

VMC ANNUAL REPORT--1991

Inventory and Monitoring of Amphibians on the west slope of Mt. Mansfield, Vermont. Dr. Stephen C. Trombulak, Department of Biology, Middlebury College, Middlebury, Vermont 05753.

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 my results for 1991 as well as the overall design for my continued monitoring activity.

The purpose of my study is to develop a baseline data set on what species are present in the Mt. Mansfield region, in what specific habitats, and with what abundances. Key indicator species will then be intensively monitored in the future in order to assess changes in their abundance over time.

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 Map 1.

Second, nighttime 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 Map 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.

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.

I have so far identified 12 species of amphibians from this area, from a total possible of 20 species known from Vermont (Table 1). Seven of these 12 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.

Green frog: 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.

Three 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 two-lined salamander: streams up to 3900 feet.

One species, the northern spring salamander, was seen only occasionally, although it is highly likely that it is more abundant than the surveys indicate. One species, the Bullfrog, was rare, being identified at only one site on one occasion. If it is indeed present it has probably been introduced to the area by humans.

Two species are suspected to be in the area but have not yet been observed:

Blue-spotted salamander complex (includes hybrids)

Pickerel frog

Six other species that are known in Vermont are unlikely to be present.

Mudpuppy: unlikely given the available habitat in the study area.

- Jefferson salamander complex (includes hybrids): unlikely given the available habitat in the study area.
- Four-toed salamander: 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 area.
- Mink frog: unlikely given the available habitat in the study area.

Preliminary analysis of the data indicate that five of these species will merit long-term monitoring because of their current abundances, range of habitat types, and ease of investigation:

Spring peepers: small frogs that breed in most ponds; sensitive to changes in water quality and perhaps the introduction of bullfrogs (unpublished data); censused by sites during nighttime road searches.

Gray treefrogs: similar to peepers; likely to be sensitive to vegetational changes in ponds and water quality (DeGraaf and Rudis, 1983); less seasonally constrained for monitoring; censused by sites during nighttime road searches.

Redback salamanders: small salamanders that live and breed in moist soil, rotting logs, and leaf litter over most of the elevational range of Mt. Mansfield; sensitive to high levels of soil acidity and low abundance of soil insects (Wyman and Hawksley-Lescault, 1987) but not by forest clearing (Pough et al., 1987); censused by active searches and drift fences.

Spotted salamanders: medium-sized salamanders that breed in permanent and vernal pools and spend most of their non-breeding time underground; egg mortality influenced by pH (Pough 1976); censused by counts of egg masses in breeding pools and drift fences.

Wood frogs: medium-sized frogs that breed in ponds and are active as adults on the forest floor; likely to be sensitive to changes in water pH for breeding and forest clearing as adults (DeGraaf and Rudis, 1983); censused by counts of egg masses in breeding pools, nighttime road searches, and drift fences.

Two additional species, the Green frog and Eastern American toad, will be monitored because reliable data on their distributions and abundances will be obtained as a result of the studies of the five other species mentioned above, and because of some evidence that they may be particularly sensitive to pesticides (Lazell, 1976). I also plan to monitor closely the presence of the Bullfrog. Although it is currently rare in this area, it is commonly and easily introduced into permanent ponds, and has been implicated by

research carried out by my lab at other sites in the decline of indigenous amphibian species.

This monitoring effort is part of a larger amphibian monitoring program co-ordinated by Mr. James Andrews, Middlebury College. Similar survey and monitoring activities are being conducted at a series of sites in Addison, Chittenden, and Franklin Counties with the goal of understanding the dynamics of amphibian populations throughout the Champlain Basin.

I plan to continue monitoring the key species in particular, and all species in general, to identify changes in their abundances and distributions that may indicate changes in the environmental health of the forest and its waters.

References

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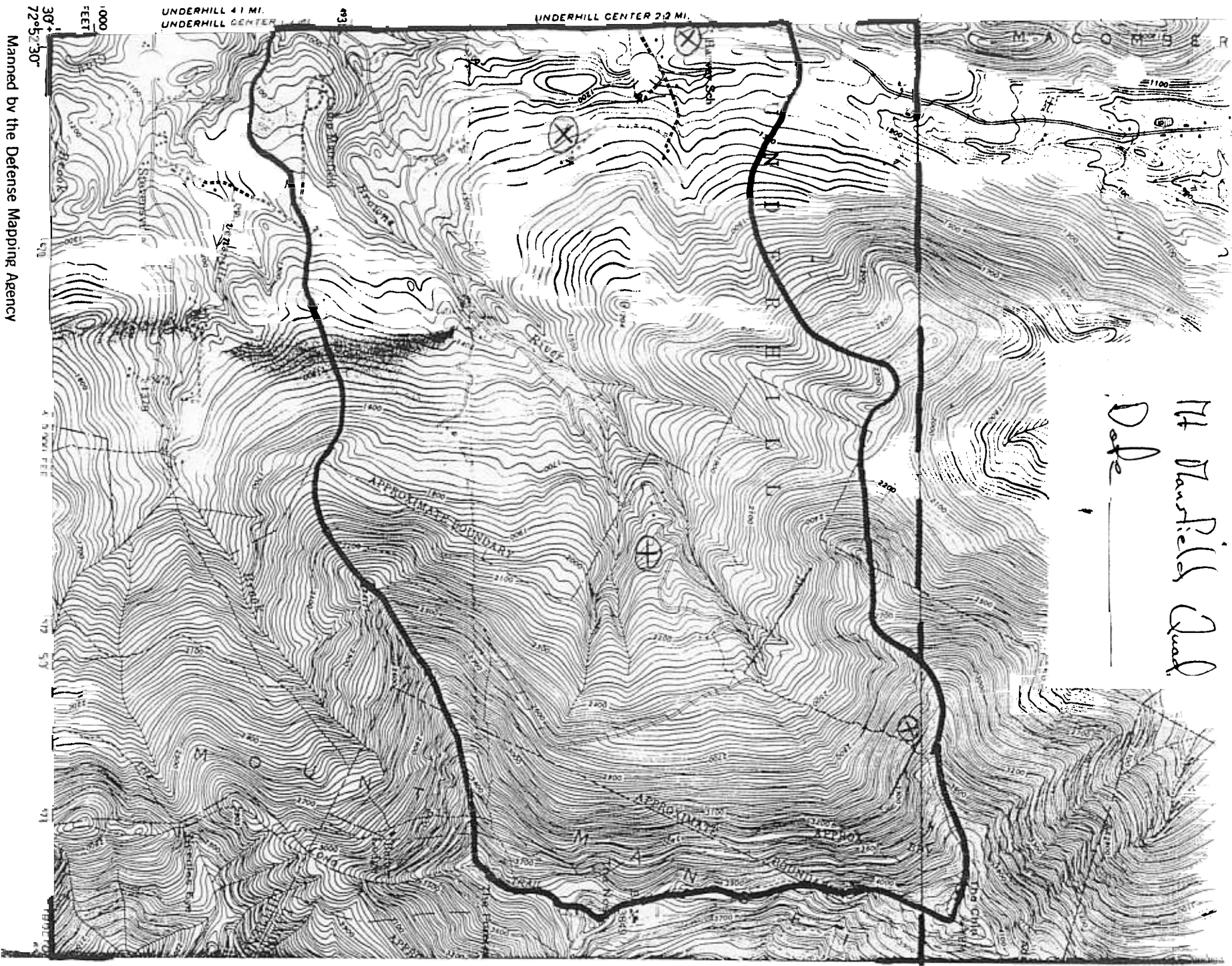
Funding sources

Vermont Monitoring Cooperative	\$4125
Howard Hughes Medical Institute	\$1800
Middlebury College	\$1000
Lake Champlain Management Conference	\$1428

Map 1
Location of drift fences (X)

74 Mansfield Quad

D. De



Manned by the Defense Mapping Agency

Map α.
Mt. Mansfield
Road Search Area

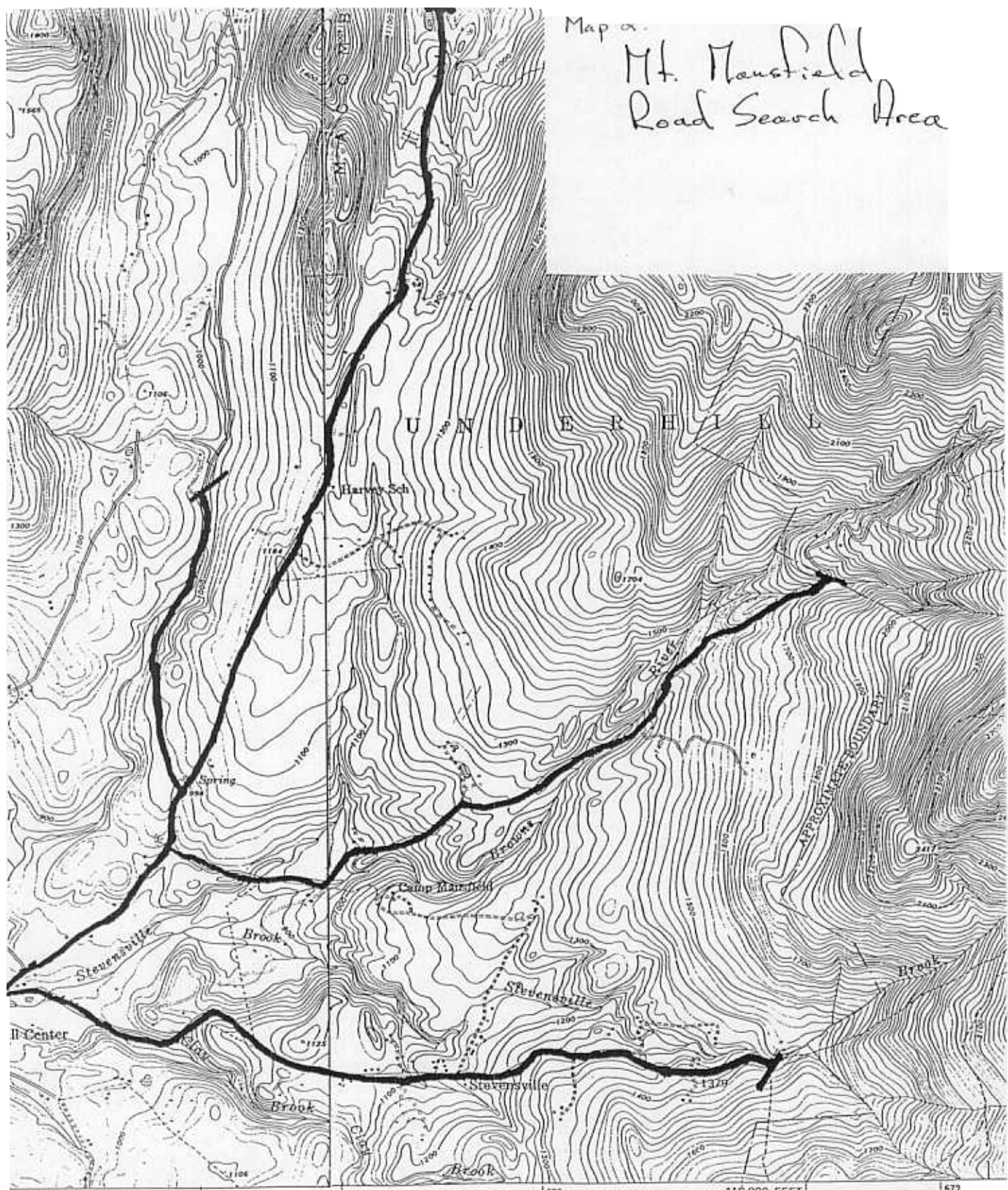


Table 1. Amphibians of Mt. Mansfield, Vermont, based on surveys from Spring 1991 to Spring 1992.

<u>Species name</u>	<u>Common name</u>	<u>S^a</u>	<u>C^b</u>
<u>Necturus maculosus</u>	Mudpuppy	U	
<u>Ambystoma jeffersonianum</u>	Jefferson salamander	U	
<u>Ambystoma laterale</u> complex	Blue-spotted salamander complex	S	
<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	U	
<u>Gyrinophilus porphyriticus</u>	Northern spring salamander	K	O
<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	A
<u>Rana septentrionalis</u>	Mink frog	U	
<u>Rana sylvatica</u>	Wood frog	K	A
<u>Rana pipiens</u>	Northern leopard frog	U	
<u>Rana palustris</u>	Pickerel frog	S	
<u>Bufo americanus</u>	Eastern American toad	K	A

Key

a: Status

- U = unlikely**
- K = known**
- S = suspected, based on published range maps and occurrence of appropriate habitat in the study area**

b: Commonality

- A = abundant, present in most appropriate habitats and 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**