HOME RANGE AND CRITICAL AREAS FOR BALD EAGLES AT STANDLEY LAKE

Submitted to the
City of Westminster

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INTRODUCTION

Effective conservation of breeding bald eagles depends on an accurate estimate of their habitat requirements. Viable nesting areas are threatened by increasing competition with humans in eastern Colorado, so determination of critical habitat is crucial to the reproductive success of bald eagles in the area. Preservation of critical habitat depends on determination of the total land area used by bald eagles (defined here as home range), as well as critical areas within the home range that satisfy specific habitat requirements (e.g. foraging grounds, perching sights and roosting sites)(Garrett et al. 1993).

Quantitative information concerning home range size of nesting bald eagles is scarce. In areas with large bald eagle populations estimations of home range based on distance between nesting pairs are common. Similarly, territory is estimated as the area within the home range actively defended from other bald eagles (Stalmaster 1987, Grier 1965). However, these are rough approximations and are only useful where there is competition among bald eagles for home range and territory. In eastern Colorado, where the distance between nests is not indicative of home range size, a quantitative case-by-case treatment is necessary to estimate the amount of area needed to satisfy nesting requirements. In Jefferson County, information about habitat use is particularly important to assist developers in making decisions that minimize conflicts with endangered bald eagles.

Garrett et al. (1993) estimated home range size and high-use areas by tracking bald eagle movements and plotting them on topographic maps. They used the harmonic mean method (Dixon and Chapman 1980) to estimate centers of activity. These locational data allowed them to make quantitative estimations of home range size and areas of intensive use. However, their observations were strictly locational and did not address behavior at specific locations. Behavioral observations, in conjunction with locational observations, will allow managers to determine areas

within the home range that satisfy specific requirements for reproductive success and survival.

METHODS

STUDY AREA

Standley Lake, located in Jefferson County, Colorado, is an 1800 acre freshwater lake surrounded by county park land. The lake provides drinking water for nearby residential areas and is used for fishing, camping, boating and water skiing (pers. comm., Westminster City Manager's Office). Land to the northeast, east and southeast is primarily residential and land to the northwest and west is primarily open space inhabited by black-tailed prairie dogs (*Cynomys ludovicianus*).

Quantitative Observations

A pair of bald eagles was first noted in the Standley Lake area in early January, 1993. They began exhibiting nesting behavior in mid-February, and the Colorado Bird Observatory was contacted in early March to begin monitoring their activities. We observed a pair of bald eagles on 13 days between 12 February and 22 March 1993. Bald Eagles were located when they arrived at the Standley Lake site each day from their roost site to the northwest. We observed the eagles continuously throughout each observation bout and recorded their location and behavior at all times. Behaviors were categorized as directional flight (FD), soaring flight (FS), territorial flight (FT), flight with prey (XP), perching on the nest (PN), perching in trees (PT), feeding (XS) and preening (PR). We recorded the duration of each behavior in seconds. Other data included type of prey and weather conditions.

Observations were made from vehicles which served as blinds and allowed researchers to move quickly and easily among observation areas. All observations were assisted by binoculars and spotting scopes.

Prey items were categorized as avian (birds), mammalian (mammals) or piscine (fish) and were identified to species when possible. Prey items were easily identified to class using a spotting scope.

We plotted locational information on 1:24,000 scale USGS topographic maps and identified locations using the Universal Transverse Mercator (UTM) grid system as described by Grubb and Eakle (1988). The UTM grid system provides discrete coordinates for locations on USGS topographic maps and is computer compatible to facilitate data analysis. When possible, flight paths were recreated on clear acetate sheets laid over a topographic map and UTM locations were plotted at the end point of each flight path.

Anecdotal Accounts

We supplemented quantitative data with information provided by local residents and researchers. These sources provided valuable information about the history of the pair, early nest-building activity, other raptor species in the area and roost site location. Anecdotal accounts will be addressed in the discussion section of this paper.

Data Analysis

A time budget was generated by determining the amount of time that each behavior was observed (behavior duration) as a percentage of total observation time.

We estimated home range size and centers of activity using the harmonic mean method (Dixon and Chapman, 1980; Garrett et al., 1993) and the computer program MCPAAL (Stuwe and Blowhowiak 1986). We defined home range as the area within the 95% utilization distribution and centers of activity as the areas within the 25% utilization distribution (Dixon and Chapman, 1980). Critical areas were defined as areas containing crucial habitat features such as the nest tree, perching trees, and foraging grounds (Garrett et al., 1993), and were found within the 25% utilization distribution.

We separated flight data and perching data to determine centers of activity for each. This allowed us to make a quantitative estimation of critical areas used by the bald eagles.

RESULTS

Time Budget

Of 77.5 hours of behavioral observations, eagles spent 73.1 hrs (94.3%) perching. Perching on the nest or in trees comprised 95.3% of total perching time and perching on the ground or in the water comprised the remaining 4.7%. Perching activities were divided among resting (86.0%), feeding (9.1%) and preening (4.8%). The remaining time was spent vocalizing, copulating and nest building (.1%).

Flight time composed 5.7% of behavioral observations and was partitioned into directional flight (50.2%), Soaring flight (42.4%), flight with prey (4.6%) and territorial flight (2.8%).

Home Range And Critical Area

Home range size for the eagle pair was 9.6 square km as determined by the 95% utilization distribution (Dixon and Chapman, 1980). High-use area size was .05 square km measured within the 25% utilization contour (Fig. 1). Home ranges and critical areas separated by sex, flight behavior and perching behavior are shown in Figs. 2-7. In every case, the 25% contour encompassed the nest tree and the primary perching trees. Primary perching trees appear as points due west and due south of the nest (Figs. 1-7).

Foraging

Prey items were comprised of mammals (86.6%), fish (6.7%) and birds (6.7%). We observed a total of 15 prey items. All mammalian prey items were blacktail prairie dogs (*Cynomys ludovicianus*). Critical feeding areas were located northwest of

the nest within the 95% and 25% utilization distribution for flight behavior (Fig. 4).

Roosting

The roost area was approximately 16 km northwest of the nest tree in Eldorado Springs, CO (Boulder County). Eagles were first observed at the roost site on 17 February and were observed on four of five evenings thereafter.

DISCUSSION

Time Budget

The bald eagles at Standley Lake had a similar time budget to bald eagles in other studies (Watson et al. 1991, Stalmaster 1987). Generally, over 90% of a bald eagle's diurnal time budget is spent perching, and flight time accounts for approximately 4% to 10% of total daily activity (Stalmaster 1985).

The relatively small proportion of time spent in flight illustrates the need for separating perching and flight behaviors and determining centers of activity for each. Although flight time accounts for only 4.7% of observed behavior, it accounts for 100% of hunting time for the bald eagles at Standley Lake. Therefore, the flight locations are crucial to survival and reproduction.

Home Range and Critical Area

Size and shape of bald eagle home ranges vary significantly throughout the year (Garrett et al. 1993). We estimated the home range for the study period, but extrapolating home ranges for any other time of year is inappropriate. A longer study period would produce more meaningful results for a bald eagle's total habitat requirement.

At 9.6 square km , the Standley Lake bald eagles have a small home range relative to bald eagles in other studies. However, our estimate lies within estimates from other studies

(Stalmaster 1987),and the actual home range of the pair is, in all probability, larger than our estimate. Other studies depend on radio telemetry and aerial surveys for locational information (e.g. Garrett et al. 1993, Watson et al. 1991). These techniques facilitate tracking eagles when they are not visible to observers on the ground. We tracked bald eagles visually from vehicles. Our limited vision and mobility created a bias in favor of locations near the nest. Also, we did not include roost sight information in our data. Again, this creates a bias toward the nest site.

Certain habitat features are critical to the Standley Lake bald eagles. Perch trees to the west and to the south of the nest (appear as points on Figs. 1-7) and the nest tree were critical perching areas. For foraging, the area northwest of 100th avenue was crucial to the eagle's foraging success (Fig. 4).

Foraging

Bald eagles are generally considered to be fish-eating birds, however they are also noteworthy opportunists (Stalmaster 1987). At Standley Lake, bald eagles preyed primarily upon mammals. Large prairie dog populations in the area provided an accessible food source. Although we never observed an actual capture of a mammal, we believe bald eagles acquired food with a combination of kleptoparasitism (stealing prey from other predators) and capturing live prey on their own. An abundance of ferruginous hawks (*Buteo regalis*), which feed heavily on prairie dogs, provided opportunities for kleptoparasitism (Murdock pers. comm.). Ferruginous hawks were seen near feeding eagles which may be an indication that eagles stole prey from them.

The condition of prey items indicated that bald eagles may have captured some live prairie dogs. Eagles were seen carrying intact prairie dogs, which indicated that the prey item had not been partially eaten by another predator. Further investigation is required to determine how and where bald eagles forage near

Standley Lake.

ACKNOWLEDGMENTS

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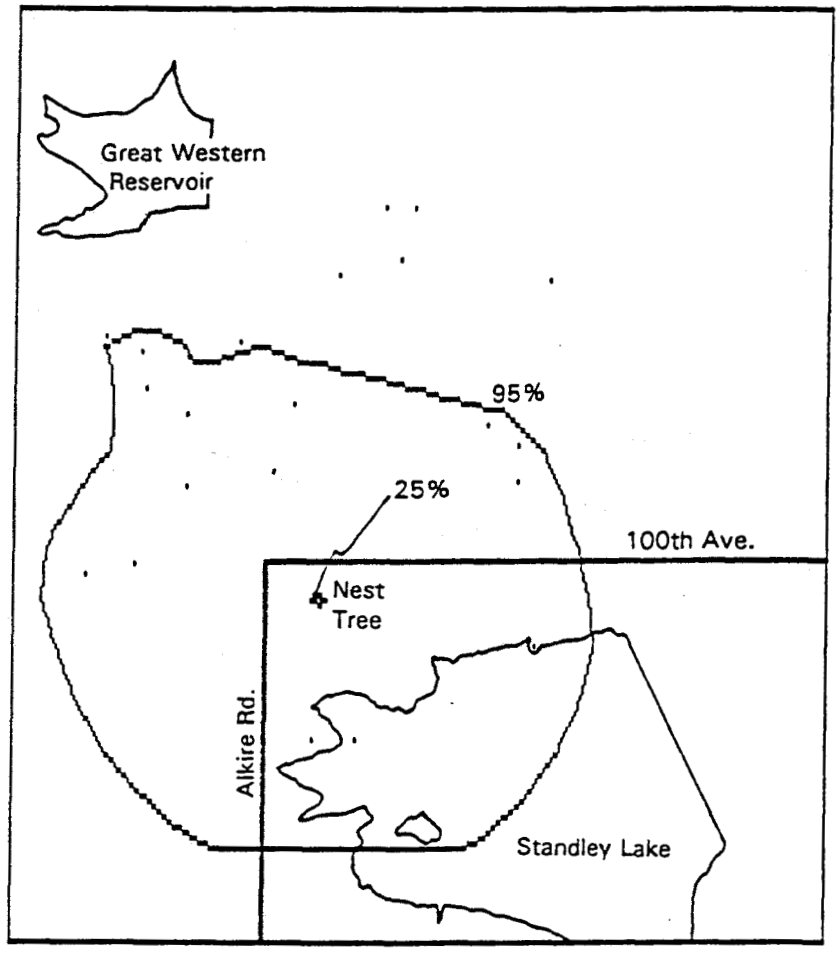

Fig. 1. 95% and 25% utilization contours for perching and flight observations of the bald eagle pair at Standley Lake. The 95% utilization contour represents the home range.

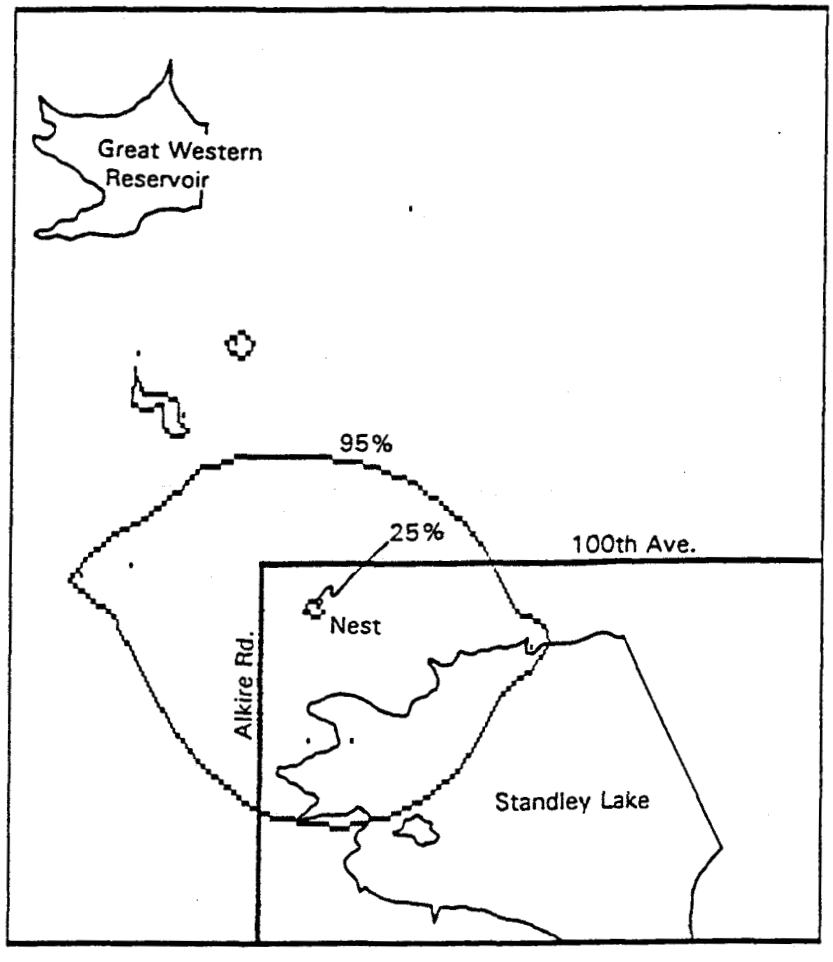

Fig. 2. 95% and 25% utilization contours for perching and flight observations of the male bald eagle at Standley Lake.

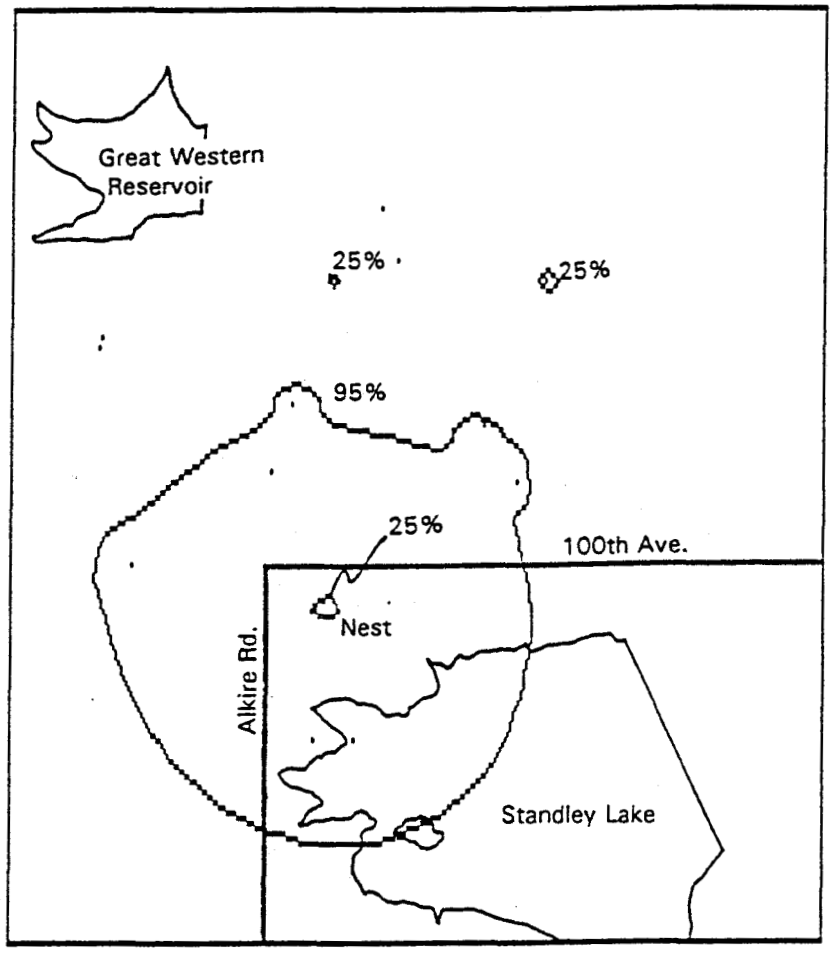

Fig. 3. 95% and 25% utilization contours for perching and flight observations for the female bald eagle at Standley Lake.

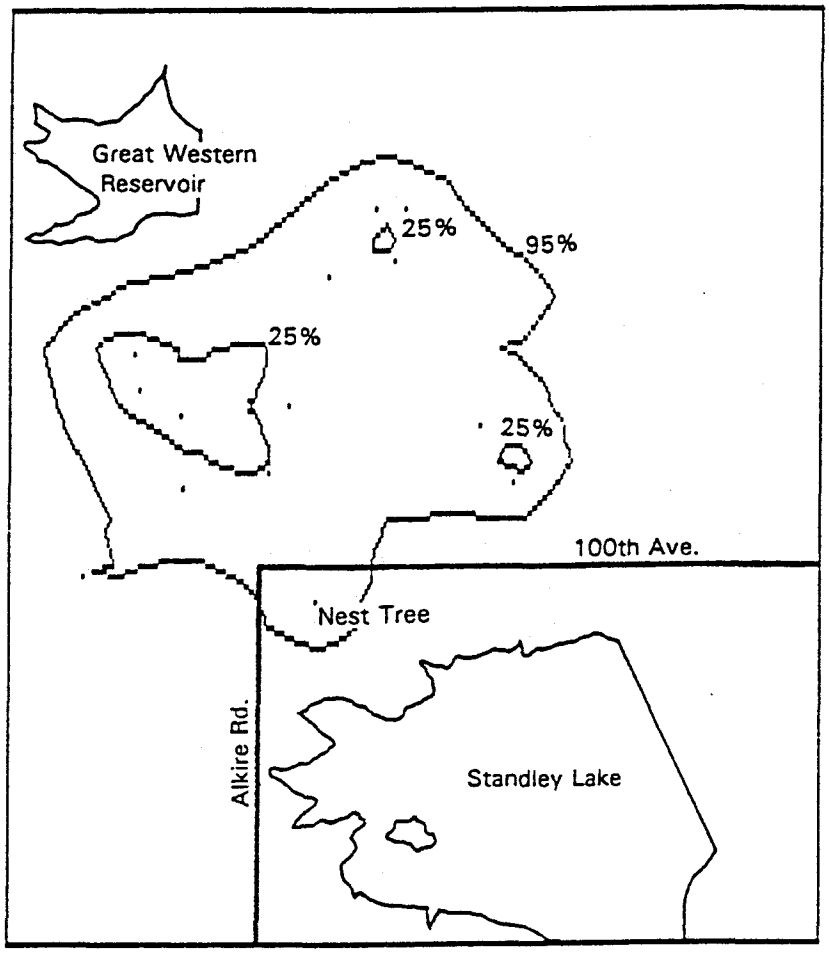

Fig. 4. 95% and 25% utilization contours for flight observations of the bald eagle pair at Standley Lake.

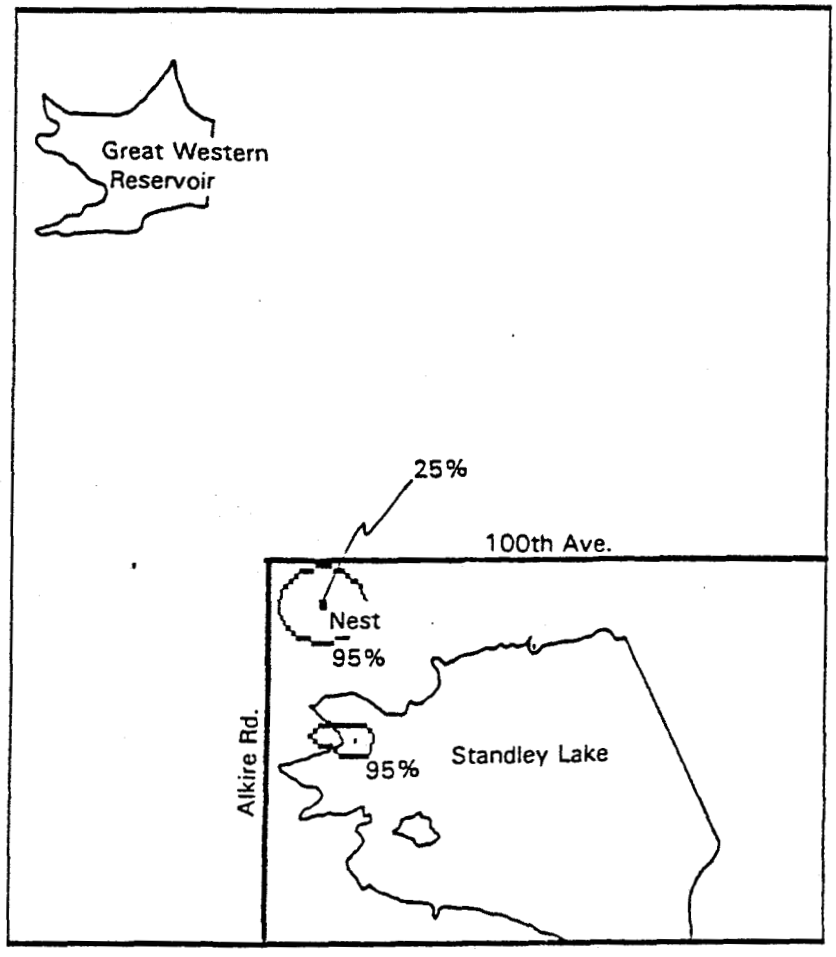

Fig. 5. 95% and 25% utilization contours for perching observations for the bald eagle pair at Standley Lake.

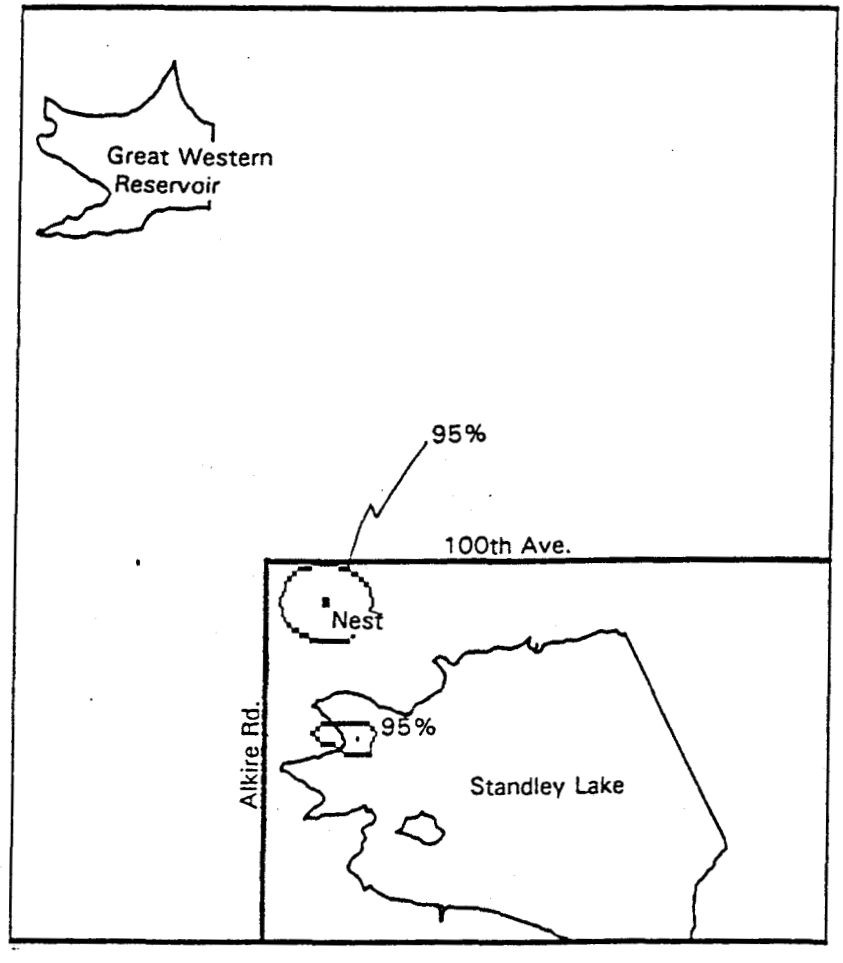

Fig. 6. 95% and 25% utilization contours for perching observations of the male bald eagle at Standley Lake.

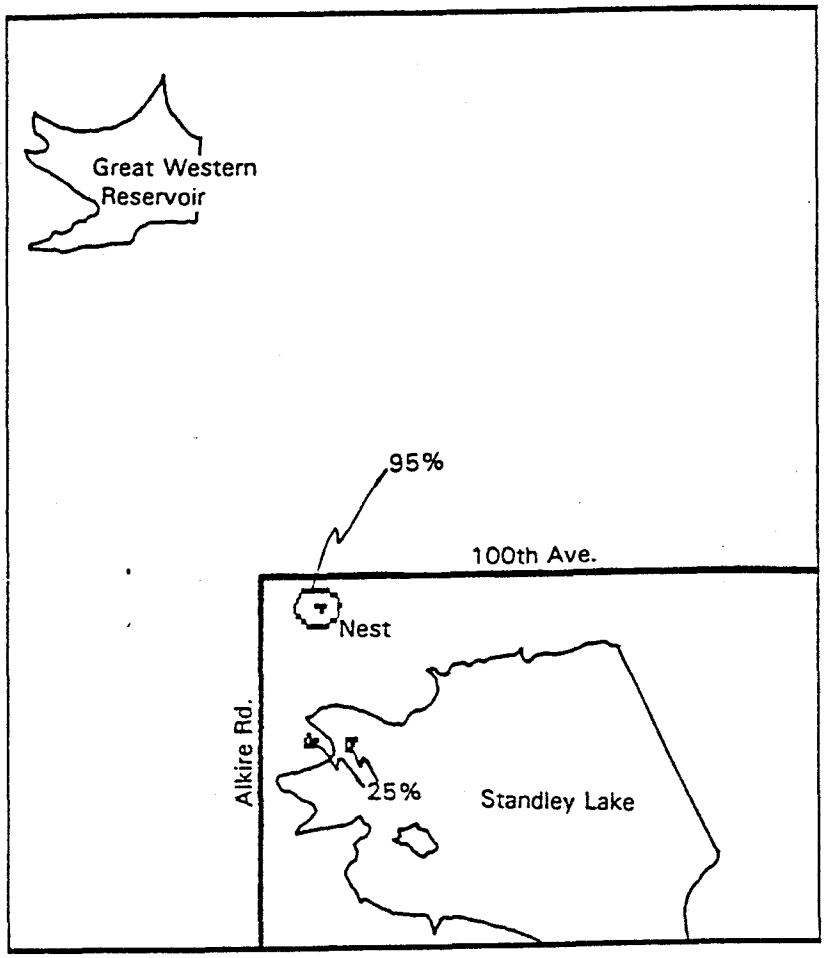

Fig. 7. 95% and 25% utilization contours for perching observations of the female bald eagle at Standley Lake.

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