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 year², 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 (λ = 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

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: <u>Factors affecting the past, current, and future, production and distribution</u>
<u>of trumpeter swans in Alaska</u>
Project Duration: July 1, 2004 – June 30, 2007
Report Period: July 1, 2005 – June 30, 2006
Report Due Date: September 30, 2006
Partner: University of Alaska Fairbanks

Objectives:
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:
1. Objectives 1 and 3 are nearly complete. The data from 2005 became available in late
spring of 2006 and the final analysis has begun. All models have been written and the final
runs on the entire data set are in progress. This may take several weeks, after which the final
results will be written up and submitted for publication in the Fall 2006. Preliminary results
indicate that after accounting for increasing survey area, populations increased at a rate of
1.5-4% per year and fewer swans were estimated to be present at higher latitudes. The initial
results from these analyses were presented at both the 20th Trumpeter Swan Society
Conference in Council Bluffs, Iowa, in October 2005, and at the Pacific Flyway Study
Committee in Otter Rock, Oregon in February 2006.

2. In the Fall 2005 work also began on objectives 2,6, and 7. As was detailed in the 2005
report, we have acquired data for 3 additional areas around the state; Cordova, Tetlin, and the
Kenai pennisula. The Cordova area was chosen as a starting point for model construction.
GIS was used to extract data layers potentially relevant to swan nesting/productivity such as
fire history, roads, oil/gas wells, wetland type, wetland size, and elevation. A majority of the

models for this analysis have been constructed using these variables, and analysis will continue after objectives 1 and 3 are complete. These same models will then be applied to the other 3 areas, including Minto Flats.

3. During this reporting period additional computer processors were purchased, using funds available due to the cancellation of a survey in the previous year, to assist with the fitting of the models. This has greatly increased the computational speed and the number of models that can be run concurrently. Approximately 40 hours were spent surveying Minto Flats for swans during this reporting period as well.

Significant Deviations:
1. Objective 2 will be addressed in the regional analyses.

2. We have been told that survey design issues have or will be addressed within the U.S. Fish and Wildlife Service, so we are not currently pursuing objective 5 (as stated in 04-05 report).

3. The amount of development in the Minto Flats area has been much less than expected prior to the initiation of this study. Due to the small amount of development that has occurred, we would not be able to detect any direct effects of development on breeding swans at this time (Objective 8). We still intend to investigate the factors affecting production and wetland selection at Minto Flats, and the other three areas with adequate data: Kenai NWR, Tetlin NWR, and the Cordova area. The amount of oil and gas development on the Kenai NWR has been substantial over the past 50 years and we will include an analysis of its potential effects on breeding swans.

Actual Costs during this Report Period *(personnel plus all operating expense totals)*:
(Reported costs included ADF&G indirect calculated at 13.5%)
Federal (from ADF&G):   Partner (nonfederal share):
$63,227 $21,076

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

Additional Information:

1. Is this project contributing samples to the Alaska Avian Influenza detection effort? _NO____
2. Do you anticipate having any unspent funds at the end of the project? __NO___

FEDERAL AID
INTERIM PERFORMANCE REPORT

Alaska Department of Fish and Game
State Wildlife Grant

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, 2008

Report Period: July 1, 2006 – June 30, 2007

Report Due Date: September 30, 2007

Partner: University of Alaska Fairbanks

Project Objectives

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

1. Objectives 1 and 3 have been completed and have been written up for committee review. Committee comments must still be incorporated and then the manuscript will be ready for journal submission later this year. We estimated that adult populations grew at a rate of 5.9% annually and cygnet production grew at a rate of 5.3% annually on average.

2. Work has been slowed for objectives 2, 6, and 7 due to a lack of availability of digital habitat data for several regions, especially the Minto Flats area. The digitization process is over 50% complete and should be finished early this fall. All areas of the Cordova, Tetlin NWR, and Kenai NWR regions have been digitized, and the analyses for Cordova and Tetlin

are nearly complete. We expect to finish this analysis for the remaining areas later this winter.

Significant Deviations

1. We have been told that survey design issues have or will be addressed within the U.S. Fish and Wildlife Service, so we are not currently pursuing objective 5 (as stated in 04-05 and 05-06 reports).

2. Objective 8 will not be addressed because the amount of development in the Minto Flats area has been much less than expected prior to the initiation of this study. Due to the small amount of development that has occurred, we would not be able to detect any direct effects of development on breeding swans at this time (as stated in 05-06 report).

Project Leader: Mark Lindberg

FEDERAL AID
FINAL PERFORMANCE REPORT

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Alaska Department of Fish and Game
State Wildlife Grant

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

PARTNER: University of Alaska Fairbanks

PRINCIPAL INVESTIGATORS: Mark Lindberg (UAF)

PROJECT DURATION: July 1, 2004 – June 30, 2008

REPORT PERIOD: July 1, 2007 – June 30, 2008

I.   PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

Trumpeter swans were nearly extinct by the end of the 1800's with remnant populations
existing only in Alaska and the Yellowstone National Park area. In 1968 aerial surveys
were conducted over all know breeding areas in Alaska to help assess the population.
Since 1975, surveys have been conducted every 5 years, however, each year additional
areas were added to the survey in response to a perceived change in population extent.
This created substantial problems for analysis because it became difficult to separate
changes in population size from increases in survey extent. One of the main goals for this
research was to produce an unbiased estimate of the rate of population change through
time. This required the development of Bayesian models to account for the changes in the
amount of area surveyed.

In addition to a rigorous assessment of the population dynamics of this species, it was
also important to identify important habitat features of breeding swans for their future
conservation. The identification of preferred breeding habitats will be especially
important in the future due to climate change, which is expected to be especially acute in
Alaska.

II.   REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED

Very little published research is available for trumpeter swans. Trumpeter swan data were
collected in Alaska as stated above, but most of the information was not published. The
only major publication on Alaskan trumpeter swans was published in 1971 (Hansen,
H.A., P.E.K. Shepherd, J.G. King, and W.A. Troyer. 1971. The trumpeter swan in
Alaska. Wildlife Monographs 26:3-83.) A general summary of trumpeter swan biology is
available in (Mitchell, C.D. 1994. Trumpeter swan (*Cygnus buccinator*) In: The birds of

North America, No. 105. Poole, A. and F. Gill Eds. Philadelphia: The Academy of Natural Sciences, Washington D.C.: The American Ornithologists Union.).

We are unaware of any other studies in progress in Alaska on this species.

III. **APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED**

Statewide:

OBJECTIVE 1: Estimate spatial and temporal rates of population change in Trumpeter swans.

We used Bayesian models to address this objective because these models allow the inclusion of missing data. Because the survey area increased each year, this resulted in many missing data values for areas that were added in later years. A standard analysis cannot account for this and prevented an unbiased assessment of trends in the past.

Using these models, we estimated that the adult segment of the population grew at an annual rate of 5.9%, and the cygnet population grew at an annual rate of 5.3%. We also found evidence that cygnet production exhibited higher rates of increase at higher latitudes in later years, which may be evidence for population level effects due to climate change. An increase in production in later, warmer years may indicate that the number of ice-free days has increased enough to allow successful reproduction to occur.

OBJECTIVE 2: Describe variation in size, elevation, and latitude of water bodies used by breeding Trumpeter swans.

We used generalized linear mixed models to identify habitat types preferred by breeding swans. We used long-term occupancy data from 4 areas throughout the state: Minto Flats State Game Refuge, Tetlin National Wildlife Refuge, Kenai National Wildlife Refuge, and the Cordova area to build models relating habitat features to occupancy probabilities.

Larger closed-basin wetlands such as lakes and ponds, were occupied by swan broods at much higher rates than other wetland types such as shrubby or forested wetlands. We also found a negative effect of transportation infrastructure on occupancy by broods in some areas, suggesting that swans are sensitive to human disturbance. Our results suggest that the recent and rapid growth of trumpeter swan populations in Alaska may be saturating available breeding habitat and anthropogenic and climate induced changes to swan breeding habitats have the potential to limit future production

OBJECTIVE 3: Estimate spatial and temporal patterns in Trumpeter swan production rates.

See Objective 1.

OBJECTIVE 4: Project maximum sustainable breeding populations for Alaska.

Early on in the project we were instructed that this would take place at the agency level, so we did not address this objective.

OBJECTIVE 5: Provide recommendation for future surveys.

Same as Objective 4.

Minto Flats State Game Refuge:

OBJECTIVE 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.

This was combined into a larger scale analysis in Objectives 1 and 2.

OBJECTIVE 7: Describe variation in temporal patterns of trumpeter swan production prior to the start of natural gas exploration on this refuge.

Because development failed to occur on the refuge during the study period (see Objective 8), we combined this analysis with that of Objective 2. Temporal patterns of production were addressed as part of this larger analysis and the results indicated that there was variability through time in the occupancy probabilities of breeding habitats, but in general the probability of occupancy of wetlands increased through time. This may indicate that historical occupancy rates are important for individual wetland management decisions because even high quality habitats are not occupied in every year. This is important in light of the evidence that swans react negatively to human disturbance (Objective 2) because historically important habitats could be rendered unsuitable if disturbance levels increase.

OBJECTIVE 8: Develop spatially explicit models of the relationship between development activities and changes in trumpeter swan nesting distribution and production.

No oil and gas development occurred on the refuge during the study period, so this objective was not addressed specifically. Some exploration did occur on part of the refuge where few swans nest, precluding any analysis. The effects of human disturbance and oil and gas development in other areas were addressed in Objective 2.

IV.   MANAGEMENT IMPLICATIONS

This project helped us to understand the population dynamics and habitat requirements of swans in Alaska. Trumpeter swan populations are continuing to grow and there is some evidence of habitat saturation in some areas. At some point wintering areas may become saturated as well and managers will have to decide how many swans can be supported by the available habitat. Some of our work indicated that swans are moving north into new habitats, but that older habitats are becoming saturated and there may be a growing component of non-breeders in the population. As the climate warms, there could be some substantial changes to wetland habitats, such as wetland shrinkage. This could dramatically affect swan productivity by reducing the number or quality of preferred breeding habitats. We identified the habitat types preferred by swans, so managers will now have a better idea of which types are most important for monitoring as the climate changes. Also, the negative impacts of human disturbance that we identified could be very important for the conservation of this species as development in Alaska continues. These birds breed at low densities on the landscape, and we found that occupancy decrease if infrastructure was located within at least ¼ mile of brood-rearing locations. This should be taken into consideration for development of areas such as Minto Flats where there are very few areas that would be less than ¼ mile from a historical brood-rearing area. Even though we did not have a direct comparison before and after

development for Minto Flats, based on our other results it seems probable that occupancy of brood-rearing wetlands would decrease if development occurs.

V.   SUMMARY OF WORK COMPLETED ON JOBS FOR LAST SEGMENT PERIOD ONLY (July 1, 2007 – June 30, 2008)

Overall, during this segment period all analyses were completed and 3 dissertation chapters/manuscripts were produced for future publication. The overall dissertation was also completed and successfully defended in May.

JOB/ACTIVITY 1A: Estimate spatial and temporal rates of population change in Trumpeter swans.

A manuscript/dissertation chapter was finished based on the results from this analysis. The analysis was completed during the previous segment period. This manuscript will be submitted to the Journal of Wildlife Management for publication.

JOB/ACTIVITY 2A: Describe variation in size, elevation, and latitude of water bodies used by breeding Trumpeter swans.

In order to conduct this analysis, wetland maps of the 4 areas had to be digitized by hand. This was completed during this segment period, the analysis was conducted, and 2 manuscripts/dissertation chapters were completed relating occupancy to habitat and climate change factors. These manuscripts will be submitted to appropriate journals for publication in the future.

JOB/ACTIVITY 3A: Estimate spatial and temporal patterns in Trumpeter swan production rates.

See Job/Activity 1.

JOB/ACTIVITY 4A: Project maximum sustainable breeding populations for Alaska.

Early on in the project we were instructed that this would take place at the agency level, so we did not address this objective.

JOB/ACTIVITY 5A: Provide recommendation for future surveys.

Early on in the project we were instructed that this would take place at the agency level, so we did not address this objective.

Minto Flats State Game Refuge:

JOB/ACTIVITY 6A: Describe variation in temporal patterns of nesting distribution of trumpeter swans prior to (before 2004) the start of natural gas exploration on this refuge.

See Job/Activity 2.

JOB/ACTIVITY 7A: Describe variation in temporal patterns of trumpeter swan production prior to the start of natural gas exploration on this refuge.

See Job/Activity 2.

JOB/ACTIVITY 8A: Develop spatially explicit models of the relationship between development activities and changes in trumpeter swan nesting distribution and production.

Not completed/addressed because development did not occur on the refuge during the study period.

VI.   PUBLICATIONS

Schmidt, J.H. 2008. The effects of a changing environment on the population dynamics of trumpeter swans in Alaska. Dissertation. 125p.

(Prepared for submission to *The Journal of Wildlife Mangement*)
Schmidt, J.H., M.S. Lindberg, D.S. Johnson, B. Conant, and J. King. Monitoring Alaskan trumpeter swan population change using Bayesian hierarchical models.

ABSTRACT
Time series of survey data provide essential data for management of wildlife. To improve management of swans in Alaska, we analyzed aerial survey data of trumpeter swans, which were collected in all known breeding habitats in Alaska from 1968-2005. As is common for many surveys, these data presented some analytical challenges. For example, during the period of study, numbers of swans counted increased 9-fold and the area surveyed increased 4-fold, which made it difficult to separate changes in the population from changes in the area surveyed. Other survey problems that are commonly encountered include missing data, and differences in observers, sites, or years. Each of these can be addressed individually in a frequentist framework, but a Bayesian approach provides a formal framework which can simultaneously address these issues. We used Bayesian hierarchical negative binomial models of swan counts because the additional scaling parameter in this distribution helped to more accurately describe our data than did over-dispersed Poisson models. We analyzed adult and cygnet counts separately, and to investigate the bias associated with making assumptions about missing values, we reanalyzed the data filling in missing values with 0's prior to the addition of a given geographic unit to the survey. This analysis strategy was in response to the suggestion that survey units were added as swans colonized them, so prior years would have had counts of zero. We estimated that adult populations grew at an average rate of 5.9% annually and cygnet production grew at a rate of 5.3% annually. We also found evidence that cygnet production exhibited higher rates of increase at higher latitudes in later years, which may be evidence for population level effects due to climate change. An increase in production in later, warmer years may indicate that the number of ice-free days has increased enough to allow successful reproduction to occur. Given probable continued increases in trumpeter swan numbers, managers should consider the size of the wintering population that is desired or that can be supported by the available winter habitat and the effects that breeding-range expansion might have on tundra swan populations.

(Prepared for submission to *Global Ecology and Biogeography*)
Schmidt, J.H., M.S. Lindberg, D.S. Johnson, D.L. Verbyla. The effects of climate
warming on habitat occupancy of trumpeter swans in Alaska.

ABSTRACT

Aim To investigate the potential relationship between changes in climate and trumpeter swan habitat occupancy throughout Alaska between 1968 and 2005.
Location Alaska, USA
Methods Statewide surveys for trumpeter swans were first undertaken in 1968, and from 1975-2005 surveys covering all known breeding areas were conducted every 5 years during August and September. We used Bayesian hierarchical occupancy models to examine the effects of latitude, time, and the average number of days above freezing on occupancy of suitable habitat by trumpeter swans.
Results The average number of days above freezing generally decreased as latitude increased. Model selection results indicated support for a model containing relationships between both latitude and the number of days $>0°C$ and occupancy probability. Model fit was determined to be satisfactory based on the Bayesian *P*-value. The predicted probability of occupancy from the best approximating model increased as the number of days $>0°C$ increased. Sites at higher latitudes had lower occupancy probabilities. Even though these parameters were partially correlated, model selection procedures indicated that models containing both latitude and the number of days $>0°C$ were a better explanation of the data than models containing only one of these parameters.
Main conclusions Strong support for a relationship between occupancy and the average number of days $>0°C$ indicated that the recent increase in the range of trumpeter swan populations in Alaska may be related to climate warming. This may be resulting in competition between trumpeter and tundra swans for breeding habitat and may impact some segments of these populations. The future impacts of continued climate change on the Alaskan trumpeter swan population are unknown, but this study is one of the few of which we are aware that directly investigates the effects of climate change on an avian species, and the first for a waterfowl species in particular, over most of its range.

(Prepared for submission to *The Auk*)
Schmidt, J.H., M.S. Lindberg, D.S. Johnson, and J.A. Schmutz. Environmental and
human influences on trumpeter swan habitat occupancy in Alaska.

ABSTRACT

Approximately 70-80% of the entire continental population of trumpeter swans depend heavily on wetland habitats in Alaska for reproduction. This makes the identification of important habitat features and the impacts of human interactions essential for the long-term management of this species. We conducted an analysis of habitat preferences in 4 areas throughout the state and found that some wetland types, especially larger closed-basin wetlands such as lakes and ponds, were occupied by swan broods at much higher rates than other wetland types such as shrubby or forested wetlands. We also found a negative effect of transportation infrastructure on occupancy by broods in and around the Minto Flats State Game Refuge (MFSGR) and the Tetlin National Wildlife Refuge (NWR). This finding is of particular interest because most of the MFSGR has recently

been licensed for oil and gas exploration. We also investigated the potential effects of the shrinkage of closed-basin ponds on habitat occupancy by nesting trumpeter swans. A reduction in the number and size of ponds throughout the state is occurring on a large scale and this could have important impacts on breeding swans in the future. We compared pond use by nesting swans with pond size and change characteristics between 1982 and 1996 and found no relationships between occupancy and changes in pond size. However, we believe that the recent and rapid growth of trumpeter swan populations in Alaska may be saturating available breeding habitat and anthropogenic and climate induced changes to swan breeding habitats have the potential to limit future production.

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FEDERAL AID
FINAL PERFORMANCE REPORT

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ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 25526
Juneau, AK 99802-5526

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STATE WILDLIFE GRANT (SWG)

STATE: Alaska   **GRANT AND SEGMENT NR.:**   T-1-3
                                                         PROJECT NR.:   1

WORK LOCATION: Fairbanks

PROJECT DURATION: 1 July 2003 – 30 June 2004

PROJECT REPORTING PERIOD: 1 July 2003 – 30 June 2004

PROJECT TITLE: Creamer's Field Migratory Waterfowl Refuge: Conservation, Research,
                    Management and Plan Revision

Project Objectives:

1: Review and refine management strategies for the Refuge.Job Activity
   Job Activity a: Review the 10-year "Interim Management Plan" for the Refuge, which was
   developed in 1993 and is due for revision.
   Job Activity b: Involve stakeholders (including public) in the Plan revision and provide a
   variety of opportunities and avenues to inform them about the Refuge and conservation and
   management issues, and to receive input.
   Job Activity c. Revise the plan as necessary based on stakeholder input and the status of
   refuge resources.
   Job Activity d. Address current issues and problems on Creamer's Refuge.
   d.1.) Investigate issues concerning of dogs on the Refuge and develop guidelines and
   regulations.
   d.2.) Design new boardwalks, viewing platforms and other facilities to replace Boreal Forest
   Trail.

2. Protect and enhance habitat for migratory birds with special emphasis on waterfowl
   (AS16.20.039(c)(1)). Monitor results and use information to modify existing plan as
   required.
   Job Activity a.: Farm fields to provide mature grain, sprouts and open habitat for cranes,
   waterfowl, and other wildlife.
   Job Activity b.: Maintain ponds and wetlands for waterfowl, cranes, shorebirds, and other
   wildlife. Monitor and evaluate effectiveness of different habitats and improvements in
   meeting management goals relating to wildlife conservation. Monitor water quality in ponds
   and nutrient levels in farm fields.
   Job Activity c.: Conduct regular counts of waterfowl and cranes during spring and fall
   migration periods.

3. Provide opportunities to study various species of wildlife and wildlife habitat typical to
   Interior Alaska (AS16.20.039(c)(2)).

Job Activity a.: Continue to support and conduct scientific studies, such as the migration banding station, and swallow and crane projects. Develop as possible additional studies to assist in management of Refuge, address biological knowledge gaps, and improve management of wildlife and their habitats in Interior Alaska. Where appropriate, encourage and develop citizen science components that allow for increased public involvement in wildlife conservation activities and greater understanding of the role of scientific research in conservation and management.

4. Participate in cooperative agreements with local airports and others to attract birds to the Refuge to lessen likelihood of bird hazards at airports.
   Job Activity a.: Coordinate meetings of cooperators.
   Job Activity b.: Provide advice and information to cooperators on bird behavior and biology, and deterrence of birds from airports.
   Job Activity c.: Develop and maintain attractive farm crops, open space, water bodies and wetlands.

5. Develop informational materials to help ensure long-term conservation of refuge resources.
   Job Activity a.: Develop educational materials, including brochures and signs, essential to conserving refuge resources.

Summary of Project Accomplishments:

1. a-b. Finally completed formal agreement with Friends of Creamer's Field, entering into concession agreement. Initiated updating and renewal of agreement with Camp Habitat (summer day camp program), a cooperative agreement with 2 local organizations.
   c. Worked with USFWS Law Enforcement in regards to their concerns about potential migratory bird baiting as a result of Refuge farming practices.
   d. Completed planning for reconstruction of Boreal Forest Trail in conjunction with Division of Administration, Friends of Creamer's Field and public.

2. a. In spring 2004, 44 acres in mature barley were planted and another 93 were prepared for planting to sprouting barley in late July. Planting was modified to provide mature grain in narrow strips and small squares, both providing more accessible edges than previous large blocks of rectangular field. This was an effort to avoid having to cut and leave lay mature grain which has been construed as baiting.
   b. Nutrient levels of fields and ponds was monitored. No chemical fertilizers, herbicides or pesticides are used on the Refuge. In fall 2003, Worked with our Sport Fisheries Division to improve the "Kids Fishing" pond in farm fields.
   c. Record numbers of geese (4420) and ducks (3090) were attracted to the farm fields in fall 2003. The number of cranes (2450) was close to the record set in fall 2002 (2770).

3. a. Continued studies of Sandhill crane survival and movement. In August 2003, captured and banded 14 additional cranes (a total of 106 banded since 2001). Observed and recorded banded cranes in Refuge fields daily during August and early September. Mist-netting and banding of songbirds continued for the 12th consecutive year at the Creamer's migration station operated by the Alaska Bird Observatory. A local high school student

continued to monitor the tree swallow boxes in the farm fields and won awards at the state-wide Science Symposium.

4. a. Hosted annual bird/aircraft safety coordination meeting with representatives from Fairbanks International Airport, Eielson Air Force Base, Fort Wainwright, University of Alaska Experimental Agriculture Station, US FWS, and Corps of Engineers.
   b. Provided advice and assistance to Fairbanks International Airport and other local airports on bird hazing, bird behavior, and other aspects of bird/aircraft safety program.

5. a. Hosted 8703 guests to the Creamer's Refuge Visitor Center, 4,889 to educational/interpretation programs, and 26,362 to our Refuge trail system. In addition, the Alaska Bird Observatory provided bird banding and conservation programs at the migration station to 88 groups, including more than 2,755 individuals (mostly school groups). Newly developed teaching units focusing on natural history, ecology and conservation were used in Refuge programs for the first time in 2003. Educational articles conveying conservation and natural history information about refuge wildlife and habitat were published monthly in the Fairbanks Daily Newsminer. Artwork and other assistance was provided in the production of wildlife viewing brochures and wildlife ecology interpretive signs (owls, fire and other subjects).

Project Costs (includes indirect costs)**:**
Federal share $ 126,630.25 + state share $ 75,978.15 = total cost $ 202,608.40

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