The effects of human disturbance on common loon productivity in northwestern Montana
by Lynn Michelle Kelly

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Fish and Wildlife Management
Montana State University
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Abstract:
Productivity and effects of human disturbance on common loons (Gavia immer)was studied from 1986-1991 in the Tobacco-Stillwater and Clearwater-Swan drainages in northwestern Montana. The adult loon population in these 2 drainages makes up approximately 30% of Montana's population. A density of 72.2 ha of lake surface area per loon was determined. Seventeen pairs exhibited territorial behavior and an average of 10 pairs were successful in raising at least one chick. Ninety percent of nests were located on islands situated in open water, along transitional swamp shorelines or within marshes. Fifty-two percent (n=23) of nests on islands in open water, 64% (n=l1) of nests along transitional swamp shorelines and 75% (n=4) of nests within marshes were successful. Successful nests had a significantly deeper water access than unsuccessful nests. Significant differences in vegetation surrounding nest sites were observed between the 2 drainages. Nest losses with known causes were attributed to flooding, wash-out by wave action, and infertility. Suspected causes of nest failures included human disturbance, dropping water levels and interactions with bald eagles. Reuse of a physiographic area for nesting occurred 94% (n=32) of the time. Nests were located within 50 m of a previously used nest bowl 50% of the time. Loons nesting successfully one year reused the area within 50 m of the previous successful nest over 60% of the time. A significant negative relationship was shown between the number of chicks produced per total nest attempt and the surface area disturbance ratio. A positive relationship was indicated between the number of fledged juveniles per nest attempt after protective signs were used and Skaar's disturbance rating. Human related disturbance, which included boats and shoreline activities accounted for 59% of the observed flushes and kept loons off their nests an average of 24 minutes per flush. Natural activities taking loons off the nest included territorial activities, nest building, heat stress and insect harassment. These activities accounted for 40% of the flushes and lasted an average of 8 minutes per flush. Average flushing distances due to approaching boats for the 4 weeks of incubation were 129,121, 91, 64 m respectively. Floating signs 137 m from nests formed a voluntary closure after which the number of nest departures attributed to human recreational activity were reduced from 32 to 13. The number of successful nests, number of chicks, and number of 2-chick broods were significantly increased after the use of protective floating signs. These data demonstrate that recreational activity on nesting territories was having a significant negative effect upon loon productivity which can be mitigated with the use of floating signs surrounding nest sites.

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APPROVAL

of a thesis submitted by

Lynn Michelle Kelly

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

July 23, 1992
Date

Robert P. Eng
Chairperson, Graduate Committee

Approved for the Major Department

24 July 1992
Date

Robert S. Moore
Head, Major Department

Approved for the College of Graduate Studies

7/31/92
Date

R L Brown
Graduate Dean

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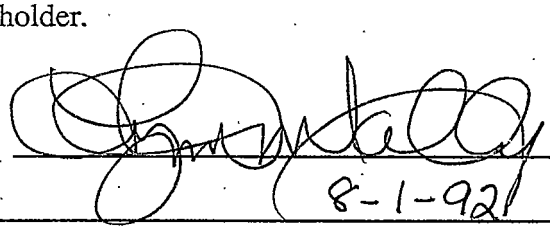
Signature 

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ABSTRACT

Productivity and effects of human disturbance on common loons (Gavia immer) was studied from 1986-1991 in the Tobacco-Stillwater and Clearwater-Swan drainages in northwestern Montana. The adult loon population in these 2 drainages makes up approximately 30% of Montana's population. A density of 72.2 ha of lake surface area per loon was determined. Seventeen pairs exhibited territorial behavior and an average of 10 pairs were successful in raising at least one chick. Ninety percent of nests were located on islands situated in open water, along transitional swamp shorelines or within marshes. Fifty-two percent (n=23) of nests on islands in open water, 64% (n=11) of nests along transitional swamp shorelines and 75% (n=4) of nests within marshes were successful. Successful nests had a significantly deeper water access than unsuccessful nests. Significant differences in vegetation surrounding nest sites were observed between the 2 drainages. Nest losses with known causes were attributed to flooding, wash-out by wave action, and infertility. Suspected causes of nest failures included human disturbance, dropping water levels and interactions with bald eagles. Reuse of a physiographic area for nesting occurred 94% (n=32) of the time. Nests were located within 50 m of a previously used nest bowl 50% of the time. Loons nesting successfully one year reused the area within 50 m of the previous successful nest over 60% of the time. A significant negative relationship was shown between the number of chicks produced per total nest attempt and the surface area disturbance ratio. A positive relationship was indicated between the number of fledged juveniles per nest attempt after protective signs were used and Skaar's disturbance rating. Human related disturbance, which included boats and shoreline activities accounted for 59% of the observed flushes and kept loons off their nests an average of 24 minutes per flush. Natural activities taking loons off the nest included territorial activities, nest building, heat stress and insect harassment. These activities accounted for 40% of the flushes and lasted an average of 8 minutes per flush. Average flushing distances due to approaching boats for the 4 weeks of incubation were 129, 121, 91, 64 m respectively. Floating signs 137 m from nests formed a voluntary closure after which the number of nest departures attributed to human recreational activity were reduced from 32 to 13. The number of successful nests, number of chicks, and number of 2-chick broods were significantly increased after the use of protective floating signs. These data demonstrate that recreational activity on nesting territories was having a significant negative effect upon loon productivity which can be mitigated with the use of floating signs surrounding nest sites.

INTRODUCTION

The common loon (Gavia immer) is most often associated with the Great Lake states, Canada and Alaska. Few people associate loons with Montana, and most people are surprised to learn that Montana has the only significant loon population in the continental United States west of the Mississippi River. The loon has become increasingly visible in Montana and its presence on a territory is seen as an indicator of the pristine quality of the lakes found in northwest Montana.

Efforts to determine population estimates and breeding status of the common loon in the northeastern United State began when it became apparent that the use of pesticides was adversely affecting populations of fish-eating birds. While environmental pollutants have negatively affected loons, studies generally indicated that loon populations were declining due more to housing developments along shorelines of nesting lakes and increased human recreational activities than to losses associated with pesticides (McIntrye, 1989; Reum, 1976).

Regional efforts to assess common loon populations have only recently begun. Historically, the common loon was listed as a breeding species in California, Oregon and Washington. During the 1930's there was a major decline in the loon's breeding range, and by the 1950's, the bird had apparently been extirpated as a breeding species in these 3 states. Within the last few years very limited nesting success has been documented in Washington (Corkran 1988).

Pairs of loons and single birds were sighted in several portions of Idaho; however, only 1 nest has been documented on the Idaho-Wyoming border (Fitch and Trost, 1985). Ten pairs of nesting loons have been identified in Yellowstone National Park (McEneaney 1988). These 11 pairs probably constitute most of the population of loons in Wyoming.

British Columbia appears to have a healthy breeding population of several hundred nesting pairs with numbers increasing (Corkran 1988).

Efforts to determine the status of common loons in Montana began in 1982 when Skaar (1989) began a survey in northwestern Montana. Average values between 1982-1989 indicated that the summer population consisted of 160 loons and 44 territorial pairs. However, only an average of 24 pairs successfully raised 1-2 chicks each year. Successful breeding occurred mostly on lakes associated with glaciated valley floors. Loons did not utilize lakes which were less than 5.4 ha in size or above 1491 m in elevation.

Since the population of loons in Montana is located on the edge of loon distribution in North America, recreational development of lakes in this region has the potential to fragment this population creating "biological islands". These are areas of at least marginal habitat surrounded by habitats of unacceptable quality (Picton and Mackie, 1980). Gene flow between the "islands" is theoretically essential to the long term survival of the species. If excessive fragmentation due to loss of habitat continues between the Pacific Northwest and the Canadian provinces of British Columbia and Alberta, subpopulations of common loons in Montana could become vulnerable to local extinction.

The regulatory status of the common loon in Montana varies with the government agency involved. The U.S. Forest Service in Region 1 listed the loon as a "sensitive species" in September 1986. Region 6 of the U. S. Fish and Wildlife Service has not classified the loon as threatened or endangered, nor is the loon a candidate species for either of these classifications. The Montana Department of Fish, Wildlife and Parks has classified and protected the loon as a nongame species.

Skaar's (1986) work on common loons in Montana provided important information regarding general population size and habitat requirements. However, when the U. S. Forest Service designated the loon a "sensitive species", more specific information within

major river drainages was necessary to more adequately manage these birds; thus, the specific goals of this study were to:

1) Establish a population data-base for lakes within the Clearwater-Swan and Tobacco-Stillwater River drainages.
2) Determine patterns of lake use as related to individual territorial requirements.
3) Identify the nest sites and nursery areas within the territories of loons in the study area.
4) Identify sources of disturbance and their affects on nesting and brood rearing success.
5) Analyze the habitat composition of nest sites and the degree to which these areas were reused from year to year.
6) Document nest chronology, nest success, chick development, and fledging success.

STUDY AREA

Clearwater-Swan Drainage

Two study areas were located in northwestern Montana (Fig.1). The first area included 11 lakes located between the towns of Condon and Seeley Lake in the Swan valley (Fig. 2).

The Swan valley lies between the Mission Mountains on the west and the Swan Mountains on the east. Both ranges are composed of Precambrian sedimentary formations which rose up as great slabs and then tilted down and eastward. All of the study area lakes originated due to glacial action (Alt and Hyndman 1986). There is a small divide between Lindbergh and Clearwater lakes. The water flowing south of the divide forms the Clearwater River while the drainages flowing north form the Swan River.

Eight of the lakes are located along the Clearwater River drainage. These lakes include Clearwater, Rainy, Alva, Inez, Seeley and Salmon. Placid Lake is in the Owl Creek drainage and and Marshall Lake is in the Marshall Creek drainage. Both of these streams flow into the Clearwater River.

Lindbergh, Holland and Loon Lakes are all in the Swan River drainage. Holland Lake is drained by Holland Creek, a tributary of the Swan River. Physical characteristics of all 11 lakes are presented in Table 1. General locations of each loon territory in this drainage are indicated in Figure 2.

Upland vegetation consists of mixed coniferous forests. Riparian areas along the 2 river drainages are dominated by thick stands of willow (Salix spp.).The climate of the Swan Valley is characterized by cool, wet springs and warm summers. Mean annual precipitation ranges between 102 - 152 cm. Precipitation for April, May and June in 1986 was 2.0, 6.2, 7.1 cm, respectively, and for the same months in 1987 was 1.9, 5.1 and 6.0 cm. Ice-out occurred in a northward progression beginning at Salmon Lake at the south end. Lakes typically became ice free between 1-15 April.