

Mt. Mansfield Amphibian Monitoring

Update

2010

(Covering 1993-2010)

For the Vermont Monitoring Cooperative

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Amphibian Monitoring on Mt. Mansfield, Vermont 1993-2010

Background

After an initial amphibian survey and establishment of monitoring protocols, populations of amphibian species have been monitored annually on Mount Mansfield since 1993. The goals of the monitoring are to (1) establish a baseline data set of abundance indices for the amphibian species caught in the fences, (2) monitor year-to-year changes in their abundance indices, (3) monitor changes in the number and type of obvious external abnormalities, (4) gather inventory data for the Vermont Herp Atlas, and (5) gather basic natural history information on the species present. Amphibians are targeted for this kind of study because their multiple habitat usage and permeable skin make them especially sensitive to changes in environmental conditions. This is the longest-running set of amphibian monitoring data in the state. Three fences are opened and checked up to five times per month during rain events throughout the field season (April through October excluding August). The abundance indices are generated using the three most successful trap-nights per month. For more detailed information on methods, locations of fences, and survey results, see the 1995 VForEM annual report.

The drift-fence array at Mt. Mansfield was the only amphibian drift-fence monitoring location in Vermont from 2003 through 2007. During 2008 monitoring began again at Lye Brook Wilderness and continued at Mt. Mansfield as well. Periodic monitoring at Lye Brook allows us to compare data at the two locations to see if there are corresponding patterns that may signal statewide changes. In 2009 only the Lye Brook Wilderness fences were monitored and we hope to return there in 2012. Intensive monitoring in 2011 will be at Mt. Mansfield only.

As per a former contract with the State of Vermont, in 2009 it was agreed that amphibian and reptile monitoring and survey data would continue to be gathered, reviewed, entered into our database, and forwarded to the Vermont Monitoring Cooperative. However, in an effort to save money and time, we agreed at that point to begin an every-other-year schedule of generating indices, analyzing, and reporting on the data gathered. Consequently, the 2009 report included basic background information and a very brief review of the survey data. Funding allowed for data collection at Lye Brook during the field season of 2009, and at Mount Mansfield in 2010. This report contains analyses of these data. Electronic copies of the data are included with this report.

Population Trends

In 2010 all the usual salamander species were caught as adults, including two Spring Salamanders (*Gyrinophilus porphyriticus*). Young of all of these salamander species except Northern Dusky (*Desmognathus fuscus*) and Spring Salamanders were also caught. These are the same species and age-classes that were caught in 2008.

In 2010 and in 2008 adults of all the local anurans (frogs) normally found were caught except there were no adult or young Spring Peepers (*Pseudacris crucifer*). The last time an adult Spring Peeper was caught at our three fences was in 2007. In 2010 all anuran young of the year were found except Pickerel Frogs (*Lithobates palustris*).

Linear regressions most closely fit most of the data plots, so they were used to show potential trends in the abundance indices for all species caught from 1993-2010 (Figures 1-6). The data gathered suggest that only the Eastern Red-backed Salamander (*Plethodon cinereus*) shows a significant increase. During the same time frame the Spring Peeper has disappeared from our fences and the Wood Frog (*Lithobates sylvaticus*) is showing a significant decline.

Young of the Year

In the 1995 report we began calculating the number of young of the year and percentage of young of the year, and recording date of first metamorph found in a drift fence. The cutoff points listed on Table 1 were calculated in 1995, based on data we had collected and information gathered from the literature. As mentioned in the footnotes, in addition to using the total length as one cutoff for determining young of the year, we also use dates, as some larvae or tadpoles may overwinter in their aquatic phase and metamorphose in the early spring. In 2010, young of the year made up 23% of those caught, slightly higher than 2007 and 2008, 21% and 17% respectively (Table 3 and 4). These percentages are low relative to previous years of this study. Since the study's inception the young of the year have varied from 16% (1998) to 74% (2002). Table 3 and Table 4 summarize the young of the year information for salamanders and frogs respectively.

All frogs monitored except for Green Frogs (*Lithobates clamitans*) generally go from egg to metamorph in one season. At this latitude, Green Frogs spend at least one winter as a tadpole and metamorphose a year or more after the eggs were laid. Other frogs can metamorphose at a very small size. American Toads (*Anaxyrus americanus*) can be as small as 8-13 mm after metamorphosis. Gray Treefrogs (*Hyla versicolor*) as small as 15 mm. Wood Frogs can transform as small as 10-20 mm and Spring Peepers as small as 13 mm. It is possible that a froglet may have transformed in a previous year but still be under the cut-off size to be considered young of the year when found the following spring. Therefore, when determining young of the year we did not include small frogs or toads found in spring or early summer if it was unlikely enough time had passed to allow for typical development. Different species of salamanders show even more variability and for many the term *young of the year* is misleading. It would be more accurate for us to say *first year of terrestrial phase*. The Eastern Newt (*Notophthalmus viridescens*) and the Eastern Red-backed Salamander generally develop into a terrestrial form in the first year of their life; although like the frogs, they may still be very small and below our cutoff sizes the spring after they were deposited as eggs. Spotted Salamanders (*Ambystoma maculatum*) have a minimal larvae phase of about 60 days but can remain in the water over their first winter. Small Spotted Salamanders found in the spring and early summer are not counted as young of the year in this report. Northern Dusky Salamanders can spend 7 to 11 months as larva and transform the spring after emerging from eggs. Northern Two-lined Salamanders (*Eurycea bislineata*) may remain in their aquatic stage for 2 – 3 years, and Spring Salamanders for up to 3-4 years (Harding 2000). The young of the year for these species were individuals that had likely hatched in previous years but were spending their first year in the terrestrial form.

Green Frog

The number of Green Frogs increased slightly through 2002 when there was a dramatic increase from 1.9 per trapping to 22.1 per trapping, for a total of 350 Green Frogs captured (Figure 1). After that one dramatic year, there was a large drop back down to the historic trend line in 2003 and only relatively small annual variations since then. In 2010 only 0.9 Green Frogs were found per trapping. Currently, the population appears to be level with no significant negative or positive trends seen. So far, the take home message here is the ability of this species to show dramatic short-term population changes.

American Toad

In our last update we reported that the number of American Toads appeared to fluctuate in a cyclical way growing to peaks over the course of a few years and then gradually dropping back down over a few years. However, the data from 2003 through 2008 revealed an entirely new pattern of large annual variations (Figure 2) with the peak in 2007 (3.4 toads per trapping) very close to the all-time high in 1998 of 3.6 toads per trapping. In 2010, 2.2 toads were found per trapping. This new annual variation is so large that no significant long-term trend can be seen.

Wood Frog

Wood Frogs continue to have large year-to-year fluctuations (Figure 3 and Table 2) but a long-term decline is very clear. In 2005 and in 2006 their per-trapping rate fell to 1.9 and 2.1 followed by an increase in 2007

to 4.7 and back down to 2.5 in 2008. In 2010 very few Wood Frogs were found, 1.9 per trapping. The species is showing a distinct, and dramatic, downward trend. The cause of this decline is unknown but is of concern. Appropriate breeding habitat still exists close to at least one of the fences and egg-masses have been observed in these pools. However, there may have been declines in foraging habitat, overwintering success, or successful development of the eggs or young.

Spring Peeper

Although the numbers vary from year-to-year, the overall trend for Spring Peepers has been steadily downward since 1993 (Figure 3). In 2007 we had only two Spring Peepers caught during the entire season and no young of the year. In 2008 and in 2010 we had no adults or young. This is not the first time however, that we had no Spring Peepers at the fences. In 2001 we also had no Spring Peepers for that one year. However, the current disappearance has now lasted for three years. This is of concern and we don't know the cause of this decline. As mentioned in previous updates, local changes in breeding habitat are one possible explanation for a localized long-term decline, but we have no data to support a significant change in habitat. Spring Peepers breed primarily in open, shallow, and well-vegetated wetlands. If local breeding habitat were flooded by beaver and/or exposed to trout, populations might well be expected to decline. This is supported by the fact that we have never caught a Spring Peeper at the drift-fence at Underhill State Park. As far as we can tell, there is no breeding habitat in that area.

We mentioned in our last update that predation from an increased number of Green Frogs might be related to the declines; however, Green Frogs have been declining themselves for the last few years with no corresponding increase in the numbers of Spring Peepers. Other possible causes could be the aging of forests, loss of edge habitat, and the resulting shading of wetlands in the area. However, the concurrent decline in Wood Frogs, a species that breeds successfully in pools surrounded by mature hardwood forests, suggests there may be some other factor impacting both species (foraging habitat, overwintering success, developmental issues). So far, we have not seen this decline at Lye Brook Wilderness, so this decline appears to be a local phenomenon.

Eastern Newt

The Eastern Newt has also shown large annual fluctuations in recent years. From 1993 to 2002 the largest annual change in our abundance index was 0.5 per trapping. In 2003 the index dropped 1.1, jumped back up 1.2 in 2005 (two years later), dropped 0.9 in 2006 and has climbed by 0.5 per year for the last two years. In 2010 1.6 animals were captured per trapping. Due to this large annual variation, the long-term trend line is not particularly meaningful, but shows a virtually flat line since 1993 to 2010 (Figure 4).

Eastern Red-backed Salamander

Like the other amphibian species found at this site, the Eastern Red-backed Salamander population sometimes fluctuates largely from year-to-year, however, since 2001 this species has shown a steady, and now dramatic, increase from 1.8 to 6.7 captures per trapping in 2008 and a record 8.9 salamanders per trapping in 2010 (Figure 5). This is the greatest abundance of this species that we have seen at this site since monitoring began. This species is reported to do well in maturing hardwood forests with abundant woody debris. Unlike the Wood Frog and Spring Peeper it overwinters deep in the soil below the frost line, so it should not be subject to overwintering mortality. Also, unlike Wood Frogs and Spring Peepers, it does not require wetlands in any stage of its development.

Spotted Salamander

The Spotted Salamander has a virtually flat trend line, with increased annual variation since 2002 (Figure 5). In 2010, 2.0 animals were captured per trapping. This is only the second time this many animals have been found since the study began. This is a long-lived species with a life span of over 20 years. As a result, adult numbers are not expected to vary as much as a shorter-lived species such as a Spring Peeper or Wood Frog. At this site it breeds in the same pools as the Wood Frog. Table 3 shows that breeding in these pools was successful in 2010 for this species since 57% of the Spotted Salamanders caught in 2010 were young of

the year. One might assume that Wood Frog recruitment should also have been high in these pools, but Table 4 shows that recruitment of Wood Frogs has been low since 2003 when 59% of those caught were young of the year. One difference is that Spotted Salamanders are more tolerant of predation, short-term draught, and late season freezes than are Wood Frogs. They also over-winter well below the frost line where Wood Frogs freeze and thaw in the leaf litter and are very susceptible to winter kill if soil temperatures drop below approximately -6 C (20-21 F). Another interesting correlation is that the increased annual variation of Spotted Salamanders began in 2002, the same year that Green Frog populations soared, Wood Frog populations peaked, and E. Red-backed Salamanders began their impressive increase. The different life histories of these species may provide some clues as to what is driving declines in Wood Frogs and Spring Peepers at the same time we see increases in other species such as Eastern Red-backed Salamanders.

Pickerel Frog

We catch so few Pickerel Frogs (>1.0 per trapping) that although it appears the population continues to decrease slightly; it is not possible to draw any meaningful conclusions (Figure 2 and Table 3).

Northern Two-lined Salamander

In the past, we have also caught very few Northern Two-lined Salamanders. In 2005 we saw a great increase to 1.1 per trapping, followed in 2006 by a dramatic drop back to 0.2, then 0.4 in 2007 and 0.9 in 2008 and then back to 1.1 in 2010. (Figure 6 and Table 3). The fences are not located in appropriate locations to monitor for this species. They prefer saturated soils however and increased saturation of soils as a result of heavy rains would be expected to increase numbers of this species at the fences. The increasing trend line shown in Figure 6 represents a very small sample size and could change quickly.

Abnormalities

The number of abnormalities continues to be low. In 2007 and 2008 there were no amphibians found with abnormalities out of 300 caught in 2007 and 208 caught in 2008. Again in 2010, no abnormalities were found in the 274 animals captured. The numbers of abnormalities at this site have always been well below the level of concern. From 1998 through 2010, the total number of amphibians showing abnormalities from all captures has been 11 individuals.

Summary

The drift-fence array at Mt. Mansfield has facilitated the longest-running amphibian-monitoring program in the state. It was the only amphibian drift-fence monitoring location in Vermont from 2003 through 2007. During 2008 monitoring began again at Lye Brook Wilderness and continued at Mt. Mansfield as well. During 2009 monitoring took place only at Lye Brook and in 2010 monitoring took place only at Mt. Mansfield. Data from these efforts has been exported in Excel format and sent via E-mail to VMC. Monitoring will continue at Mt. Mansfield in 2011 and hopefully return for one more year at Lye Brook in 2012.

Although we have not used power analysis to evaluate apparent trends in species populations since 2001 (see 2001 VForEM annual report), at that time three species (American Toad, Green Frog, and Wood Frog) were increasing overall, and we had the statistical power to confidently report those trends. Despite the lack of the more statistically rigorous power analysis recently, the linear regressions alone show that these trends have not continued. The Green Frog and the American Toad show no significant trends, although they have shown some large annual variation. The Wood Frog is now showing a dramatic decline as a result of particularly low abundance in 2005, 2006, 2008, and 2010. The downward trend for Spring Peepers has reached bottom with no Spring Peepers of any age captured at our fences in 2008 or 2010. Eastern Red-backed Salamanders have increased in abundance for the last nine years and are now more numerous than at any other time since monitoring began at this site in 1993. There was also some precipitating event in 2002 when both Wood Frogs and Green Frogs showed a very brief one-year peak in abundance. At the same time Spotted Salamanders began larger annual oscillations in annual populations

and within a year Eastern Red-backed Salamanders began their dramatic population increase. Life history differences and similarities between species will help us rule out some potential causes of these changes and suggest others, but at this point, little is known about what is driving these changes.

Although always rare at this site, the number of abnormalities remains very low.

Acknowledgments

The Vermont Department of Forests, Parks, and Recreation through the Vermont Monitoring Cooperative (VMC) and Vermont Family Forests supported long-term monitoring at Mt. Mansfield during 2010. Field personnel were Irene Linde, Robert Robbins, and Warren Ellison.

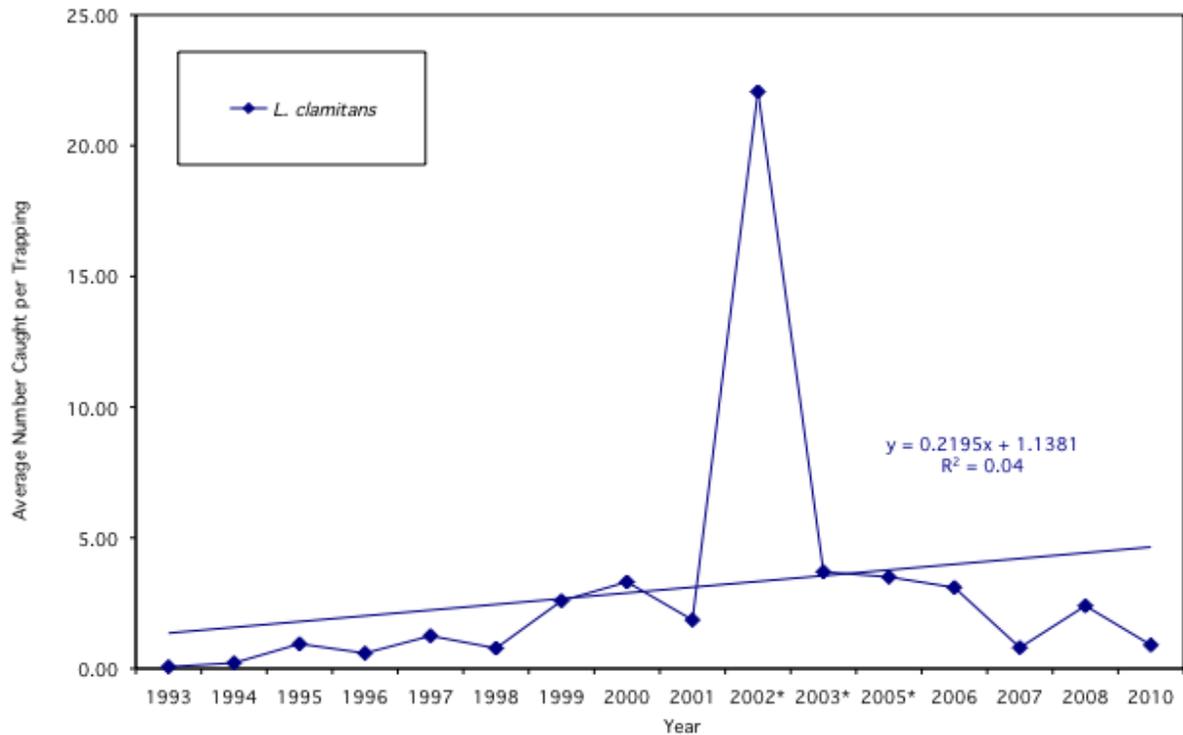


Figure 1. Green Frog (*Lithobates clamitans*) population indices from Mt. Mansfield, Underhill, Vermont, 1993-2010.

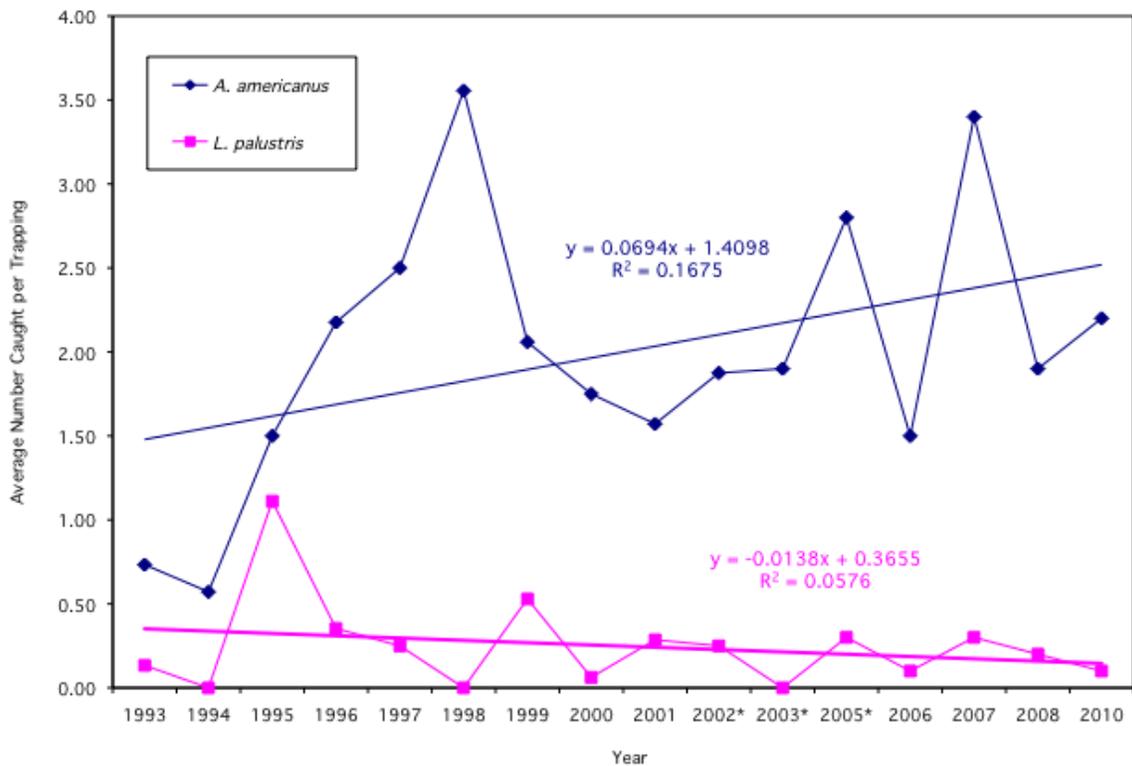


Figure 2. American Toad (*Anaxyrus americanus*) and Pickerel Frog (*Lithobates palustris*) population indices from Mt. Mansfield, Underhill, Vermont, 1993-2010. The numbers for the Pickerel Frog are too low to draw any meaningful conclusions.

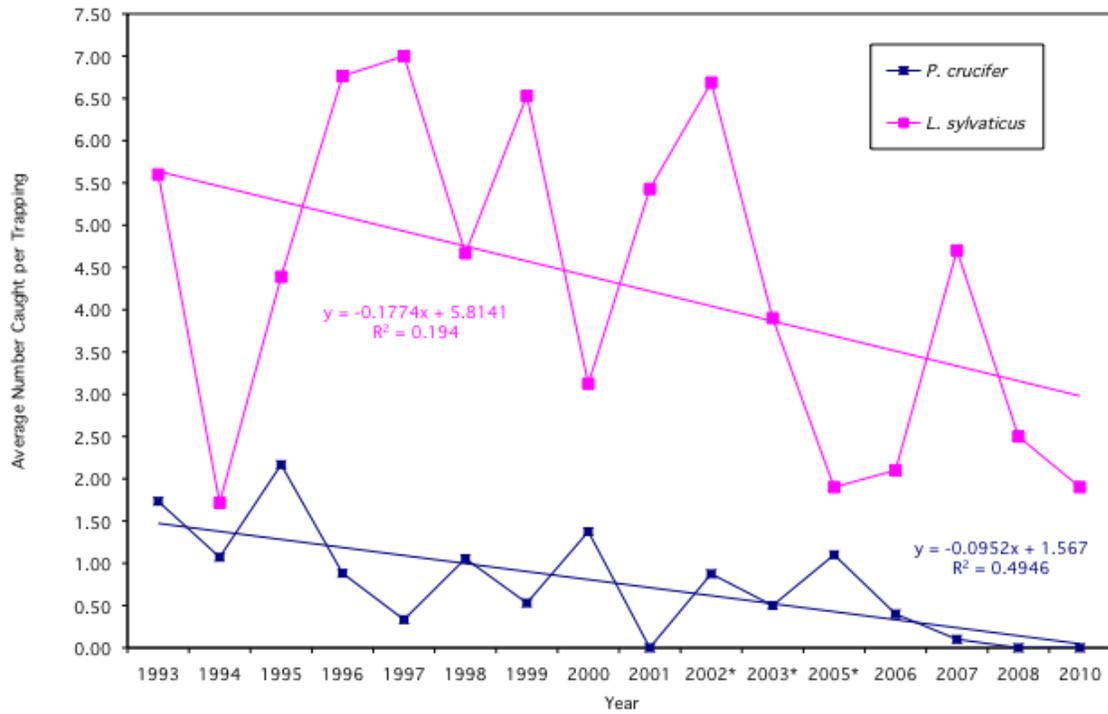


Figure 3. Wood Frog (*Lithobates sylvaticus*) and Spring Peeper (*Pseudacris crucifer*) indices from Mt. Mansfield, Underhill, Vermont, 1993-2010.

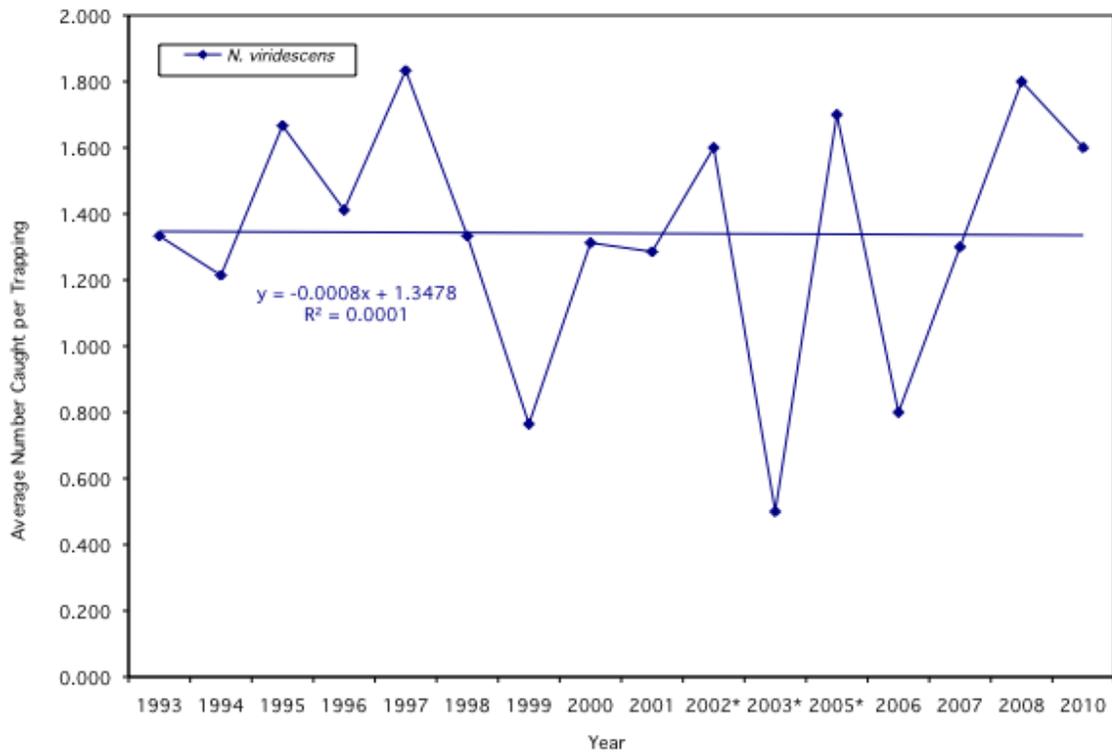


Figure 4. Eastern Newt (*Notophthalmus viridescens*) population indices from Mt. Mansfield, Underhill, Vermont, 1993-2010.

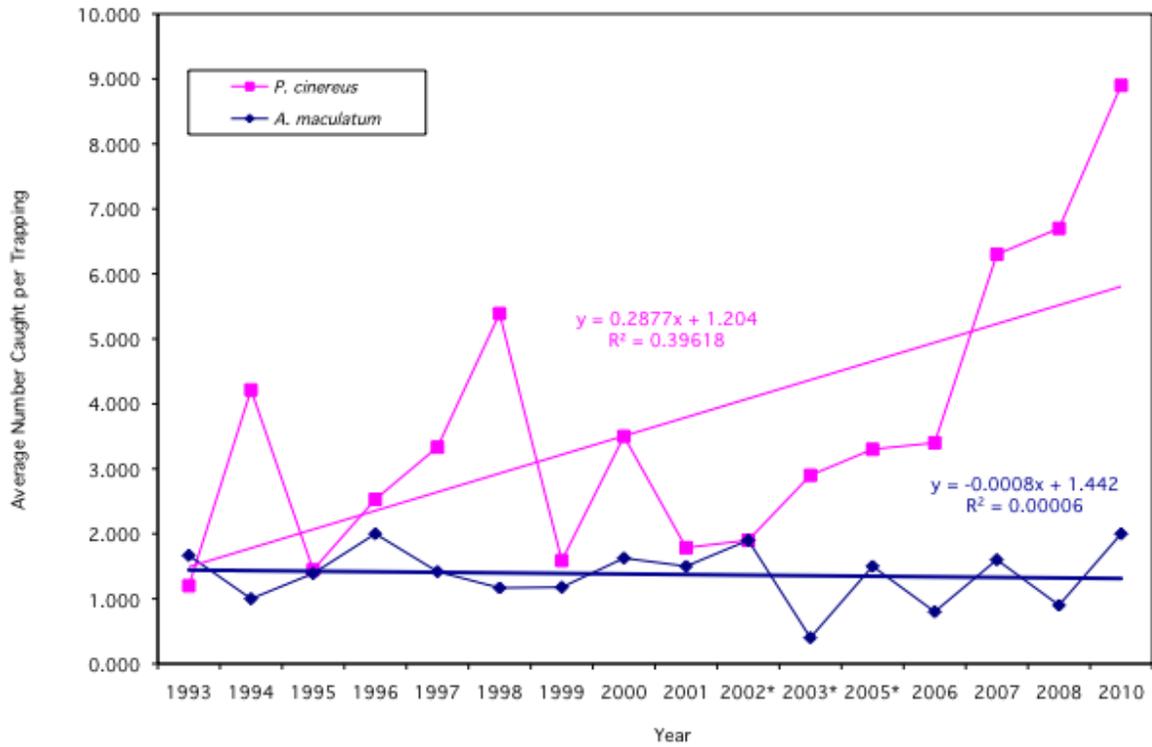


Figure 5. Spotted (*Ambystoma maculatum*) and Eastern Red-backed (*Plethodon cinereus*) Salamander population indices from Mt. Mansfield, Underhill, Vermont, 1993-2010.

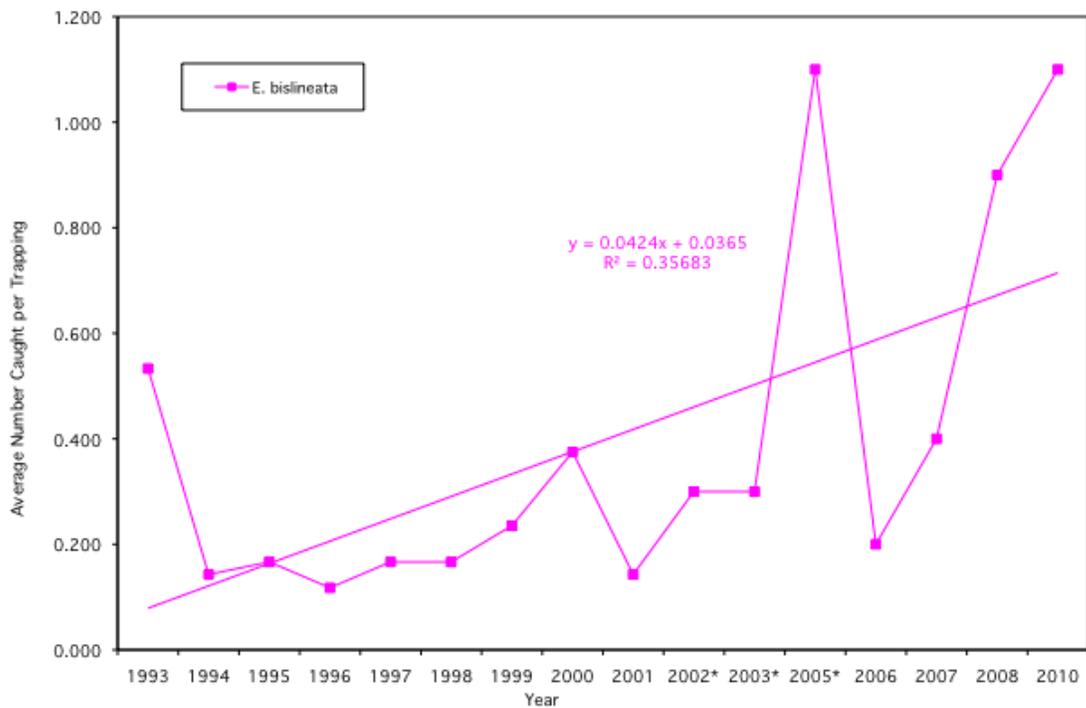


Figure 6. Northern Two-lined Salamander (*Eurycea bislineata*) population index from Mt. Mansfield, Underhill, Vermont, 1993-2010. Capture rates are too low to draw meaningful conclusions about long-term trends for this species.

Table 1. Monitoring results from the two drift-fences at 1,200 ft. and one at 2,200 ft. on Mt. Mansfield, Underhill, Vermont during 2010. Traps were opened whenever conditions were appropriate for amphibian movement from April through November excluding August. Three successful trappings per month (± 10 days) were the goal, however due to periods of low rainfall, two trappings per month were sometimes used. **Data from 15 of 20 trap-efforts were used: May 3, 6 and June 2; June 5, 17, and 23; July 10, 20, and 29; September 13, 17, and 28; October 7, 26, and November 5.** Abnormality, maximum size, and first metamorph data were taken from all 20 trappings.

Common name	Scientific name	# of all ages	# of young of the year ¹	% young of the year	date of first metamorph ²	largest adult (total length in mm)	# per trapping ³	% of group	% of total catch	# abnormal/total ⁵
Caudates (Salamanders)										
Spotted Salamander	<i>Ambystoma maculatum</i>	28	16	57%	July 29	194	2.0	14%	10%	0/28
Dusky Salamander	<i>Desmognathus fuscus</i>	9	0	0%	NA	89	0.6	4%	3%	0/9
N. Two-lined Salamander	<i>Eurycea bislineata</i>	15	3	20%	July 29	101	1.1	7%	5%	0/15
Spring Salamander	<i>Gyrinophilus porphyriticus</i>	2	0	0%	NA	156	0.1	1%	1%	0/2
Eastern Newt	<i>Notophthalmus viridescens</i>	23	15	65%	July 20	86	1.6	11%	8%	0/23
E. Red-backed Salamander	<i>Plethodon cinereus</i>	125	6	5%	October 26	90	8.9	62%	46%	0/125
Group totals	Group totals	202	40	20%	NA	NA	14.4	100%	74%	0/202
Anurans (Frogs)										
American Toad	<i>Anaxyrus americanus</i>	31	4	13%	July 29	88	2.2	43%	11%	0/31
Green Frog	<i>Lithobates clamitans</i>	12	11	92%	July 20	44	0.9	17%	4%	0/12
Pickerel Frog	<i>Lithobates palustris</i>	2	0	0%	NA	40	0.1	3%	1%	0/2
Wood Frog	<i>Lithobates sylvaticus</i>	27	6	22%	July 10	62	1.9	38%	10%	0/27
Spring Peeper	<i>Pseudacris crucifer</i>	0	0	0%	NA	N/A	0.0	0%	0%	0/0
Group totals	Group totals	72	21	29%	NA	NA	5.1	100%	26%	0/72
Amphibian totals	Amphibian totals	274	61	22%	NA	NA	19.6	NA	100%	0/274

¹ For each species, individuals under a given total length were considered potential young of the year. The chosen length was based on the timing of their appearance, gaps in their size continuum, and records in the literature. The cutoff sizes used were *A. maculatum* (70 mm), *D. fuscus* (30 mm), *E. bislineata* (60 mm), *N. viridescens* (45 mm), *P. cinereus* (32 mm), *A. americanus* (23 mm), *H. versicolor* (26 mm), *P. crucifer* (20 mm), *L. clamitans* (44 mm), *L. palustris* (34 mm), and *L. sylvaticus* (27 mm). Young of the year for *G. porphyriticus* have external gills and are aquatic for up to 4 years. In addition, it was necessary to examine the minimum possible development time for each species. Individuals shorter than the cutoff lengths clearly overwinter (possibly as larvae for *N. viridescens* and *A. maculatum*) and show up in very early spring. These are not counted as young of the year.

² No trapping took place in August.

³ These figures are rounded to the nearest 0.1. All other figures are rounded to the nearest whole number. As a result of this, group totals may not be equivalent to the sum of the individual species' values.

⁵ These may contain old deformities (traumatic) as well as malformities (developmental). Salamanders missing all or portions of their tails are not included. The total number checked may contain specimens that were caught more than once.

Table 2. A comparison of drift-fence data from 1993 through 2010 (no data were collected in 2004 or 2009) field seasons at Mt. Mansfield, Underhill, Vermont. Data used are from two fences at 1,200 ft. and one fence at 2,200 ft. in elevation.

Common name	# per trapping ¹															
	93	94	95	96	97	98	99	00	01	02 ²	03 ²	05 ²	06	07	08	10
Caudates (Salamanders)																
Spotted Salamander	1.7	1.0	1.4	2.0	1.4	1.2	1.2	1.6	1.5	1.9	0.4	1.5	0.8	1.6	0.9	2.0
Dusky Salamander	0.3	0.3	0.3	0.0	0.0	0.6	0.1	0.4	0.3	0.4	0.1	0.0	0.0	0.1	0.3	0.6
N. Two-lined Salamander	0.5	0.1	0.2	0.1	0.2	0.2	0.2	0.4	0.1	0.3	0.3	1.1	0.2	0.4	0.9	1.1
Spring Salamander	<0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.2	0.1
Eastern Newt	1.3	1.2	1.7	1.4	1.8	1.3	0.8	1.3	1.3	1.6	0.5	1.7	0.8	1.3	1.8	1.6
E. Red-backed Salamander	1.2	4.2	1.3	2.5	3.3	5.4	1.6	3.5	1.8	1.9	2.9	3.3	3.4	6.3	6.7	8.9
Group totals	5.1	6.8	4.9	6.1	6.8	8.6	3.9	7.3	5.0	6.1	4.2	7.8	5.2	9.6	10.8	14.3
Anurans (Frogs)																
American Toad	0.7	0.6	1.5	2.2	2.5	3.6	2.1	1.8	1.6	1.9	1.9	2.8	1.5	3.4	1.9	2.2
Gray Treefrog	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Green Frog	<0.1	0.2	0.9	0.6	1.3	0.8	2.6	3.3	1.9	22.1	3.7	3.5	3.1	0.8	2.4	0.9
Pickereel Frog	0.1	0.0	1.1	0.3	0.3	0.0	0.5	0.1	0.3	0.3	0.0	0.3	0.1	0.3	0.2	0.1
Wood Frog	5.6	1.7	4.4	6.8	7.0	4.7	6.5	3.1	5.4	6.7	3.9	1.9	2.1	4.7	2.5	1.9
Spring Peeper	1.7	1.1	2.2	0.9	0.3	1.1	0.5	1.4	0.0	0.9	0.5	1.1	0.4	0.1	0.0	0.0
Group totals	8.2	3.6	10.1	10.8	11.3	10.1	12.2	9.8	9.1	31.9	10.0	9.5	7.2	9.3	7.0	5.1
Amphibian totals	13.4	10.4	15.0	16.8	18.1	18.7	16.1	17.0	14.1	38.0	14.2	17.4	12.4	18.9	17.8	19.4

¹ Numbers per trapping are rounded to the nearest 0.1. All other figures are rounded to the nearest whole number. As a result of this, group totals may not be equivalent to the sum of the individual species' values. There were a total of 15 trappings in 1993, 14 in 1994, 18 in 1995, 17 in 1996, 12 in 1997, 18 in 1998, 17 in 1999, 16 in 2000, 14 in 2001, 16 in 2002, 15 in 2003, 16 in 2005, 16 in 2006, 15 in 2007, 14 in 2008, and 15 in 2010. Trappings counted were on those nights when at least 2 of the three traps were opened under appropriate weather conditions for amphibian movement.

² For three years we used dowels to reduce small mammal mortality. In order to compare those year's with other year's data, we converted all numbers to approximate non-dowel values. Using the pre-selected data sets, this was done by excluding all dowel captures, doubling captures in unimproved traps and adding snake trap data.

³ These figures are rounded to the nearest 0.1. All other figures are rounded to the nearest whole number. As a result of this, group totals may not be equivalent to the sum of the individual species' values.

Table 3. A comparison of young-of-the-year from drift-fence data from 1995 through 2010 (no data were collected in 2004 or 2009) field seasons at Mt. Mansfield, Underhill, Vermont. Data used are from two fences at 1,200 ft. and one fence at 2,200 ft. in elevation.

Common Name	# young of the year/ total amphibians captured (% of young of the year) ^{1,2}													
	95	96	97	98	99	00	01	02 ³	03 ³	05 ³	06	07	08	10
Caudates (Salamanders)														
Spotted Salamander	3/25 (12%)	16/34 (47%)	0/17 (0%)	4/21 (19%)	0/20 (0%)	12/26 (46%)	6/21 (29%)	5/25 (20%)	5/10 (50%)	3/20 (15%)	6/12 (50%)	4/24 (17%)	4/12 (33%)	16/28 (57%)
Dusky Salamander	0/6 (0%)	0/0 (0%)	0/0 (0%)	0/10 (0%)	0/2 (0%)	0/7 (0%)	0/4 (0%)	0/7 (0%)	0/1 (0%)	0/1 (0%)	0/0 (0%)	0/1 (0%)	0/4 (0%)	0/9 (0%)
N. Two-lined Salamander	0/3 (0%)	0/2 (0%)	0/2 (0%)	0/3 (0%)	0/4 (0%)	0/6 (0%)	0/2 (0%)	1/2 (50%)	1/2 (50%)	1/8 (13%)	0/3 (0%)	0/7 (0%)	2/13 (15%)	3/15 (20%)
Spring Salamander	0/0 (0%)	0/1 (0%)	0/0 (0%)	0/0 (0%)	0/0 (0%)	0/0 (0%)	0/0 (0%)	0/0 (0%)	0/0 (0%)	0/3 (0%)	0/0 (0%)	0/0 (0%)	0/3 (0%)	0/2 (0%)
Eastern Newt	13/30 (43%)	3/24 (13%)	1/22 (5%)	0/24 (0%)	0/13 (0%)	5/21 (24%)	6/18 (33%)	14/19 (74%)	0/5 (0%)	4/16 (25%)	4/13 (31%)	10/19 (53%)	4/25 (16%)	17/23 (74%)
E. Red-backed Salamander	0/24 (0%)	0/42 (0%)	2/40 (5%)	1/97 (1%)	0/27 (0%)	2/56 (4%)	0/25 (0%)	0/19 (0%)	0/24 (0%)	1/27 (4%)	1/55 (2%)	6/94 (6%)	1/94 (1%)	6/125 (5%)
Salamander group totals	16/88 (18%)	19/103 (18%)	3/81 (4%)	5/155 (3%)	0/66 (0%)	19/116 (16%)	12/70 (17%)	19/72 (26%)	6/42 (14%)	9/75 (12%)	11/83 (13%)	20/144 (14%)	11/151 (7%)	42/202 (21%)
Frog group totals	92/182 (51%)	67/183 (37%)	52/136 (38%)	48/182 (26%)	67/208 (32%)	74/156 (47%)	45/128 (35%)	369/454 (81%)	62/113 (55%)	49/102 (48%)	69/114 (61%)	28/146 (20%)	30/98 (31%)	21/72 (29%)
Amphibian totals	108/270 (40%)	86/286 (30%)	55/217 (25%)	53/337 (16%)	67/274 (24%)	93/272 (34%)	57/198 (29%)	389/526 (74%)	68/155 (44%)	58/177 (33%)	80/197 (41%)	48/290 (17%)	41/249 (16%)	63/274 (23%)

¹ There were a total of 18 trappings in 1995, 17 in 1996, 12 in 1997, 18 in 1998, 17 in 1999, 16 in 2000, 14 in 2001, 16 in 2002, 15 in 2003, 16 in 2005, 16 in 2006, 15 in 2007, 14 in 2008, and 15 in 2010. Trappings counted were on those nights when at least 2 of the three traps were opened under appropriate weather conditions for amphibian movement. Data from 1993 and 1994 are not included in this chart as not all individuals were measured.

² For each species, individuals under a given total length were considered potential young of the year. The chosen length was based on the timing of their appearance, gaps in their size continuum, and records in the literature. The cutoff sizes used were *A. maculatum* (70 mm), *D. fuscus* (30 mm), *E. bislineata* (60 mm), *N. viridescens* (45 mm), *P. cinereus* (32 mm), *A. americanus* (23 mm), *H. versicolor* (26 mm), *P. crucifer* (20 mm), *L. clamitans* (44 mm), *L. palustris* (34 mm), and *L. sylvaticus* (27 mm). Young of the year for *G. porphyriticus* have external gills and are aquatic for up to 4 years. In addition, it was necessary to examine the minimum possible development time for each species. Individuals shorter than the cutoff lengths clearly overwinter (possibly as larvae for *N. viridescens* and *A. maculatum*) and show up in very early spring. These are not counted as young of the year.

³ For three years we used dowels to reduce small mammal mortality. In order to compare those year's data, we converted all numbers to approximate non-dowel values. Using the preselected data sets, this was done by excluding all dowel captures, doubling captures in unimproved traps and adding snake trap data.

Table 4. A comparison of young-of-the-year from drift-fence data from 1995 through 2010 (no data were collected in 2004 or 2009) field seasons at Mt. Mansfield, Underhill, Vermont. Data used are from two fences at 1,200 ft. and one fence at 2,200 ft. in elevation.

Common Name	# young of the year/ total amphibians captured (% of young of the year) ^{1,2}													
	95	96	97	98	99	00	01	02 ³	03 ³	05 ³	06	07	08	10
Anurans (Frogs and Toads)														
American Toad	25/27 (93%)	10/37 (27%)	6/30 (20%)	12/64 (19%)	2/35 (6%)	4/28 (14%)	6/22 (27%)	4/20 (20%)	3/19 (16%)	11/32 (34%)	12/24 (50%)	0/51 (0%)	0/26 (0%)	4/31 (13%)
Gray Treefrog	0/0 (0%)	0/0 (0%)	0/0 (0%)	0/1 (0%)	0/0 (0%)	1/2 (50%)	0/0 (0%)	0/0 (0%)	0/0 (0%)	0/0 (0%)	0/0 (0%)	0/7 (0%)	0/0 (0%)	0/0 (0%)
Spring Peeper	3/39 (8%)	2/15 (13%)	2/4 (50%)	0/19 (0%)	0/9 (0%)	12/22 (55%)	0/0 (0%)	4/11 (36%)	2/6 (33%)	0/9 (0%)	0/7 (0%)	0/2 (0%)	0/0 (0%)	0/0 (0%)
Green Frog	14/17 (82%)	4/10 (40%)	10/15 (67%)	9/14 (64%)	27/44 (61%)	42/53 (79%)	21/26 (81%)	340/350 (97%)	31/44 (70%)	28/36 (78%)	43/49 (88%)	6/12 (50%)	25/34 (74%)	11/12 (92%)
Pickereel Frog	18/20 (95%)	1/6 (17%)	0/3 (0%)	0/0 (0%)	0/9 (0%)	1/1 (100%)	4/4 (100%)	2/2 (100%)	0/0 (0%)	2/2 (100%)	1/1 (100%)	2/4 (50%)	1/3 (33%)	0/2 (0%)
Wood Frog	31/79 (39%)	50/115 (43%)	34/84 (40%)	27/84 (32%)	38/111 (34%)	14/50 (28%)	14/76 (18%)	18/76 (27%)	26/44 (59%)	8/23 (35%)	13/23 (57%)	20/70 (29%)	4/35 (11%)	6/27 (22%)
Frog group totals	92/182 (51%)	67/183 (37%)	52/136 (38%)	48/182 (26%)	67/208 (32%)	74/156 (47%)	45/128 (35%)	369/454 (81%)	62/113 (55%)	49/102 (48%)	68/114 (61%)	28/146 (20%)	30/98 (31%)	21/72 (29%)
Salamander group totals	16/88 (18%)	18/103 (18%)	3/81 (4%)	5/155 (3%)	0/66 (0%)	18/116 (16%)	12/70 (17%)	18/72 (26%)	6/42 (14%)	9/75 (12%)	11/83 (13%)	20/144 (14%)	11/151 (7%)	42/202 (21%)
Amphibian totals	108/270 (40%)	86/286 (30%)	55/217 (25%)	53/337 (16%)	67/274 (24%)	93/272 (34%)	57/198 (29%)	389/526 (74%)	68/155 (44%)	58/177 (33%)	80/197 (41%)	48/290 (17%)	41/249 (16%)	63/274 (23%)

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