Sea Duck Joint Venture
Annual Project Summary for Endorsed Projects
FY 2005 – (October 1, 2004 to September 30, 2005)
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Project Title (SDJV Project #65): Spring Migration of Surf Scoters Along the Pacific Coast: Important Habitats and Energetic Implications

YEAR 1 of a 3 YEAR STUDY

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Project Description:
Although Pacific Surf Scoters have been the subject of a growing body of research during winter, little is known about their spring migration ecology. Spring migration conditions have important implications for waterfowl productivity, and habitat conditions and nutrient reserve levels during spring migration have been implicated as important factors affecting broad-scale and long-term population declines. An important part of establishing connectivity and cross-seasonal effects through the annual cycle is the determination of distributions and habitat requirements at critical annual cycle stages. Satellite and VHF transmitters have been deployed on Surf Scoters across their Pacific wintering range, including Baja California Mexico, San Francisco Bay, Puget Sound, and the Strait of Georgia. As part of a collaborative study of Surf Scoter spring migration ecology, we are using a combination of satellite telemetry, radio telemetry, and surveys to document spring distributions of Pacific Surf Scoters throughout southeast Alaska and the northern BC coast, with a focus on identifying important stopover areas and associated habitat attributes. We also collected birds to obtain information on spring energetics. In this document, we describe the findings from the first year of this 3-year project.

Objectives:
This project has a variety of objectives: (1) to identify important Surf Scoter late spring migration stopover areas, (2) to identify which habitat attributes correspond to identified important areas (e.g. herring spawn events, bathymetry, substrate type), and (3) to relate the spatial and temporal use of these sites to the habitat attributes of these sites. This project has direct implications for the identification of important coastal habitats – a high priority in the SDJV Strategic Plan. In addition, this work will contribute to studies of body mass variation in relation to areas (e.g., San Francisco Bay and Strait of Georgia), seasons (late winter, pre-migration, migration), and spawn occurrence, as well as to studies of the cross-seasonal persistence of contaminants in Surf Scoters. Our studies will provide an important link for understanding nutritional status and relationships among wintering, migrating, and breeding areas.

Preliminary Results:

Satellite Telemetry

Considering the large distances and remote areas involved, satellite telemetry is a particularly useful method for investigating spring migration ecology. Satellite transmitter (PTT) locations provide an unbiased and comprehensive picture of individual bird movements, without the spatial and temporal constraints of conventional radio-telemetry and surveys. However, sample sizes are limited, and it is uncertain whether the small number of satellite transmitters is representative of population-level patterns.

This project relies on satellite telemetry data from cooperators all along the Pacific coast. This broad deployment allows for strong inferences about migration strategies of Pacific Surf Scoters in general, rather than just those from any particular wintering site. Table I shows the number of satellite transmitters deployed by wintering site over the past few years. Transmitters that did not leave wintering areas are not included.

Table I. Number of satellite transmitters (PTTs) deployed in Pacific Surf Scoters in 2003, 2004, and 2005. Transmitters that did not leave wintering areas are not included.

Wintering Site	Partner	2003	2004	2005
Strait of Georgia, BC	CWS/SFU	0	0	8
Puget Sound, WA	WDFG	0	7	16
San Francisco Bay, CA	USGS	8	0	9
Baja California, Mexico	USGS - ASC	0	0	5
	Total	**8**	**7**	**38**

Satellite telemetry data from these years indicates several areas where Surf Scoters likely congregate during spring migration. In British Columbia, these areas include the Fraser Delta and the Strait of Georgia (Baynes Sound). In Southeast Alaska, these areas include Annette Island and West Behm Canal near Ketchikan, Stephens Passage and Gastineau Channel near Juneau, and northern Lynn Canal, Chilkoot Inlet, Chilkat Inlet, and Taiya Inlet. An overview of PTT locations during spring migration (April and May) from these years is shown in Figure 1.

Two general spring migration strategies are apparent from the satellite location data. Some birds stage in the southern Strait of Georgia and Washington State and then head directly inland towards breeding grounds, whereas others stage in the Strait of Georgia, then move up the coast and stage in northern BC or Southeast Alaska prior to heading inland. Of the 53 satellite marked individuals over all three years, 22 individuals staged in Washington State and the southern Strait of Georgia before turning inland, while 27 individuals in northern BC or Southeast Alaska prior to heading towards breeding grounds. The remaining 4 birds from Baja California Mexico did not pass through the Washington/British Columbia area during migration.

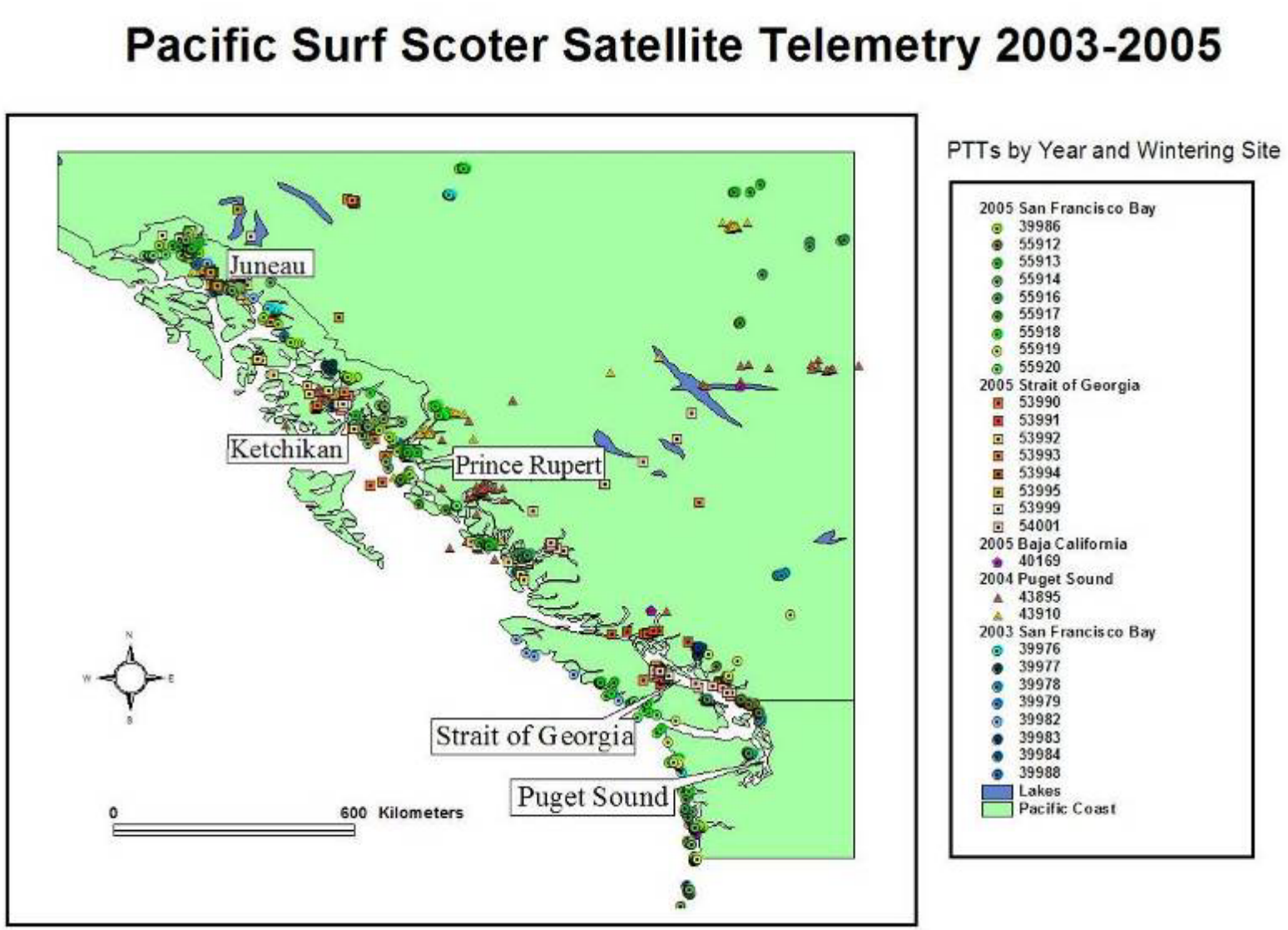

Figure 1. Summary map showing spring (April and May) locations of Surf Scoters marked with satellite transmitters in 2003, 2004, and 2005. Note: Surf Scoters marked in Puget Sound in 2004 that turned inland from Washington State/Strait of Georgia and Surf Scoters marked in Puget Sound in 2005 are not shown.

Conventional VHF Telemetry

Research partners have marked Surf Scoters with VHF transmitters at wintering sites along the Pacific coast. Table II shows the number of VHF radios deployed by wintering site in 2005. Radios that did not leave the wintering sites (either shed, dead, or non migrant) are not included.

Table I. Number of VHF transmitters deployed in Pacific Surf Scoters in 2005.

Wintering Site	Partner	2005
Strait of Georgia, BC	CWS/SFU	69
Puget Sound, WA	WDFG	35
San Francisco Bay, CA	USGS	68
Baja California, Mexico	USGS - ASC	9
	Total	**181**

Satellite telemetry data from the current and previous years had identified several promising stopover areas near Ketchikan and Juneau, and telemetry flights were planned to investigate these areas. Input from fisheries biologists regarding herring spawn events was also factored into planning flight routes. Observers flew a total of 15 hours over five days (April 26, May 3, 8, 11 and 19) in a Helio Courier.

We located a total of 18 VHF-marked individuals from the following wintering areas: 9 from San Francisco Bay, 4 from Puget Sound, and 5 from the Strait of Georgia. Figure 2 summarizes the locations of all radios heard and flocks observed. Most of the radio locations occurred in the northern end of Lynn Canal, including Sullivan Island, Chilkoot Inlet, Chilkat Inlet, and Taiya Inlet. Considering that the coastline covered during these telemetry flights is only a very small proportion of the habitat available, the number of VHF radios heard indicates that these are habitat areas of considerable use and importance.

Surveys

During telemetry flights, we also noted the location and size of all aggregations of Surf Scoters observed along the coastline (Fig. 2). In the Ketchikan area, most of the observations were made in West Behm Canal, and at the southern end of Annette Island. Near Juneau, large aggregations were observed in Gastineau Channel, Stephens Passage, and Berners Bay. Very large aggregations were also observed around the northern end of Lynn Canal; including Sullivan Island, Chilkoot Inlet, Chilkat Inlet, and Taiya Inlet. Some White-winged Scoters were observed in some of the flocks around and north of Juneau, particularly in Stephens Passage and Gastineau Channel. The White-winged Scoters were typically observed intermixed with smaller flocks, and were not observed in the large dense aggregations seen around the northern end of Lynn Canal.

Satellite telemetry, conventional radio telemetry, and surveys all provided a similar depiction of the areas being used by migrating Surf Scoters. Observations during boat-based work also indicated that the areas identified by telemetry and aerial observations were heavily used. In general, each of these data types provided useful information in confirming the importance of these identified stopover sites. A notable exception was Berners Bay, where we observed large aggregations of Surf Scoters during aerial surveys and boat-based work, but had no indications of use from satellite or radio telemetry data.

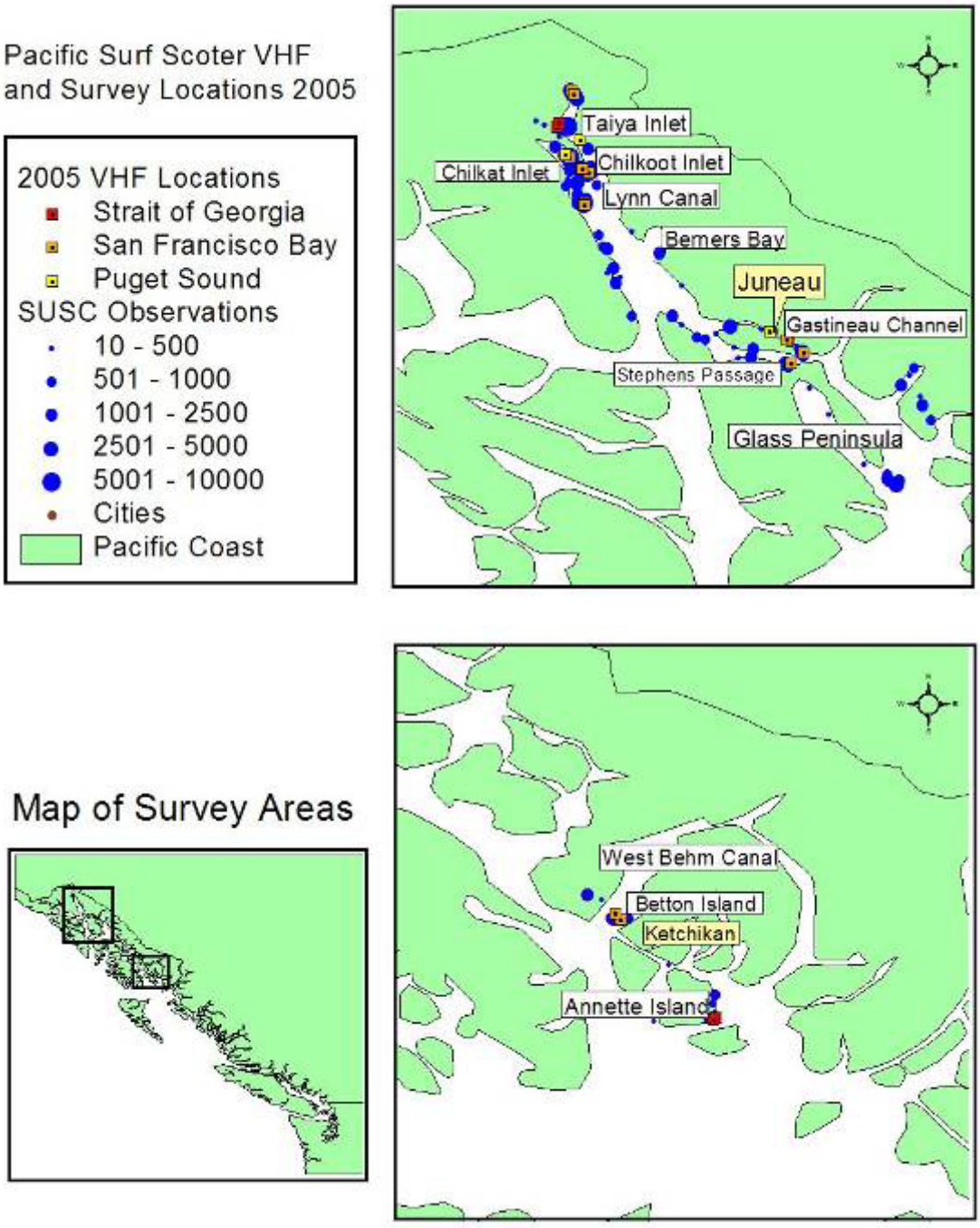

Figure 2. Summary maps showing VHF locations and aerial survey observations of Surf Scoters in April and May 2005.

Important Habitat Attributes

Of the habitat attributes related to Surf Scoter distribution and abundance, the relationship between Surf Scoter aggregations and herring spawn is the most noticeable. Although we conducted our observations fairly late in the overall spawn chronology, the aggregations (as identified by the methods above), were largely tied to areas with active spawn.

Large numbers of birds were observed in areas where herring spawn had recently occurred, and preliminary diet observations from collections indicate that Surf Scoters feed heavily on this resource when available (Fig. 3). Large aggregations were also seen in areas that are not known to be herring spawn events, but were anecdotally referred to as eulachon spawn events. Bathymetry and substrate type also appear to be related to use as a stopover site, as these factors are related to the availability of food resources.

Figure 3. Surf Scoters feeding on herring spawn near Betton Island, AK on April 26 2005. (Photo credit: M. Wilson)

Collections

Collections were conducted to obtain tissue samples for stable isotope, body condition, diet, and contaminant analysis, in collaboration with Eric Anderson (University of Wyoming) and Susan Wainwright-De La Cruz (USGS). A total of 50 Surf Scoters (25 male and 25 female) were collected at sites near Ketchikan (Betton Island), and around Juneau and Lynn Canal (Berners Bay, Colt Island, and Mab Island). Samples taken included blood, feathers, liver, kidney, adipose and breast tissue. Lab analyses are pending: samples and carcasses are being stored at the San Francisco Bay Estuary Field Station.

Preliminary diet data show that scoters are feeding heavily on herring spawn when it is available (Fig. 4). Of the 50 birds collected, 28 had been feeding on herring spawn, 8 had been feeding on mussels, and 14 had no observable esophageal contents. In areas where we could visually confirm recent spawn activity (roe on kelp), 28 of the 39 birds collected in these sites were feeding on spawn.

Figure 4. Herring spawn and gizzard from collected Surf Scoter, Berners Bay AK, May 2005 (Photo credit: M.Wilson).

Birds collected at the stopover sites showed a noticeable increase in mass in relation to wintering and early spring birds in the Strait of Georgia. Seasonal variation in body mass in female and male Surf Scoters is shown in Figure 5.

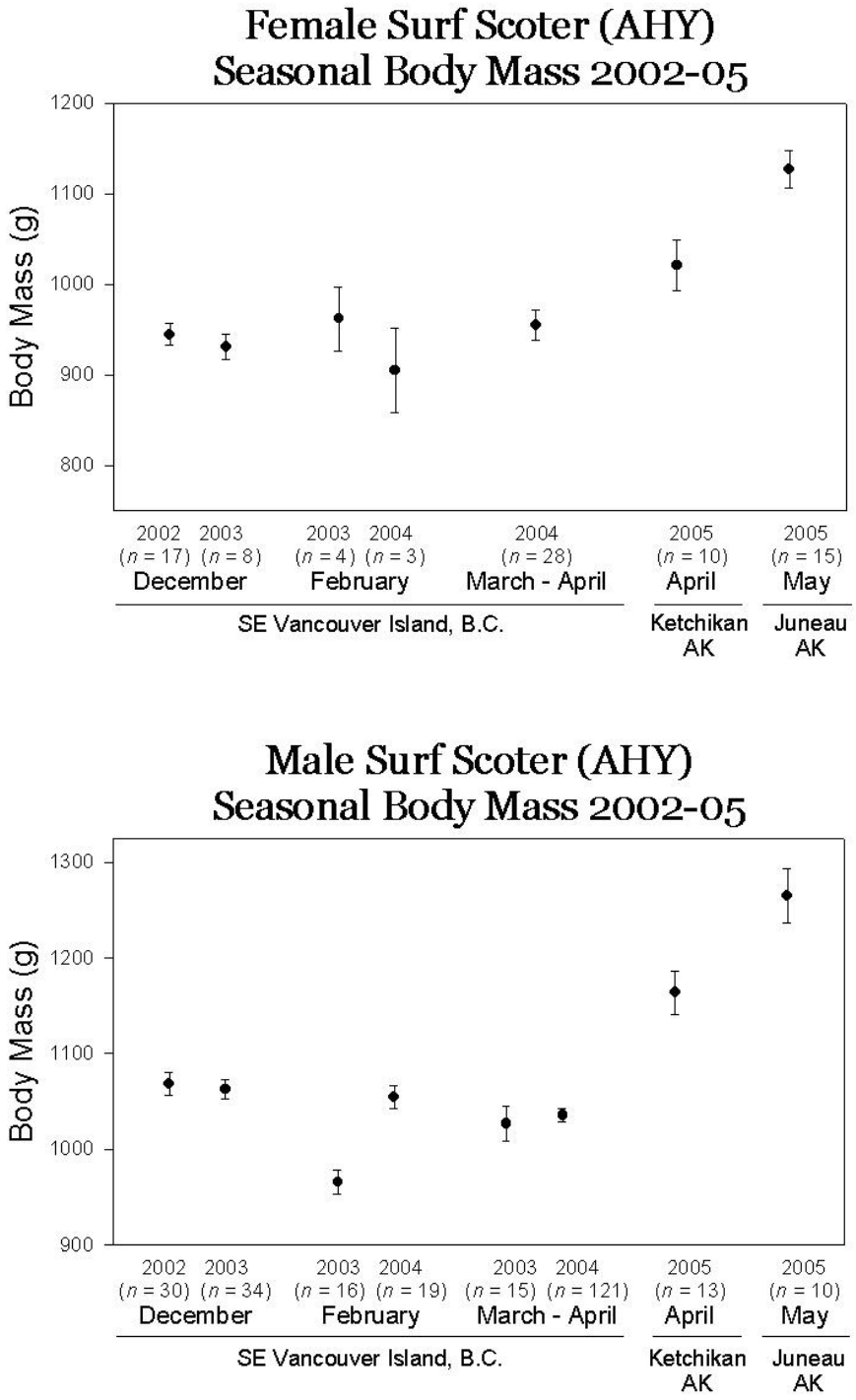

Figure 5. Seasonal body mass variation in female and male Surf Scoters in 2002 - 2005.

Project Status:

We accomplished the objective of identifying some important stopover areas in SE Alaska. The use of conventional radio telemetry provided a useful confirmation of the effectiveness of satellite telemetry over such large areas. We also identified several important biotic and abiotic habitat attributes (spawning events, bathymetry, and substrate type), which are being further studied using existing habitat information and GIS, although there is still considerable GIS, lab, and field work needed to fully understand these important spring migration habitats.

Partners will be deploying VHF and PTT transmitters at some wintering sites, and these data will be incorporated into this project in Year 2. We hope to increase sample sizes in all aspects of this project (location data, habitat information, and energetics data).

Given the large number of Surf Scoters using the abundant coastline in SE Alaska (and the proportionately low number of deployed VHF transmitters) we propose to use systematic survey flights for identifying important stopover areas, and will use aerial telemetry to supplement these systematic coastline surveys. In addition to aerial telemetry, we are also considering the use of systematic boat and ground telemetry surveys. Many large flocks were repeatedly located in relatively accessible areas, and these surveys would maximize the likelihood of locating these birds. In order to document the effects of herring spawn on scoter distribution and abundance during migration, we propose to conduct these surveys over the course of the herring spawn season, with surveys flown pre-spawn, height of spawn, and post-spawn.

Project Funding Sources (US$)

SDJV (USFWS) Contribution	Other U.S. federal contributions	U.S. non-federal contributions	Canadian federal contributions	Canadian non-federal contributions	Source of funding (agency or organization)
$36,661					
				$42,235	SFU
	$28,000				USGS
		$18,000 $10,000			Wa Dept Fish + Wild Univ. Wyoming

Total Expenditures by Category (US$)

ACTIVITY	BREEDING	MOLTING	MIGRATION	WINTERING	TOTAL
Banding					
Surveys					
Research			**$134,896**		
Communication					
Coordination					