Alaska Department of Fish and Game
State Wildlife Grant
ANNUAL INTERIM PERFORMANCE REPORT

Grant Number: T-1   **Segment Number:** 6
Project Number: 8
Project Title: Factors affecting the past, current, and future, production and distribution
of trumpeter swans in Alaska
Project Duration: July 1, 2004 – June 30, 2007
Report Period: July 1, 2004 – June 30, 2005
Report Due Date: September 30, 2005

Objectives (*as submitted in grant project statement*):
Statewide:
1. Estimate spatial and temporal rates of population change in Trumpeter swans;
2. Describe variation in size, elevation, and latitude of water bodies used by breeding
   Trumpeter swans;
3. Estimate spatial and temporal patterns in Trumpeter swan production rates;
4. Project maximum sustainable breeding populations for Alaska;
5. Provide recommendation for future surveys.

Minto Flats State Game Refuge:
6. Describe variation in temporal patterns of nesting distribution of trumpeter swans prior to
   (before 2004) the start of natural gas exploration on this refuge;
7. Describe variation in temporal patterns of trumpeter swan production prior to the start of
   natural gas exploration on this refuge;
8. Develop spatially explicit models of the relationship between development activities and
   changes in trumpeter swan nesting distribution and production.

Summary of Accomplishments (*Describe accomplishments related to the work that was
proposed to be done during this same period in the Project Description and work schedule*):
Objectives 1-5:
1. We developed a suite of models that will identify the most important factors affecting
   changes in adult and cygnet abundance through time. These models include independent
   variables for survey year and survey year^2, map (survey units), and latitude (Objective 2).
   The current model set contains approximately 30 models including relevant combinations
   of these variables, and deviance information criterion (DIC) will be used to select among
   competing models. This model set will be run for both the cygnet and the adult data to
   describe differences in variation between these two age groups (Objective 1 and 3).

2. Because of the complexity of the models and the data, the number of simulations required
   to reach convergence is sizable. Currently we are running most models for 0.5 million
   iterations to obtain good parameter estimates. These iterations take 1-2 days to complete
   for each model, limiting the speed with which we can select the optimal model. For this
   reason, we are attempting to obtain computational time on the supercomputer here at
   UAF to speed the overall analysis if possible. In light of the long run times required for

the models, we are waiting until the data from 2005 are available (in September or October) before running all of the models in the model set to convergence.

3. Our preliminary analyses of the statewide survey data indicate that the yearly rate of population change (λ) for adult swans is approximately 1.06 (6% per year), which is quite high for a long-lived species such as swans. Preliminary estimates of cygnet production indicate that the number of cygnets produced has increased at a rate of 4% per year ($\lambda = 1.04$), although in later years cygnet production appears to have stabilized. This could indicate that an upper capacity for production has been reached, although we cannot say definitively at this point. After the inclusion of 2005 data, we will be better able to estimate the current trends in cygnet production as well as any changes in the growth rate of adult swans. We will also be able to address whether swans are using areas at higher latitudes in later years (Objective 2). Once the model set is run including the data from 2005, we will project the maximum sustainable breeding population for Alaska (Objective 5).

Objectives 6 – 8:
1. The development of skills and methodology over the past year will be directly applicable to the remaining objectives relating to the more intensively surveyed areas in and around Minto Flats State Game Refuge (MFSGR).

2. We will initiate this analysis in the fall 2005. As part of this analysis, we will address the variation in size and elevation of wetlands used by breeding Trumpeter Swans in more detail (Objective 2). This will be more appropriately addressed during this portion of the overall analysis due to the intensive GIS work that will accompany it.

Significant Deviations *(if any, and explain the reasons for these):*
Objectives 1-5:
1. The methods originally proposed for this analysis were not fully adequate. During each survey year, the area surveyed was increased substantially, which creates critical problems for a standard regression analysis. After examining the data from 1968-2000 and considering these issues, we determined that a Bayesian approach would be the most effective and informative (Link et al. 2002).

2. We have been told that survey design issues will be addressed within the U.S. Fish and Wildlife Service, so we are not currently pursuing objective 5.

Objectives 6 – 8:
3. Since starting the project we have learned about several other areas in the state that were surveyed on a yearly basis; Kenai National Wildlife Refuge, Tetlin National Wildlife Refuge, and survey units in the Cordova area. We have acquired these data and plan to subject them to the same analysis as data from MFSGR to develop more complete state-wide conclusions about factors affecting production and wetland selection.

Actual Costs during this Report Period *(personnel plus all operating expense totals)*:

Federal (from ADF&G):   Partner (nonfederal share):
    $36,005.33 $12,001.78

Project Leader *(or Report Contact Person)*:   Mark Lindberg

Additional Information: *(Not required. Add any additional detail, if desired, related to the progress of the project)*: None