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BIRD USE OF WETLANDS CREATED BY SURFACE MINING

G.A. Perkins[1] and J.S. Lawrence
Cooperative Wildlife Research Laboratory
Southern Illinois University
Carbondale, Illinois 62901

ABSTRACT

The use of wetland habitats remaining after surface-mining in west-central Illinois by summer resident birds was documented during 1979-1980 and 1982-1984 while studying giant Canada geese on the area. Confirmed nesting species were giant Canada goose, mallard, black duck, blue-winged teal, wood duck, hooded merganser, mute swan, American coot, common moorhen, pied-billed grebe, killdeer, and spotted sandpiper. Suspected nesting species were lesser scaup, northern pintail, American bittern, and green-backed heron. Other summer visitors were green-winged teal, redhead, common merganser, great blue heron, great egret, cattle egret, sora, and king rail. It was concluded that wetlands created by surface-mining made a valuable contribution in terms of avian habitat in west-central Illinois.

INTRODUCTION

Water areas resulting from surface mining for coal often have been regarded as a liability, being characterized as acidic, low in fertility, and having poor fish production (Lewis and Peters 1954, Riley 1960, Stockinger and Hays 1960, Riley 1965, Campbell et al. 1965, Campbell and Lind 1969, Lind and Campbell 1970, Gash and Bass 1973, Wilbert 1974, and others). However, there is evidence that in many situations surface mine waters provide quality aquatic environments (Christy et al. 1979, Rosso 1979, Streeter et al. 1979, Konik 1980, Coss 1981, Klimstra and Nawrot 1982). Little attention has been given to the potential value of wetlands on surface mines as habitat for wetland bird species. Sandusky (1978) documented use of surface mine ponds in southern Illinois by 3 nesting duck species and Perkins (1981) reported that giant Canada geese (*Branta canadensis maxima*) introduced on sur-

[1]Present address: Bayou Meto Wildlife Management Area, Rt. 1, Box 188A, Humphrey, AR 72073.

face mined lands in west-central Illinois were thriving. This report documents use of wetland habitats on surface mines in west-central Illinois by summer resident birds and demonstrates the potential value of wetlands development as a reclamation alternative.

STUDY AREA AND METHODS

The 4-county study area included 17,783 ha of surface mined land in Fulton County, 8,362 ha in Knox County, 1,137 ha in Peoria County, and 1,083 ha in Henry County (Fig. 1). Nearly 60% of the study area was mined prior to enactment of the Open Cut Land Reclamation Act of 1962 and was not subject to reclamation requirements (Klimstra and Thornburg 1982). However, certain areas with high quality soils were voluntarily reclaimed by minimal strike-off and some grading. Post-law lands exhibited a range of reclamation intensity from minimal strike-off to grading to approximate original contour, corresponding to increasing regulatory constraints imposed by changes in Illinois legislation during 1962-1976 (Klimstra and Thornburg 1982).

Forage production and grazing were the most common land uses; principal vegetative species included brome (*Bromus* spp), sweet clover (*Melilotus* spp), fescue (*Festuca* spp), and alfalfa (*Medicago* spp). Forested tracts of volunteer species were locally common, especially on pre-law lands. Row-cropping was not prevalent except on the most recently reclaimed tracts, but represented the major surrounding land use.

Wetlands and deepwater habitats totalling 2,244 ha (Haynes and Klimstra 1975, unpubl. coal company data) were highly variable ranging from small seasonally flooded basins to large deep lakes. Problem waters existed only in very isolated settings where runoff was received from mine wastes and were not due to weathering of overburden material. Water quality was generally good, supporting a diversity of aquatic macrophytes and invertebrates. Konik (1980) identified 71 invertebrate taxa in 2 Fulton County lakes and found abundant aquatic vegetation at depths up to 5 m; muskgrass (*Chara* spp), pondweeds (*Potamogeton* spp), and southern naiad (*Najas quadalupensis*) were the principal species. Other locally abundant aquatic plants included waterweed (*Elodea* spp), watermilfoil (*Myriophyllum* spp), coontail (*Ceratophyllum demersum*), and American lotus (*Nelumbo lutea*). Emergent species, mainly cattails (*Typha latifolia*, *T. angustifolia*) and softstem bulrush (*Scirpus validus*), often dominated shorelines with suitable slopes. Ephemeral basins and areas of moist soil were dominated by communities of nutgrasses (*Cyperus* spp), spikerushes (*Eleocharis* spp), sedges (*Carex* spp), rushes (*Juncus* spp), and a wide array of pioneering annuals.

The physical characteristics of water bodies were a function of the method of coal extraction and the degree of reclamation. Bucket-wheel excavation produced smaller, less uniform spoilbanks than did shovel and dragline. When inundated, the former yielded areas with very irregular shorelines and numerous islands, while the latter often resulted in a series of parallel impoundments with more uniform shorelines and fewer islands; both were characterized by a diverse bottom topography. Boxcut and incline impoundments were often deep, steep-sided, fairly uniform, and offered only a very narrow littoral zone.

Data were collected during 1979-1980 and 1982-1984 while studying giant Canada geese introduced into the study area in 1969. Observations are of those wet-

land bird species believed to be summer residents, and do not include those known to frequent the area during migrations. Records were kept for species within 5 orders: Anseriformes (ducks, geese, and swans), Ciconiiformes (herons, bitterns, and egrets), Podicipediformes (grebes), Gruiformes (rails and coots), and Charadriiformes (shorebirds). Based on the nature of the observations, species were placed in one of 3 categories. *Confirmed nesting species* were those for which either nests or broods were observed. *Suspected nesting species* exhibited behavior indicating nesting activities or frequenting a given location; no nests or broods were located. *Other summer visitors* were species recorded during the summer but no observations indicated nesting activity. Bird species names follow the latest classification of the American Ornithologists' Union (1983).

RESULTS AND DISCUSSION

Twelve species were confirmed as nesting, 4 as suspected nesting, and 8 as summer visitors (Table 1). Individual species accounts follow with observations on their use of wetland and adjacent upland habitats.

Confirmed Nesting Species

Canada Goose (*Branta canadensis maxima*). — Perkins (1981) detailed the status and breeding biology of the giant Canada goose population estimated to be over 3,000 prior to production in 1980. Of 242 nests monitored during 1979 and 1980, 74.8% were successful; clutch size averaged 5.7. Mean brood size at hatching was 5.2 both years. Not only were island nest sites more preferred (83.5%) over those on shore, they were more successful (82.2%) compared to shore nests (37.5%). Sweet clover, grasses,, and broad-leaved weeds, composed the bulk of nest materials. An abundance of relatively safe islands for nesting was a key factor in population productivity. Impounded spoils created by bucket-wheel excavators provided the greater number of desirable island situations.

Mallard (*Anas platyrhynchos*). — Mallards were the most commonly observed nesting ducks. Mean clutch size of 17 nests located during incubation was 9.8 eggs; this was higher than the 9.0 reported by Bellrose (1980) for 5,170 nests. The small sample of nests recorded was restricted to early nests; overall clutch size was probably lower as early clutches have more eggs (Dzubin and Gollop 1972). Although half of the nests located were on islands, such nests were more likely to be found. Mainland nests were in areas of ungrazed grasses 0.5-1.0 m tall. Based on all age classes recorded, mean size of 78 broods was 7.2. Undisturbed broods were most often noted in shallow water with aquatic vegetation.

Black duck (*Anas rubripes*). — No nests and only one brood of the black duck were documented. Its occurrence in west-central Illinois approaches the western and southern limits of its breeding range (Bellrose 1980); and, it is listed as a rare summer resident in Illinois (Bohlen 1978). This species is an ecological equivalent to the mallard in many respects and probably utilizes similar habitats. A few black ducks were released on the study area by the Illinois Department of Conservation, and probably accounted for the observed production.

Blue-winged Teal (*Anas discors*). — One blue-winged teal nest containing 2 eggs was located on 1 June 1979 when the female was observed returning to the site in tall grass, about 100 m from water. The combination of later nest initiation and a tendency to nest far from water (Bellrose 1980) possibly precluded other dis-

coveries. Mean size of 10 broods of all age classes was 5.8; these were most often observed in small shallow ponds with aquatic vegetation. Numerous observations of pairs and lone males indicated this species was much more common than suggested by nest and brood records.

Wood duck (*Aix sponsa*). — Female wood ducks were observed entering nest cavities at 2 locations but nests were not checked. Four broods ($\bar{X} = 12$ ducklings) were recorded; however, incidental observations were unlikely, due to the tendency of wood ducks to frequent areas of emergent and overhanging woody vegetation. Also, little time was spent on forested tracts of pre-law lands best suited for wood duck nesting.

Hooded Merganser (*Mergus cucullatus*). — Five hooded merganser broods were recorded between 10 May and 13 June 1983 on one area adjacent to the Illinois River in Fulton and Peoria counties (Fig. 1). Few mature trees were present and nesting likely occurred in nearby bottomland forests. Broods probably moved to wetlands on the mined area for more suitable foraging. According to Bellrose (1980), hooded mergansers cannot find adequate food in highly turbid waters. The Illinois River and associated wetlands are generally highly turbid (Bellrose et al. 1979), while mine site waters reflect very low turbidity (Konik 1980).

Mute Swan (*Cygnus olor*). — Several mute swans were introduced into the study area during the early 1970's; successful nests were observed during subsequent years prior to 1979 (Illinois Department of Conservation unpubl. data). Four unsuccessful nests were observed; all were built on platforms of cattail stems anchored among standing cattails.

American Coot (*Fulica americana*). — Two families of coots consisted of 1 adult with 8 young on 2 July 1979, and of 2 adults with 3 young on 27 June 1980. Singles, pairs, and small groups were commonly observed throughout spring and summer on small wetland basins with shorelines dominated by cattail. This wetland type is a preferred nesting habitat of coots (Fredrickson 1977). The American coot is listed as an uncommon summer resident in central Illinois (Bohlen 1978).

Common Moorhen (*Gallinula chloropus*). — The common moorhen (formerly common gallinule), a threatened species in Illinois, has been reported nesting recently in only Cook and Lake counties in extreme northeastern Illinois (Natural Land Institute 1981). Although our studies yielded no nests, a brood of 3 was observed on 6 July 1982. According to Strohmeyer (1977), nesting habitat requirements are similar to those of the American coot.

Pied-billed Grebe (*Podilymbus podiceps*). — Two broods of grebes (2 and 4) were observed on 6 July 1979 at one site in Peoria County. Singles and pairs were observed occasionally on all types of wetlands and deepwater habitats. This species is considered an uncommon summer resident in central Illinois (Bohlen 1978).

Killdeer (*Charadrius vociferus*). — Killdeer, the most common resident shorebird in Illinois (Bohlen 1978) was abundant. Several broods were observed but no count was recorded. The "wing-injury feigning" display of the female was commonly encountered during the summer.

Spotted Sandpiper (*Actitis macularia*). — An uncommon summer resident of central Illinois (Bohlen 1978), spotted sandpipers were rarely observed after spring migration. One nest containing 2 eggs was located on a gravel bar after a female flushed on 25 May 1980, and one flightless young was observed with an adult in 1984. Because of the small inconspicuous nature of these birds, it is possible other nests were present but undetected.

Suspected Nesting Species

Lesser Scaup (*Aythya affinis*). — A pair of lesser scaup was observed five times during 1-16 May 1979 at the same loafing site near a cattail bed on a 6.5 ha permanent lake in Fulton County. A lone male (presumably from the same pair) was observed at the same site 4 times during 18-28 May, indicating the female was incubating nearby. Two similar instances of apparent nesting activity were recorded in 1980. According to Bohlen (1978) the lesser scaup is a rare summer resident in Illinois.

Northern Pintail (*Anas acuta*). — Several sightings of pairs and observation of a group of 6 flightless pintails on 1 July 1980 indicated some nesting probably occurred. A small number of pintails was released on surface mines in the area by the Illinois Department of Conservation. The pintail is considered a rare summer resident in central Illinois (Bohlen 1978).

American Bittern (*Botaurus lentiginosus*). — American bitterns were observed 4 times during 15 May-6 July 1979, 11 times during 19 May-3 July 1980, and were also seen in 1982 and 1983. All sightings occurred at a small permanent pond surrounded by a dense bed of cattails, the characteristic nesting habitat for this species (Bent 1926). Of the 15 observations in 1979 and 1980, 8 were of 1 individual and 7 were of 2 individuals. The "thunder-pumping" performance, a component of the nuptial display (Bent 1926), was observed on 2 occasions. The American bittern is classified as a state endangered species in Illinois (Natural Land Institute 1981).

Green-backed Heron (*Butorides striatus*). — Although no observations of nesting activities by the green-backed heron (formerly green heron) were recorded, individuals were often seen foraging during all times of the day at 2 sites in Fulton County. The frequency and site-fidelity of observations suggested this species probably nested in those localities. Bohlen (1978) classified the green-backed heron a common summer resident in Illinois.

Other Summer Visitors

Observations of single individuals of green-winged teal (*Anas crecca*), redhead (*Aythya americana*), and common merganser (*Mergus merganser*), were recorded occasionally during June and July. Great blue herons (*Ardea herodias*) and great egrets (*Casmerodius albus*) were commonly seen foraging throughout the study area during all years. These colonial nesting birds presumably made feeding flights to the area from a nearby rookery along the Illinois River. Cattle egrets (*Bubulcus ibis*) were occasionally observed during 1982 and 1983. Five soras (*Porzana carolina*) and 2 king rails (*Rallus elegans*) were observed at one site in Knox County in 1979; the rails were flushed from narrow between-spoil depressions dominated by sedges and cattails and lacking open water.

CONCLUSIONS

It is evident that a variety of bird species utilize aquatic areas resulting from surface mining in west-central Illinois. The value of these wetlands as habitat is reflected in the array of requirements of the birds using them. Habitats provide, collectively and individually, safe island nest sites for geese and mallards; expanses of grassy upland areas for duck nesting; a good interspersion of open water, submersed aquatic vegetation, and emergent vegetation providing a variety of nesting, loafing, and feeding sites; shallow feeding areas for wading birds; clear water for foraging by fish-eating birds; and large open lakes for molting and staging areas. The significance of this habitat contribution is maximized by the fact that intensive

row-crop production otherwise dominates the landscape in this part of Illinois.

The important societal values of many wetland functions have been widely documented (Clark and Clark 1979, Greeson et al. 1979, Richardson 1981, Gopal et al. 1982, Adamus 1983, and others). Larson (1976) termed those with highest significance as "red flag" values and suggested that wetlands with such characteristics be given highest priority for preservation. The 4 of 10 "red flag" values proposed by Larson (1976), and adapted by others (Schuldiner et al. 1979, Zorach 1979), documented on this particular study area include (1) having rare, restricted, endemic, or relict flora and fauna, (2) having flora or fauna at, or very near, the limits of their geographic range, (3) being relatively scarce in a given physiographic region, and (4) having high production or use by water, marsh and shore birds. It is notable that of the 24 species recorded, 6 have a status in central Illinois of uncommon, 5 rare, 1 threatened, and 1 endangered (Table 1).

This and other studies (Haynes and Klimstra 1975, Klimstra et al. 1977, Rosso 1979, Konik 1980, Coss 1981, Perkins 1981, Klimstra and Nawrot 1982, and Sponsler 1982) demonstrate that water areas created by surface mining in the Midwest are not a liability, but rather a valuable asset. Unfortunately, current reclamation laws severely limit water development as an alternative use of surface mined lands. Because most of man's efforts to exploit natural resources have negative impacts, the opportunity to create new diverse habitats by employing appropriate reclamation techniques should be encouraged.

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Table 1. Wetland birds observed on surface mines in west-central Illinois; 1979-1980, 1982-1984.

SPECIES	STATUS IN CENTRAL ILLINOIS[a]	# NESTS OBSERVED	# BROODS OBSERVED
CONFIRMED NESTING SPECIES			
Canada Goose	Introduced	242	101
Mallard	Common	17	79
Black Duck	Introduced	0	1
Blue-winged Teal	Uncommon	1	10
Wood Duck	Common	2	4
Hooded Merganser	Rare	0	5
Mute Swan	Introduced	1	0
American Coot	Uncommon	0	2
Common Moorhen	Threatened	0	1
Pied-billed Grebe	Uncommon	0	2
Killdeer	Common	0	several
Spotted Sandpiper	Uncommon	1	1
SUSPECTED NESTING SPECIES			
Lesser Scaup	Rare	—	—
Pintail	Introduced	—	—
American Bittern	Endangered	—	—
Green-backed Heron	Common	—	—
OTHER SUMMER VISITORS			
Green-winged Teal	Rare	—	—
Redhead	Rare	—	—
Common Merganser	Rare	—	—
Great Blue Heron	Locally Common	—	—
Great Egret	Locally Common	—	—
Cattle Egret	Uncommon	—	—
Sora	Occasional	—	—
King Rail	Uncommon	—	—

[a]Status is taken from Bohlen (1978) except those listed as "Introduced".

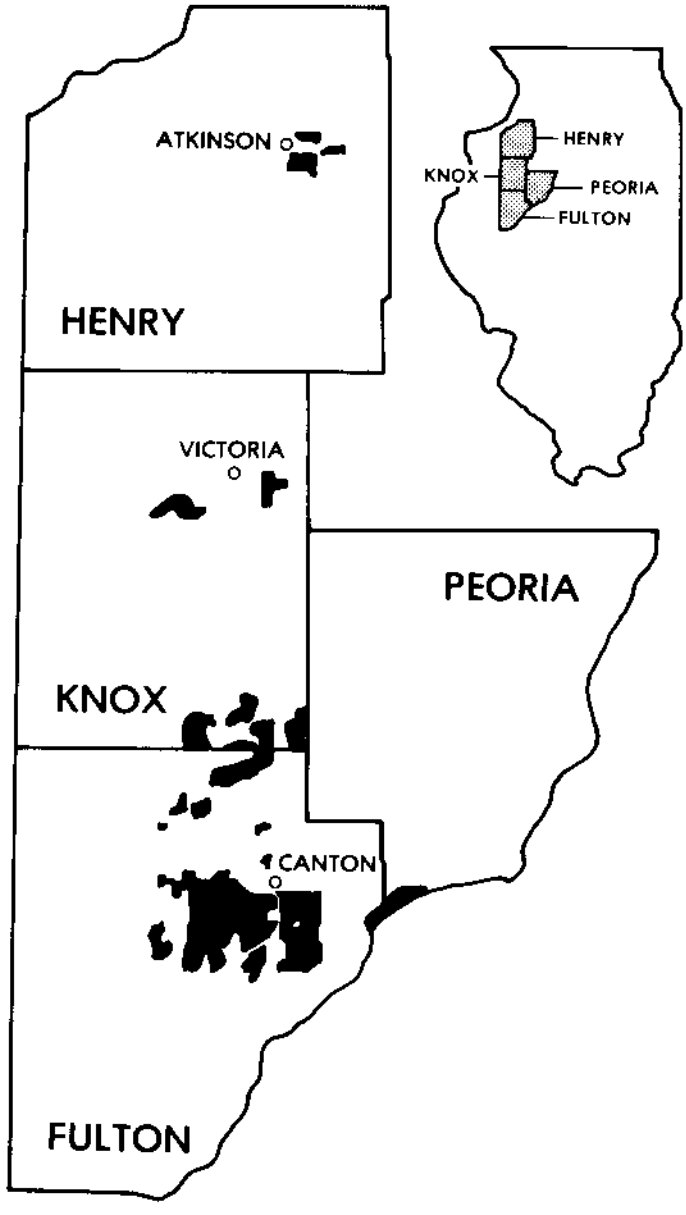

Fig. 1. Study area in west-central Illinois.