In 1969, Arizona Game and Fish Department biologist Dave Brown (pers. comm.) reported that he and two other biologists saw 13 pairs and one brood of nine young Mexican ducks south of Willcox on 5 June. The brood was seen in the marshes below the Willcox sewage lagoon.

The above-reported sightings represent extensions of the known breeding range of the Mexican duck, both to the east and west. It is not known whether the range extension is an actual and recent phenomenon or just an addition to our knowledge of the traditional range. The former explanation is supported by the fact that the newly discovered breeding areas are in extensively irrigated farming communities, where pumping of underground water has increased vastly within the past 20–30 years, creating temporary cienega-type marsh habitat at the same time that natural marshes were being destroyed by other farming practices. As a result, the Mexican ducks possibly have extended their range in the face of marsh destruction in historical habitat. If the Mexican duck has extended its range into irrigated lands in the face of marsh destruction in historical habitat, marsh development projects within the present range of this endangered species could help to save it from extinction.

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AUTUMN CONCENTRATIONS OF BALD EAGLES IN GLACIER NATIONAL PARK

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Bald Eagles (*Haliaeetus leucocephalus*) gather each autumn in Glacier National Park, northwestern Montana. They are attracted to spawning runs of kokanee salmon (*Oncorhynchus nerka*). This paper relates a brief history and reports observations on numbers and behavior of eagles during 1965–70. Maximum counts occurred in November of each year and ranged from 179–373.

STUDY AREA

The study area included lower McDonald Creek and a portion of the Middle Fork of the Flathead River (fig. 1). Numerous shallow riffles, gravel bars, and deep pools are interspersed along this mainly slow-flowing stream. McDonald Creek flows into the Middle Fork of the Flathead River, a much larger, swifter stream, which provides less suitable feeding habitat for eagles. The forest in the vicinity of the study area burned in 1925, 1926, and 1929. It is now dominated by lodgepole pine. Remnants of earlier forests serve as perch trees for the eagles. Preferred tree species are western larch (*Larix occidentalis*) and western redcedar (*Thuja plicata*). Black cottonwood (*Populus trichocarpa*) and Engelmann spruce (*Picea engelmannii*) are common along the streams and are also frequently used for perching.

HISTORY

Kokanee salmon are not native to the Flathead River system. They were introduced into Flathead Lake about 1916 and probably into Lake McDonald in 1922 and 1923 (Morton 1968). Kokanee reach maturity and spawn when 4 years old. Although some salmon in the lower McDonald Creek spawning run may come from Lake McDonald, most probably come from Flathead Lake, roughly 60 river miles downstream. The earliest documented observation of spawning kokanee in McDonald Creek is from 1935. The phenomenon is now an annual occurrence. Spawning occurs from October to January, with the peak in November. An estimated 75,000 to 150,000 kokanee annually utilize lower McDonald Creek for spawning (D. A. Hanzel, pers. comm.).

Records of eagle numbers in autumn in the park prior to 1963 are scanty. The first estimate to appear in the park's Annual Wildlife Report is from 1939. In that year the estimated number was 37. The report of such a large number probably indicates an autumn count at migration time, as the records show only a few active nests in the park in any year. The first positive record of an eagle concentration is contained in a ranger's report of November 1947. This is a description of 20 eagles soaring over the outlet of Lake McDonald.

Maximum counts show a general upward trend since 1950, with highs of 352 eagles in 1963 and 373 in 1969, but systematic counts of a comparable nature were not made prior to 1965.

METHODS

Before 1965, most counts were made by scanning with binoculars from overlook points or by walking along the stream bank and counting. In 1965 we began to census a 7-mile water route by canoe.

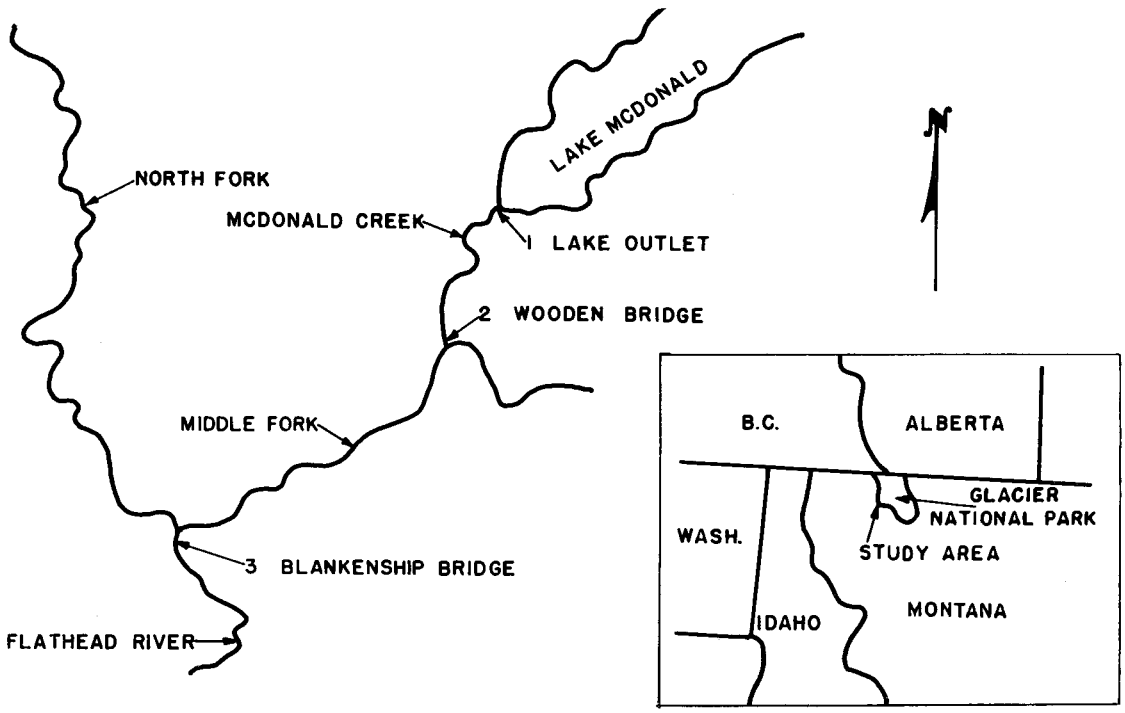

FIGURE 1. The study area showing 7-mile water route (points 1 to 3) covered in eagle census. Glacier National Park is bounded on the south by the Middle Fork of the Flathead River and on the west by the North Fork. Inset shows regional setting of study area.

Weekly counts were made on this route each autumn, October through December, from 1965–70 (except 1967).

At least two people occupied the canoe; one handled the canoe and the other counted and recorded. To avoid counting birds twice, only those eagles that flew upstream or those that did not fly as the canoe passed were counted. The boat was launched at the outlet of Lake McDonald, point 1 (fig. 1). The wooden bridge, several hundred feet upstream from the McDonald Creek-Middle Fork junction, was a key point in the counts. Birds that flew downstream passed over this bridge. A counter was stationed on the bridge (point 2) to record these eagles. Either the bridge count, or the canoe count between points 2 and 3, whichever was highest, was added to the count between points 1 and 2 to obtain the total. With these precautions, the count was a conservative one, but the method reasonably assured counting no bird twice. The greatest number of birds was usually seen along McDonald Creek. Occasionally, a large number of birds (as many as 86 were counted) soared in a swirling group up to several thousand feet in elevation. When this occurred, accurate enumeration of matures and immatures was impossible.

Adults were considered to be those eagles on which there were very few or no white feathers visible on the body and very little or no brown visible on the head. All others were recorded as immatures.

RESULTS

Bald Eagles began to arrive along McDonald Creek in early October. The influx increased most rapidly during the first 2 weeks of November. The duration of stay seemed to depend upon the duration of the salmon run and weather conditions.

Large numbers were occasionally observed downstream after dispersal from the McDonald area, as on 2 January 1963, when 102 Bald Eagles were counted by Montana State Fish and Game Department personnel between Flathead Lake and the South Fork-Middle Fork junction.

Results of weekly counts in 1965, 1966, 1968, 1969, and 1970 are shown in figure 2.

Behavior. Although both adults and immatures took dead salmon that had washed ashore or were floating at a "wading" distance from shore, adults preferred to dive upon floating or weakly swimming kokanee. Most birds fished actively for about the first hour of daylight. They were particularly vocal during this period. After the fishing and eating activity, the birds perched for varying durations. Fishing was resumed periodically the remainder of the day.

Many of the eagles did not roost near McDonald Creek at night. Up to 30 birds were observed roosting 2 miles north of the creek. At a blind along the creek, it was noted that birds were absent at first light. They began to arrive from the north and gradually gathered along the stream between 07:30 and 08:00 hours. As many as 35 were seen in a single cottonwood tree.

Eagles that obtained fish typically flew to a perch, then, with the fish clutched in the talons of one foot, emitted a series of high-pitched cries for up to a minute. These cries were often made with bill extended skyward. This brief vocal period was followed by eating. Large pieces of flesh were stripped away and swallowed in gulping motions. After the fish was devoured (usually all but the head), the eagle briefly went through bill-cleaning motions by rubbing the sides of the bill against the perch.

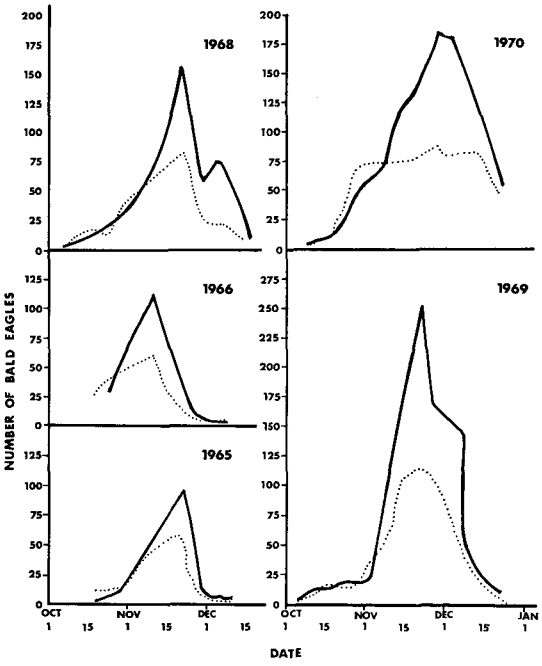

FIGURE 2. Mature and immature Bald Eagles counted on the study area during weekly counts, 1965–70, except 1967.

——— Mature eagles

····· Immature eagles

Immatures occasionally attempted to take fish from adults and were often successful. Bald Eagles were seen on the surface of deep water twice in 1970. These were immatures observed in swift water in the Middle Fork. On each occasion the bird was unable to get air-borne from the water, but reached shore by "paddling" with its wings. Attempts at flight from the shore were also unsuccessful. When last seen, both birds remained on the ground at river's edge, apparently too wet to fly. Eagles were often seen perched with their wings extended as if in the process of drying them.

Interaction with other species was rare. One immature Golden Eagle (*Aquila chrysaetos*) was observed in each of the years 1966, 1969, and 1970. In the few instances where interaction was observed, the Golden Eagle exhibited dominance over both mature and immature Bald Eagles in occupying preferred perch sites and in fighting over fish.

Magpies often ate scraps of fish left by eagles. On one occasion a magpie was observed to grasp an eagle's tail feathers with its bill. No retaliation from the eagle was noted.

Although waterfowl were common on the waters fished by the eagles, serious attacks by eagles were not observed. However, ducks were commonly put to flight by near passes of flying eagles.

DISCUSSION

During the continental Bald Eagle Project, sponsored by the National Audubon Society, the percentage of immatures in the population was: 1961—26.5%; 1962—23.7%; 1963—21.7% (Sprunt and Ligas 1966). The percentages of immatures in the Glacier concentrations are shown in table 1. A downward trend appears to be in evidence in the Glacier concentration and in the Continental Project. While the percentage of immatures in Glacier was relatively high, the trend may indicate an eventual decline in the population. However, counts to date cannot be evaluated statistically. The trend should be watched in future years.

TABLE 1. Maximum counts of total (mature and immature) Bald Eagles and percentage of immatures in the population during years of weekly census, 1965–70.

Year	Date	Count	% Immatures
1965	19 November	189	37
1966	10 November	179	33
1968	21 November	234	35
1969	20 November	373	32
1970	25 November	268	32

According to Sprunt and Ligas (1966), immature Bald Eagles move south earlier in the autumn. A pattern of earlier arrival of immatures was noted in the Glacier's concentration (see fig. 2).

Sprunt and Ligas (1966) report about 3700 wintering Bald Eagles in the conterminous United States. Large autumn and winter concentrations of northern Bald Eagles occur in the Mississippi and Missouri River Valleys and the northwest coast from Puget Sound into southeastern Alaska. What is apparently the largest reported concentration occurs on the Chilkat River near Haynes, Alaska. Estimates on the Chilkat River range as high as 3000 eagles (Greg 1961). Other high counts include those by Fawks (1964) in which 485 eagles were counted along the Mississippi River bordering Illinois and interior Illinois. Southern (1964) reported 268 Bald Eagles along a 14-mile stretch of the Mississippi River near Savannah, Illinois.

The high count in Glacier (373) therefore must be ranked among the more impressive concentrations.

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