less than one percent of the area in October.

AMPHIBIAN USE: High numbers of spotted salamanders and wood frogs use this pool for breeding habitat, with about 90 and 400 egg masses observed, respectively. This use occurred despite the recent clearcut of surrounding upland habitat. Egg masses were noticeably advanced in development beyond those found in similar pools in the region at this time. This is likely due to heating of the water from the increased solar radiation following the clearcut. This may cause premature drying of the pool and loss of larvae. Adults may have migrated from the cleared areas if the cut occurred after the previous summer. It is more likely that most amphibians migrated from the undisturbed forested areas located several hundred meters away. Adults and juveniles that leave the pool to seek terrestrial habitat will need to find these forested areas to survive; those that remain in the clearcut area, particularly juveniles, are likely to succumb to desiccation in the dry soils of this surrounding zone of disturbance. Amphibian use of this pool and the clearcut area is expected to decrease rapidly over the next few years. If this area is allowed to regenerate and remain undisturbed over a long enough period of time, it may again support amphibian populations if individuals are able to immigrate from nearby areas.

MACROINVERTEBRATE USE: The early spring's three dominant taxa were mosquitoes, and two species of worms. Though not dominant the beetles were well represented by the presence of both predaceous diving and water scavenger beetles. The fairy shrimp, *Eubranchipus bundyi* was also collected in the early spring, but gone by late spring. The late spring dominant taxa were two worms and the predaceous diving beetle *Acilius semisulcatus*. *A. semisulcatus* is a non-wintering spring migrant that overwinters in nearby permanent water, but arrives at these pools to reproduce. This pool had four genera of true bugs all known to be non-wintering spring migrants.

Dartmouth. May 2, 2000





 Pool Location
 NWI Wetlands



Dartmouth Vernal Pool
Corinth, Vermont

200 0 200 400 600 Meters


Vernal Pools of Vermont
Vermont Agency of Natural Resources, 2002

SITE NAME: Dorset Vernal Pool

TOWN: Dorset

MAPS: Dorset, VT 7.5' U.S.G.S. topographic map

LOCATION: 750 meters south of Emerald Lake, between the Vermont Railway grade and Route 7.

SOURCE OF INFORMATION: Site visits on 4/13/00, 5/15/00, and 9/22/00

OWNERSHIP: Public. Emerald Lake State Park. Vermont Department of Forests, Parks, and Recreation.

SIGNIFICANCE:

1. This site has a moderate quality vernal pool, showing some signs of disturbance.
2. This pool supports limited breeding by spotted salamanders and wood frogs.
3. Its nearby proximity to Emerald Lake makes this a convenient reproductive pool for non-over-wintering vernal pool spring migrants.

PHYSICAL SETTING: This 16 by 16 meter vernal pool is located in a 50 by 50 meter depression in the sand, gravel, and cobble deposits of a glacial kame terrace. This depression appears to be an old borrow pit, as it is steep sided, and there is no top soil except for where it had begun to redevelop in the seasonally wet vernal pool. There also appear to be old haul roads leading to this depression from the south.

This kame terrace lies in the upper reaches of the Otter Creek valley. This area is underlain by calcareous bedrock, including Monkton Quartzite, Winooski Dolomite, and Dunham Dolomite.

The vernal pool watershed is the entire 2,500 square meter borrow pit depression. The vernal pool in the bottom of this depression was one meter deep on April 13, 2000, 65 cm deep on May 15, and was dry during the September visit. The pH of the water in this pool ranged from 7.58 – 7.72. The alkalinity was 203 mg/l, dissolved calcium concentration was 46 mg/l, and dissolved magnesium was 21 mg/l, all representing the highest values measured for these parameters in any of the 28 vernal pools sampled. These alkaline, mineral-rich conditions result from ground and surface water contact with the calcareous bedrock and surficial deposits in the area. The water was slightly to moderately tannic.

SURROUNDING LANDSCAPE CONDITION: As described above, this vernal pool appears to have formed in an old sand and gravel borrow pit. Organic topsoil is lacking in the small watershed. The vernal pool is located immediately east of the railroad embankment and approximately 150 meters west of Route 7.

Surrounding the vernal pool is a young red oak-northern hardwood forest, dominated by red oak (*Quercus rubra*), red maple (*Acer rubrum*), and sugar maple (*Acer saccharum*). This forest has a closed canopy (90

percent cover) and a dense tall shrub layer of witch hazel (*Hamamelis virginiana*) and musclewood (*Carpinus caroliniana*), but as it is young, there is little woody debris on the forest floor to serve as amphibian habitat. Otter Creek flows to the north between this upland forest and Route 7 to the east. The Creek flows through a series of high quality wetlands to the south, east, and north, all within 50 meters of the vernal pool. These wetlands include open water, floating aquatic beds, shrub swamp dominated by willow (*Salix* sp.) and speckled alder (*Alnus incana*), and sedge meadow dominated by retrorse sedge (*Carex retrorsa*) and giant bur-reed (*Sparganium eurycarpum*). To the west of the vernal pool and the railroad grade, there is a very young expression of the mesic red oak-northern hardwood forest. This forest occurs on rocky soils and paper birch (*Betula papyrifera*) and nonnative honeysuckles (*Lonicera* spp.) are abundant. A nice hemlock forest occurs in the valley to the northeast of the vernal pool.

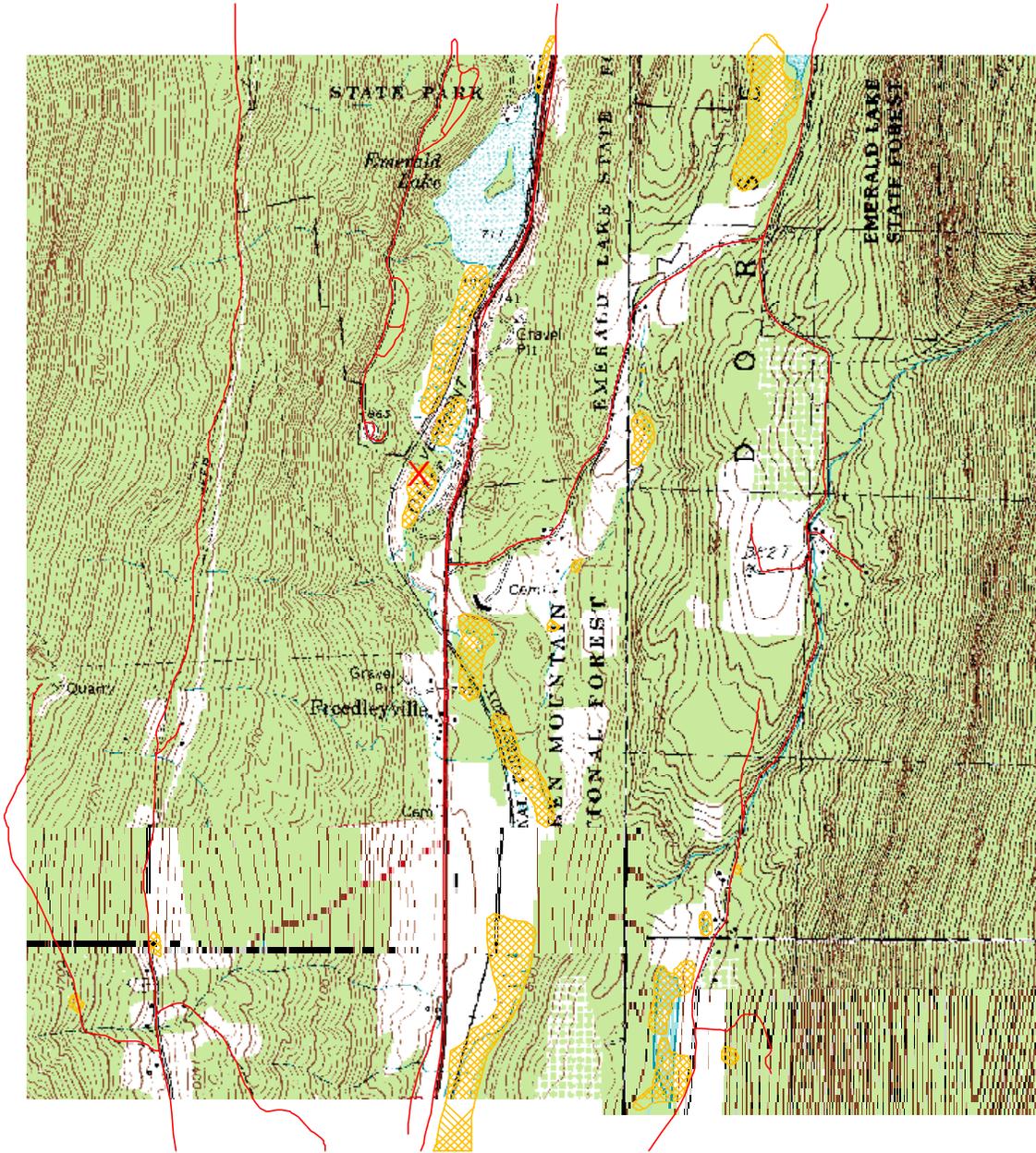
POOL VEGETATION: The vernal pool has a 70 percent canopy cover from adjacent upland forest trees. Dominant species in this young portion of the forest are paper birch, sugar maple, yellow birch (*Betula alleghaniensis*), and white ash (*Fraxinus americana*). There are several small black ash (*Fraxinus nigra*) on the wetter margins of the vernal pool. The pool itself has very little vegetation, except for a small hummock that is covered with sensitive fern (*Onoclea sensibilis*).

AMPHIBIAN USE: This pool supports a fairly low amount of spotted salamander and wood frog breeding. Almost all egg masses were found in a single location within the pool, as egg-attachment sites were very limited. From a local perspective, this pool does not support significant breeding for these species within the area, as more attractive habitat is located directly to the south in a flooded wetland adjacent to Otter Creek, where over 400 spotted salamander egg masses were observed. Surrounding upland habitat, particularly to the west, appears to be sufficient to support viable populations.

MACROINVERTEBRATE USE: The abundance of base cations and elevated alkalinity levels should make this a desirable vernal pool for those snails and fingernail clams requiring these conditions. Surprisingly, this was not the case. Vermont's most common fingernail clam *Pisidium casertanum* was found, along with a single immature snail, *Fossaria* sp. The pool had nine taxa of beetles, but the other orders were less diverse. The pool's three dominant macroinvertebrates in the early spring were the phantom midge, *Mochlonyx* sp., *P. casertanum* and the caddisfly *Limnephilus indivisus*. By late spring *Mochlonyx* sp. still remained a dominant taxa as were two midges, *Micropsectra* sp. and *Chironomus* sp.

Dorset. April 14, 2000.





 Pool Location
 Rds 911
 NWI Wetlands



Dorset Vernal Pool
 Dorset, Vermont

