

Terrestrial Flora and Vertebrate Fauna of Four East-Central Indiana Borrow Pit Lakes

ELIZABETH S. MAXWELL and RALPH D. KIRKPATRICK

Department of Biology, Ball State University, Muncie, Indiana 47306

Introduction

Borrow pit lakes created by the removal of soil during highway construction may have value to wildlife. To determine potential wildlife values of borrow pit areas, comprehensive surveys of flora and fauna of the lands adjacent to four borrow pit lakes located along Interstate 69 in Delaware and Grant Counties, Indiana, were made during 1976.

Related Literature

Few references about wildlife use of small man-made bodies of water and their adjacent areas are available. Greenwell (3) reported consistent use of Missouri farm ponds by upland game birds and game mammals, small mammals, and songbirds. In 1966, Evans and Kerbs (1, 2) studied waterfowl and shorebird use of selected stock ponds in South Dakota. They noted that although the main purpose of the stock ponds was to provide drinking water for livestock, many species of waterfowl and shorebirds used them for resting and feeding during migration periods and for summer nesting habitat. Merrill and Kirkpatrick (5) recorded that newly created borrow pit lakes along Interstate Highway 69 (I-69) in northeastern Indiana provide suitable resting and feeding habitat for various species of birds. They noted the presence of waterfowl, shorebirds, and other birds during 1968 on three study borrow pit lakes in Delaware County, Indiana.

Other literature related to the ecology of disturbed land with associated bodies of water includes a study by Jones (4) of the avifauna of a strip-mined region in southern Indiana. He included nearly 90 bodies of water in his study area. Riley (6,7,8) discussed wildlife values of reclaimed strip-mined lands in southeastern Ohio.

The Study Areas

Four study borrow pit lakes were selected adjacent to I-69 in Delaware and Grant Counties, Indiana. They varied in surface area, depth and in other morphometric characteristics. The four lakes: Cardinal, Clark's, Dumpert's, Walters', are privately owned and are located on land previously used for agricultural crops.

Cardinal Lake is L-shaped and has approximately 6.9 ha of water surface. It has a maximum depth of 2.5 m and is bounded on three sides by cultivated fields. Wildlife and erosion-control plantings are established around the perimeter of the pit. A bluegrass lane approximately 6 m wide separates the borrow pit from its bordering fields and a county road.

Clark's Borrow Pit Lake has a water surface area of 0.8 ha and a maximum depth of 2.5 m and is bounded on three sides by cultivated fields. Wildlife and

erosion-control plantings are established around the perimeter of the lake. A bluegrass (*Poa pratensis*) lane approximately 6 m wide separates the borrow pit from its bordering fields and a county road.

DumPERT's Borrow Pit Lake is near-oval in shape with a water surface area of approximately 3.2 ha and a maximum depth of 5.5 m. It is surrounded by a strip of grassland which is in turn bordered by a deciduous woodlot on the east and by cultivated fields on the north and south. Wildlife plantings have recently been made adjacent to the pit.

Walters' Borrow Pit Lake is rectangular and has a water surface area of 0.8 ha with a maximum depth of 1.75 m. It is surrounded by cultivated fields. A mature multiflora rose (*Rosa multiflora*) hedge on the north and west sides borders the borrow pit area.

Methods and Materials

Birds at each borrow pit were observed weekly using binoculars and/or a spotting telescope. Numbers and kinds of observed birds were compiled.

Small mammal populations on land adjacent to the borrow pits were sampled by mouse snaptraps and by Museum Special snaptraps. A transect line at each pit had a total of 20 trapping stations spaced at 10 m intervals. Three snaptraps were set at each station for five nights, making a total of 300 trapnights per sampling period at each pit. Traps were baited with dry rolled oats and were checked each morning and evening. Trapped specimens were identified, catalogued and deposited in the Ball State University Mammal Collection.

Vegetative cover at the borrow pits was sampled by collection of non-woody plants for later identification in the Ball State University Herbarium. Woody plants were identified in the field.

Results and Discussion

Vegetation

Terrestrial vegetation adjacent to the four borrow pit lakes was characterized by early successional species that would be expected on former cropland in this region, e.g. thistles (*Cirsium* spp.), bluegrass and chickory (*Cichorium intybus*). Multiflora rose was present on all areas, having been planted on the Walters' area, and having spread to other areas from nearby plantings. Woody invasion of fencerows included native species such as red mulberry (*Morus rubra*) and hawthorn (*Crataegus* spp.). Wildlife cover plantings on Clark's area included red and white pine (*Pinus* spp.). Wetland species encountered were principally cattails (*Typha* spp.), sedges (*Carex* spp.), cottonwood (*Populus deltoides*) and willows (*Salix* spp.).

Vegetation, with the exception of the multiflora rose hedge on Walters' area and in fencerows on all areas, was kept low by periodic mowing. This management strategy denied nesting and escape cover to larger vertebrates.

Birds

Bird surveys were conducted during 11 months (January through November) in 1968 on Cardinal Lake and Clark areas by Merrill and

TABLE 1. Status of birds observed on four borrow pit lakes in east-central Indiana during 1976 or 1968 and 1976.

Species	Cardinal		Clark's		Dumpey's	Walters'
	1968 ¹	1976	1968 ¹	1976	1976	1976
Pied-billed Grebe, <i>Podilymbus podiceps</i>					c	
Canada Goose, <i>Branta canadensis</i>		u				c
Mallard, <i>Anas platyrhynchos</i>	a	c	u		c	c
Northern Shoveler, <i>Anas clypeata</i>	c				u	
Blue-winged Teal, <i>Anas discors</i>	a	c			c	
Green-winged Teal, <i>Anas crecca</i>	c	u	u			
Wood Duck, <i>Aix sponsa</i>		u				u
Ring-necked Duck, <i>Aythya collaris</i>	u					
Lesser Scaup, <i>Aythya affinis</i>	c	c	u	u	c	u
Common Goldeneye, <i>Bucephala clangula</i>	u					
Bufflehead, <i>Bucephala albeola</i>			u		u	
Ruddy Duck, <i>Oxyura jamaicensis</i>					u	
Hooded Merganser, <i>Lophodytes cucullatus</i>	c					
Turkey Vulture, <i>Cathartes aura</i>		u				
Bobwhite, <i>Colinus virginianus</i>		u	u			
Common Egret, <i>Casmerodius albus</i>					u	
Great Blue Heron, <i>Ardea herodias</i>	u	u			u	u
Green Heron, <i>Butorides virescens</i>		u	u		u	u
American Bittern, <i>Botaurus lentiginosus</i>	u					
American Coot, <i>Fulica americana</i>	a	a			a	
American Golden Plover, <i>Pluvialis dominica</i>	u					
Piping Plover, <i>Charadrius melodus</i>		u		u		
Semipalmated Plover, <i>Charadrius semipalmatus</i>						u

¹ Data from: Merrill and Kirkpatrick (1970).

a = abundant, 51 or more individuals seen during period of study.

c = common, 11 to 50 individuals seen during period of study.

u = uncommon, 1 to 10 individuals seen during period of study.

Species	Cardinal		Clark's		DumPERT's	Walters'
	1968 ¹	1976	1968 ¹	1976	1976	1976
Killdeer,						
<i>Charadrius vociferus</i>	a	a	a	c	c	c
Solitary Sandpiper,						
<i>Tringa solitaria</i>		u				
Spotted Sandpiper,						
<i>Actitis macularia</i>	c	a		u	a	c
Greater Yellowlegs,						
<i>Tringa melanoleucus</i>		u			u	
Lesser Yellowlegs,						
<i>Tringa flavipes</i>		c		c		u
Short-billed Dowitcher,						
<i>Limnodromus griseus</i>					u	
Long-billed Dowitcher,						
<i>Limnodromus scolopaceus</i>					u	
Pectoral Sandpiper,						
<i>Calidris melanotos</i>		u				
Baird's Sandpiper,						
<i>Calidris bairdii</i>		u				
Least Sandpiper,						
<i>Calidris minutilla</i>						u
Semipalmated Sandpiper,						
<i>Calidris pusillus</i>	u	u			c	
American Woodcock,						
<i>Philohela minor</i>		c				
Common Snipe,						
<i>Capella gallinago</i>	c	c			u	
Bonaparte's Gull,						
<i>Larus philadelphia</i>	u					
Common Tern,						
<i>Sterna hirundo</i>	u					
Rock Dove,						
<i>Columba livia</i>	c	a		c	a	
Mourning Dove,						
<i>Zenaida macroura</i>	a	a	a	a	a	c
Chimney Swift,						
<i>Chaetura pelagica</i>						u
Belted Kingfisher,						
<i>Megascyle alcyon</i>		u	u		u	
Common Flicker,						
<i>Colaptes auratus</i>		u	u		u	u
Red-headed Woodpecker,						
<i>Melanerpes erythrocephalus</i>	u					
Hairy Woodpecker,						
<i>Picoides villosus</i>					u	
Downy Woodpecker,						
<i>Picoides pubescens</i>		u			u	
Eastern Kingbird,						
<i>Tyrannus tyrannus</i>				u	u	

¹Data from: Merrill and Kirkpatrick (1970).

a = abundant, 51 or more individuals seen during period of study.

c = common, 11 to 50 individuals seen during period of study.

u = uncommon, 1 to 10 individuals seen during period of study.

Species	Cardinal		Clark's		Dumpe ¹ 's	Walters'
	1968 ¹	1976	1968 ¹	1976	1976	1976
Least Flycatcher, <i>Empidonax minimus</i>		u				
Eastern Wood Pewee, <i>Contopus virens</i>					u	
Horned Lark, <i>Eremophila alpestris</i>	a		c		u	
Barn Swallow, <i>Hirundo rustica</i>	c	c	c	u	c	c
Tree Swallow, <i>Iridoprocne bicolor</i>		u		u	u	
Bank Swallow, <i>Riparia riparia</i>	c	u			u	u
Rough-winged Swallow, <i>Stelgedopteryx ruficollis</i>					u	
Blue Jay, <i>Cyanocitta cristata</i>					c	
Common Crow, <i>Corvus brachyrhynchos</i>	a	c	c	c	c	u
Carolina Chickadee, <i>Parus carolinensis</i>	u	c			u	
Tufted Titmouse, <i>Parus bicolor</i>		u			u	
White-breasted Nuthatch, <i>Sitta carolinensis</i>					u	
House Wren, <i>Troglodytes aedon</i>					u	
Mockingbird, <i>Mimus polyglottos</i>						u
Gray Catbird, <i>Dumetella carolinensis</i>					u	
Brown Thrasher, <i>Toxostoma rufum</i>					u	u
Robin, <i>Turdus migratorius</i>	c	c	c	u	c	u
Hermit Thrush, <i>Catharus guttata</i>					u	
Golden-crowned Kinglet, <i>Regulus satrapa</i>					u	
Cedar Waxwing, <i>Bobyccilla cedrorum</i>				u	u	
Starling, <i>Sturnus vulgaris</i>	a	a	c	c	a	c
White-eyed Vireo, <i>Vireo griseus</i>					u	
Nashville Warbler, <i>Vermivora ruficapilla</i>					u	
Yellow-rumped Warbler, <i>Dendroica coronata</i>		c				

¹Data from: Merrill and Kirkpatrick (1970).

a = abundant, 51 or more individuals seen during period of study.

c = common, 11 to 50 individuals seen during period of study.

u = uncommon, 1 to 10 individuals seen during period of study.

Species	Cardinal		Clark's		Dumpert's	Walters'
	1968 ¹	1976	1968 ¹	1976	1976	1976
Bay-breasted Warbler, <i>Dendroica castanea</i>					u	
Pine Warbler, <i>Dendroica pinus</i>					u	
Palm Warbler, <i>Dendroica palmarum</i>		u				
Common Yellowthroat, <i>Geothlypis trichas</i>					u	
House Sparrow, <i>Passer domesticus</i>	a	c		a	a	c
Meadowlark, <i>Sturnella</i> spp.	a	c	a	u	u	u
Red-winged Blackbird, <i>Agelaius phoeniceus</i>	a	a	a	a	a	a
Rusty Blackbird, <i>Euphagus carolinus</i>				u		
Common Grackle, <i>Quiscalus quiscula</i>	a	a	a	c	a	a
Brown-headed Cowbird, <i>Molothrus ater</i>	c	u	u			
Cardinal, <i>Cardinalis cardinalis</i>		c	u		u	u
Indigo Bunting, <i>Passerina cyanea</i>					u	u
American Goldfinch, <i>Carduelis tristis</i>	u	u		u	u	
Savannah Sparrow, <i>Passerculus sandwichensis</i>	a	u	u		c	
Vesper Sparrow, <i>Poocetes gramineus</i>		u			c	
Dark-eyed Junco, <i>Junco hyemalis</i>		u			a	c
Tree Sparrow, <i>Spizella arborea</i>		u			u	
Field Sparrow, <i>Spizella pusilla</i>	u	c		c	c	c
White-throated Sparrow, <i>Zonotrichia albicollis</i>		u			u	
Fox Sparrow, <i>Passerella iliaca</i>		u			u	u
Song Sparrow, <i>Melospiza melodia</i>	c	c	c	c	c	c

¹Data from: Merrill and Kirkpatrick (1970).

a = abundant, 51 or more individuals seen during period of study.

c = common, 11 to 50 individuals seen during period of study.

u = uncommon, 1 to 10 individuals seen during period of study.

Kirkpatrick (5). A comparison of bird observations for 1968 and 1976 (12 months) for these areas reveal that 11 waterfowl species were found on Cardinal Lake during one or both of the study years (Table 1). Common goldeneye (*Bucephala clangula*), hooded merganser (*Lophodytes cucullatus*), ring-necked

duck (*Aythya collaris*) and the shoveler (*Anas clypeata*) were observed in 1968 but not in 1976. The Canada goose (*Branta canadensis*) and the woodduck (*Aix sponsa*) were seen only in 1976. The American woodcock (*Philohela minor*) was not seen in 1968 but was common in 1976, probably as a breeding and nesting species. During the interval between 1968 and 1976, woodcock nesting cover and feeding areas developed in the low, wet, unmowed area immediately south of Cardinal Lake.

The number of waterfowl species observed on Clark's Borrow Pit area declined from four to one between 1968 and 1976. Bufflehead (*Bucephala albeola*), green-winged teal (*Anas crecca*), lesser scaup (*Aythya affinis*), and the mallard (*Anas platyrhynchos*) were seen in 1968 but only the lesser scaup was seen in 1976.

A total of 65 avian species was observed at the Dumpert Borrow Pit and 33 species were observed at the Walters' Borrow Pit during 1976. The greater number of species seen at Dumpert's is probably due to its larger surface area and to the greater number of habitats in its immediate vicinity.

Mammals

A total of seven mammalian species was collected on transects. The masked shrew (*Sorex cinereus*) was taken on all but Dumpert's Borrow Pit area while the short-tailed shrew (*Blarina brevicauda*) was taken on all the study areas. The eastern chipmunk (*Tamias striatus*) was collected only on Walters' area. The white-footed mouse (*Peromyscus leucopus*), the deer mouse (*P. maniculatus*) and the meadow vole (*Microtus pennsylvanicus*) were taken on all four study areas. Feral house mouse (*Mus musculus*) populations were found on all but the Walters' study area.

Larger mammals not collected but known to occur on the areas include: raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), muskrat (*Ondatra zibethicus*) and Virginia opossum (*Didelphis virginiana*). Certain of these furbearers, particularly the muskrat, are harvested by trappers on Cardinal and Walters'. These larger mammals add to the biotic diversity and to the aesthetic appeal of the areas.

Conclusions

The construction of borrow pit lakes has created habitat necessary for recreationally important wetland wildlife species including waterfowl, shorebirds and certain furbearers such as the muskrat. The removal of the areas from cultivation and the establishment of permanent woody and herbaceous cover allows the presence of a diverse songbird fauna as well as several of the larger mammals. It can be anticipated that additional wildlife species will appear on the areas as community succession progresses. In a region of intensive farming and rapid urbanization borrow pit lakes will become of increasing importance for recreational activities including birdwatching, trapping and nature study.

Literature Cited

1. EVANS, K. E., and R. R. KERBS. 1967. Waterfowl and shorebird use on selected stock ponds in Jackson County: 1966. South Dakota Bird Notes **19**(2):28-30.
2. EVANS, K. E., and R. R. KERBS. 1977. Avian use of livestock watering ponds in western South Dakota. U.S. Dept. Agri. Forest Serv. Gen. Tech. Rept. RM-35. 11 p.
3. GREENWELL, G. A. 1948. Wildlife values of Missouri farm ponds. N. Amer. Wildl. Conf. Trans. **13**:271-281.
4. JONES, G. S. 1968. Avifauna of a study area in the strip-mined region of Indiana. Ind. Audubon Quart. **46**(4):92-97.
5. MERRILL, R. L., and R. D. KIRKPATRICK. 1970. Utilization of three Delaware County, Indiana borrow pits by birds. Ind. Audubon Quart. **48**(1):14-20.
6. RILEY, C. V. 1954. The utilization of reclaimed coal strip-lands for the production of wildlife. N. Amer. Wildl. Conf. **19**:324-337.
7. RILEY, C. V. 1957. Reclamation of coal strip-mined lands with reference to wildlife plantings. J. Wildl. Manage. **21**(4): 402-413.
8. RILEY, C. V. 1960. The ecology of water areas associated with coal strip-mined lands in Ohio. Ohio Jour. Sci. **60**(2):106-121.