BIRDS OF UPLAND OPENINGS

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Abstract.--Northern forest openings are variable in vegetative life form. Eighty species of nongame birds are associated with forest openings or edge of forest openings in Northern Michigan. Current management is reviewed and suggestions for additional management practices and studies are included.

INTRODUCTION

Upland openings are an integral part of the forest environment. They are the beginning stage in the development of a forest and differ greatly from the usual mental image of a forest represented by trees. Their physical aspect is very different and their biological production - plants and animals - is very different from that of a stand of timber.

Management of forest upland openings is a controversial subject. To the wildlife biologist they represent a unique vegetative association which produces animals not produced in any other vegetative association of the forest. The timber manager looks at upland openings as nonproducing forest lands. This may be a logical consequence since the production of an acre of timber has an identified value while the production of a forest opening is incompletely documented (documented only in terms of a few known game species).

This discussion will review some of the existing information about upland forest openings and attempt to emphasize the value of this vegetative type to nongame birds.

Included are a description of upland openings, a listing of the nongame birds found associated with them, a review of current management, and recommendations for additional management consideration.

Upland openings come in a variety of sizes, shapes, and vegetative forms. All are important when discussing bird communities.

Large upland openings are generally referred to as fields, pastures, abandoned pastures, cultivated areas, grasslands, and/or prairies. Small openings are referred to as forest openings; they may be grassy openings or, if with shrubs and trees, brushy openings.

The importance of upland openings is recognized generally in terms of their importance to game species. McCaffery and Creed (1969) demonstrated the importance of upland forest openings to deer. They consider that "... the principal value of openings to all forms of forest wildlife lies in the variety of vegetation they provide." They acknowledge that "... these values are inadequately known in a quantative sense," but some are at least qualitatively recognized.

Dr. Peterle (1954) and Dr. Amman (1957) documented the necessity of maintaining wildland openings - 640 acres (260 hectares) and larger - if sharptail grouse are to continue as a species in Michigan. Robert Dorney (1959) described the importance of upland openings for ruffed grouse in Wisconsin.

Most studies dealing with nongame birds of upland openings are with large grasslands, cultivated areas, or nonforest types.

Watkins (1895), Frothingham (1900), and Blackwelder (1909) described breeding birds (and others) found in various large open types in Michigan about the turn of the century - about the time of major conversion from forest to farm - and from trees to ashes. More recent work by Kendeigh (1948) in the northern part of the Lower Peninsula of Michigan includes a brief account of breeding birds of a large (100 acre or 40 hectares) meadow.

Breeding bird censuses, American Birds (1973-1978), include studies of fields,

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cultivated areas, and various forest types. Since the minimum size for such studies is twenty-five acres, small forest openings are not included. If clearcutting fits the definition of upland opening, then studies dealing with recently clearcut forest types (Niemi, 1974) provide information about breeding birds in forest openings.

In another study in Minnesota, Barbara Bergstedt and G. Niemi (1974) compared breeding bird populations inhabitating a recent burned and unburned forest. Depending upon the physical structures or life form remaining after the fire, and again depending on the definition of upland opening, the burned forest may be an upland opening.

Dr. Gysel's study of the vegetation and animal use of a powerline right-of-way in Southern Michigan (1962) was one of the first to specifically consider small forest openings and nongame birds. Herman Shugart and D. James (1973) bridged the gap between field and early forest stages in the Study of Ecological Succession of Breeding Bird Populations in Northwestern Arkansas.

It is difficult to make regional interpretations of local bird population studies, or to make local interpretations of regional studies for several reasons. The same bird species may occur in totally different ecological types (deciduous versus conifer type) in different parts of its breeding range, (Kendeigh, 1945). The lack of standardization of type description currently in use makes it difficult at best, and frequently impossible, to interpret or compile summaries (Shugart and James, 1973). This difficulty is compounded by considerable natural variation within the same type. G. Niemi recognized difficulties in measuring changes (comparing populations) of breeding bird populations due in part to lack of homogeneity, or great heterogeneity of habitats, especially where small forest openings are concerned (Niemi, undated). Opening size and the size of the surrounding vegetative type have an important influence on the species component of inhabitating communities (Bond, 1957) but, except for birds like sharptail grouse or upland sandpiper, the relationship is poorly understood.

The description of vegetative types does not always recognize important habitat components. L. Brecker, (1943) recognized life form, "...the physical aspect of the vegetation or the materials in, on, or from which the bird builds its nest, seeks its food and finds its shelter," as a very important factor governing the suitability or availability of the niche. F. James (1971) and H. Shugart and B. Patten (1972) identified and demonstrated life form or vegetative structure as a determinant factor in the selection of niche by birds, yet few if any existing studies use vegetative type descriptions which consider life form in any but the most general way. For instance, a description of a pole size hardwood stand does not include information about understory or ground vegetation.

DESCRIPTION OF UPLAND FOREST OPENINGS

Upland openings are different things to different land managers. To a forester an upland opening is an area with 10% stocking of commercial forest trees and with grass. An opening with 16% or less stocking of seedlings and saplings (less than 5" dbh) is considered as a nonstocked stand. A stand is defined as an area of uniform vegetation composition and structure. Forest biologists generally recognize upland openings as any area without trees. There are grassy openings, grass and forb openings, and shrub openings. The shrubs may be young trees. A nonstocked stand may be considered an opening or it may be considered a sparse stand of trees.

Openings are vegetative stages in the succession pattern of the forest. Their life span - how long they last - depends upon their vegetative composition. In Minnesota the length of time since the last major disturbance and the type of vegetation present at the time of disturbance are important factors in determining the structure and composition of the present plant community (Ohmann, 1973). The formation of dense sod contributes to the lasting qualities of upland openings. Sod openings will last 40-50 years or more if undisturbed. The age of some openings in the northern hardwood types in the Upper Peninsula of Michigan is estimated to be 50 years - Kendeigh found meadows in the northern part of the Lower Peninsula of Michigan changed very little in 29 years (Kendeigh, 1948). Similar situations exist in Minnesota (J. Mathison, 1978).[2/]

Sod development in a forest environment results from repeated burns, or intensive burns, cultivation, heavy grazing, or mechanical action which causes soil compaction or herbicide use (J. Wigger, 1978).[3/]

Size is a most obvious feature of upland openings and is perhaps one of the more important. Breeding birds found in large openings

2/ Mathison, John, 1978, Personal Communication, U.S. Forest Service, U.S. Department of Agriculture.

3/ Wigger, Gerald, 1978, Personal Communication, U.S. Forest Service, U.S. Department of Agriculture.

are different from those associated with small openings: Watkins (1895), Blackwelder (1909), Frothingham (1906), and Kendeigh (1945, 1948). Weather conditions (microclimate) are very different in large and small openings. Forest Stearns and B. Ringger (1972) found that in large openings extremes and duration of extremes of temperature are very different than in smaller openings.

The distinction between large and small openings is difficult to make. Effective size, in terms of solar radiation, wind movement at ground level, mean and maximum temperature, and relative humidity depend upon the height of the surrounding trees. Dr. Stearns and Ms. Ringger used the ratio of opening diameter to height of surrounding trees to express opening size.

The size in acres of openings of different D/H ratios in different timber types (vegetative types) are indicated in Table 1.

Openings with a D/H ratio of 0.05:1 and smaller are no different than the surrounding forest, in terms of wind movement, solar radiation, radiation out from the opening, and relative humidity. Openings with D/H ratio of 1:1 and D/H 2:1 experience highest average maximum temperature and longest periods of high relative humidity. Wind barely penetrates into them, they have longer frost free periods, and mosquitoes and deer flies are more abundant. Large openings have a D/H ratio of 6:1 or 10:1 or more. Openings with D/H ratio of 10:1 to D/H ratio 20:1 and larger are more appropriately considered grasslands rather than forest openings. (Ringger and Stearns, 1972).

Vegetative composition (species composition) of openings appears less important than the growth form or life form - the overall shapes of the vegetation. Kendeigh (1948) and Bond (1957) recognized that community segregation of birds is correlated with types of vegetation rather than species of plants involved. Kendeigh observed the occurence of some structure: stump, snag, or post, was a suitable substitute for a particular life form plant. Because of its presence birds were invited into areas not normally occupied. S. Ulfstrand (1975) observed that in habitats containing the same number of trees and shrub species, flock diversity of birds will be higher the more structurally diversified the vegetation.

Studies by F. James (1971), H. Shugart and D. James (1973), and J. Niemi (no date), demonstrate the ability to associate bird species with life form rather than species composition.

Upland openings do not exist without edge. Edges have been considered especially productive areas for many species of birds. Studies in mixed forest type borders (edges) by Marten (1960) in Ontario, documented large populations of birds - more species were present there than were found in the interior forest. Egler (1966) considered the edge between forest and upland opening (right-of-way) to be valuable habitat for nongame birds. Gates and Gysel (1978) working in a continuous field-forest edge found that with increasing distance from the edge, changes in habitat composition and structure apparently resulted in decreasing numbers of nests of the open-nesting passerines found during their study. They also found that over half of the nests were found within 15 meters (approximately 50 feet) of the edge. Seventy-five percent of the nests belonged to birds characteristic of mixed breeding habitat, i.e., birds requiring an open vegetative canopy with dense cover near the ground for nesting and feeding, and elevated singing and observation perches.

Carlson (1976) found in an opening-jack pine mixture in Northern Michigan that all successful nests of bluebirds were in habitat that contained both open areas with scattered trees and densely stocked areas.

Although the importance of "edge" for a diversity of species has been emphasized by a number of authors, Gates and Gysel (1978) have issued a warning about the dangers inherent in narrow edge situations and question their value. They do not dispute the importance of edge; indeed in their study at Rose Lake they found most nests there, but nesting success was greatly reduced. They cited predation and cowbird parasitism as the most important reasons for failures, and believe the increased predation rate was a response to the concentration of nests. They propose that narrow man-made forest edges could well function as "ecological traps" for avian species characteristic of habitats with mixed life form. Because they say extensive areas of narrow field-forest edge have only been in existence for a brief period relative to the evolutionary time scale, these may then not be like the ecological niche in which these mixed habitat species developed and so they may not be able to cope with the increased predation. The most important aspects of upland openings are vegetative life form and size.

BIRDS OF UPLAND OPENINGS

The preparation or interpretation of a list of birds of upland openings must be done with considerable reservation. R. Bond (1957) and S.C. Kendeigh (1945, 1948) both indicate that bird populations are not really divisible

Table 1.--Acres - Size of Opening by D/H and Tree Height.

D/H Ratio	White Pine 85'	Maple 80'	Red Pine 70'	Aspen 65'	Spruce Fir 50'	Jack Pine 50'
1:1	.52	.46	.35	0.30	0.18	
2:1	2.08	1.85	1.41	1.22	.72	
3:1	4.69	4.15	3.18	2.75	1.62	
4:1	8.34	7.39	5.65	4.88	2.88	
5:1	13.01	11.54	8.83	7.62	4.51	
6:1	18.76	16.62	12.72	10.97	6.49	
7:1	25.53	22.62	17.32	14.93	8.83	
8:1	33.35	29.54	22.62	19.50	11.54	
9:1	42.21	37.39	28.62	24.68	14.60	
10:1	52.11	46.16	35.34	30.47	18.03	
20:1	208.43	184.63	141.36	121.88	72.12	
30:1	468.97	415.42	318.05	274.24	162.27	
40:1	833.72	738.52	565.41	487.54	288.48	
50:1	1302.69	1153.94	883.48	761.78	450.76	
60:1	1875.87	1661.67	1272.22	1096.96	649.09	
70:1	2553.27	2261.72	1731.63	1493.09	883.48	
80:1	3334.88	2954.08	2261.72	1950.15	1153.94	
90:1	4220.70	3738.75	2862.48	2468.16	1460.45	
100:1	5210.75	4615.75	3533.93	3047.11	1803.03	

Table 1 A.--Hectares - Size of Opening by D/H Ratio and Tree Height.

D/H Ratio	White Pine 85'	Maple 80'	Red Pine 70'	Aspen 65'	Spruce Fir 50'	Jack Pine 50'
1:1	.21	.19	.14	.12	.07	
2:1	.84	.75	.57	.49	.29	
3:1	1.90	1.68	1.29	1.11	.66	
4:1	3.38	2.99	2.29	1.97	1.17	
5:1	5.27	4.67	3.57	3.08	1.83	
6:1	7.59	6.73	5.15	4.48	2.63	
7:1	10.33	9.15	7.01	6.04	3.57	
8:1	13.50	11.95	9.15	7.89	4.67	
9:1	17.09	15.13	11.58	9.99	5.91	
10:1	21.09	18.68	14.30	12.33	7.30	
20:1	84.35	74.72	57.21	49.32	29.19	
30:1	189.79	168.12	128.71	110.98	65.67	
40:1	337.40	298.87	228.82	197.30	116.75	
50:1	527.19	466.99	357.54	308.29	182.42	
60:1	759.15	672.47	514.86	443.93	262.68	
70:1	1033.29	915.31	700.78	604.25	357.54	
80:1	1349.61	1195.50	915.31	789.21	446.99	
90:1	1708.09	1513.05	1158.43	998.85	591.04	
100:1	2108.76	1867.97	1430.16	1233.15	729.68	

Table 2.--Birds of Upland Openings

	Large Opening	Small Opening	Edge	Forest
Turkey Vulture(Cathartes Aura)				
Sharp Shinned Hawk(Accipter striatus velox)				
Red Tailed Hawk(Buteo jamaicensis)				
Broad-winged Hawk(Buteo platypterus)				
Rough-Legged Hawk(Buteo lagopus)				
Marsh Hawk(Circus cyancus)				
Kestrel(Sparrow Hawk)(Falco sparverius)				
Sandhill Crane(Grus canadensis)				
Killdeer(Charadrius vociferus)				
Upland Sandpiper(Bartramia longicauda)				
Herring Gull(Larus argentatus)				
Ring Billed Gull(Larus delawarensis)				
Mourning Dove(Zenaidra macroura)				
Snowy Owl(Nyctea scandiaca)				
Hawk Owl(Surnia ulula)				
Short-eared Owl(Asio flammeus)				
Whip-poor-Will(Caprimulgus vociferus)				
Night Hawk(Chordeilis minor)				
Chimney Swift(Choetura pelagica)				
Ruby throated Hummingbird(Archilochus colubris)				
Flicker(Colaptes auratus)				
Downy Woodpecker(Dendrocopus pubescens)				
Eastern Kingbird(Tyrannus tyrannus)				
Phoebe(Sayornis phoebe)				
Least Flycatcher(Empidonax minimus)				
Horned Lark(Eremuphilia alpestris)				
Tree Swallow(Iridoprocne bicolor)				
Bank Swallow(Riparia riparia)				
Rough-winged Swallow(Stelgidopteryx ruficollis)				
Barn Swallow(Hirundo rustica)				
Cliff Swallow(Petrocheliden pyrrhonota)				
Purple Martin(Progne subis)				
Bluejay(Cyanocitta cristata)				
Raven(Corvus corax)				
Crow(Corvus brachyrhynchos)				
Black Capped Chickadee(Parus atricapillus)				
House Wren(Troglodytes aedon)				
Catbird(Dumatella carotinensis)				
Brown Thrasher(Toxostoma rufum)				
Robin(Turdus migratorius)				
Eastern Bluebird(Sialis sialis)				
American Pipit(Anthus spinoletta)				
Cedar Waxwing(Bombycilla cedrorum)				
Northern Shrike(Lanius excubitor)				
Loggerhead Shrike(Lanius ludovicians)				
Starling(Sturnus vulgaris)				
Black & White Warbler(Mniotilta varia)				
Nashville Warbler(Vermivora ruficapilla)				
Yellow Warbler(Dendroica petechia)				
Yellow-rumped Warbler(Dendroica coronata)				
Chestnut-sided Warbler(Dendroica pensylvanica)				
Mourning Warbler(Oporornis philadelphia)				
Northern Yellowthroat(Geothlypis trichas)				
Bobolink(Dolichonyx oryzivorus)				
Eastern Meadowlark(Sturnella magna)				
Western Meadowlark(Sturnella neglecta)				
Red-wing(Aqelaius phoeniceus)				
Rusty Blacbird(Euphagus carolinus)				
Brewer's Blackbird(Euphagus cyanocephalus)				

Table.--continued

	Large Opening	Small Opening	Edge	Forest
Common Grackle(*Quiscalus quiscula*)				
Cowbird(*Molothrus ater*)				
Indigo Bunting(*Passerina cyanea*)				
Purple Finch(*Cardo purpureus*)				
Pine Grosbeak(*Pinicola enucleator*)				
Redpoll(*Acanthus flammea*)				
Pine Siskin(*Spinus pinus*)				
American Goldfinch(*Spinus tristis*)				
Rufous-sided Towhee(*Pipilo erythropthalmus*)				
Savannah Sparrow(*Passerculus sandwichensis*)				
Grasshopper Sparrow(*Ammodramus savannarum*)				
Vesper Sparrow(*Pooecetes gramineus*)				
Dark Eyed Junco(*Junco hyemalis*)				
Tree Sparrow(*Spizella arborea*)				
Chipping Sparrow(*Spizella passerina*)				
Clay Colored Sparrow(*Spizella pollida*)				
Field Sparrow(*Spizella pusilla*)				
White-throated Sparrows(*Zonotrichia albicollis*)				
Song Sparrow(*Melospiza melodia*)				
Lapland Lonspur(*Calcarius lapponicus*)				
Snow Bunting(*Plectrophenax nivalis*)				

into groups corresponding to any plant association, but that "groups' readily overlap one another. F. James (1971), H. Shugart, and D. James (1973), using modern statistical methods have been able to locate birds along a continuum of vegetational structure from open country to forest association in Arkansas. Bergstedt and Niemi (1974) have undertaken a similar study in a burned over forest area in Minnesota.

Unfortunately there are no known similar studies of upland openings in the northern Lake States. The list of birds of upland openings (Table 2) is based on the observations of many persons (Taylor)[4/] in addition to published accounts.

The distinction between birds of small openings and edge is poorly documented.

UPLAND OPENING MANAGEMENT

Nature provides upland openings, grassy and shrubby, through such agents as fire, wind, flooding (including beaver flooding), insects, disease, and the death of old trees.

Modern forest management discriminates against these openings in several ways. Forest fires are prevented or controlled. Modern silviculture works to minimize loss of wood through old age, insects and disease. Timber harvest methods are scheduled to achieve immediate reestablishment of forest stands. Tree plantings are used where delay in reestablishment is experienced or expected, and to fill in nonstocked or partially stocked stands.

If openings are to remain a part of the forest, the need for them must be recognized, and their development, maintenance, and protection planned.

In the Lake States, upland opening management has been, and largely is, based on the recognized needs of game species. Large upland openings - 200 acres (80 hectares) and larger - are a special management situation to benefit sharptail grouse or geese.

Small forest openings are managed as a part of the forest. The objective usually is to maintain a percent of forest lands in the upland openings. The percent, from 1-5%, is based on a compromise with other management activities - often to favor a target species such as ruffed grouse, deer, kirtland's warbler, or sandhill crane.

The size of the openings vary from 1/2 (0.2 hectares) to 10 (4 hectares) acres; most are about 1 acre (0.4 hectares). Size may be based on a requirement for a particular species (as noted above), on tradition, opinion, or simply to complement other forest management activities.

Distribution of upland openings is usually planned to take advantage of an existing opening or situation which will require the least development costs, and to attain uniform distribution.

Management procedure is to maintain existing suitable openings and develop additional openings as needed. Methods used include timber harvest, hand cutting trees and shrubs, prescribed burning, use of herbicides and mechanical methods such as bulldozer and roller chopper. In the future livestock grazing may become important as a maintenance and development tool in the special management of large opening. With all treatment the objectives are to kill all woody vegetation and establish or reinforce the sod ground cover. Use of herbicide provides the best and most certain result.

UPLAND OPENING MANAGEMENT RECOMMENDATION AND RESEARCH NEEDS

In the absence of biological information about optimum size - forest type relationships, it is prudent to vary opening size (D;H ratio). Size variation (D/H ratio of 1:1 to about a D/H ratio of 20:1) will compensate for our lack of knowledge of the habitat requirement of the majority of animals of opening and edge, and minimize any trend to create monotype openings.

The variety of types of openings is as important as the size or number. Different arrangements of the vegetative life forms prove attractive to different species. The difference between an opening with bluebirds, flickers, or kestrels may be only the absence or presence of a snag or two.

Kingbirds may use stumps, firecharred (Pinkowski, 1977) or not (personal observation) for nesting. A clump of shrubbery may harbor nesting and feeding birds that would not otherwise be there. In their discussion of park-like areas, Hooper et al (1973) found that some plots had greater bird diversity than they expected, and they believed that clumped vegetation provided nesting and escape cover for more birds than could have been supported if this small amount of vegetation had been dispersed.

4/ Taylor, Charlotte M., 1966-1978, Breeding Bird Surveys on Two Routes in Michigan's Upper Peninsula, (Unpublished).

In various bird studies emphasis generally has been on breeding birds; use by birds for other than breeding may well be overlooked - as examples, all the broad-winged hawk nests that Carlson (1976) found in his study areas were within 425' (130 meters) of a forest opening and most of them were much closer. Sandhill cranes nest in bogs, but do their feeding and bring their young to feed in the forest openings. Aerial feeding birds, such as nighthawks, are frequently seen over openings. The scavengers, crows, ravens, and vultures patrol the openings. Robins come for blueberries and short-eared owls for their food. Migrating finches feed on the forbs and shrubs. In considering the numbers and kinds of openings, all these uses should be recognized.

Openings should be planned to furnish particular life forms. To this end our present concern for seeding openings, or favoring various grass, grass-forb, or shrub associations needs to be expanded to provide other life form aspects, such as stumps, snags, hollow logs, fallen trees or standing trees.

Life forms of the forest not available elsewhere in the forest, such as sparse stands or park-like stands, should be provided as a part of upland opening management.

The description, or interpretation of life form is more basic to the understanding and management of nongame birds (and game birds), than are timber types or currently used forest vegetation designations. Development of procedures to interpret life form from type designation is desirable. The availability to interpret a vast amount of timber management data in terms of biomass of the various parts of a forest stand would be a giant step toward description of life form, with a minimum of additional effort. James (1971), Anderson and Shugart (1974), and Shugart and Patten (1972) have developed methods that could be utilized.

Livestock grazing has been mentioned as a tool. It may also become a reason for openings - this is still new so the effects it may have are speculative.

The partial list of the birds using these openings should be completed before grazing starts so that the effect of grazing on the birdlife can be assessed.

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