I. FY07 Invitation: Narrative Forms for Proposals

PROPOSAL SIGNATURE FORM

THIS FORM MUST BE SIGNED BY THE PROPOSED PRINCIPAL INVESTIGATOR AND SUBMITTED ALONG WITH THE PROPOSAL. If the proposal has more than one investigator, this form must be signed by at least one of the investigators, and that investigator will ensure that Trustee Council requirements are followed. Proposals will not be reviewed until this signed form is received by the Trustee Council Office.

By submission of this proposal, I agree to abide by the Trustee Council's data policy (*Trustee Council Data Policy**, adopted July 9, 2002) and reporting requirements *(Procedures for the Preparation and Distribution of Reports***, adopted July 9, 2002).

PROJECT TITLE: Harlequin Duck Population Dynamics in Prince William Sound: Measuring Recovery from the *Exxon Valdez* Oil Spill

Printed Name of PI: Dan Rosenberg

Signature of PI: _____ Date: 7/27/06

Printed Name of co-PI: _____

Signature of co-PI: _____ Date _____

Printed Name of co-PI: _____

Signature of co-PI: _____ Date _____

* **www.evostc.state.ak.us/Policies/data.htm**
** **www.evostc.state.ak.us/Policies/Downloadables/reportguidelines.pdf**

Trustee Council Use Only Project No. 070759 Date Received: _____

FY07 INVITATION
PROPOSAL SUMMARY PAGE
(to be filled in by proposer)

Project Title: Harlequin Duck Population Dynamics in Prince William Sound: Measuring Recovery from the *Exxon Valdez* Oil Spill

Project Period: FY 2007

Proposer(s): Dan Rosenberg

Study Location: Prince William Sound

Abstract: This project will monitor the recovery of harlequin ducks and is directly linked to recovery objectives in the EVOS Restoration Plan. The outlook for recovery is improving, however, oil remains in the intertidal, ducks are exposed to oil, populations in oiled areas while no longer declining have not increased more than those in unoiled areas, and proportions of females in oiled areas remain lower than reference areas. This suggests a lack of full recovery. We will conduct winter boat surveys to test if harlequin ducks have recovered from the EVOS by comparing population structure and trends between oiled and unoiled treatments in four areas (2 oiled, 2 unoiled) of PWS. Similar structure and increasing trends in oiled areas, when interpreted with complimentary data, will indicate recovery status. Work will be complimentary to studies addressing lingering oil, cytochrome P450 induction, and population modeling to provide a more comprehensive assessment of recovery.

Funding Request Includes 9% G&A.

Total EVOS Funds Requested for FY07 = $ 86.7K

Non-EVOS Funds to be used in FY07 = $ 24.1

TOTAL: 110.8K

Date: July 27, 2006

(NOT TO EXCEED ONE PAGE)

Harlequin Duck Population Dynamics in Prince William Sound: Measuring Recovery from the *Exxon Valdez* Oil Spill

Exxon Valdez Oil Spill Trustee Council
FY 2007 Proposal
Injured Resources and Services

I. NEED FOR THE PROJECT

A. Statement of Problem

Harlequin duck (*Histrionicus histrionicus*) populations in Prince William Sound (PWS) have not recovered from the effects of 1989 Exxon Valdez Oil Spill (EVOS Trustee Council 2002). The outlook for full recovery for harlequin ducks is improving (Rosenberg et al. 2006). However, oil remains in the intertidal (Short et al. 2004), ducks in oiled areas are still being exposed to lingering oil (Ballachey et al. 2006) and population trends in oiled areas while no longer declining are not increasing at an equal or greater rate than those in unoiled areas (Rosenberg et al. 2006). Further proportions of females in oiled areas remain lower than reference areas (Rosenberg et al. 2006). This suggests a lack of full recovery.

Harlequin ducks occur year-round in intertidal zones of PWS (Isleib and Kessel 1973). At least 1,298 harlequin ducks were estimated to have died as a direct result of oil exposure following the Exxon Valdez oil spill (J. Piatt pers. comm.). Oil spill studies of harlequin ducks in western Prince William Sound (PWS) from 1990-93 found consistently low numbers of birds during the breeding season, little breeding, low productivity, and an apparent decline in post-breeding molting birds (Patten et al. 1998a, Patten et al. 1998b). In 1995, six years after the Exxon Valdez oil spill there was no sign of recovery (Exxon Valdez Oil Spill Trustee Council 1996).

As of 1997, populations were declining in oiled areas while increasing in unoiled areas (Rosenberg and Petrula 1998). However, ducks in oiled areas exhibited elevated levels of cytochrome P4501A induction, indicating continued oil exposure, and adult female winter survival was lower in oiled than unoiled areas (Trust et al. 2000, Esler et al. 2000). Lower survival rates may be related to continued oil exposure (Peterson 2001).

Meanwhile, results of longer-term monitoring surveys (Lance et al. 2001) were equivocal with respect to the effects of oil contamination on the population level of harlequin ducks. Evidence of recovery was observed in the winter population but not in summer. Different sampling schemes made comparisons difficult with more specific harlequin duck monitoring surveys. A more recent analysis by Sullivan et al. (2005), using the same data as Lance et al. 2001 plus additional years of surveys, found no evidence of increasing population trends in oiled areas or PWS as a whole from 1990–2004.

Collectively, these studies suggest that oil exposure, female survival, and population dynamics are linked and provide strong evidence that harlequin ducks have not fully recovered from the effects of the *Exxon Valdez* oil spill.

Sea duck populations, in general, are composed of relatively long-lived birds with delayed sexual maturity. Long-term population stability depends on high adult survival coupled with a few years of successful reproduction. Productivity may be limited to a few favorable years and population levels may change slowly. In addition, harlequin ducks are highly philopatric to breeding, molting, and wintering sites (Robertson and Goudie 1999, Robertson et al. 2000). This is an adaptive strategy in natural situations and predictable environments. It is not favorable in the face of dramatic environmental perturbations and does not favor rapid recovery or colonization of new undisturbed sites. Initial high losses of adults, especially females, may result in a long and slow recovery period, especially when initial causes of mortality are still influential. Population monitoring provides a direct approach to assess recovery.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

This study is directly linked to the recovery objectives for harlequin ducks in the EVOS Restoration Plan (Exxon Valdez Oil Spill Trustee Council 2002). Two main hypotheses have been presented to explain lack of full recovery: (1) ingested oil or contaminated prey is continuing to cause higher mortality rates and/or (2) initial mortality caused significant losses to the western PWS population, which may result in a protracted recovery period. This project will help assess the recovery rate and identify constraints to recovery of harlequin ducks by providing winter population trends, comparing population structure, and providing an index of recruitment between oiled and unoiled areas. It will also provide insight into geographic differences within PWS. In the short-term it will help us understand the effects of lingering oil and in the long-term help identify mechanisms of population change in the nearshore environment.

Information from this project will also aid in the development of a population model that will improve our ability to predict rates of population change and estimate the time period necessary for full recovery. There are no precedents for recovery from oil spills for harlequin ducks. Harlequin duck populations have relatively low intrinsic growth rates (Goudie et al. 1994) so full recovery from initial and chronic mortality may be delayed until long after all spill effects have abated (Esler et al. 2002). While some of the demographic information for a model has been collected for PWS populations (Rosenberg and Petrula 1998, Rosenberg et al. 2006, Holland-Bartels et al.1999) and harlequin ducks in North America (Goudie et al. 1994, Robertson and Goudie 1999), specifics are still lacking, including long-term data on natural variation, productivity, recruitment, dispersal, and immature survival.

Long-term data sets are needed for predictive modeling of ecological change. Harlequin ducks occur year-round in the nearshore environment, feed on benthic invertebrates, exhibit site-fidelity, are relatively long-lived, and are widely dispersed in the Gulf of Alaska. They are the only benthic feeding avian species present in abundance year-round in PWS. These characteristics make them unique among nearshore avian predators and ideal candidates for monitoring ecosystem change.

In addition to establishing population recovery from the EVOS, identifying and establishing mechanisms of population change depends on an historical knowledge of the status of the resource prior to environmental perturbations and an understanding of the inter-annual variability among years in periods of relatively little perturbations in the larger physical system. Thus, our ability to detect departures from natural variation is necessary if we are to accurately evaluate the effects of major environmental perturbations whether natural or human-caused. This requires numerous samples, distributed through space and time. We are focusing on relatively long-lived avian predators that tend to show less natural variability. With time-series data on harlequin duck abundance and distribution in concert with abiotic and biotic ecosystem changes we will improve our ability to interpret the affects of natural or man-induced processes and understand the mechanisms of population change.

Results of this work will have a direct bearing on assessing the status and outlook for this resource and help guide agency programs and policies related to public uses, including subsistence and recreational hunting, land-use practices, and wildlife viewing.

In addition to monitoring harlequin ducks, this survey also monitors spatial and temporal patterns of change for common loons, surf, white-winged, and black scoters, Barrow's and common goldeneyes, common and red-breasted mergansers, and sea otters.

II. PROJECT DESIGN

A. Objectives

1. Compare population structure (number of breeding pairs, immature males, adult males, and females) between treatments (oiled and unoiled survey areas) from 1997 to present.

2. Compare annual changes in density between oiled and unoiled treatments from 1997 to present.

3. Compare annual changes in density and population structure *within* oiled and unoiled treatments.

4. Compare changes in densities of harlequin ducks between winters of 1972 and 1973 with winter 2007 surveys for both oiled and unoiled areas.

5. Add to our knowledge of harlequin duck life history and provide long-term data set for population modeling.

6. Monitor numbers of Barrow's and common goldeneyes, surf, white-winged, and black scoters, red-breasted and common mergansers, and loons.

7. Integrate data with other long-term monitoring surveys to detect long-term changes in marine ecosystems

This study will test the following hypotheses:

1. Objective 1.
   H_o: The ratio of males to females; total ducks to subadult males; and breeding pairs to total ducks is the same for oiled and unoiled populations during March.

   $H_{1:}$ The ratio of males to females; total ducks to immature males; and breeding pairs to total ducks is different for oiled and unoiled populations during March.

2. Objective 2.
   Ho: The rate and direction of population change between years is the same for oiled and unoiled survey sites.

   $H_{1:}$ The rate and direction of population change between years is different for oiled and unoiled survey sites.

3. Objective 3.
   H_o: The rate and direction of population change between years is the same within oiled and unoiled survey sites.

   H_1: The rate and direction of population change between years is different within oiled and unoiled survey sites.

4. Objective 4.
   To compare the potential disparity of harlequin duck densities between oiled and unoiled regions over time we will examine the ratio of average density in the following hypothesis:

   H_o: No difference in density ratio exists between historical counts and contemporary resampling on the same transects.

$$\frac{\text{density}_{\text{oiled}}}{\text{density}_{\text{unoiled}}}$$

   H_1: There is a difference in the ratio

5. Objective 5. No hypothesis is being tested.

6. Objective 6. No hypothesis is being tested at this time.

7. Objective 7. No hypothesis is being tested at this time.

B. Procedural and Scientific Methods

We propose to continue winter boat surveys in order to compare population trends and structure with data from six surveys conducted from 1997–2005. We will survey oiled and unoiled areas identified in project \427 (Rosenberg and Petrula 1998) plus the additional oiled and unoiled

areas added by project \407 (Rosenberg et al. 2006). This will increase statistical power to detect recovery, improve our ability to assess changes in the marine ecosystem, and quantify geographic variation within PWS. Surveys will be conducted in late-winter and follow procedures and methods in Rosenberg et al. 2006.

In addition to harlequin ducks, other sea ducks, loons, and sea otters will be recorded on transects. For harlequin ducks, observations will be recorded by sex and males will be divided into two age groups using predetermined criteria (Rosenberg and Petrula 1998).

To compare the potential disparity of harlequin duck densities between oiled and unoiled regions over time we will examine the ratio of average density between historical counts conducted in March of 1972 and 1973 (Dwyer et al., undated and reanalyzed by Klosewski and Laing 1994) and contemporary resampling of the same transects. Although the recovery goals and objectives for harlequin ducks include a return to conditions had the spill not occurred and a return to prespill population demographics (Exxon Valdez Oil Spill Trustee Council 2002), little historical demographic data exists for comparison. Surveys conducted in 1972 and 1973 are the only prespill winter data available on population abundance. In the first few years after the spill, population estimates for harlequin ducks in oiled areas were less than expected when compared with pre- to postspill trends for unoiled areas (Klosewski and Laing 1994). Similar comparisons have not been conducted since 1991 but Sullivan et al. (2005) suggests that harlequin duck populations in oiled areas have remained stable since the spill.

C. Data Analysis and Statistical Methods

Population composition and annual changes in density will be compared to test whether harlequin duck populations are exhibiting similar growth trends or the oiled (injured) population is exhibiting a different direction or rate of change (see Rosenberg et al. 2006). We will continue to test whether low reproductive success in oiled areas has resulted in changes in population age and sex structure. The proportion of first-year males to total males will be used as a measure of past reproductive success. Surveys will be used to detect changes in abundance and compare the direction and rate of change between years for the four survey areas and two treatments. Data from winter surveys in 1997, 2000–2002, and 2004–5 will be incorporated into the analysis.

Survey Coverage

Shoreline length (km) of transects will be calculated from the Alaska Department of Natural Resources PWS_ESI ARC/INFO GIS database. Shoreline length of small islands not included in the PWS_ESI ARC/INFO GIS database was calculated using the U.S. Forest Service CNFSHORE ARC/INFO GIS database.

Sex and Age Structure

We used a generalized logit model (natural logarithm of ratios) (Agresti 1990) to test for annual differences among study areas (WPWS, SWPWS, EPWS, MONT) and between treatment (oiled) and reference (unoiled) areas for the following sex and age ratios: (1) males to females; (2) adult males to immature males and 3) adult females to immatures (both sexes) (Rosenberg et al. 2006). Model fit was assessed using AIC and a backward elimination process. At each step a reduced

model was used to test for significant year, area, or treatment effect (Agresti 1990). Such a criterion allows for optimal fitting of the data without over-parameterizing the model. The SAS model used the GLIMMIX Procedure with a binomial distribution and a logit link function. The full model is presented in Rosenberg et al. (2006).

Proc GLIMMIX also allowed us to create a more complex covariance structure that accounted for the correlation found in measuring the same transects over multiple years. This reduces the occurrence of Type I errors since the variance is more appropriately modeled and not underestimated.

Trend Analysis

Transect observations were modeled as Poisson counts weighted by the length of the transect. We standardized all counts of birds to linear densities (birds/km of shoreline surveyed) to facilitate comparisons in change in densities among regions and between treatments. Proc GLIMMIX was used, this time using a Poisson distribution with a log link function. The full model and statistical analysis is presented in Rosenberg et al. (2006).

Because the sampling scheme was not appropriate for comparing overall measures of abundance among regions we modeled the two treatments separately, including estimating difference variance components for each treatment. As in the ratio analyses, proc GLIMMIX also allowed us to account for the correlation found in measuring the same transects over multiple years. Using this model eliminates the need for a power analysis because we are directly modeling a slope instead of evaluating a sample of slopes from each transect as was previously done (Rosenberg and Petrula 1998).

Historical Comparisons

We will partition the historical transects surveyed by Dwyer et al. (no date) by treatment (oiled or unoiled). Within treatments, transects will be stratified according to harlequin duck habitat quality and oiling history. All of the transects within the oiled treatment that contained harlequin ducks in 1972 and 1973 will be resurveyed and transects from the unoiled regions will be randomly selected while keeping the proportion of transects within each strata similar to transects in the oiled region. The exact number of transects in the unoiled region will be determined as the amount most efficient to reduce variance in the density ratio within budgetary constraints.

D. Description of Study Area

The proposed project will be conducted in the oil spill area of western and southwestern Prince William Sound and unoiled eastern PWS between Valdez and Cordova, northern Montague Island and northern PWS.

March surveys will repeat transects surveyed in /407 Harlequin Duck Recovery Monitoring (Rosenberg et al. 2006). Transects in the spill area will be located on Knight Island, Applegate Island, Culross Island, Foul Bay, Falls Bay, Crafton Island, Chenega Island, Green Island, Naked

Island, and Bainbridge, Evans, Danger and Latouche islands. Surveys in unoiled areas will include portions of Hinchinbrook Island, Simpson Bay, Sheep Bay, Port Gravina, Landlocked Bay, Bligh and Busby islands, Galena Bay and Valdez Arm, and Montague Island. Additional transects in unoiled areas necessary for historical comparisons may be selected from northern PWS.

E. Coordination and Collaboration with Other Efforts

The results of this have and will continue to be coordinated with several ongoing and proposed *Exxon Valdez* Oil spill Trustee council projects including the following: 1) Quantifying Temporal Variation in Harlequin Duck Exposure to Exxon Valdez Oil, Dan Esler, Project /0777; 2) Oil Exposure in Nearshore Vertebrate Predators, Brenda Ballachey, project /0774; 3) Lingering Oil and Predators: Pathways of Exposure and Population Status, Stanley Rice, project /0620; 4) Surveys to Monitor Marine Bird Abundance in PWS during Winter and Summer, project /0751, David Irons; and 5) Population Modeling in Harlequin Ducks, Dan Esler. This work was also heavily utilized by Integral Consulting, Inc., for Assessment of Lingering Oil and Resource Injuries from the *Exxon Valdez* Oil Spill, project /0776 and Information Synthesis and Recovery Recommendations for Resources and Services Injured by EVOS, project /0783.

ADF&G personnel will conduct all data collection and analysis. Winter surveys and contracts for vessel support for winter surveys will be coordinated with related EVOS projects. Private sector contracts for winter vessel support will be solicited.

This project will be integrated with ongoing studies and findings of past studies including project \407 Harlequin Duck Population Dynamics: Measuring Recovery from the Exxon Valdez Oil Spill. Information exchange has been ongoing with several marine bird and mammal studies.

III. SCHEDULE

A. Project Milestones

Objective 1. Compare population structure (number of breeding pairs, immature males, adult males, and females) between treatments (oiled and unoiled survey areas). To be met by March 2007 (field work) and October 2007 (report).

Objective 2. Compare annual changes in density between oiled and unoiled treatments from 1997 to present. To be met by March 2007 (field work) and October 2007 (report).

Objective 3. Compare annual changes in density and population structure *within* oiled and unoiled treatments. To be met by March 2007 (field work) and October 2007 (report).

Objective 4. Compare changes in densities of harlequin ducks between winters of 1972 and 1973 with winter 2007 surveys for both oiled and unoiled areas. To be met by March 2007 (field work) and October 2007 (report).

Objective 5. Add to our knowledge of harlequin duck life history and provide long-term data set for population modeling. To be met by October 2007 (report) and provide Population Modeler with data as needed.

Objective 6. Monitor population change in Barrow's and common goldeneyes, surf, white-winged, and black scoters, red-breasted and common mergansers, and loons. To be met by March 2007 (field work).

Objective 7. Integrate data with other long-term monitoring surveys to detect long-term changes in marine ecosystems. To be met by October 2007 (report).

This is proposed as a possible multi-year monitoring program designed to assess the recovery of an injured species. Each project objective will be assessed annually for oiled and unoiled areas then compared with each other and with data collected in subsequent years.

B. Measurable Project Tasks

FY 07, 1st quarter (October 1, 2006-December 31, 2006)

Project funding approved by Trustee Council.
Interagency coordination. Plan logistics and personnel for winter surveys. Contract for vessel support.

FY 07, 2nd quarter (January 1, 2007-March 31, 2007)

Annual Trustee Council Workshop.
Hire seasonal technicians. Prepare field equipment. Finalize field logistics. Conduct winter surveys in PWS.

FY 07, 3rd quarter (April 1, 2007-June 30, 2007)

Create databases, GIS. Analyze field data and begin report preparation. Maintain equipment.

FY 07, 4th quarter (July 1, 2007-September 30, 2007)

Finish analyses and final report/manuscripts submitted to Trustee Council Office.

V. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

A. Community Involvement and Traditional Ecological Knowledge (TEK)

A Traditional Ecological Knowledge report was prepared as part of EVOS Restoration Project 427 Harlequin Duck Recovery Monitoring (Rosenberg and Petrula 1998). As we have done in the past we will coordinate when appropriate with the villages of Tatitlek (Gary Kompkoff) and Chenega Bay (Larry Evanoff, Pete Kompkoff and Kate McLaughlin), Cordova (Scott Hahn, Bruce Cain), Valdez (Charlie Hughey, David Dengel), and Whittier (Dean Rand) on our activities and possibilities for community involvement. No funds are being requested for local hire or community involvement.

B. Resource Management Applications

The Alaska Department of Fish and Game, has a statutory mandate to manage and protect wildlife and their habitats on state and private lands for the benefit of Alaskans. Migratory bird management requires good scientific information to detect population change, prevent habitat degradation, and manage public uses of migratory birds and their habitats. Numbers of several sea duck species are declining throughout much or all of their range including Alaskan breeding populations (Goudie et al 1994, Hodges 1996). The ADF&G Statewide Waterfowl Program is responsible for adopting migratory bird hunting regulations (sport and subsistence) within the Pacific Flyway under the federal framework, and commenting on permits for mariculture and wetland, development within the nearshore environment, adjacent commercial and recreational activities, and oil spill contingency plans. This study will provide ADF&G with information to improve its management capabilities. Contact Tom Rothe or Dan Rosenberg, ADF&G.

V. PUBLICATIONS AND REPORTS

A final report will be presented by October 2007. Publications will be prepared for peer-review journals in lieu of final report when possible and will depend upon the duration of the project. Publications planned for FY07: Harlequin duck population dynamics following the *Exxon Valdez* Oil Spill. Waterbirds. Submit May 2007.

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Professional History

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Habitat Biologist. Alaska Department of Fish and Game, Anchorage, AK. 1983–1985.
Wildlife Biologist. U.S. Fish and Wildlife Service, Anchorage, AK. 1980–1983.
Adjunct Faculty. Anchorage Community College, Anchorage, AK. October 1984 - May 1987.

EDUCATION
Humboldt State University, Arcata, CA. March 1979.
Bachelor of Science degree - Wildlife Management.
Boston University, Boston MA. 1969 - 1972. Liberal Arts.

AWARDS
ADF&G Employee of the Year, 1991.
Alaska Outdoor Council, Waterfowl Conservationist of the Year, 1993

SELECTED PUBLICATIONS

Rosenberg, D. H., M. J. Petrula, D. D. Hill, and A. M. Christ. 2006. Harlequin duck population dynamics: measuring recovery from the *Exxon Valdez* oil spill. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 407). Alaska Department of Fish and Game, Division of Wildlife Conservation, Anchorage, Alaska.

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COLLABORATORS

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Corrine Brown, DVM, Wild Waterbird Conservancy, Grand Cane, LA
Dan Esler, Simon Fraser Univ., Vancouver, BC
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William Larned, U.S. Fish and Wildlife Service, Office of Migratory Birds, Soldotna, Alaska.
Dan Mulcahy, DVM - U. S. Geological Survey, Alaska Science Center, Anchorage, AK
Russ Oates, U.S. Fish and Wildlife Service, Office of Migratory Birds, Anchorage, Alaska.
John Pearce, U.S. Geological Survey, Molecular Ecology Laboratory, Alaska Science Center, Anchorage, Alaska.
Jason Schamber, U.S. Geological Survey, Alaska Science Center, Anchorage, Alaska.
John Takekawa, U.S. Geological Survey, San Francisco Bay Estuary Field Station
Pam Tuomi, DVM – Alaska SeaLife Center, Seward, AK
Denny Zwifelhofer, U.S. Fish and Wildlife Service, Kodiak National Wildlife Refuge, Kodiak, AK

Harlequin Duck Population Dynamics in Prince William Sound: Measuring Recovery from the *Exxon Valdez* Oil Spill

Rosenberg FY07

Data Management and Quality Assurance/Quality Control Statement

1. **Study Design etc.** See Project Plan (attached) and the following reference:

Rosenberg, D. H., M. J. Petrula, D. D. Hill, and A. M. Christ. 2006. Harlequin duck population dynamics: measuring recovery from the *Exxon Valdez* oil spill. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 407). Alaska Department of Fish and Game, Division of Wildlife Conservation, Anchorage, Alaska.

See Metadata form (attached).

2. **Data Quality.**

a). All observers will be experienced, highly trained in small craft operation, bird identification, and harlequin duck sex and aging; b). All observers will be trained in standardized data recording protocols and techniques; c). All data will be recorded on pre-formatted standardized field forms and maps produced on "rite-in-rain" paper, data sheets will be retained by the Principal Investigator (PI) d). Whenever possible observations will be verified by two observers; e). Surveys will not be conducted when wave height or visibility compromise accuracy, survey speed will be adjusted according to conditions; f). Locations will be recorded by GPS and stored in memory, recorded on field forms, and marked on paper maps g). Crews and skiffs will be interchanged daily; h). Transects will be marked on maps and endpoints recorded by GPS. All crew will be familiarized with endpoints prior to starting transects. Radio contact will be maintained between crews if questions arise. i). Periodic replicate sampling will occur.

3. **Data Characteristics**

a) FGDC Metadata record file attached.
b) Taxonomic Sampling (counts) – list of fields: Observer, Boat, Date, Transect start and finish time and GPS location, Time of observation, Wind Speed/Direction, Visibility, Wave Height, Transect number, Flock No., No. Males, No. Females, No. Pairs, No. Sub-adult males, No. Unknown sex and age, Total Harlequins, Latitude of observation in Decimal Degrees, Longitude in Decimal Degrees, Water depth (m), No. Sea otters, No. Loons, No. other waterfowl by species

4. **Algorithm** – No conversion algorithms will be used (except GPS locations).

5. **Collections** - No samples will be collected as a routine part of this study.

6. **Instrument Calibration** - NA

Data management and Quality Assurance/Quality Control Statement (continued).

7. **Data Reduction and Reporting**

a). See Proposal: Project Design, C. Data analysis and Statistical Methods and the following reference:

Rosenberg, D. H., M. J. Petrula, D. D. Hill, and A. M. Christ. 2006. Harlequin duck population dynamics: measuring recovery from the *Exxon Valdez* oil spill. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 407). Alaska Department of Fish and Game, Division of Wildlife Conservation, Anchorage, Alaska.

b). To avoid errors in data entry, crew and PI will review data sheets daily and will immediately clarify any illegible or questionable data before it is entered into the computer. The raw data will be entered into an IBM-PC compatible computer in a standard EXCEL spreadsheet format. Rows, columns, and summations of categories will be crosschecked. Computer data will be printed and crosschecked with field data forms to screen for errors.

SAS Institute software will be used for statistical calculations.

Harlequin Duck Population Dynamics in Prince William Sound: Measuring Recovery

Budget Justification for FY07: $86.7K (w/G&A); $79.5 (w/o G&A).

Personnel Costs: Amount Requested $ 41.1

The ADF&G Statewide Waterfowl Program has a full time staff of 3, which includes the Statewide Coordinator. The Coordinator is not available for surveys. We have no additional staff, clerical or otherwise. To survey the proposed study area requires a window of 19 days using 2 skiffs with a crew of 2 each. Additional days from previous studies are because we expanded the scope of the study to resurvey areas done in the winters of 1972 and 1973. Thus, we need to be prepared to hire or fund 2 part-time employees. At minimum, one of these employees is necessary for mobilization and demobilization. While conducting surveys at sea, state labor contracts require supplemental sea duty pay.

The state is providing 3.0 months of personnel costs for the two full-time biologists in the Statewide Waterfowl Program to cover project planning, additional mobilization and demobilization costs, survey time, and report preparation and writing, and attendance at conferences and meetings.

Travel Costs: Amount Requested $0.4

Travel costs are minimal. We need to get personnel, boats, and equipment to Whittier and leave vehicles and boat trailers in Whittier. Because of the duration of the project we will split the survey into 2 periods, returning to Anchorage in the interim. Although the Whittier tunnel is a state facility, the state agencies are charged a toll for trucks and boat trailers.

Contractual Costs: Amount Requested $35.3

The majority of this is for vessel support during the survey. Short daylight and winter weather preclude the efficient and safe use of a field camp. Therefore it is necessary to charter a larger vessel to provide housing and tow skiffs when necessary in inclement weather to make travel safer and more efficient. Costs are based on past bids that vary from year to year. Weather delays also are factored in to the estimates. Fuel costs and inflation have increased charter costs and due to the uncertainty of charter boat availability costs may vary greatly for similar vessels at certain times of year.

NOTE: If it is decided by the Trustee Council not to do the additional surveys (comparing 1972 and 1973 surveys with 2007 data) then costs for personnel and charter will decrease.

We have never had to postpone or delay surveys due to mechanical problems. Boat and motor maintenance is necessary for safe and efficient operation. Honda recommends a

complete tune-up every 200 hours (about the amount we put on each motor during a survey). The minimum cost is $250 per motor – we have three motors. That leaves just $1250 for any other repairs and maintenance. Shop labor is at minimum $90/hour.

One of our boats and motors is provided in-kind by ADF&G.

Air Charter costs are based on floatplane access (206) from either Anchorage or Cordova depending upon the location and situation. This includes changes in field crew if needed, emergency evacuation, emergency delivery of boat parts or survey equipment.

We do not have a dedicated truck (or vehicle for the waterfowl program) and need to arrange to use shared vehicles. We require 2 vehicles to tow the boats and transport gear to and from Whittier and move boats to service etc. This pays for 1 month of leasing costs for one shared vehicle or the two we require. The other is provided in-kind by ADF&G.

Commodities Costs: Amount Requested $2.7

The biggest costs are for boat fuel, purchased in Whittier and boat parts. Boat fuel is based on the amount used in past surveys for 2 skiffs operating for almost 200 hours each in a 15-day period. We are adding additional surveys this year and will require more fuel. Fuel costs are estimated a year in advance. Many parts need to be replaced annually and/or require spare parts in case of failure during the field season. It would be costly and inefficient to return to town in the middle of a survey to buy parts so we need to be prepared. Safety is also a factor. Harlequin duck surveys are conducted in rocky nearshore areas and prop damage is not uncommon. Boat propellers alone cost about $100 each and we require a minimum of 5 extra propellers.

Equipment Costs: Amount Requested $0.0

No new equipment is being purchased.

Why costs not being fully covered by ADF&G.

The Alaska Department of Fish and Game, has a statutory mandate to manage and protect wildlife and their habitats on state and private lands for the benefit of Alaskans. The ADF&G Statewide Waterfowl Program has very limited funds to fulfill the obligations of this mandate and funds will not be increased in 2007. Limited staffing and funding precludes ADF&G from undertaking these surveys as part of normal operations and in the past ADF&G has not conducted marine bird surveys in PWS as part of its normal waterfowl management functions nor responded to oil spills.

ADF&G is offering to partner to study the effects of lingering oil from the EVOS by providing staff salaries, and ADF&G in-kind contributions of s boats, vehicles, and office equipment and supplies, and filed sampling equipment. In addition ADF&G is covering some salary costs.

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

Budget Category:	Authorized FY 2006	Proposed FY 2007
Personnel		$41.1
Travel		$0.4
Contractual		$35.3
Commodities		$2.7
Equipment		$0.0
Subtotal	$0.0	$79.5
General Administration		$7.2
Project Total	$0.0	$86.7
Full-time Equivalents (FTE)		0.4
Other Resources		

LONG RANGE FUNDING REQUIREMENTS					
			Estimated FY 2008		
			$90.1		
Dollar amounts are shown in thousands of dollars.					
$24.1					

Comments:

Cost Share: Fish and Game providing salary for PI (2 months) and WBII (1 month)
See Note in Budget Justification - costs based on repeating population monitoring survey conducted from 1997 to 2006 and additional survey to comapre winters 1972 and 1973 surveys with present abundance in same areas. If later survey is not conducted costs will be reduced.

This proposal is being accepted as a 1-Yr request.
Details for the FY 08 estimate were not supplied.
FY 08 budget was not detailed within the budget justification.
The financial information is only considered complete for FY 07 funding request.

G&A formula was corrected to 9% - 8/13/06

FY07

Project Number: 070759
Project Title: Harlequin Duck Population Dynamics in PWS
Agency: Alaska Department of Fish and Game

Prepared: 4 August 2006
Revised G&A on 13 August 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2007 - September 30, 2008

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2007
D. Rosenberg	WBIII, Principal Investigator	18L	1.0	8.6	4.8	13.4
Mike Petrula	WBII, survey and data analysis	16 G	0.7	6.9	1.5	6.3
1 F&G Tech.	F&G Tech. III, Field Technician	11G	1.0	5.1	1.0	6.1
Doug Hill	WB1	14E	1.5	5.7	2.9	11.5
Aaron Christ	Biometrician	20C	0.5	7.5	0.0	3.8
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		4.7	33.8	10.2	
					Personnel Total	$41.1

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2007
Whittier parking, 2 vehicles- 18 days					0.2
Whittier Toll - 2 vehicles and trailers		4			0.2
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.4

FY07

Project Number: 070759
Project Title: Harlequin Duck Population Dynamics in PWS
Agency: Alaska Department of Fish and Game

Prepared: 4 August 2006
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2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

Contractual Costs:	Proposed
Description	FY 2007
Boat and outboard motor repair and maintenance	2.0
Air charter for field support 4 hrs @ $400/hr	1.6
Launch fee, Trailer and boat moorage Whittier	0.2
Vessel support for March surveys 20 days @1500/day	30.0
Truck Leasing Costs	0.5
Manuscript Publication	1.0
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$35.3

Commodities Costs:	Proposed
Description	FY 2007
Boat fuel 450 gallons @ $3.50/gal	1.6
Boat supplies- replacement parts, props, fuel lines, fuel filters, water filters, battery, absorbent rags, oil, emergency provisions	0.8
Field survey supplies- rite-in-rain notebooks/paper, nautical charts, batteries,	0.3
Commodities Total	$2.7

FY07

Project Number: 070759
Project Title: Harlequin Duck Population Dynamics in PWS
Agency: Alaska Department of Fish and Game

Prepared: 4 August 2006
Revised G&A on 13 August 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2007
NONE			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.			0.0
		New Equipment Total	$0.0

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency
19 ft.rigid hull inflatable	1	ADFG
17 ft. Boston Whaler	1	ADFG
10x40 binoculars	4	ADFG
Spotting Scopes	2	ADFG
Survival Suits	4	ADFG
Outboard Motors/various hp	5	ADFG
GPS	2	ADFG
Marine VHF radios	4	ADFG
Truck	1	ADFG

FY07

Project Number: 070759
Project Title: Harlequin Duck Population Dynamics in PWS
Agency: Alaska Department of Fish and Game

Prepared: 4 August 2006
Revised G&A on 13 August 2006

Assessing potential oil exposure to harlequin duck populations in Prince William Sound

Metadata:

Identification_Information:

Citation:

Citation_Information:

Originator: Dan Rosenberg

Publication_Date: 20060803

Title:

Assessing potential oil exposure to harlequin duck populations in Prince William Sound

Edition: 2007

Geospatial_Data_Presentation_Form: map

Publication_Information:

Publication_Place: Anchorage AK

Publisher: Alaska Department Fish and Game

Description:

Abstract:

Harlequin duck (Histrionicus histrionicus) populations in Prince William Sound (PWS) have not recovered from the effects of 1989 Exxon Valdez Oil Spill. Studies suggest full recovery is constrained by oil exposure through ingestion of contaminated prey or through direct contact with sediments. The geographic extent of potential oil exposure (where concentrations of harlequin ducks overlap with lingering oil) throughout the spill region of western PWS has not been quantified. Passive sampling devices will act as surrogates for plumage oiling and potential ingestion of contaminated prey and serve as indicators of oil exposure to harlequin ducks. Sampling will occur in late-winter/early spring (mid-March to mid-April) before birds migrate to breeding areas. This study will expand the geographic area sampled for bioavailable oil by other researchers and improve our ability to detect lingering oil and assess recovery in harlequin ducks and other intertidal predators.

Purpose:

Monitor recovery of harlequin ducks (histrioicus histrionicus) from the effects of the 1989 Exxon Valdez oil spill.

Supplemental_Information:

Lingering Oil

***** Spatial Reference Information (Beg) *****

Projection Parameters Clarke_1866_Albers Projection: Albers False_Easting: 0.000000 False_Northing: 0.000000 Central_Meridian: -154.000000 Standard_Parallel_1: 55.000000 Standard_Parallel_2: 65.000000 Latitude_Of_Origin: 50.000000

Spatial Information Raster: Number of Columns: Number of Rows: Pixel Resolution (m): Data Type: byte

***** Spatial Reference Information (End) *****

Time_Period_of_Content:

Time_Period_Information:

Range_of_Dates/Times:

Beginning_Date: 20071101

Ending_Date: 20081101

Currentness_Reference: ground condition

Status:

Progress: Planned

Maintenance_and_Update_Frequency: As needed

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -148.33

East_Bounding_Coordinate: -146

North_Bounding_Coordinate: 61.2

South_Bounding_Coordinate: 59.667

Keywords:

Theme:

Theme_Keyword_Thesaurus: McGraw-Hill Dictionary of Scienctific Technical Terms

Theme_Keyword: harlequin ducks

Theme_Keyword: histrionicus

Theme_Keyword: marine birds

Theme_Keyword: seaduck

Theme_Keyword: passive sampler

Theme_Keyword: oil spill
Theme_Keyword: SPMD
Theme_Keyword: lingering oil
Theme_Keyword: Exxon Valdez Oil Spill
Place:
Place_Keyword_Thesaurus: Dictionary of Alaska Place Names
Place_Keyword: Prince William Sound
Place_Keyword: Alaska
Temporal:
Temporal_Keyword_Thesaurus: Websters New World Dictionary
Temporal_Keyword: winter
Temporal_Keyword: spring
Temporal_Keyword: summer
Access_Constraints: Permission of Provider
Use_Constraints: Permission of Provider
Browse_Graphic:
Browse_Graphic_File_Name: NA
Browse_Graphic_File_Description: NA
Browse_Graphic_File_Type:

Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Point

Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Dan Rosenberg
Contact_Organization: Alaska Department Fish and Game
Contact_Address:
Address_Type: Mailing and Physical Address
Address: 525 W. 67th Ave
City: Anchorage
State_or_Province: AK
Postal_Code: 99518
Country: USA
Contact_Voice_Telephone: 907-267-2453
Contact_Facsimile_Telephone: 907-267-2859
Contact_Electronic_Mail_Address: dan_rosenberg@fishgame.state.ak.us

Resource_Description: Distribution of Lingering Oil 2007 Passive Sampling
Distribution_Liability:
Distributor assumes no liability for misuse or misinterpretation

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Metadata_Reference_Information:
Metadata_Date: 20060803
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Dan Rosenberg
Contact_Organization: Alaska Department Fish and Game
Contact_Address:
Address_Type: Mailing and Physical Address
Address: 525 W. 67th Ave
City: Anchorage
State_or_Province: AK
Postal_Code: 99518
Country: USA
Contact_Voice_Telephone: 907-267-2453
Contact_Facsimile_Telephone: 907-267-2859
Contact_Electronic_Mail_Address: dan_rosenberg@fishgame.state.ak.us
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998

Generated by mp version 2.6.0 on Fri Aug 04 13:41:33 2006