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## Occurrence of Waterfowl Along a Proposed Impoundment, the Saylorville Reservoir<sup>1</sup>

WILLIAM H. SCHMIDT<sup>2</sup> AND ARNOLD O. HAUGEN<sup>3</sup>

*Abstract.* Waterfowl were studied from early fall 1958 through spring 1959 along selected Des Moines River segments that will be affected by the Saylorville reservoir (now under construction). Periodic counts conducted during fall and spring yielded a total of 1,948 waterfowl (18 species) and 4 coots. During fall three species of geese (410) and five species of puddle ducks (302) were seen. Spring counts indicated 1,186 ducks of 14 species, including diving ducks (8%) and mergansers (11%). Four puddle duck species made up 74% of spring duck populations. Waterfowl per mile data were considered more valuable than waterfowl per hour data in developing usage patterns and indices. During fall a total of 169.2 miles were sampled, and waterfowl seen averaged 4.2 per mile. The following spring, along 45.0 river miles, an average of 23.0 waterfowl per mile was seen. Fall waterfowl densities varied greatly, with three peaks of waterfowl usage, but during spring, a single, rapid build-up followed by a decline in numbers occurred. Spring waterfowl-use days per mile (874) were over 10 times those of the previous fall (86.5). During fall 1958 (65 days), waterfowl-use days were calculated as 4,412 for the entire Saylorville project area (51 miles). Spring 1959 (40 days) waterfowl-use days totaled 44,574 for the same area. These data indicate considerably greater usage of the area by waterfowl than had previously been estimated.

### INTRODUCTION

"Swans, geese, brants and an almost endless variety of ducks are in the greatest abundance along the rivers, upon the lakes, and not infrequently upon the prairies" (Anonymous, 1950). Such was the comment of an early-day settler of Iowa. In 1840, Iowa was a land of prairie potholes and marshes, providing nesting area, as well as sanctuary, for many species of migratory waterfowl. Today, Iowa's land is 95% cultivated or grazed, duck production is minimal, and the main contact with migratory waterfowl occurs during spring and fall migrations along the Mississippi and Central flyways. Large water impoundments, such as the proposed Saylorville reservoir, have become an important element in man's continuing rearrangement of wildlife habitat. As part of the federal flood control project in the upper Mississippi basin, the Saylorville impoundment illustrates a controversial, yet widely applied concept, that of harnessing rivers to provide flood protection for large cities and agriculture, with

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irrigation, power, navigation and recreation facilities included as provisional benefits.

This paper, from a study that developed population indices for several wildlife species (Schmidt, 1962), considers waterfowl values of the Saylorville impoundment area of the Des Moines River.

STUDY AREA

*Des Moines River Basin.* With the widest basin and largest watershed of any river in Iowa (12,925 square miles), the Des Moines River drains about 23% of the state. Above Des Moines, as a result of recent glaciation, the topography is youthful, with a narrow valley that drops 150 to 200 feet from the uplands to a flood plain that seldom exceeds 3,000 feet in width. This lower portion of the valley is usually divided into irregular areas by a first bottom and terraces at elevations of 5 to 20 feet above the flood plain (U.S. Army Corps of Engineers, 1957).

The stream bed, entrenched 6 to 10 feet below the flood plain, is largely sand and gravel with occasional rocks and boulders. There are numerous sandbars but few islands. Except for infrequent oxbows or adjacent spring-fed or drainage ponds, there is no aquatic vegetation. Emergent marsh vegetation is usually lacking except around these ponds and in scattered fringes along the river's edge (U.S. Department of Interior, 1953).

*Saylorville Reservoir.* The proposed Saylorville dam site is located on the Des Moines River 11 miles north of Des Moines at river mile 213.7. The 6,150-foot earth fill dam will inundate up to 15,400 acres at spillway elevation (Table 1), with the reservoir extending upstream 40 miles (52 river miles). The long, sinuous storage area will have a maximum width of 1.5 miles just upstream from the dam. With average conditions, a conservation pool of 5,500 acres would be maintained about 9 months of the year, and during normal spring conditions approximately 8,000 acres might be covered with water. Only occasional floods (once in 20 years) would raise water to the spillway level (U.S. Department of Interior, 1949; U.S. Army Corps of Engineers, 1963).

Table 1. Saylorville reservoir data (U.S. Army Corps of Engineers, 1957).

Level	Elev. (ft.)	Capacity (acre ft.)	Area (acres)	Stream flooded (mi.)	Tribu- taries flooded (mi.)	Shore- flooded line (mi.)
Maximum pool . . . .	884	600,000	15,400	51	7.5	139
Average annual maximum pool . .	845	155,000	7,800	29	4.6	64
Conservation pool . . . . .	833	75,000	5,500	22	3.7	44
Stream bed at damsite	795					

## METHODS

During fall 1958, weather conditions permitting, float counts of waterfowl were made along selected sample areas of the Des Moines River 6 days per week. During spring 1959, an average of three float counts per week was completed over the same areas. With few exceptions, float counts were begun shortly after dawn and were made from a 16-foot canoe, with the aid of 8 X 30 binoculars. Severe weather or river conditions made it necessary for several waterfowl counts to be made on foot.

## RESULTS

A total of 1,948 waterfowl of 18 species, together with 4 coot (*Fulica americana* Gmelin), was seen in the Saylorville study area during 50 field trips in fall of 1958 and spring of 1959.

*Fall.* From September 13 through November 12, five species of ducks (mallard, blue-winged teal, green-winged teal, wood duck and pintail) were observed along the Des Moines River (Table 2). Over 64% of ducks identified were teal, approximately 23% mallards, and 12% wood ducks. Over 27% of all ducks seen could not be positively identified.

Blue-winged teal, always early migrants, were seen from early September through mid-October. Both green-winged teal and mallard were seen the first week of October, but mallard remained in evidence into November, with an isolated observation, December 3, on one of the few areas of the river not frozen over. The first wood ducks seen were identified as residents, small numbers were detected through late October. The last week of November brought freezing temperatures and semi-permanent river ice.

Table 2. List of waterfowl referred to in the text, each with its scientific name (American Ornithologists' Union, 1957).

Common name	Scientific name
Canada goose	<i>Branta canadensis</i> (Linnaeus)
Snow goose	<i>Chen hyperborea</i> (Pallas)
Blue goose	<i>Chen caerulescens</i> (Linnaeus)
Mallard	<i>Anas platyrhynchos platyrhynchos</i> Linnaeus
Black duck	<i>Anas rubripes</i> Brewster
Gadwall	<i>Anas strepera</i> Linnaeus
Pintail	<i>Anas acuta</i> Linnaeus
Green-winged teal	<i>Anas carolinensis</i> Gmelin
Blue-winged teal	<i>Anas discors discors</i> Linnaeus
American widgeon	<i>Mareca americana</i> (Gmelin)
Shoveler	<i>Spatula clypeata</i> (Linnaeus)
Wood duck	<i>Aix sponsa</i> (Linnaeus)
Ring-necked duck	<i>Aythya collaris</i> (Donovan)
Scaup	<i>Aythya</i> sp.
American goldeneye	<i>Bucephala clangula americana</i> (Bonaparte)
Bufflehead	<i>Bucephala albeola</i> (Linnaeus)
Hooded merganser	<i>Lophodytes cucullatus</i> (Linnaeus)
American merganser	<i>Mergus merganser americanus</i> Cassin

More geese (410) than ducks (329) were observed. Of three goose species seen, Canada geese were most numerous (155), but blue and snow geese (128) were also common. Largest totals of waterfowl were recorded on those days when high-flying geese were seen, a factor contributing to the 45% of total geese not identified. Nearly 82% of the geese seen were observed in the period October 27 to November 2. On October 27, all 220 waterfowl observed were migrating geese.

*Spring.* From March 14 through June 8, 14 species of ducks were seen along the proposed Saylorville impoundment area. Mallard, green-winged teal, blue-winged teal, and wood duck, in that order, comprised 74% of the total number of 1,186 waterfowl observed. Four species of diving ducks (scaup, ringneck, bufflehead and goldeneye) comprised 8% of waterfowl observed, with scaup and ringneck most numerous. Fish ducks (American mergansers and a few hooded mergansers), considered less desirable species for hunting, accounted for almost 11% of the spring duck population. Most American mergansers seen were males. Other species of ducks (shoveler, gadwall, black duck, and baldpate) each amounted to less than 1% of the total population. Only 5.5% of all ducks were unidentified.

Only one species, the blue-winged teal, was considered inadequately represented by spring float counts. Migratory flocks and pairs of this species were observed as late as June, often on temporary ponds resulting from spring rains.

On June 8, a final 13-mile float count to census breeding waterfowl showed two wood duck hens with broods of 8 and 14 young. Several other nesting pairs were observed and broods were reported from other areas. Several pair of blue-winged teal reportedly nested along one oxbow area.

*Waterfowl per Mile and per Hour.* To derive meaningful indices from data gathered, waterfowl seen per mile and per hour were determined.

From September 13 through November 12, 1958, recurrent sampling showed an average of 4.2 waterfowl per mile along 169.2 river miles. The daily figures from which these mean ratios were derived varied from 0 to 110.0 waterfowl per mile and illustrate the great variations in waterfowl density encountered during the fall migration period. The average figure of 5.5 waterfowl seen per hour (129 hours observation) on the river was slightly greater than the number seen (4.2) per mile of river channel checked.

From March 14 through April 19, 1959, an average of 23.0 ducks per mile (no geese) were observed along the 45.0 river miles checked. Approximately 29 ducks per hour were observed

during 35.8 hours spent on the river, with a variation from 5.4 to 74.5 ducks seen per hour.

Spring 1959 waterfowl numbers showed a single, progressive buildup and subsequent decline within a much compressed time period compared with the more leisurely and much more irregular pattern of waterfowl migration during the previous fall.

*Waterfowl-use Days.* Waterfowl-use days are commonly employed on refuges and other unit areas to indicate degree of utilization. Periodic counts made in this study were suitable for calculating an index to use on a per mile basis.

Waterfowl are extremely mobile, thus in determining usage figures an attempt was made to differentiate between waterfowl actually using the Des Moines River and those unlikely to have used it. Only ducks and geese flushed from the river, or flying at or below valley horizon level, were considered.

*Fall.* Mean numbers of waterfowl observed per day per mile varied from 0 to 5.1 for 5-day periods over the 65-day interval from September 13 to November 17. These figures were based on observation of 252 birds, of which only 26 were geese, with no mergansers or diving ducks seen.

Three peaks of waterfowl (and puddle duck) usage were observed (Figure 1). The first peak, only partially sampled, occurred during mid-September. The second peak, reaching an apex during the period October 8 to 12, was the only one reinforced by goose numbers. The third peak occurred in late October and the first part of November. Sieh (1958) described a mass migration of mallards and diving ducks on November 2.

Two additional mass movements of waterfowl are known to have occurred, but nearly all ducks were observed at medium to high altitude and probably spent little time in the area. During the first flights (October 17 and 18), ducks numbering in the hundreds passed through the area, flying very high. Again on November 18, before fall freeze up, appreciable numbers of mallards were noted.

The season total waterfowl—use days per mile during fall were approximately 87.

*Spring.* Mean numbers of waterfowl observed per day per mile varied from 3.3 to 61.7 for eight 5-day periods from March 14 through April 22. Spring waterfowl—use days were based on 1,040 waterfowl observed on recurrently sampled stream areas totaling 45.0 miles. The previous fall, less than one-fourth that number of waterfowl (252) were seen while sampling nearly four times as many river miles (169.2).

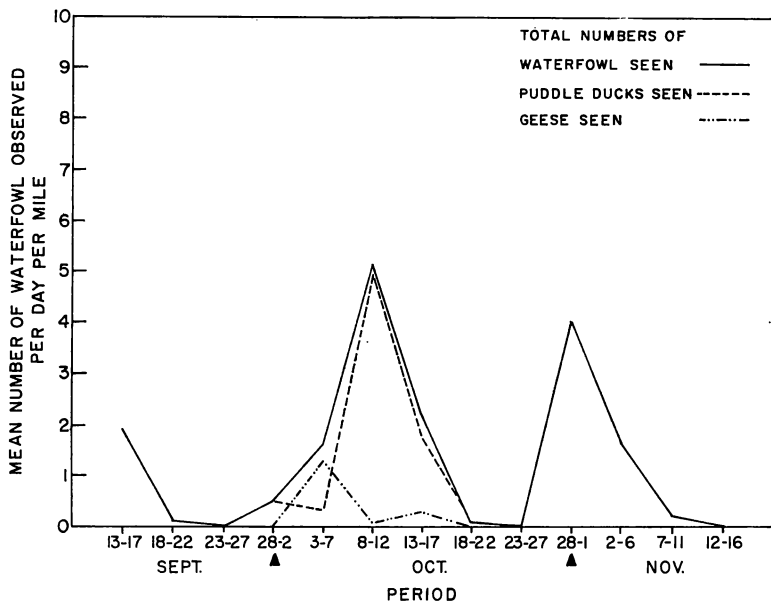


Fig. 1. Waterfowl use trends along the Saylorville impoundment Des Moines River (fall 1958).

Puddle ducks (759) made up the major portion of the usage pattern, but diving ducks (97) and mergansers (128) were important for shorter time periods. Only three coots were seen.

Usage trends for waterfowl as a whole and for the three major groups represented (Figure 2) followed a rather stable pattern, with a spectacular increase after March 14 to peak March 19-28. This was followed by a rapid decline at the end of March and a gradual, but relatively steady decline during April.

Total waterfowl use per day per mile amounted to 874.0 for the season, over 60% of which occurred in the 10-day period of March 19-28.

### DISCUSSION

*Populations.* Indices to duck populations in this study might be considered minimum rather than normal usage levels for this area, because droughts in the Canadian Prairie provinces contributed to serious duck population declines in 1958 and 1959. In 1959, along the Mississippi Flyway, mallards had an age ratio (young to adult) of 0.53:1 (U.S. Fish and Wildlife Service, 1961). A fall harvest of less than two young per adult is usually indicative of a declining population (Sieh, 1959).

Goose populations of the Mississippi Flyway were considered satisfactory, since their northern Canada breeding grounds were not seriously affected by drought.

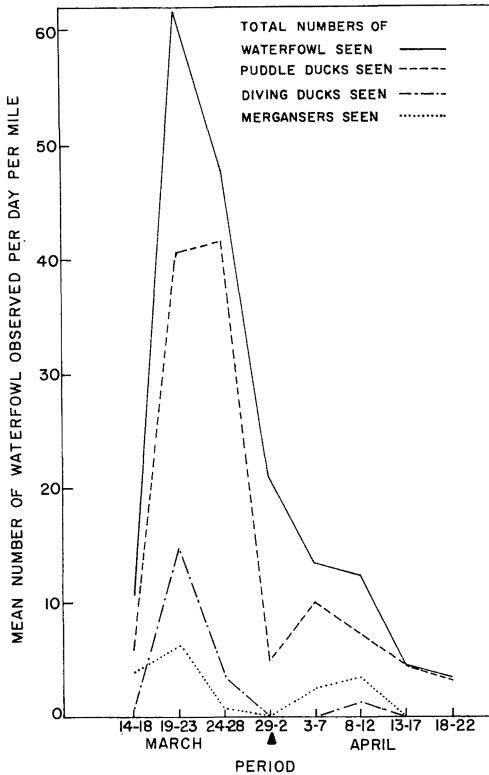


Fig. 2. Waterfowl use trends along the Saylorville impoundment Des Moines River (spring 1958).

Table 3. Comparison of season totals of waterfowl use days for segments of the Des Moines River (equivalent to channel length to be flooded at three levels of the proposed Saylorville impoundment) (fall 1958).

	Altitude above sea level (feet)	River channel flooded (miles)	Puddle ducks	Geese	Combined waterfowl
			Total use days		
Conservation pool . . .	833	22	1,705	187	1,903
Average annual maximum pool . . . . .	845	29	2,248	247	2,509
Maximum flood pool . . .	884	51	3,953	434	4,412

*Previous Estimates.* Comparison with previous estimates for waterfowl use of the Saylorville impoundment area along the Des Moines River indicates considerably more use than had previously been recognized.

River Basin studies of the 15,400-acre project site indicated



Table 4. Comparison of season totals of waterfowl use days for segments of the Des Moines River (equivalent to channel length to be flooded at three levels of the proposed Saylorville impoundment) (spring 1959).

	Altitude above sea level (feet)	River channel flooded (miles)	Puddle ducks	Diving ducks	Mergansers	Combined waterfowl
	Total use days					
Conservation pool . . . . .	833	22	12,980	2,255	1,892	19,228
Average annual maximum pool	845	29	17,110	2,973	2,494	25,346
Maximum flood pool . . . . .	884	51	30,090	5,228	4,386	44,574

about 1,400 acres, including 51 miles of river channel and adjoining marshy areas, were inferior waterfowl habitat. These studies further indicated that in 1948 “an estimated average of 500 waterfowl use the proposed project site from March 1 to April 30 and from September 1 to November 30” (U.S. Department of Interior, 1949).

*Total Waterfowl-use Days.* Total numbers of waterfowl using the Des Moines River in the proposed Saylorville impoundment area cannot be directly determined from this study. An estimate of total waterfowl-use days can be derived from data on waterfowl numbers seen per mile when related to miles of river channel affected. The result provides an index to the fall 1958-spring 1959 waterfowl resource value of the future impoundment area.

The Saylorville reservoir water level and surface acreage will vary annually and seasonally. Stream discharge records<sup>4</sup> indicate nearly all flooding occurs from March through July and is most serious during May and June. During fall, impoundment levels would most nearly approximate the conservation pool level (833 feet). It is estimated maximum spring impoundment levels would reach 884 feet (maximum pool level) once every 20 years but in more normal years, would fluctuate around the average annual maximum pool level (845). Depending on severity of the flood, return to the conservation pool level might be effected in a few days to 71 days (U.S. Department of Interior, 1949). To facilitate comparison, data on fall 1958 and spring 1959 total waterfowl-use days along the Des Moines River are summarized at three different reservoir levels (Tables 3 and 4).

Total waterfowl-use days for the fall of 1958 (September 13 to November 12) amounted to 86.5 for each river mile observed. Thus, assuming similarity of river segments, waterfowl-use days

<sup>4</sup> Longfield, R. J., Iowa City, Iowa. Des Moines River discharge records. Personal communication. 1961.

for the season totaled 1,903 for the 22-mile river channel area to be inundated at conservation pool level.

Over 10 times the waterfowl-use days per mile (874) were noted in spring 1959 as compared with the previous fall (86.5). As a result, even the minimum 22-mile channel length, which would be inundated by the conservation pool level, showed an estimated 19,228 waterfowl-use days for spring 1959. As in the fall, puddle ducks (12,980 duck-use days) were the most important waterfowl group, but diving ducks (2,255 duck-use days) and mergansers (1,892 duck-use days) were also relatively consistent users.

The total value for the project site (51 river miles) was approximately 45,000 (44,574) waterfowl-use days for the 40-day period of investigation in spring 1959.

*Potential.* Waterfowl usage potential along the proposed Saylorville reservoir may exceed by several times the 1958-59 river usage value. Though much of the reservoir is rather steep sided and narrow, upper reaches of the impoundment at conservation pool level will have relatively large expanses of shallow water. Such areas may develop emergent and wetland growth suitable for waterfowl usage.

Wood duck nesting along the Des Moines River is often noted. Clearance of timber from the reservoir site to 1 foot above conservation pool level (834 feet) has been recommended (U.S. Department of Interior, 1949). Such action should leave major portions of habitat suitable for wood duck nesting along with a subsequent possibility of wood duck roosting populations.

The great mobility and range of waterfowl gives opportunity for concentrations to form on major impoundments during migration, largely because of the sanctuary offered. Thus, during fall 1958 only 26 geese were actually observed resting on the river, while an additional 374 were observed passing over the area. Low river levels were not attractive to diving ducks. During spring, though duck usage levels were much higher than fall, geese passing through the area were not observed on the river.

Development of the proposed chain of large reservoirs (Rathbun on the Chariton River, Red Rock on the lower Des Moines River, and Saylorville above Des Moines) coupled with large natural lakes in northern Iowa, would provide a series of large, conveniently located water areas in central Iowa. In future years **inducement** of such impoundments might well "channel" increasing numbers of geese, diving ducks, and puddle ducks through central Iowa.

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