

Table 2.

Vegetational Attributes of Trees in South Officer's Woods, from Lindsey, et. al. 1964.

Species	B ₂ (Basal area per acre in sq. ft.)	D ₂ (Density per acre)	V ₃ (Importance)
Beech (<i>Fagus grandifolia</i>)	63	22	37
Tulip-tree (<i>Liriodendron tulipifera</i>)	23	16	17
Black Gum (<i>Nyssa sylvatica</i>)	13	23	17
Red Maple (<i>Acer rubrum</i>)	6.2	10	7.9
White Oak (<i>Quercus alba</i>)	3.5	2	2.5
Sycamore (<i>Platanus occidentalis</i>)	2.5	5.5	3.9
White Ash (<i>Fraxinus americana</i>)	2.1	3.0	2.4
Sassafras (<i>Sassafras albidum</i>)	2.0	5.5	3.6
Silver Maple (<i>A. saccharinum</i>)	1.7	1.0	1.2
Sugar Maple (<i>A. saccharum</i>)	.8	2.0	1.4
Black Cherry (<i>Prunus serotina</i>)	.6	1.0	.8
Black Walnut (<i>Juglans nigra</i>)	.4	1.5	1.0
Red Oak (<i>Q. borealis</i>)	.2	1.0	.6
Flowering Dogwood (<i>Cornus borealis</i>)	.2	1.5	.8
5 other species	1.6	2.5	2.0
	120.5 (Stand basal area per acre)	97.5 (Stand density per acre)	

impeded walking. Other species in this layer were: Spicebush (*Lindera benzoin*), 6; Poison Ivy (*Rhus radicans*), 5; Pawpaw (*Asimina triloba*), 5; Climbing Bittersweet (*Celastrus scandens*), 2; Maple-leaved Viburnum (*Viburnum acerifolium*), 2. In the herb layer these stratum ranks were recorded: Poison Ivy, 7; greenbrier, 5; Spicebush, 5; Herbaceous Greenbrier (*Smilax herbacea*), 3; May-apple (*Podophyllum peltatum*), 3; jewelweed (*Impatiens* sp.), 3; Jack-in-the-pulpit (*Arisaema triphyllum*), 3; other species less common. Webster noted the height of the canopy as 90-100 feet. Plants names follow the reference cited. **Edge:** Along 1100 feet of the boundary line, young forest (trees 6-8 inches in diameter) is immediately adjacent, and extends a considerable distance. Along 1700 feet old forest, similar to the census tract, extends 100 feet or more from the line. Along 2000 feet old forest extends only 30-50 feet before a brushy edge begins, in turn bordering open field. **Topography:** Almost flat except for a dissected small creek valley in the north-central area; elevation 780-800 feet; relief 20 feet. **Weather:** Generally, late April and May were mild with moderate rains; June was hot with several heavy showers. During counts, the sky was clear, or mostly so, 6 times, and overcast twice; wind was usually zero and never exceeded 6 m.p.h.; temperatures ranged from 48° to 75° F. **Coverage:** April 17; May 9 (partial), 28; June 7, 9, 10 (partial), 11, 16, 19, 20. **Total:** 38 man-hours of censusing plus about 7 man-hours of measuring. Eight early morning counts (usually 5:00-8:30 a.m.) and two evenings of listening.

Census: Cerulean Warbler, 10.5 (42); Blue-gray Gnatcatcher, 10 (40); Tufted Titmouse, 9 (36); Red-eyed Vireo, 8 (32); Cardinal, 7.5 (30); Acadian Flycatcher, 7 (28); Kentucky Warbler, 6.5 (26); E. Wood Pewee, 5 (20); Wood Thrush, 5 (20); Yellow-throated Vireo, 4 (16); Red-bellied Woodpecker, 3.5 (14); Downy Woodpecker, 3.5 (14); Brown-headed Cowbird, 3 (12) (females); Summer Tanager, 3 (12); Mourning Dove, 2.5; Carolina Chickadee, 2.5; White-breasted Nuthatch, 2.5; Carolina Wren, 2; Starling, 2; Rufous-sided Towhee, 2; Yellow-billed Cuckoo, 1.5; Ruby-throated Hummingbird, 1.5 (females); Blue Jay, 1.5; Hooded Warbler, 1.5; Whip-poor-will, 1; Black-billed Cuckoo, 1; Yellow-shafted Flicker, 1; Red-headed Woodpecker, 1; Great Crested Flycatcher, 1; Am. Redstart, 1; Barred Owl, 0.5; Pileated Woodpecker, 0.5; Hairy Woodpecker, 0.5; Com. Crow, 0.5; Louisiana Waterthrush, 0.5; Indigo Bunting, 0.5. **Total:** 36 species; 114 territorial males (or females) (458 per 100 acres). **Visitors:** Red-tailed Hawk, Cooper's Hawk, Turkey Vulture, Chimney Swift, Catbird, Ovenbird, Com. Grackle. **Remarks:** Juanita R. Webster, Marcus Webster, John Wilkins, and Bruce Cummins assisted with some of the count work, but their time was not calculated above. We thank William I. Officer, who owns the woods, for permitting us to make the study. Financial assistance was received from the Indiana Academy of Sciences. — J. DAN WEBSTER and DIANA L. ADAMS, *Hanover College, Hanover, Ind. 47243.*

25. OLD GROWTH OAK-HICKORY FOREST. — **Location:** Indiana; Kramer Woods, 7 miles southwest of Rockport, Spencer County; 37°51'N, 87°08'W, Owensboro West Quadrangle, U.S.G.S. **Size:** 22.5 acres (330 yards square, measured with steel tape and compass). **Description of Area:** Part of a 212-acre forest which A. A. Lindsey, D. V. Schmelz and S. A. Nichols, (*Natural Areas in Indiana and their Preservation*, Purdue Univ., Lafayette, 1969), call, "Far and away the best remaining example of the low ground forest type of southern Indiana." The census area is in the mid-northern part of Kramer Woods. The soil is deep, poorly-drained Ginat silt loam. The plant ecology was studied by the above in 1967-1969 (*op. cit.* and also Schmelz, *Proc. Indiana Acad. Science* 77:184, 1968). A summary of those reports follows: The soil tends to wetness, as was reflected in the vegetation — bottomland species of oaks (Southern Red, Pin, Shumard, and Swamp Chestnut). Other important species were Sweet Gum, Silver Maple, and Hackberry; all the prominent trees were low ground species. The largest stem was a 51.5-inch Shumard Oak. Table 1 presents the vegetational attributes of trees exceeding 4 inches DBH in Kramer Woods, based on a full tally of 21.4 acres; there were 123 trees 30 inches DBH or larger in this sample. The stratum rank of shrubs was: Spicebush (*Lindera benzoin*), 6; Trumpet Creeper (*Bignonia radicans*), 6; Poison Ivy (*Rhus radicans*), 5; Cat Greenbrier (*Smilax glauca*), 4; Moonseed (*Menispermum canadense*), 3; Woodbine (*Parthenocissus quinquefolia*), 3; grape (*Vitis* sp.), 3; and Am. Elder (*Sambucus canadensis*), 2. In the herb layer we recorded

these stratum ranks: Poison Ivy, 8; White Aster (*Aster lateriflorus*), 5; Trumpet Creeper, 5; Spicebush, 4; Wood Nettle (*Laportea canadensis*), 4; 20 other species, 3 or less. Webster noted that the average canopy height of the forest was about 110 feet. Names of plants and methods of plant analysis follow the two papers cited. **Edge:** The tract was bordered on all sides by similar forest. However, the northern boundary was only 50 feet from a gravel road, whereas all other boundaries were 1000 ft. or more from any edge. **Topography:** Almost flat, but bisected by a century-old drainage ditch 5 feet deep; elevation 370 feet. **Weather:** Generally, late April and May were mild with some light rains; June and early July were hot with several heavy showers. During counts, the sky was clear or mostly so 5 times, but overcast 3 times; wind never exceeded 4 m.p.h.; temperatures ranged from 56° to 83° F. (66° to 83° in June). **Coverage:** April 26; June 11 (partial), 12, 13, 15, 26, 28, 30; July 1. Eight morning counts (usually from 5 to 8 a.m.), totaling 41 man-hours, plus 2 or 3 hours of measuring. Also, camp was on the area; some time was spent each evening listening for night birds. **Census:** Cerulean Warbler, 12 (53); Tufted Titmouse, 7 (31); Blue-gray Gnatcatcher, 7 (31); Red-eyed Vireo, 7 (31); Acadian Flycatcher, 5.5 (24); Yellow-throated Vireo, 5.5 (24); Cardinal, 5.5 (24); Downy Woodpecker, 3.5 (16); Carolina Wren, 3.5 (16); Kentucky Warbler, 3.5 (16); E. Wood Pewee, 3 (13); Wood Thrush, 3 (13); Red-bellied Woodpecker, 2.5; Carolina Chickadee, 2.5; White-breasted Nuthatch, 2.5; Hooded Warbler, 2; Brown-headed Cowbird, 2 (females); Summer Tanager, 2;

Table 1. Vegetational Attributes in Kramer Woods, from Lindsey et. al. 1969.

Species	B ₂ (Basal area per acre in sq. ft.)	D ₂ (Density per acre)	V ₃ (Importance)
Shumard Oak (<i>Quercus shumardii</i>)	38	14	23.5
Pin Oak (<i>Q. palustris</i>)	17	4.3	9.4
Shagbark + Shellbark	14	13	13.5
Hickory (<i>Carya ovata</i> + <i>laciniosa</i>)			
Sweet Gum (<i>Liquidambar styraciflua</i>)	12	5.8	8.4
Swamp White Oak (<i>Q. bicolor</i>)	10	3.8	6.3
White Oak (<i>Q. alba</i>)	5.1	2.3	3.4
S. Red Oak (<i>Q. falcata</i>)	4.6	1.5	2.8
Beech (<i>Fagus grandifolia</i>)	4.1	1.2	2.9
Am. Elm (<i>Ulmus americana</i>)	3.5	9.7	7.5
Green Ash (<i>Fraxinus pennsylvanica</i>)	3.4	5.4	4.7
Swamp Chestnut Oak (<i>Q. michauxii</i>)	2.7	1.5	2.0
Red Elm (<i>U. rubra</i>)	2.6	3.1	3.0
Red Maple (<i>Acer rubrum</i>)	2.3	2.2	2.3
Bitternut Hickory (<i>C. cordiformis</i>)	1.4	2.0	1.8
Black Walnut (<i>Juglans nigra</i>)	1.3	1.1	1.2
Black Gum (<i>Nyssa sylvatica</i>)	1.2	1.1	1.2
17 other species	4.9	7.6	6.5
	128.5 (Stand basal area per acre)	78.9 (Stand density per acre)	

Yellow-billed Cuckoo, 1.5; Red-headed Woodpecker, 1.5; Great Crested Flycatcher, 1.5; Blue Jay, 1.5; White-eyed Vireo, 1.5; Rufous-sided Towhee, 1.5; Mourning Dove, 1; Black-billed Cuckoo, 1; Ruby-throated Hummingbird, 1 (female); Hairy Woodpecker, 1; Scarlet Tanager, 1; Indigo Bunting, 1; Barred Owl, 0.5; Pileated Woodpecker, 0.5; Com. Crow, 0.5; Com. Grackle, 0.5; Black-and-white Warbler, 0.5; Chuck-will's-widow, +; Screech Owl, +; Yellow-shafted Flicker, +; Am. Redstart, +; Song Sparrow, +. **Total:** 40 species; 97 territorial males (or females) (431 per 100 acres). **Visitors:** Chimney Swift, Yellow-throated Warbler, Am. Goldfinch. **Remarks:** Had the northern boundary been moved an additional 50 feet into the woods to lessen edge effect, only one species, the Song Sparrow, would have been eliminated. A good many grackles were present in June, at least as visitors; our estimate that one pair bred in the census area may be wide of the mark. We thank the Misses Helen K. and Katherine Houghland, the owners of Kramer Woods, for permission to make the study. Financial assistance was received from the Indiana Academy of Science. — J. DAN WEBSTER and DIANA L. ADAMS, *Hanover College, Hanover, Ind. 47243.*

26. OLD GROWTH WHITE OAK-BEECH-SUGAR MAPLE FOREST. — **Location:** Indiana; Donaldson's Woods. Spring Mill State Park, north side of Rt. 60, 3 miles SE of Mitchell, W ½ of the NE ¼ of Sect. 4, T 3 N, R 1 E, Mitchell Quadrangle. **Size:** 22.5 acres (square, 330 x 330 yards) measured by steel tape and compass. **Description of Area:** Forest crown is

closed for the most part with an understory of shrubs 8 to 10 feet high; and average herbaceous ground cover for this type of woodland. The following tree description is from Lindsey and Schmelz, *Proc. Indiana Acad. Sci.* 74: 169-177, 1965, and the shrubs and herbs by A. A. Lindsey, D. V. Schmelz and S. A. Nichols, *Natural Areas in Indiana and Their Preservation*, Purdue Univ., Lafayette, 1969. **Stratum ranking of shrubs:** Spicebush (*Lindera benzoin*), 7; Maple-leaved Viburnum (*Viburnum acerifolium*), 4; Woodbine (*Parthenocissus quinquefolia*), *Smilax* sp., Poison Ivy (*Rhus radicans*), 3; Hazelnut (*Corylus americana*), Coralberry (*Symphoricarpos orbiculatus*), grape (*Vitis* sp.), Toothed Arrowwood (*Viburnum dentata*), Blackhaw (*V. prunifolium*), and rose (*Rosa* sp.), 2. **Stratum ranking of herb layer species:** Woodbine, 7; *Smilax* sp., *Galium* sp., and Yellow Agrimony (*Agrimonia rostellata*), 4; grasses, Sanicle (*Sanicula canadensis*), White Snakeroot (*Eupatorium rugosum*), grape (*Vitis* sp.), Christmas Fern (*Polystichum acrostichoides*), Grape Fern (*Botrychium dissectum*), and *Desmodium* sp., 3. **Edge:** Area bounded on three sides by similar forest and somewhat so on the fourth except for the bridle trail, 50 feet away in some places. **Topography:** Karst region with an elevation of 650 feet. Soil is mostly Frederick silt loam, slope phase, with a small amount of Bedford silt loam on ridge tops. **Weather:** Six days were clear, of which two started with fog; two were cloudy, one of which resulted in rain; and one was partly cloudy. Wind was insignificant except for a slight breeze one day and the storm wind the day it rained. Temperatures ranged from 60° to 83° F; the average for the five months

Table 1. Vegetational Attributes of Trees Over 4 inches DBH, from Lindsey and Schmelz, 1965

Species	B ₂ (Basal area per acre in sq. ft.)	D ₂ (Density per acre)	V ₃ (Importance)
White Oak (<i>Quercus alba</i>)	62.32	24.47	34.70
Beech (<i>Fagus grandifolia</i>)	11.92	26.47	15.90
Red Oak (<i>Q. borealis</i>)	8.74	4.49	5.32
Black Oak (<i>Q. velutina</i>)	8.15	3.27	4.71
Sugar Maple (<i>Acer saccharum</i>)	8.29	26.93	14.70
Shagbark Hickory (<i>Carya ovata</i>)	7.69	6.80	5.58
Tulip-tree (<i>Liriodendron tulipifera</i>)	6.33	1.89	3.27
Pignut Hickory (<i>C. glabra</i>)	3.11	3.78	2.82
Black Gum (<i>Nyssa sylvatica</i>)	2.79	4.19	2.87
Shellbark Hickory (<i>C. laciniosa</i>)	1.91	1.48	1.37
White Ash (<i>Fraxinus americana</i>)	1.90	3.78	2.35
Red Maple (<i>A. rubrum</i>)	1.57	4.29	2.44
Bitternut Hickory (<i>C. cordiformis</i>)	1.54	1.18	1.10
Ironwood (<i>Ostrya virginiana</i>)	.23	1.65	.79
Flowering Dogwood (<i>Cornus florida</i>)	.16	1.53	.71
Other species	1.40	1.84	1.32
	128.40 (Stand basal area per acre)	117.30 (Stand density per acre)	

April 1-August 31 is 67.1 °F. Rain averages 21.2 inches in the five-month period. Coverage: May 16; June 16, 17, 21, 22; July 2, 3, 5 (partial), 7; average of 3 hours each, varying from 5:00 a.m. to 10:30 p.m., making a total of 31 man-hours. Casual observations continued through July and August about twice a week. Owls were searched for on two nights. Census: Acadian Flycatcher, 9 (40); Red-eyed Vireo, 6.5 (29); E. Wood Pewee, 5.5 (24); Wood Thrush, 5.5 (24); Tufted Titmouse, 4 (18); White-breasted Nuthatch, 4 (18); Yellow-throated Vireo, 4 (18); Scarlet Tanager, 4 (18); Cardinal, 3.5 (16); Blue-gray Gnatcatcher, 3 (13); Kentucky Warbler, 3 (13); Brown-headed Cowbird, 3 (13) (females); Summer Tanager, 3 (13); Great Crested Flycatcher, 2.5; Ovenbird, 2.5; Cerulean Warbler, 2; Red-bellied Woodpecker, 1.5; Downy Woodpecker, 1.5; Rufous-sided Towhee, 1.5; Mourning Dove, 1; Yellow-billed Cuckoo, 1; Yellow-shafted Flicker, 1; Blue Jay, 1; Black-billed Cuckoo, 0.5; Pileated Woodpecker, 0.5; Com. Crow, 0.5; Carolina Chickadee, 0.5; Catbird, 0.5; Ruby-throated Hummingbird, +. Total: 29 species; 55.5 territorial males (or females) (247 per 100 acres). Remarks: No night birds were heard although Barred Owls were heard in others parts of the park. The Black-billed Cuckoo was heard only in July and August. Financial assistance was received from the Indiana Academy of Science. — DIANA L. ADAMS and J. DAN WEBSTER, *Hanover College, Hanover, Ind. 47243*.

27. GREEN ASH WOODLAND. — Location: Manitoba; east of Delta Village, on the south shore of Lake Manitoba; 50°11'N, 98°19'W, (on sheet 62 J/1 West, MacDonald, National Topographic Series). Size: 5 ha = 12.4. Description of Area: Trees, 2 inches diameter and over, based on 12 0.1 acre circular plots 326/acre; total basal area 92.9 square feet/acre. Green Ash (*Fraxinus pennsylvanica*) 43.1 sq. ft., 195 trees/acre; Box-elder (*Acer negundo*) 26.1 sq. ft., 94 trees/acre; and willow (*Salix* spp.) 12.6 sq. ft., 37 trees/acre made up 87 percent of the stand basal area. Cottonwood (*Populus deltoides*), Com. Hackberry (*Celtis occidentalis*), Choke Cherry (*Prunus virginiana*), Am. Elm (*Ulmus americana*) and Saskatoon Serviceberry (*Amelanchier alnifolia*) provided the remaining stand components. This woodland has a single tree stratum with the upper canopy ranging from several extremely large Cottonwoods, at least 65 feet in height, to the mean canopy height of 35 feet. Shrubs occupied approximately 65% of the ground cover and herbaceous plants occupied 50% of the area. Shrubs present were Red-berried Elder (*Sambucus pubens*), Red-osier Dogwood (*Cornus stolonifera*), Am. Hazel (*Corylus americana*) and Choke Cherry. Herbaceous cover consisted of *Viola rugulosa*, *Smilacina stellata*, *Aralia nudicaulis*, *Urtica dioica*, *Mirabilis nyctaginea*, *Solidago* sp., *Cirsium arvense*, *Parthenocissus quinquefolia*, *Cicuta maculata* and *Rhus radicans*. On July 5 a strong southeast wind blew down 29.4% of the Box-elders, 21.5% of the hackberries, 12.3% of the Green Ash and 7.1% of the willows measured in the study area. Sixteen per cent of all standing trees were destroyed reducing the basal area per acre to 78.3 square feet. This woods, with the south shore of Lake Manitoba as the

north boundary and the 35,000 acre Delta Marsh as its south boundary, shows evidence of periodic wind damage of this kind. Certainly vegetation successional trends are strongly influenced by winds along the beach ridge. The soil is sand with a shallow humus layer. The elevation ranges 813-817 feet above sea level. Coverage: May 13, 19, 26, 31; June 10, 16, 21; hours 6:00-8:30 a.m. and 4:30-7:00 p.m. Bird surveys totaled 15.5 hours and an additional 20.5 hours were spent on the plot during vegetational analysis and nest searches. Census: Yellow Warbler, 29 (580, 235); Least Flycatcher, 14 (280, 113); Mourning Dove, 12 (240, 97); Catbird, 9 (180, 73); E. Kingbird, 8 (160, 65); Baltimore Oriole, 7 (140, 57); House Wren, 6 (120, 49); Song Sparrow, 5 (100, 40); Red-eyed Vireo, 4 (80, 32); Warbling Vireo, 3 (60, 24); Brown Thrasher, 2.5; Robin, 2.5; Mallard, 2; Black-billed Cuckoo, 2; Brown-headed Cowbird, 2; Downy Woodpecker, 1; Veery, 1; Ruby-throated Hummingbird, +; Yellow-bellied Flycatcher, +; Com. Grackle, +. Total: 20 species; 110 territorial males (2200 per square kilometer, 890 per 100 acres). Visitors: Am. Bittern, Killdeer, Am. Redstart, Rusty Blackbird. Remarks: A regular weekly check for nests was made during the study period. The following nests were discovered: 14 Mourning Doves, 2 Catbirds, 1 Mallard, 1 Robin, 1 Red-eyed Vireo, 1 Yellow Warbler, 1 Song Sparrow. The bird population in this woodland is high for this latitude. The biologically rich Delta Marsh adjacent to this woodland provides an influx of insects to support these birds. Chironomids forming thick clouds were observed over the study area during June. Later other insect forms such as mosquitoes and ladybird beetles were noted in large numbers. — ROBERT E. JONES, *Delta Waterfowl Research Station, Delta, Man., Canada*.

28. DECIDUOUS OAK WOODLAND. — Location: California; on the Jasper Ridge Biological Experimental Area of Stanford University, San Mateo County, 3.5 miles west-southwest of the Main Quadrangle; 37°24'20"N, 122°13'30"W, NW/4 of Palo Alto Quadrangle, U.S.G.S. Size: 8 acres. Description of Area: See *Audubon Field Notes* 24: 554-55, 749-750 (1970). The 4 acres of meadow encircled by the area are not included in the 8-acre measurement. Weather: Abnormally cloudy, cold and windy. Almost half the field work was done on cloudy days. Rainfall normal. Coverage: March 20, 21, 28, 29; April 1, 2, 6, 8, 12, 15, 22, 27; May 6, 14; June 3. Censuses averaged 156 minutes each and totaled 39 hours. Nest-finding and territory outlining totaled 94 party-hours. A separate research project was also conducted on the plot, totaling 58 hours, and many nests were found and territories mapped. Total hours spent on plot, 191. Census: Oregon Junco, 7 (88); Com. Bushtit, 6.5 (81); Anna's Hummingbird, 6 (69) females; Rufous-sided Towhee, 6 (75); California Quail, 4 (50) females; Violet-green Swallow, 4 (50) females; Plain Titmouse, 3.5 (44); Bewick's Wren, 3.5 (44); Blue-gray Gnatcatcher, 3 (38); Orange-crowned Warbler, 3 (38); Scrub Jay, 2.5; Brown Towhee, 2.5; Allen's Hummingbird, 2 females; Lesser Goldfinch, 2; Hutton's Vireo, 1.5; Ash-throated Flycatcher, 1; W. Wood Pewee, 1;

Chestnut-backed Chickadee, 1; White-breasted Nuthatch, 1; Wren-tit, 0.5; Purple Finch, 0.5; Red-shafted Flicker, +; Steller's Jay, +. **Total:** 23 species; 62 territorial males (or females) (775 per 100 acres). **Visitors:** *Regular* (average individuals per visit): Cliff Swallow, 4; Turkey Vulture, 2; Red-tailed Hawk, 1; Mourning Dove, 1; Barn Swallow, 1; House Finch, 1; Cooper's Hawk, 0.3. *Irregular* (total number recorded on plot during all visits): Am. Goldfinch, 154 (until April 27); Pine Siskin, 81 (until April 22); W. Bluebird, 10; Sparrow Hawk, 6; Warbling Vireo, 5; Acorn Woodpecker, 4; Band-tailed Pigeon, 3; W. Meadowlark, 3; Black-headed Grosbeak, 3; Lark Sparrow, 3; Great Horned Owl, 2; White-throated Swift, 2; Red-shouldered Hawk, 1. **Remarks:** Nesting is almost entirely confined to the north edge bordering the adjacent Coast Live Oak woodland. If this long narrow rectangle of about 2 acres was removed there would be only 6.5 territorial males on the remaining 6 acres (109 per 100 acres). If the 2-acre edge was considered alone, the density of territorial males would be 1975 per 100 acres. Nineteen nests were found in one half-acre of this area alone. (The density of nesting birds in the adjacent Coast Live Oak forest was thought to be much closer to that of the 6 acres than the edge.) Thus this area is not really suitable for this type of study; the edge effect is so great that the density figures for the plot as a whole have limited applicability. However, it would be difficult to find a large continuous area of Blue Oaks. Almost all species were seen to feed heavily on caterpillars in the deciduous Blue Oak foliage, and most items carried to nests appeared to be caterpillars. For instance, the Oregon Junco, normally a ground forager, was observed to spend 95% of 3380 seconds of timed observations foraging 20 feet or higher above ground while feeding nestlings. Very little foraging by any species was noted in the Toyon shrubs, although they are abundant. The area had a significantly higher number of territorial males this year than last (32.5). This difference was due largely to a higher number of Com. Bushtit (only 1 in 1970) and Oregon Junco (4 in 1970) territories. The Lesser Goldfinch and Purple Finch did not nest last year. Only the White-breasted Nuthatch showed a marked decrease this year (2.5 in 1970). The difference between the two years may reflect the greater amount of time spent on the area this year. Nests: 64 discovered on or bordering the plot. Of the 50 whose outcome was known, 32% fledged young; 16 were successful (8 in holes and 5 on the ground); 32 were destroyed or robbed (California Quail, 1; Anna's Hummingbird, 4; Allen's Hummingbird, 2; W. Wood Pewee, 1; Com. Bushtit, 13; Blue-gray Gnatcatcher, 5; Hutton's Vireo, 2; Orange-crowned Warbler, 1; Lesser Goldfinch, 2; Brown Towhee, 1); and 2 abandoned (Wren-tit, 1; Purple Finch, 1). Scrub and Steller's Jays may have been the nest predators, but no destruction was ever witnessed. Introduced E. Gray Squirrels (seen several times) are spreading into the area, and might also have been responsible. Of 14 Com. Bushtit nests located (many second or third attempts), all were destroyed but one, which fledged 2 young by at least May 20. Three pairs of Blue-gray Gnatcatchers had lost 2 nests each by the end of the study, and were attempting a

third. Nests above ground but not in holes had a very low percentage of success; only 3 out of 33 whose outcome was known fledged young (9% success: Scrub Jay, 1; Hutton's Vireo, 1; Com. Bushtit, 1). No nests in holes whose outcome was known were unsuccessful. Five Plain Titmice nests fledged 2-4 young between May 12 and May 20. Two Chestnut-backed Chickadee nests fledged 4-5 young on May 11 and 20. One White-breasted Nuthatch nest fledged 4 young by May 23. Oregon Juncos had a good year; 5 of 8 pairs fledged 1-4 young, May 4-11. The Mourning Dove and House Finch may have attempted to nest, but the nests were not located. Pine Siskins and Am. Goldfinches were attracted by the budding Blue Oaks in the early part of the period; they were not found regularly at any other time. Owl pellets were frequently found, but the Great Horned Owl was seen only twice. Some, but not all, of the Warbling Vireos and Black-headed Grosbeaks noted as irregular visitors may have been migrants. Two male Anna's Hummingbirds had territories on the edge of the plot. Black-tailed Deer and W. Fence Lizards were seen frequently and E. Gray Squirrels and Southern Alligator Lizards occasionally. Paul Hertz and Stacey Zones assisted in collection of data. Michael Perrone gave much detailed information from last year's census. We are grateful to Dave DeSante for his sponsorship, advice, and assistance. — VAN REMSEN (compiler), 7160 West 9th Place, Lakewood, Colo. 80215, PETER JENSEN and ANNEKE DE WERK.

29. MATURING UPLAND RED PINE-WHITE PINE PLANTATION. — **Location:** New York; 2 miles west of Alfred; part of the State "reforestation area" between Randolph Road and Water Wells Road near the western boundary of Alfred Township, Allegany County; 42°30'N, 77°45'W; Andover Quadrangle, U.S.G.S. **Size:** 15.4 ha = 38 acres (nearly square, surveyed by tape and compass). **Description of Area:** See *Audubon Field Notes* 24: 754-755 (1970). **Coverage:** May 29; June 2, 4, 7, 8, 10, 11, 23; July 8, 13, 16, 17. Hours varied between 6:15 a.m. and 12:20 p.m. and between 8:00 and 9:20 p.m., E.D.T., for a total of 36 man-hours. **Census:** Black-throated Green Warbler, 22 (143, 58); Blackburnian Warbler, 14 (91, 37); Ovenbird, 9 (59, 24); Brown Creeper, 6 (39, 16); Slate-colored Junco, 6 (39, 16); Robin, 5 (33, 13); Black-capped Chickadee, 3 (20, 8); Blue Jay, 2; Solitary Vireo, 2; Brown-headed Cowbird, 2; Red-eyed Vireo, 1.5; Wood Thrush, 1; Veery, 1; Canada Warbler, 1; Scarlet Tanager, 1; Rose-breasted Grosbeak, 1; Red-breasted Nuthatch, +; Hermit Thrush, +. **Total:** 18 species; 77.5 territorial males (504 per square kilometer; 204 per 100 acres). **Visitors:** Red-shouldered Hawk, Ruffed Grouse, Chimney Swift, Barn Swallow, Hairy Woodpecker, Downy Woodpecker, Com. Crow, White-breasted Nuthatch, Cedar Waxwing, Black-and-white Warbler, Magnolia Warbler, Com. Grackle, Purple Finch, Am. Goldfinch, Rufous-sided Towhee. **Remarks:** Three nests were discovered. A female Black-throated Green Warbler was noted carrying larvae to a nest located 30 feet up on a Red Pine branch. A junco was flushed from a nest containing 4 eggs located behind a fringe of grass overhanging a shallow

ledge along the stream bank. There was no water flow at the time. The nest was empty on the following day and in an undisturbed condition. A Robin was flushed from a nest 15 feet up on the top of a dead pine stub; the contents of the nest were not identified. As in 1970, a Red-shouldered Hawk nested a few hundred yards southwest of the plot; two young were seen in the nest. The 1971 census matches 1970 closely in species composition and in number. There was an increase of 2 Brown Creepers and a decrease of 4 juncos and 2 Red-eyed Vireos. Otherwise the numbers are within one of the 1970 census. The single towhee territory of 1970 was abandoned. The unidentified owl observed in the darkness at the close of one of the evening visits in July was possibly a Long-eared Owl, a species which nested on the plot last year. There was some uncertainty as to whether any of the visiting Cedar Waxwings had established nesting territories within the plot. Additional visits during July would have been useful in this determination. The mean temperature recorded at the Alfred Cooperative Weather Station was 52.9° F. for May and 65.4° F. for June. These mean temperature values are 3.1° higher for May and 4.8° higher for June than the 50-year average for the two months. The precipitation was 1.37 and 3.14 inches, respectively, for May and June. There were no exceptional storms or prolonged cold or wet periods to disturb nesting during the study period. The cooperation of the Division of Lands and Forests of the New York State Conservation Department is gratefully acknowledged. — CLARENCE W. KLINGENSMITH, *Alfred University, Alfred, N.Y. 14802.*

30. BLACK SPRUCE FOREST. — **Location:** Ontario; about 30 miles east of Matheson, Cochrane District, and about two miles east of Ghost River, on south side of Highway 101; northwest corner of plot is near 48°31½'N, 79°50'W, on map sheet 32 D/12 West, Lightning River, National Topographic Series. **Size:** 17.5 ha = 43.2 acres (rectangular, 500 x 350 metres, laid out in 50-metre squares with compass and measured rope). **Description of Area:** A Black Spruce (*Picea mariana*) forest, partly undisturbed and dense, partly over-mature and quite open owing to wind-throw and/or insect damage. Over 90% of all trees on the plot are Black Spruces; other tree species include Balsam Fir (*Abies balsamea*), 6%; Paper Birch (*Betula papyrifera*), Quaking Aspen (*Populus tremuloides*), and Tamarack (*Larix laricina*), each less than 1%, based on 20 samples, each of 10 metres radius. Canopy trees (25 or more feet tall) averaged about 6 inches DBH; in the closed stands there were about 32 canopy trees per sample, averaging 40 feet tall, whereas in the open areas the 17 trees per sample averaged at least 50 feet, some attaining as much as 75 feet in height. Such tall, slender trees are presumably very vulnerable to wind-throw, once the canopy is broken, and the ground in the open areas is crisscrossed with fallen trees ranging from recent to largely moss-covered. The tall shrub layer (5-15 feet) is also dominated by Black Spruce (65%) and Balsam Fir (9%), most of the remainder being Speckled Alder (*Alnus rugosa*, 20%), chiefly in three-damper areas. Other tall

shrubs include Small Pussy Willow (*Salix humilis*) and Mountain Juneberry (*Amelanchier bartramiana*). The ground cover and low shrub layers were estimated from 20 samples, each of one square metre. The most important elements here were Schreber's Moss (*Pleurozium schreberi*), on 15 samples (important on 6); Low Sweet Blueberry (*Vaccinium angustifolium*), 15 (5); Labrador-tea (*Ledum groenlandicum*), 14 (4); Black Spruce, 13 (9); Lambkill (*Kalmia angustifolia*), 12 (2); peat-mosses (*Sphagnum* spp.), 11 (8); dead wood, 11 (4); broom-mosses (*Dicranum* spp.), 10 (2); Creeping Snowberry (*Gaultheria hispida*), 10; spruce and fir needles, 9 (1); others rated as important in one or more samples included Common Reindeer-moss (*Cladonia rangiferina*), 5 (2); Leatherleaf (*Chamaedaphne calyculata*), 5 (2); dead leaves (mostly of *Ledum*), 3 (2); an unidentified moss, 3 (1); and Sedge (*Carex trisperma*), 2 (1). The major plants were all detected about as frequently in the open areas as in the closed stands, which suggests that these differ more in history than in ecology. The forest became gradually denser towards the western edge, where Balsam Fir and associated plants became more frequent. Plant names were taken from M. L. Fernald, *Gray's Manual of Botany*, 8th Ed., 1950. **Edge:** Similar forest borders the plot to south, west and north. A small area adjacent to the northeast corner and extending south and east between the plot and the highway had been logged and/or burned-over a number of years ago; this is very open, with scattered aspens and firs, and very little spruce. **Topography:** Essentially flat, on a gravelly plain from which the Ghost Range rises to 1650 feet a mile north of the plot; elevation about 1000 feet. **Coverage:** May 28, 31; June 5, 8, 13, 15, 18, 27; July 2, 6. All surveys were made between 5:09 a.m. and 3:12 p.m. only the combined bird and plant survey on July 6 extending after 12:07 p.m.; total time was about 24 hours, plus 7¼ hours on the combined survey. In addition, 14¼ hours were spent on the plot while surveying and marking the grid. **Census:** White-throated Sparrow, 9.5 (54, 22); Ruby-crowned Kinglet, 7.5 (43, 17); Nashville Warbler, 5.5 (31, 13); Myrtle Warbler, 3.5 (20, 8); Hermit Thrush, 2.5; Magnolia Warbler, 2; Boreal Chickadee, 1.5; Brown Creeper, 1.5; Golden-crowned Kinglet, 1.5; Slate-colored Junco, 1.5; Northern Three-toed Woodpecker, 1; Yellow-bellied Flycatcher, 1; Winter Wren, 1; Purple Finch, 0.5; Pine Siskin, 0.5. **Total:** 15 species; 40.5 territorial males (231 per square kilometer, 94 per 100 acres). **Visitors** (total number noted): Canada Jay, 1; Com. Raven, 1; Red-breasted Nuthatch, 1; Solitary Vireo, 1; Tennessee Warbler, 1; Chestnut-sided Warbler, 1; Yellowthroat, 1; Evening Grosbeak, 2; Pine Grosbeak, 1. **Remarks:** Nests found: Northern Three-toed Woodpecker, 1; White-throated Sparrow, 1. This was apparently only the second nest of this woodpecker to be reported in Ontario, which points up the scarcity of field work in the boreal forest more than an actual rarity of the species. The woodpeckers foraged on dead and dying trees in the open areas, where their nest was found, but the White-throated Sparrow was the only other species to hold territories there. Most species clearly avoided the open area, even though the trees there included the tallest ones on the

plot. A pair of Spruce Grouse was seen on May 21, but not later. Other vertebrates seen: Varying Hare, 1. — ANTHONY J. ERSKINE, *Migratory Bird Populations, Canadian Wildlife Service, Ottawa, Ont., Canada.*

31. MATURE JACK PINE FOREST. — **Location:** Ontario; about 18 miles east of Matheson, Cochrane District, and one mile east of Perry Lake, Michaud Twp., on the north side of Highway 101; centre of plot is at 48°32'N, 80°05'W, on map sheet 42 A/9 East, Matheson, National Topographic Series. **Size:** 28.5 ha = 70.4 acres (rectangular, 700 x 450 metres, with a rectangle 300 x 100 metres omitted along the northwest edge; laid out with compass and measured rope). **Description of Area:** A mature forest of Jack Pine (*Pinus banksiana*), with canopy trees ranging from 25 to 45 feet tall (scattered trees to 60 feet) by 5-12 inches DBH. Three sub-types may be distinguished. About 47% of the area bears very open Jack Pine stands, interspersed with lichens and low shrubs and including scattered patches of bare sand ("Blow-outs"). Here the only trees are Jack Pines, averaging about 30 feet tall with 11 canopy trees (over 20 feet) per sample of 10 metres radius. About 41% is much denser Jack Pine forest, where the canopy has shaded much of the smaller growth. Here again the canopy trees (over 30 feet) are 96% Jack Pine, with 4% Quaking Aspen (*Populus tremuloides*), averaging 40 feet tall with 29 trees per sample. The subcanopy, 15-25 feet tall, including 99% Jack Pine, averages 25 trees per sample, of which 10 are dead. Finally, about 12%, occupying a rocky knoll and two smaller ham-

mocks, has a moderate growth of Paper Birch (*Betula papyrifera*) and Quaking Aspen intermingled with the pines, and a well developed understorey of Speckled Alder (*Alnus rugosa*) and Pin Cherry (*Prunus pensylvanica*). The canopy averages about 40 feet tall, including 33% Jack Pine, 40% Paper Birch, 25% Quaking Aspen, and 2% Black Spruce (*Picea mariana*); however, nearly 90% of the trees over 40 feet tall are Jack Pines. There is an average of 18 canopy trees per sample, and 19 subcanopy trees, among which birch, Pin Cherry, and Aspen predominate. The tall shrub layer (up to 15 feet) is composed largely of Jack Pine regeneration in the open areas, but Speckled Alder is dominant wherever there is shade, especially under the broad-leaved canopy on the knolls. The ground cover was estimated from 27 samples, each of one square metre. Pine needles occurred in 23 samples, and were important in 9 of them, whereas dead leaves, on 5 samples (important on 3), were scarcely detected except on the knolls. Plant species occurring on 8 or more samples include Low Sweet Blueberry (*Vaccinium angustifolium*), 22 (2); Com. Reindeer-moss (*Cladonia rangiferina*), 17 (12); Alpine Reindeer-moss (*C. alpestris*), 17 (3); Lambkill (*Kalmia angustifolia*), 13 (4); Schreber's Moss (*Pleurozium schreberi*), 8 (4); other plants of general distribution include Sweet-fern (*Comptonia peregrina*), another blueberry (*Vaccinium* sp.), and Bush Honeysuckle (*Diervilla lonicera*), while the typical forest plants Bunchberry (*Cornus canadensis*) and False Lily-of-the-valley (*Maianthemum canadense*) predominate on the knolls. Plant names are taken from M.L. Fernald, *Gray's Manual of Botany*,



Census 31. Dense Jack Pine forest, with ground cover of Lambkill. June 1, 1971.

8th Ed., 1950. **Edge:** The plot is bounded by similar forest on all sides. A narrow, sandy trail runs along the southern edge, joining Highway 101 about 100 metres south of the plot. Another mesic ridge, with birch and aspen among the pines, adjoins the northwest edge. **Topography:** Gently undulating, rising gradually from south to north, with the steep-sided knoll and hummocks rising up to 40 feet above the general level; elevation about 1110-1170 feet. **Coverage:** May 26, 29; June 1, 4, 13, 16, 19, 26; July 1-2. All surveys were made between 5:18 a.m. and 4:02 p.m., only two extending after 12:40 p.m.; survey time totaled 19.5 hours, plus 8.5 hours spent on the combined plant and bird survey on July 1-2. In addition, 11.5 hours were spent on the plot while measuring and marking the grid. **Census:** Hermit Thrush, 4.5 (16.6); Ovenbird, 4 (14, 6); Slate-colored Junco, 3.5 (12, 5); Chipping Sparrow, 3 (11, 4); Myrtle Warbler, 2.5; Nashville Warbler, 2; Ruby-crowned Kinglet, 1.5; Robin, 1; Solitary Vireo, 1; Black-throated Green Warbler, 1; White-throated Sparrow, 1. **Total:** 11 species; 25 territorial males (88 per square kilometer, 35 per 100 acres). **Visitors:** *Possible Breeders:* Ruffed Grouse, 1 (twice, not noted after May 26); Golden-crowned Kinglet, 2 (3 times, not after June 1); Red-eyed Vireo, 2 (regular on mesic ridge to northwest, noted twice on knolls); *Irregular:* Tree Swallow, 1; Com. Raven, 1; Boreal Chickadee, 3; Red-breasted Nuthatch, 1; Blackburnian Warbler, 1; Am. Redstart, 1; Evening Grosbeak, 1. **Nest found:** Slate-colored Junco, 1 (successful). Flying young seen (number of groups): Hermit Thrush, 1; Slate-colored Junco, 1 (not that from nest). Of the breeding species, Solitary Vireo, Black-throated Green Warbler and Ovenbird were restricted (or almost so) to the areas of mixed forest on the knolls, and can hardly be considered birds of the Jack Pine forest. The low density prevailing in this habitat is probably responsible for most species having poorly defined territories. However, the possibilities of confusing Nashville and Myrtle Warblers, and juncos and Chipping Sparrows, undoubtedly contributed to this uncertainty. The scarcity of White-throated Sparrows on the plot was striking, and juncos too were uncommon, though not as scarce as on the plot censused last year (*Audubon Field Notes* 24: 751-752, 1970). The results of these two censuses are similar to those obtained in Jack Pine forests elsewhere *CWS Progress Note* 20, section (i); they do not confirm "the relatively wider variety and larger numbers of birds" reported by Godfrey (*Nat. Mus. Canada, Nat. Hist. Papers* 44: 1-6, 1968) for Jack Pine stands near Amos, Quebec, about midway between my census areas. — ANTHONY J. ERSKINE, *Migratory Bird Populations, Canadian Wildlife Service, Ottawa, Ont. Canada.*

32. PONDEROSA PINE-SCRUB OAK-MOUNTAIN MAHOGANY WOODLAND. — **Location:** Colorado; one mile east of Franktown on Highway 86; 39°20'N, 104°40'W. **Size:** 20 acres (a trapezium, 453.7 feet on the north, 607.36 feet on the south along Highway 86, 1906.4 feet on the east, 1649.9 feet on the west). **Description of Area:** See *Audubon Field Notes* 22: 673-674 (1968). This is the fifth year of study. **Coverage:** April 29; June 1, 3, 10, 18, 25; July 2, 9, 16, 23, 31. Hours varied from 8:30 a.m. to

5:00 p.m. and totaled 35 for the 11 trips. **Census:** W. Bluebird, 15 (75); W. Wood Pewee, 5 (25); House Wren, 3 (15); Rufous-sided Towhee, 3 (15); White-breasted Nuthatch, 1 (5); Robin, 1 (5); Virginia's Warbler, 1 (5); Black-headed Grosbeak, 1 (5); Lesser Goldfinch, 1 (5). **Total:** 9 species; 31 territorial males (155 per 100 acres). **Visitors:** Turkey Vulture, Cooper's Hawk, Red-tailed Hawk, Mourning Dove, Com. Nighthawk, Broad-tailed Hummingbird, Red-shafted Flicker, Hairy Woodpecker, Downy Woodpecker, Tree Swallow, Steller's Jay, Scrub Jay, Com. Crow, Black-capped Chickadee, Mountain Chickadee, Pygmy Nuthatch, Solitary Vireo, Brown-headed Cowbird, W. Tanager, Cassin's Finch, House Finch, Pine Siskin, Lark Sparrow, Gray-headed Junco. **Remarks:** Nineteen nests were in boxes: W. Bluebird (one a second brood), White-breasted Nuthatch and 3 House Wrens. The nuthatch has been unsuccessful every year. Of the W. Bluebird nests, one with 6 eggs, three with 5 eggs, and one with 4 eggs, all fledged; 2 with 5 eggs fledged 3 each; and predators destroyed 4. There was a total of 56 W. Bluebird eggs in the 15 boxes; 31 fledged (21 banded). Two of the House Wrens were successful with all 14 eggs laid fledging young, but the second brood of one box was destroyed. The Robin's 3 nestlings disappeared after about 3 days of age, but the nest remained intact. I saw immature Robins at the water on July 3, so they evidently nested nearby. Only 2 W. Wood Pewees were seen out of the nest. The Com. Crow was seen feeding a young bird on the study area, but the many days I saw it fly over with food convinced me that the nest was off the plot. The young Gray-headed Junco on June 25 is the only one of that species seen during the study period. Although I heard the Solitary Vireo in 3 areas, I could not establish a territory for it. The Virginia's Warbler had a singing spot(s) on a ridge, but I could not find the nest. While the Black-headed Grosbeak nest was not successful, there were 2 immatures at the feeder and water on July 31. — MILDRED O. SNYDER, *161 Del Mar Circle, Aurora, Colo. 80010.*

33. MATURE DOUGLAS-FIR FOREST. — **Location:** California; 4 miles northwest of Bolinas, Marin County, and 1 3/4 miles north of Point Reyes Bird Observatory; 37°56'N, 122°43'W, Bolinas Quadrangle, U.S.G.S. The area is within the Point Reyes National Seashore. **Size:** 15 acres (rectangle 600 x 1100 feet, measured). **Description of Area:** The plot occupied part of an easterly sloping ridge near the southern extension of Inverness Ridge. The head of McCormick Creek is just below and to the southeast. The elevation varied from about 1150 to 1050 feet. The plot forms a partial plateau comprised of four small hill-like rises separated by gently sloping saddles. No logging has taken place in the plot area. What exists today is a mature Douglas-fir (*Pseudotsuga menziesii*) forest. The canopy created by the Douglas-fir is open and the height varies between 50 and 70 feet. California Laurel (*Umbellularia californica*) and Coast Live Oak (*Quercus agrifolia*) creates a spotty subcanopy where sunlight penetrates through the open true canopy. The point quarter method (*Ecology*, 37: 451-460, 1956) was used to determine species composition. The Douglas-fir, with an average diameter of 28 inches (DBH),

had a relative density of 75.9% followed by Coast Live Oak, 15.4%, and California Laurel, 8.7%. The understory, owing to the openness of the Douglas-fir and the proximity of the plot to seasonal coastal fog, was very lush and dense. A detailed recording of the understory vegetation was not made, rather a rough estimate was given for the dominant species. Hazelnut (*Corylus cornuta*), 25%; Sword Fern (*Polystichum munitum*), 25%; and Huckleberry (*Vaccinium ovatum*), 25%; formed dense brushy areas from 3 to 6 feet tall. The remaining 25% was covered with other low-growing plants consisting of Minor's Lettuce (*Montia perfoliata*), Milk Maids (*Dentaria californica*), hedge nettle (*Stachys* sp.), Star-Flower (*Trientalis latifolia*), California Blackberry (*Rubus ursinus*), Lady Fern (*Athyrium filix-femina*), Wild Iris (*Iris douglasiana*), nettle (*Urtica* sp.), and Poison Oak (*Rhus diversiloba*). **Coverage:** April 7, 14, 21, 28; May 5, 19, 25; June 2. Trips were made in the morning between 6 and 12 a.m. Approximately 24 party-hours. **Census:** Wilson's Warbler, 5 (33); Allen's Hummingbird, 3 (20); Wrentit, 3 (20); Winter Wren, 3 (20); Golden-crowned Kinglet, 3 (20); Rufous-sided Towhee, 3 (20); Oregon Junco, 2.5; Brown Creeper, 2; Hermit Thrush, 2; Song Sparrow, 2; Western Flycatcher, 1.5; Steller's Jay, 1.5; Chestnut-backed Chickadee, 1.5; Com. Bushtit, 1; Pygmy Nuthatch, 1; Robin, 1; Pine Siskin, 1; Hairy Woodpecker, +; Red-breasted Nuthatch, +. **Total:** 19 species, 37 territorial males (247 per 100 acres). **Visitors:** Turkey Vulture, Red-tailed Hawk, Band-tailed Pigeon, Red-shafted Flicker, Warbling Vireo, Audubon's Warbler, Purple Finch. **Remarks:** Nests found: Brown Creeper (1), Chestnut-backed Chickadee (1), Pygmy Nuthatch (1), Robin (1). The Chestnut-backed Chickadee fledglings left the nest between May 5 and 19. On June 2, the Pygmy Nuthatches were not seen. The Brown Creepers were still feeding young in a nest about 12 feet above ground in a Douglas-fir stump (8 inches DBH). The dense understory of Hazelnut and Huckleberry was responsible for the occurrence of species such as the Wrentit, Wilson's Warbler, Rufous-sided Towhee and Song Sparrow. The Bushtit was almost invariably found in the subcanopy of the Coast Live Oak. The remaining species were either found exclusively in conifers or sharing both the understory and the conifers. Wilson's Warbler density in the Douglas-fir is virtually the same as two other habitat types within 2 miles of this plot, suggesting that this species has the ability to breed in diverse habitats providing there is dense understory and suitable moisture. — BILL MILTON and SUZZANE MURRAY, Point Reyes Bird Observatory, Bolinas, Calif. 94924.

34. MIXED CONIFEROUS-HARDWOOD FOREST. — **Location:** New Brunswick; 2.3 miles north of the post office in Albert, Albert County, to the right of Crooked Creek Road, located along a wood road, locally called "The Crazy Road." The plot base point is 325 paces from Crooked Creek Road; Hillsborough Topographic Map 21H/15E at Grid intersection 64/70.5. **Size:** 24.8 acres (paced). Rectangular, 400 x 300 yards, with the grid lines running on the magnetic north and south. **Description of Area:** Two types of forest occur, each comprising about one-half of the

area: *I.* Mature mixed forest that is 25% Sugar Maple (*Acer saccharum*), 20% Yellow Birch (*Betula lutea*), 20% Red Spruce (*Picea rubens*), 20% Balsam Fir (*Abies balsamea*), 10% Beech (*Fagus grandifolia*), and 5% White Birch (*B. papyrifera*), with a sparse understory of saplings of the tree species, plus Mountain Maple (*A. spicatum*), Hobblebush (*Viburnum alnifolium*) and Fly Honey-suckle (*Lonicera canadensis*), White Ash (*Fraxinus americana*) and mountain-ash (*Pyrus* sp.). The ground vegetation is quite dense with Bunchberry (*Cornus canadensis*), Goldthread (*Coptis groenlandica*) and Wood-sorrel (*Oxalis montana*) predominating. Bluebead-Lily (*Clintonia borealis*), violets (*Viola* spp.), club-mosses (*Lycopodium* spp.), Wood Fern (*Dryopteris spinulosa*), Twinflower (*Linnaea borealis*) and Wild Sarsaparilla (*Aralia nudicaulis*) are also important. Indian Cucumber-root (*Medeola virginiana*), Hooker's Orchid (*Habenaria hookeri*), Pink Ladyslipper (*Cypripedium acaule*), and Indian Pipe (*Monotropa uniflora*) are common in small areas. Various lichens and mosses are found throughout. *II.* Young, mostly coniferous forest (probably resulting from cutting of the preceding type) of 45% Balsam Fir, 30% Red Spruce, and 25% various hardwood species, mostly Yellow and White Birch, and Red Maple (*Acer rubrum*), with a very sparse understory (absent in dense stands) of young fir with some Red Spruce, Mountain Maple, White Birch and Fly Honey-suckle. Ground flora, often quite sparse, consists mostly of mosses and lichens with some Bunchberry, Wood Fern, Twinflower, Goldthread, Wood-sorrel, Wild Sarsaparilla, Bluebead-Lily, club-mosses and Com. Speedwell (*Veronica officinalis*). Along the road are various grasses, sedges (*Carex* spp.), goldenrods (*Solidago* spp.), asters (*Aster* spp.), Jewelweed (*Impatiens capensis*), Interrupted Fern (*Osmunda claytoniana*), Hay-scented Fern (*Dennstaedtia punctilobula*), Pearly Everlasting (*Anaphalis margaritacea*), avens (*Geum* sp.) and Agrimony (*Agrimonia striata*). Near the brook are some patches of Speckled Alder (*Alnus rugosa*) and such herbs as Joe-pye Weed (*Eupatorium maculatum*), Boneset (*E. perfoliatum*), Jewelweed, Blue-flag (*Iris versicolor*), Muskflower (*Mimulus moschatus*), Swamp Thistle (*Cirsium muticum*) and buttercup (*Ranunculus* sp.). A few small clearings have Hay-scented Fern, blackberry (*Rubus* sp.) and Am. Spike-nard (*Aralia racemosa*) in dry areas or Cinnamon Fern (*Osmunda cinnamomea*), Interrupted Fern, Raspberry (*Rubus strigosus*), Water-Horehound (*Lycopus uniflorus*), and sedges (*Carex* spp.) in wet areas. **Edge:** Similar forest surrounds the plot on all sides. **Topography:** The elevation rises from about 350 feet in the southwest corner to about 400 feet at the northeast corner. Hills along this valley rise to over 1000 feet. The Crazy Road traverses the plot from northwest to southeast, and a small brook (noisy during spring runoff, but nearly dry in the summer) crosses from northeast to southwest. Neither affects the canopy or produces a particular edge effect. **Weather:** This spring was cold and damp, with very little warm weather before June 21. The winter was long and hard with an extra heavy snowfall. The temperature ranged each morning between 40° and 50°F. The evening temperature was 65°. Mornings were sunny or slightly

cloudy, except on June 14 when it was overcast with light drizzle at times. This did not seem to interfere with the singing. Wind: nil to 5 m.p.h. Coverage: June 3, 7, 10, 12, 14, 17, 24. Eight trips, between 5:05 and 8:30 a.m., except one on June 7 from 7:30 to 9:15 p.m. Total man-hours: 18.5; average trip, 2 hours, 24 minutes. Census: Bay-breasted Warbler, 12 (48); Black-throated Green Warbler, 11 (44); Ovenbird, 11 (44); Magnolia Warbler, 10 (40); Swainson's Thrush, 8 (32); Robin, 7 (28); Blackburnian Warbler, 6 (24); Yellow-bellied Flycatcher, 5.5 (22); Purple Finch, 5 (20); Red-breasted Nuthatch, 4 (16); Nashville Warbler, 4 (16); Am. Redstart, 4 (16); Slate-colored Junco, 4 (16); Boreal Chickadee, 3 (12); Hermit Thrush, 3 (12); Ruby-crowned Kinglet, 3 (12); Red-eyed Vireo, 3 (12); Tennessee Warbler, 3 (12); Parula Warbler, 3 (12); White-throated Sparrow, 3 (12); Yellow-bellied Sapsucker, 2; Blue Jay, 2; Golden-crowned Kinglet, 2; Ruffed Grouse, 1; Winter Wren, 1; Solitary Vireo, 1; Cape May Warbler, 1; Black-throated Blue Warbler, 1; Myrtle Warbler, 1. Total: 29 species; 124.5 territorial males (502 per 100 acres). Visitors: Goshawk, Hairy Woodpecker, Com. Raven, Com. Crow, Warbling Vireo, Canada Warbler, Rose-breasted Grosbeak, Evening Grosbeak, Pine Grosbeak. Remarks: The plot was chosen to be as typical as possible of the coastal forest of this part of southern New Brunswick. In some areas there is a predominance of hardwoods (maple particularly) and in others of softwoods. Wood roads and small brooks are typical. There is a very heavy infestation of Spruce Bud Worm in this whole area, which no doubt accounts for some of the high census figures. Nests: Yellow-bellied Sapsucker, Robin (2), Hermit Thrush, Swainson's Thrush, Ovenbird, Am. Redstart (2). Mammals seen: Moose (twice); Red Squirrel (3 mornings); Varying Hare (once); vole. The carcass remains (hair and a few bones) of a young (probably yearling) deer were on the plot. My sincere thanks to Mary Majka and David Christie for their assistance in choosing the site and for providing the description of the area, and to A. J. Erskine, Canadian Wildlife Service, for his encouragement and help. — FORD ALWARD, Box 14, Albert, N. B., Canada.

35. FAIRLY OPEN PINE-HEMLOCK-HARDWOOD FOREST. — Location: Maine; Joyce's Island, Rome, at the north end of Great Pond (Great Lake) in the Belgrade Lakes region. Size: 4.8 ha = 12 acres (surveyed). Description of Area: A subclimax mixed forest with several openings, partially described in *Audubon Field Notes* 11: 455-456 (1957) and 15: 516-517 (1961). This year a more detailed plant survey was made. Canopy trees range from 50 to 80 feet in height; the canopy coverage is about 60% on the average. About 90% of all trees were counted by mapping (with a total of 67 mapping units). Tree species 3 inches DBH and over (figures after each species give number/acre, relative density (%), relative dominance, and frequency) are: White Pine (*Pinus strobus*), 58,28,53,96; Red Maple (*Acer rubrum*), 44,22,9,96; Red Pine (*P. resinosa*), 25, 12, 18, 67; Hemlock (*Tsuga canadensis*), 23, 11, 5, 61; Paper Birch (*Betula papyrifera*), 21, 10, 8, 67; Red Oak (*Quercus rubra*), 15, 7, 3, 78; dead standing trees, 7, 3,

2, 63; Balsam Fir (*Abies balsamea*), 4, 2, 0.3, 37; Beech (*Fagus grandifolia*), 3, 1, 0.3, 24; Red Spruce (*Picea rubens*), 3, 1, 0.5, 18; Gray Birch (*B. populifolia*), 2, 1, 0.2, 19; Black Cherry (*Prunus serotina*), 2, 1, 0.2, 15; others (7 species), 3, 1, 0.4, (?). The average number of trees per acre is 210.2; total basal area is 157.5 square feet per acre. Trees by diameter size class (figures after each class give number of trees/acre, relative density (%), basal area in square feet/acre, relative dominance): A (3-6 in.), 79, 38, 7.9, 5; B (6-9 in.), 31, 15, 9.4, 6; C (9-15 in.), 56, 26, 44.4, 28; D (15-21 in.), 33, 16, 59.9, 38; E (21-27 in.), 10, 5, 31.0, 20; F (27-33 in.), 1, 0, 4.9, 3. Saplings are numerous in many places and are mostly Red Maple, Red Oak, Hemlock, White Pine (chiefly in openings), Beech, Black Cherry, Paper Birch (in openings), and Balsam Fir, listed in approximate descending numerical importance. Shrubs and small trees are frequent, especially near the shoreline; important species (percentages are rough frequencies) are: Alleghany Shadbush (*Amelanchier laevis*), 69%; Mountain Holly (*Nemopanthes mucronata*), 65%; Withe-rod (*Viburnum cassinoides*), 63%; High-bush Blueberry (*Vaccinium corymbosum*), 48%; Arrow-wood (*Viburnum recognitum*), 44%; Speckled Alder (*Alnus rugosa*), 42%; Low Sweet Blueberry (*Vaccinium angustifolium*), 42%; Winterberry (*Ilex verticillata*), 29%; Yew (*Taxus canadensis*), 27%; Black Huckleberry (*Gaylussacia baccata*), 27%; Maleberry (*Lyonia ligustrina*), 23%; Com. Juniper (*Juniperus communis*), 19%; and Sweet Gale (*Myrica gale*), 17%. Ground cover is over 50%. Important herbaceous plants, with their rough frequencies in percentages, are: Wild Sarsaparilla (*Aralia nudicaulis*), 83%; Bracken (*Pteridium aquilinum*), 77%; Canada Mayflower (*Maianthemum canadense*), 75%; Hay-scented Fern (*Dennstaedtia punctilobula*), 42%; Cinnamon Fern (*Osmunda cinnamomea*), 25%; Starflower (*Trientalis borealis*), 25%; Pink Lady-slipper (*Cypripedium acaule*), 23%; Sensitive Fern (*Onoclea sensibilis*), 19%; Wood Fern (*Dryopteris spinulosa* var. *intermedia*), 17%. Rocks and boulders are frequent, especially in the eastern third of the island and on the shoreline. Some areas are covered with dead pine needles, dead leaves, or both. Buildings (mostly cabins) occupy about 1 acre of ground space; a tennis court with a clay surface takes up about half an acre. Since 1962 little change has taken place except for natural growth. A fire removed one cabin and injured or killed several adjacent trees last winter; four other cabins were torn down, and one was under construction this June. A few trees next to this cabin were cut; most had been injured by another fire. Several trees have died over the years. A large Red Maple was felled by a storm on July 1; lightning struck a large White Pine, whose top two-thirds fell over two days later. Natural succession has reduced the formerly common Raspberry (*Rubus idaeus*), ground-pine (*Lycopodium* sp.), and goldenrods (*Solidago* spp.). Weather: A rather warm and dryish breeding season. Temperatures during the census period ranged from 50° to 86° F. Violent thunderstorms occurred on the afternoon of July 1. Coverage: Daily, June 26 to July 5; also some casual coverage on June 25 and