

AMPHIBIAN MONITORING ON MOUNT MANSFIELD

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Abstract:

Populations of all amphibian species are monitored annually on Mount Mansfield to (1) document the occurrence of amphibian species in this area, (2) establish a baseline data set on their distributions and abundances for future analysis of changes in these species, and (3) monitor year-to-year changes in their status. Amphibians are targeted for this kind of study because their unique life-history characteristics, involving close association with both water and soil, as well as yearly breeding activity, makes them especially well suited as an indicator taxa of changes in environmental conditions in forest environments.

Highlights of our activities for 1992 include the first full year of monitoring at all 3 elevations (1200, 2200, and 3200 feet) and surveys of egg masses and pH in the Lake of the Clouds and four vernal pools. New results for 1992 include (1) the discovery of the pickeral frog (*Rana palustris*) in the region, bringing the total number of species known in the area to 13, (2) the development of a baseline elevational-distribution database for amphibians over the slope of Mount Mansfield, (3) observation that reproductive success of spotted salamanders and wood frogs in vernal pools occurred but was seemingly low, and (4) that the pH of these breeding ponds is very close to the lethal pH reported for spotted salamanders. Evaluations of the five key indicator species in our study (spring peeper, redback salamander, spotted salamander, wood frog, and grey treefrog) show that all five are present and at seeming abundant levels, although the length of our monitoring activities here is much too short at the present time to draw any meaningful conclusions.

Introduction:

Amphibians such as frogs and salamanders are ideal indicators of forest health and water quality because their survival depends on clean water and a narrow range of soil and water acidity. Changes in amphibian populations over time may indicate changes in environmental quality that might only be discovered after much longer periods of time and with more expensive monitoring procedures. Also, different species of amphibians are sensitive to different conditions. Therefore, comparing the changes in different species may identify exactly what kind of environmental changes are occurring in the study area. The following report describes our results for 1992 as well as the overall design for our continued monitoring activity.

The purpose of this study is to (1) document the occurrence of amphibian species in this area, (2) establish a baseline data set on their distributions and abundances for future analysis of changes in these species, and (3) monitor year-to-year changes in their status. On-going monitoring of key indicator species will aid in the assessment of changes in their abundance over time.

Methods:

Four techniques are used to inventory the amphibian species in this area and to monitor their abundances. First, four drift fences have been built at three elevations on the west slope: 1200 feet (2 fences), 2200 feet (1), and 3200 feet (1). Each fence, with the exception of the fence at 3200 feet, is made of two 50-foot sections of 20 inch wide metal flashing buried 4 inches below the surface of the ground. The two sections are placed at right angles to each other, resulting in 100 feet of flashing set upright as a 16 inch high fence. Buckets are buried every 12.5 feet on both sides of the fence so that the top edges of the buckets are flush with the ground. The fence at 3200 feet is made of only 1 50-foot section of flashing with buckets at 12.5-foot intervals. Amphibians that encounter a fence while moving through the forest will turn to one side and eventually fall into a bucket. The lids are taken off the buckets in the late afternoon on rainy days, and the captured amphibians identified and counted the following morning. The locations of these four sites are indicated on Figure 1.

Second, night-time road surveys are done on rainy nights to identify all amphibians seen on roads and calling in the vicinity of roads. By driving a set route at a constant speed (10 mph), standardized estimates of amphibian abundances and locations of breeding sites can be made throughout the entire area covered by roads. The roads used for these road surveys are indicated on Figure 2.

Third, selected breeding ponds in the area are searched during the breeding season for eggs and males calling for mates. The number of egg masses provide an index of the abundance of each species. In 1992, pools monitored for egg masses and water pH were the West Bank of Harvey Brook, the East Bank of Harvey Brook, the vernal pool below the PMRC, the pond behind the PMRC sugar shack, and the Lake of the Clouds.

Fourth, active searches, involving turning over rocks and logs, are done irregularly during the day near the drift fences. The number of individuals of each species found in a given area in a given amount of time provide a direct measure of species presence and an index of species diversity and abundance.

The distribution of the methods over the slope of Mount Mansfield is displayed in Figure 3.

Results and Discussion:

We have so far identified 13 species of amphibians from this area, from a total possible of 20 species known from Vermont (Table 1, Figure 4). Six of these 13 were abundant, being observed or heard on almost all visits wherever suitable habitat is found:

- Red-spotted newt: adults found in streams and ponds and terrestrial juveniles on roads and in the forest up to 3900 feet.
- Redback salamander: found in the forest throughout most of the elevational range of the study area, but not observed above 3200 feet; extremely common.
- Northern spring peeper: heard calling regularly from ponds throughout the area, mainly below 2000 feet.
- Gray treefrog: heard calling regularly from ponds throughout the area, mainly below 2000 feet.
- Wood frog: located up to tree line where breeding ponds occur.
- Eastern American toad: concentrated below 2200 feet.

Five species were locally common, being seen regularly in their limited appropriate habitat:

- Spotted salamander: egg masses found in the spring in a few of the ponds in the area, particularly Lake of the Clouds, a vernal pool below the PMRC, a small pond behind the sugar shed at PMRC, and in quiet backwater along Harvey Brook.
- Northern dusky salamander: streams up to 2200 feet.
- Northern spring salamander: streams up to 2200 feet.
- Northern two-lined salamander: streams up to 3900 feet.
- Green frog: heard calling regularly from ponds throughout the area, mainly below 2000 feet.

The pickeral frog was occasionally observed, but only below 2200 feet. The occurrence of one species, the bullfrog, is still questionable; it was identified at only one site on one occasion in 1991, but was not heard in 1992. If it was indeed present in 1991 it was probably introduced to the area by humans and may have died during the winter of 1991-92.

Four species are suspected to be in the general area but have not yet been observed, perhaps due to the lack of appropriate habitat in the VMC area proper:

Blue-spotted salamander complex (includes hybrids)
Jefferson salamander complex (includes hybrids)
Four-toed salamander
Mink frog

Three other species that are known in Vermont are unlikely to be present anywhere in the area:

Mudpuppy: unlikely given the available habitat in the study area.
Western chorus frog: known in Vermont from only one site in Grand Isle County.
Northern leopard frog: unlikely given the available habitat in the study region.

We have targeted five of the species in this area as indicator species because of their current abundances, range of habitat types, and ease of investigation. We only have two years of data on these species (1991, 92), therefore it is too soon to draw any conclusions on trends in their demography. However, the following summarizes the year's results on these species (Table 2-4).

Spring peepers: commonly observed during both night-time road searches and surveys of breeding choruses. They are by far the most common species observed on the roads and had six times the number of choruses (50) than any other species.

Gray treefrogs: not observed in any searches or drift fences, but this is expected due to their secretive behavior. Four choruses were noted.

Redback salamanders: commonly found in drift fences.

Spotted salamanders: Two individuals were found in drift fences. Egg mass were located in all of the pools and the Lake of the Clouds. Although a large number of egg mass was seen in one vernal pool, none of them successfully hatched. Evidence of successful reproduction was seen only on the West Bank of Harvey Brook. Measurements of pH in these ponds indicate that they are very close to the lethal pH measured in other studies (4.0-4.5), suggesting a possible explanation for the low level of successful reproduction.

Wood frogs: commonly observed on night-time road searches, surveys for choruses, and in drift fences. Wood frogs successful bred in 3 of the 5 ponds studied, although the number of egg masses was seemingly small.

Future plans:

We plan to continue monitoring the amphibian populations throughout this area following the techniques we have employed so far. We feel confident that we have a complete survey of the species in the study area; therefore,

our efforts now will focus exclusively on monitoring the populations to build-up a picture of long-term trends in their distributions and abundances. We especially plan to expand our efforts to monitor water quality and breeding success of amphibians in vernal pools and lakes in the area.

Context:

This work on Mount Mansfield is part of a large survey and monitoring effort we are conducting throughout western Vermont. We have similar sites at several locations in the lowlands of the Champlain Basin, and have this spring begun a parallel study of amphibians in the Lye Brook Wilderness Area of the southern Green Mountain National Forest. It is our hope that by conducting monitoring activity over a large geographic area that trends in the status of amphibian populations over regional scales can be determined.

Mt Mansfield
Road S. h. Area

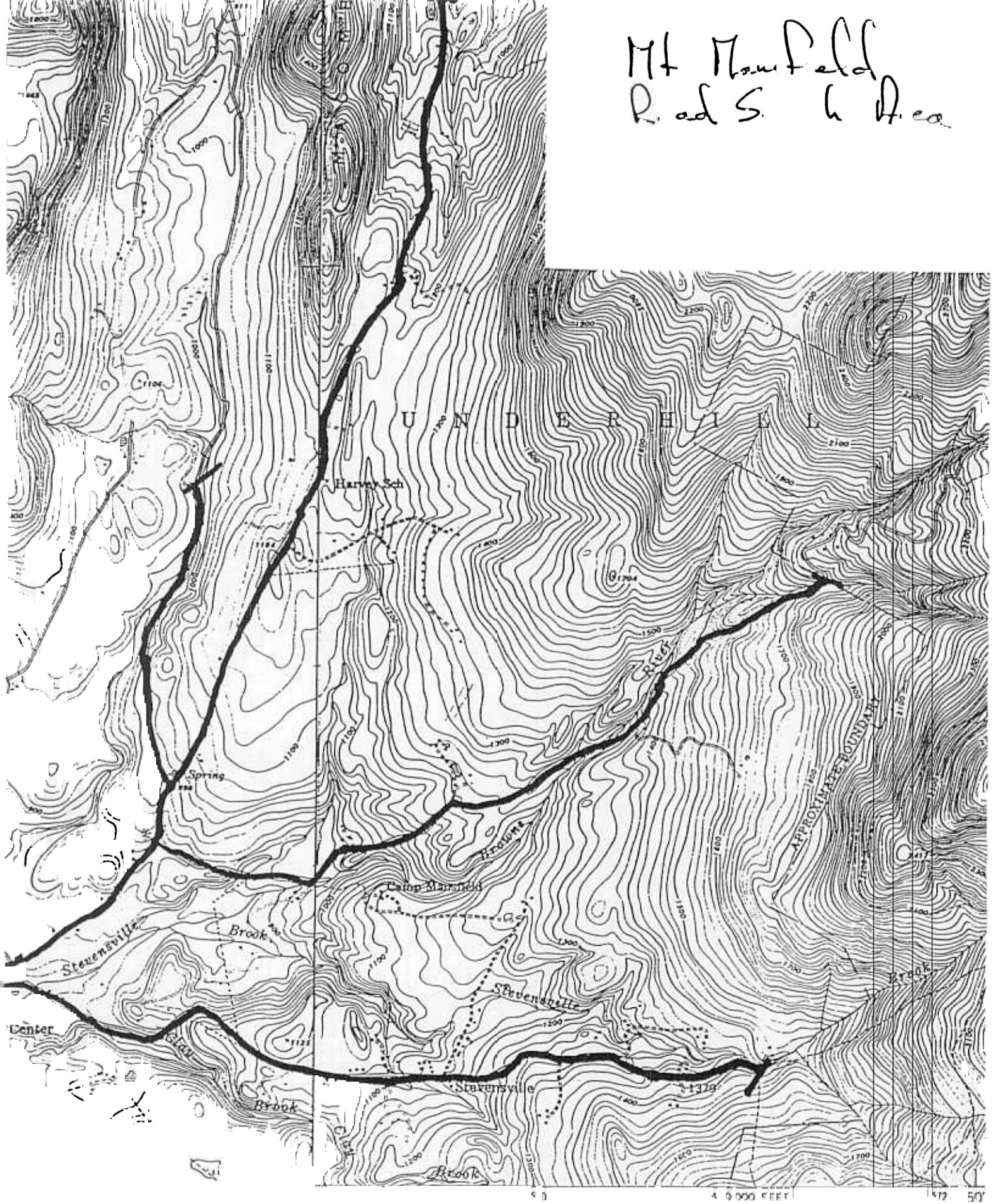
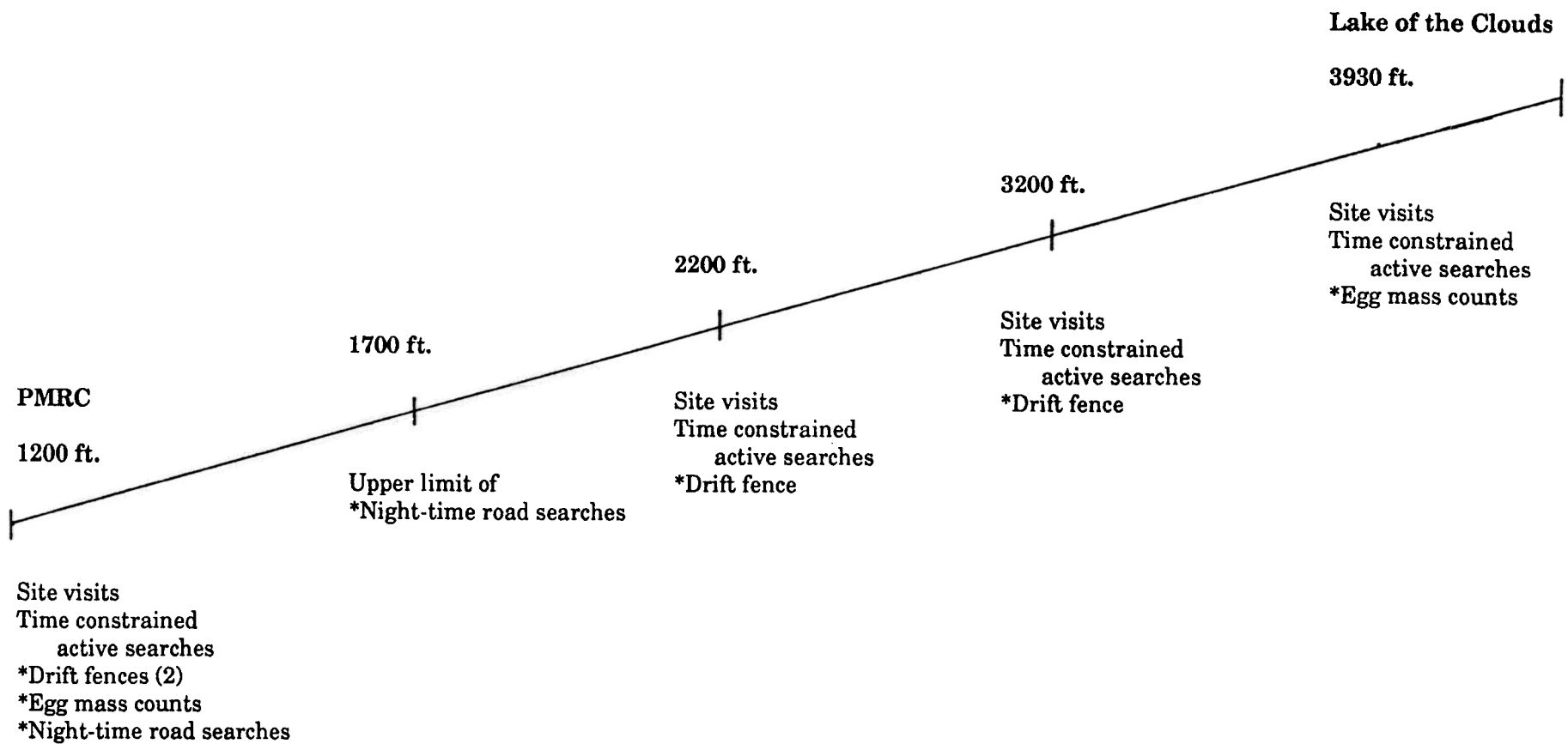


Figure 3
Mt. Mansfield Inventory Methods by Elevation



*method to be continued for long-term monitoring

Table 1. Amphibians of Mt. Mansfield, Vermont, based on surveys from Spring 1991 to Fall 1992.

Species name	Common name	S ^a	C ^b
<u>Necturus maculosus</u>	Mudpuppy	U	
<u>Ambystoma jeffersonianum</u> complex	Jefferson salamander complex	P	
<u>Ambystoma laterale</u> complex	Blue-spotted salamander complex	P	
<u>Ambystoma maculatum</u>	Spotted salamander	K	LC
<u>Notophthalmus viridescens</u>	Red-spotted newt	K	A
<u>Desmognathus fuscus</u>	Northern dusky salamander	K	LC
<u>Plethodon cinereus</u>	Redback salamander	K	A
<u>Hemidactylium scutatum</u>	Four-toed salamander	P	
<u>Gyrinophilus porphyriticus</u>	Northern spring salamander	K	LC
<u>Eurycea bislineata</u>	Northern two-lined salamander	K	LC
<u>Hyla versicolor</u>	Gray treefrog	K	A
<u>Pseudacris crucifer</u>	Northern spring peeper	K	A
<u>Pseudacris triseriata</u>	Western chorus frog	U	
<u>Rana catesbeiana</u>	Bullfrog	K?	R
<u>Rana clamitans</u>	Green frog	K	LC
<u>Rana septentrionalis</u>	Mink frog	P	
<u>Rana sylvatica</u>	Wood frog	K	A
<u>Rana pipiens</u>	Northern leopard frog	U	
<u>Rana palustris</u>	Pickerel frog	K	O
<u>Bufo americanus</u>	Eastern American toad	K	A

Key

a: Status

- U = unlikely
- P = possible, based on published range maps
- S = suspected, based on published range maps and the existence of appropriate habitat within the study area
- K = known
- ? = needs verification

b: Commonality

- A = abundant, habitat is widely distributed throughout study area, and it is observed on most visits
- LC = locally common, found regularly but in only a few areas
- O = occasional, found uncommonly
- R = observed only once or twice

Figure 4.

Results of Mt. Mansfield Inventory 1991 & 1992
(Data Combined from all Methods)

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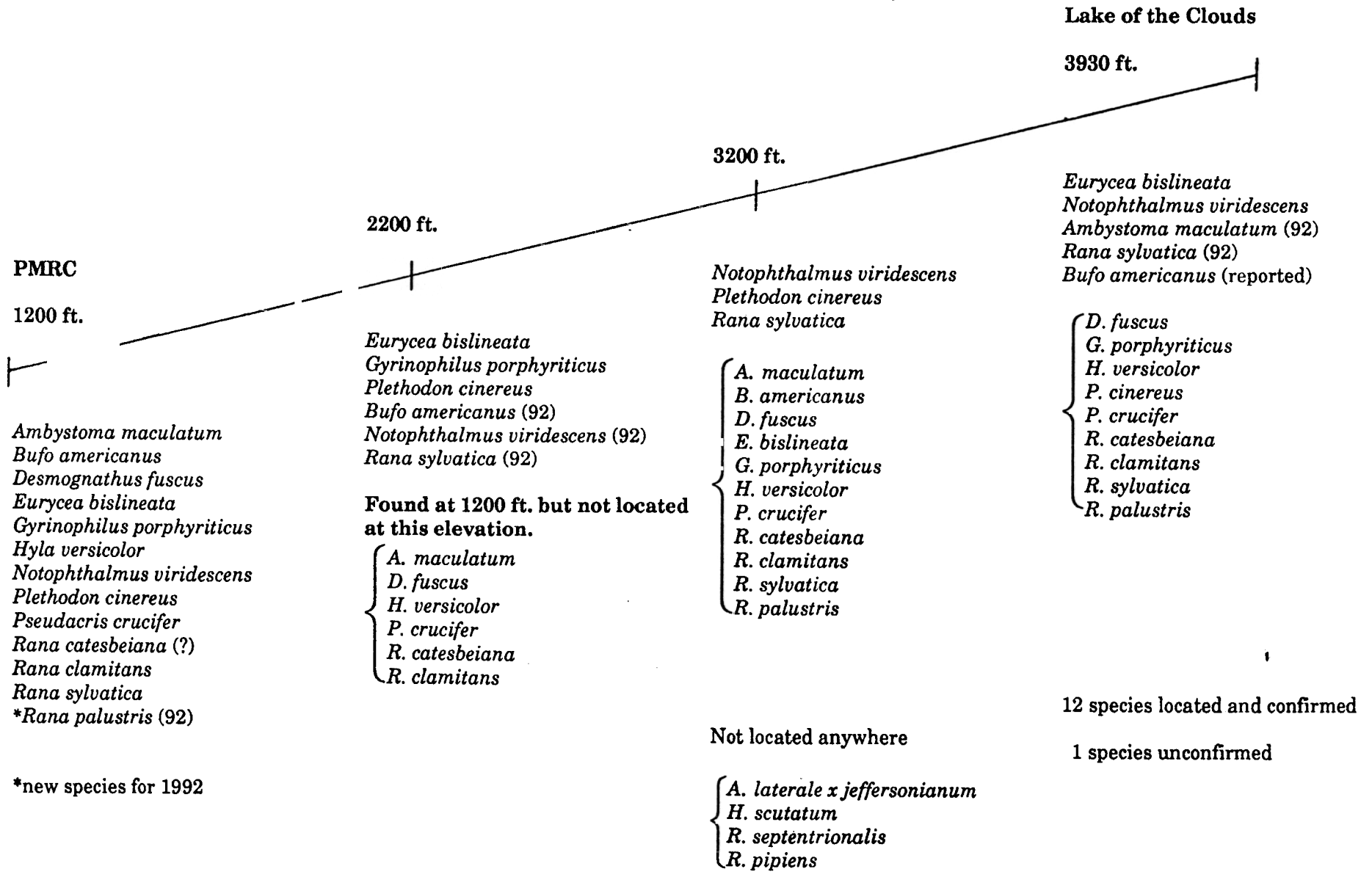


Table 2.

**Night-time Road Search Data for Mt. Mansfield, Vermont, based on surveys
from Spring 1991 to Fall 1992.**

Individuals

Species name	Common name	# of ind.	# per NTRS	% of total catch
<u>Notophthalmus viridescens</u>	Red-spotted newt	9	1.5	6
<u>Plethodon cinereus</u>	Redback salamander	1	.2	1
<u>Gyrinophilus porphyriticus</u>	Spring salamander	1	.2	1
<u>Pseudacris crucifer</u>	Northern spring peeper	98	16.3	66
<u>Rana clamitans</u>	Green frog	5	.8	3
<u>Rana catesbeiana</u>	Bullfrog	1	.2	1
<u>Rana sylvatica</u>	Wood frog	16	2.7	11
<u>Rana palustris</u>	Pickerel frog	1	.2	1
<u>Bufo americanus</u>	Eastern American toad	16	2.7	11
Totals		148	24.8	101

Large Choruses

Species name	Common name	# of choruses	# per NTRS	% of total catch
<u>Hyla versicolor</u>	Gray tree frog	4	.7	6
<u>Pseudacris crucifer</u>	Northern spring peeper	50	8.3	81
<u>Rana sylvatica</u>	Wood frog	8	1.3	13
Totals		62	10.3	100

Total night-time road searches during seasons = 6

Table 3.

**Drift Fence Data for Mt. Mansfield, Vermont, based on surveys from Spring
1991 to Fall 1992.**

Species name	Common name	# of ind.	# per trapping	% of total catch
<u>Ambystoma maculatum</u>	Spotted salamander	2	.4	4
<u>Notophthalmus viridescens</u>	Red-spotted newt	11	2.2	24
<u>Desmognathus fuscus</u>	Northern dusky salamander	4	.8	9
<u>Plethodon cinereus</u>	Redback salamander	11	2.2	24
<u>Eurycea bislineata</u>	Northern two-lined salamander	4	.8	9
<u>Pseudacris crucifer</u>	Northern spring peeper	1	.2	2
<u>Rana clamitans</u>	Green frog	1	.2	2
<u>Rana sylvatica</u>	Wood frog	9	1.8	20
<u>Rana palustris</u>	Pickerel frog	1	.2	2
<u>Bufo americanus</u>	Eastern American toad	2	.4	4
Totals		46	9.2	100

Total trappings = 5

Table 4

1992 Egg mass Data from Mt. Mansfield

Site No.	Location/Date	# of A. mac. egg masses	mean # of eggs	# of R. syl. egg masses	mean # of eggs	mean pH
1 West bank of Harvey Brook						
	May 8	6	51.3 ± 11.7	0		
	May 11	7	none hatched	2	some hatched	
	June 29	hatched				
2 East bank of Harvey Brook						
	May 8	1	10	0		
	May 11	" "		" "		
	June 26	dry				
3 Vernal pool below PMRC						
	May 8	18		36		4.65 ± .06
	May 11	" "		" "		
	June 26	dry				
4 Pond behind sugar shack						
	May 8	3	69.3 ± 10	hatched		4.4 ± .2
	May 11	" "				
	June 26	dry		dry		
5 Lake of the Clouds						
	May 15	spermato-phores		22, still calling	415 (n=2)	4.58 ± .2
	June 2	2	55 ± 21	hatched		
	July 10	1	90			