A Survey of the Former Champion International Lands
in Essex County, VT

for Rare, Threatened, or Endangered

Reptiles and Amphibians

with Notes on Communal Amphibian Breeding Areas
and Selected Natural Communities.

Prepared for

The United States Fish and Wildlife Service

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Introduction

The purpose of this effort was to perform a herpetological survey of two portions (Conte NWR & West Mt. WMA) of the former lands of Champion International Inc. in Essex County, Vermont. The goals of the survey were to locate any rare, threatened, or endangered reptiles or amphibians, perform general herpetological surveys at selected sites, and note any communal amphibian breeding sites and vernal pools located during the survey. I will here report on all reptiles and amphibians (herptiles) located in the study (Tables 1-4) paying particular attention to those with a Vermont State Heritage rank of S3 or lower and/or a global rank of G4 or lower. All communal breeding sites and vernal pools are scored based on productivity and diversity, shown on maps (Figures 1 through 4) and briefly described. Results of surveys of the nearby and selected sites are shown in Tables 5 through 23. Those species reported in interviews but not located during the survey are shown in Table 24.

Communal breeding sites are broadly defined here to include any body of water at which amphibians gather from the surrounding landscape to breed and/or lay their eggs. The definition of a vernal pool which I will use is: a temporary pool which has no permanent inlet or outlet and is filled by local surface water or ground water in the spring and which dries during years of average rainfall in late summer or fall. Semipermanent pools differ only in that they hold water throughout the year in most years of average rainfall and dry only during drought conditions. It has been my experience that semipermanent pools are both more diverse and more productive than vernal pools.

Methods

No one method will inventory the complete range of reptiles and amphibians occurring in an area. A combination of methods must be employed over a variety of seasons. I used seven herp-survey methods, starting fieldwork with salamander trapping on April 26 and finishing in the field with snake surveys on October, 2000. In addition a flyover of the site was made on May 3. As much as possible, visits were timed to be during the optimal window of opportunity to locate all potential reptile and amphibian species in the area. A total of 35 days were spent on the ground at the site: four days in April, seven in May, six in June, eight in July, five in August, four in September, and one in October. All work was performed by the author working alone or supervising volunteers or interns. All of the selected mandatory sites were visited at least once during the field season using an active search. Those that had roads in or immediately adjacent to them were visited more often and a wider variety of methods were used. In addition, all seven methods were used in many other areas throughout the study site in an effort to locate rare, threatened, or endangered species or to investigate the productivity and diversity of breeding sites that were located.

The seven **herp-survey** methods used in this inventory are described below.

An active search is a concentrated effort in a predetermined area to locate reptiles and amphibians by raking leaf litter, looking under rocks and logs, looking within rotten logs or under any items, natural or unnatural, that provide moist and shady retreats during the day. Since this method can be used under almost any conditions during the field season, it is the method that I used most frequently. Active searches for reptiles were also performed under conditions in which they would be basking (cool sunny days in early spring or early fall).

A site check is a less localized form of active search that includes time spent searching for and traveling between the best micro-habitats. Site checks were frequently used while traveling to vernal pools or other target locations.

A night-time road search consists of driving roads at a speed of 10-15 mph with the vehicle window open to hear calling anurans, and with eyes on the road and road margins to see herptiles crossing the route. Road searches were performed when the

surface of the road was wet or the night was relatively warm and humid. When herptiles were heard or spotted, the car was stopped, the organisms identified and counted, and their locations noted. The many small roads in and surrounding this property made this a useful survey method. Many reptiles and amphibians were located and noted while traveling to or from the study sites and may be outside the boundaries of the former Champion Lands. If so, they are clearly identified as such in the database and the text.

Salamander trapping involves the use of a series of unbaited minnow traps placed at selected locations in shallow water around the margin of potential breeding pools and swamps. It was used to locate caudates (salamanders) that bred in pools in the spring. It is a very effective method for locating amphibians but is only useful during a narrow window of time (April-May). I used these traps in a few remote sites that were located during the flyover but primarily in sites that were located along the old logging roads. One to three traps were used per breeding site depending on its size.

Day-time road searches were performed in the fall on sunny days after cold nights. On these days many snakes that are otherwise difficult to locate can be found on the roads (alive and dead). Snakes move to denning areas in the fall. If their movement causes them to cross roads they often hesitate on the roads to bring up their body temperatures. Unfortunately this often results in road kills but it also alerts the researcher to the presence of a species in an area. Most of the roads in or near the study sites were driven in the fall and road kills and live specimens were identified.

Turtle trapping was performed both in the larger study site and at nearby locations that appeared to be prime turtle habitat. All mandatory sites that had aquatic habitat deep enough for turtles were trapped at least once. Turtle trapping performed on public and private lands nearby but outside of the study site was part of a thesis project by one of my interns. The data are included in this report but clearly identified as outside of the study area. Up to eleven 30-inch hoop traps with 1 inch mesh were baited with sardines and left for approximately 24 hours.

Interviews are useful in gathering important leads on areas where unusual or rare herptiles may be located now or were historically. I conducted fifteen interviews in person or over the phone. Some of the interviewees were recommended by ranger Keith Weaver, some were local Fish and Wildlife personnel and others were residents who lived near the study site.

In addition to the above methods I used the Vermont Herp Atlas records. As coordinator of the Herp Atlas Project, all known records of Vermont herptiles current or historic are on a database on my computer. These records were accessed to check for all other records from the area (Table 24, column 7).

Accidental discoveries are often made while employing a method not intended to locate that specific species or scouting or working at a site. Individuals located accidentally are identified as such in the data.

Two methods were used to locate **communal breeding locations and vernal pools.**

A low-elevation flyover prior to leaf emergence, if timed properly, can provide a very efficient survey of amphibian breeding locations (including vernal pools). Some of these locations are mapped on National Wetland Inventory Maps but many are too small or temporary to have been mapped. The timing and flight conditions of the May 3 flyover combined to provide excellent visibility. Still, most of the small pools described were located during on the ground field work. A couple of the more remote sites checked were located from the air. Some of the remote vernal pools seen from the air were not visited and more (particularly those obscured by coniferous growth) surely were missed. This portion of the survey was not intended to be comprehensive.

Ground surveys at this site consisted of searching for breeding sites while performing other amphibian survey methods at sites selected for other reasons. In the early spring (April-May) calling Wood frogs (*Rana sylvatica*) often lead surveyors to

vernal pools. No ground surveys away from roaded areas were performed specifically for communal breeding sites.

The pools were scored based on a combination of diversity and productivity with a one being the highest rating and a four being the lowest. The rating is partially subjective and relative to other pools at this site. The presence of only two amphibian species was considered low diversity, three moderate, and four or more was considered good diversity. Even if a pool showed evidence of only two breeding species it still could be very significant in terms of its productivity. Productivity was based on the number of egg-masses, larvae, and individuals seen and the number of choruses heard at the site.

Some of the vernal pools located in the spring contained direct evidence of breeding (egg masses or adults). Pools not located until the fall would no longer have visible egg-masses or migratory adults and hence species usage is unknown. Pools discovered late in the summer or early fall and scored 3 or 4 may have been scored more highly if visited in the spring. Since vernal pools diminish in size over the course of the year, the three measurements sometimes included in this report are an estimate of the extent of the water in the pool if it was at mean spring levels (early May). The three measurements are a rough estimate of the greatest length, greatest width, and depth at the deepest point.

Most of the vernal or semipermanent pools located were filling a man-made or enhanced depression or were filled by some alteration of drainage.

Results: reptiles and amphibians located, basic ecology, relative abundance, and ranks

Twenty species of herptile were located in or near the project area: six species of salamander, eight species of frog (& toad), three species of turtle, and three species of snake. All of these sightings, with state and global heritage ranks, the number of sightings and the number of sites at which they were located are summarized in Table 4. The results are further subdivided into Conte NWR, West Mt. WMA, Wenlock WMA (Tables 1-3) and records from outside these three areas but nearby (Table 5). No state or federally listed species were located. A site in this table is defined as a location at least 0.5 kilometers distant from the nearest known location for the same species.

Salamanders as a group were not particularly abundant in the study sites. Some such as *Plethodon cinereus* (Redback salamander) are sensitive to flooding and low soil pH. Many salamanders prefer a deep litter layer and well-shaded, moist, mature, hardwoods for part of their life cycle. Many of the woodlands were poorly-drained or shallow-soiled softwoods.

Six **caudate** (salamander) species were located in the project area. *Ambystoma maculatum* (Spotted Salamander) was the most frequently located salamander and the only widespread salamander species at the site. I located adults, egg masses, and larvae 66 times at 42 sites. This species breeds in many of the vernal pools, semipermanent pools, and beaver dams of the area.

Nineteen *Plethodon cinereus* (Redback Salamander) were located at 14 sites. This is the only salamander species in Vermont that does not require standing or running water. Hence it can be dispersed widely in woods well away from pools, ponds, and streams. Very few of this normally abundant species were located. They are intolerant of flooding and low soil pH (Wyman and Hawksley-Lescault, 1987). They were found in moist hardwood uplands with a deep litter layer and only a few sites that we visited matched this description.

Fourteen *Eurycea bislineata* (Northern Two-lined Salamander) were located at eight sites. This species' habitat is along the margins of small streams and in or near seepage areas. The best habitat appears to be within hardwoods in well-oxygenated streams. This was an unusual habitat type within the sites selected for inventory.

Only eight *Notophthalmus viridescens* (Eastern Newt) were located at seven different sites. Adults were seen only in Lewis Pond but the Red Eft (terrestrial) stage was occasionally located in the woods or along the roads. This species is tremendously abundant in much of the hardwood forests of the state but is surprisingly rare here and

in some surrounding areas that I have surveyed. It may again be a combination of softwoods, lack of deciduous soil litter, and low soil pH that limit it. Low aquatic pH may also be a limiting factor but was not checked.

Desmognathus fuscus (Dusky Salamander) was located six times at only 3 sites. It uses habitat similar to *E. bislineata* and not much of that habitat type was located within the selected sites.

Gyrinophilus porphyriticus (Spring Salamander) is a stream salamander that requires well oxygenated, cold, clear, clean water with abundant stone cover. I was able to locate only a single specimen of this species in the small brook draining into West Mt. Pond.

None of these salamanders are rare in Vermont or the US. Dusky salamander and Spring salamander are ranked as S4 species. The other four (Spotted, Eastern newt, Redback, and Northern two-lined) are all S5 species in Vermont and G5 globally.

Eight species of **anurans** (frogs and toads) were located in the project areas. *Pseudacris crucifer* (Spring Peeper) was recorded 122 times at 69 different sites and was the most frequently located herptile species. It is clearly widespread within the former Champion Lands however it is also among the easiest to locate as a result of its loud clear piercing call and long calling period. This species is more often heard then seen. Some reports of this species are of choruses which may include scores of individuals. It breeds in a variety of still waters from ditches to beaver dams.

Bufo americanus (American Toad) was located at sixty sites, sometimes it was heard calling or occasionally two or three adults were seen in a search area. It is surprisingly abundant relative to other anurans at this site.

Rana clamitans (Green Frog) was located at 51 different sites in generally small numbers primarily in beaver ponds, river backwaters, and semipermanent pools but also in the vernal pools. It breeds in still permanent water with surrounding vegetation but travels widely as long as it can stay moist. Green frogs can not successfully breed in vernal pools since their tadpoles require two to three winters to mature, but young adults often can be found feeding in them.

Rana sylvatica (Wood Frog) was located at 47 sites as egg masses, tadpoles, or adults but never in impressive numbers. Like the Spotted Salamander, it breeds in vernal and semipermanent pools, and beaver dams. After breeding, adults return to the woods to forage and overwinter.

Rana palustris (Pickerel Frog) was located at 11 different sites. This species likes dense annual vegetation near clean permanent water. Open beaver meadows or bog mats near ponds or lakes are often ideal habitat combinations. Its call is weak and is sometimes given from underwater so it is easy to miss with calling surveys. The Pickerel Frog state rank was recently changed (January 1997) to an S4.

Rana septentrionalis (Mink Frog) is a primarily Canadian species limited to the northern third of the state (for the most current range maps of any of these species visit www.middlebury.edu/herpatlas). Unlike all other anurans found in Vermont, it is a northern species at the southern edge of its range. It has the most limited Vermont distribution of any species of herptile found at this site. The study site is in the center of Vermont's range for this species and I could see this species being the amphibian flagship species for this site. I located thirteen of this species at nine sites. It is an S4 species.

Rana catesbeiana (Bullfrog) was heard or seen six times at three sites. Early field guides reported this species missing from the northeast corner of Vermont and this is still often the case (Conant and Collins, 1998). One local story that I heard from a few sources is that it was purposefully introduced into Spectacle Pond. We did find it there. It was very localized within the study sites with all populations in or near Maidstone Lake and Wheeler Ponds. It is a voracious predator on anything that moves and fits in its mouth including other amphibians and other Bullfrogs. This species requires permanent still water with vegetated margins.

I was unable to locate *Hyla crucifer* (Gray Treefrog) within the study site but I did hear and see it along Rte. 102 just east of the study site in the Connecticut River Valley.

After breeding along the Connecticut River Valley some of this breeding assemblage probably disperse into summer habitat along the eastern margin of West Mt. WMA. Brett Engstrom reported hearing it once in this area. It is an arboreal species and hence it is very difficult to find. It is most easily located by call during hot humid June and July nights. However, it was not found breeding anywhere within the study sites. It breeds in permanent or semipermanent water containing standing vegetation.

All the anuran (frog) species located other than *R. palustris* and *R. septentrionalis* are listed as S5 species in Vermont and G5 globally. Additional information on the field marks, habitat, and natural history of all Vermont amphibians is contained in Appendix A.

Reptiles are very rarely as abundant as amphibians in Vermont. As expected they were located much less frequently. On a landscape scale, reptile diversity usually increases as you move down drainage. **Turtles** in general were harder to find here. Most aquatic turtle species prefer lower elevation floodplain habitats with soft-bottomed water bodies. However, three turtle species were found in or near the study sites.

Chrysemys picta (Painted Turtle) was located at two locations: Dennis Pond and Big Wheeler. It is also located along the Nulhegan lowlands (Nulhegan Pond), in the Connecticut River oxbows and in Spectacle Pond but we could not locate it either in the Nulhegan River or any of the Conte sites, despite significant trapping effort. Two adults were found dead and a third was found injured along Rte. 105 near Nulhegan Pond (excellent sandy egg-laying habitat).

Chelydra serpentina (Snapping Turtle) was also located in the Nulhegan lowlands near Nulhegan Pond but not within the study sites. This species is almost entirely aquatic except when laying its eggs. It is rugged and adaptable. It inhabits all types of permanent water. I expect that it does exist within the study site but in low numbers. Both of these turtles are S5 species in Vermont and G5 globally.

Clemmys insculpta (Wood turtle) was located twice from almost the same location: where the main branch of the Nulhegan crosses Rte. 105 (Figure 4). One turtle was killed on Rte. 105 and the second was missing a leg but otherwise healthy. Turtles with missing legs are common and it is assumed to be the result of predation by otter, raccoon, or perhaps Snapping Turtles. The live turtle was found along the North Branch of the Nulhegan but not more than 75 meters from Rte. 105. The exposed sandy soils in this area provide excellent nesting habitat for all three turtle species. Wood Turtles were also reported in three interviews. It would be useful to know where the core habitat is for this species. Wood Turtles overwinter and take refuge in streams with sand or gravel bottoms and spend a great deal of time feeding on land up to 250 m or more from the river (Parren, 2000, unpub. data). The Wood Turtle is an S3 species in Vermont and the only S3 species located in this survey. It is also considered a species of Special Concern by the Vermont Reptile and Amphibian Scientific Advisory Group. Although this label has no legal or regulatory status, it identifies species that the group feels may be at risk. The only other Essex County records are from the Victory Bog area. In my opinion, of the herptile species located within this study area, this is the species most at risk.

Three species of **snake** were confirmed in or near the project area. *Thamnophis sirtalis* (Common Garter Snake) was located sixty-six times at 47 sites. This species is by far the most abundant and adaptable snake species in Vermont and hence has a state rank of S5.

Storeria occipitomaculata (Redbelly snake - S5) was located at nine sites. I located them while searching logging headers or during day- and night-time road searches. The headers often provide abundant cover and exposure to the sun. This is a secretive mixed woodland snake.

A single *Diadophis punctatis* (Ringneck Snake) was located along Rte. 102 outside the eastern boundary of the West Mt. WMA. I suspect that this species is found in small numbers in West Mt. WMA at low elevations with southern or western sun exposure. This is a secretive S4 species.

Table 1. Results of the reptile and amphibian inventory of the **Conte NWR** portion of the former Champion Lands in Essex County, Vermont. This portion of the study site was visited on 20 different days starting on April 26, 2000 and ending on October 1, 2000. Seven field methods were used: active searches, day-time road searches, interviews, night-time road searches, salamander trapping, site checks, and turtle trapping.

Species name	Common name	State Rank	Global Rank	# of records	# of sites
Salamanders					
Ambystoma maculatum	Spotted Salamander	S5	G5	37	24
Plethodon cinereus	N. Redback Salamander	S5	G5	11	9
Notophthalmus viridescens	Eastern Newt	S5	G5	4	3
Eurycea bislineata	N. Two-lined Salamander	S5	G5	3	3
Desmognathus fuscus	N. Dusky Salamander	S4	G5	5	2
Gyrinophilus porphyriticus	Spring Salamander	S4	G5	0	0
Frogs and Toads					
Pseudacris crucifer	Spring Peeper	S5	G5	61	36
Rana sylvatica	Wood Frog	S5	G5	67	33
Bufo americanus	American Toad	S5	G5	42	27
Rana clamitans	Green Frog	S5	G5	34	25
Rana septentrionalis	Mink Frog	S4	G5	8	5
Rana palustris	Pickerel Frog	S4	G5	4	3
Hyla versicolor	Gray Tree Frog	S5	G5	0	0
Rana catesbeiana	Bullfrog	S5	G5	0	0
Turtles					
Chelydra serpentina	Common Snapping Turtle	S5	G5	0	0
Chrysemys picta	Painted Turtle	S5	G5	0	0
Clemmys insculpta	Wood Turtle	S3	G4	0	0
Snakes					
Thamnophis sirtalis	Common Garter Snake	S5	G5	37	30
Storeria occipitomaculata	Redbelly Snake	S5	G5	8	7
Diadophis punctatus	Ringneck Snake	S4	G5	0	0

Table 2. Results of the reptile and amphibian inventory of the **West Mt. WMA** portion of the former Champion Lands in Essex County, Vermont. Records are from 21 days between April 25, 2000 and October 1, 2000. Seven field methods were used: active search, day-time road searches, interviews, night-time road searches, salamander trapping, site checks, and turtle trapping.

Species name	Common name	State Rank	Global Rank	# of records	# of sites
Salamanders					
Ambystoma maculatum	Spotted Salamander	S5	G5	17	13
Eurycea bislineata	N. Two-lined Salamander	S5	G5	11	5
Plethodon cinereus	N. Redback Salamander	S5	G5	8	5
Notophthalmus viridescens	Eastern Newt	S5	G5	3	3
Desmognathus fuscus	N. Dusky Salamander	**S4**	G5	1	1
Gyrinophilus porphyriticus	Spring Salamander	**S4**	G5	1	1
Frogs and Toads					
Bufo americanus	American Toad	S5	G5	31	26
Pseudacris crucifer	Spring Peeper	S5	G5	38	23
Rana clamitans	Green Frog	S5	G5	22	16
Rana sylvatica	Wood Frog	S5	G5	12	8
Rana palustris	Pickerel Frog	**S4**	G5	12	8
Rana catesbeiana	Bullfrog	S5	G5	6	3
Rana septentrionalis	Mink Frog	**S4**	G5	1	1
Hyla versicolor	Gray Tree Frog	S5	G5	0	0
Turtles					
Chrysemys picta	Painted Turtle	S5	G5	2	2
Chelydra serpentina	Common Snapping Turtle	S5	G5	0	0
Clemmys insculpta	Wood Turtle	**S3**	**G4**	0	0
Snakes					
Thamnophis sirtalis	Common Garter Snake	S5	G5	27	15
Storeria occipitomaculata	Redbelly Snake	S5	G5	1	1
Diadophis punctatus	Ringneck Snake	**S4**	G5	0	0

Table 3. Results of the reptile and amphibian inventory of the **Wenlock WMA** portion of the former Champion Lands Survey in Essex County, Vermont. Records are from 15 days between April 26, 2000 and October 1, 2000. Five field methods were used: day-time road searches, night-time road searches, salamander trapping, site checks, and turtle trapping.

Species name	Common name	State Rank	Global Rank	# of records	# of sites
Salamanders					
Ambystoma maculatum	Spotted Salamander	S5	G5	12	5
Notophthalmus viridescens	Eastern Newt	S5	G5	1	1
Desmognathus fuscus	N. Dusky Salamander	**S4**	G5	0	0
Eurycea bislineata	N. Two-lined Salamander	S5	G5	0	0
Gyrinophilus porphyriticus	Spring Salamander	**S4**	G5	0	0
Plethodon cinereus	N. Redback Salamander	S5	G5	0	0
Frogs and Toads					
Pseudacris crucifer	Spring Peeper	S5	G5	23	10
Rana clamitans	Green Frog	S5	G5	16	10
Bufo americanus	American Toad	S5	G5	15	7
Rana sylvatica	Wood Frog	S5	G5	8	6
Rana septentrionalis	Mink Frog	**S4**	G5	4	3
Hyla versicolor	Gray Tree Frog	S5	G5	0	0
Rana catesbeiana	Bullfrog	S5	G5	0	0
Rana palustris	Pickerel Frog	**S4**	G5	0	0
Turtles					
Clemmys insculpta	Wood Turtle	**S3**	**G4**	2	1
Chelydra serpentina	Common Snapping Turtle	S5	G5	0	0
Chrysemys picta	Painted Turtle	S5	G5	0	0
Snakes					
Thamnophis sirtalis	Common Garter Snake	S5	G5	2	2
Storeria occipitomaculata	Redbelly Snake	S5	G5	1	1
Diadophis punctatus	Ringneck Snake	**S4**	G5	0	0

Table 4. **Combined** results of the reptile and amphibian inventory of the former Champion Lands in Essex County, Vermont. Records are from 35 days between April 25, 2000 and October 1, 2000. Seven field methods were used: active search, day-time road searches, interviews, night-time road searches, salamander trapping, site checks, and turtle trapping.

Species name	Common name	State Rank	Global Rank	# of records	# of sites
Salamanders					
Ambystoma maculatum	Spotted Salamander	S5	G5	66	42
Plethodon cinereus	N. Redback Salamander	S5	G5	19	14
Eurycea bislineata	N. Two-lined Salamander	S5	G5	14	8
Notophthalmus viridescens	Eastern Newt	S5	G5	8	7
Desmognathus fuscus	N. Dusky Salamander	**S4**	G5	6	3
Gyrinophilus porphyriticus	Spring Salamander	**S4**	G5	1	1
Frogs and Toads					
Pseudacris crucifer	Spring Peeper	S5	G5	122	69
Bufo americanus	American Toad	S5	G5	88	60
Rana clamitans	Green Frog	S5	G5	72	51
Rana sylvatica	Wood Frog	S5	G5	87	47
Rana palustris	Pickerel Frog	**S4**	G5	16	11
Rana septentrionalis	Mink Frog	**S4**	G5	13	9
Rana catesbeiana	Bullfrog	S5	G5	6	3
Hyla versicolor	Gray Tree Frog	S5	G5	N	N
Turtles					
Chrysemys picta	Painted Turtle	S5	G5	2	2
Chelydra serpentina	Common Snapping Turtle	S5	G5	N	N
Clemmys insculpta	Wood Turtle	**S3**	**G4**	2	1
Snakes					
Thamnophis sirtalis	Common Garter Snake	S5	G5	66	47
Storeria occipitomaculata	Redbelly Snake	S5	G5	10	9
Diadophis punctatus	Ringneck Snake	**S4**	G5	N	N

Table 5. **Near-site** results of the reptile and amphibian inventory of the former Champion Lands in Essex County, Vermont. Records are from 25 days between April 26, 2000 and October 1, 2000. Six field methods were used: active search, day-time road searches, interviews, night-time road searches, site checks, and turtle trapping.

Species name	Common name	State Rank	Global Rank	# of records	# of sites
Salamanders					
Ambystoma maculatum	Spotted Salamander	S5	G5	3	3
Notophthalmus viridescens	Eastern Newt	S5	G5	1	1
Desmognathus fuscus	N. Dusky Salamander	**S4**	G5	0	0
Eurycea bislineata	N. Two-lined Salamander	S5	G5	0	0
Gyrinophilus porphyriticus	Spring Salamander	**S4**	G5	0	0
Plethodon cinereus	N. Redback Salamander	S5	G5	0	0
Frogs and Toads					
Bufo americanus	American Toad	S5	G5	15	8
Pseudacris crucifer	Spring Peeper	S5	G5	10	8
Rana clamitans	Green Frog	S5	G5	6	6
Rana sylvatica	Wood Frog	S5	G5	5	3
Hyla versicolor	Gray Tree Frog	S5	G5	4	2
Rana catesbeiana	Bullfrog	S5	G5	2	2
Rana palustris	Pickerel Frog	**S4**	G5	2	2
Rana septentrionalis	Mink Frog	**S4**	G5	0	0
Turtles					
Chrysemys picta	Painted Turtle	S5	G5	16	5
Chelydra serpentina	Common Snapping Turtle	S5	G5	2	2
Clemmys insculpta	Wood Turtle	**S3**	**G4**	0	0
Snakes					
Thamnophis sirtalis	Common Garter Snake	S5	G5	2	2
Storeria occipitomaculata	Redbelly Snake	S5	G5	1	1
Diadophis punctatus	Ringneck Snake	**S4**	G5	0	0

Species reliably reported from Essex County but not located during the survey

Reliable reports of two additional species are found from Essex County in the Vermont Herp Database: a single sight record of *Ambystoma laterale* (Blue-spotted Salamander - S3) from Victory, and three records of *Rana pipiens* (Northern Leopard Frog - S4), two from Averill and one from Victory.

If a significant population of Blue-spotted Salamanders were within the confines of the study sites I should have located them during night-time road searches. The success of this method in locating its congener *Ambystoma maculatum* (Spotted Salamander) suggests to me that I would have located *A. laterale* as well, if it were present. I think it unlikely that they are breeding on the property. I asked about this species in five of the interviews and no one had seen it. Still, since they are an S3 species, staff should be on the lookout for them. They are a newt sized (3-4 inch) solid-bodied, black salamander with light-blue spots. They might be encountered crossing a road on some rainy spring or fall evening or even found under cover of some bit of bark or other organic woody debris. If it were located, an effort should be made to locate its breeding site and protect and manage the breeding site along with the surrounding woodlands. It has been located north of Essex County in the Eastern Townships of Quebec (Bider and Matte, 1996).

Northern Leopard Frogs are explosive breeders. They should have been easily located if in the area. I think it is unlikely that they are. They are sometimes used as a bait species and released. They were reported in one of the interviews but this species is easily confused with *R. palustris* (Pickerel Frog).

Species reported in interviews that were never previously reported from Essex County or located during the survey

A few other species were mentioned in interviews (Table 24) but have never been reported from Essex County. One of them, *Necturus maculosus* , (Mudpuppy - S2, SC) was well described by Brendon Whittaker from the small pool south of the railroad tracks and north of Rte 105 just west of the Stone Dam Bridge. This species is not easily confused with any other. He reported it as a 24-inch-long muddy-brown salamander with legs. This is about 10 inches longer than any reported *N. maculosus* in this state but no other salamander even approaches that size. *N. maculosus* is known from the Connecticut River north to Windham County but has never been reported further north. This species spawns and feeds up streams from Lake Champlain and the Connecticut River and could reach this site easily from the Connecticut. It also is occasionally used as a bait species. I made no effort to locate this species since it was not considered a realistic possibility. It is entirely aquatic and requires the use of methods not used for any other reptile or amphibian. This is an S2 species of Special Concern. Its use of the Nulhegan can not be safely ruled out and additional field work is recommended.

A single *Clemmys guttata* (Spotted Turtle - S1, End.) was well described by Walt Driscoll, a local taxidermist and owner of a local sport shop. He described a turtle he saw in Webster's Brook in Brighton about eight years ago. It was a clear and convincing description. A second report was unconvincing and included no details. This turtle is an S1 species in Vermont and is listed as endangered. The closest known Vermont population is in Vernon in the southeastern corner of the state. However, a single turtle was reported in 1972 from relatively close by in the Eastern Townships of Quebec, 8 km south of Sherbrooke (Bider and Matte, 1996). No recent records have come from the Eastern Townships, despite significant survey effort. This turtle is small(~12 cm) with a smooth, black, slightly-domed shell on which there are yellow spots. It is a popular pet species and scattered reports may indicate released pets. Appropriate habitat does exist within the study site: small scattered wetlands and slow brooks with plenty of open basking sites. Two populations in Ontario are in large bogs (Bider and Matte, 1996). This is another species to be on the lookout for. Methods used were appropriate to locate this species but it is secretive and not all of the appropriate habitat was surveyed. Local staff should be educated on the identification of this species.

Liochlorophis vernalis (Smooth Green Snake - S4) was reported in three interviews but I did not locate it despite the use of appropriate methods at appropriate times nor is it reported from the closest Eastern Townships of Quebec (Bider and Matte, 1996). It prefers upland pastures and overgrown fields and could possibly be in the area in small numbers.

The only other reports that resulted from an interview (Table 24) that I believe are worth mentioning are the four reports of *Nerodia sipedon* (Northern Water Snake, S3). One additional unconfirmed report from 1996 came from Moose Bog. No confirmed reports of this species come from any of the nearby counties nor from the Eastern Townships. Garter Snakes in this area get large, often feed near water, and often are missing all or a portion of their stripes. These snakes may account for the Northern Water Snake reports.

It is not possible to prove the absence of rare species. It is still possible that other species exist in low numbers within the project area. However, given the distribution and amount of field effort combined with interviews of individuals who have spent a great deal of time in the area, it is very unlikely that species not already discussed have viable populations within the project areas. A list of all known Vermont species of reptiles and amphibians along with their protective status and state ranks is contained in Appendix B.

The general survey of mandatory and suggested sites

Twelve mandatory sites and 6 recommended sites were surveyed during this field season. The results of those surveys are shown in Tables 6-23. Species not found within the study sites, that were found nearby and are expected to travel through the sites at some point in the year, are listed as nearby species.

Although all mandatory sites were visited at least once and some were visited multiple times, a thorough survey of each of the mandatory sites was not possible. In order for a survey of any size site to be comprehensive, the site needs to be visited during a variety of windows of opportunity that cover the calling, migration, and activity periods of the complete variety of reptiles and amphibians that could potentially use the site. Given the size of the total survey area, travel times in car and on foot, some initial confusion about the mandatory sites, and the two other goals of this survey (rare, threatened, and endangered species, and communal breeding sites), time did not permit multiple visits to the more remote sites that did not also include appropriate habitat for any of the targeted rare species such as turtles. Still the species found, do allow for some comparisons and taken together they represented a good cross-section of the study area. I believe the combined list of reptiles and amphibians located is very thorough for one field season's work.

Since most reptiles and amphibians are mobile species that require different habitat types for different life stages, times of the year, or climatic conditions, the margins of the communities selected are more likely to provide the diversity that these species need than the center of a large piece of homogeneous community type. An exception would be a community that includes small pockets of microhabitat (breeding pools, overwintering sites) that meet their needs. Another exception is the one species of amphibian that we have in Vermont that does not require water in which to lay its eggs *Plethodon cinereus* (Redback salamander). It lays eggs inside rotten logs, under roots, or in other moist locations. It is a very common species in deciduous and mixed upland woods but is intolerant of flooding. Consequently any of the mandatory sites that contained deciduous leaf litter, and were not flooded contained this species. Even this species shows seasonal movements apparently in response to soil moisture requirements (Andrews, unpub. data). Other species that prefer similar foraging habitat but also need breeding sites in the form of pools (*A. maculatum, R. sylvatica*), or streams or hillside seeps (*E. bislineata, D. fuscus*) were sometimes present in or along the margins of these communities if breeding sites were available.

All of the turtles require some form of permanent open water but lay eggs in well drained uplands sometimes up to a few kilometers away from their foraging or

overwintering sites. All the snake species found do best in habitat with small openings and abundant amphibian or invertebrate prey species and may need to travel between foraging areas or to nearby overwintering sites.

The most herpetologically diverse of the mandatory sites were those that contained a variety of aquatic breeding habitats mixed with or near foraging habitat. Hence **North Notch Shrub Swamp** with its streams, river, pools, beaver ponds, and proximity to upland hardwoods or mixed woods had the greatest diversity (9 species). **Dennis Pond** (6 species) provided the breeding sites for permanent water and pool breeding amphibians some of which traveled from nearby upland habitats. It also provided overwintering, and foraging sites for the turtles which traveled to nearby upland sites to lay their eggs. **Little Wheeler** (6 species) and **Big Wheeler** (5 species) were similar. **Lewis Pond South East Hill** (5 species) provided moist upland deciduous habitat with seepage areas and nearby breeding sites for amphibians. **Black-Logger Hills** (6 species) was similar but had streams in addition to seepage areas. The **Upper Yellow Branch Riparian Zone Wetlands** (5 species) had streams, beaver ponds, pools, and nearby upland habitat.

At the other end of the spectrum were **West Mt. Ridgeline** (*P. cinereus* only) that were dry and distant from breeding sites. Sites like **Big Swamp** (0 species) **and Mollie Beattie (Western) Bog** (1 species) were acidic, and although wet, lacked open water for breeding or foraging sites, or drainage for streams, and were fairly distant from upland mixed or hardwood sites.

In addition to its herpetological diversity (for Essex County), **North Notch Shrub Swamp** was also the only site that held both of the most interesting species for the entire study area. It had both *C. insculpta* (Wood turtle) and *R. septentrionalis* (Mink Frog). Due to its potential turtle habitat, bottom of the drainage location, and easy accessibility it was surveyed more intensely than some of the other sites but I do not believe its diversity is a sampling artifact. *R. septentrionalis* was also found at **Ferdinand Bog**, and the **Upper Yellow Branch Riparian Zone Wetlands** as well as a few other locations outside the target areas.

Table 6. Results of the reptile and amphibian inventory of the **Dennis Pond** site within the former Champion Lands in Essex County, Vermont. Records are from five days between May 24, 2000 and September 29, 2000. Four field methods were used in or near the study site: active search, night-time road search, site check, and turtle trapping.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5		Nearby		
Frogs and Toads						
Pseudacris crucifer	S5	G5		22		
Bufo americanus	S5	G5		1		
Rana clamitans	S5	G5		4		
Rana palustris	S4	G5		4		
Turtles						
Chrysemys picta	S5	G5		1		
Snakes						
Thamnophis sirtalis	S5	G5		1		
Other Species						
Nashville warbler, Pied-billed grebe ? (calling), Brook trout, Osprey (3), American Bittern, Canada Geese, Blue Heron						

Table 7. Results of the reptile and amphibian inventory of the **Ferdinand Bog** site within the former Champion Lands in Essex County, Vermont. Records are from four days between June 7, 2000 and September 30, 2000. Four field methods were used in or near the site: active search, day-time road search, night-time road search, and turtle trapping.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Frogs and Toads						
Pseudacris crucifer	S5	G5		5		
Bufo americanus	S5	G5		1		
Rana clamitans	S5	G5		2		
Rana sylvatica	S5	G5		Nearby		
Rana palustris	S4	G5		Nearby		
Rana septentrionalis	S4	G5		1		
Snakes						
Thamnophis sirtalis	S5	G5		Nearby		
Other Species						
Nearby: White-winged crossbills						

Table 8. Results of the reptile and amphibian inventory of the **Maidstone Lake Hills West** site within the former Champion Lands in Essex County, Vermont. Records are from July 19, 2000. Two field methods were used in or near the study site: active search and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5		1		
Plethodon cinereus	S5	G5		12		
Frogs and Toads						
Pseudacris crucifer	S5	G5		Nearby		
Bufo americanus	S5	G5		Nearby		
Rana clamitans	S5	G5		Nearby		
Rana sylvatica	S5	G5		Nearby		
Rana catesbeiana	S5	G5		Nearby		
Snakes						
Thamnophis sirtalis	S5	G5		Nearby		
Other Species						
American redstart, Swainson's thrush, Slug sp. (orange), Slug sp. (brown & yellow), Land snail sp.						

Table 9. Results of the reptile and amphibian inventory of the **West Mt. Ridgeline** site within the former Champion Lands in Essex County, Vermont. Records are from July 20, 2000. Two field methods were used in or near the study site: active search and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Plethodon cinereus	S5	G5		1		
Frogs and Toads						
Bufo americanus	S5	G5		Nearby		
Snakes						
Thamnophis sirtalis	S5	G5		Nearby		
Other Species						
American redstart, Blackburnian warbler, Winter wren, Yellow-rumped warbler						

Table 10. Results of the reptile and amphibian inventory of the **Paul Stream Lower Slope West** site within the former Champion Lands in Essex County, Vermont. Records are from July 19, 2000. Two field methods were used in or near the study site: active search and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Plethodon cinereus	S5	G5		4		
Eurycea bislineata	S5	G5		Nearby		
Frogs and Toads						
Bufo americanus	S5	G5		Nearby		
Rana sylvatica	S5	G5		1		
Other Species						
None noted						

Table 11. Results of the reptile and amphibian inventory of the **North Notch Shrub Swamp** site within the former Champion Lands in Essex County, Vermont. Records are from ten days between April 26, 2000 and July 18, 2000. Three field methods were used in or near the study site: night-time road search, site check, and turtle trapping.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5		1	5	
Notophthalmus viridescens	S5	G5		Nearby		
Frogs and Toads						
Pseudacris crucifer	S5	G5	9	2		
Bufo americanus	S5	G5	3	3		
Rana clamitans	S5	G5		24	6	
Rana sylvatica	S5	G5	1	1		
Rana septentrionalis	S4	G5		3		
Turtles						
Clemmys insculpta	S3	G4		1 + 1 Nearby		
Snakes						
Thamnophis sirtalis	S5	G5		1		
Storeria occipitomaculata	S5	G5		1		
Other Species						
Wood duck, Black duck, Common merganser, Northern parula, Sucker sp., Jumping mouse sp., Peromyscus sp., Freshwater mussels sp. (large ~15 cm) Nearby: Savannah sparrow in sand pits						

Table 12. Results of the reptile and amphibian inventory of the **Mollie Beattie (Western) Bog** site within the former Champion Lands in Essex County, Vermont. Records are from five days between June 21, 2000 and October 1, 2000. Four field methods were used in or near the study site: active search, day-time road search, night-time road search and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5		Nearby		
Frogs and Toads						
Pseudacris crucifer	S5	G5		2		
Bufo americanus	S5	G5		Nearby		
Rana clamitans	S5	G5		Nearby		
Rana sylvatica	S5	G5		Nearby		
Snakes						
Thamnophis sirtalis	S5	G5		Nearby		
Other Species						
Barred owl, Slug sp. (bright orange) Nearby: Wild turkey and poults, Fingernail clam sp., Colonial bryozoan sp., Swainson's thrush						

Table 13. Results of the reptile and amphibian inventory of the **Upper Yellow Branch Riparian Zone Wetlands** site within the former Champion Lands in Essex County, Vermont. Records are from five days between April 26, 2000 and July 4, 2000. Four field methods were used in or near the study site: active search, salamander trapping, night-time road search, and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5		1		
Frogs and Toads						
Pseudacris crucifer	S5	G5		2		
Bufo americanus	S5	G5				>21
Rana clamitans	S5	G5		2		5
Rana sylvatica	S5	G5		Nearby		
Rana septentrionalis	S4	G5		3		
Snakes						
Thamnophis sirtalis	S5	G5		1		
Other Species						
Yellow-rumped warbler, Black and white warbler, American redstart, Yellow -throat, Broad-winged hawk, Freshwater mussel sp., Fingernail clam sp., Caddisfly sp. larvae, Dragonfly sp.						

Table 14. Results of the reptile and amphibian inventory of the **Big Swamp** site within the former Champion Lands in Essex County, Vermont. Records are from five days between April 26, 2000 and July 5, 2000. Four field methods were used in or near the study site: active search, night-time road search, salamander trapping, and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5		Nearby		
Frogs and Toads						
Pseudacris crucifer	S5	G5		Nearby		
Bufo americanus	S5	G5		Nearby		
Rana clamitans	S5	G5		Nearby		
Rana sylvatica	S5	G5		Nearby		
Other Species						
Black-backed three-toed woodpecker, Hairy woodpecker, Yellow-rumped warbler, Kinglet sp., Slugs (bright orange), Dragonfly sp. larvae						

Table 15. Results of the reptile and amphibian inventory of the **Lower Yellow Branch Spruce-fir Flats** site within the former Champion Lands in Essex County, Vermont. Records are from July 6, 2000. Two field methods were used in or near the study site: active search and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5		Nearby		
Plethodon cinereus	S5	G5		Nearby		
Frogs and Toads						
Rana clamitans	S5	G5		1		
Rana sylvatica	S5	G5		1		
Snakes						
Thamnophis sirtalis	S5	G5		1		
Other Species						
Nearby: Fingernail clam sp., Dragonfly sp. (large 10 cm black backed with yellow and black on either side), Dragonfly sp. (black body and blue wings)						

Table 16. Results of the reptile and amphibian inventory of the **North Branch East Hill** site within the former Champion Lands in Essex County, Vermont. Records are from July 21, 2000. Two field methods were used in or near the study site: active search and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5		1		
Plethodon cinereus	S5	G5		4		
Frogs and Toads						
Bufo americanus	S5	G5		1		
Rana clamitans	S5	G5		Nearby		
Rana sylvatica	S5	G5		3		
Snakes						
Thamnophis sirtalis	S5	G5		Nearby		
Other Species						
Goshawk (territorial), Land snail sp., Slug sp. (orange), Slug sp. (brown and yellow) Nearby: Colonial bryozoan sp.						

Table 17. Results of the reptile and amphibian inventory of the **Lewis Pond Southeast Hill** site within the former Champion Lands in Essex County, Vermont. Records are from July 5, 2000. Two field methods were used in or near the study site: active search and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Plethodon cinereus	S5	G5		7		
Eurycea bislineata				1		
Desmognathus fuscus	S5	G5		2		
Frogs and Toads						
Bufo americanus	S5	G5		1		
Rana sylvatica	S5	G5		6		
Snakes						
Thamnophis sirtalis	S5	G5		Nearby		
Other Species						
None noted						

Table 18. Results of the reptile and amphibian inventory of the **Black-Logger Hills** site within the former Champion Lands in Essex County, Vermont. Records are from August 17, 2000. Two field methods were used in or near the study site: active search and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Plethodon cinereus	S5	G5		2		
Eurycea bislineata	S5	G5		1		
Desmognathus fuscus	S4	G5		9		
Frogs and Toads						
Pseudacris crucifer	S5	G5		1		
Bufo americanus	S5	G5		1		
Rana sylvatica	S5	G5		2		
Other Species						
None noted						

Table 19. Results of the reptile and amphibian inventory of the **North Paul Beaver Meadows** site within the former Champion Lands in Essex County, Vermont. Records are from three days between April 27, 2000 and May 7, 2000. Three field methods were used in or near the study site: night-time road search, site check, and salamander trapping.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5			>40	
Frogs and Toads						
Pseudacris crucifer	S5	G5		Nearby		
Rana sylvatica	S5	G5		Nearby		
Other Species						
Black duck, Common grackle, Mallard, Swamp sparrow, Rusty blackbird, Canada geese Nearby: Caddis fly sp. larvae, Dragonfly sp. larvae, Predaceous water beetle sp.						

Table 20. Results of the reptile and amphibian inventory of the **Blowdown Bogs** site within the former Champion Lands in Essex County, Vermont. Records are from May 8, 2000. Two field methods were used near the study site: day-time road search and night-time road search.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Frogs and Toads						
Pseudacris crucifer	S5	G5	Nearby			
Other Species						
None Noted						

Table 21. Results of the reptile and amphibian inventory of the **Upper Yellow Branch Open Wetland Complex** site within the former Champion Lands in Essex County, Vermont. Records are from three days between April 27, 2000 and June 23, 2000. Three field methods were used in or near the study site: day-time road search, night-time road search, and site check.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5		Nearby		
Frogs and Toads						
Pseudacris crucifer	S5	G5		Nearby		
Bufo americanus	S5	G5		Nearby		
Rana clamitans	S5	G5		Nearby		
Rana sylvatica	S5	G5		Nearby		
Snakes						
Thamnophis sirtalis	S5	G5		Nearby		
Other Species						
None noted						

Nonmandatory Sites

Table 22. Results of the reptile and amphibian inventory of the **Little Wheeler Pond** site within the former Champion Lands in Essex County, Vermont. Records are from five days between April 28, 2000 and July 3, 2000. Three field methods were used in or near the study site: night-time road search, site check, and turtle trapping.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Salamanders						
Ambystoma maculatum	S5	G5			1	
Frogs and Toads						
Pseudacris crucifer	S5	G5	1	2		
Bufo americanus	S5	G5	1	2		
Rana clamitans	S5	G5		1		
Rana palustris	S4	G5		1		
Rana catesbeiana	S5	G5		2		
Other Species						
Wood duck, Brown bullhead, Fresh water mussel sp., Pitcher plant sp.						

Table 23. Results of the reptile and amphibian inventory of the **Big Wheeler Pond** site within the former Champion Lands in Essex County, Vermont. Records are from four days between May 9, 2000 and July 3, 2000. Three field methods were used in or near the study site: night-time road search, site check, and turtle trapping.

Species name	State Rank	Global Rank	Choruses	Individuals	Egg-masses	Larvae
Frogs and Toads						
Pseudacris crucifer	S5	G5	>2			
Bufo americanus	S5	G5	1	8		
Rana clamitans	S5	G5		2		
Rana catesbeiana	S5	G5		1		
Turtles						
Chrysemys picta	S5	G5		1		
Other Species						
Ring-necked duck, Green-winged teal, Hooded merganser, Common merganser, Canada geese, Belted kingfisher, Common loon (calling), Pumkinseed, Chain pickerel, Brown bullhead, Crayfish sp. (large) Nearby: Belted kingfisher nest in gravel pit						

Table 24. Species that were not found within the study site but were mentioned during interviews. Fifteen individuals knowledgeable about wildlife in the area were interviewed. Only species that were specifically discussed are listed. Different species were discussed during different interviews. Misidentification of reptiles and amphibians is very common but useful leads can be gathered.

Species name	Common name	State Rank	Global Rank	# of pos. reports	# of neg. reports	Essex County Records	Remarks
Salamanders							
Ambystoma laterale	Blue-spotted Salamander	**S3**	G5	0	5	Yes	Unlikely, solid negative evidence
Ambystoma jeffersonianum	Jefferson Salamander	**S2**	G5	0	1	No	Unlikely, solid negative evidence
Necturus maculosus	Mudpuppy	**S2**	G5	1	2	No	Possible, hard to misidentify, well described, may spawn in Nulhegan River
Frogs and Toads							
Hyla versicolor	Gray Treefrog	S5	G5	1	1	Yes	**Probable,** found nearby, assumed to be within site along eastern border
Rana pipiens	N. Leopard Frog	**S4**	G5	1	0	Yes	Unlikely, easily confused with *R. palustris*
Turtles							
Chelydra serpentina	Snapping Turtle	S5	G5	8	1	Yes	**Probable,** found nearby, assumed to be within site
Clemmys guttata	Spotted Turtle	**S1**	G5	2	**3**	No	Unlikely, very secretive, no known populations for 100's of miles, one report had good detail
Emydoidea blandingii	Blanding's Turtle	**Unk.**		0	2	No	Unlikely, but secretive wtih disjunct populations
Other turtles	Other turtles			0	2	No	Unlikely
Snakes							
Crotalus horridus	Timber Rattlesnake	**S1**	G5	1	4	No	Unlikely, often misidentified
Black snakes	Rat Snake and Racer	**S2, S1**	G5	0	4	No	Unlikely
Diadophis punctatus	Ringneck Snake	**S4**	G5	2	3	Yes	**Probable,** found nearby, assumed to be within site along eastern border, small numbers
Lampropeltis triangulum	Milk Snake	S5	G5	1	6	No	Unlikely, widespread in state but remarkably unknown from this region
Liochlorophis vernalis	Smooth Green Snake	**S4**	G5	3	3	No	Possible, may be in open grassy habitat, such as along powerline
Nerodia sipedon	N. Water Snake	S3	G5	4	5	No	Unlikely, may be unstriped *T. sirtalis*
Storeria dekayi	Brown Snake	S4	G5	1	0	No	Unlikely, often confused with Redbelly

The only S3 species that is known to use the area is ***C. insculpta*** **(Wood Turtle)**. In Vermont it is a species of special concern (see factsheet, Appendix C). I fear that if the rate of habitat consumption in this state continues (6,500 acres per year, EPA figures), increased habitat fragmentation and traffic will increase the pressures on this species and slowly eliminate populations. Sites like the Conte NWR have an unusual opportunity to protect all the habitat requirements of this mobile species and perhaps even to protect multiple populations and maintain some level of genetic diversity and resilience. Mike Klemens (2000) points out that among the many threats worldwide to turtles, the primary threats to this species are habitat destruction, fragmentation, and illegal collection. Unlike the other two species of turtle located, this species is primarily terrestrial. Although it returns often to its home stream, it wanders territories that extend along river valleys and up to a few hundred meters away from the river. All of the Nulhegan River and its larger tributaries within the Conte NWR should be considered potential habitat, but particularly the North Branch. Deep still pools with little current are required for overwintering so very shallow brooks and those on steeper slopes would generally not be suitable.

Management concerns are road kills, fragmentation of habitat, commercial and personal collection, mortality as a result of accidents with mowing or logging equipment, or the disturbance of the process of egg-laying or egg laying sites by humans or predators.

Direct mortality on heavily traveled roads are a serious threat to this species. Many of my reports from around the state are of specimens killed in roads. The one road-killed ***C. insculpta*** along with other turtle road-kills (two *C. picta*) suggest that road-kills may happen with enough regularity (two-three per year) along Rte. 105 to bring about a gradual decline or elimination of this species, at least in this portion of its range. If the bulk of the population is located further away from the road along one of the tributaries of the Nulhegan, Rte. 105 may not be a serious threat to the population. In a large area such as this it would be very helpful to learn where the critical use areas are for this species (feeding areas, overwintering areas, nesting areas, and corridors between them). Since this is a secretive species it would be useful to attach radio transmitters to 3-6 adults and monitor their activities throughout a few field seasons in order to locate these areas. During this type of study other individuals are often located and could be marked and measured or fitted with radios. The presence of juveniles would be reassuring evidence that successful recruitment is still taking place. Since this species lives up to 40 years in wild populations (Lovich et al., 1990) it is possible to see adults in an area long after successful recruitment has stopped.

Roadside or open area mowing could also cause mortality depending on the timing of the cut and the height of the mower blade. If mowing were done only after the ground freezes in the fall, mortality would be minimized. The higher the mower blades the better. A minimum height of six inches should be maintained.

Commercial and personal collection are both threats. Increased recreational use of the turtle's core use areas could also provide an increased threat to this species. Studies have shown a decrease in populations of this species with increased recreational pressure (Garber and Burger, 1995). Other than mortality as a result of increased traffic and recreational vehicles, the implication is that the increased occurrence of accidental meetings of terrestrial turtle (very cute) and human often results in a kidnapped turtle which is permanently removed from the breeding population. This turtle does not breed until it reaches an age of ~14 years (Ernst et al, 1994). It is a long lived, low reproductive capacity species which can not tolerate the removal of those few adults that have managed to make it to breeding age. Since this turtle can sell for large sums of money (100's or even thousands of dollars for adult breeding pairs) on the black market it is important to not advertise too widely that it is present in the area. On the other hand, local educational efforts explaining its identification, natural history, and sensitivity and that it should be left in place could also be helpful (including the local wardens and any state or federal employees working in the area). Vigilance regarding anyone that may be illegally collecting (any collecting would be illegal without a permit from the commissioner) is necessary.

Increased egg predation from raccoons and skunks also may be limiting populations state-wide. If nests are found, covering the nest with wire mesh so that they can not be dug up can prevent egg mortality but these coverings need to be checked regularly or be designed so that small turtles can escape. Public and camper education, keeping roads and traffic to a minimum, maintaining sections without trails, and the use of underpasses when necessary could all help this species survive.

In his recent book on turtle conservation Mike Klemens (2000) made an insightful observation regarding conservation intervention on behalf of a species: "when data are not sufficiently conclusive to support an intervention on behalf of turtles what are the risks of acting with incomplete data versus the risks of inaction?

Road impacts on herptiles in general

If the interests of local wildlife populations were our primary and only concern, traffic on Rte. 105 would be limited and controlled. Road mortality is a serious threat to a wide variety of wildlife through direct mortality, migrational barriers, hydrologic disruption, pollution, construction impacts, spread of exotics, and increased human usage (Trombulak and Frissell, 2000). Much of the February 2000 issue of Conservation Biology is dedicated to the ecological effects of roads and a variety of websites have sprung up with useful bibliographies (see End of the Road: www.nrdc.org/publications). As traffic increases, so do the negative effects on local amphibian densities (Fahrig et al, 1995). Heine (1987) calculated that 26 cars per hour could reduce the survival rate of toads crossing roads to zero. During my day- and night-time road searches seven species of herps were found dead in the road including twenty *T. sirtalis* (Common Garter Snake) and eight *B. americanus* (American Toad). Although road mortality has been shown to cause declines in both reptiles and amphibians, even the limited loss of the adults of longer-lived turtle species such as *C. insculpta* can not be sustained (Congdon et al., 1993).

Realizing that political reality would probably limit traffic control possibilities on Rte. 105, other options to minimize road impacts include signage to alert traffic to wildlife of all types and ask drivers to avoid or assist wildlife crossing roads, lowered speed limits, speed control bumps, narrowing of roads, removal of blacktop, closing of roads after dark or on rainy evenings after dark, fencing and tunnels, and hiring or training volunteers to act as conservation officers. Clearly the impact on wildlife of building, improving, or relocating roads should be taken into consideration and the effects of increased traffic flow should also be considered. Small roads contained entirely within the management areas could be controlled more easily than the large public highways. One benefit of the removal of camps is the reduction in traffic on the back roads and the decline of road kills. Limiting the amount or type of vehicles (bicycles instead of cars) would also bring about a decline in road mortality. Keeping certain roads closed on rainy nights during spring migration (April and May) would limit their impact on many amphibians.

An option widely used now in Europe and beginning to see some use in North America is the combined use of fencing or walls and underpasses for reptiles, amphibians, (Langton, 1989) and some small to medium sized mammals. Underpasses have been very effective when carefully designed and strategically placed. I would suggest additional studies to locate and evaluate movement corridors of the most sensitive species or greatest numbers of species. I did not find large concentrations of amphibians crossing Rte. 105. Moderate numbers were crossing to the North Notch Shrub Swamp from the hillsides to the south of Rte. 105 where the hills and the swamp were closest to the road. A second crossing site was near the vernal pool between the railroad tracks and the road just west of where the Nulhegan River crosses near the eastern boundary of Conte NWR (Figure 3). This pool dries too early in the summer to produce many amphibians. Amphibians may have been moving to pools on the north side of the tracks. Showcasing wall and underpass technology would be useful for the region as a whole but only if the underpasses were used. Websites with additional information on wildlife underpasses are listed below. They are expensive. The design that makes the most sense based on my experience and observations would be that used in Payne's Prairie in Florida (reptile wall and culverts). The continuous wall is a valuable addition to the design and it is aesthetically more pleasing than a fence.

Critter Crossings (Federal Highway Administration)
www.fhwa.dot.gov/environment/wildlifecrossings/index.htm
see the chapters on Tortoise Underpasses, Salamander Tunnels, and Amphibian-Reptile wall and culverts

Proceedings of the Third International Conference on Wildlife Ecology and Transportation (Florida Dept. of Transportation)
www.dot.state.fl.usemo/sched/icowet_III_pdf

Other concerns with road design that are not presently an issue here but that planners should be aware of is that high curbs trap amphibians on roads and storm drains, if not carefully designed, act as pit traps. Alternative designs for storm drains are available were they ever proposed in this area.

Communal amphibian breeding sites

Forty-eight sites were entered into the database and are listed and mapped here (Figures 1-4) as potential communal amphibian breeding sites. Forty-two of them were later confirmed as breeding sites. Six others looked promising but showed no signs of amphibian breeding. Three of the latter were first discovered on July 5 which is too late in the season to expect to see eggs or adults. This is not a complete list of amphibian breeding sites nor was it intended to be. Most of the sites listed are small vernal or semipermanent pools that were along the roads and readily accessible. Most remote pools remain unvisited. In addition, some large permanent water bodies (e.g., Tuttle Pond) and associated wetlands were not assessed and may well be very important amphibian breeding areas. A few of these larger complexes such as Wheeler Pond and Dennis Pond that were mandatory or suggested survey sites are significant communal breeding areas but are listed separately (Tables 6-23).

As previously described in the methods section, these pools were scored based on their diversity and productivity with one being the highest and four the lowest. I rated nine of the sites as 1's. These are identified on the maps (Figures 1- 4) with rectangles around the site label (date of discovery) and a circled 1 above it. The 17 sites scored as 2's are underlined and sites scored 3 or 4 are identified only with their site labels.

Two important factors that determine the productivity and diversity of pools are their ability to hold water long enough for larvae to metamorphose and leave the ponds (mid-July for most species) and their accessibility and proximity to good foraging and overwintering habitat. Very shallow pools are usually unproductive. The presence of a small number of egg-masses or adults does not indicate successful production of metamorphosed young. Small numbers of breeding adults will try breeding in inappropriate sites that may dry too early to produce metamorphs. Large numbers of eggs and/or large numbers of breeding adults are evidence of past breeding success. A pool in the middle of a black spruce swamp well removed from breeding or overwintering habitat is less likely to be used than one on the edge of the swamp near a mixed-hardwood hillside. No evidence of rare, threatened, or endangered amphibians was found in any of the pools.

Although not vernal or semipermanent, beaver ponds can be important amphibian breeding sites both for typical vernal pool breeding species such as *A. maculatum* or *R. sylvatica* and for permanent water breeders such as *R. septentrionalis*, *R. palustris*, and *R. clamitans*. Through personal observation I have come to believe that if predaceous fish are present the vernal-pool breeding species will be successful in beaver ponds or other large permanent water bodies only if they have adequate sub-aquatic cover for the tadpoles or larvae. As beaver ponds age and break, vernal pools may be created. Sometimes setbacks and wetlands along the edges of large ponds and lakes also provide breeding habitat for species thought of as vernal pool breeders.

All pools are labeled vernal, semipermanent, or other type. Whether a pool is labeled vernal or semipermanent is a judgment call that I made based on its depth, aquatic vegetation, and amphibian species present. For all pools the herp species found using them are listed along with other species of interest. Vernal pool invertebrates such as fingernail claims are noted.

Shrub swamp — 26 April 2000

Physical Info Score 1

Misc Info.

Shrub swamp, good diversity and moderate productivity seen
A. maculatum, 4 adults, 10 egg-masses
R. sylvatica, 2 adults, 20 egg masses
R. clamitans, 3 adults
T. sirtalis, 1 adult
P. crucifer, 1 chorus

Other species...

Essex County
Lewis Town
Conte Large Block
Site Lewis Pond Rd.
Specific loc Pool 4/26-03
Swamp at 4.5 from West gate
UTM Zone 19T UTMe 0283388 UTMn 4965385
Site notes Spruce, alders, willow, birch

Vernal Pool — 26 April 2000

Physical Info Score 1

Deeper tannic pool

Misc Info.

Roadside ditch, moderate diversity, good productivity seen
R. sylvatica, tadpoles, 60 egg masses
R. clamitans, 1 adult
A. maculatum, 10 egg masses, 3 adults

Other species...

Essex County
Lewis Town
Conte Large Block
Site Big Swamp* near
Specific loc Pool 4/26-07
At ~9.1 miles from West gate
south of swamp along road
UTM Zone 19T UTMe 0283154 UTMn 4968909
Site notes Upland clear cut, young fir, birch

Semipermanent pool — 28 April 2000

Physical Info Score 1

Classic pool; deep. 20m x 8m x 150 cm.

Misc Info.

Classic pool, good diversity and productivity
R. sylvatica - 30 egg masses, 2 adults
A. maculatum - egg masses, 36 adults
B. americanus - 8 adults nearby
P. crucifer, chorus
R. clamitans, calling, 1 metamorph

Other species...

Essex County
Ferdinand Town
Wenlock WMA Large Block
Site South America Pond Rd., Wenlock WMA
Specific loc Pool 4/27-2
1.3 miles from Wenlock gate
right of road
UTM Zone 19T UTMe 0282365 UTMn 4958992
Site notes Weather History: Wet snow after midnight; cool late spring
Maple yellow birch, white birch

Vernal pool — 27 April 2000

Physical Info Score 1

4 m x 4 m x 100 cm
Classic but small

Misc Info.

Classic, moderate diversity, low productivity, + inverts
A. maculatum - 2 egg masses
R. sylvatica - 5 egg masses
P. crucifer - chorus

Other species...

Two inverts visible - fairy shrimp?
Filamentous algae

Essex County
Ferdinand Town
West Mt. Large Block
Site: South America Pond Rd

Specific loc: Pool 4/27-3a
2.1 miles from Wenlock gate
Across from brook backwaters by junction.

UTM Zone 19T UTMe 0282315 UTMn 4957040

Site notes: Weather History: Light rain last night, snow last week
White birch, yellow birch, spruce

Vernal pool — 28 April 2000

Physical Info Score 1

Classic pool. 5m x 4m x 100 cm.

Misc Info.

Classic pool, low diversity but good productivity
A. maculatum - 5 egg masses
R. sylvatica - 50 egg masses

Other species...

Essex County
Ferdinand Town
Wenlock WMA Large Block
Site: South America Pond Rd., Wenlock WMA

Specific loc: Pool 4/28-1
1.2 miles [in on right] from Wenlock gate

UTM Zone 19T UTMe 0282592 UTMn 4958980

Site notes: Weather History: Wet snow after midnight; cool late spring. Maple; birch; aspen - 2nd growth

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Semipermanent pool — 9 May 2000

Physical Info Score 1

8m x 2m x 60 cm, in ditch on east side of road

Misc Info.

Ditch along road but good diversity and moderate productivity seen + inverts
T. sirtalis, 1 large adult
R. clamitans, 6 large adults, 3 tadpoles
R. sylvatica, 5 old egg-masses, 1 adult
R. septentrionalis, 1 adult
A. maculatum, 1 dead adult

Other species...

Dragonfly sp. larvae
Predaceous diving beetles sp.

Essex County
Bloomfield Town
Conte Large Block
Site: Power Line Road (north)

Specific loc: Pool 5/8-2 - 2.2 miles from Stone Dam to orange flagging - 0.4 mile after turn to access power lines
in ditch on east side of road

UTM Zone 19T UTMe ____ UTMn ____

Site notes: Weather History: rain late yesterday and overnight
grasses, cattails

Vernal Pool 21 June 2000

Physical Info Score 1

6 m x 3 m x 30 cm

Misc Info.

Nice pools, good diversity, moderate productivity, excellent site for R. clamitans suggests permanence or nearby breeding
R. septentrionalis - 2, A. maculatum - >5
R. palustris - 1, R. clamitans - >20; every 4 -5 yards
R. sylvatica- possible tadpole
Amphibians grouped from both, side by side, pools

Other species...

Essex County
Lewis Town
Conte Large Block
Site Lewis Pond Rd.
Specific loc Pool 6/21-2, East side of road to Lewis Pond
UTM Zone 19T UTMe 0279980 UTMn 4972950
Site notes Weather History: Rainy

Vernal Pool 21 June 2000

Physical Info Score 1

10 m x 4 m x 60 cm

Misc Info.

Nice pools, good diversity, moderate productivity, excellent site for R. clamitans suggests permanence or nearby breeding
R. septentrionalis - 2, A. maculatum - >5
R. palustris - 1, R. clamitans - >20; every 4 -5 yards
R. sylvatica- possible tadpole
Amphibians grouped from both side by side pools

Other species...

Essex County
Lewis Town
Conte Large Block
Site Lewis Pond Rd
Specific loc Pool 6/21-3, Pond east side of road to Lewis Pond, next to 6/21-2
UTM Zone 19T UTMe 0279980 UTMn 4972950
Site notes Weather History: Rainy

Vernal pool 19 July 2000

Physical Info Score 1

8 m x 3 m x 20 cm

Misc Info.

Nice pool, good diversity + reptiles, moderate productivity but late in season, Bullfrogs & Green frogs probably visiting non-breeders
R. clamitans - 17 adults, R. sylvatica - tadpoles & 15 metamorphs, A. maculatum - 5 larvae >1 egg masses
R. catesbeiana - 2 small adults, P. crucifer - 1 adult
T. sirtalis -1 adult

Other species...

Essex County
Maidstone Town
West Mt. Large Block
Site Maidstone Lake Hills West* near
Specific loc Pool 7/19-2
UTM Zone 19T UTMe 0288743 UTMn 4946290
Site notes Weather History: Cool, thunderstorms, flooding

Vernal pool — 25 April 2000

Physical Info Score 2

Scattered vernal pools; old header with small spruce grasses, moss, late raspberries - cattails, open

Misc Info.

Disturbed setting but moderate diversity and productivity
R. sylvatica [including choruses and 20 egg masses]
A. maculatum - 5 egg masses
P. crucifer - calling

Other species...

Essex County
Maidstone Town
West Mt Large Block
Site Paul Stream Road

Specific loc Pool 4/25-1

UTM Zone 19T UTMe 0288485 UTMn 4948430

Site notes

Man-made pond — 26 April 2000

Physical Info Score 2

deep pond with dock

Misc Info.

Man-made and permanent, moderate diversity and productivity, permanent fish-less water a plus
A. maculatum, 5 masses, two adults
R. sylvatica, 20 egg masses
R. clamitans, 1 adult

Other species...

Essex County
Brunswick Town
Conte Large Block
Site Lewis Pond Rd

Specific loc Pool 4/26-01, man-made pond near camp

UTM Zone 19T UTMe 0283627 UTMn 4963722

Site notes

Vernal Pool — 26 April 2000

Physical Info Score 2

Misc Info.

Roadside ditch, low diversity, moderate productivity seen
A. maculatum, 1 egg-mass
R. sylvatica, 40 egg masses

Other species...
Mammal:
Fisher - tracks

Essex County
Lewis Town
Conte Large Block
Site Lewis Pond Rd

Specific loc Pool 4/26-02
Ditch at 3.5 m from West gate

UTM Zone 19T UTMe _____ UTMn _____

Site notes

Vernal Pool — 26 April 2000

Physical Info Score 2

Misc Info.

Roadside ditch, low diversity, moderate productivity seen
A. maculatum, spermatophores, 18 males
R. sylvatica, 3 adults, 15 egg-masses

Other species...

Essex County
Lewis Town
Conte Large Block
Site: Upper Yellow Branch Riparian Zone Wetlands* near
Specific loc: Pool 4/26-04 Ditch at 5.9 mi. from west gate
UTM Zone 19T UTMe 0282149 UTMn 4967812
Site notes: Upland, spruce, fir, birch, dense young trees.

Vernal pool — 5 July 2000

Physical Info Score 2

5 m x 5 m x 60 cm

Misc Info.

Roadside pool, moderate diversity, low productivity
R. clamitans - 2
R. septentrionalis - 1
R. sylvatica - >15 tadpoles

Other species...

Essex County
Lewis Town
Conte Large Block
Site: Road to Tin Shack
Specific loc: Pool 4/26-05a - where stream crosses before T
UTM Zone 19T UTMe 0282698 UTMn 4970065
Site notes: Weather History: Warm, sunny, cold front came through

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Vernal Pool — 26 April 2000

Physical Info Score 2

Gravel Pit

Misc Info.

Man-made depressions in gravel pit, good diversity but low productivity
R. sylvatica, >1000 tadpoles, 10 egg-masses
R. septentrionalis, adults calling
R. clamitans, 2
N. viridescens, 1
R. americanus, > 100 tadpoles

Other species...

Essex County
Lewis Town
Conte Large Block
Site: Road east of Tin Shack
Specific loc: Pool 4/26-06 At 7.9 miles from West gate
UTM Zone 19T UTMe 0284031 UTMn 4970173
Site notes: Gravel pit, right at T intersection. Horsetails; short, dense.

Vernal Pool — 26 April 2000

Physical Info Score 2

Misc Info.

Altered but classic looking, low diversity, moderate productivity
P. crucifer, 1 chorus
R. sylvatica, 20 egg-masses

Other species...

Mammals: Moose - tracks all over road, Beaver - fresh cuttings
Deer - saw 1, some tracks, Coyote - tracks

Essex County
Bloomfield Town
Conte Large Block
Site Stone Dam Road
Specific loc Pool 4/26-09
At 12.3 miles from West gate
UTM Zone 19T UTMe 0285739 UTMn 4964947
Site notes Birch, maple, spruce, tamarack. Upland, alder, equal age patch cut (near bridge).

Beaver Pond — 28 April 2000

Physical Info Score 2

Brook backwater, Beaver Pond

Misc Info.

Beaver pond, one species and moderate productivity seen
A. maculatum- 14 adults

Other species...

Caddisfly sp. larvae

Essex County
Ferdinand Town
West Mt. Large Block
Site South America Pond Rd.
Specific loc Pool 4/27-3b
2.1 miles from Wenlock gate
UTM Zone 19T UTMe 0282315 UTMn 4957040
Site notes Weather History: Wet snow after midnight; cool late spring.

Vernal pool — 27 April 2000

Physical Info Score 2

Mostly dry when visited on July 19, 2000, small pool of water about 30 cm across

Misc Info.

Classic looking pool on roadside, one species but good productivity
R. sylvatica - 50 egg masses

Other species...

Essex County
Maidstone Town
West Mt. Large Block
Site Maidstone Lake Road
Specific loc Pool 4/27-5,
Maidstone Rd. across from Metcalf & Crowell Camp 21A
UTM Zone 19T UTMe 0289122 UTMn 4946664
Site notes Weather History: Cool and overcast all day, warm and dry yesterday [04/25/00]. Birch, maple, hemlock

Vernal Pool 26 May 2000

Physical Info Score 2

4 m x 8 m x 150 cm

Misc Info.

Good looking pool, low diversity but good productivity seen + reptiles
A. maculatum - >50 egg masses
T. sirtalis - 1
R. clamitans? - 1

Other species...

Essex County
Ferdinand Town
West Mt. Large Block
Site Ferdinand Bog* near
Specific loc Pool 5/26-1
UTM Zone 19T UTMe 0285432 UTMn 4949989
Site notes Weather History: Overcast, rains, very wet spring. Gray birch, spruce, fir

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Vernal pool 8 May 2000

Physical Info Score 2

8m x 5m x 50 cm

Misc Info.

Disturbed but classic looking, one species and moderate productivity seen
A. maculatum - egg masses ~10

Other species...

Essex County
Bloomfield Town
Conte Large Block
Site Power Line Road (north)
Specific loc Pool 5/8-3c - 2.8 miles after turn to access power lines; seen from air
UTM Zone 19T UTMe UTMn
Site notes Weather History: rained after midnight - hot 25 degrees C yesterday.

Beaver Ponds 8 May 2000

Physical Info Score 2

Beaver ponds and bog on ridge. Beaver meadow.

Misc Info.

Good diversity and moderate productivity + reptiles, expect more than I observed
A. maculatum - spermatophores,
R. clamitans - 20 tadpoles, chorus Occasional
P. crucifer - chorus Occasional, 3 adults
B. americanus - >3
T. sirtalis, 1 adult

Other species...
horsetail

Essex County
Lewis Town
Conte Large Block
Site Power Line Road (north)
Specific loc Pool 5/8-5b = 5.7 miles after turn to access power lines, beaver ponds on ridge to east up drainage
UTM Zone 19T UTMe UTMn
Site notes Weather History: rained after midnight - 25 degrees C yesterday. Beaver meadow. Maple; yellow birch; hobble bush; trillium; grasses

Vernal Pool — 21 June 2000

Physical Info Score 2

40 m x 6 m x 50 cm

Misc Info.

Classic looking pool, low diversity but good productivity, + unusual looking moss, sphagnum?
A. maculatum - 60 egg masses
R. clamitans - 1 adult

Other species...

Unusual moss, tall, aquatic, in mats (not on substrate)

Essex County
Lewis Town
Conte Large Block
Site: Mollie Beattie (Western) Bog Road, 1 mile N of Beattie Bog
Specific loc: Pool 6/21-1, 1 mile N of Beattie Bog; 2.4 miles past intersection
UTM Zone 19T UTMe 0279371 UTMn 4969438
Site notes: Weather History: Rainy

Vernal pool — 19 July 2000

Physical Info Score 2

5 m x 3 m x 40 cm
manmade vernal pool

Misc Info.

Man-made pit, good diversity, low productivity seen but late in season, suspect more
R. clamitans - 2 juveniles
R. sylvatica - >2 tadpoles
R. catesbeiana, 1 adult
A. maculatum, >3 larvae

Other species...

Essex County
Maidstone Town
West Mt Large Block
Site: Maidstone Lake Hills West* near
Specific loc: Pool 7/19-1 manmade vernal pool
UTM Zone 19T UTMe 0288782 UTMn 4946308
Site notes: Weather History: Cool, thunderstorms, flooding

Vernal Pool — 4 July 2000

Physical Info Score 2

10 m x 3 m x 40 cm

Misc Info.

Good diversity, low productivity
R. sylvatica - > 100 tadpoles
A. maculatum - 2 larvae
R. septentrionalis or R. clamitans - 1 adult
P. crucifer - calls

Other species...

Essex County
Lewis Town
Conte Large Block
Site: Mollie Beattie (Western) Bog* near
Specific loc: Pool 7/4-1
UTM Zone 19T UTMe 0280499 UTMn 4967799
Site notes

Vernal Pool — 4 July 2000

Physical Info Score 2

Misc Info.

Moderate diversity, low productivity, but late in season + inverts
R. sylvatica -tadpoles
A. maculatum - 4 larvae
B. americanus - > 50 tadpoles

Other species...

Fingernail clams - 100+
Colonial bryozoans - small (1.5 cm) diameter clear solid ball, >100 small brown dots within

Essex County
Lewis Town
Conte Large Block
Site Mollie Beattie (Western) Bog* near
Specific loc Pool 7/4-3
UTM Zone 19T UTMe 0280185 UTMn 4968098
Site notes

Vernal Pool — 4 July 2000

Physical Info Score 2

Misc Info.

Moderate diversity, low productivity, but late in season + inverts
R. clamitans - 1
A. maculatum - 2 egg masses & >20 larvae
R. sylvatica - > 50 tadpoles

Other species...

Fingernail clams sp.
Colonial bryozoans sp. - small (1.5 cm) diameter clear solid ball, >100 small brown dots within

Essex County
Lewis Town
Conte Large Block
Site Mollie Beattie (Western) Bog* near
Specific loc Pool 7/4-4
UTM Zone 19T UTMe 0280841 UTMn 4967318
Site notes

Vernal pool — 25 April 2000

Physical Info Score 3

Scattered vernal pools; open

Misc Info.

Disturbed setting, low diversity and productivity seen
R. sylvatica - 1 mass; chorus
P. crucifer - calling

Other species...

Essex County
Maidstone Town
West Mt. Large Block
Site Paul Stream Road
Specific loc Pool 4/25-2
UTM Zone 19T UTMe 0289166 UTMn 4949646
Site notes Young fir- alder; grasses, berries,

Vernal Pool — 25 April 2000

Physical Info Score 3

Essex — County
Maidstone — Town
West Mt — Large Block
Site: Ray's Place, Camp

Misc Info.

One species, low productivity but not examined carefully
R. sylvatica, chorus
not trapped

Specific loc: Pool 4/25-3

Other species...

UTM Zone 19T UTMe ____ UTMn ____

Site notes: Weather History: Rain and wet snow last 4 days

Vernal Pool — 26 April 2000

Physical Info Score 3

Essex — County
Lewis — Town
Conte — Large Block
Site: Road to Tin Shack

Misc Info.

Roadside ditch, one species, low productivity + reptiles
T. sirtalis, 1 adult
R. sylvatica, 4 egg-masses

Specific loc: Pool 4/26-05
Ditch at 6.6 mi
right then left at small sign from West gate

Other species...

UTM Zone 19T UTMe 0282696 UTMn 4970105

Site notes: Upland, spruce, fir, birch, tamarack, maple dense. Tannic staining in water

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Vernal Pool — 26 April 2000

Physical Info Score 3

Essex — County
Lewis — Town
Conte — Large Block
Site: Stone Dam Road

Misc Info.

Classic looking but low diversity and productivity seen
A. maculatum, spermatophores
R. clamitans, 1 adult

Specific loc: Pool 4/26-08
At 11.1 miles from west gate

Other species...

UTM Zone 19T UTMe 0284938 UTMn 4966464

Site notes: Tamarack, spruce, birch, moss, dense young trees and medium 30 ft. spruce at intersection.

Vernal Pool — 26 April 2000

Physical Info Score 3

Misc Info.

Ditch, low diversity + reptiles, low productivity seen
T. sirtalis, 1
P. crucifer, 1 chorus
A. maculatum, 1 adult, 4 egg-masses

Other species...

Essex — County
Bloomfield — Town
Conte — Large Block
Site: Stone Dam Road
Specific loc: Pool 4/26-10
At 14.8 miles From West gate
UTM Zone 19T UTMe 0287407 UTMn 4962584
Site notes: Hardwood, maple, spruce, yellow birch, alder, blackberry, uncut

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Vernal pool — 26 April 2000

Physical Info Score 3

Vernal pool on roadside. Beaver pond in drainage below gate had interesting aquatic vegetation
30 cm x 5m x 8m

Misc Info.

One species, low productivity seen
A. maculatum - 1 egg mass

Other species...
Black duck, Ruffed grouse

Essex — County
Brunswick — Town
West Mt. — Large Block
Site: Paul Stream Pond Road
Specific loc: Pool 4/26-11
UTM Zone 19T UTMe 0291862 UTMn 4951674
Site notes: Weather History: Cool and overcast all day, warm and dry yesterday [04/25/00]. Spruce, tamarack, maple, moss, young conifers.

Vernal pool — 28 April 2000

Physical Info Score 3

Classic pool; shallow

Misc Info.

Classic looking pool but one species and low productivity, may be too shallow
A maculatum, 1

Other species...

Essex — County
Ferdinand — Town
Wenlock WMA — Large Block
Site: South America Pond Rd., Wenlock WMA
Specific loc: Pool 4/27-1
0.9 miles from Wenlock gate
Left of the road heading south
UTM Zone 19T UTMe 0283007 UTMn 4959117
Site notes: Weather History: Wet snow after midnight; cool late spring. Maple, yellow birch, spruce

Vernal pool — 28 April 2000

Physical Info Score 3

Classic but shallow; 5m x 5m x 30 cm

Misc Info.

Classic pool in woods, low diversity, low productivity
A. maculatum - 2 egg masses, 2 adults
R. sylvatica - 3 egg masses

Other species...

Caddisfly sp. larvae, Dragonfly sp. larvae, Predaceous water beetle sp.

Essex County
Ferdinand Town
West Mt. Large Block
Site: North Paul Beaver Meadow* near South America Pond Rd.
Specific loc: Pool 4/27-4
3.3 miles from Wenlock gate
UTM Zone 19T UTMe 0282126 UTMn 4955615
Site notes: Weather History: Wet snow after midnight; cool late spring. Maple, yellow birch, aspen - young

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Vernal Pool — 28 April 2000

Physical Info Score 3

17m x 4m x 100 cm

Misc Info.

Good looking pool but one species and low productivity seen
A. maculatum - egg mass - 1

Other species...

Essex County
Brunswick Town
West Mt. Large Block
Site: Little Wheeler Pond
Specific loc: Pool 4/28-3 along west side of road NW of Little Wheeler Pond, neglected to get precise location, roughly 100 m NW of the UTM below
UTM Zone 19T UTMe 0291280 UTMn 4954509
Site notes: Weather History: Snow this morning.

Vernal pool — 8 May 2000

Physical Info Score 3

4m x 2m x 30 cm

Misc Info.

In open, shallow, low diversity and productivity
R. sylvatica - 1 juvenile
P. crucifer - 2 adults

Other species...

Essex County
Bloomfield Town
Conte Large Block
Site: Power Line Road (north)
Specific loc: Pool 5/8-3a - 2.8 miles after turn to access power lines; marked with yellow flag - on left; in powerline
UTM Zone 19T UTMe ____ UTMn ____
Site notes: Weather History: rained after midnight - hot 25 degrees C yesterday.

Vernal pool 8 May 2000

Physical Info Score 3

4m x 3m x 30 cm

Misc Info.

Disturbed but classic looking, one species and low productivity seen

A. maculatum - egg masses ~6

Other species...

Essex County

Bloomfield Town

Conte Large Block

Site Power Line Road (north)

Specific loc Pool 5/8-3b - 2.8 miles after turn to access power lines; marked with 451+2,82 near pole #5

UTM Zone 19T UTMe UTMn

Site notes Weather History: rained after midnight - hot 25 degrees C yesterday

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Beaver Ponds 8 May 2000

Physical Info Score 3

Beaver Pond Complex

Misc Info.

Beaver Ponds, one species and low productivity seen, but visited very briefly

B. americanus - heard chorus - medium

Other species...

Deer

Essex County

Bloomfield Town

Conte Large Block

Site Power Line Road (north)

Specific loc Pool 5/8-4 - 3.2 miles after turn to access power lines - Beaver Pond Complex on left

UTM Zone 19T UTMe UTMn

Site notes Weather History: rained after midnight - hot 25 degrees C yesterday

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Vernal pool 8 May 2000

Physical Info Score 3

Vernal seepage pool

Misc Info.

Small and shallow pool, one species and low productivity

B. sylvatica - 7 egg masses

Other species...

Horsetail

Essex County

Lewis Town

Conte Large Block

Site Power Line Road (north)

Specific loc Pool 5/8-5a = 5.7 miles after turn to access power lines, near beaver pond

UTM Zone 19T UTMe UTMn

Site notes Weather History: rained after midnight - hot 25 degrees C yesterday. White cedar

Vernal pool — 19 July 2000

Physical Info Score 3

No open water

Misc Info.

Large open pool, low diversity and productivity + reptiles, clearly very shallow but late in season
R. sylvatica - dried tadpoles in pools
B. americanus - 1
T. sirtalis - 2

Other species...

Essex — County
Ferdinand — Town
West Mt. — Large Block
Site — Maidstone Lake Hills West* near

Specific loc — Pool 7/19-3, Maidstone Lake Vernal Pool (VTDEC), VT DEC has marked this pool- very roughly 500 m SW of the study site UTM below

UTM Zone 19T UTMe ~0288474 UTMn ~4946529

Site notes — Weather History: Cool, thunderstorms, flooding

Vernal Pool — 4 July 2000

Physical Info Score 3

5 cm x 2 m x 30 cm
man-made, old road bed

Misc Info.

Ruts in old road bed, low diversity and productivity + reptiles
T. sirtalis -1
R. sylvatica - >10 tadpoles
A. maculatum - 5 old egg masses

Other species...

Essex — County
Lewis — Town
Conte — Large Block
Site — Mollie Beattie (Western) Bog* near

Specific loc — Pool 7/4-2
Man-made, old road bed

UTM Zone 19T UTMe 0279620 UTMn 4968859

Site notes

Vernal pool — 5 July 2000

Physical Info Score 3

3 m x 4 m x 30 cm

Misc Info.

One species, low productivity, but late
R. sylvatica, >3 tadpoles

Other species...

Essex — County
Lewis — Town
Conte — Large Block
Site — Big Swamp* near

Specific loc — Pool 7/5-1a opposite of Pool 4/26-05a; 1st pool east side of road

UTM Zone 19T UTMe 0282698 UTMn 4970065

Site notes — Weather History: Warm, sunny, cold front came through

Vernal pool 28 April 2000

Physical Info Score 4

In old gravel pit 8m x 20m x 80 cm

Misc Info.

Decent looking pool in old gravel pit, but no amphibians seen

Nothing found but water tannic and light poor

Other species...

Mallard on nest - 6 eggs

Essex County

Ferdinand Town

West Mt. Large Block

Site VEPCO Rd. off South America Pond Rd. (across river from VEPCO)

Specific loc Pool 4/28-2, UTM is approximate (+or-200 m) see map

UTM Zone 19T UTMe 0281600 UTMn 4961394

Site notes Weather History: Wet snow after midnight; cool late spring. Tamarack, birch, spruce

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Vernal pool 8 May 2000

Physical Info Score 4

Trap Info.

Portion of alder swamp, no amphibians seen

Other species...

Essex County

Bloomfield Town

Conte Large Block

Site Stone Dam Road

Specific loc Pool 5/8-1a 0.4 mile from Stone Dam to yellow flagging - near power lines In alder swamp west of road

UTM Zone 19T UTMe 287833 UTMn 4962426

Site notes Weather History: rained after midnight - hot 25 degrees C yesterday. Elm, elder, black cherry - grasses; adder's tongue in alder swamp

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Vernal pool 8 May 2000

Physical Info Score 4

Ditch along road

Trap Info.

No amphibians seen

Other species...

Essex County

Bloomfield Town

Conte Large Block

Site Stone Dam Road

Specific loc Pool 5/8-1b 0.5 mile from Stone Dam to yellow flagging - 1.3 miles to turn accessing power lines

UTM Zone 19T UTMe 287715 UTMn 4962512

Site notes Weather History: rained after midnight - hot 25 degrees C yesterday. Elm; elder; black cherry - grasses; adder's tongue

Vernal pool 5 July 2000

Physical Info Score 4

Misc Info.

No amphibians but late in year

Other species...

Essex County
Lewis Town
Conte Large Block
Site Big Swamp* near
Specific loc Pool 7/5-1b; 2nd pool east side of road
UTM Zone 19T UTMe 0282698 UTMn 4970065
Site notes Weather History: Warm, sunny, cold front came through

---

Vernal pool 5 July 2000

Physical Info Score 4

Misc Info.

No amphibians but late in year

Other species...

Essex County
Lewis Town
Conte Large Block
Site Big Swamp* near
Specific loc Pool 7/5-1c; 3rd pool east side of road
UTM Zone 19T UTMe 0282698 UTMn 4970065
Site notes Weather History: Warm, sunny, cold front came through

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Vernal pool 5 July 2000

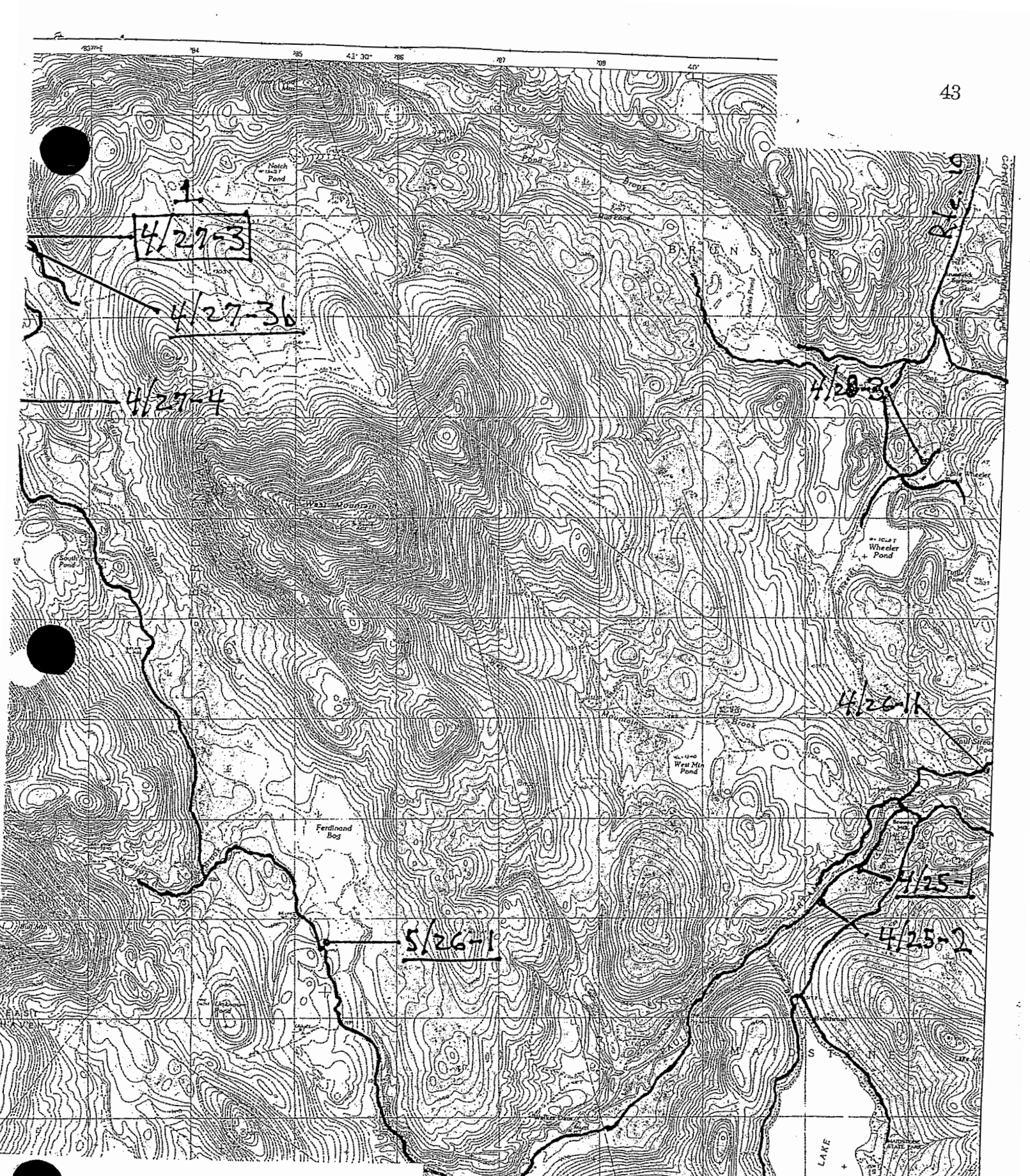
Physical Info Score 4

Misc Info.

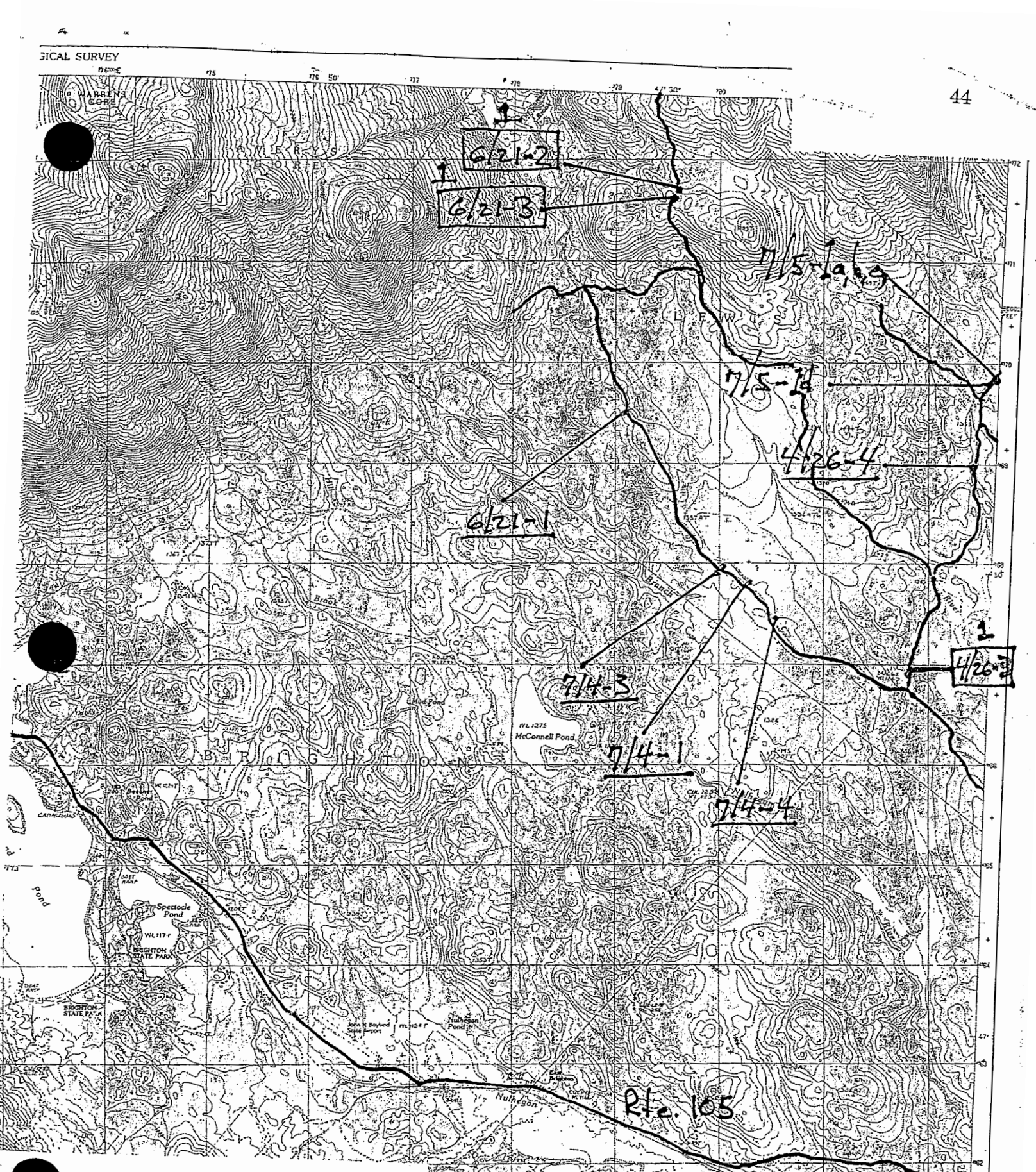
No amphibians but late in year

Other species...

Essex County
Lewis Town
Conte Large Block
Site Big Swamp* near
Specific loc Pool 7/5-1d; 1st pool west side of road
UTM Zone 19T UTMe 0282698 UTMn 4970065
Site notes Weather History: Warm, sunny, cold front came through



. Locations of amphibian breeding tes on the former Champion lands, in ssex County, VT. Sites in rectangles are ne most productive and diverse (Scored 1). ites underlined were moderately roductive or diverse (Score 2).



2. Locations of amphibian breeding sites on the former Champion lands, in Essex County, VT. Sites in rectangles are the most productive and diverse (Scored 1). Sites underlined were moderately productive or diverse (Score 2).

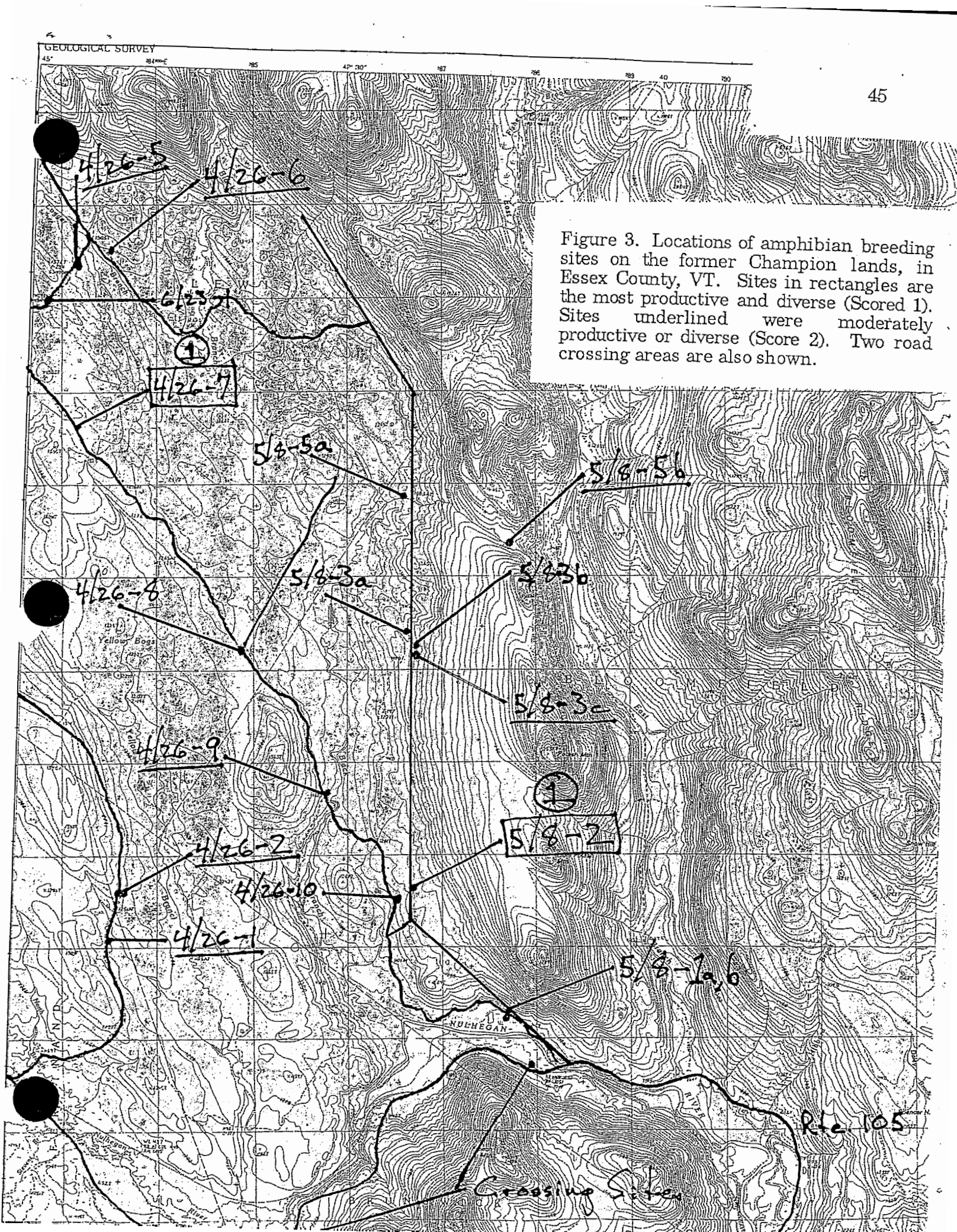


Figure 3. Locations of amphibian breeding sites on the former Champion lands, in Essex County, VT. Sites in rectangles are the most productive and diverse (Scored 1). Sites underlined were moderately productive or diverse (Score 2). Two road crossing areas are also shown.

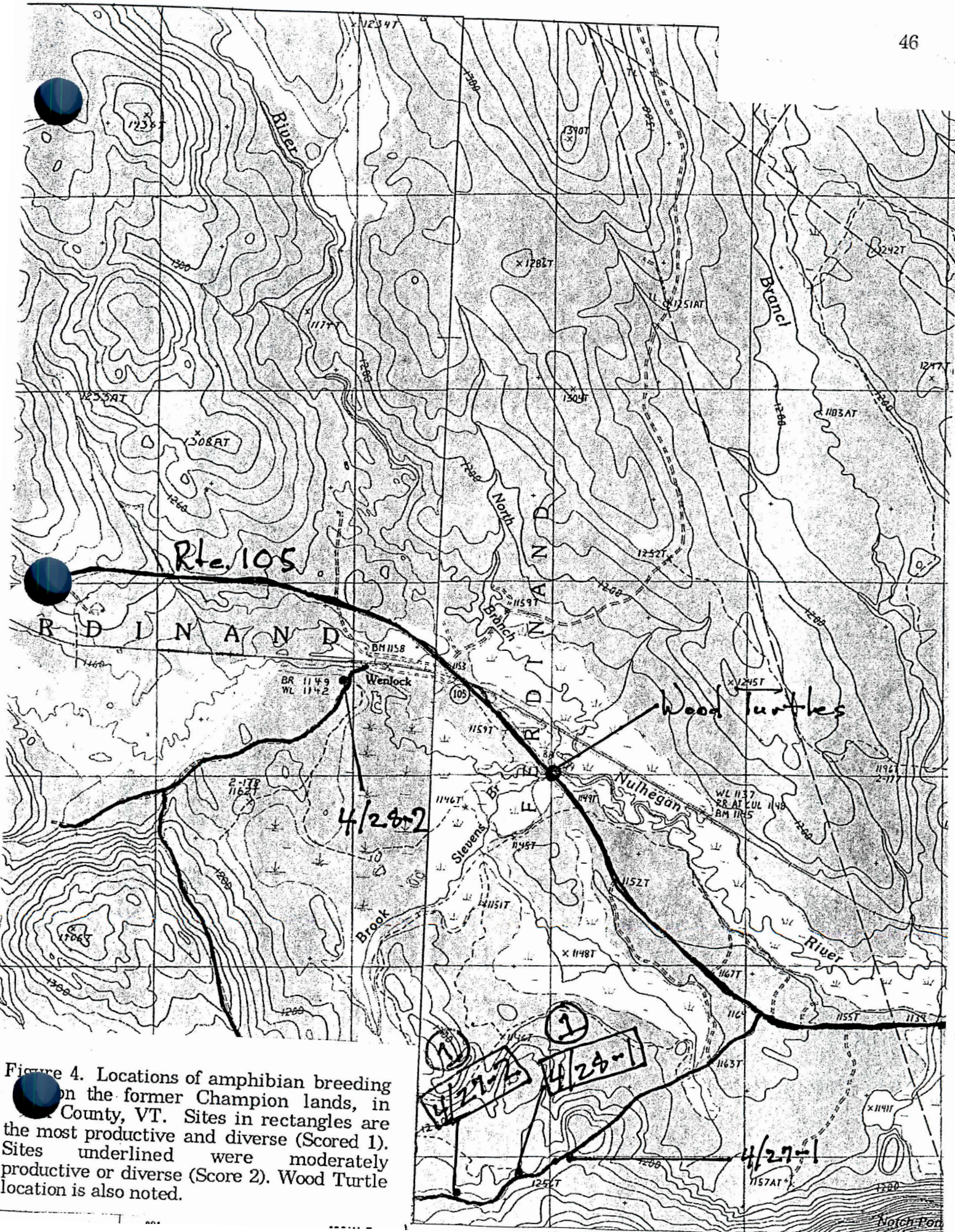


Figure 4. Locations of amphibian breeding on the former Champion lands, in County, VT. Sites in rectangles are the most productive and diverse (Scored 1). Sites underlined were moderately productive or diverse (Score 2). Wood Turtle location is also noted.

Conservation (vernal and semipermanent pools)

Vernal pools are the result of a fine balance between the amount of water received and the rate at which it is lost. If they are exposed to more sunlight than they normally receive, they may evaporate too fast to provide habitat through metamorphosis in June or July. Hence it is important that these pools remain shaded (if in the shade at present) and that the drainage is not altered in such a way as to prevent them from receiving and/or holding as much run-off. A minimum 30 m **buffer** of uncut trees should be left to conserve shade. However, it should be kept in mind that the amphibians breeding in these pools may be coming from as far away as 400 meters. deMaynadier and Hunter (1995) recommend that no more than 25% of the basal area should be cut in a 100 m 2nd-tier buffer that extends beyond the no-cut zone. Heavy equipment should be kept out of the pools and they should not be filled with debris. Fish should not be introduced into any pools, beaver ponds or lakes that have significant breeding populations of spring breeding amphibians. The introduction of salmonids in the western US to high elevation lakes has been shown to be the cause of precipitous declines of both salamanders and frogs. Many of the papers on the relationships between fish and amphibians were recently reviewed by Gillespie and Hero (1999).

Access to the pools is a concern, if heavily traveled roads are built or already exist between wintering areas and breeding pools, scores of amphibians will be killed on warm rainy nights in the spring as they migrate to the pools to breed. If such roads can be closed during these periods (April through early May nights) it will minimize road kills of spring-breeding adults. Although young will still need to leave the ponds in June through August. As mentioned previously, properly designed amphibian tunnels built under roads can guide young and adult amphibians under roads.

Amphibian **breeding traps** can result when pools are created in gravel pits or road beds that hold water long enough to entice amphibians to breed but not long enough for the young to metamorphose. Even if these pools hold water through the time of metamorphosis, some of them are too frequently disturbed by vehicles to produce metamorphs. The drainage of man-made pools that are frequently disturbed (road beds) should be altered so that they do not gather any water in the spring. Pools could also be created in areas that are not disturbed. I don't suggest this as a method to replace significant pools but as a way to enhance amphibian breeding at disturbed sites such as old logging headers. If so, care should be taken to make sure they are deep enough to hold water through July of most years (>70 cm).

As a result of their moist permeable skin, amphibians absorb water and any substance that is dissolved in it directly through their skin. Although many **biocides** have been shown to be toxic to amphibians (Power et al, 1989), the short-term toxic effects of most chemicals (herbicides, pesticides, fungicides, etc.) have not been tested on amphibians. The long-term and/or sublethal effects are almost never tested prior to commercial use. Alternatives to chemicals should be sought to protect amphibian species. Power line right-of-ways should be mechanically cut.

Timber Management

Many studies have examined the relationships between different timber management practices and amphibian richness and abundance (see review by deMaynadier and Hunter 1995). Most work supports the finding that amphibian richness and abundance decrease with clearcuts and similar shelter wood cuts (Ash, 1988, Howard and Caschetta 1999, Petranka et al, 1993) but gradually return to pre-cut levels with time (60 to 120 years) as long as source populations and travel corridors are maintained intact. deMaynadier and Hunter (1998) also showed that these declines extend 25-35 m beyond the edges of the affected area cut. Sedimentation of streams also diminishes the abundance and diversity of salamanders present (Bury and Corn, 1988 and Corn and Bury, 1989) and the effects may last for many years. The need to maintain protected buffer strips along streams and around breeding sites is clear but sometimes obscures the equally important concept of protecting foraging and overwintering habitat for the species that breed in those water bodies. Semlitsch (1998) reviewed travel distances of many amphibian species and

determined that a protected distance of 164.3 m would include 95% of the salamander population using a given pond. This is clearly short, however, of the total distance traveled by *R. sylvatica* and *N. viridescens*. and does not consider recolonization distances.

General recommendations for the maintenance of reptile and amphibian habitat relative to timber harvesting practices are included in the handout Forest Management Practices to Minimize the Negative Impacts on Vermont Reptiles and Amphibians. I have included a copy (Appendix D).

General thoughts on conservation design from the herp perspective

Most mobile species use a variety of community types over the course of the year and over the course of their lives. In addition, they need to be able to recolonize areas where populations have been eliminated due to drought, winter kill, disease, or anthropogenic forces. They need to be able to find alternative cover, food sources, breeding, or overwintering sites when natural disasters occur. Genetic diversity also needs to be maintained by allowing different populations to interact. Movement needs to be planned for and not obstructed. To do this a management plan should contain a web of sites that connect to each other and the external boundaries of the site to be managed to allow movement in and out of the managed site and between locations within the managed site. This does not mean that all human uses need to be curtailed but only that they do not interfere with the regular movement of species. Permeability is a term that I think should be used when thinking of the ability of a species to move comfortably across the landscape. Does the intended use leave the landscape permeable to the wide variety of species you wish to maintain. When details about the permeability of landscape uses are not known for many species, I believe that the safest and most logical way to proceed to maintain natural biodiversity is to maintain a network of interconnected sites where natural processes are allowed to occur. Human use areas should be the isolated islands within and scattered along the margins of the managed area. Managed areas should not surround the natural process areas. In this scenario, if despite our best intentions the human use is impermeable to a species or group of species, than a natural area will always be on either side of the human use area. This is the reverse image of most of the plans that I have seen. Carefully planned access routes, of limited size, with limited traffic, at limited times, would be the only breaks in the web of interconnected natural process lands. Since the travel corridors of different species would be through different community types (different communities would offer different permeability) intact examples of all the community types along the margin should be left. Consequently, Wood Turtles will be able to travel in and out of the site along the floodplains and rivers, and Redback salamander will be able to travel through moist deep deciduous leaf litter under a mature canopy of trees. Protecting isolated natural communities would not allow for this movement.

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Other Useful Sources of Information on New England Reptiles and Amphibians

Identification. A few good field guides to reptiles and amphibians exist. These help you identify herptiles but do not give you life history information. One that is easy to find, and up to date is:

Conant, R., and J.T. Collins. 1998. A field guide to reptiles and amphibians of Eastern and Central North America. Third Edition, expanded, Houghton Mifflin Company, Boston Massachusetts 616 pp.

Natural History. These guides focus less on identification and more on natural history, local distribution, and conservation.

DeGraaf, R.M., and D.D. Rudis. 1983. Amphibians and reptiles of New England. The University of Massachusetts Press, Amherst, Massachusetts 85 pp.

Harding, J.H. 1997. Amphibians and reptiles of the Great Lakes Region. The University of Michigan Press, Ann Arbor, Michigan 378 pp. (Lake Champlain is part of the Great Lakes Drainage so we share most of the same species.)

Hunter, M.L., A. Calhoun, and M. McCullough (eds.). 1999. Maine amphibians and reptiles. The University of Maine Press, Orono, Maine 272 pp. (This edition includes a CD of local frog calls. Call 207-581-1408 to order.)

Klemens, M.K. 1993. Amphibians and reptiles of Connecticut and adjacent regions. State Geological and Natural History Survey of Connecticut, Bulletin No. 112 318 pp.
(call 203-566-7719 to order)

Tyning, T.F. 1990. A guide to amphibians and reptiles. Little, Brown and Company. Boston Massachusetts 400 pp.

Calls. A very useful tape to help you learn the calls of frogs and toads is:

Eliot, L. 1992. The calls of frogs and toads; Eastern and Central North America. Nature Sound Studio. Ithaca New York.
(call 1-800-336-5666 to order)

Websites. Many useful sites exist. Some provide more reliable information than others. A few reliable sites to get you started:

North American Amphibian Monitoring Program (NAAMP).
http://www.im.nbs.gov/amphibs.html

North American Reporting Center for Amphibian Malformations (NARCAM).
http://www.npsc.nbs.gov/narcam/

Society for the Study of Amphibians and Reptiles (SSAR).
http://falcon.cc.ukans.edu/~gpisani/SSAR.html

The Snakes of Massachusetts (a useful identification key).
http://klaatu.oit.umass.edu/umext/snake/

The Vermont Reptile and Amphibian Atlas
http://www.middlebury.edu/herpatlas

Appendix A

Identification and Natural History Notes on the Amphibians of Vermont

The Salamanders of Vermont

Species that spend their adult lives in or near water

Name	Field Marks	Habitat	Occurrence	Notes
Mudpuppy *Necturus maculosus* 20-33 cm	very large, totally aquatic dark-brown salamander with the external gills of a larvae throughout its life; wide flat heads with squared snouts; young larvae have light longitudinal stripes	large permanent bodies of water	primarily in the major tributaries of both Lake Champlain and the Connecticut river, as well as larger lakes draining into them	very difficult to locate other than through methods used for fish; has been killed in lampricide treatments of Lewis creek
Eastern newt *Notophthalmus viridescens* 5.7-12.2 cm	a small to medium-sized salamander with rough relatively dry skin and no vertical grooves along its sides; red in its adolescent terrestrial stage (red eft), becoming green as it matures with yellow undersides; at all stages it has red spots and a line horizontally through its eye	primarily hardwood woodlands at all elevations; terrestrial when young and aquatic when adult; adults found in permanent and semipermanent water that is slow or standing	very abundant in appropriate habitat throughout the state	toxic to predators in the red eft stage
Dusky salamander *Desmognathus fuscus* 6.4-11.5 cm	a muddy-brown medium-sized salamander with a rounded body and partially keeled tail; look for a light line extending from the eye down and backwards to the corner of the mouth	very wet soils along slow streams and in small seepage areas in hardwood forests particularly where the soil is richly organic and deep with a heavy, dark overstory	locally common in appropriate habitat; found at a wide range of elevations; apparently intolerant of occasional drying	partially keeled tail, wet habitat, and dark-brown color separate it from the elusive Mt. Dusky
Spring salamander *Gyrinophilus porphyriticus* 12.1-19 cm	large size of adults and larvae; solid salmon-pink with dark reticulations; heavy rounded body with laterally flattened tail	springs and cool, clean, well-oxygenated, headwaters of streams	can be locally abundant in high-elevation, small, fishless, (?) streams; distributed wherever permanent cool headwaters can be found	turn large flat rocks in streams that are over a square foot in area to locate this impressive salamander
N. two-lined salamander *Eurycea bislineata* 6.4-12 cm	delicate slender body with a flattened yellow or brown back contrasting with darker sides; adults have tails with yellow-orange undersides	very wet soils, gravel, or in crevices between rocks; in or along permanent streams or ditches in wooded areas	throughout Vermont at all elevations; it can be locally abundant	during or after heavy rains it wanders up to 100 meters from the nearest stream or seep

Appendix B

Vermont Nongame and Natural Heritage Program Rankings for Reptiles and Amphibians

1999 List

Amphibians and Reptiles of Vermont

Nongame and Natural Heritage Program
Vermont Department of Fish and Wildlife
103 South Main St.
Waterbury, VT 05671-0501
May 1999

Common Name	Scientific Name	State Rank	State Status
Reptiles			
Spiny Softshell	*Apalone spinifera*	S1	T
Common Snapping Turtle	*Chelydra serpentina*	S5	
Painted Turtle	*Chrysemys picta*	S5	
Spotted Turtle	*Clemmys guttata*	S1	E
Wood Turtle	*Clemmys insculpta*	S3	SC
Common Map Turtle	*Graptemys geographica*	S3	SC
Common Musk Turtle	*Sternotherus odoratus*	S2	SC
Five-lined Skink	*Eumeces fasciatus*	S1	E
Eastern Racer	*Coluber constrictor*	S1	SC
Timber Rattlesnake	*Crotalus horridus*	S1	E
Ringneck Snake	*Diadophis punctatus*	S4	
Eastern Rat Snake	*Elaphe obsoleta*	S2	SC
Milk Snake	*Lampropeltis triangulum*	S5	
Northern Water Snake	*Nerodia sipedon*	S3	
Smooth Green Snake	*Liochlorophis vernalis*	S4	
Brown Snake	*Storeria dekayi*	S4	
Redbelly Snake	*Storeria occipitomaculata*	S5	
Eastern Ribbon Snake	*Thamnophis sauritus*	S2	SC
Common Garter Snake	*Thamnophis sirtalis*	S5	
Amphibians			
Jefferson Salamander	*Ambystoma jeffersonianum*	S2	SC
Blue-spotted Salamander	*Ambystoma laterale*	S3	SC
Spotted Salamander	*Ambystoma maculatum*	S5	
Marbled Salamander	*Ambystoma opacum*	SR	
Northern Dusky Salamander	*Desmognathus fuscus*	S4	
Allegheny Dusky Salamander	*Desmognathus ochrophaeus*	SR	
Northern Two-lined Salamander	*Eurycea bislineata*	S5	
Spring Salamander	*Gyrinophilus porphyriticus*	S4	
Four-toed Salamander	*Hemidactylium scutatum*	S2	SC
Northern Redback Salamander	*Plethodon cinereus*	S5	
Common Mudpuppy	*Necturus maculosus*	S2	SC
Eastern Newt	*Notophthalmus viridescens*	S5	
American Toad	*Bufo americanus*	S5	
Fowler's Toad	*Bufo fowleri*	S1	SC
Gray Treefrog	*Hyla versicolor*	S5	
Spring Peeper	*Pseudacris crucifer*	S5	
Western Chorus Frog	*Pseudacris triseriata*	S1	E
Bullfrog	*Rana catesbeiana*	S5	
Green Frog	*Rana clamitans*	S5	
Pickerel Frog	*Rana palustris*	S4	
Northern Leopard Frog	*Rana pipiens*	S4	
Mink Frog	*Rana septentrionalis*	S4	
Wood Frog	*Rana sylvatica*	S5	

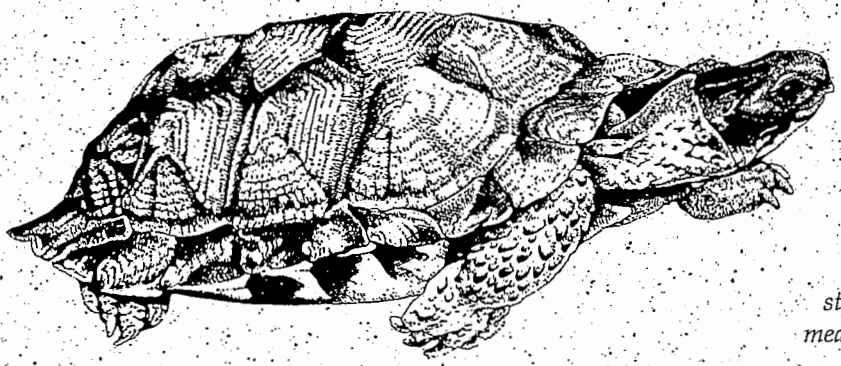
Appendix C

Wood Turtle (*Clemmys insculpta*) Fact Sheet

Vermont's Wildlife Heritage

Nongame and Natural Heritage Program

Species at Risk



Wood Turtle

Clemmys insculpta

The wood turtle is a moderately sized turtle with reddish-orange skin on portions of its neck and legs and a roughly textured, or sculpted shell. The adult's shell is about 7 to 8 inches long. It spends the winter on stream bottoms and most breeding occurs in streams. Although it regularly returns to streams throughout year, it may travel up to 1000 feet from the stream while foraging for food in hardwood forests or meadows.

Turtles are an ancient group of animals, originating many millions of years ago. Wood turtles have only been in Vermont for the past 10,000 years, following the retreat of the last glacier. In spite of their long history of success, wood turtles have not fared well recently in the face of human development and use of the landscape: The wood turtle is a species of conservation concern in the northeastern states, including Vermont, due to its region-wide decline.

Human activities are the main cause of the turtles' decline. While it is rare that any person intentionally harms a wood turtle, the cumulative effect of our activities does have a negative impact. Although it is illegal to collect wood turtles in Vermont, people do remove them from the wild. Collection results in population decline and loss. A Connecticut wood turtle population was studied before and after a water supply area was opened to limited permit hiking. Wood turtle collection was the likely cause of this population disappearing after only ten years.

We also harm turtles by transforming their habitat into housing or commercial building lots, clearing away stream-bank vegetation, and inadvertently hitting them with mowing machines or cars.

Adult wood turtles may live 60 years, but egg and hatchling survival is extremely low. Survival of adult wood turtles is key to maintaining this species. Mature turtles are important because they manage to produce the few offspring that will carry the population into the future.

Turtle Time Table

Early April - First emergence from water to stream bank. Initially, turtles stay near stream, then gradually move farther away.

Early June - Initial movements to summer foraging areas which may be 1000 feet from stream. These areas consist of meadows, wetlands and woods.

Mid June - Females with eggs move to nesting area. Some females will travel over one mile to nest. Return to foraging area within a few weeks

June through mid September - Turtles spend up to a month at a time foraging well away from stream, but return to the stream for short periods.

Late August through mid November - Breeding occurs in the stream, and also occurs to a lesser extent in the spring months.

Noveimber through April - Turtles stay underwater at wintering sites in streams where they absorb oxygen through their skin. Some movement may occur during this time, but the turtles are generally confined to protected pools.

(continued on back)

The Nongame and Natural Heritage Program (NNHP) is responsible for managing and enhancing Vermont's native plants, natural communities, and animals that are not hunted or fished (nongame species). A unit within the Vermont Department of Fish and Wildlife, the NNHP's mission includes the preservation of Vermont's rich and varied natural heritage for present and future generations.

Appendix D

Forest Management Practices to Minimize Negative Impacts on Vermont Reptiles and Amphibians

Forest Management Practices to Minimize Negative Impacts on Vermont Reptiles and Amphibians

Most amphibians spend the majority of their lives away from water in the surrounding woods. The wetlands, vernal pools, and ponds are critical for breeding of most species but the forests are also critical for the foraging and wintering of those species. Some local amphibians migrate 300 meters or more from wintering and foraging areas to breeding ponds. Most snakes, some turtles, and Vermont's only lizard spend the majority of their lives away from water. Hence management of wetlands and the surrounding woods both have an impact on reptiles and amphibians. Some species of larger snakes and most land turtles require many years to reach breeding age. Direct mortality or removal of breeding adults can have a devastating impact on a population.

Specific management plans for rare, threatened, or endangered species

Learn to recognize Vermont's rare, threatened, and endangered species.

(habitat in which they are found should be managed specifically for them)

(contact the Vermont Non-game and Natural Heritage Program, they will be interested in the distribution information and may be able to make specific management suggestions)

General

Maintain large down trees (2 per acre, 7 per hectare), dead standing trees, and a future supply consisting of older standing trees.

Maintain standing trees with knotholes and dead branches.

Within areas that are heavily cut, patches of older trees should be left in addition to the scattered mature trees.

Maintain a thick layer of deciduous litter.

Softwood plantations limit the number and diversity of amphibians.

(decreased coarse woody debris, decreased structural diversity, decreased hardwood leaf litter, increased acidity)

(in these situations maintaining pockets of hardwoods and leaving large debris on the ground would help to minimize the impact)

Long rotations provide the old mature growth and dense forest cover amphibians prefer.

(as forests age they show increasing amphibian abundance up to an age of 60 to 70 years old in wet cool habitats and up to 120 years in warm, dry, lowland habitats)

Minimize compaction of the soil and direct mortality by keeping heavy equipment off the site when the ground is saturated.

(winter logging or logging in late summer and early fall conditions should help minimize this effect)

Protect and maintain shrub cover in the forest and on forest edges.

Openings

Maintain a natural pattern of forest cover with small forest breaks.

Large clear-cuts regularly show fewer amphibians than adjacent older growth.

(successive short rotation clear-cuts showed the lowest abundance of amphibians)

(natural disasters such as diseases and storms seem to have less of an effect on amphibian abundance as clear-cuts, probably because of the amount of coarse woody debris left behind)

(large clear-cuts seem to block the movements of some amphibian species)

Small upland meadows with nearby woods provide partial habitat requirements for some snake species.

In small upland meadows exposed rock piles, sawdust piles, and coarse woody debris can provide good habitat for snakes.

Wetland areas

Maintain the ability of swamps, vernal, and semipermanent pools to hold water.

Do not create ditches and ruts that will hold water only briefly. Amphibians often lay their eggs in these small patches of water which dry too soon to permit the larvae to transform and leave. They should either be prevented or they should be deep and shaded enough to hold water through July.

Streams, ponds, and vernal pools should be kept shaded and silt should be kept out.

(among other effects, silt fills the spaces in stream beds where the larval amphibians hide and feed)

(direct sun may speed the rate of evaporation in vernal pools)

Equipment and logs should be kept out of vernal pools and other wetlands.

(small amounts of coarse woody debris or single trees that fall into a wetland are not harmful but vernal pools should not be filled with debris)

Buffer strips should be maintained around all water bodies including streams, ponds, and vernal pools.

(these strips minimize siltation, maintain shade, maintain undisturbed soil and deep leaf litter, provide patches of older growth as sources for recolonization, and provide movement corridors)

(the width of uncut buffer strips should be a minimum of 30 meters, with a wider zone of up to 100 meters where cutting and its impacts are limited)

(deMaynadier and Hunter suggest no more than 25% of the basal area should be cut in this second tier buffer)

(buffer strips should be widest where streams are larger, where the intensity of harvest is greatest, where the surrounding terrain is steepest, or where rare, threatened, or endangered species are found)

Equipment should be kept out of forested seepage areas.

Forest cover over seepage areas should be maintained.

Chemicals

Amphibians absorb any chemicals which are in the water (dew, ground water, streams etc.) around them.

(minimize use of herbicides, pesticides, etc.)

(one study suggests that CaCl spread on roads to minimize dust may be a barrier to amphibian movement)

Roads

Minimize the number of roads, size of roads, and the amount of traffic on roads.

(a rural paved road in upstate New York killed between 50 and 100 percent of migrating amphibians breeding near it)

Permanent roads should be planned not to intercept the annual movements of reptiles and amphibians between breeding, foraging and wintering habitats.

Other Species

Allow only moderate grazing after the breeding season.

Keep livestock out of the riparian zone and away from vernal pools and ponds.

If livestock need access to a pond or a lake, limit it. Maintain as much naturally vegetated shoreline as possible.

Don't introduce fish in streams and ponds where they were not previously found.

(many fish feed on amphibian eggs and larvae, and absence of predacious fish is a primary requisite of vernal pool breeders)

Open areas with dense annual or shrubby growth near water bodies or on the edge of woods provide foraging areas for some species

open areas that are to be kept open should be cut high and either not raked or raked by hand, (direct mortality should be minimized)

these areas could be cut after the ground is frozen and before the first snows (reptiles and amphibians would no longer be active)

General amphibian microhabitat requirements include;

breeding locations that hold water at least through July,
coarse woody debris in adjacent forested areas,
foliage height diversity in adjacent forested areas,
canopy cover over breeding and foraging areas,
deep deciduous leaf litter for moisture retention and feeding,
cool and moist conditions.

General reptile microhabitat requirements include;

coarse woody debris (standing and down),
small open patches for basking, mixed with well shaded refugia for warm weather and feeding,
undisturbed areas in and around wetlands for feeding and breeding,
access to safe denning areas.

Many of the above ideas were taken from a recent review of the literature regarding amphibians and forest management. This review includes an extensive bibliography that might be of interest.

deMaynadier, P. and M. Hunter. 1995. The relationship between forest management and amphibian ecology: a review of the North American literature. Environmental Reviews 3: 230-261.

Additional suggestions for this list were provided by the author (J. Andrews), P. Bartelt, S. Droege, S. Jackson, L. Raw, and R. Waldick.

James Andrews, 7/96