A Survey of the Army Corps of Engineers' North Springfield Dam and Stoughton Pond Project Area for Vernal Pools and Rare or Protected Reptiles and Amphibians

Prepared for

The Vermont Field Office of
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Introduction

The purpose of this contract was to generate a thorough survey of the US Army Corps of Engineers' property at North Springfield, Vermont for rare or protected reptiles and amphibians and to locate and briefly describe any significant vernal pools. I will here report on all reptiles and amphibians located in the study 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 vernal pools which appeared to be important amphibian breeding locations are shown on maps and briefly described.

The definition of a vernal pool which I will use is: a temporary or semipermanent pool which has no permanent inlet or outlet and is filled by local surface water in the spring. At this particular site there are also pools which are filled by water backing up from the dams during floods. When the bulk of the water recedes, some of these pools retain shallow water much like a vernal pool. Some of these pools along the margins of the high water line apparently act as vernal pools in supporting amphibian breeding if they are not flooded during the breeding period of a particular species. In addition to the true vernal pools, I will also report on these and other types of pools which showed evidence of supporting spring-breeding amphibians.

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 eight herp-survey methods starting fieldwork on April 14, 1998 and finishing in the field on October 1, 1998. 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 16 days were spent at the site: four days in April, two in May, two in June, three 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 USAC land surrounding Stoughton Pond and North Springfield Dam was visited during some point during the survey.

The eight **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 searching for vernal pools.

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 amphibians crossing the route. Road searches were performed when the surface of the road was wet or the night was relatively warm and humid. When amphibians were heard or spotted, the car was stopped, the amphibians identified and counted, and their locations noted. The many small roads in and surrounding this property made this a useful survey method. All roads enclosed by Rte. 106 on the West and south, Reservoir and Plains Roads on the east, and Rte. 131 on the north were driven during periods of reptile and amphibian activity.

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 many of the potential breeding sites that were located before the end of the spring breeding activity.

Day-time road searches were performed in the fall on sunny days after cold nights. On these days many snakes can be found on the roads (alive and dead) that are otherwise difficult to locate. 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. This often results in road kills but it alerts the researcher to the presence of a species in an area. All roads near the dams were driven in the fall and road kills and live specimens were identified.

Interviews are useful in gathering important leads on areas where unusual or rare herptiles may be located now or were historically. I interviewed USAC employees at the site and the USAC naturalist by phone. I also talked to local landowners and state biologists.

Herp Atlas records. As coordinator of the Herp Atlas Project all known records of Vermont herps current or historic are on a database on my computer. These records were accessed to locate all other records (scant) from the area (Appendix A).

Previous surveys. Aquatic surveys had been done previously on the waters of the two dams. These records were available through the Springfield Vermont Fish and Wildlife office.

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 base printout.

Three methods were used to locate **vernal pools**.

Interviews. Vernal pools are frequently unobtrusive and/or remote, but larger pools and beaver dams are sometimes known by local residents and staff. I asked for locations of wet areas when interviewing local residents and staff regarding herps.

Maps. USGS topo maps were used to locate spots that have the potential to have vernal pools. They also indicated some semipermanent and permanent breeding locations.

Ground surveys consisted of hiking the boundaries and interior of all the land owned by the US Army Corps at these two sites. Although this technique is more efficient before the foliage appears on the trees, the size of the area to be surveyed dictated that this technique be used throughout the season. Vernal pools located in the spring contained direct evidence of breeding (egg masses or adults) and usage data was available. Vernal pools located in the fall were dry. Hence species usage can only be inferred. Since vernal pools diminish in size over the course of the year, the three measurements included in this report are an estimate of the extent of the water in the pool if it was at mean spring levels (May). The three measurements are of greatest length, greatest width, and depth at the deepest point.

Some of the vernal pools located were filling a man-made or enhanced depression: foundations, ditches, road beds, wells, and excavated areas often provide important amphibian breeding sites. Most of these still fit the definition I gave above of vernal pools. Many of these have temporary or semipermanent inlets and outlets and lie along drainages, or border intermittent streams. Some of these sites were mapped, if they appeared to be important amphibian breeding areas. Those that were clearly man-made

are labeled as such, and those that fit the strict definition of a natural vernal pool are labeled.

Reptiles and amphibians located, basic ecology, relative abundance, and ranks

Sixteen species of herptile were located in the two project areas: five species of salamander, seven species of frog (& toad), two species of turtle, and two species of snake. All of these sightings, with dates, documentation status, locations, methods used, and author of the field reports are listed in Appendix B. No state or federally listed species were located. All herptiles located or reported, their relative abundance, and status are summarized in Tables 1 and 2.

Amphibians as a group were not particularly abundant in the project area. Some such as *Plethodon cinereus* (Redback salamander) are sensitive to flooding. Many amphibians require a deep litter layer and well-shaded, moist, mature, hardwoods for part of their life cycle. Others are sensitive to fragmentation. Many of the woodlands surrounding breeding sites in this area were highly fragmented by roads, sand pits, and other forms of development. Areas of well drained sandy soil were also less than ideal for amphibian moisture requirements.

Five **caudate** (salamander) species were located in the project area. *Ambystoma maculatum* (Spotted salamander) adults and egg masses were located twenty times. This species breeds in many of the vernal pools and beaver dams of the area as well as some of the flood pools along the edge of the floodplain. *Plethodon cinereus* (Redback salamander) was located 12 times. 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. Relatively few of this normally abundant species were located. *Eurycea bislineata* (Northern two-lined salamander) was located 11 times. This species' habitat is along the margins of small streams and in or near seepage areas. *Notophthalmus viridescens* (Eastern newt) were located only six times. Adults were occasionally seen in still water and the Red eft stage was occasionally located in the woods. *Desmognathus fuscus* (Dusky salamander) was located five times with a maximum number of three at one site. It was sometimes found with *E. bislineata* but it was also found in shaded seepage areas in the woods.

None of these salamanders are rare in Vermont or the US. The last one (Dusky salamander) is listed as an S4 species. The first four (Spotted, Eastern newt, Redback, and Northern two-lined) are all S5 species in Vermont and G5 globally. Appendix C contains the 1997 listings of Vermont herp species and their explanations.

Seven species of **anurans** (frogs and toads) were located in the project areas. *Rana sylvatica* (Wood frog) was located 23 times as egg masses, tadpoles, or adults but always in small numbers. Like the spotted salamander, it breeds in vernal pools, beaver dams, and in a couple of the flood pools along the margin of the floodplain. After breeding, adults return to the woods. *Rana clamitans* (Green frog) was located 20 times in generally small numbers primarily in beaver ponds and isolated floodplain pools. It breeds in still permanent water with surrounding vegetation but travels widely as long as it can stay moist. *Bufo americanus* (American toad) was also located 12 times as singles or occasionally two or three in an area. At other Army Corps sites, this is one of the few species that I have seen breed in the floodplain after the spring flood water subsided. *Pseudacris crucifer* (Spring peeper) was recorded 11 times. 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. Total numbers were not impressive. *Rana palustris* (Pickerel frog) was located seven times. Again, relatively few were found. This species likes dense annual vegetation near clean permanent water. *Hyla crucifer* (Gray tree frog) was located six

Table 1. Reptiles and amphibians found in North Springfield Dam and Stoughton Pond Project areas.

Species	Common name	# of reports	State rank	Global rank
Caudates	**Salamanders**			
Ambystoma maculatum	Spotted salamander	20	S5	G5
Plethodon cinereus	Redback salamander	12	S5	G5
Eurycea bislineata	N. two-lined salamander	11	S5	G5
Notophthalmus viridescens	Eastern newt	6	S5	G5
Desmognathus fuscus	Dusky salamander	5	S4	G5
Anurans	**Frogs and toads**			
Rana sylvatica	Wood frog	23	S5	G5
Rana clamitans	Green frog	20	S5	G5
Bufo americanus	American toad	12	S5	G5
Pseudacris crucifer	Spring peeper	11	S5	G5
Rana palustris	Pickerel frog	7	S4	G5
Hyla versicolor	Gray tree frog	6	S5	G5
Rana catesbeiana	Bullfrog	2	S5	G5
Testudines	**Turtles**			
Chrysemys picta	Painted turtle	8	S5	G5
Chelydra serpentina	Snapping turtle	2	S5	G5
Serpentes	**Snakes**			
Thamnophis sirtalis	Common garter snake	6	S5	G5
Lampropeltis triangulum	Milk snake	1	S5	G5

Table 2. Reptiles reported through interviews or Herp Database records that are suspected of using the site but were not found during the survey in the project areas.

Species	Common name	# of reports	State rank	Global rank
Serpentes	**Snakes**			
Clemmys insculpta	Wood turtle	7	S3	G5

times. 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. It is probably under-reported here as a result. It breeds in permanent water containing standing vegetation. *Rana catesbeiana* (Bullfrog) was located twice. This species requires permanent still water with vegetated margins. The Pickerel frog state rank was recently changed (January 1997) to an S4. All other anuran (frog) species located are listed as S5 species in Vermont and G5 globally.

Reptiles are very rarely as abundant as amphibians in Vermont. As expected they were located much less frequently. Two species of turtle were found in the project area. *Chrysemys picta* (Painted turtle) was seen eight times. They were seen basking in the shallow bays of the dams, particularly the southwest arm of North Springfield Dam. This species prefers still permanent water bodies with soft bottoms. *Chelydra serpentina* (Snapping turtle) was located twice and it was reported from the fish surveys. Since this species is almost entirely aquatic and I did not trap for them, they are underreported. This turtle is rugged and adaptable. It inhabits all types of permanent water. Both of these are S5 species in Vermont and G5 globally.

Only two species of snake were confirmed in the project area. *Thamnophis sirtalis* (Common garter snake) was located six times. This species is by far the most abundant and adaptable snake species in Vermont. One *Lampropeltis triangulum* (Milk snake) was found just northeast of the airport. This species is also ranked as an S5 but is no where near as widespread and abundant as the Common garter snake.

Species reported from the area but not located during the survey

Seven additional species were mentioned in interviews, historic reports, or reported to the state-wide atlas for Springfield or Weathersfield but not located during the survey: Timber rattlesnake (S1), Mudpuppy (S2), Wood turtle (S3), Spring salamander (S4), Leopard frog (S4), Ringneck snake (S4), and Smooth green snake (S4). The rarest of these, *Crotalus horridus* (Timber rattlesnake) is an S1 species and is listed as endangered in Vermont. According to historic records it once was found quite commonly near Skitchawaug and Ascutney Mountains. No confirmed reports of this species have been recorded in Windsor County since 1964 and it is very unlikely that this species still is found in the area. *Necturus maculosus* (Mudpuppy) is an S2 species and a species of special concern. It is known from the Connecticut River and may move into the Black River to breed. This is a very large (up to over a foot in length) entirely aquatic salamander that would show up in fish surveys. Although I did not trap for this species, multiple fish surveys have been completed in the dams and along the Black River and this species has not been caught. There is no evidence that this species uses this Army Corps property.

On the other hand, although I did not locate them during my recent surveys, Herp Atlas records suggest that small numbers of ***Clemmys insculpta*** (Wood turtle), do occasionally use the Army Corps lands at this site. The Wood turtle is an S3 species in Vermont. It has been reported from the Black River drainage six times with the most recent report dating 1995. A single turtle was twice seen attempting to nest behind the Fish and Wildlife garage at Springfield Airport. The site is within 200 meters of Army Corps land. Wood turtles are known to travel over a mile to reach good nesting locations. It seems probable that small numbers occasionally use Army Corps lands in this area.

All of the remaining species reported from these two towns but not located during my survey are S4 species. The Spring salamander (*Gyrinophilus porphyriticus*) prefers cold, clear, well oxygenated first order streams and springs higher up in the watershed. The Leopard frog (*Rana pipiens*) is usually quite easy to locate. If it was on the land surveyed, I should have found them. They are easily misidentified and the one reference to this species may have been a case of a misidentified pickerel frog. The Smooth green snake (*Opheodrys vernalis*) and Ringneck snake (*Diadophis punctatus*) are both secretive

species that could have been overlooked if a small number of them inhabit the survey region. However, if significant populations were in the survey area, I would have found them.

Two additional species that have a state rank of S1 and one with a state rank of S2 have been reported from Windsor County but not Springfield or Weathersfield. There is no evidence that they use the Army Corps lands surveyed now or that they have in the past but local staff should be aware of their significance if they ever were sighted. Fowler's toad (*Bufo woodhousii fowleri,* S1) was reported from White River Junction in 1983. It is the only record of this species from Windsor County. I suspect its distribution is limited to the Connecticut River Floodplain but the sandy soils in this area appear to be appropriate habitat for them. The Black racer (*Coluber constrictor,* S1) is Vermont's rarest snake. One historic record (not well documented) exists from Royalton in 1911. If it exists in this state at all it would most likely be found in overgrown fields adjacent to the southern Connecticut River Valley. Jefferson's salamander (*Ambystoma jeffersonianum*, S2) has been reported in recent years from Norwich. This large gray-brown salamander is a semipermanent woodland-pool breeder. The surveyed area is within the range of this salamander but there is no evidence of its presence here.

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 listed here have viable populations within the project areas.

Additional information on the field marks, habitat, and natural history of all Vermont amphibians is contained in Appendix D.

Vernal Pools

Thirty-four vernal pool type habitats were noted in my field notes. Seventeen locations are mapped representing 27 of these pools. Not all of them are classic vernal pools. Figure 1 shows locations of all these pools. Table 3 gives a brief description of pool type, significance, size, origin, and includes notes on the amphibians which were found using the pools. The numbers are keyed to those on my maps. No evidence of breeding rare, threatened, or endangered amphibians was found in any of the pools..

The floodplains of North Springfield Dam and Stoughton Pond contain many low areas that trap and hold water after flooding. The largest and most permanent of these are clearly shown on USGS topographical maps or National Wetlands Inventory maps. However, most of the vernal pools I identified on my maps are not on either of the above two map types. In addition, some of the smaller pools in the floodplains are not shown. Most of these are scattered along the intermittent streams that drain the floodplain or are associated with some of the small wetlands within it. The locations of many of the intermittent streams and wetlands are mapped on NWI maps. If the floodplain was filled at the normal time of spring breeding for amphibians (April), these depressions would not be available to them. Those that are located well out in the floodplain would only rarely be available to spring breeders, although they could be breeding sites for summer breeders (the ones that do not use vernal pools). Some of the pools along the margins of the floodplain would be available more frequently. However, even if the flood water withdraws early enough for amphibians to reach some of these sites, the flooding distributes predators such as fish into some of these little pools. These predators would have a negative impact on the breeding success of vernal pool breeders at these sites. I located spring breeding amphibians in some of the smaller depressions along the margin of the floodplains.

Although not vernal pools, beaver dams are also important amphibian breeding sites. The vernal-pool breeding species found in this project area also breed in beaver ponds with adequate sub-aquatic cover for the tadpoles, and adequate surrounding

woodlands for the adults. I saw amphibian egg masses in many of the beaver ponds on the property but I have not mapped them. As beaver ponds age and break, vernal pools may be left. I also discovered two old wells that may allow minimal breeding. I did not map the old wells.

Three of the pools are natural ridgetop vernal pools (H5, H13, and H14). H14 however showed no signs of amphibian breeding. One of the most productive pools (H9) is within the upper extent of the floodplain and may have been manmade. Some of the productive pools have been altered in some way or another by man (H1, H3, H4, H7, H16 and perhaps others). Many were originally formed as oxbows of streams or are part of an intermittent stream bed (H1, H8, H10, H11). Three of the most productive are clearly the remnants of an old sand pit and are just outside of Army Corps boundaries (H6). One pool is quite marsh-like and within the upper reaches of the floodplain (H12). Two may be too ephemeral to support breeding amphibians (H15, H17). They were discovered in the fall after they were already dry.

Conservation (herps)

The only S3 species that records suggest uses the area was *C. insculpta* (Wood turtle). This species is far more terrestrial than the other two local turtle species. It wanders territories that extend along river valleys and up to a few hundred meters away from the river. It was never reported from Army Corps property but it was reported from both upstream and downstream along the Black River and near the airport, hence all of the two project areas should be considered potential habitat. In a large area such as this with an apparently small population of *C. insculpta* it would be necessary to attach radio transmitters to the adults and monitor their activities in order to locate significant feeding, overwintering, and nesting areas.

C. insculpta are excellent climbers but must find the dams a serious obstacle (although not insurmountable as evidenced by M. Toni's observation of a Wood turtle on top of Townshend Dam). The large gaps between the rocks used in the construction of sections of the dam may act as traps. The wooded, or grassy areas should not be a barrier. Heavily traveled roads are a serious threat to this species. Many of my reports from around the state are of specimens killed in roads. Commercial and personal collection are also a threat. 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 or in the driest portions of August mortality would be minimized. The higher the mower blades the better. A minimum height of six inches should be maintained. Increased recreational use of the project areas would 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. Increased egg predation from raccoons and skunks also may be limiting populations. 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 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.

Table 3. Descriptive information on the vernal pools found in the project area.

Vernal pool — North Springfield Dam — Pond 1 in nature area. 4 traps 10m X 10m X 40 cm. See field map for this date.

H1 — 4/15/98 — Despite its location in an intermittent streambed, this is a productive breeding site.

Pond near trail in nature area west of road and south of parking area. Dimensions: 10m X 10m X 40 cm. See map for this date. In drainage of an intermittent stream. A small area up drainage from this site and on the opposite side of the road may hold water long enough of r. breeding in some years. Old well further up drainage may also provide breeding habitat.

A. maculatum, R. sylvatica, and R. clamitans seen

Vernal pool — North Springfield Dam — West of nature area road, North Springfield Dam.

H2 — 4/29/98

Vernal Pool (#1). 5 meters X 20 meters X 40 centimeters. Part of a series of four vernal pools along the same drainage. They begin near an old road and parking spot on the east side of the Nature Center Access Road and continue south along the road. This, the last one is on the west side of the road.

R. sylvatica

Vernal pools — North Springfield Dam — Pools in nature area along road. Pool dimensions: 20m X 4m X 30 cm. See field map for this date.

H3+ — 4/15/98

H4-6. Pools in nature area along road. Pool dimensions: 22m X 4m X 30 cm. See map for this date. Part of a series of four vernal pools along the same drainage. They begin near an old road and parking spot on the east side of the Nature Center Access Road and continue south along the road. The last one is on the west side of the road. Other two proceeding north are 16 and 15 meters long.

A. maculatum

Vernal pool — North Springfield Dam — NSD.

H4 — 4/28/98

Vernal Pool #2 on boundary 4 meters X 2 meters X 60 centimeters. Artificially created by drainage ditch around an open area.

A. maculatum, R. sylvatica

Vernal pool — North Springfield Dam — North Springfield Dam.

H5 — 4/28/98

Vernal Pool #1 on boundary 5 meters X 40 meters X 20 centimeters. Classic but shallow.

A. maculatum, R. sylvatica

Vernal pool — North Springfield Dam — East of property line.

H6 — 4/28/98

3 vernal pools in sandpit. Very productive but off Army Corps Property.

Large numbers of A. maculatum, R. sylvatica, and R. clamitans

Vernal pool — North Springfield Dam — East of nature area road near the turn around, North Springfield Dam.

H7 — 4/29/98

Vernal Pool (#2). 4 meters X 2 meters X 30 centimeters. An enlarged spring area.

R. sylvatica

Vernal pools — Between Dams — Between dams, listed as 9/9-h on field map.

H8+ — 9/9/98 — Weather History: Cloudy, cool and damp for the last 2 days.

Six vernal pools in the floodplain of intermittent drainage (oxbows).
5 meters X 3 meters, 5 X 2, 3 X 3 X 10cm (still held water), 5 X 3, 3 X 2, 5 x 3.

This site was visited too late in the season to see evidence of early spring breeders.

Vernal pool — North Springfield Dam — Pond 3 north end of Stoughton Pond. Traps in pond 20m X 5m X 30 cm. See field map for this date.

H9 — 4/15/98

Pond 3 north end of Stoughton Pond. Pond 20m X 5m X 30 cm. See field map for this date. Classic vernal pool. It probably is flooded when dam is filled in spring.

A. maculatum, R. sylvatica

Vernal pool — Stoughton Pond — Vernal pool 5-19-1 on map.

H10 — 5/19/98 — Weather History: Very warm over the last 4 days, no rain.

Largest portion of a series of oxbow pools. 20 meters X 4 meters X 50 centimeters.

R. clamitans, A maculatum, and what looked like old R. sylvatica egg masses (listed in separate records). Also contained fish

Vernal pools Stoughton Pond Vernal pools 5-19-8 and 9 on map. At upper end of oxbow

H11+ 5/19/98 Weather History: Very warm over the last 4 days, no rain

Vernal pools at upper end of oxbow. 7 meters X 4 meters X 30 centimeters, and 5 meters X 3 meters X 20 centimeters

Vernal pool North Springfield Dam Pond 4, floodplain pond 50m X 5m X 50 cm. See field map for this date.

H12 4/15/98

Pond 4, floodplain pond 50m X 5m X 50 cm. See field map for this date. Filled with marsh vegetation: tussocks.

A. maculatum

Vernal pool Stoughton Pond Vernal pool 5-20-1 on map. Classic pool on the ridge on the boundary line.

H13 5/20/98 Weather History: Warm, sunny, early spring

Classic vernal pool on the ridge, 40 meters X 5 meters X 30 centimeters, on the boundary line.

A. maculatum, dark water, pollen, and poor light made it difficult to see into the pool.

Vernal pool Stoughton Pond Vernal pool 5-20-2 on map. Classic pool on the ridge on the boundary line.

H14 5/20/98 Weather History: Warm, sunny, early spring

Classic vernal pool on the ridge, 7 meters X 4 meters X 20 centimeters, on the boundary line.

Nothing seen in pool, but visibility was very poor. Rechecked on June 4, no signs of amphibian breeding.

Woodland pool Black River Woodland Pool #1 on map. Along drainage to the west of the trail.

H15 8/18/98 Weather History: Warm, humid, very wet summer

Woodland Pool along drainage to the west of the trail. It is an ~8 meters X 8 meters, widening of drainage.

*Total time reflects a 1 hour break from 13:30-14:30. This site was visited too late in the season to see evidence of early spring breeders.

Alder swamp wetland Black River Alder swamp wetland 2a and 2b on map.

H16 8/18/98 Weather History: Warm, humid, very wet summer

Alder swamp wetland is fed by springs on the hillside and roadside drainage, low sections provide possible amphibian breeding habitiat. Total area 70 meters X 30 meters, lowest area is 7 meters X 6 meters. Many seepage areas, alders, cattails, some provide amphibian breeding areas. They are quite extensive at the base of the hill, and they extend down the drainage to the floodplain.

This site was visited too late in the season to see evidence of early spring breeders.

Ephemeral pool Black River Ephemeral Pool 1a on field map. Southwest of Black River between dams.

H17 8/19/98 Weather History: Light rain yesterday, warm wet summer

Ephemeral Pool 20 meters X 5 meters, fern growth in the bottom of pool is unusual and suggests a shallow, short-lived pool, may be unproductive.

*Total time reflects a 45 minute break. This site was visited too late in the season to see evidence of early spring breeders.

Although *C. horridus* (Timber rattlesnake) was not located in the project areas, the eyes and ears of USAC employees should remain open for a possible visitation. Even after listing as an endangered species, Timber rattlesnakes continue to be killed on sight by some, and captured and sold illegally by others. In addition, roads and increased road traffic have killed many of this species. It has a low reproductive capacity. If small numbers persist in the area at all, they would probably use these lands only as summer foraging habitat. I did not locate any rattlesnakes nor did I hear recent reports of them in the area. I have no evidence of any kind that they are presently on these lands and no proof that they ever were. If located they should be well documented (photographed if possible), reported to the Vermont Natural Heritage Program, and left undisturbed. They are not an aggressive species and pose no threat to humans if left alone. Even when present they are rarely detected by recreationists. If this species is found at a later date, a useful resource on its natural history and conservation is Brown (1993). As with *C. insculpta*; education of campers and residents, controlling mowing times and heights, minimizing roads, traffic, and trails, and the use of underpasses all could help conserve this species.

Most of the woodland species of reptiles and amphibians were located above the high water line of the dams. Suggesting that they are intolerant of flooding. The recent high water line could be determined by the flotsam deposited in the woods. I have seen this intolerance to flooding before, particularly with *P. cinereus* (Redback salamander). However other species such as *E. bislineata* (N. two-lined salamander) and *D. fuscus* (Dusky salamander) were not located below the high water line in the project areas. Frogs and spring breeding salamanders did migrate into the margins of the floodplain to breed and *C. serpentina* (Snapping turtle) and *C. picta* (Painted turtle) were found in the floodplains also.

Notes on the conservation of the more common species are contained in the species found section. Other general recommendations for the maintenance of reptile and amphibian habitat is included in the handout Forest Management Practices to Minimize the Negative Impacts on Vermont Reptiles and Amphibians. I have included a copy (Appendix E).

Conservation (vernal 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 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 100m 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. If possible they should not be flooded by backwater from the dams. This could introduce predators, or prevent access to the breeding adults.

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 roads can be closed during these periods (April-May nights) it will minimize road kills of breeding adults. Although young will still need to leave the ponds in June through August. Properly designed amphibian tunnels built under roads can guide young and adult amphibians, reptiles, and small mammals under roads. These are used heavily in Europe but have only begun to be used in the US (Langton, 1989). They are a worthwhile investment in wildlife.

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 should be altered so that they do not gather any water in the spring. They could also be relocated to areas that are not disturbed, and are deep enough to hold water through July of most years.

Amphibians absorb water and any substance that is dissolved in it directly through their skin. The long-term affects of many chemicals (herbicides, pesticides, fungicides, etc.) have not been tested on amphibians. Many others have been shown to be toxic (Power et al, 1989). Alternatives to chemicals should be sought to protect amphibian species.

Other species of interest

Other species (not reptiles or amphibians) identified while in the field are written in the copies of my field notes. Those that were most unusual are listed here.

Skunk cabbage	East of N. Springfield Dam	4/28
Osprey	N. Springfield Dam	4/29, 9/8
Willow flycatcher	Stoughton Pond	5/20, 6/5
Green heron	N. Springfield Dam	6/5, 9/4
Black-billed cuckoo	Between Dams	8/18
Great egret	N. Springfield Dam	9/4,9/8,9/30

Literature cited

Brown, W.S. 1993. Biology, status, and management of the timber rattlesnake (*Crotalus horridus*): a guide for conservation, Herpetological Circular No. 22. Society for the Study of Reptiles and Amphibians 78 pp.

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.

Ernst, C.H., R.W. Barbour, and J.E. Lovich. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington D.C. 578 pp.

Garber, S.D. and J. Burger. 1995. A 20-yr study documenting the relationship between turtle decline and human recreation. Ecological Applications, 5(4) pp. 1151-1162.

Power, T., Clark, K.L., Harfenist, A., and D.B. Peakall. 1989. A review and evaluation of the amphibian toxicological literature, Technical Report No. 61, Canadian Wildlife Service, Headquarters 222 pp.

Langton, T.E., 1989. Amphibians and Roads. Proceedings of the Toad Tunnel Conference, Rendsburg, Federal Republic of Germany, 7-8 January, 1989. ACO Polymer Products, Ltd. Shefford U.K. 202 pp.

Useful sources of information on Vermont Reptiles and Amphibians.

Vermont Distribution

Andrews, J.S. 1995. A preliminary atlas of the reptiles and amphibians of Vermont. Middlebury College Reprographics. 64 pp.

Identification. A few good field guides to reptiles and amphibians exist. 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. Other excellent sources of local natural history information about New England's reptiles and amphibians are:

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

Hunter, M.L., J. Albright, and J. Arbuckle (eds.). 1992. The amphibians and reptiles of Maine. Bulletin 838, The Maine Agricultural Experiment Station, University of Maine, Orono, Maine 188 pp.

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.

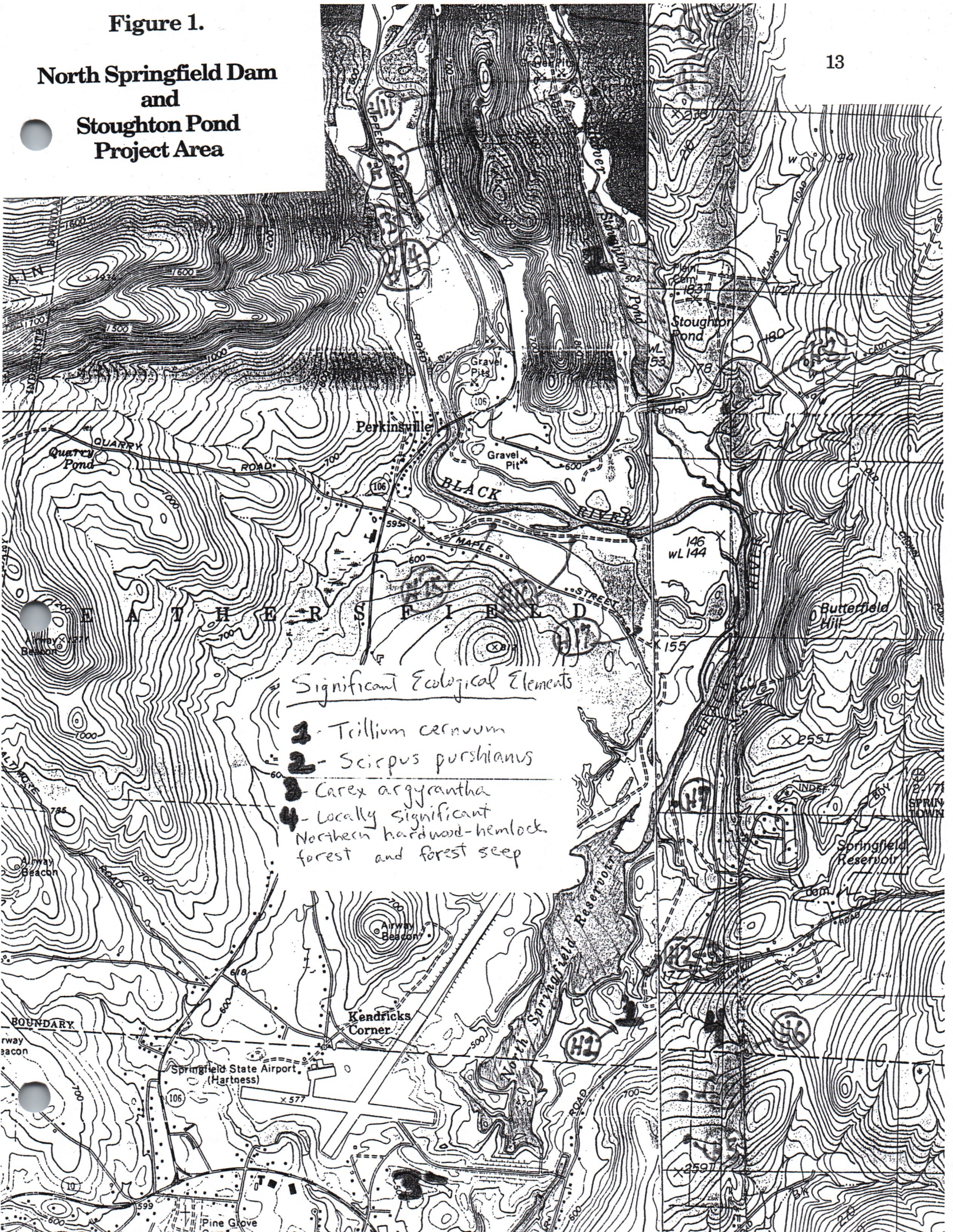
Tyning, T.F. 1990. A guide to amphibians and reptiles. Little, Brown and Company. Boston Massachusetts 400 pp.

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.

Figure 1.

North Springfield Dam and Stoughton Pond Project Area



Appendix A

Springfield and Weathersfield Records from the Vermont Herp Atlas as of January 1998

Sorted by Class and Latin Name

Gyrinophilus S4 G5 **Town** Weathersfield **County** Windsor 5/18/96

Continuation of Names of Field Workers: M. Little; J. Pryzpels; K. Royar; and K. McFarland

Little Ascutney Wildlife Management Area

J. Andrews S. Parren S. Faccio K. Cox

Necturus maculosus S2 G5 **Town** Springfield **County** Windsor 12/30/82

Article reports others having been caught. J. Andrews transcribed from paper

South of Springfield near the toll bridge

Mike Kazak

Rana pipiens S4 G5 **Town** Weathersfield **County** Windsor

Gary Pelton USACE naturalist interviewed on 6/3/98. Despite specific inquiries Gary had not seen any other species other than those surveyed by me already. He did report both Smooth green and Ringneck snakes from his home in Weathersfield. a Hognose snake from somewhere in Vermont or New Hampshire. and a

In floodplain of the North Springfield Dam.

Gary Pelton J. Andrews

Crotalus horridus S1 G5 **Town** Springfield **County** Windsor 3/15/41

New England Naturalist, No. 10, March - June 1941, "The Timber Rattlesnake in Vermont" pages 26-27, by Harold Trapido

near the Cheshire Bridge

Harold Trapido Leland Griggs

Diadophis punctatus S4 G5 **Town** Weathersfield **County** Windsor 1/1/90

Exact date not provided (~1990). Handled, bit Gary after its tail was cut off by a lawnmower. Reported to J. Andrews in a phone interview. 8-9 inches long. this is the only one he has ever seen.

Gary Pelton's Residence, Bower Hill Road, 1/10 mile west of Interstate 91 overpass. Found in lawn.

Gary Pelton

Opheodrys vernalis S4 G5 **Town** Weathersfield **County** Windsor 7/15/97

Exact date not provided (summer 1997). Alive, ~12 inches long. Gary Pelton provided record via phone interview with J. Andrews.

Gary Pelton's Residence, Bower Hill Road, 1/10 mile west of Interstate 91 overpass.

Gary Pelton

Clemmys insculpta S3 G4 **Town** Springfield **County** Windsor 1/1/86

Turtle sighted ca. Summer 1986

Rte 106, 5 miles east of junction of Routes 106 & 10

K. Cox

Clemmys insculpta S3 G4 **Town** Springfield **County** Windsor 6/17/90

Route 5 ~1.6miles S of Springfield Rte 5S/Rte 11 intersection

K. Cox

Clemmys insculpta S3 G4 **Town** Springfield **County** Windsor 8/10/90

Road casualty

Just N of Junction of Rtes 106 & 10, on 106 between County and Grace Roads, near Weathersfield Town Line

K. Cox

Clemmys insculpta S3 G4 **Town** Weathersfield **County** Windsor 6/29/95

Left front foot and tail were damaged some time ago - "stumpy" - looking

Behind the F & W garage at Springfield Airport (Hartness Municipal Airport)

Chris Bernier J. Cyr

Clemmys insculpta S3 G4 **Town** Weathersfield **County** Windsor 5/24/95

Seen by Jackie while stocking salmon fry.

First island on Black River below covered bridge in Weathersfield.

Jackie Cyr

Clemmys insculpta S3 G4 **Town** Weathersfield **County** Windsor 8/8/96

approx 5-6 inches
approx 12 years old

On Cady Hill Rd just east (~100 yds) of junction with Peekins Hill Road (Map attached -J.A.)

Jay McMenemy

Clemmys insculpta S3 G4 **Town** Weathersfield **County** Windsor 1/1/95

Gary Pelton USACE naturalist interviewed on 6/3/98 seen a few years ago. Despite specific inquiries Gary had not seen any other species other than those surveyed by me already. He did report both Smooth green and Ringneck snakes from his home in Weathersfield. a Hognose snake from somewhere in Vermont or New Hampshire. and a

North of Stoughton Pond in Weathersfield

Gary Pelton J. Andrews

Clemmys insculpta S3 G4 **Town** Weathersfield **County** Windsor 10/1/98

Duplicate record for Springfield. Date of sighting not indicated. 10/1/98 is the date of interview with Ken Cox, fisheries biologist. Gathered information on wood turtles and fish surveys (negative mudpuppy information) see notes. Old records from area.

North Springfield Dam

Ken Cox J. Andrews

Clemmys insculpta S3 G4 **Town** Springfield **County** Windsor 10/1/98

Duplicate record for Weathersfield. Date of sighting not indicated. 10/1/98 is the date of interview with Ken Cox, fisheries biologist. Gathered information on wood turtles and fish surveys (negative mudpuppy information) see notes. Old records from area.

North Springfield Dam

Ken Cox J. Andrews

Appendix B

All Herptiles Located During the 1998 Survey of the North Springfield Dam and Stoughton Pond Project Area

Sorted by Class and Latin Name

Spotted salamander	S5	Weathersfield	Windsor	4/15/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	4/15/98	Photo	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	4/15/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	4/15/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	4/28/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	4/28/98	Photo	J. Andrews
Spotted salamander	S5	Springfield	Windsor	4/28/98	Sight	J. Andrews
Spotted salamander	S5	Springfield	Windsor	4/28/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	4/29/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	4/29/98	sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	4/29/98	sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	6/4/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Spotted salamander	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
Dusky salamander	S4	Weathersfield	Windsor	4/28/98	Photo	J. Andrews
Dusky salamander	S4	Weathersfield	Windsor	4/29/98	Sight	J. Andrews
Dusky salamander	S4	Weathersfield	Windsor	6/4/98	Photo	J. Andrews
Dusky salamander	S4	Weathersfield	Windsor	8/18/98	Sight	J. Andrews
Dusky salamander	S4	Weathersfield	Windsor	9/9/98	Sight	J. Andrews
Northern two-lined	S5	Weathersfield	Windsor	4/28/98	Photo	J. Andrews
Northern two-lined	S5	Weathersfield	Windsor	4/28/98	Sight	J. Andrews
Northern two-lined	S5	Weathersfield	Windsor	4/28/98	Sight	J. Andrews
Northern two-lined	S5	Springfield	Windsor	4/29/98	Sight	J. Andrews
Northern two-lined	S5	Weathersfield	Windsor	6/5/98	Photo	J. Andrews
Northern two-lined	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
Northern two-lined	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
Northern two-lined	S5	Weathersfield	Windsor	8/19/98	Sight	J. Andrews
Northern two-lined	S5	Weathersfield	Windsor	8/18/98	Sight	J. Andrews
Northern two-lined	S5	Weathersfield	Windsor	9/9/98	Sight	J. Andrews
Northern two-lined	S5	Weathersfield	Windsor	9/4/98	Sight	J. Andrews
Eastern newt	S5	Weathersfield	Windsor	4/14/98	Sight	J. Andrews
Eastern newt	S5	Weathersfield	Windsor	4/29/98	Sight	J. Andrews
Eastern newt	S5	Weathersfield	Windsor	6/5/98	Sight	J. Andrews
Eastern newt	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
Eastern newt	S5	Weathersfield	Windsor	9/9/98	Sight	J. Andrews
Eastern newt	S5	Springfield	Windsor	9/8/98	Sight	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	4/28/98	Photo	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	4/28/98	Sight	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	4/28/98	Photo	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	6/4/98	Photo	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	6/4/98	Sight	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	6/4/98	Sight	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	6/5/98	Sight	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	8/20/98	Sight	J. Andrews
Redback salamander	S5	Weathersfield	Windsor	9/9/98	Sight	J. Andrews
Redback salamander	S5	Springfield	Windsor	9/4/98	Sight	J. Andrews
American toad	S5	Weathersfield	Windsor	6/4/98	Photo	J. Andrews
American toad	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
American toad	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
American toad	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
American toad	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
American toad	S5	Springfield	Windsor	5/19/98	Heard	J. Andrews

American toad	S5	Weathersfield	Windsor	5/19/98	Heard	J. Andrews
American toad	S5	Weathersfield	Windsor	5/19/98	Heard	J. Andrews
American toad	S5	Weathersfield	Windsor	8/19/98	Sight	J. Andrews
American toad	S5	Weathersfield	Windsor	8/18/98	Sight	J. Andrews
American toad	S5	Weathersfield	Windsor	8/20/98	Sight	J. Andrews
American toad	S5	Weathersfield	Windsor	9/4/98	Sight	J. Andrews
Gray tree frog	S5	Weathersfield	Windsor	5/20/98	Heard	J. Andrews
Gray tree frog	S5	Springfield	Windsor	5/19/98	Heard	J. Andrews
Gray tree frog	S5	Springfield	Windsor	5/19/98	Sight	J. Andrews
Gray tree frog	S5	Weathersfield	Windsor	5/19/98	Heard	J. Andrews
Gray tree frog	S5	Weathersfield	Windsor	5/19/98	Heard	J. Andrews
Gray tree frog	S5	Weathersfield	Windsor	9/4/98	Heard	J. Andrews
Spring peeper	S5	Weathersfield	Windsor	4/15/98	Heard	J. Andrews
Spring peeper	S5	Springfield	Windsor	4/15/98	Sight	J. Andrews
Spring peeper	S5	Weathersfield	Windsor	4/14/98	Sight	J. Andrews
Spring peeper	S5	Weathersfield	Windsor	4/29/98	Heard	J. Andrews
Spring peeper	S5	Springfield	Windsor	5/19/98	Heard	J. Andrews
Spring peeper	S5	Weathersfield	Windsor	5/19/98	Heard	J. Andrews
Spring peeper	S5	Weathersfield	Windsor	5/19/98	Heard	J. Andrews
Spring peeper	S5	Weathersfield	Windsor	8/18/98	Heard	J. Andrews
Spring peeper	S5	Weathersfield	Windsor	8/20/98	Sight	J. Andrews
Spring peeper	S5	Weathersfield	Windsor	9/9/98	Sight	J. Andrews
Spring peeper	S5	Weathersfield	Windsor	9/9/98	Heard	J. Andrews
Bullfrog	S5	Springfield	Windsor	5/19/98	Heard	J. Andrews
Bullfrog	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	4/15/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	4/28/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	6/4/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	6/5/98	Photo	J. Andrews
Green frog	S5	Weathersfield	Windsor	6/5/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	5/20/98	Heard	J. Andrews
Green frog	S5	Springfield	Windsor	5/19/98	Heard	J. Andrews
Green frog	S5	Weathersfield	Windsor	5/19/98	Heard	J. Andrews
Green frog	S5	Weathersfield	Windsor	8/18/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	9/9/98	Sight	J. Andrews
Green frog	S5	Springfield	Windsor	9/8/98	Sight	J. Andrews
Green frog	S5	Springfield	Windsor	9/8/98	Sight	J. Andrews
Green frog	S5	Weathersfield	Windsor	9/4/98	Sight	J. Andrews
Pickerel frog	S4	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
Pickerel frog	S4	Springfield	Windsor	5/19/98	Heard	J. Andrews
Pickerel frog	S4	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Pickerel frog	S4	Weathersfield	Windsor	8/19/98	Sight	J. Andrews
Pickerel frog	S4	Weathersfield	Windsor	8/20/98	Sight	J. Andrews
Pickerel frog	S4	Weathersfield	Windsor	9/9/98	Sight	J. Andrews
Pickerel frog	S4	Springfield	Windsor	9/8/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	4/15/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	4/15/98	Photo	J. Andrews
Wood frog	S5	Springfield	Windsor	4/15/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	4/14/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	4/14/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	4/14/98	Heard	J. Andrews
Wood frog	S5	Weathersfield	Windsor	4/28/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	4/28/98	Sight	J. Andrews

Wood frog	S5	Springfield	Windsor	4/28/98	Sight	J. Andrews
Wood frog	S5	Springfield	Windsor	4/28/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	4/29/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	4/29/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	6/4/98	Photo	J. Andrews
Wood frog	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	5/20/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	8/19/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	8/18/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	8/20/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	9/9/98	Sight	J. Andrews
Wood frog	S5	Weathersfield	Windsor	9/4/98	Sight	J. Andrews
Milk snake	S5	Weathersfield	Windsor	8/20/98	Sight	J. Andrews
Common garter snake	S5	Weathersfield	Windsor	6/5/98	Photo	J. Andrews
Common garter snake	S5	Weathersfield	Windsor	6/5/98	Sight	J. Andrews
Common garter snake	S5	Weathersfield	Windsor	5/19/98	Sight	J. Andrews
Common garter snake	S5	Weathersfield	Windsor	8/20/98	Sight	J. Andrews
Common garter snake	S5	Weathersfield	Windsor	8/20/98	Sight	J. Andrews
Common garter snake	S5	Weathersfield	Windsor	9/4/98	Sight	J. Andrews
Snapping turtle	S5	Weathersfield	Windsor	4/29/98	Sight	J. Andrews
Snapping turtle	S5	Weathersfield	Windsor	4/29/98	Sight	J. Andrews
Painted turtle	S5	Weathersfield	Windsor	4/15/98	Sight	J. Andrews
Painted turtle	S5	Springfield	Windsor	4/15/98	Sight	J. Andrews
Painted turtle	S5	Weathersfield	Windsor	4/29/98	Sight	J. Andrews
Painted turtle	S5	Weathersfield	Windsor	4/29/98	Sight	J. Andrews
Painted turtle	S5	Weathersfield	Windsor	6/5/98	Sight	J. Andrews
Painted turtle	S5	Weathersfield	Windsor	6/5/98	Sight	J. Andrews
Painted turtle	S5	Weathersfield	Windsor	8/19/98	Sight	J. Andrews
Painted turtle	S5	Weathersfield	Windsor	8/20/98	Sight	J. Andrews
Wood turtle	S3	Weathersfield	Windsor	10/1/98	Sight	Ken Cox
Wood turtle	S3	Springfield	Windsor	10/1/98	Sight	Ken Cox

Appendix C

Vermont Nongame and Natural Heritage Program Rankings for Reptiles and Amphibians

1997 List

Amphibians and Reptiles of Vermont
Legal Status and Informational Ranks
October 1997

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

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Amphibians					
Ambystoma jeffersonianum	Jefferson salamander	S2	G5	SC	
Ambystoma laterale	Blue-spotted salamander	S3	G5	SC	
Ambystoma maculatum	Spotted salamander	S5	G5		
Ambystoma opacum	Marbled salamander	SR	G5		
Desmognathus fuscus	Dusky salamander	S4	G5		
Desmognathus ochrophaeus	Mountain dusky salamander	SR	G5		
Eurycea bislineata	Two-lined salamander	S5	G5		
Gyrinophilus porphyriticus	Spring salamander	S4	G5		
Hemidactylium scutatum	Four-toed salamander	S2	G5	SC	
Plethodon cinereus	Redback salamander	S5	G5		
Necturus maculosus	Mudpuppy	S2	G5	SC	
Notophthalmus viridescens	Eastern newt	S5	G5		
Bufo americanus	American toad	S5	G5		
Bufo woodhousii	Woodhouse's toad	S1	G5	SC	
Hyla versicolor	Gray treefrog	S5	G5		
Pseudacris triseriata	Northern chorus frog	S1	G5	E	
Pseudacris crucifer	Spring peeper	S5	G5		
Rana catesbeiana	Bullfrog	S5	G5		
Rana clamitans	Green frog	S5	G5		
Rana palustris	Pickerel frog	S4	G5		
Rana pipiens	Northern leopard frog	S4	G5		
Rana septentrionalis	Mink frog	S4	G5		
Rana sylvatica	Wood frog	S5	G5		
Reptiles					
Chelydra serpentina	Snapping turtle	S5	G5		
Chrysemys picta	Painted turtle	S5	G5		
Clemmys guttata	Spotted turtle	S1	G5	T	
Clemmys insculpta	Wood turtle	S3	G4	SC	
Graptemys geographica	Map turtle	S3	G5	SC	
Sternotherus odoratus	Stinkpot	S2	G5	SC	
Apalone spinifera	Spiny softshell	S1	G5	T	
Eumeces fasciatus	Five-lined skink	S1	G5	E	
Coluber constrictor	Black racer	S1	G5	SC	
Diadophis punctatus	Ringneck snake	S4	G5		
Elaphe obsoleta	Rat snake	S2	G5	SC	
Lampropeltis triangulum	Milk snake	S5	G5		
Nerodia sipedon	Northern water snake	S4	G5		
Opheodrys vernalis	Smooth green snake	S4	G5		
Storeria dekayi	Brown snake	S4	G5		
Storeria occipitomaculata	Northern red-bellied snake	S5	G5		
Thamnophis sauritus	Eastern ribbon snake	S3	G5		
Thamnophis sirtalis	Common garter snake	S5	G5		
Crotalus horridus	Timber rattlesnake	S1	G5	E	

Vermont Nongame & Natural Heritage Program
Department of Fish and Wildlife
Explanation of Legal Status and Information Ranks

State Status As per the Vermont Endangered Species Law (10 V.S.A. Chap. 123)

E: Endangered: in immediate danger of becoming extirpated in the state
T: Threatened: with high possibility of becoming endangered in the near future

Information categories only; not established by this law

SC: Special Concern: rare; status should be watched
PE: Proposed for endangered
PT: Proposed for threatened

Federal Status As per the Federal Endangered Species Act (P.L. 93-205)

LE: Listed endangered
LT: Listed threatened

NATURAL HERITAGE RANKING Informational categories only; not established by law. Developed by the Science Division of The Nature Conservancy.

State Ranks of Plants, Animals, and Natural Communities

State ranks are assigned by the Nongame & Natural Heritage Program based on the best available information. Ranks are reviewed annually. For bird species the ranks refer to breeding status only.

S1: Very rare, generally 1 to 5 occurrences believed to be extant and/or some factor(s) making it especially vulnerable to extirpation from the state.
S2: Rare, generally 6 to 20 occurrences believed to be extant and/or some factor(s) making it vulnerable to extirpation in the state
S3: Uncommon, believed to be more than 20 occurrences and/or there is some threat to it in the state
S4: Apparently secure in state, often with more than 100 occurrences
S5: Demonstrably secure in state
SA: Accidental in state
SE: An exotic established in state
SH: Known from historical records only
SR: Reported from the state, but without persuasive documentation
SRF: Reported in error but this error persisted in the literature
SP: Possible in the state but no reported or documented records
SSYN: No longer considered a taxon in the state.
SZ: Not of practical conservation concern because there are no definable occurrences
SX: Extirpated from the state
SU: Status uncertain
?: Denotes provisional rank
Breeding Status (primarily birds) only for species which have distinct breeding and or nonbreeding populations
B: Breeding status e.g. S1B is a very rare breeder
N: Nonbreeding status e.g. S1N is a very rare nonbreeder; and SZN is a migrant that occurs in an irregular, transitory, and/or dispersed manner

Global Ranks of Plants, Animal, and Natural Communities

Global Ranks are assigned by the international network of Natural Heritage Data Centers. The ranks are tracked by The Nature Conservancy and by The Natural Heritage Programs. They reflect the rarity and endangerment of species worldwide.

G1: Critically imperiled globally (on the order of 1-5 occurrences worldwide)
G2: Endangered globally (ca. 6-20 occurrences worldwide)
G3: Threatened globally: rare and/or local
G4: Apparently secure globally, though perhaps locally rare
G5: Demonstrably secure globally
T: Subrank for subspecies and varieties; 1-5 ranking similar to G ranks
Q: Questionable taxonomic assignment
?: Denotes provisional rank
NE: Exotic established in nation
GU: Status uncertain

For further information contact the Nongame and Natural Heritage Program, Vermont Dept. of Fish and Wildlife, Waterbury, VT 05671-0501 (802) 241-3700

Appendix D

Identification and Natural History Notes on the Amphibians of Vermont

Species which lay their eggs in still water, but spend most of their adult lives on land

Name	Field Marks	Habitat	Occurrence	Notes
Blue-spotted salamander *Ambystoma laterale* 9-12 cm	a small but solid bodied salamander with a black background heavily spotted with blue, a narrow head, and closely spaced nostrils	lowland oxbows and temporary pools; usually near rocky hillsides	can be fairly abundant in good habitat; apparently scattered throughout the state	usually found with its hybrid relatives; not as subterranean as Jefferson's; much easier to find outside the breeding season
Blue-spotted salamander hybrids *Ambystoma laterale X jeffersonianum* 9-16 cm	larger than the above species with slightly wider heads and more widely spaced nostrils	same as above	same as above	usually found with and outnumbering its non-hybrid relatives
Jefferson salamander *Ambystoma jeffersonianum* 15-18 cm	a large, gray-brown, solid-color, salamander with a few small light flecks restricted to the lower sides; look for the broad head and widely spaced nostrils	rocky wooded areas with upland vernal pools and semipermanent ponds	apparently restricted to low hills outside of the Green Mountains	usually associated with the hybrids listed below; very difficult to locate outside of its breeding period in April
Jefferson salamander hybrids *Ambystoma jeffersonianum X laterale* 10-18 cm	more heavily spotted with blue than the Jefferson's with a narrower head and darker background color but still a large salamander	same as above	same as above	these hybrid complex salamanders often outnumber the non-hybrids with which they are found; they are almost entirely female and are genetically diverse
Spotted salamander *Ambystoma maculatum* 11.2-19.7 cm	a large heavy bodied salamander with a black background and yellow spots (the yellow of the spots is sometimes mixed with red or green)	found in greatest concentrations in woods around permanent or semipermanent, fishless, bodies of standing water with vegetation along the margins, but it also breeds in temporary pools	widespread throughout the state in wet wooded areas where appropriate breeding habitat can be found	easiest to find during its spring breeding season of April-May; at other times it remains underground
Four-toed salamander *Hemidactylium scutatum* 5.1-9 cm	a slightly rounded orange-brown body, an enamel-white belly with black spots and a constriction at the base of its tail	rocky oak-hickory hillsides including or adjacent to dark swamps or pools with sphagnum moss	probably restricted to the warmer areas of western and southern Vermont; it is never very abundant	only recently has it been discovered in the Lake Champlain Basin

Species which are entirely terrestrial throughout their lives

Name	Field Marks	Habitat	Occurrence	Notes
Redback salamander *Plethodon cinereus* 5.7-10 cm	small slender and delicate with a flat red back; sometimes dark brown or gray morphs are found	mature hardwood forests that are not highly acidic in nature appear to be the best habitat but it is found in smaller numbers in any wet woods	widely distributed at all elevations throughout the state; often very abundant under ideal conditions	our only salamander that does not spend its larval stage in the water, hence it can be found far from the nearest standing water

Unconfirmed species found in nearby states

Marbled salamander *Ambystoma opaqum* 9-10.7 cm	short, heavy, rounded, body with a black background and strong pewter bars or blotches	dry hillsides with semipermanent or temporary pools	reported once in the 50's from the Inman Pond area of Fair Haven	not verified in the state; unlike other *Ambystoma* species it migrates to breeding sites in fall
Mountain dusky salamander *Desmognathus fuscus* 7-10 cm	look for a redback-like dusky with a rounded tail and a light line from the eye to the corner of its mouth	redback-type habitat under logs and rocks but along streams and ravines	one juvenile reported from within the state; no populations of adults have been located	this species is found across the border in New York State; the Taconics would be a good place to look for it
Slimy salamander *Plethodon glutinosis* 12.1-17.2 cm	a large slender black salamander with white spots and very sticky skin secretions	shaley stream-banks or road-cuts	limited amounts of this habitat occur in Vermont, if found, one would expect it to be in southern Vermont	isolated populations are reported from New Hampshire but the contiguous range begins further south in southern New York

Version 3, James S. Andrews, April 1996; most sizes and names are taken from Reptiles and Amphibians of Eastern/Central North America by Roger Conant and Joseph T. Collins, 1991

The Frogs of Vermont

Name	Field Marks	Habitat	Occurrence	Notes
American toad *Bufo americanus* 5.1-9 cm	rough warty skin with small black spots; usually one or two large warts per spot; belly with black markings	widespread in many habitats, at all elevations, but most common in woodlands with small bodies of permanent and semipermanent water	rarely found in dense concentrations; often in yards and driveways under lights but seems to most abundant in scattered forested areas	glands on its head release toxins when it is eaten
Fowler's toad *Bufo woodhousii fowleri* 5.1-7.5 cm	rough warty skin with large black spots; usually many small warts per spot; plain white belly; other differences need to be studied carefully with text diagrams	sandy soils ?	very rare, two reports from southern Vermont; we are at the northern extreme of its range	the mating call is a very distinctive bleating cry; somewhat like the crying of a baby or bleating of a sheep
Gray treefrog *Hyla versicolor* 3.2-5.1 cm	rough, bumpy, skin similar to a small toad but with a small white patch under the eye and adhesive disks on its toes; usually grayish but it sometimes can be found in background colors from white to dark green	in the vicinity of slow moving or standing water with abundant vegetation	widespread if appropriate breeding habitat can be found; usually in trees when not breeding	can be located by its call during breeding season (May - July), very difficult to locate otherwise
Bullfrog *Rana catesbeiana* 9-15.2 cm	very large size, looks like large green frog except dorsolateral ridges do not extend down the edges of the back past the tympanum (ear)	standing or slow-moving permanent water, usually at lower elevations in or near large water bodies	locally common, but missing from large areas that do not contain the appropriate habitat	wanders from water only during heavy rains
Green frog *Rana clamitans* 5.7-9 cm	a medium-sized green frog with ridges extending well past the tympanum and with stripes on the hind legs oriented across the legs	permanent water of all kinds and sizes, (rivers, ponds, lakes)	very widespread at all elevations but most abundant on standing or slow moving well vegetated water bodies	this is the common pond frog; it wanders from water only during heavy rains; it's color and pattern vary tremendously from light to very dark-green and unspotted to heavily spotted
Mink frog *Rana septentrionalis* 4.8-7 cm	very much like a small green frog but the ridges usually don't extend past the tympanum (ear); it is heavily spotted with spots on, not bands crossing the legs; when agitated it releases a burst of garlic scent	slow-moving heavily vegetated bodies of water adjacent to larger bodies	locally common only in the far north and central part of the state	often reported to be associated with northern spruce-fir forests or at least the latitudes where these forests are found

Name	Field Marks	Habitat	Occurrence	Notes
Wood frog *Rana sylvatica* 3.5-7 cm	a medium-sized frog that has a plain-brown back with black patches below the eyes and around the tympanum, the upper lip is white in contrast	very widespread in woodlands of all elevations, where semipermanent or temporary pools can be found to breed in	very abundant in woodlands throughout the state	the color of the brown varies tremendously from very light to dark and reddish to brown
Northern leopard frog *Rana pipiens* 5.1-9 cm	a medium-sized frog that has oval spots on a green or gold background with white on the underside of the legs	often found in fields or woods near large lowland marshes and swamps	can be locally very abundant but missing from high elevations and other portions of the state	compare carefully with the Pickerel frog
Pickerel frog *Rana palustris* 4.4-7.5 cm	a medium-sized frog that has roughly rectangular spots on a brown background; look for the yellow undersurface of the legs on the adult frogs	beaver meadows and adjoining woods near clean, cool, permanent, water	never very abundant but compared to leopard frogs it is more widespread in woods and mountains throughout the sate	reported to release toxins capable of killing other amphibians when in a confined area
Spring peeper *Pseudacris crucifer* 1.9-3.2 cm	a very small brown frog with thin dark lines that often form a rough X on its back; small adhesive disks on its toes	in vegetation or woods near heavily vegetated swamps and marshes of all sizes; apparently missing from the immediate areas populated by bullfrogs	can be very abundant and is widespread at all elevations throughout Vermont	with the occasional exception of moist woods in late summer and early fall it can be difficult to locate other than by its call in the spring
Western chorus frog *Pseudacris triseriata* 1.9-3.9 cm	a peeper-sized frog with parallel stripes running the length of its back	apparently peeper-type habitat	one population was located in Grand Isle county in the 1980's, but it has not been found since	it has not been located at all in Vermont in recent years; state endangered; we are at the eastern limit of its range

Version 2, James S. Andrews, April 1996 most sizes and names are taken from Reptiles and Amphibians of Eastern/Central North America by Roger Conant and Joseph T. Collins, 1991

Appendix E

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