# INTRODUCTION

The introduction presents information which will be helpful to the reader in interpreting and using the species accounts that constitute the body of the atlas. The preface presents a brief overview of the history and methods of breeding bird atlas surveys.

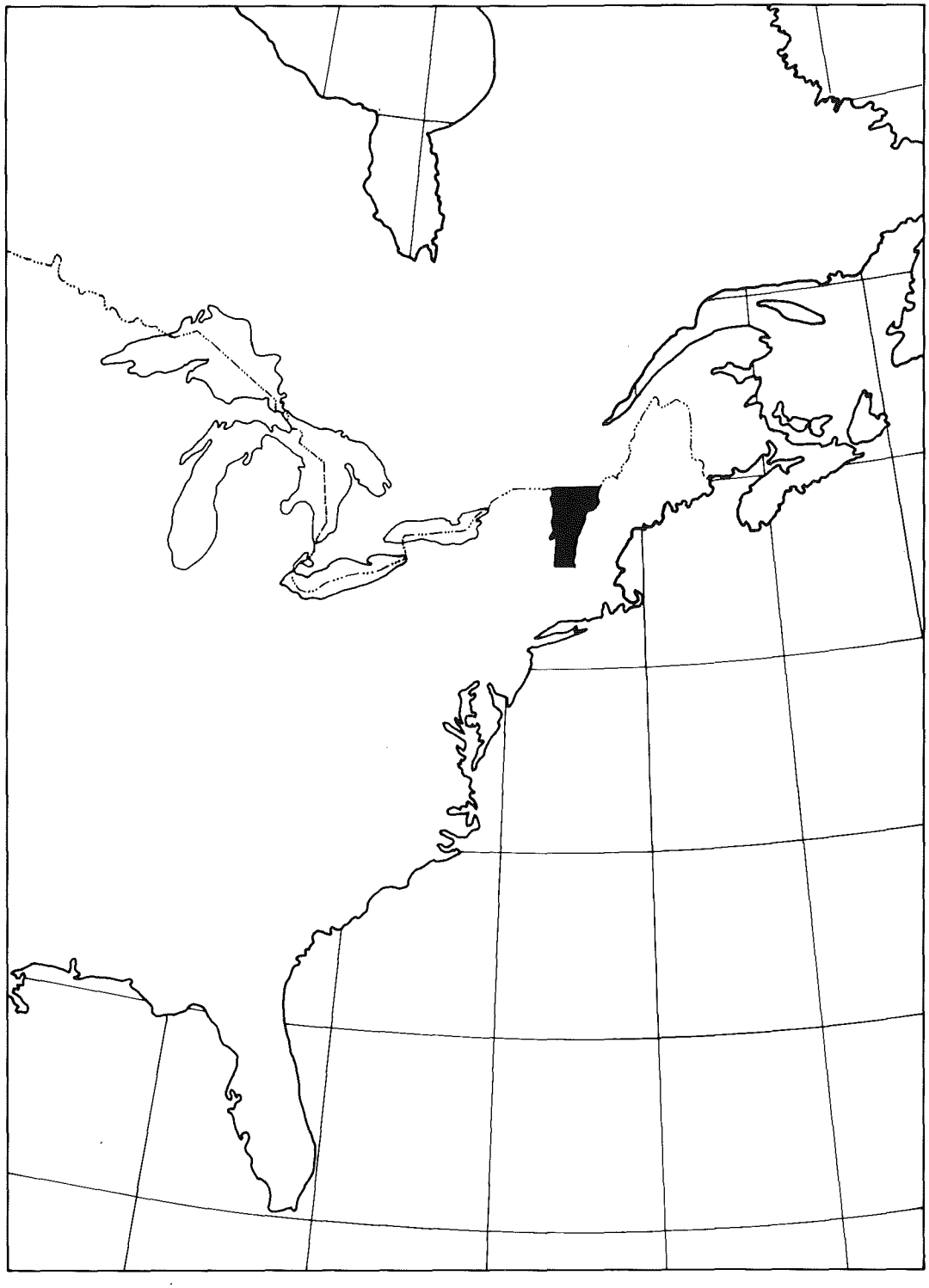
Vermont is a small state in northeastern North America (Map 2), but it has, as the species accounts show, a rich diversity of bird life. While the chief purpose of this atlas is to document the status and distribution of the species of birds breeding within Vermont between 1976 and 1981, additional objectives include: documenting an ecological data base for biologists and researchers against which future and inevitable change can be measured; providing distributional data on Threatened or Endangered species; providing a record of unique and fragile habitats vital to continued reproduction of certain species; providing hard data for legislators, land-use planners, developers, and environmentalists concerned with conservation measures and environmental impact issues; explaining survey techniques that can be repeated 10, 50, or 100 years in the future; informing the public about birds as a natural resource; and providing information for naturalists and birders on the breeding birds of Vermont.

For a breeding bird atlas, surveys are made to determine which species nest in an area, rather than to determine the number of individuals of a given species in an area. The field observer reports every species of bird breeding within the surveyed geographical area, attempting to confirm breeding for as many species as possible. Most breeding bird surveyors, following the lead of the British atlas organizers, have carried out their surveys over a five-year period, judged by the British to be the shortest time possible in which to accomplish the prodigious amount of fieldwork necessary, and the maximum period of time desirable for "freezing" the distribution of avifauna. The Vermont Atlas Project ran for six years, including the 1976 pilot project year; the survey of priority blocks extended from 1977 to 1981.

## Collecting data: priority blocks and coverage standards

The first step in planning an atlas project is to establish geographical areas (usually squares or rectangles called *blocks*) by utilizing a map grid. The blocks are then surveyed by fieldworkers to determine which species occur in each area, and what each species' breeding status is within the area.

The basic grid for the Vermont survey was provided by U.S. Geological Survey maps, which are mapped by minutes of latitude and longitude. Each 7.5-minute map was divided into six blocks of



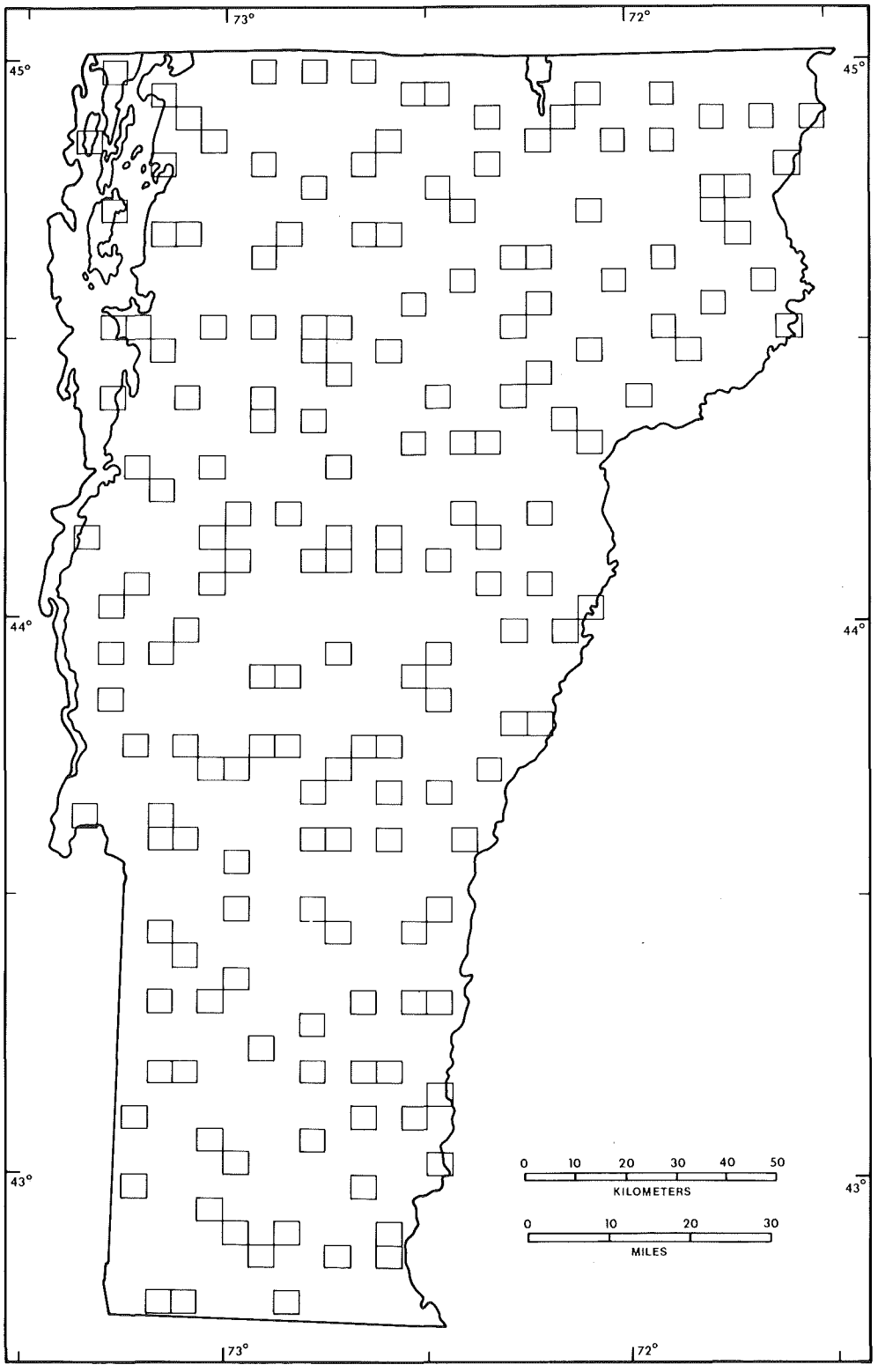
MAP 2. Position of Vermont in North America

approximately 25 square kilometers (10 square miles), measuring approximately 5 kilometers (3 miles) to a side (7.5 minutes = 1/8 of 1 degree of latitude or longitude). During the pilot project year, it became evident that it would be impossible to survey all 24,887 square kilometers (9,609 square miles) of the state with the manpower available. (For full information on the history of and procedures for grid-based atlasing, the reader is referred to the *Proceedings of the Northeastern Breeding Bird Atlas Conference* [Laughlin, Kibbe, and Robbins 1982] and to "Atlasing the Distribution of the Breeding Birds of North America" [Laughlin, Kibbe, and Eagles 1982].)

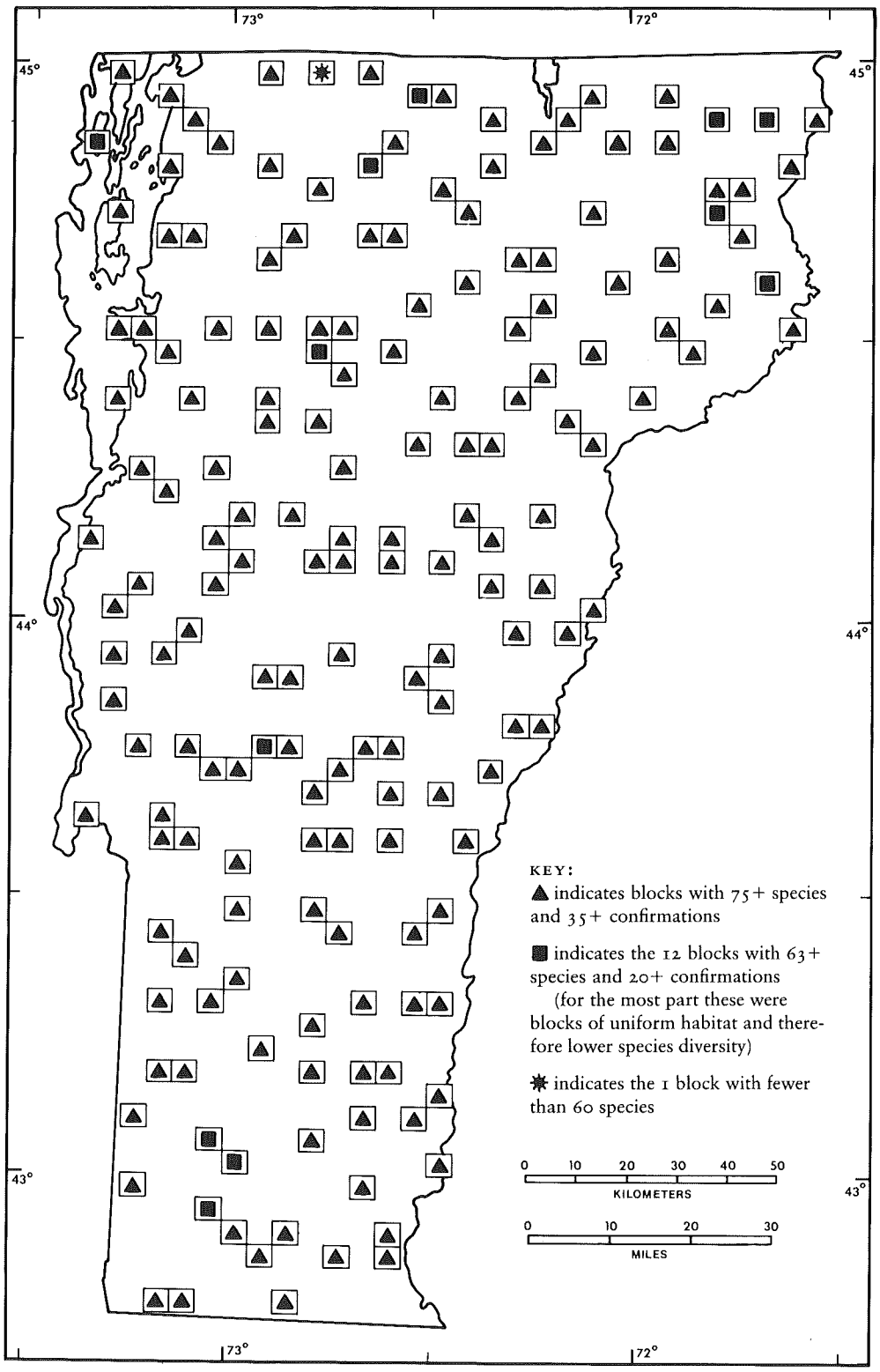
A selective sampling system was therefore employed. One *priority block* was randomly selected to be surveyed from the six blocks occurring in each 7.5-minute quadrangle; 179 priority blocks were selected (to be assured of as complete coverage as possible) (Map 3). Since the grid system employed divides the state into some 1,000 blocks, there were also 821 non-priority blocks; any locality in the state was within either a priority or a non-priority block, so all reports of breeding birds from both priority and non-priority blocks were accepted by the Atlas Project. The dots on the map in each species account indicate from which priority and non-priority blocks reports for that species came. *However, the hollow squares outlined on the maps delineate only the priority blocks.* In addition, 24 blocks containing areas of unique and fragile habitat (UFAs; see p. 7) were selected to be surveyed.

In 1978, utilizing their two years of personal fieldwork in blocks which they were covering themselves, the experienced field birders who made up the Vermont Breeding Bird Atlas Committee established standards for field coverage in blocks: a block was to be considered satisfactorily surveyed when 75 species were located in the block, and 35 of those species were confirmed as breeders. The committee members' experience indicated that most blocks in Vermont contain approximately 100 breeding species (W. G. Ellison, W. J. Norse, D. P. Kibbe, S. B. Laughlin, D. B. Clark, pers. observs.); the presence of 75 species would indicate that at least 75% of the species in the block during the breeding season were recorded.

At the end of the 1979 season, all 179 priority blocks and 24 unique and fragile areas had been entered by a field worker at least once, and surveying in 60 priority blocks had resulted in data meeting adequate coverage standards. To cover the remaining 119 priority blocks, the Vermont Institute of Natural Science launched intensive block-busting efforts in the summers of 1980 and 1981. Atlas Project teams averaged 70 species and 35 confirmations in priority blocks worked for 10 to 12 hours. Regional coordination, regular fieldwork, and block-busting efforts yielded adequate statewide coverage by atlas committee standards (see Map 4).




MAP 3. Location of Vermont Atlas Project Priority Blocks




MAP 4. Coverage Obtained at the Close of the Atlas Project

## Recording field data: codes and verification

Field observations were interpreted and entered on an Atlas Project recording sheet (Figure 1), which categorized breeding records for each species as Possible, Probable, or Confirmed. (For definitions of the codes used by fieldworkers and in some species accounts, see Recording Codes Used by the Vermont Atlas Project, following the introduction.) To fulfill the goal of the survey, a species had to be confirmed only *once* in each block; for the purposes of the survey, it did not matter if 1 American Robin or 100 was nesting in the block, as long as 1 was confirmed. The recording sheet used by each fieldworker was submitted at the end of every season to the regional coordinator, who then submitted it to VINS. A new recording sheet was provided to fieldworkers for each summer of the survey; after the first year, a master sheet was provided to each block worker each season as well, showing which species had been located in the block so far. Atlas Project staff reviewed the records and compiled the data each fall from the recording sheets submitted to the Vermont Institute of Natural Science.

### *Recording species of rare or unknown status*

Birds that were considered by the Vermont Atlas Committee to be of limited distribution, rare, or of unknown nesting status in Vermont were designated by an asterisk on the recording sheet and were called *asterisked species*. Forty-five (23%) of the 199 species listed on the recording sheet were so classified. Asterisked Species Reports (ASRs) were required on the species originally asterisked on the recording sheet (except for a few later found to be in good numbers), on species determined after the first two years of the project to be far rarer than expected, and on species not originally listed because they had never before been known to breed in Vermont. The species on the Vermont Atlas Committee's final list of species for which Asterisked Species Reports were required were:

Common Loon
Double-crested Cormorant
Great Egret
Cattle Egret
Gadwall
Northern Shoveler
Lesser Scaup
Turkey Vulture
Bald Eagle
Osprey
Spruce Grouse
Gray Partridge
Yellow Rail†
Great Black-backed Gull
Yellow-billed Cuckoo
Common Barn-Owl
Short-eared Owl
Boreal Owl†
Red-headed Woodpecker
Black-backed Woodpecker
Three-toed Woodpecker
Horned Lark
Gray Jay
Tufted Titmouse
Carolina Wren
Sedge Wren
Blue-gray Gnatcatcher
Loggerhead Shrike
Philadelphia Vireo
Worm-eating Warbler†
Blue-winged Warbler
Tennessee Warbler
Cape May Warbler
Cerulean Warbler
Bay-breasted Warbler
Prairie Warbler
Palm Warbler†
Yellow-breasted Chat
Wilson's Warbler
Orchard Oriole
Pine Grosbeak
House Finch
Pine Siskin
Red Crossbill
White-winged Crossbill
Grasshopper Sparrow
Henslow's Sparrow
Lincoln's Sparrow

†No records obtained during the Atlas Project survey

Upon sighting an asterisked species, a fieldworker was requested to call his or her regional coordinator or the Vermont Institute of Natural Science. Where possible, the regional coordinator or a VINS staff member confirmed the report by an on-site visit. The worker then submitted a detailed Asterisked Species Report form, signed by both the observer and the regional coordinator, giving details of the sighting and the breeding evidence. These reports were reviewed by experts familiar with the species, who reported in turn to the Vermont Atlas Committee. Final acceptance of all Asterisked Species Reports rested with the atlas committee. Some asterisked species were determined by the Atlas Project survey to be present in Vermont in good numbers, and some species not so designated were established as rare or declining in numbers, indicating how little was known of Vermont's bird life in 1976.

### Data analysis by physiographic region

The recorded distribution of bird species that breed in Vermont was computer analyzed by physiographic region (Map 5). The physiographic map used is based, with some variations, on a detailed map developed by the Vermont Fish and Game Department (Dickinson and Garland 1974; Garland 1977; for a description of the state's regions, see Appendix A). The table below relates Vermont's physiographic regions to state area, area surveyed, and number of priority blocks.

| Physiographic region | approximate area of region (sq km/sq mi) | % of state's area | number of priority blocks | % of surveyed area of state |
|---|---|---|---|---|
| Champlain Lowlands | 4,999 (1,930) | 20 | 31 | 17 |
| Green Mountains | 7,252 (2,800) | 29 | 54 | 30 |
| North Central | 3,289 (1,270) | 13 | 19 | 11 |
| Northeast Highlands | 1.968 ( 760) | 8 | 16 | 9 |
| East Central | 2,461 ( 950) | 10 | 19 | 11 |
| Taconic Mountains | 2,279 ( 880) | 9 | 16 | 9 |
| Eastern Foothills | 2,642 (1,020) | 11 | 24 | 13 |

#### *Unique and fragile areas* (UFAs)

Thirty-four areas of unique and fragile habitat (UFAs) were selected for survey for the Atlas Project. Surveyed were the block or blocks into which the UFA fell and the UFA itself. UFAs were selected from areas indicated by published sources—the *Vermont Natural Areas Project* (Klein 1976), *Natural Areas in Vermont* (Vogelman 1964), *Vermont Natural Areas* (Vogelman 1969)—and from areas nominated by the Audubon chapters and members of the Vermont Atlas Committee. The final list was adopted by the Vermont Atlas Committee.

VERMONT ATLAS PROJECT RECORDING SHEET

BLOCK # 1 8 2 3 YEAR 1 9

| NAME | A.O.U.# | CODE | PO | PR | CO |
|---|---|---|---|---|---|
| | 7 8 9 10 | 11 | | | |
| Common Loon * | 0 0 7 .0 | | | | |
| Pied-billed Grebe | 0 0 6 .0 | | ✓ | | |
| Great Blue Heron | 1 9 4 .0 | | ✓ | | |
| Green Heron | 2 0 1 .0 | | | | |
| Cattle Egret * | 2 0 0 .1 | | | | |
| Bl.-crowned Night Heron | 2 0 2 .0 | | | | |
| Least Bittern | 1 9 1 .0 | | | | |
| American Bittern | 1 9 0 .0 | | | | |
| Canada Goose | 1 7 2 .0 | | | | |
| Mallard | 1 3 2 .0 | | | | |
| Black Duck | 1 3 3 .0 | | | | FL |
| Gadwall * | 1 3 5 .0 | | | | |
| Pintail | 1 4 3 .0 | | | | |
| Green-winged Teal | 1 3 9 .0 | | | | |
| Blue-winged Teal | 1 4 0 .0 | | | | |
| American Wigeon | 1 3 6 .0 | | | | |
| Northern Shoveler * | 1 4 2 .0 | | | | |
| Wood Duck | 1 4 4 .0 | | ✓ | | |
| Redhead * | 1 4 6 .0 | | | | |
| Ring-necked Duck | 1 5 0 .0 | | ✓ | | |
| Lesser Scaup * | 1 4 9 .0 | | | | |
| Common Goldeneye | 1 5 1 .0 | | | | |
| Hooded Merganser | 1 3 1 .0 | | | | |
| Common Merganser | 1 2 9 .0 | | | | |
| Red-breasted Merganser | 1 3 0 .0 | | | | |
| Turkey Vulture * | 3 2 5 .0 | | | | |
| Goshawk | 3 3 4 .0 | | ✓ | | |
| Sharp-shinned Hawk | 3 3 2 .0 | | | S | |
| Cooper's Hawk | 3 3 3 .0 | | | | |
| Red-tailed Hawk | 3 3 7 .0 | | ✓ | | |
| Red-shouldered Hawk | 3 3 9 .0 | | ✓ | | |
| Broad-winged Hawk | 3 4 3 .0 | | ✓ | | |
| Bald Eagle * | 3 5 2 .0 | | | | |
| Marsh Hawk | 3 3 1 .0 | | | | |
| Osprey * | 3 6 4 .0 | | | | |
| American Kestrel | 3 6 0 .0 | | ✓ | | |
| Spruce Grouse * | 2 9 8 .0 | | | | FY |
| Ruffed Grouse | 3 0 0 .0 | | | | FY |
| Bobwhite | 2 8 9 .0 | | | | |
| Ring-necked Pheasant | 3 0 9 .1 | | | | |
| Gray Partridge * | 2 8 8 .1 | | | | |
| Turkey | 3 1 0 .0 | | | | |
| King Rail * | 2 0 8 .0 | | | | |
| Virginia Rail | 2 1 2 .0 | | | | |
| Sora | 2 1 4 .0 | | | | |
| Yellow Rail * | 2 1 5 .0 | | | | |
| Common Gallinule | 2 1 9 .0 | | ✓ | | |
| American Coot | 2 2 1 .0 | | | | |
| Killdeer | 2 7 3 .0 | | ✓ | | |
| American Woodcock | 2 2 8 .0 | | | D | |
| Common Snipe | 2 3 0 .0 | | | D | |

| NAME | A.O.U.# | CODE | PO | PR | CO |
|---|---|---|---|---|---|
| | 7 8 9 10 | 11 | | | |
| Upland Sandpiper | 2 6 1 .0 | | | | |
| Spotted Sandpiper | 2 6 3 .0 | | | | DD |
| Solitary Sandpiper * | 2 5 6 .0 | | | | |
| Least Sandpiper * | 2 4 2 .0 | | | | |
| Great Bl.-backed Gull * | 0 4 7 .0 | | | | |
| Herring Gull | 0 5 1 .0 | | | | |
| Ring-billed Gull | 0 5 4 .0 | | | | |
| Common Tern | 0 7 0 .0 | | | | |
| Black Tern | 0 7 7 .0 | | | | |
| Rock Dove | 3 1 3 .1 | | | | |
| Mourning Dove | 3 1 6 .0 | | | | |
| Yellow-billed Cuckoo * | 3 8 7 .0 | | | | |
| Black-billed Cuckoo | 3 8 8 .0 | | | | |
| Barn Owl * | 3 6 5 .0 | | | | |
| Screech Owl | 3 7 3 .0 | | | | |
| Great Horned Owl | 3 7 5 .0 | | | ✓ | |
| Barred Owl | 3 6 8 .0 | | | ✓ | |
| Long-eared Owl | 3 6 6 .0 | | | | |
| Short-eared Owl * | 3 6 7 .0 | | | | |
| Boreal Owl * | 3 7 1 .0 | | | | |
| Saw-whet Owl | 3 7 2 .0 | | | T | |
| Whip-poor-will | 4 1 7 .0 | | | | |
| Common Nighthawk | 4 2 0 .0 | | | | |
| Chimney Swift | 4 2 3 .0 | | | ✓ | |
| Ruby-throated Hummingb. | 4 2 8 .0 | | | ✓ | |
| Belted Kingfisher | 3 9 0 .0 | | | | FY |
| Common Flicker | 4 1 2 .0 | | | | ON |
| Pileated Woodpecker | 4 0 5 .0 | | | D | |
| Red-headed Woodpecker * | 4 0 6 .0 | | | ✓ | |
| Yellowbellied Sapsucker | 4 0 2 .0 | | | | ON |
| Hairy Woodpecker | 3 9 3 .0 | | | S | |
| Downy Woodpecker | 3 9 4 .0 | | | ✓ | |
| Bl-bk. 3-T Woodpecker * | 4 0 0 .0 | | | | FL |
| N. 3-toed Woodpecker * | 4 0 1 .0 | | | | |
| Eastern Kingbird | 4 4 4 .0 | | | T | |
| GreatCrested Flycatcher | 4 5 2 .0 | | | | |
| Eastern Phoebe | 4 5 6 .0 | | | | UN |
| Yel.-bellied Flycatcher | 4 6 3 .0 | | | T | |
| Alder Flycatcher | 4 6 6 .3 | | | | |
| Willow Flycatcher | 4 6 6 .4 | | | | |
| Least Flycatcher | 4 6 7 .0 | | | | |
| Eastern Wood Pewee | 4 6 1 .0 | | | ✓ | |
| Olive-sided Flycatcher | 4 5 9 .0 | | | T | |
| Horned Lark * | 4 7 4 .0 | | | | |
| Tree Swallow | 6 1 4 .0 | | | | ON |
| Bank Swallow | 6 1 6 .0 | | | ✓ | |
| Rough-winged Swallow | 6 1 7 .0 | | | | |
| Barn Swallow | 6 1 3 .0 | | | | UN |
| Cliff Swallow | 6 1 2 .0 | | | | |
| Purple Martin | 6 1 1 .0 | | | | |
| Gray Jay * | 4 8 4 .0 | | | | FY |

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PO=Possible, PR=Probable, CO=Confirmed -- Enter Criteria Code in Correct Column *Indicates

FIGURE 1

Name G.F. Oatman et al. Address _____ (zip) Map Name Averill Quad.

| NAME | A.O.U.# | CODE | PO | PR | CO | NAME | A.O.U.# | CODE | PO | PR | CO |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 8 9 10 | 11 | | | | | 7 8 9 10 | 11 | | | |
| Blue Jay | 4 7 7 .0 | | | | FL | Blackpoll Warbler | 6 6 1 .0 | | | S | |
| Common Raven | 4 8 6 .0 | | | | NB | Pine Warbler | 6 7 1 .0 | | | | |
| Common Crow | 4 8 8 .0 | | ✓ | | | Prairie Warbler * | 6 7 3 .0 | | | | |
| Black-capped Chickadee | 7 3 5 .0 | | | | FY | Palm Warbler * | 6 7 2 .0 | | | | |
| Boreal Chickadee | 7 4 0 .0 | | | | FY | Ovenbird | 6 7 4 .0 | | ✓ | | |
| Tufted Titmouse * | 7 3 1 .0 | | | | | Northern Waterthrush | 6 7 5 .0 | | | | FY |
| White-breasted Nuthatch | 7 2 7 .0 | | | | | Louisiana Waterthrush | 6 7 6 .0 | | | | |
| Red-breasted Nuthatch | 7 2 8 .0 | | | | FY | Mourning Warbler | 6 7 9 .0 | | | | |
| Brown Creeper | 7 2 6 .0 | | | | NY | Common Yellowthroat | 6 8 1 .0 | | | | FY |
| House Wren | 7 2 1 .0 | | | | | Yellow-breasted Chat * | 6 8 3 .0 | | | | |
| Winter Wren | 7 2 2 .0 | | | S | | Wilson's Warbler * | 6 8 5 .0 | | | | |
| Carolina Wren * | 7 1 8 .0 | | | | | Canada Warbler | 6 8 6 .0 | | | | DD |
| Long-billed Marsh Wren | 7 2 5 .0 | | | | | American Redstart | 6 8 7 .0 | | ✓ | | |
| Sh-billed Marsh Wren * | 7 2 4 .0 | | | | | House Sparrow | 6 8 8 .2 | | | | |
| Mockingbird | 7 0 3 .0 | | | | | Bobolink | 4 9 4 .0 | | | | |
| Gray Catbird | 7 0 4 .0 | | | D | | Eastern Meadowlark | 5 0 1 .0 | | | | |
| Brown Thrasher | 7 0 5 .0 | | ✓ | | | Red-winged Blackbird | 4 9 8 .0 | | | | FL |
| American Robin | 7 6 1 .0 | | | | FY | Orchard Oriole * | 5 0 6 .0 | | | | |
| Wood Thrush | 7 5 5 .0 | | | S | | Northern Oriole | 5 0 7 .0 | | | | FL |
| Hermit Thrush | 7 5 9 .0 | | | | FL | Rusty Blackbird | 5 0 9 .0 | | | | FL |
| Swainson's Thrush | 7 5 8 .0 | | | D | | Common Grackle | 5 1 1 .0 | | | | FY |
| Gray-cheeked Thrush | 7 5 7 .0 | | | | | Brown-headed Cowbird | 4 9 5 .0 | | ✓ | | |
| Veery | 7 5 6 .0 | | | S | | Scarlet Tanager | 6 0 8 .0 | | | S | |
| Eastern Bluebird | 7 6 6 .0 | | | | | Cardinal | 5 9 3 .0 | | | | |
| Blue-gray Gnatcatcher * | 7 5 1 .0 | | | | | Rose-breasted Grosbeak | 5 9 5 .0 | | ✓ | | |
| Golden-crowned Kinglet | 7 4 8 .0 | | | | FY | Indigo Bunting | 5 9 8 .0 | | | S | |
| Ruby-crowned Kinglet | 7 4 9 .0 | | | D | | Evening Grosbeak | 5 1 4 .0 | | ✓ | | |
| Cedar Waxwing | 6 1 9 .0 | | | S | | Purple Finch | 5 1 7 .0 | | | | FL |
| Loggerhead Shrike * | 6 2 2 .0 | | | | | Pine Grosbeak * | 5 1 5 .0 | | | | |
| Starling | 4 9 3 .0 | | ✓ | | | House Finch * | 5 1 9 .0 | | | | |
| Yellow-throated Vireo | 6 2 8 .0 | | | | | Pine Siskin * | 5 3 3 .0 | | ✓ | | |
| Solitary Vireo | 6 2 9 .0 | | | S | | American Goldfinch | 5 2 9 .0 | | ✓ | | |
| Red-eyed Vireo | 6 2 4 .0 | | | S | | Red Crossbill * | 5 2 1 .0 | | | | |
| Philadelphia Vireo * | 6 2 6 .0 | | | | | Wh.-winged Crossbill * | 5 2 2 .0 | | | D | |
| Warbling Vireo | 6 2 7 .0 | | | | | Rufous-sided Towhee | 5 8 7 .0 | | | | |
| Black-and-white Warbler | 6 3 6 .0 | | ✓ | | | Savannah Sparrow | 5 4 2 .0 | | | | |
| Worm-eating Warbler * | 6 3 9 .0 | | | | | Grasshopper Sparrow * | 5 4 6 .0 | | | | |
| Golden-winged Warbler | 6 4 2 .0 | | | | | Henslow's Sparrow * | 5 4 7 .0 | | | | |
| Blue-winged Warbler * | 6 4 1 .0 | | | | | Vesper Sparrow | 5 4 0 .0 | | | | |
| Tennessee Warbler * | 6 4 7 .0 | | | S | | Dark-eyed Junco | 5 6 7 .0 | | | | FY |
| Nashville Warbler | 6 4 5 .0 | | | | DD | Chipping Sparrow | 5 6 0 .0 | | | | NE |
| Northern Parula | 6 4 8 .0 | | | S | | Field Sparrow | 5 6 3 .0 | | | | |
| Yellow Warbler | 6 5 2 .0 | | ✓ | | | White-throated Sparrow | 5 5 8 .0 | | | | NY |
| Magnolia Warbler | 6 5 7 .0 | | | | NE | Lincoln's Sparrow * | 5 8 3 .0 | | | D | |
| Cape May Warbler * | 6 5 0 .0 | | | | FY | Swamp Sparrow | 5 8 4 .0 | | | | NB |
| Black-throated Blue W. | 6 5 4 .0 | | | | NE | Song Sparrow | 5 8 1 .0 | | | | FY |
| Yellow-rumped Warbler | 6 5 5 .0 | | | | NB | | | | | | |
| Black-throated Green W. | 6 6 7 .0 | | ✓ | | | | | | | | |
| Blackburnian Warbler | 6 6 2 .0 | | | D | | | | | | | |
| Chestnut-sided Warbler | 6 5 9 .0 | | | | FY | | | | | | |
| Bay-breasted Warbler * | 6 6 0 .0 | | | | | | | | | | |

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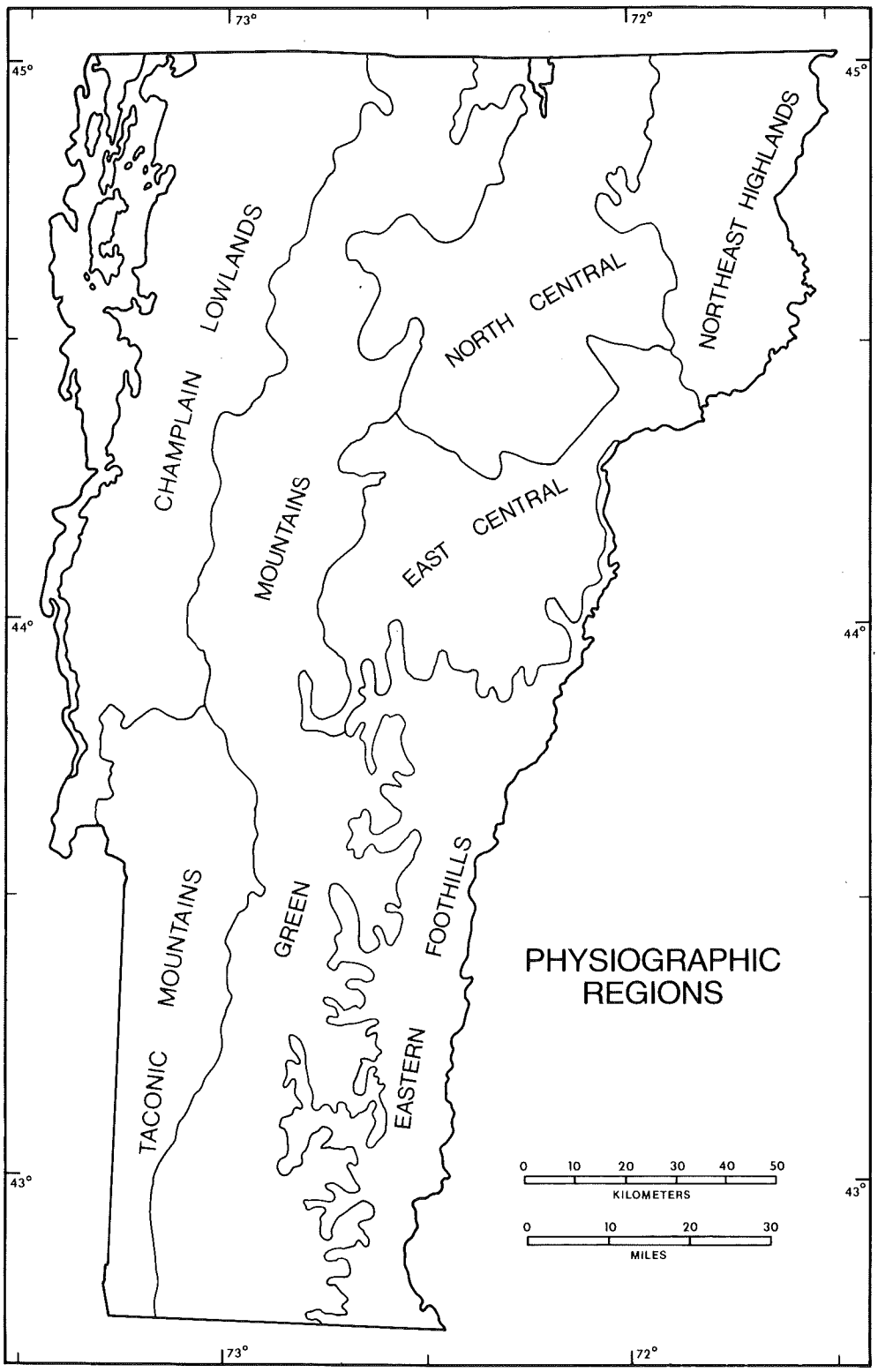
hypothetical or little-known, potential breeding species--all records must be fully documented.




MAP 5. Vermont Physiographic Regions (based on Garland 1977)

The following criteria were considered in designating UFAs: (1) whether an area contained breeding habitat for Endangered, Threatened or Rare species of birds; (2) whether it represented a unique ecosystem, as determined by completeness of the ecological unit, diversity of species, extent of human disturbance, or aesthetic value; (3) the relative rarity of an area's habitat in state, county, or country; (4) an area's physical characteristics, such as size (the larger areas were considered the most important); (5) usefulness of an area for education or research; (6) the viability of preserving an area; and (7) the ecological stability of an area. Areas judged by the Vermont Atlas Committee to be the most important were designated as primary UFAs, and were assured of field coverage; less important areas were designated as secondary UFAs, and were not all covered. Full data on species located in each primary UFA are on file at the Vermont Institute of Natural Science, as is information on those secondary UFAs which were surveyed.

The following UFAs were chosen and surveyed:

| **Primary UFAs** | **Town** |
|---|---|
| MARSHES | |
| Barton River Marsh (including Black River Marsh and South Bay Channel) | Coventry |
| Dead Creek | Panton and Addison |
| East Creek | Orwell |
| Little Otter Creek | Ferrisburg |
| Missisquoi Marsh | Swanton |
| Sandbar Marsh (including Sandbar Swamp Forest) | Milton |
| West Rutland Marsh | West Rutland |
| Herrick's Cove | Rockingham |
| Intervale | Burlington |
| SWAMPS | |
| Cornwall Swamp | Cornwall |
| Vernon Black Gum Swamp | Vernon |
| BOGS | |
| Bog Pond | Fairlee |
| Chickering Bog | Calais |
| Colchester Bog | Colchester |
| Cranberry Bog (Pownal Bog) | Pownal |
| Franklin Bog | Franklin |
| Lost Pond Bog | Mt. Tabor |
| Peacham Bog | Peacham |
| Scanlon Bog | Brandon |

BOREAL HABITATS

| | |
|---|---|
| Bear Swamp | Wolcott |
| Chimney Hill | Wilmington |
| Haystack | Dover and Wilmington |
| Moose Bog | Ferdinand |
| Mt. Snow | Dover |

PONDS

| | |
|---|---|
| Shelburne Pond | Shelburne |
| Wallingford Pond | Wallingford |
| Bristol Pond | Bristol |

ARCTIC-ALPINE HABITATS

| | |
|---|---|
| Camels Hump summit | Huntington |
| Mt. Mansfield ridge | Underhill |

LAKE CHAMPLAIN NESTING ISLANDS

| | |
|---|---|
| Young Island | Grand Isle |
| Grandma or No-Name Island | North Hero |
| Hen Island | North Hero |
| Popasquash Island | St. Albans |
| Rock Island | Georgia |

### Secondary UFAs

MARSHES

| | |
|---|---|
| Dorset Marsh | Dorset |
| Fairfield Marsh | Fairfield |
| La Platte River Marsh | Shelburne |
| Mallets Creek Marsh | Colchester |
| Whitney Creek Marsh | Addison |
| Tinmouth Channel | Tinmouth |

BOGS

| | |
|---|---|
| Alburg Black Spruce (Tamarack Bog) | Alburg |
| Ferdinand Bog | Ferdinand |
| Lake Carmi Black Spruce Bog | Franklin |

OTHER

| | |
|---|---|
| Ryder Pond | Jacksonville |
| Peckham Hill | Pownal |

## The species accounts

The species accounts are comprised of an individual text and a map for each of the 178 species confirmed as breeders during the Atlas Project; there is an additional account for the White-winged Crossbill, which is an irregular breeder in Vermont and was not

confirmed during 1976–81. Fourteen shorter species accounts contain text on each of those species for which fieldwork indicated possible or probable breeding status, but for which confirmation was lacking between 1976 and 1981. A concluding section provides accounts on two other species—one a former Vermont breeding species now being reintroduced, and one a species newly established as a breeder in Vermont.

Each species account contains information on the species' habitat and life history, an analysis of the species' distribution as documented by the Vermont Atlas Project survey, a summary of Vermont nesting information, the species' historical status (where appropriate), and an indication of whether the species is recommended for Vermont's Endangered, Threatened, or Species of Special Concern lists. This list was prepared by the Vermont Endangered Species Committee, and proposed to the Secretary of the Agency of Environmental Conservation in January 1985.

Statistical data that accompany each account define the species' occurrence in priority blocks; although occurrence in non-priority blocks is incorporated on the maps, it is not considered in the statistical data. Statistical information on the number and the percentage of the priority blocks in which the species was found, and a breakdown of its recorded breeding status, are given. Dots on a species' map indicate its presence in both priority and non-priority blocks, and dot size represents breeding status:

- possible breeding
- probable breeding
  confirmed breeding

Also accompanying each species account are figures showing the number of priority blocks in each physiographic region in which the species occurred, in what percentage of the region's priority blocks it was found, and the percentage of the species' occurrence in priority blocks statewide that is represented by its regional occurrence. For example, the statistical data for the Veery's occurrence in one of the state's physiographic regions are:

| | no. of priority blocks in which recorded | % of region's priority blocks | % of species total priority blocks |
|---|---|---|---|
| Champlain Lowlands | 29 | 94 | 16 |

Thus the Veery occurred in 29 priority blocks (of the total 31) within the Champlain Lowlands region; these represented its occurrence in 94% of the blocks of that region; and its occurrence in the Champlain Lowlands represented 16% of its occurrence in priority blocks statewide.

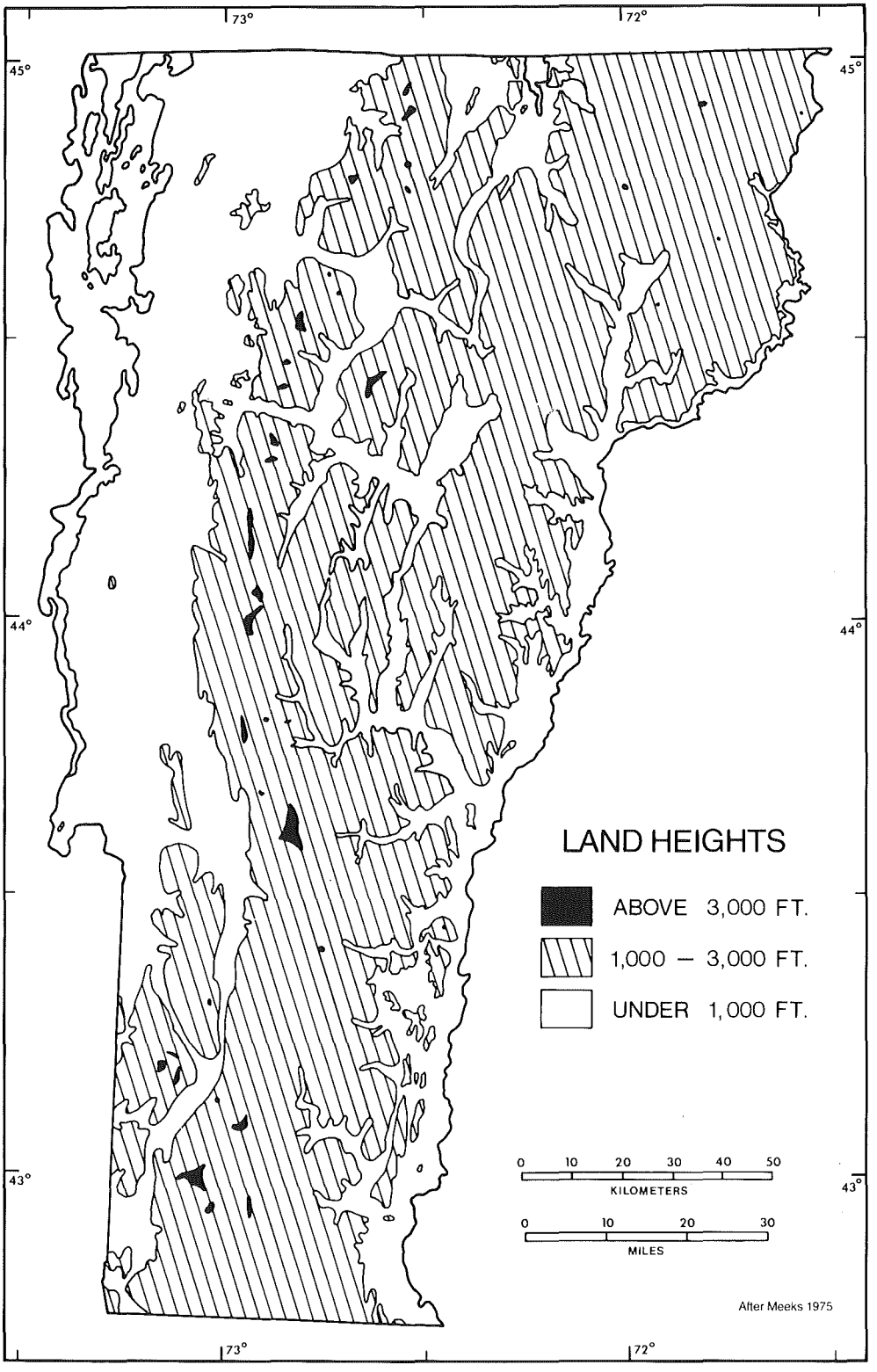
Environmental conditions and land-use practices within each region have affected the composition and distribution of the state's avifauna to a marked degree. Maps 5–12 and the corresponding overlays will help the reader to evaluate species occurrence and distribution in Vermont. Many species are distributed according to elevational gradients (Map 7 and Overlay 3). Changes in agricultural use, as farmland reverts to woodland, greatly affect species dependent on hayfields (such as Eastern Meadowlarks and Bobolinks) and agricultural land (Upland Sandpipers, Vesper Sparrows); Map 8 and Overlay 4 indicate the present expanse of Vermont's farmland. Summer temperatures vary with elevation and topography (Map 9, Overlay 5), and influence many breeding species' distribution. The amount of rainfall affects both vegetation and species distribution (Map 10, Overlay 6). The most profound influences on avifauna are vegetative cover (Map 11, Overlay 7), and the distribution of river systems and wetlands (Map 12, Overlay 8). The state's ecological zones and geography are discussed in Appendix A.

Authors of many individual accounts have identified features influencing the species' distribution, but detailed comparative assessments of the specific factors involved in the patterns of occurrence observed were beyond the scope of the Atlas Project survey. Similarly, relatively little information was collected on habitat relationships, breeding chronology, or relative abundance. Authors of species accounts relied to a large degree on published data and on their personal assessment of a species' abundance and habitat selection, as well as on the Atlas Project results.

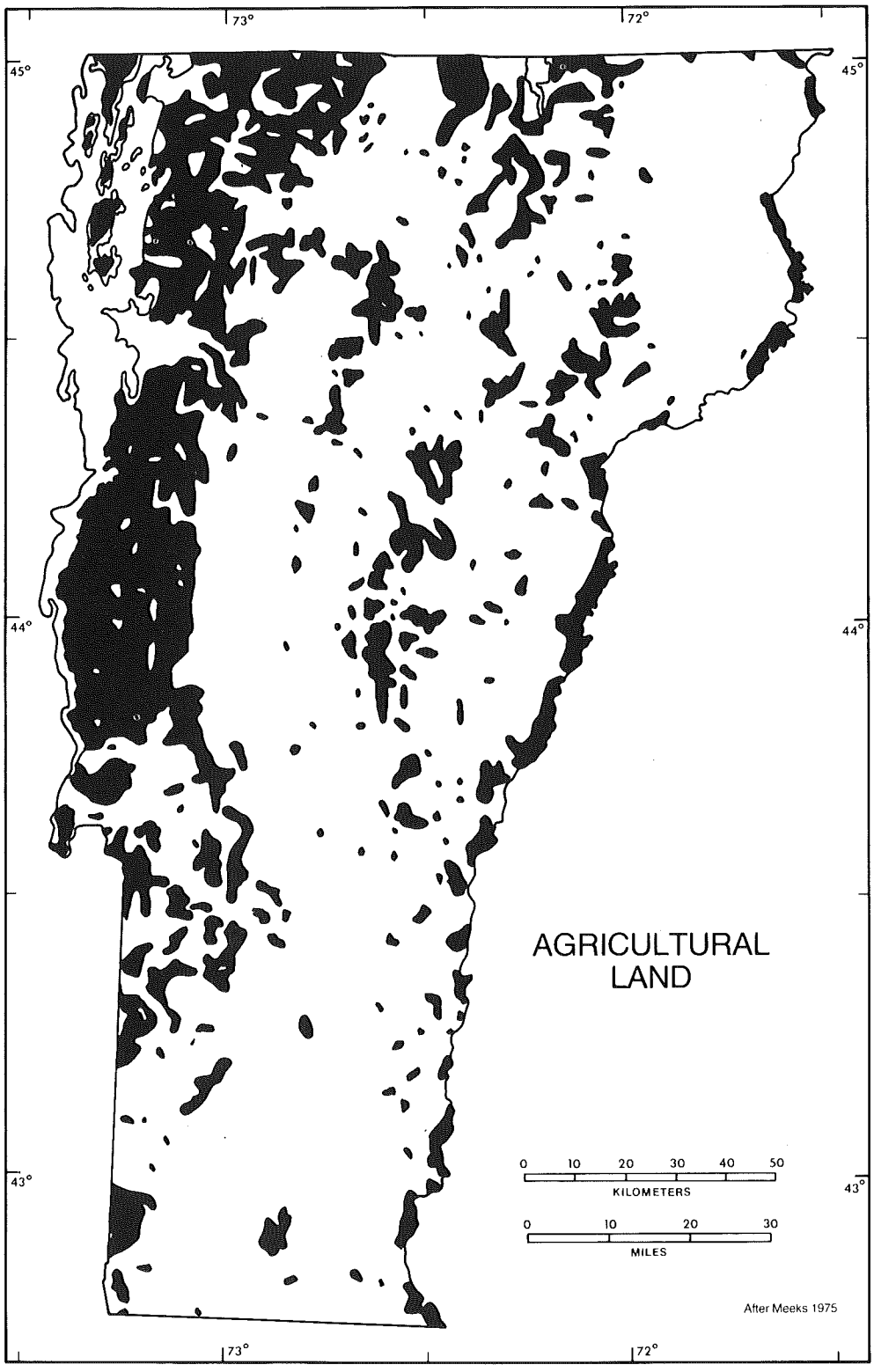
Each of the species' accounts attempts to place the Atlas Project findings in the perspective of earlier work. However, no comprehensive survey of Vermont's avifauna had been done before the Atlas Project, so appraisals of changes in species' status must be tempered with the knowledge that earlier published work may be fragmentary or extremely local in coverage.

For each species, all available data on that species' dates of nest building, egg laying, hatching young, and fledging young have been researched. The North American Nest Record Program's data at the Cornell Laboratory of Ornithology in Ithaca, New York, were especially valuable. In addition, data were collected from Vermont fieldworkers; gleaned from published information in the *Records of Vermont Birds*, *Bulletin of New England Bird Life*, and *Records of New England Birds*; and obtained from the egg collections at the Montshire Museum in Hanover, New Hampshire, and the Pember Collection at the University of Vermont in Burlington, Vermont. Historical data came from L. H. Ross's field notes, now at the Vermont Institute of Natural Science, and the bird records of the Green Mountain Audubon Society in Huntington, Vermont. All available data are used in the species accounts, although for

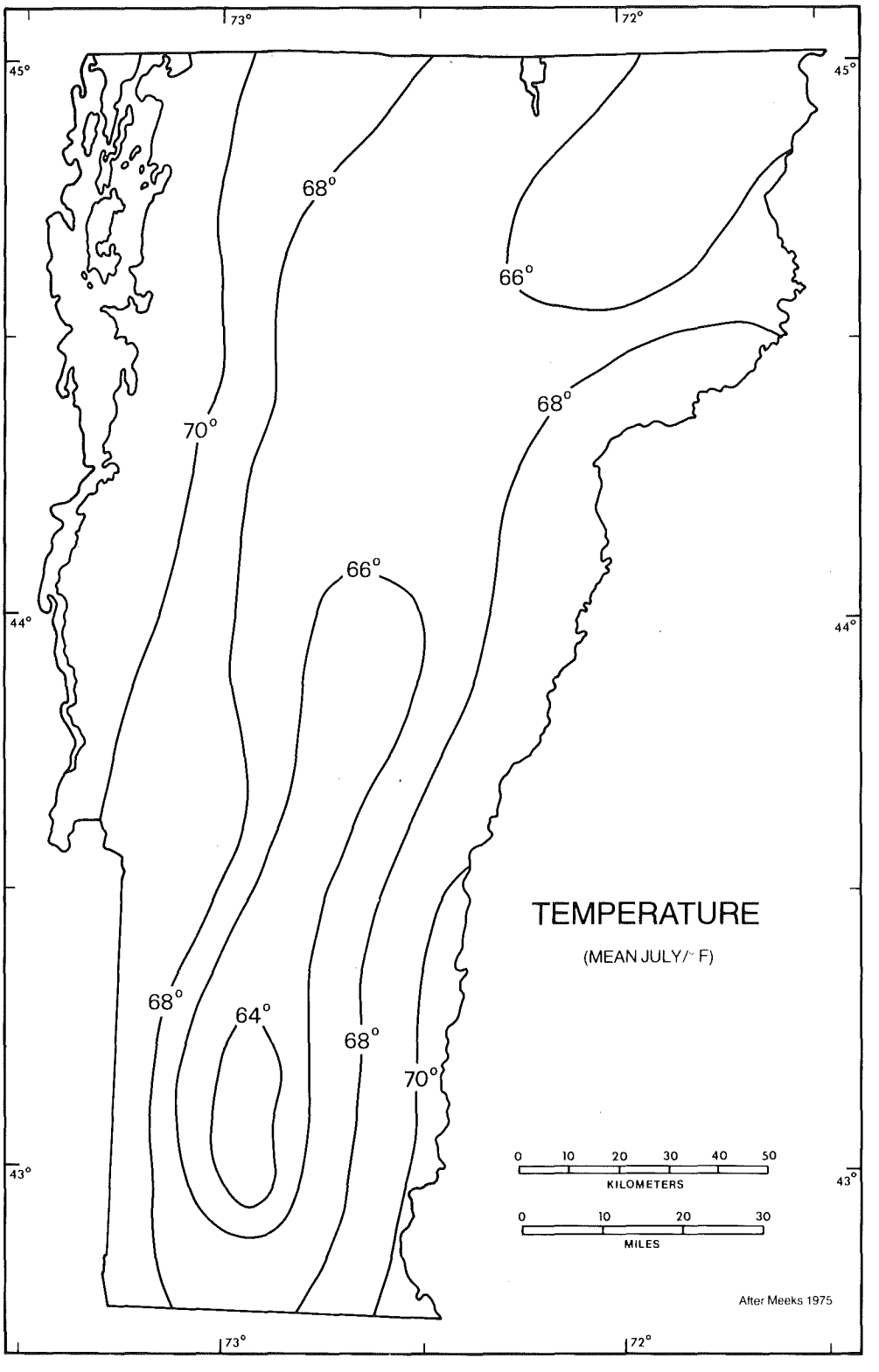

MAP 6. Vermont Counties



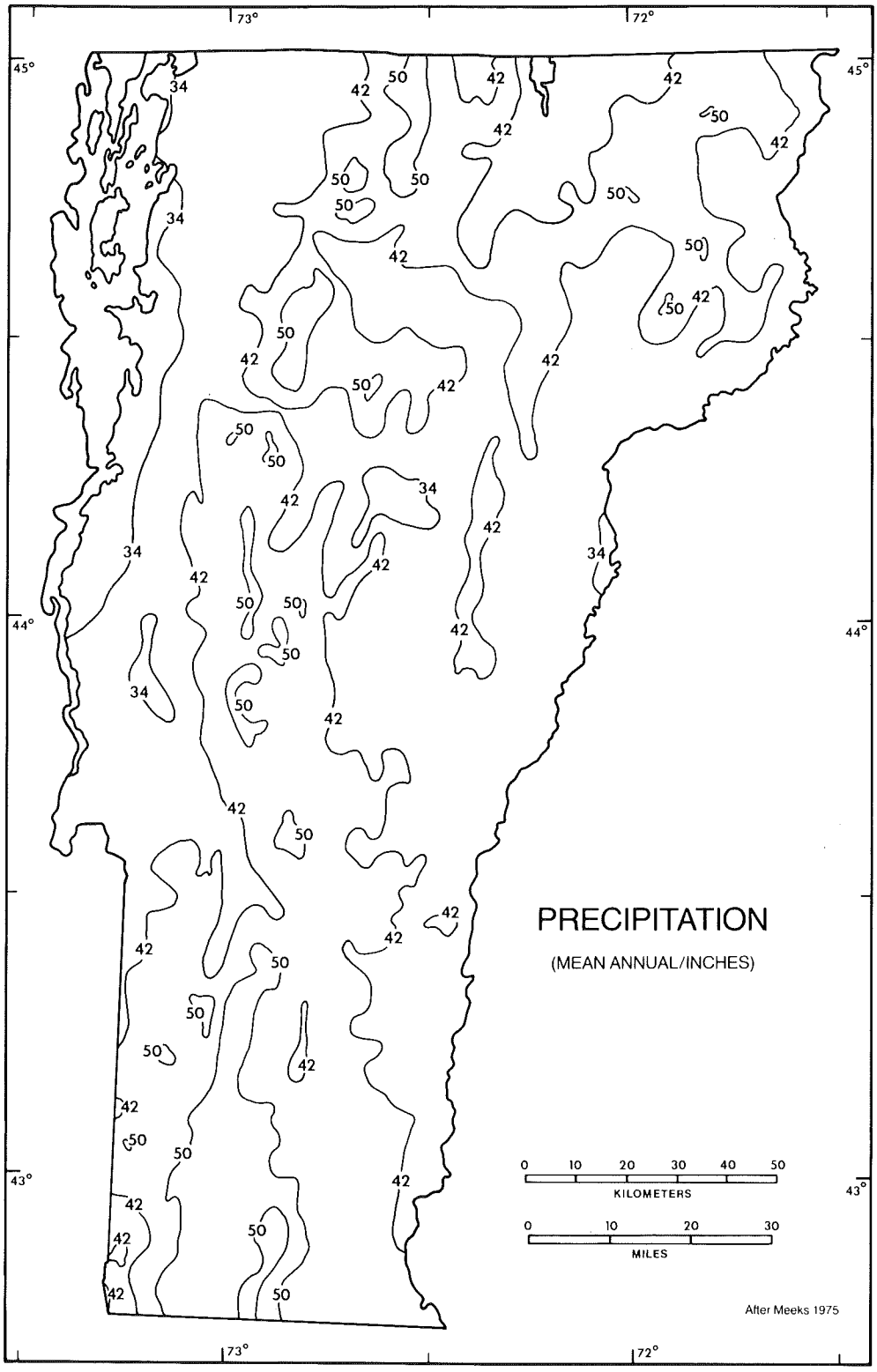

MAP 7. Land Heights



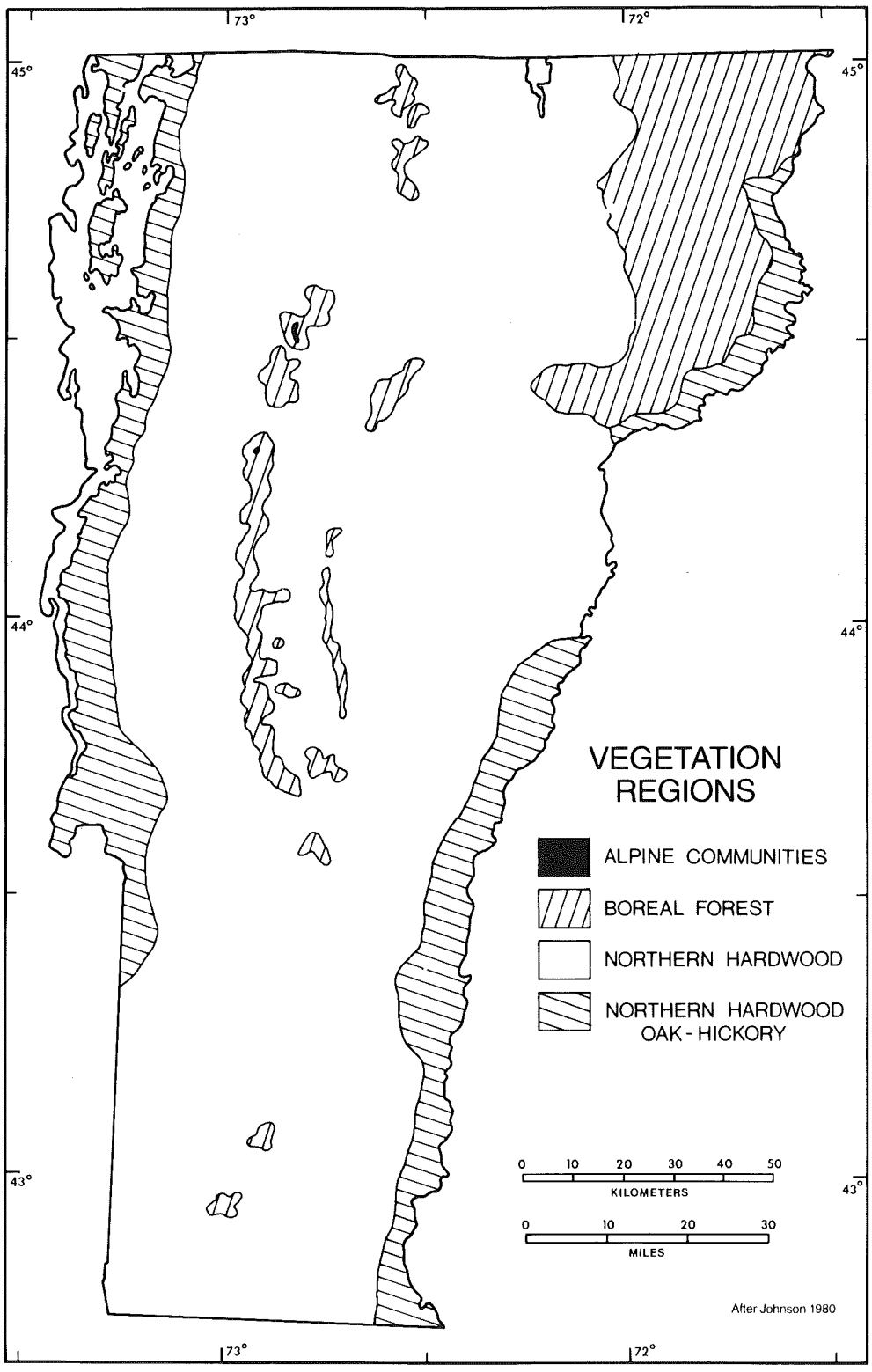

MAP 8. Agricultural Land



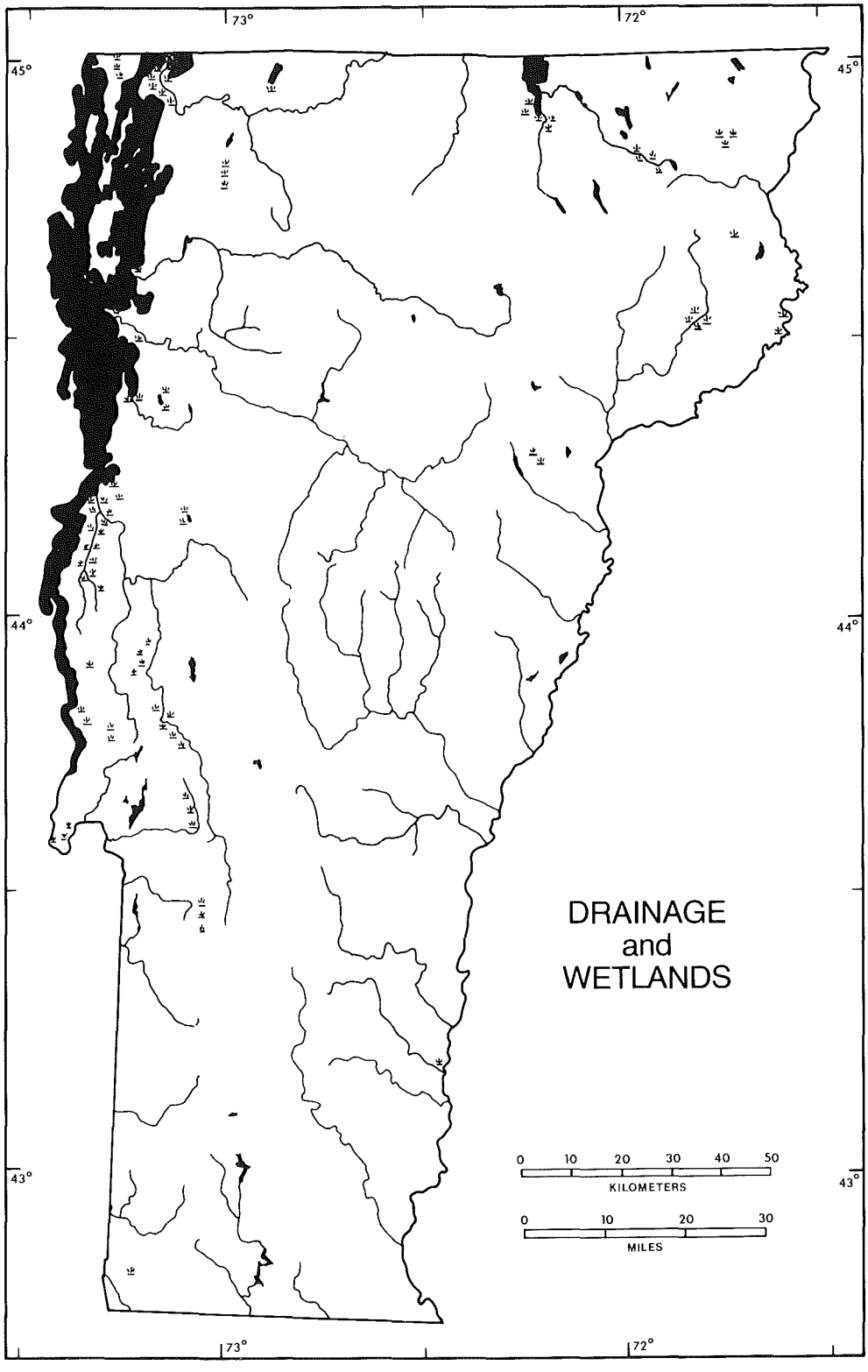

MAP 9. Mean July Temperature (in Fahrenheit)




MAP 10. Annual Mean Precipitation (in inches)




MAP 11. Vegetation Regions




MAP 12. Drainage and Wetlands

many species data are extremely scant. The data on nest building, egg laying, hatching, and fledging young are available on file cards at the Vermont Institute of Natural Science; future fieldworkers are urged to report their observations to the Vermont Institute of Natural Science to increase this important resource.

### Results and interpretation

During fieldwork in 1976–81, 193 species of birds were recorded as breeders: 8 species as possible breeders, 7 species as probable breeders, and 178 species as confirmed breeders. Of the 191 species listed on the recording sheet in 1976, 8 were not found (Redhead, King Rail, Yellow Rail, Solitary Sandpiper, Least Sandpiper, Boreal Owl, Worm-eating Warbler, Palm Warbler); and 3 species not listed were located (Double-crested Cormorant, Great Egret, Cerulean Warbler).

Statewide, an average of 84 species was seen in each priority block. The Champlain Lowlands had the highest regional average—88 species per block—an indication of the region's varied habitat of marshes, fields, and woodlands. The Eastern Foothills and East Central and North Central regions averaged 86 species per block; these regions support a large number of boreal forest species, as well as many southern, lowland birds. The Taconic Mountains were next with 83 species per block, while the Green Mountains and Northeast Highlands each had an average of 81 species per priority block. The latter two areas received much of their coverage during block-busting surveys that ceased once adequate coverage standards were achieved. Although large areas of the two regions contain relatively unbroken forest with little habitat diversity, it should be pointed out that the highest species tallies in the state—107 in the Victory Bog block, and 130 and 112 in blocks in Winhall and Londonderry—came from these regions.

The Vermont Atlas Project made discoveries that changed many preconceived ideas about Vermont's birds and their distribution. Some species once considered very limited in Vermont were found to be more widely distributed than expected. These include the Blue-gray Gnatcatcher, Yellow-throated Vireo, Mourning Warbler, Rusty Blackbird, and Lincoln's Sparrow. Several species formerly considered regular nesters were found to be either very rare (Sedge Wren) or almost totally absent (Henslow's Sparrow). First state breeding records were established for 7 species: Turkey Vulture, Barn Owl, Carolina Wren, Blue-winged Warbler, Cerulean Warbler, Bay-breasted Warbler, and House Finch.

Despite the severity of Vermont's winter weather, a pronounced expansion of "southern" breeding species is evident in the Atlas Project data. Species considered very local in even the southernmost reaches of the state only a quarter of a century ago seem to

be expanding their northern distributional limits well into the state. Species included in this movement are both migratory (e.g., Blue-winged Warbler) and nonmigratory (Northern Cardinal, Tufted Titmouse, and Northern Mockingbird). Although the increasing popularity of birdfeeders may have aided a few of the latter species, much remains to be learned about the factors underlying the success of these expanding populations. This atlas will enable us to document future expansions.

### Biases and limitations

Although efforts were made to ensure that all priority blocks met minimum standards for adequate coverage (75 species identified, with 35 confirmed), several biases are known to be reflected in Atlas Project data. Biases pertaining to nocturnal, secretive, or early-nesting species are treated in the species' accounts; in general, species in these categories were undersurveyed. Many species, such as owls and rails, were seldom located without special survey efforts. In Vermont's Atlas Project, attempts were made to reduce underrepresentation to the greatest possible extent by publicity campaigns directed to the general public (i.e., to urge reporting of Whip-poor-wills and woodcock), and, in a few local instances, concerted searches with tape recorders in suitable habitat.

A more general bias affecting coverage of all species resulted from the uneven distribution of Atlas Project workers in the state. Attempts to minimize this problem by selecting priority blocks for survey only partially alleviated the situation, since vast tracts, particularly in the mountainous regions and Northeast Highlands, were outside the normal range of the state's active birders. Efforts to solicit aid from active local birders unaffiliated with organized bird clubs resulted in some additional coverage, but it was necessary to mobilize block-busting teams to achieve adequate coverage in more than half the blocks in those areas. Because block-busters concentrated their efforts in June and July, when the probability of getting confirmations for a large number of species is greatest, many of the early- or late-nesting species and more secretive species may be underrepresented in these blocks.

Rare species, such as the Loggerhead Shrike, probably were found in priority blocks in proportion to their actual abundance statewide, unless they were secretive as well as rare (Kibbe 1982).

Actual hours of coverage in various blocks varied tremendously. Coverage is impossible to compare among blocks, particularly since an expert block-busting team could in one or two days identify and confirm twice as many species as a less experienced observer could in hundreds of hours. *Readers are cautioned, therefore, that the distributions portrayed herein reflect only those of species actually recorded and do not necessarily preclude the oc-*

*currence of any species within a given block with appropriate habitat, given additional coverage. In no block is it assumed that the species recorded constitute the entire set of species breeding within the block during the survey period, although in several priority and a few non-priority blocks the percentage of species that escaped detection must have been extremely small.*

While a more intensive analysis based on the environmental parameters of each block surveyed would have been desirable, the Atlas Project analyses are restricted to overall distributional patterns as evidenced in each physiographic region. Future researchers are urged to make further in-depth analyses of individual species' distribution, based on the environmental features—available water, community types, elevation, topography, land uses—of given survey blocks.

# RECORDING CODES USED BY THE VERMONT BREEDING BIRD ATLAS PROJECT

POSSIBLE BREEDING (PO) Used only for a bird recorded in the breeding season in possible nesting habitat, but with no other indication of breeding noted. Summering and non-breeding adults (e.g., gulls in a dump, migrant shorebirds and warblers) not counted

PROBABLE BREEDING (PR)

S Singing male present (or breeding calls heard) on more than one date in the same place. A good indication that a bird has taken up residence if the dates are a week or more apart

T Bird (or pair) apparently holding territory. In addition to singing, chasing of other individuals of the same species often marks a territory

D Courtship and display, or agitated behavior or anxiety calls from adults suggesting the probable presence of a nearby nest or young; brood-patch or cloacal protuberance on trapped adult

N Bird visiting probable nest site

B Nest building by wrens and woodpeckers. Wrens may build many nests, and woodpeckers, although they usually drill only one nesting cavity, drill roosting holes

CONFIRMED BREEDING (CO)

DD Distraction display or injury feigning; coition. (Agitated behavior and/or anxiety calls, D only)

NB Nest building by any species except wrens and woodpeckers

UN Used nest found. These must be carefully identified if they are to be used for confirmation. Some nests (e.g., that of the Northern Oriole) last through the winter and are very characteristic. Most are difficult to identify correctly.

FE Female with egg in the oviduct

FL Recently fledged young (including downy young of waterfowl, etc.). This code used with caution for species such as blackbirds and swallows, which may move some distance soon after fledging. Recently fledged passerines are still dependent on their parents and are fed by them

FS Adult carrying fecal sac

FY Adult(s) with food for young. Some birds (gulls, terns, and birds of prey) continue to feed their young long after they've fledged, and may move considerable distances. Also, some birds (e.g., terns) may carry food long distances to young in a neighboring survey block. Care especially needed on the edge of a block. Care needed to avoid confusion with courtship feeding (D)

ON Adult(s) entering or leaving nest site in circumstances indicating occupied nest. *Not generally used for open-nesting birds.* Used for hole nesters only when a bird enters a hole and remains inside; when the male and female exchange places while incubating the eggs; or when a bird leaves a hole after having been inside for some time

NE Nest and eggs, or bird sitting on nest, or egg shells found below nest. If a cowbird egg is found in a nest, NE used for both cowbird and the host nest

NY Nest with young or downy young of waterfowl, quail, waders, etc. If a young cowbird is found with young of other species, NY used for both cowbird and the host species. Since precocial downy young may be led considerable distances by their parents, care needed when such records are made close to the edge of a block

# TERMS AND ABBREVIATIONS

Nomenclature for birds used throughout the text follows the sixth edition of American Ornithologists' Union *Check-list of North American Birds* (1983). In many cases, this newly accepted nomenclature revises long-standing common names. In the species accounts and in the index of bird names the old name is also given.

a — acre

AOU — American Ornithologists' Union

ASR — Asterisked Species Report. The documentation collected during the Vermont Breeding Bird Atlas Project to verify reports on little-known or hypothetical breeding species (see p. 6). Asterisked Species Reports are cited as supporting data for this book by the abbreviation ASR, followed by the name of the fieldworker who filed the report

BBC — Breeding bird censuses, coordinated by the National Audubon Society and published in *American Birds* (formerly *Bird-Lore* and *Audubon Field Notes*). In the text, references to BBC data are by author's name and date of publication where appropriate

BBS — U.S. Fish and Wildlife Service Breeding Bird Survey route. Roadside surveys carried out yearly. Statistical analyses of Vermont routes were made by Chandler S. Robbins for the Atlas Project, and are on file at the Vermont Institute of Natural Science, Woodstock

Blue List — *American Birds*' Blue List identifies species perceived by experienced fieldworkers to be exhibiting a long-term decline, at least in portions of their ranges. It has been published annually since 1971

BNEBL — *Bulletin of New England Bird Life*

BVR — Vermont Bird Verification Report. Reports required by the Vermont Bird Records Committee to document sightings of rare or unusual species and nesting of species that are rare breeders in Vermont; acceptance is by vote of the committee. Bird Verification Reports are cited in the text by the abbreviation BVR followed by the name of the observer who filed the report

CBC — Christmas Bird Count data, from the annual survey conducted since 1900 and coordinated by the National Au-

| | |
|---|---|
| | dubon Society, and published in *Bird-Lore* from 1901 to 1940, *Audubon Magazine* from 1941 to 1947, *Audubon Field Notes* from 1948 to 1970, and *American Birds* from 1971 to 1984. Cited in text as CBC followed by count year being referenced. Refer to appropriate journal for year cited. |
| cm | centimeter |
| DBH | diameter at breast height; standard measurement of tree diameter |
| ft | foot |
| GMAS records | Green Mountain Audubon Society's accumulated historical bird records, located at the Huntington Nature Center, Huntington, Vermont. Microfiche copy at the Vermont Institute of Natural Science. Cited in text as "GMAS records" followed by the name of the person who made the report |
| ha | hectare |
| in | inch |
| km | kilometer |
| m | meter |
| mi | mile |
| RNEB | *Records of New England Birds* |
| RVB | *Records of Vermont Birds*, identified in the publication by the year of the season that it describes rather than the year published, and therefore cited in the text as RVB followed by the year and season. Inclusive dates indicate publication of data through the years cited |
| UFA | Area of unique and fragile habitat, surveyed for the Atlas Project (see p. 7); data sheets on file at the Vermont Institute of Natural Science |
| VDFG | The Vermont Department of Fish and Game; in 1984, the department's name was changed to the Vermont Department of Fish and Wildlife. |
| VINS | Vermont Institute of Natural Science, Woodstock |