SAMPLING FOR HIGHLY PATHOGENIC ASIAN H5N1 AVIAN INFLUENZA IN MIGRATORY BIRDS IN ALASKA

Results of 2006 Field Season

U.S. Fish and Wildlife Service, Region 7 (Alaska)
U.S. Geological Survey, Alaska Science Center

Executive Summary

The purpose of this report is to summarize the accomplishments of the U.S. Fish and Wildlife Service – Region 7, the U.S. Geological Survey (USGS) – Alaska Science Center (ASC), and their partners for early monitoring and detection for Highly Pathogenic Avian Influenza (HPAI) in wild birds in Alaska. The Department of the Interior's (DOI) role in the National Strategy for Pandemic Influenza is to sample and test high priority migratory bird species for HPAI. To accomplish this, an interagency national strategic plan was developed which targeted wild bird species in North America that have the highest risk of being exposed to or infected with HPAI. This plan focused on birds that migrate directly between Asia and North America. The geographic focus of this plan was on Alaska because Alaska represents a unique crossroads where migratory flyways from Asia and North America overlap.

The National Strategic Plan called for Alaska DOI and their partners to sample over 15,000 birds from high priority species in Alaska. Priority species were determined by an interagency committee and a sampling strategy was adopted (Alaska Interagency HPAI Bird Surveillance Working Group). Samples were collected from harvested birds during the spring subsistence and fall harvest, live bird sampling, and mortality investigations. All samples were processed by the USGS-ASC and sent to the USGS National Wildlife Health Center (NWHC) for analysis.

Alaska DOI and their partners collected 19,792 samples from wild birds. The Alaska Science Center processed and sent 16,807 samples to the NWHC. This total was composed of 5,212 samples from hunter harvested birds, 11,595 live bird samples, and 95 from dead birds. Because target sampling goals have been met for the majority of high priority species the ASC is archiving 2,985 samples from priority and non-priority species for future analysis.

Samples from 129 species of North American wild birds were tested. In the majority of samples from the 26 targeted "high-priority" species, avian influenza, as detected by the matrix RT-PCR test of the cloacal swab specimens was found in fifteen of these species. Of the 16,807 samples, 1.6% were positive for avian influenza virus according to the matrix RT-PCR test of cloacal samples. Results from virus isolation are pending. None of the samples collected in Alaska were positive for HPAI.

Species	Samples Collected			AI Positive	Prevalence
	Live	Harvest	Total		
Steller's Eider	708	0	708	6	0.008
Northern Pintail	961	440	1,401	85	0.061
Lesser Snow Goose	198	515	713	17	0.024
Emperor Goose	541	144	685	11	0.016
Spectacled Eider	343	7	350	2	0.006
Black Brant	1,768	311	2,079	8	0.004
Lesser Sandhill Crane	28	133	161	0	0
Tundra Swan	363	222	585	7	0.012
Long-tailed Duck	1	51	52	1	0.019
Pacific Common Eider	354	43	397	1	0.003
King Eider	3	677	680	6	0.009
Dunlin	875	23	898	2	0.002
Sharp-tailed Sandpiper	208	17	225	0	0
Bar-tailed Godwit	166	39	205	3	0.015
Ruddy Turnstone	26	4	30	0	0
Pectoral Sandpiper	528	53	581	0	0
Red Knot	73	6	79	0	0
Long-billed Dowitcher	132	33	165	0	0
Rock Sandpiper	159	14	173	0	0
Pacific Golden Plover	30	12	42	0	0
Buff-breasted Sandpiper	93	0	93	0	0
Aleutian Tern	302	0	302	1	0.003
Glaucous Gull	33	106	139	5	0.036
Eastern Yellow Wagtail	304	0	304	0	0
Arctic Warbler	774	0	774	0	0
Gray-cheeked Thrush	230	0	230	0	0
Non-target species	2,394	2,362	4,756	159	0.033
Mortalities	0	0	95	0	0
Archived samples	0	0	2985		
Total	11,595	5212	19,887		

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Acknowledgments

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SAMPLING FOR HIGHLY PATHOGENIC ASIAN H5N1 AVIAN INFLUENZA IN MIGRATORY BIRDS IN ALASKA

INTRODUCTION

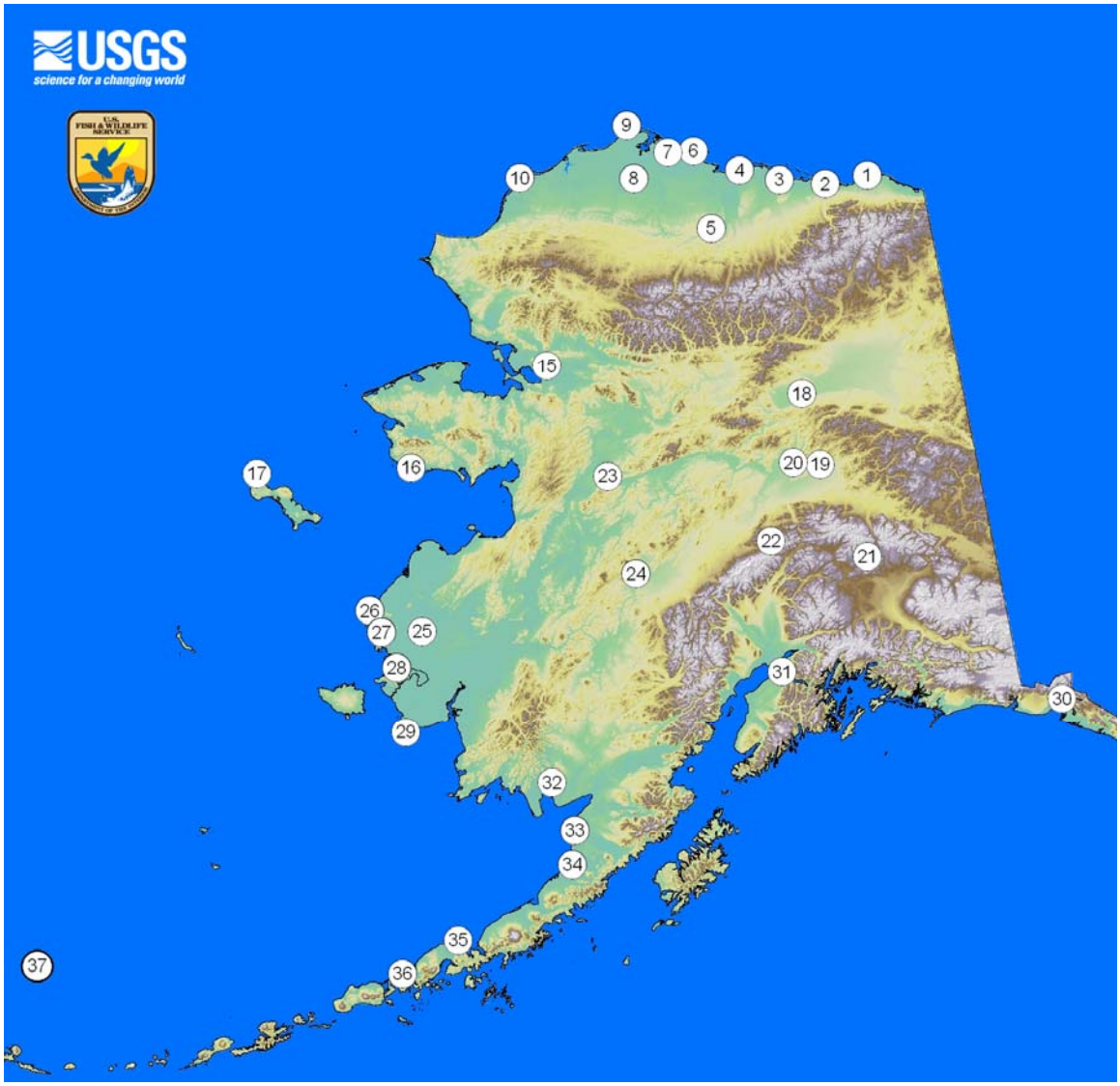
Highly pathogenic avian influenza (HPAI) type A of the subtype H5N1 has spread widely from southeast Asia into Europe, the Middle East, Africa, China, South Korea, Japan, and Russia (Webster et al. 2006, WHO 2006). To date, fifty-one countries have experienced outbreaks (Butler and Ruttimann 2006). Much debate centers on whether HPAI is spread by wild migratory birds, or through movement of domestic poultry and smuggled birds (Chen et al. 2005, Normile 2005, Van Borm et al. 2005, Kilpatrick et al. 2006, Muzaffar et al. 2006). Clearly, this disease occurs in wild birds, but the observed die-offs indicate that wild birds suffered high mortality and thus were not likely efficient carriers (Chen et al. 2005). However, recent data suggest that apparently healthy, wild birds are carriers of HPAI H5N1 (Gilbert et al. 2006), substantiating concerns that migrating birds may distribute this virus around the globe (Chen et al. 2006).

Alaska represents a unique crossroads where migratory flyways from Asia and North America overlap. Species of birds that winter in southern Asia return and breed in Alaska each summer. Conversely, species of birds that winter in North America cross the Bering Straits and spend a portion of the summer in Asia. Alaska was identified as the most likely location that Asian H5N1 would first occur in North America if introduced by wild birds (Interagency Working Group 2006).

In early 2006, an Alaska Interagency Avian Influenza Working Group was formed to develop a ranking matrix for selecting priority species to be sampled within Alaska. Most wild bird species with populations that utilize areas of both Alaska and Asia were identified and considered in the ranking exercise. For each species, a score was given for each of five factors: 1) proportion of the population occurring in Asia [score 1-5; 5=100%], 2) contact with a known 'hot spot' or source [1=no contact, 2=contact], 3) habitats used in Asia in context with exposure potential [1=offshore marine, 2=estuary, 3=terrestrial, 4=freshwater], 4) population size in Alaska [1=1,000, 2=10,000, 3=100,000, 4=1,000,000], and 5) ability to obtain a representative sample of sufficient size [1=no, 2=maybe, 3=yes]. Details of the ranking system used for selecting the species sampled in 2006 are presented in "Sampling Protocol for Highly Pathogenic Asian H5N1 Avian Influenza in Migratory Birds in Alaska" (Alaska Interagency HPAI Bird Surveillance Working Group 2006).

This report is a summary of migratory bird species sampled in Alaska by U.S. Fish and Wildlife Service, U.S. Geological Survey, and their partners in 2006. Sampling of live birds occurred throughout the state (Fig. 1) and hunter harvest samples were collected in regions that traditionally participate in subsistence and sport harvest (Fig. 2, pg. 80). The report is separated into sampling method, species sampled, number of samples secured by geographic area, and the influenza test results for these samples provided by the U.S. Geological Survey, National Wildlife Health Center, Madison, Wisconsin.

Figure 1. Live bird sampling locations for H5N1 Avian Influenza in Alaska, 2006. For information on species sampled and specific locations see key following map.



Site No.	Species	General location	Specific location
1	Buff-breasted Sandpiper	North Slope	Okpilak Delta
1	Dunlin	North Slope	Okpilak Delta
1	Long-billed Dowitcher	North Slope	Okpilak Delta
1	Pectoral Sandpiper	North Slope	Okpilak Delta
1	Ruddy Turnstone	North Slope	Okpilak Delta
2	Buff-breasted Sandpiper	North Slope	Canning River Delta
2	Long-billed Dowitcher	North Slope	Canning River
2	Pectoral Sandpiper	North Slope	Canning River

Site No.	Species	General location	Specific location
2	Ruddy Turnstone	North Slope	Canning River
3	Black Brant	North Slope	Prudhoe Bay
3	Buff-breasted Sandpiper	North Slope	Prudhoe Bay
3	Dunlin	North Slope	Prudhoe Bay
3	Long-billed Dowitcher	North Slope	Prudhoe Bay
3	Pectoral Sandpiper	North Slope	Prudhoe Bay
4	Dunlin	North Slope	Colville River Delta
4	Pectoral Sandpiper	North Slope	Colville River Delta
4	Spectacled Eider	North Slope	Colville River Delta
4	Tundra Swan	North Slope	Colville River Delta
5	Arctic Warbler	North Slope	Brooks Range-Colville River
5	Gray-cheeked Thrush	North Slope	Brooks Range-Colville River
6	Black Brant	North Slope	Teshekpuk Lake-north
7	L. Snow Goose	North Slope	Ikpikpuk River
8	Buff-breasted Sandpiper	North Slope	NPR-A
8	Dunlin	North Slope	NPR-A
8	Long-billed Dowitcher	North Slope	NPR-A
8	Pectoral Sandpiper	North Slope	NPR-A
8	Ruddy Turnstone	North Slope	NPR-A
9	Buff-breasted Sandpiper	North Slope	Barrow
9	Dunlin	North Slope	Barrow
9	Glaucous Gull	North Slope	Barrow
9	Long-billed Dowitcher	North Slope	Barrow
9	Northern Pintail	North Slope	Barrow
9	Pectoral Sandpiper	North Slope	Barrow
10	Dunlin	North Slope	Icy Cape, Kasegaluk Lagoon
10	Long-billed Dowitcher	North Slope	Icy Cape, Kasegaluk Lagoon
15	Northern Pintail	Selawik NWR	Kauk River
16	Arctic Warbler	Seward Peninsula	Seward Peninsula
16	Eastern Yellow Wagtail	Seward Peninsula	Seward Peninsula
16	Dunlin	Seward Peninsula	Wooley Lagoon
17	King Eider	St. Lawrence	St. Lawrence Island
18	Northern Pintail	Interior	Yukon Flats NWR, Mallard Lake
19	Sandhill Crane	Interior	Fairbanks, Creamers Field
20	Northern Pintail	Interior	Minto Flats State Game Refuge, Minto Lakes
21	Arctic Warbler	Interior	Denali Highway
22	Arctic Warbler	Interior	Denali NPP
23	Northern Pintail	Lower Yukon	Koyukuk NWR, Willow Lake
24	Northern Pintail	Lower Yukon	Innoko NWR, Kaiyup Flat
24	Northern Pintail	Lower Yukon	Innoko NWR, Netletna River
24	Northern Pintail	Lower Yukon	Innoko NWR, Upper Iditarod River Lakes
25	Northern Pintail	YKD-central	Kgun Lake
26	Eastern Yellow Wagtail	YKD-central	Askinuk Mtns, Kagankaguti Lake
26	Eastern Yellow Wagtail	YKD-central	Cape Romanzof
26	Gray-cheeked Thrush	YKD-central	Askinuk Mtns, Kagankaguti Lake
26	Gray-cheeked Thrush	YKD-central	Cape Romanzof

Site No.	Species	General location	Specific location
27	Bar-tailed Godwit	YKD-central	Old Chevak
27	Bar-tailed Godwit	YKD-central	Tutakoke
27	Black Brant	YKD-central	Tutakoke
27	Common Eider	YKD-central	Tutakoke
27	Common Eider	YKD-central	Kanaryarmiut Station
27	Dunlin	YKD-central	Tutakoke
27	Emperor Goose	YKD-central	Manokinak River
27	Emperor Goose	YKD-central	Old Chevak
27	Glaucous Gull	YKD-central	Tutakoke
27	Long-billed Dowitcher	YKD-central	Kanaryarmiut Station
27	Long-billed Dowitcher	YKD-central	Tutakoke
27	Pectoral Sandpiper	YKD-central	Kanaryarmiut Station
27	Pectoral Sandpiper	YKD-central	Tutakoke
27	Red Knot	YKD-central	Tutakoke
27	Rock Sandpiper	YKD-central	Tutakoke
27	Sharp-tailed Sandpiper	YKD-central	Old Chevak
27	Sharp-tailed Sandpiper	YKD-central	Tutakoke
27	Spectacled Eider	YKD-central	Kanaryarmiut Station
27	Spectacled Eider	YKD-central	Tutakoke
28	Black Brant	YKD-central	Baird Inlet
28	Black Brant	YKD-central	Kigigak Island
28	Black Brant	YKD-central	Hazen Bay
28	Common Eider	YKD-central	Kigigak Island
28	Emperor Goose	YKD-central	Baird Inlet
28	Emperor Goose	YKD-central	Kigigak Island
28	Spectacled Eider	YKD-central	Kigigak Island
28	Tundra Swan	YKD-south	Yukon-Kuskokwim Delta
29	Steller's Eider	YKD-south	Kuskokwim Shoals
30	Aleutian Tern	Southeast	Yakutat
31	Pectoral Sandpiper	Cook Inlet	Anchorage Coastal Wildlife Refuge
32	Arctic Warbler	Bristol Bay	Dillingham
33	Bar-tailed Godwit	Alaska Peninsula	Egegik Bay
33	Dunlin	Alaska Peninsula	Egegik Bay
33	Pacific Golden-Plover	Alaska Peninsula	Egegik Bay
33	Red Knot	Alaska Peninsula	Egegik Bay
33	Rock Sandpiper	Alaska Peninsula	Egegik Bay
34	Dunlin	Alaska Peninsula	Ugashik Bay
34	Pectoral Sandpiper	Alaska Peninsula	Ugashik Bay
34	Sharp-tailed Sandpiper	Alaska Peninsula	Ugashik Bay
35	Steller's Eider	Alaska Peninsula	Nelson Lagoon, Walrus Island
36	Steller's Eider	Alaska Peninsula	Izembek Lagoon
36	Tundra Swan	Alaska Peninsula	Izembek NWR
37	Common Eider	Aleutians	Near Islands (Attu, Agattu, and Nizki/Alaid Islands

Taxon: Steller's Eider (*Polysticta stelleri*)

Justification: The vast majority of Steller's Eiders breed in east Asia and return to Alaska each fall to molt and winter.

Ranking score: 15

Background: The Pacific population of Steller's Eider, currently estimated at approximately 80,000 birds, primarily breeds in the Siberian Arctic and molts, winters and stages along the Alaska Peninsula and northern Bristol Bay (Kertell 1991). Spring migration starts in April as birds disperse to breeding grounds; males and failed- and non-breeding females return to Alaskan molting areas in July and August. Successful breeders and juvenile birds likely return to Alaska in October.

Important molting areas include Izembek Lagoon, Nelson Lagoon, Seal Islands, and Kuskokwim Shoals. Molting eiders congregate in large dense flocks, which may facilitate transmission of disease amongst individuals by concentrating birds from a number of different breeding locations into relatively small areas.

Over 700 birds were sampled from Nelson Lagoon, Izembek Lagoon in Izembek National Wildlife Refuge (NWR), and Kuskokwim Shoals using a 2-stage stratified design. Logistic constraints precluded sampling at the Seal Islands. Each location is discussed separately and a final table presents the analytical results at the end of this section.

Nelson Lagoon: Steller's Eiders were captured, sampled, and released in Nelson Lagoon, a shallow bay sheltered by a series of barrier islands about 150 km northeast of Cold Bay, Alaska. There, Steller's Eiders occur as single-species flocks of flightless, molting birds during September and October.

Methods*:* Boats and equipment were staged out of the remote village of Nelson Lagoon and eider capture operations were based from the village and from a campsite on Deer Island, approx. 25 km southeast of the village. Flocks of flightless Steller's Eiders were herded onto the beach of barrier islands and into a holding pen using motorboats, kayaks, and by persons wading in shallow water. Swab samples were collected and sample vials containing preservation media were placed in a liquid nitrogen vapor shipper and air freighted to Anchorage. All birds were banded with #7A incoloy metal leg bands.

Results: A total of 837 Steller's Eiders was captured and banded at Nelson Lagoon. Cloacal swabs were collected from 262 Steller's Eiders (Table 1). Of those, eighteen

were adult females, 244 were adult males, and 10 were sub-adult males. Shallow water and extreme tides made eider herding and capture challenging; wind, rain, and fog were common and precluded trapping on several days.

AI Results: Five of the 262 Steller's Eider cloacal samples tested positive for avian influenza. None of the five samples were H5 or N1 positive. This represents a 2% prevalence of avian influenza in the Nelson Lagoon molting birds.

Table 1. Birds captured and cloacal swabs collected from molting Steller's Eiders at Nelson Lagoon, September 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Walrus Island	837	18	244	262

Other Accomplishments: Of the 837 captured eiders, 118 were birds banded in prior years (worn bands were replaced with new bands on 54 birds). Four of the recaptured birds (with color leg bands) were banded at Kodiak Island by Alaska Department of Fish and Game in 2004 and 2005 (one of those birds had been previously caught and banded at Nelson Lagoon in 1995). Also, another of those four had been marked with a satellite transmitter at Kodiak in March 2005 and migrated to Chukotka, Russia, the following summer. It molted at Nelson Lagoon in fall 2005, wintered again at Kodiak in 2005/06 and was headed north at Kuskokwim Shoals during its last transmission in May 2006; the 2006 Nelson Lagoon capture added another point to its history.

Izembek Lagoon

More than 20,000 Steller's Eiders arrive at Izembek Lagoon each fall to molt; these individuals include eiders from across their breeding range in northern Siberia and Alaska (Dau et al. 2000). The Steller's Eider Recovery Plan tasks Izembek NWR with quantifying annual survival rates at Izembek Lagoon through a systematic mark-recapture program. Izembek Refuge has been capturing and banding eiders in Izembek Lagoon on an intermittent basis from 1961-1984 and on an annual basis since 1991.

Methods: Capture operations consist of driving flocks of flightless eiders by boat into a corral set up on shore. Usually 3-5 boats and 1-2 kayaks are used during a drive. Most drives are conducted during a daytime low tide when eiders are concentrated in the channels of the lagoon and can be driven directionally toward a trap site. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 1,796 Steller's Eiders (745 females and 1,051 males) was captured and banded during six drives at three locations (NE Neumann Island, Blaine Point, and Cape Glazenap; Table 2). A seventh drive was conducted at a fourth location (Southend Creek), but no birds were successfully trapped during this drive. Cloacal swabs were

collected from 206 of the captured birds. Of those, 87 were adult females, and 119 were adult males.

AI results: One of the 206 Steller's Eider cloacal samples tested positive for avian influenza. This represents < 1% prevalence of avian influenza in the Izembek molting birds.

Table 2. Birds captured and cloacal swabs collected from Steller's Eiders at Izembek National Wildlife Refuge, September 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Neumann Island	95	14	24	38
Blaine Point	1087	16	46	62
Neumann Island	189	10	10	20
Neumann Island 2	423	45	39	84
Cape Glazenap	2	2	0	2
Total	1796	87	119	206

Other Accomplishments: Izembek Refuge captures up to 2,500 eiders to estimate annual survival rates for monitoring long-term changes in survival rates of the Steller's Eider population. To assess health and energetic demands, blood and morphometric data are also obtained. The Refuge also hosts the *Eider Journey* program, which provides a safe and informative educational experience for North Slope high school students to learn about birds that nest in their hometown.

Kuskokwim Shoals

More than 10,000 Steller's Eiders have been observed along the Kuskokwim Shoals during the molt period. Little is known about the breeding population origin of these individuals, however, a large proportion of radio marked Steller's Eiders from Barrow, Alaska, were thought to molt along the shoals. Molting birds were only found adjacent to one island (Kwigluk). There is a large eel grass bed found in the shallow water along the inside of this island making this habitat similar to Izembek Lagoon. Logistic expense and susceptibility to poor weather makes it unlikely that long term studies could be successfully conducted at this site.

Methods: Boats and equipment were staged out of the village of Kipnuk. Four capture drives were conducted on Kwigluk Island which lies 10 miles offshore and is a 40 mile round trip boat ride from Kipnuk. Lack of dry banding areas makes capture and processing of eiders in this area difficult. Long travel times are required to reach banding locations. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 531 Steller's Eiders (142 females and 389 males) was captured during four drives at Kwigluk Island (Table 3). This total includes one recapture of a bird originally banded at Izembek Lagoon in February 2004. Cloacal swabs were collected from 229 of the captured birds.

AI Results: None of the 229 Steller's Eiders cloacal samples tested positive for avian influenza.

Table 3. Birds captured and cloacal swabs collected from Steller's Eiders at Kwegluk Island Lagoon, September 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Kwegluk Island	531	62	165	2	229

Other Accomplishments: In addition to the AI samples, 71 blood samples were collected for serum chemistry and heavy metal analyses. Also, 50 feather samples were obtained as reference samples for stable isotopic signatures associated with the shoals.

North Slope:
We also collected 14 samples opportunistically from nesting and recovered dead birds on the North Slope. Cloacal swabs were collected from 11 captured and released Steller's Eiders and three birds found dead (Table 4). Thirteen birds were adult females, one was an adult male.

AI Results: All of the samples tested negative for AI.

Table 4. Bird samples collected opportunistically from nesting and recovered dead Steller's Eiders in Barrow, 2006.

Location	Total birds captured	Mortality event	AI samples		Total AI samples
			Female	Male	
Barrow	11	3	13	1	14

Table 5. Avian influenza analytical results for Steller's Eiders collected in Alaska, 2006.

Location	Total samples	Mortality	Total AI positive	Prevalence
Nelson Lagoon	262	0	5	0.02
Izembek NWR	206	0	1	0.005
Kuskokwim Shoals	229	0	0	0
North Slope	11	3	0	0
Total	708	3	6	0.025

Neesha Wendling, USFWS

Taxon: Northern Pintail (*Anas acuta*)

Justification: Northern Pintails are one of the most common ducks found in Alaska during the breeding season. The combination of band recovery and satellite telemetry data indicate that birds wintering in Asia are found in Alaska in summer and birds that winter in North America cross to Asia in summer. Thus, this species has regular contact with Asian species making it a likely vector for disease transmission.

Ranking score: 15

Background: Approximately 50% of the North American population of Northern Pintails is counted in Alaska each summer. Birds sampled in western Alaska in spring likely represent small proportions of Asian wintering birds. Pintails captured in late July and August likely represents some proportion of North American wintering birds returning from Asia. In developed areas, pintails prefer ephemeral wetlands and regularly utilize farm fields and wetlands. Thus, the habitats used by pintails increases their likelihood of exposure to poultry wastes.

Over 1,000 birds were sampled from six areas around the state using a 2-stage stratified design. Of those, 961 were live bird samples and 440 were hunter killed (see Spring Subsistence and Fall Harvest). Eight additional samples were archived. Each location is discussed separately and a final table presents the analytical results at the end of this section.

Spring
Spring Northern Pintails were sampled exclusively from subsistence birds. A total of 181 birds were sampled at three locations; Yukon Delta NWR (YDNWR), Seward Peninsula, and St. Lawrence Island from April through June (see Spring Subsistence).

Fall
Fall Northern Pintails were captured and sampled on molting and staging areas across Alaska in August. In addition, 259 samples were collected from fall harvested birds (see Fall Harvest).

Innoko NWR and Koyukuk NWR: Northern Pintails were captured, sampled and released at Kaiyuh Flats and Willow Lake. Kaiyuh Flats is 35 miles southeast of Nulato on the Northern Unit of Innoko NWR. The Kaiyuh Flats are an extensive network of lakes, sloughs, creeks, and rivers on the south side of the Yukon River. Willow Lake is a large, shallow lake approximately eight miles east of the village Huslia on the Koyukuk

NWR. Dulbi Slough originates at the north east end of Willow Lake and runs south ending at the confluence with the Koyukuk River.

Methods: Six rolled traps were pre-baited with cracked corn and barley. A two-person crew with the use of an aluminum canoe checked traps twice a day. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: Two hundred fifty-eight Northern Pintails were captured and banded at Kaiyuh Flats and Willow Lake. Cloacal swabs were collected from 245 Northern Pintails (Table 6). Of those, 18 were adult females, 4 were adult males, 147 were juvenile females and 77 were juvenile males.

AI Results: Twenty-five of the 245 Northern Pintail cloacal samples tested positive for avian influenza. None of the twenty-five samples were H5 or N1 positive. One sample was invalid. This represents a 10% prevalence of avian influenza in the Kaiyuh Flats and Willow Lake birds.

Table 6. Cloacal swabs collected from Northern Pintails at Koyukuk National Wildlife Refuge, August 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Kaiyuh Flat	105	76	16	92
Willow Lake	153	88	65	153
Total	258	164	81	245

Other Accomplishments: Duck banding was initiated on the Koyukuk NWR at Willow Lake in 1989. This was the first banding project conducted on the Kaiyuh Flats. All birds were banded at both sites.

Innoko NWR: Northern Pintails were captured, sampled and released at Netletna River and Upper Iditarod River Lakes on the Innoko NWR.

Methods: Trapping locations were selected based on previous waterfowl production surveys and an aerial search for high densities of pintails. Trap sites were pre-baited a week before trapping began with a mixture of cracked corn and barley. Walk-in clover-leaf traps were set up at wetland edges and left open during the pre-baiting period. Traps were checked twice a day. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 288 Northern Pintails was captured and banded at Netletna River and Upper Iditarod River Lakes. Cloacal swabs were collected from 288 Northern Pintails (Table 7). Of those, 124 were adult females, 132 were adult males, 15 were juvenile

females, 11 were juvenile males, five were juvenile sex undetermined, and one undetermined for sex and age.

AI Results: Nine of the 288 Northern Pintail cloacal samples tested positive for avian influenza. None of the 25 samples was H5 or N1 positive. This represents a 3% prevalence of avian influenza in the Innoko NWR birds.

Table 7. Birds captured and cloacal swabs collected from Northern Pintails at Innoko National Wildlife Refuge, August 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Netletna River	255	123	131	1	255
Upper Iditarod River Lakes	33	16	12	5	33
Total	288	139	143	6	288

Other Accomplishments: Feather samples were collected for stable isotope analysis to determine patterns of winter distribution. All birds were banded.

Yukon Delta NWR: Northern Pintails were captured, sampled and released at Kgun Lake on the YDNWR.

Methods: Cloverleaf, swim-in traps were pre-baited with whole-kernel corn on traditional trapping sites in marshy areas along the northwest shoreline of Kgun Lake. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: Nine hundred sixty-three Northern Pintails were captured and banded at Kgun Lake. Cloacal swabs were collected from 205 Northern Pintails (Table 8). Of those, 55 were adult females, 24 were adult males, 49 were juvenile females, 75 were juvenile males, one was a juvenile female, and one was a juvenile male.

AI Results: Nine of the 205 Northern Pintail cloacal samples tested positive for avian influenza. None of the nine samples were H5 or N1 positive. This represents a 4% prevalence of avian influenza in the Kgun Lake birds.

Table 8. Birds captured and cloacal swabs collected from Northern Pintails at Yukon Delta National Wildlife Refuge, August 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Kgun Lake	963	105	100	205

Other Accomplishments: Since 1990, YDNWR has participated in the Northern Pintail banding program established by the USFWS - Division of Migratory Bird Management. All birds banded at Kgun Lake will continue to provide baseline data for a Pacific Flyway management plan.

Minto Lakes: Minto Flats State Game Refuge has been a long-term banding site for both locally produced and migrant ducks, including pintails. Northern Pintails were captured, sampled and released at Minto Flats State Game Refuge.

Methods*:* Welded wire swim-in traps were deployed and baited with barley at Minto Lakes. Traps were checked at least twice each day. All captured ducks were classified to species, sex, and age, and banded. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 283 pintails was captured and banded at Minto Lakes. Cloacal swabs were collected from 111 Northern Pintails (Table 9). Of those, 23 were adult females, two were adult males, 63 were juvenile females, and 23 were juvenile males. Water levels were high, but dropped substantially during the first week. Ten days of nearly continuous rainfall caused water levels to rise again. Consequently, fewer ducks were trapped.

AI Results: Eleven of the 111 Northern Pintail cloacal samples tested positive for avian influenza. None of the eleven samples was H5 or N1 positive. This represents a 10% prevalence of avian influenza in the Minto Lakes birds.

Table 9. Birds captured and cloacal swabs collected from Northern Pintails at Minto Flats State Game Refuge, August 2006.

Location	Total Captured	AI samples		Total AI Samples
		Female	Male	
Minto Lakes	283	86	25	111

Other Accomplishments: The Minto Lakes area has been the subject of research on avian influenza ecology and prevalence for over 10 years and Alaska Department of Fish and Game facilitated sampling of ducks by University of Alaska Fairbanks for several research projects.

Yukon Flats NWR: Northern Pintails were captured, sampled and released at Mallard Lake on the Yukon Flats NWR. The camp was located on Mallard Lake which is part of the Long Lake complex of lakes approximately 20 miles southwest of Beaver, Alaska.

Methods: Walk-in traps were baited with cracked corn and situated on the shorelines of Mallard Lake. Captured birds were fitted with a leg band, sexed, aged, and morphological measurements were taken. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: Sixty-nine Northern Pintails were captured and banded at Mallard Lake. Cloacal swabs were collected from 67 Northern Pintails (Table 10). Of those, 15 were adult females, six were adult males, one was adult sex undetermined, 18 were juvenile females, and 27 juvenile males.

AI Results: None of the 69 Northern Pintails samples tested positive for avian influenza.

Table 10. Birds captured and cloacal swabs collected from Northern Pintails at Yukon Flats National Wildlife Refuge, August 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Mallard Lake	69	33	33	1	67

Selawik NWR: Northern Pintails were captured, sampled and released at the Kauk River, 35 miles north of Buckland.

Methods: Northern pintails were trapped near the mouth of the Kauk River. Coastal areas were scouted using fixed wing aircraft and an inflatable outboard motor boat for suitable sampling, camp, and access sites. Traps were pre-baited with corn and placed along the shorelines. Green plastic fencing enclosed the trap and small mesh bird netting topped the swim-in trap preventing escape.

Results: Forty-five Northern Pintails were captured and banded at Kauk River. Cloacal swabs were collected from 45 Northern Pintails (Table 11). Of those, 15 were adult females, 14 were adult males, seven were juvenile females, and nine were juvenile males.

AI Results: Two of the 45 Northern Pintail cloacal samples tested positive for avian influenza. None of the two samples was H5 or N1 positive. This represents a 4% prevalence of avian influenza in the Kauk River birds.

Table 11. Birds captured and cloacal swabs collected from Northern Pintails at Selawik National Wildlife Refuge, August 2006.

Location	Total Captured	AI samples		Total AI Samples
		Female	Male	
Kauk River	45	22	23	45

Table 12. Avian influenza analytical results for Northern Pintails collected in Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
Kaiyuh Flat	92	10	0.11
Willow Lake	153	15	0.10
Netletna River	255	9	0.04
Upper Iditarod River Lakes	33	0	0.00
Kgun Lake	205	9	0.04
Minto Lakes	111	11	0.10
Mallard River	67	0	0.00
Kauk River	45	2	0.04
Total	961	56	0.06

Donna Dewhurst, USFWS

Taxon: Lesser Snow Goose (*Chen caerulescens caerulescens*)

Justification: The entire breeding population of Lesser Snow Geese from Wrangel Island, Russia migrates to Alaska and to the southern Pacific Flyway. A very small segment of this Asian-breeding population also winters in Japan.

Ranking score: 15

Background: Lesser Snow Geese that nest on Wrangel Island, Russia, migrate through Alaska to wintering areas in British Columbia and California. Wrangel Island Lesser Snow Geese use St. Lawrence Island and the Yukon-Kuskokwim Delta (YKD) in western Alaska as stopover areas during autumn migration (Ely et al. 1993). Part of the population also stops on the Stikine River Delta in southeast Alaska in fall. In spring, the population uses stopover areas in southeast Alaska, Cook Inlet, and the YKD. Approximately 2,000-3,000 snow geese are harvested for subsistence purposes on the YKD in fall and spring. A small number (<100) is shot by sport hunters in southeast Alaska.

Methods: No live capture project focused on Lesser Snow Geese due to the difficulty in trapping birds. However, 198 Lesser Snow Geese were sampled opportunistically on the North Slope. The majority of sampling for HPAI in snow geese occurred through subsistence harvested birds.

Results: One hundred ninety-eight cloacal samples were collected from live Lesser Snow Geese. Five hundred fifteen Lesser Snow Geese were sampled from spring subsistence and fall harvest birds (see Spring Subsistence and Fall Harvest). All 713 were analyzed for avian influenza viruses.

AI Results: Seventeen Lesser Snow Geese tested positive for avian influenza. None of the 17 samples were H5 or N1 positive. This represents a 3% prevalence of avian influenza in hunter harvest Lesser Snow Geese.

Donna Dewhurst, USFWS

Taxon: Emperor Goose (*Chen canagica*)

Justification: Ninety percent of the world population of Emperor Geese breeds on the Yukon-Kuskokwim Delta.

Ranking score: 13

Background: Most of the global population of Emperor Geese breeds on the outer coast of the Yukon Kuskokwim Delta (Eisenhauer and Kirkpatrick 1977), with as many as 35,000 nests estimated in some years (Fischer et al. 2005). These geese are not colonial nesters, but are readily captured in small numbers in June while nesting and in large numbers (with young) in late July/early August during the flightless primary molt (Petersen et al. 1994). Most Emperor Geese that fail to incubate a nest migrate in early June from the YKD to northern Chukotka in eastern Russia where they molt their flight feathers. Most of the global population spends spring and fall staging periods on the Alaska Peninsula (Nelson Lagoon having the greatest number), and during winter they are distributed from Kodiak Island to the Commander Islands, Russia, with the majority on the Aleutian Islands (Petersen et al. 1994).

More than 600 birds from Manokinak River, Kigigak Island, Baird Inlet, and Old Chevak, were sampled. All of these sites are located in the YDNWR. Of these, 541 were live bird samples and 144 hunter-killed samples (see Spring Subsistence). Each location is discussed separately and a final table presents the analytical results at the end of this section.

Manokinak River: The lower Manokinak River is a high density nesting area for Emperor Geese on the YKD. Emperor Geese were sampled at the Manokinak River during two stages of the breeding season. Adult females were captured in late June during nest incubation and adults and goslings of both genders were sampled during brood rearing in early August.

Methods*:* In June, Emperor Geese nests were located by systematically searching a ~20 km^2 area on the lower Manokinak River. A subset of unbanded nesting females was trapped on nests during late incubation using bow traps. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

In August, molting adults and flightless gosling Emperor Geese were herded into drive traps at three sites along the lower Manokinak River. Birds were herded into a holding pen on an open mud flat by persons walking in a line through the capture area and boats were used to keep birds from re-entering the river.

Results: A total of 448 Emperor Geese was captured and banded at Manokinak River. Cloacal swabs were collected from 283 Emperor Geese (Table 13). Of those, 116 were adult females, 55 were adult males, 50 were juvenile females, and 62 were juvenile males.

AI Results: None of the 283 Emperor Geese cloacal samples tested positive for avian influenza.

Table 13. Birds captured and cloacal swabs collected from nesting and molting Emperor Geese at Yukon Delta National Wildlife Refuge, June and August 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Manokinak River	448	166	117	283

Other Accomplishments: Studies of Emperor Goose nesting and brood rearing ecology have been conducted on the lower Manokinak River for more than a decade. Of the 448 captured Emperor Geese (all adult females) all were banded with stainless steel metal leg bands on one leg and a colored plastic tarsal band with a unique 3-digit alpha numeric code on the other. A total of 225 female Emperor Geese was found incubating nests; of these, 42 were captured and sampled for AI. A total of 39 adult females were uniquely banded and added to the population of marked birds. All nests were revisited at hatch to mark goslings with webtags. In August, 60 of the molting birds were recaptured individuals (i.e., previously banded); an additional 192 females were given unique tarsal bands. Additionally, feather and eggshell membranes, and blood, were collected from nesting females for stable isotopic analysis.

Old Chevak: Emperor Geese were captured, sampled and released in Yukon-Kuskokwim Delta's outer coast, about four km SSE of Chevak. A sub-sample of the captured birds was sampled for AI and all birds were released.

Methods: Brood drives were conducted by biologists and teenage volunteers from the village of Old Chevak. Flocks of flightless Emperor Geese were herded into holding pens by the banding crew walking across the tundra in a coordinated effort. All captured birds were banded with an aluminum USFWS leg band.

Results: A total of 222 Emperor Geese (108 females and 114 males) was captured and banded during three drives at Old Chevak. Cloacal swabs were collected from 182 Emperor Geese (Table 14). Of those, 51 were adult females, 45 were adult males, 37 were juvenile females, and 49 were juvenile males. Storms and extreme tides prevented conducting more drives.

AI Results: None of the 182 Emperor Geese cloacal samples tested positive for avian influenza.

Table 14. Birds captured and cloacal swabs collected from Emperor Geese at Yukon Delta National Wildlife Refuge, July 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Old Chevak	222	88	94	182

Other Accomplishments: Feathers were collected for stable isotope analysis.

Kigigak Island: Emperor Geese were sampled on Kigigak Island, a high-density nesting location on YDNWR.

Methods: Adult Emperor Geese were captured in three ways: by placing a mist net over the top of females on nests, by flushing nesting females into a mist net, or by flushing the female off the nest, placing a string-activated trap on the nest, and triggering the trap once the female returned to the nest.

Results: A total of 42 Emperor Geese was captured and banded at Kigigak Island on the YDNWR. Cloacal swabs were collected from 42 Emperor Geese. All were adult females.

AI Results: None of the 42 Emperor Geese samples tested positive for avian influenza at Kigigak Island.

Other Accomplishments: Morphometric measurements and body mass were recorded for all captured individuals.

Baird Inlet: Emperor Geese were sampled at Baird Inlet which is located about 0.5 km south of the village of Newtok. Habitat consists of low coastal tundra, sedges, and grasses.

Methods: Adult Emperor Geese were captured by flushing the female off the nest, placing a string-activated trap on the nest, and triggering the trap once the female returned to the nest.

Results: A total of 34 Emperor Geese was captured at Baird Inlet on the YDNWR. Cloacal swabs were collected from 34 Emperor Geese (Table 15). All were adult females.

AI Results: None of the 34 Emperor Geese samples tested positive for avian influenza at Baird Inlet.

Other Accomplishments: Morphometric measurements and body mass were recorded for all captured individuals.

Table 15. Avian influenza analytical results for Emperor Geese sampled on the Yukon Delta National Wildlife Refuge, Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
Manokinak River	283	0	0
Old Chevak	182	0	0
Kigigak Island	42	0	0
Baird Inlet	34	0	0
Total	541	0	0

An additional 144 samples were collected during the spring subsistence harvest on the YKD (see Spring Subsistence). Eleven of the samples collected from hunters tested positive for avian influenza. None of the 11 samples was H5 or N1 positive. This represents a 2% prevalence of avian influenza.

Daniel Rizzolo, USGS ASC

Taxon: Spectacled Eider (*Somateria fischeri*)

Justification: The vast majority of Spectacled Eiders breed in east Asia and return to the Bering Sea each fall to over-winter.

Ranking score: 12

Background: Spectacled Eiders breed in three geographically distinct areas: the Yukon-Kuskokwim Delta, the Alaskan Arctic Coastal Plain, and the Siberian Arctic (Petersen et al. 2000). Birds from all three breeding populations winter in large mixed flocks in the Bering Sea (Petersen et al. 1999). Conditions observed for wintering flocks in some years are highly conducive for fecal/oral transmission of viruses with large concentrations of birds packed into small leads in the sea ice (Petersen et al. 1999).

Over 300 birds were sampled from Kanaryarmuit, Kigigak Island, and Tutakoke. All of these sites are located in the YDNWR. Of these, 343 were live bird samples, seven were hunter-killed samples (see Spring Subsistence and Fall Harvest) and one live bird sample was invalid. Logistic constraints precluded sampling on the Arctic Coastal Plain. Each location is discussed separately and a final table presents the analytical results at the end of this section.

Kanaryarmuit: The YKD is important breeding habitat for Spectacled Eiders where they nest in dispersed colonies close to the coastline, principally on small islands within freshwater ponds during May and June.

Methods: Opportunistic sampling of Spectacled Eiders feces was conducted coincident with nesting surveys of geese and eiders on the Yukon-Kuskokwim Delta. Seventy-five randomly selected plots (0.32 km^2) were searched from 8 June to 22 June 2006. Spectacled Eiders typically defecate as they flush from their nests enabling the collection of fresh fecal material. Sample vials were kept chilled within insulated cold packs until return to camp where samples were frozen in a liquid nitrogen vapor shipper. Vapor shippers were air freighted to Anchorage.

Results: Forty-four Spectacled Eiders samples were collected on 24 plots; (Table 16). Forty-three viable fecal samples were obtained from opportunistic sampling during the YKD nest plot survey. Of those, all were adult females.

AI Results: One of the 43 Spectacled Eiders samples tested positive for avian influenza. The sample was not positive for H5 or N1. This represents < 1% prevalence of avian influenza in the Kanaryarmuit birds.

Table 16. Birds captured and fecal samples obtained from Spectacled Eiders at Yukon Delta National Wildlife Refuge, June 2006.

Location	Total birds captured	AI fecal samples Female	Total AI samples
Kanaryarmuit	44	43	43

Kigigak Island: Spectacled Eiders were captured, banded and released at Kigigak Island, located along the outer fringe of YDNWR, near the mouth of Baird Inlet. The island is bordered by the Ninglick River and the Bering Sea.

Results: Two hundred thirty-eight Spectacled Eiders were captured, banded and sampled at Kigigak Island. Two hundred thirty-six viable cloacal and fecal swabs were collected from Spectacled Eiders (Table 17). Of those, 196 were adult females, 22 juvenile females and 18 juvenile males. There were 104 cloacal samples and 132 fecal samples including one invalid sample and one mortality.

AI Results: One of the 236 Spectacled Eiders samples tested positive for avian influenza. The sample was not positive for H5 or N1. This represents < 1% prevalence of avian influenza in the Kigigak Island birds.

Table 17. Birds captured and cloacal and fecal swabs collected from Spectacled Eiders at Yukon Delta National Wildlife Refuge, June 2006.

Location	Total birds captured	AI samples Female	Male	Cloacal	Fecal	Mortality event	Total AI samples
Kigigak Is	238	218	18	104	132	1	236

Other Accomplishments: Genetic samples were also collected and morphometrics and productivity data recorded. All birds were banded or band numbers recorded; data will be used in a mark/recapture study to estimate annual survival for Spectacled Eiders in this region.

Tutakoke: Spectacled Eiders were captured, banded and released at Tutakoke. The capture site was located along the outer fringe of YDNWR, near the mouth of the Tutakoke River.

Results: Sixty-three Spectacled Eiders were captured, banded and sampled at Tutakoke. Cloacal and fecal swabs were collected from 63 Spectacled Eiders (Table 18). Of those, 61 were adult females, and two adult males. Of the samples, 30 were cloacal samples and 33 were fecal samples.

AI Results: None of the Spectacled Eiders samples tested positive for avian influenza.

Table 18. Birds captured and cloacal and fecal swabs collected from Spectacled Eiders at Yukon Delta National Wildlife Refuge, June 2006.

Location	Total birds captured	AI samples		Cloacal	Fecal	Total AI samples
		Female	Male			
Tutakoke	63	61	2	30	33	63

Table 19. Avian influenza analytical results for Spectacled Eiders collected in Alaska, 2006.

Location	Total samples	Mortality	Total AI positive	Prevalence
Kanaryarmuit	43	0	1	0.02
Kigigak Island	235	1	1	0.004
Tutakoke	63	0	0	0
North Slope	1	0	0	0
Total	343	1	2	0.006

An additional seven hunter samples were collected during the spring subsistence and fall harvest (see Spring Subsistence and Fall Harvest). One opportunistic live sample was collected from the North Slope. None of these samples tested positive for avian influenza.

Taxon: Black Brant (*Branta bernicla nigricans*)

Justification: Black Brant that breed and winter in northeastern Asia have both direct and indirect links with Alaska.

Ranking score: 12.0

Background: Several thousand Black Brant breed and molt along the arctic coast of Russia. The Russian population winters in North America, Japan, Korea, and northeastern China, near recent outbreaks of the Asian H5N1 virus (e.g., Hong Kong). Mixing of flocks likely occurs between these populations, and potentially with birds wintering in northern Europe. Also, molt migrants from Russia may come to the arctic coast of Alaska (King and Hodges 1979) and conversely molters from Alaska may migrate to Russia (e.g., Wrangel Island; Ward et al. 1993). Finally, Brant marked in Alaska have been observed staging and wintering in Japan (Derksen et al. 1996), indicating that there is interchange between birds from Alaska and those that winter closest to infected areas.

Brant nest in high concentrations (colonies) and during brood rearing, molting, and staging, they concentrate in flocks. Brant breeding colonies are found in two areas: the YKD and the Arctic Coastal Plain (ACP). Molting flocks occur at Teshekpuk Lake. During the fall staging period at Izembek Lagoon nearly the entire world population of Black Brant comes together.

Over 1,700 birds were sampled from Baird Inlet, Baird Peninsula, Kigigak Island, Tutatoke, and the North Slope using a 4-stage sampling design. The 4-stage sampling design is broken into arrival/early nesting, molting, brood rearing, and fall staging. Of those, 1,768 were live bird samples and 311 were hunter killed (see Spring Subsistence). In addition, 229 fall harvest samples were archived. Each sampling stage and its location will be discussed separately and a final table presents the analytical results at the end of this section.

Early Nesting
Early nesting sampling was conducted in three areas of the YKD in June 2006.

Yukon Delta NWR: Black Brant were captured, banded, and released from three of the four major nesting colonies: Baird Inlet, Kigigak Island, and Tutakoke. Baird Inlet is located about 0.5 km south of the village of Newtok near the mouth of Baird Inlet. The island is surrounded by large mudflats at low tide and nearly all ponds on the island are tidal. Kigigak Island is located along the outer fringe of Yukon-Kuskokwim Delta, near

the mouth of Baird Inlet. Spring and fall storm tides regularly inundate the island, except for upland areas, which are flooded only during severe storm tides. Tutakoke is located along the outer fringe of YDNWR, near the mouth of the Tutakoke River. The river is bordered by the intertidal mudflats of the Bering Sea to the west and by the Kushunuk River to the north. The area contains many shallow ponds, lakes, and a network of tidal sloughs. Habitat is the same for all capture locations, consisting of low coastal tundra, sedges, and grasses.

Methods: The YKD is the major breeding area for Black Brant, hosting approximately 80% of the world population. Females were captured on nests late in incubation using nest traps. Swab samples were collected and sample vials containing preservation media were placed in a liquid nitrogen vapor shipper and air freighted to Anchorage. All birds received a metal USFWS band and plastic tarsal band.

Results: Two hundred seventeen Black Brant were captured at Baird Inlet, Kigigak Island, and Tutakoke. Cloacal swabs were collected from 207 Black Brant (Table 20). All were adult females.

AI results: One of the 207 Black Brant cloacal samples tested positive for avian influenza. The sample was not positive for H5 or N1. This represents < 1% prevalence of avian influenza in the YKD nesting birds.

Table 20. Black Brant captured and cloacal samples taken at Yukon Delta National Wildlife Refuge, June 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Baird Inlet	70	68	0	68
Kigigak Island	70	67	0	67
Tutakoke	77	72	0	72
Total	217	207	0	207

Molting
Molting birds were captured, sampled, and released. Hazen Bay is just north of Baird Inlet on the YKD; Teshekpuk Lake area is on the North Slope.

Hazen Bay and North Slope: Failed and non-breeding birds from a variety of breeding colonies concentrate in the vicinity of Teshekpuk Lake on the North Slope for molt. Large flocks of birds are regularly found dispersed across a series of four large lakes. Molting birds congregated at Hazen Bay in the Yukon-Kuskokwim Delta.

Methods: Corral traps were used at both locations to capture and sample birds. In the vicinity of Teshekpuk Lake large flocks of molting Black Brant were found dispersed

across a series of seven large lakes. We sampled 200-400 birds per lake. On the YKD we conducted reconnaissance flights to locate molting flocks of Black Brant, originally targeting the Black River area, but no brant were observed. A single molting flock of ~ 2,000 birds was found on the south edge of Hazen Bay and were targeted for capture. Using planes and ground personnel, birds were driven into corral traps. Samples were taken as cloacal swabs and most birds were marked with a metal USFWS band and a plastic tarsal band.

Results: A total of 2,609 Black Brant was captured and banded at Hazen Bay and Teshekpuk Lake. Cloacal swabs were collected from 867 Black Brant (Table 21). Of those, 414 were adult females, 305 adult males, 74 were sub-adult females, 72 were sub-adult males, and two were unidentified to age and sex.

AI Results: None of the 859 Black Brant samples tested positive for avian influenza. Two of the samples from Teshekpuk Lake were invalid.

Table 21. Birds captured and cloacal swabs collected from molting Black Brant at Yukon Delta National Wildlife Refuge and North Slope, July 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Hazen Bay	438	263	136	1	400
Teshekpuk Lake	2171	225	241	1	467
Total	2609	488	377	2	867

Other Accomplishments: We assessed body condition in relation to stage of molt, the proportion of breeders and non-breeders, and molt phenology between molting Black Brant on the YKD and the arctic coastal plain (ACP). Also, we compared molt ecology between the YKD and ACP birds captured for AI sampling. Birds were weighed, measured (including 1st primary as an indicator of molt stage), aged, and breeding status of females was noted (i.e., presence or absence of a brood patch).

Tutakoke: Molting Black Brant were captured, sampled and released in Tutakoke, which is located along the outer fringe of YDNWR, near the mouth of the Tutakoke River. The area contains many shallow ponds, lakes, and a network of tidal sloughs.

Methods: Corral traps were used to capture and sample birds at Tutakoke. Cloacal samples were collected and sample vials containing preservation media were placed in a liquid nitrogen vapor shipper and air freighted to Anchorage. All birds received a metal USFWS band and plastic tarsal band.

Results: One hundred ninety-four Black Brant were captured, banded and cloacal swabs collected at Tutakoke (Table 22). Of those, 112 were adult females and 81 were adult males, and one was juvenile female. One sample was invalid.

AI Results: None of the 194 Black Brant samples tested positive for avian influenza.

Table 22. Birds captured and cloacal swabs collected from molting Black Brant at Yukon Delta National Wildlife Refuge, July 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Tutakoke	207	113	81	194

Brood-Rearing
Goslings were sampled from the major brood-rearing colonies on the Yukon-Kuskokwim Delta.

Kigigak Island and Baird Peninsula: Goslings were captured, banded, and released from brood-rearing colonies. Kigigak Island is located along the outer fringe of Yukon-Kuskokwim Delta, near the mouth of Baird Inlet. Baird Peninsula is located about 0.5 km south of the village of Newtok near the mouth of Baird Inlet. Habitat for both areas consists of low coastal tundra, sedges, and grasses. The peninsula contains permanent water ponds, but water depth is shallow and tides control access for biological surveys.

Methods: Aerial surveys were conducted to locate brood rearing areas for Kigigak Island and Baird Peninsula using radio-marked female brant. Ground crews then herded the birds into a corral. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper. Most birds were marked with a metal USFWS band and a plastic tarsal band.

Results: A total of 1,634 Black Brant was captured and banded at Kigigak Island and Baird Peninsula. Cloacal swabs were collected from 500 Black Brant goslings (Table 23). Of those, 252 were juvenile females, 247 were juvenile males, and one was adult female. One successful drive was conducted at Kigigak Island and two at Baird Peninsula.

AI results: None of the 500 Black Brant samples tested positive for avian influenza. One sample from Baird Peninsula was invalid.

Table 23. Birds captured and cloacal swabs collected from brood-rearing Black Brant at Yukon Delta National Wildlife Refuge, July 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Kigigak Island	807	142	158	300
Baird Peninsula	827	111	89	200
Total	1,634	253	247	500

Fall Staging

The fall staging samples were from fall harvest birds sampled at Izembek NWR, Seward Peninsula, Savoonga, North Slope and YKD. All samples were archived.

Table 24. Avian influenza analytical results for Black Brant collected in Alaska, 2006.

Location	Sampling Stages	Total samples	Total AI positive	Prevalence
Kigigak Island	Nesting and Brood-Rearing	367	0	0.0
Baird Inlet	Nesting	68	1	0.01
Hazen Bay	Molting	400	0	0.0
Teshekpuk Lake	Molting	467	0	0.0
Baird Inlet	Brood-Rearing	200	0	0.0
Tutakoke	Nesting and Molting	266	0	0.0
Total		1,768	1	0.0005

An additional 311 samples were collected during the spring subsistence in the YDNWR (see Spring Subsistence). Seven of the samples collected from hunters tested positive for avian influenza. None of the samples was H5 or N1 positive. This represents a 1% prevalence of avian influenza.

Taxon: Lesser Sandhill Crane (*Grus canadensis canadensis*)

Justification: A significant proportion of the mid-continent population of Lesser Sandhill Cranes migrates through Alaska to and from breeding grounds in eastern Chukotka, Russia. Sandhill cranes are attracted to agricultural areas with domestic poultry.

Ranking score: 11.5

Background: Lesser Sandhill Cranes in Alaska are affiliated with two different populations, the Pacific Flyway Population (PFP) and the Mid-continent Population (MCP), based on segregation during the breeding, migration and wintering periods (Tacha et al. 1994). MCP cranes breed from Hudson Bay west across Canada and interior Alaska to the YKD. The probability of Lesser Sandhill Cranes being exposed to Asian H5N1 is greater than for many other species of birds because a substantial portion of MCP cranes breeds in Asia and they commingle with Asian species of cranes (Johnsgard 1983) which migrate through areas infected with Asian H5N1. Also, cranes use a variety of natural and agricultural habitats for foraging and roosting, making them more likely than some species to contact Asia H5N1 through domestic poultry and infected sites.

One hundred sixty-one Lesser Sandhill Cranes were sampled at Creamers Field Migratory Waterfowl Refuge, YKD, St. Lawrence Island and Seward Peninsula. Twenty-eight were live bird samples and 133 were hunter samples (see Spring Subsistence and Fall Harvest).

Creamer's Field Migratory Waterfowl Refuge (Fairbanks): Creamer's Field is a state game refuge located in Fairbanks. The Alaska Department of Fish and Game manages the Refuge in a combination of natural wetlands and cultivated grain to both enhance wildlife viewing and attract cranes away from the Fairbanks airport. An ongoing crane banding and marking project facilitates AI sampling.

Methods: Lesser Sandhill Cranes were captured with rocket nets at baited sites on barley fields. Captured cranes were weighed, measured, aged, and banded. Sex of cranes cannot be determined in the field, so a blood sample was drawn for later testing. Cloacal swabs were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: Twenty-eight Lesser Sandhill Cranes were sampled at Creamer's Field. Cloacal swabs were collected from 28 Lesser Sandhill Cranes (Table 25). Twenty-four were adult and four were juvenile.

AI Results: None of the 28 Lesser Sandhill Cranes samples tested positive for avian influenza.

Table 25. Birds captured, cloacal swabs collected, and avian influenza analytical results from Lesser Sandhill Cranes at Creamer's Field Migratory Waterfowl Refuge, July and August, 2006.

Location	Total birds captured	Total AI samples	Total AI positive	Prevalence
Creamers Field	28	28	0	0

Other Accomplishments: All captured birds were banded and color marked for migration and winter distribution resighting efforts.

Erik Hill, Anchorage Daily News

Taxon: Tundra Swan (*Cygnus columbianus*)

Justification: A segment of the breeding population of Tundra Swans is believed to breed in eastern Asia and winter in North America.

Ranking score: 11

Background: Tundra Swans are polytypic, with three recognized subspecies: the nominate form *Cygnus columbianus columbianus* in North America, *C. c. bewickii* in western Eurasia and *C. c. jankowskii* in eastern Asia. The nominate form is thought to breed as far west as eastern Chukotka. In Alaska, birds breeding on the North Slope migrate eastward during autumn and winter in the Atlantic Flyway (Limpert et al. 1991, Limpert and Earnst 1994), whereas birds breeding in western Alaska migrate down the Pacific Flyway (Ely et al. 1998).

Over 500 birds (363 live birds and 222 hunter-killed) from the Alaska Peninsula, Kotzebue Sound, YKD, Seward Peninsula, and the North Slope were sampled. Each location is discussed separately and a final table presents the analytical results at the end of this section.

Southern Alaska Peninsula: Molting Tundra Swans were captured, sampled, and released on lakes adjacent to the Caribou River, near Nelson Lagoon, on the lower Alaska Peninsula in 16-19 July 2006. Unlike swans from Izembek NWR, Caribou River swans are migratory (Dau and Sarvis 2002), and mix on wintering areas in the Pacific Flyway with swans from other breeding populations.

Methods: A six-person crew and pilot located molting flocks of Tundra Swans in the Caribou River area. Swans were held in place on the lake with a small Zodiac boat and captured from the perimeter of the flock using a dip net from a smaller inflatable raft. Captured swans were restrained with electrical tape wrapped around their legs and heads tucked under their wings. Swans were transported to shore for processing by a separate banding crew. On shore, birds were further restrained using swan "vests" and cloacal samples taken. Sample vials containing preservation media were stored in a nitrogen cryoshipper and air-freighted to Anchorage.

Results: Sixty-four Tundra Swans were captured from three lakes connected to the Caribou River (Table 26). The adult birds were comprised of 29 females and 21 males. Seven swans were sub-adult females and five were sub-adult males. One female captured on 17 July and one male captured on 18 July died shortly after capture of unknown

causes. The two capture mortalities were sent to the National Wildlife Health Center for necropsy.

AI Results: None of the Tundra Swan cloacal samples, including the two mortality events, tested positive for avian influenza.

Table 26. Birds captured and cloacal swabs collected from molting Tundra Swans at Izembek National Wildlife Refuge on the southern Alaska Peninsula, July 2006.

Location	Total birds captured	AI samples		Mortality event	Total AI samples
		Female	Male		
Izembek NWR lake A	30	17	12	1	29
Izembek NWR lake B	29	17	12	0	29
Izembek NWR lake C	5	2	2	1	4
Total	64	36	26	2	62

Northern Alaska Peninsula: Molting Tundra swans were captured and cloacal swabs taken at seven ponds on the Northern Alaska Peninsula, 67 km south of King Salmon from 21–25 July.

Methods: Flightless Tundra Swans were captured using aircraft and an inflatable outboard powered boat. The aircraft kept the swans grouped together on the lake while the boat collected swans one at a time using a dip-net and delivering them to crew on shore. All captured birds were banded with an aluminum USFWS leg band, and a plastic neck collar. Samples were collected, stored in a liquid nitrogen vapor shipper and air freighted to Anchorage.

Results: Ninety-five birds were captured and 94 viable cloacal samples were collected (Table 27). Of those, 53 were adult females, 37 were adult males, one adult, sex unidentified, and three were juvenile males. This and the Caribou River effort exceeded the 150 sample goal for the Alaska Peninsula.

AI Results: One of the 94 Tundra Swans cloacal samples tested positive for avian influenza. The sample was not positive for H5 or N1. This represents < 1% prevalence of avian influenza in the northern Peninsula molting birds.

Table 27. Birds captured and cloacal swabs collected from Tundra Swans captured on the northern Alaska Peninsula, July 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
AK Peninsula NWR	94	53	40	1	94

Other Accomplishments: In addition to sampling for AI, swans were marked with aluminum leg bands and plastic neck collars. Body measurements were taken from most swans. Feathers were collected for genetics and isotope analysis. These additional data will contribute to research determining migratory pathways, timing of migration, and winter destination of Tundra Swans from different breeding areas in western Alaska.

Northwest Alaska: Molting Tundra Swans were captured, sampled and released in northwest Alaska.

Results: One hundred thirty-nine Tundra Swans were captured from 35 unique locations in northwest Alaska and cloacal swabs were obtained from 138 swans (Table 28). Of those, 81 were adult females, 55 were adult males, and two were unidentified adults. All captured birds were leg-banded and 100 were marked with neck collars.

AI Results: All of the 138 Tundra Swans samples tested negative for avian influenza. One of the cloacal samples was invalid.

Table 28. Birds captured and cloacal swabs collected from Tundra Swans in northwest Alaska, July 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Northwest Alaska	139	81	55	2	138

Other Accomplishments: Body measurements were taken on all captured birds and analysis is being coordinated with other swan capture crews from the YDNWR, Izembek NWR, Alaska Peninsula NWR, and USGS.

North Slope: A total of 39 adult Tundra Swans was captured and collared on the North Slope of Alaska in the Kuparuk oil field and on the Colville River Delta in cooperation with the Swan Research Program (Environmental Studies at Airlie), ConocoPhillips Alaska, and Alaska Biological Research Inc.

Methods: A helicopter and ground crew worked together to capture flightless, molting Tundra Swans at two locations on the North Slope. Samples were collected and stored in a liquid nitrogen vapor shipper and air freighted to Anchorage.

Results: Thirty-nine Tundra Swans were captured and banded on the North Slope. Cloacal swabs were collected from all captured swans (Table 29). Of those, 21 were adult females, and 18 adult males.

AI Results: All 39 Tundra Swans samples from the North Slope tested negative for avian influenza.

Table 29. Birds captured and cloacal swabs collected from Tundra Swans on the North Slope, July 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Kuparuk oil field	30	17	13	30
Colville River Delta	9	4	5	9
Total	39	21	18	39

Other Accomplishments: Of the thirty-nine Tundra Swans captured and sampled on the North Slope, eight received satellite transmitters that were affixed to plastic neck collars. Location data from these instrumented birds are being used in a web-based school program to connect northern Alaska and Canada students on the breeding grounds with students in northeastern U.S. on the swan's wintering grounds. Other data collected includes feather samples for stable isotope analysis and blood and feather samples for genetic analysis.

Yukon-Kuskokwim Delta: Flightless swans were captured on Onumtuk Slough on the Yukon-Kuskokwim Delta's outer coast.

Methods: Tundra Swans were captured on large ponds/lakes using a float plane and an inflatable outboard powered boat. All captured birds were banded with aluminum USFWS leg band, and a plastic neck collar. Samples were collected, stored in a liquid nitrogen vapor shipper and air freighted to Anchorage.

Results: Thirty Tundra Swans were captured and collared on Onumtuk Slough in YDNWR near Old Chevak. Cloacal swabs were collected from 30 Tundra Swans (Table 30). Of those, 21 were adult females and nine were adult, sex undetermined.

AI Results: All of the 30 Tundra Swans samples tested negative for avian influenza. One of the cloacal samples was invalid.

Table 30. Birds captured and cloacal swabs collected from Tundra Swans on Yukon Delta National Wildlife Refuge August, 2006.

Location	Total birds captured	AI samples		Total AI samples
		Female	Male	
Onumtuk Slough	30	21	9	30

Table 31. Avian influenza analytical results for Tundra Swans collected in Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
Izembek NWR	62	0	0
AK Peninsula NWR	94	1	0.01
Northwest Alaska	138	0	0
Kuparuk oil field	30	0	0
Colville River Delta	9	0	0
Onumtuk Slough, YDNWR	30	0	0
Total live	363	1	0.003

An additional 222 samples were collected during the spring subsistence harvest in the YKD (see Spring Subsistence). Six of the samples collected from hunters tested positive for avian influenza. None of the six samples were H5 or N1 positive. This represents a 2% prevalence of avian influenza.

Craig Ely, USGS

Taxon: Long-tailed Ducks (*Clangula hyemalis*)

Justification: A large proportion of the Alaskan breeding Long-tailed Ducks winters along the east coast of Asia. Approximately 15% of females marked in Alaska with satellite transmitters wintered as far south as Japan, North Korea, and the southern Sakhalin Islands near areas where Asian H5N1 has been identified.

Ranking score: 10

Background: Long-tailed Ducks breeding in Alaska are dispersed at very low densities throughout the coastal tundra from the Alaska Peninsula and Bristol Bay to the Arctic Coastal Plain. There is exchange between Alaskan breeding females and Asian molting and wintering areas based on satellite telemetry data.

Methods: No live capture project focused on Long-tailed Ducks because they nest at very low densities, nests are difficult to find, and there are no known molting concentrations associated with one of the primary nesting areas. Long-tailed Ducks were sampled via spring and fall hunter harvests (see Hunter Harvest).

Results: Fifty-one Long-tailed Ducks were sampled from hunter harvested birds. One opportunistic live sample was obtained on the North Slope.

AI Results: One hunter harvested sample was positive for avian influenza. The sample was not H5 or N1 positive. This represents a 2% prevalence of avian influenza in hunter harvested Long-tailed Ducks.

Taxon: Pacific Common Eider (*Somateria mollissima v-nigrum*)

Justification: Over 95% of the 80,000 Pacific Common Eider population that nests on the North Slope of Alaska and northwestern Canada winters in northeast Asia. It is likely that a portion of the 20,000 Common Eiders that nest in the Aleutian Islands winters in northeast Asia along the Kamchatka Peninsula, Russia.

Ranking score: 10

Background: Pacific Common Eiders nest in coastal regions from eastern Russia, northwestern Canada, and in Alaska from the eastern North Slope to the far western Aleutian Islands (Dement'ev and Gladkov 1967, Kear 2005). In winter, birds are generally in small (100s), dense flocks and restricted to coastal waters. Eiders may be found in large (10,000s), dense flocks when staging during spring migration (Goudie et. al. 2000) which may facilitate transmission of disease amongst individuals by concentrating birds into relatively small areas. Common Eiders nest colonially, and birds concentrated in these dense areas may facilitate transmission of HPH5N1. Birds were sampled from multiple locations and each is discussed separately and a final table presents the analytical results at the end of this section.

Over 300 birds were sampled from the Aleutian Islands and the Yukon Delta NWR. An additional 43 samples were collected from spring subsistence sampling (see Spring Subsistence).

Aleutian Islands: Nesting Pacific Common Eiders were captured and sampled from the Near Island group (Attu, Agattu, and Nizki/Alaid Islands) in the western Aleutian Islands. This island group is 2,400 km (1,500 miles) west of Anchorage and 390 km (242 miles) east of Russia. The distances between the islands varied from 35–55 km and are separated by deep waters. Birds are generally on nests from late May to early July.

Methods: Sampling efforts were staged from the USFWS research vessel M/V *Tiglax*. A skiff transported field crews to colony areas on each island. Birds were located in the dense vegetation by lining 5–8 people at 3–5 m intervals at the edge of areas where birds have been found in previous years. Fecal samples were collected from the fresh material on the eggs and grass which was deposited when hens were flushed from nest. A sub-sample of Pacific Common Eiders was captured from their nests using dip nets. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 76 Pacific Common Eiders was sampled in the Aleutian Islands and cloacal and fecal swabs were collected (Table 32). All were adult females. Of those, 25 were cloacal and 51 were fecal samples. Strong, on-shore winds made landing on the beaches hazardous, restricting work on the northeast side of an island. Thus, we were unable to search and sample areas where we found dense colonies of birds in previous years.

AI Results: None of the 76 Pacific Common Eiders samples tested positive for avian influenza.

Table 32. Birds captured and cloacal and fecal swabs collected from nesting Pacific Common Eiders in the Aleutian Islands, May through June 2006.

Location	Total birds captured	AI samples		Cloacal	Fecal	Total AI samples
		Female	Male			
Agattu	32	32		6	26	32
Alaid	28	28		13	15	28
Nizki	12	12		6	6	12
Attu	4	4		0	4	4
Total	76	76		25	51	76

Other Accomplishments: Twenty-six nesting Common Eiders were captured and blood plasma samples were collected to test for the presence of selenium.

Yukon Delta NWR

The YDNWR provides some of the most productive subarctic goose habitat including coastal nesting ground for migrating Pacific Common Eiders. Samples were collected from nesting birds in three specific areas of this region (Tutakoke River, Kigigak Island and Kanaryarmuit). A total of 278 Pacific Common Eiders were captured for cloacal and fecal sampling. Discussion of each region follows.

Tutakoke River: Tutakoke camp is located along the outer fringe of YDNWR near the mouth of the Tutakoke River. The area contains many shallow ponds, lakes, and a network of tidal sloughs and habitat consists of low coastal tundra, sedges, and grasses.

Methods: Incubating Pacific Common Eiders were captured using standard methods, including dip netting, placing a mist net over the incubating female, capture by hand, and bow traps placed at the nest.

Results: A total of 125 Pacific Common Eiders samples was taken at Tutakoke River on the YDNWR (Table 33). All were from adult females. Of those, 49 were cloacal and 76 were fecal samples.

AI Results: None of the 125 Pacific Common Eiders samples tested positive for avian influenza. Two of the 125 samples were invalid.

Table 33. Birds captured and cloacal and fecal swabs collected from Pacific Common Eiders at Yukon Delta National Wildlife Refuge, July 2006.

Location	Total birds sampled	AI samples		Cloacal	Fecal	Total AI samples
		Female	Male			
Tutakoke River	125	125	0	49	76	125

Kigigak Island: Kigigak Island is located along the outer fringe of YDNWR near the mouth of Baird Inlet. The island is bordered by the Ninglick River and the Bering Sea. Habitat consists of low coastal tundra, sedges, and grasses. Spring and fall storm tides regularly inundate the island, except for upland areas, which are flooded only during severe storm tides.

Methods: Adult Pacific Common Eiders were captured in three ways: by placing a mist net over the top of females on nests, by flushing nesting females into a mist net, or by flushing the female off the nest, placing a string-activated trap on the nest, and triggering the trap once the female returned to the nest.

Results: A total of 133 Pacific Common Eiders was sampled at Kigigak Island on the YDNWR. Of the 133 samples, 129 viable samples were obtained and analyzed (Table 34). All were adult females. Of those, 50 were cloacal and 79 were fecal samples.

AI Results: One of the 129 Pacific Common Eiders samples tested positive for avian influenza. The sample was not positive for H5 or N1. This represents < 1% prevalence of avian influenza in the Kigigak Island birds.

Table 34. Birds captured and cloacal and fecal swabs collected from Pacific Common Eiders at Yukon Delta National Wildlife Refuge, June 2006.

Location	Total birds captured	AI samples		Cloacal	Fecal	Total AI samples
		Female	Male			
Kigigak Island	133	129	0	50	79	129

Other Accomplishments: Genetic samples were also collected and morphometrics and productivity data recorded. All birds were banded and data will be used in a mark/recapture study to estimate annual survival of Pacific Common Eiders in this region.

Kanaryarmuit: The YKD is important nesting habitat for Pacific Common Eiders. On the YKD, Pacific Common Eiders nest in dispersed colonies close to the coastline, principally on small islands within freshwater ponds during May and June.

Methods: Opportunistic sampling of Pacific Common Eider feces was conducted coincident with nesting surveys of geese and eiders on the Yukon-Kuskokwim Delta. Seventy-five randomly selected plots (0.32 km^2) were searched from 8 June to 22 June 2006. Pacific Common Eiders typically defecate as they flush from their nests enabling the collection of fresh fecal material (see photo). Sample vials were kept chilled within insulated cold packs until return to camp where samples were frozen in a liquid nitrogen vapor shipper. Vapor shippers were air freighted to Anchorage at the completion of the project.

Results: A total of 26 Pacific Common Eider samples were collected on 13 plots. Twenty-four viable fecal samples were obtained from opportunistic sampling during the YKD nest plot survey. Of those, all were adult females.

AI Results: None of the 24 Pacific Common Eiders samples tested positive for avian influenza.

Other Accomplishments: Crews located 3,031 nests, comprised of 1,218 Cackling Geese, 317 Emperor Geese, 601 Greater White-fronted Geese, 112 Spectacled Eiders, 52 Common Eiders, and 731 nests of other species. Data from these nests will be used to calculate nest population, egg production, nest success and estimated hatch date for each species. This ground-based sampling procedure has been used since 1985 and contributes long-term data needed to understand population status for geese and waterfowl.

Table 35. Avian influenza analytical results for Pacific Common Eiders collected in Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
Aleutian Islands	76	0	0
Tutakoke River	125	0	0
Kigigak Island	129	1	0.008
Kanaryarmuit	24	0	0
Total	354	1	0.003

Taxon: King Eider (*Somateria spectabilis*)

Justification: A major segment of the Pacific population of King Eiders breeds not only in coastal Alaska, but also across arctic Russia from the Chukotka Peninsula west to the Taimyr Peninsula. Nesting habitat is nearly identical to Steller's and Spectacled eiders.

Ranking score: 10

Background: The King Eider nests in high-latitude coastal tundra throughout Russia, Alaska, and Canada. During the non-breeding season, birds rarely come on shore but instead forage in coastal marine waters throughout the Pacific Ocean generally no farther south than the Kamchatka Peninsula of Russia, Aleutian Islands, and Prince William Sound of Alaska (Suydam 2000). The King Eider is one of the first waterfowl species to appear in the Arctic each spring, often migrating in flocks of > 10,000 individuals (Suydam 2000). The core spring staging area in Alaska appears to be ice-free waters between Cape Lisburne and Point Barrow of northeast Alaska.

Methods: No live capture project focused on King Eiders, but target sample sizes were met through spring subsistence and fall harvest sampling. Three opportunistic live samples were obtained on the North Slope.

Results: Six hundred seventy-seven King Eider samples were collected and analyzed through hunter harvest sampling (see Spring Subsistence and Fall Harvest).

AI Results: Six of the 677 King Eider cloacal samples tested positive for avian influenza. None of the six samples were H5 or N1 positive. This represents a 9% prevalence of avian influenza in hunter harvest King Eiders.

Laura L. Whitehouse, USFWS

Taxon: Dunlin (*Calidris alpina arcticola*)

Justification: The *arcticola* subspecies of Dunlin is a high priority taxon because the entire population—numbering in the hundreds of thousands—nests on the North Slope of Alaska and spends the non-breeding season in south and east Asia where the Asian H5N1 virus is prevalent. The population's use of inland waterways and estuaries further increases the likelihood that birds come into contact with virus infected poultry and waterfowl.

Ranking score: 17

Background: Dunlin of the *arcticola* subspecies spend the winter in significant numbers in east Asia as far south as southern China (Wetlands International–Oceania 2004). *Arcticola* Dunlin banded on the North Slope of Alaska have been resighted in Japan, Taiwan, and parts of China (Y. Shigeta, R. Gill, and R. Lanctot, unpubl.). While on the wintering grounds, Dunlin occupy primarily estuarine habitats. Movement to and from the breeding and non-breeding grounds entails prolonged stays in coastal east Asia. March through April *arcticola* Dunlin migrate to their breeding grounds in northern Alaska arriving in early June (Warnock and Gill 1996). Post-breeding (July–August), *arcticola* Dunlin stopover at littoral areas on the North Slope for up to a month (Andres 1994) before migrating directly either to east Asia (Norton 1971) or to the YKD in western Alaska (R. Gill, unpubl.). Once on the YKD, *arcticola* Dunlin mix with large numbers of the *pacifica* race of Dunlin before moving to Asia in September or October (Gill and Handel 1981, Warnock and Gill 1996).

Over 800 birds were sampled from the North Slope and Yukon-Kuskokwim Delta, using a 2-stage sampling design. The 2-stage sampling design is broken into breeding and post-breeding populations (or sampling). Of those, 875 were live bird samples and 23 were hunter killed (see Spring Subsistence). In addition, 188 post-breeding samples were archived at the Alaska Science Center. Each location is discussed separately and a final table presents the analytical results at the end of this section.

Breeding

The total population of *arcticola* is estimated at 750,000 birds (Brown et al. 2001), although a more realistic number may be closer to 200,000–300,000 (Wetlands International–Oceania 2004). The only place in Alaska where *arcticola* Dunlin are known to occur in isolation of the *pacifica* subspecies is the North Slope. Breeding a*rcticola* Dunlin are found in good numbers throughout

the National Petroleum Reserve – Alaska (NPR-A) and east to the western edge of the Arctic National Wildlife Refuge. High densities have been reported at Barrow and Prudhoe Bay (Troy and Wickliffe 1990, R. Lanctot, unpubl. data); nest densities in these areas average between 12 and 15 nests/km^2. Additional areas within the NPR-A also have high densities based on surveys conducted in the late 1990s and early 2000s (J. Bart, unpubl.). Somewhere in the vicinity of Point Hope, it is suspected that the breeding areas of the *arcticola* and *pacifica* subspecies overlap (R. Gill, pers. comm.), although genetic and morphological studies have not been conducted to confirm this hypothesis.

North Slope: Breeding Dunlin were captured, sampled and released in the vicinity of Barrow and Prudhoe Bay, and throughout the NPR-A. Two opportunistic samples were collected from Wooley Lagoon, Seward Peninsula.

Methods: Due to the remoteness of the NPR-A area a helicopter was used to transfer crews to 58 sites to locate nests and collect samples. Crews captured birds in Barrow at established breeding plots and accessed other parts of the tundra surrounding Barrow using 4-wheelers on the road system. Birds were also captured at Prudhoe Bay. Dunlins were captured using mist nets during pre-nesting and bow nets placed over nests. All captured individuals had a metal band and a unique set of color bands placed on their legs.

Results: A total of 145 breeding Dunlin was captured and banded on the North Slope and Wooley Lagoon, Seward Peninsula. Cloacal swabs were collected from 141 Dunlin (Table 36). Of those, 39 were adult females, 28 were adult males, 74 adult undetermined sex. The number of samples collected from Barrow exceeded expectations, but low capture rates in Prudhoe Bay and NPR-A were attributed to a late and truncated breeding season, locating and capturing birds in a large and remote area, and difficult logistics.

AI Results: None of the 141 Dunlin samples tested positive for avian influenza.

Table 36. Cloacal swabs collected from breeding Dunlin on the North Slope and Seward Peninsula, June and July 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Barrow	86	28	18	36	82
NPR-A	41	10	7	24	41
Prudhoe bay	16	0	2	14	16
Wooley Lagoon	2	1	1	0	2
Total	145	39	28	74	141

Other Accomplishments: Feathers were collected for stable isotope studies and blood samples were collected for genetic studies. All captured birds were banded which may help document migration pathways. Some of the Dunlin banded during this study have been resighted in Japan. Many of the radioed equipped birds have subsequently been heard at other post-breeding locations.

Post-breeding

Thousands of *arcticola* Dunlin stopover along the North Slope coast after breeding (Andres 1994). They were the most common shorebird on the Colville River Delta during fall surveys in 1987 and 1988, with an average of 13.9 birds/km of shoreline and an average density of 71.9 birds/km^2 (Andres 1994). Surveys in the same area in 2005 also indicated Dunlin were present in large numbers during late August (1,075 birds/km^2 on 21 August survey); these birds were primarily adults with 3:1 adult to juvenile age ratio (Johnson et al. 2005). Significant numbers of Dunlin also frequent coastal sites near Elson Lagoon at Barrow and the Canning River Delta (Martin and Moitoret 1981, Taylor et al. in press). After leaving the North Slope, most *arcticola* Dunlin migrate to the outer YKD to stage in August and September where they mix with *pacifica* Dunlin and form huge aggregations, numbering in the tens of thousands (Gill and Handel 1981, 1990). Large aggregations are present from Hooper Bay south to the Kuskokwim River (Gill and Handel 1990; R. Gill and B. McCaffery unpubl.). Dunlin leave the YKD for Asia in September or early October.

Yukon-Kuskokwim Delta, Alaska Peninsula and North Slope: Post-breeding Dunlin were captured, sampled and released in three sampling locations: the North Slope, the Yukon-Kuskokwim Delta, and the Alaska Peninsula. Post-breeding Dunlin can be found in these areas from August through October.

Methods: Fall migrant Dunlin were sampled in August, September and October on mudflats, nearshore ponds, offshore sandbars, and river banks in YKD, Alaska Peninsula and North Slope. A variety of methods was used to capture birds at these locations, including mist nets, walk-in traps, triggered bow traps, and elastically launched "whoosh" nets. Most captured birds were banded before being released.

Results: A total of 691 Dunlin was captured, banded and sampled at the North Slope and the Yukon-Kuskokwim Delta. Both cloacal and fecal swabs were collected from post-breeding Dunlin (Table 37). Of those, one was an adult female, 276 were adult, sex undetermined, 304 were juvenile, sex undetermined and 110 were undetermined for both age and sex. The total cloacal swabs collected was 588 and total fecal swabs collected was 103.

AI Results: Two of the 691 Dunlin cloacal samples tested positive for avian influenza. None of the two samples were H5 or N1 positive. This represents < 1% prevalence of avian influenza in the North Slope and Yukon-Kuskokwim Delta post-breeding birds. One cloacal sample from Tutakoke was invalid.

Table 37. Birds captured and cloacal and fecal swabs collected from post-breeding Dunlin at North Slope and the Yukon-Kuskokwim Delta, August through October, 2006.

Location	Total birds captured	Total AI samples
Tutakoke	597	478
Egegik	175	169
Ugashik	2	2
Barrow	35	35
Icy Cape	7	7
Total	816	691

Other Accomplishments: Feathers were collected for stable isotope studies. Blood samples were collected for genetic study. All captured birds were banded to help document migration pathways. Thirty radio transmitters were attached to North Slope birds. Many of the radio equipped birds have been subsequently heard at other post-breeding locations.

Opportunistic sampling: Forty-three samples were collected opportunistically during other AI field projects (Table 38). None of the 43 Dunlin that were sampled opportunistically tested positive for avian influenza.

Table 38. Samples collected opportunistically from breeding and post-breeding Dunlin on the North Slope, July and August 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Canning River Delta	29	6	6	17	29
Okpilak Delta	6	0	0	6	6
SAG River Delta	7	0		7	7
Colville River	1	1		0	1
Total	43	7	6	30	43

Table 39. Avian influenza analytical results for Dunlin collected in Alaska, 2006.

Location	Season	Total samples	Total AI positive	Prevalence
NPR-A	Breeding	41	0	0
Prudhoe Bay	Breeding	16	0	0
Wooley Lagoon	Breeding	2	0	0
Barrow	Breeding and Post-breeding	117	1	0.009
Icy Cape	Post-breeding	7	0	0
Tutakoke	Post-breeding	478	0	0
Egegik	Post-breeding	169	1	0.006
Ugashik	Post-breeding	2	0	0
Opportunistic samples	Breeding and Post-breeding	43	0	0.0
Total		875	2	0.002

Archived Samples: A total of 188 fecal samples were archived from the Colville River Delta and Tutakoke area.

Ted Swem, USFW

Taxon: Sharp-tailed Sandpiper (*Calidris acuminata*)

Justification: A major segment of the annual cohort of juvenile Sharp-tailed Sandpipers migrates to western Alaska each autumn following contact with adults on the breeding grounds that in turn staged in east Asia during northward migration.

Ranking score: 14.5

Background: The Sharp-tailed Sandpiper nests in northeastern Siberia and spends the non-breeding season in Australasia (Higgins and Davies 1996). Its population was estimated at 160,000 individuals (Bamford et al. 2006). During passage, birds are found regularly in east Asia at sewage ponds and pasturelands but are equally common on intertidal areas. In Alaska, the species is mostly found on coastal salt meadows and on non-vegetated substrates along tidally influenced rivers. The core staging area in Alaska appears to be the central YKD.

Over 200 birds were sampled from Tutakoke and Ugashik. Of those, 208 were live bird samples and 17 were hunter killed (see Spring Subsistence and Fall Harvest). Each location is discussed separately and a final table presents the analytical results at the end of this section.

Tutakoke: Fall migrant Sharp-tailed Sandpipers were sampled in August and September on mudflats, and nearshore ponds, in the vicinity of the Tutakoke River field camp. Tutakoke is located along the outer fringe of YDNWR, near the mouth of the Tutakoke River.

Methods: Mist nets and walk-in traps were used to capture birds at Tutakoke. Most trapping was conducted within two km of the camp and the majority of fecal samples were collected farther away along the banks of the Kashunuk River and the mudflats of Angyoyaravak Bay. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 170 Sharp-tailed Sandpipers was captured, banded, and sampled at Tutakoke. Cloacal and fecal swabs were collected (Table 40). All 170 samples were from juveniles, sex undetermined. Of those, 154 were cloacal and 16 were fecal.

AI Results: None of the 170 Sharp-tailed Sandpipers samples tested positive for avian influenza.

Other Accomplishments: Blood and feather samples were collected for DNA and stable isotope analyses. These analyses will allow sex determination and, in some cases, the location of their non-breeding grounds.

Ugashik: Sharp-tailed Sandpipers were captured in late September through early October on mudflats and in salt marshes at Ugashik Bay. The trapping site was located a few kilometers west of the village of Ugashik on the Alaska Peninsula.

Methods: Capture efforts lasted one week at Ugashik. An array of mist nets was set up approximately 100 meters apart and perpendicular to the shoreline on a bend of the Ugashik River. Nets were monitored continually from nearby blinds. Birds were processed in a tent to keep them out of the inclement weather. Observers occasionally herded birds close to nets to increase the likelihood of capture. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 38 Sharp-tailed Sandpipers was captured and banded to Ugashik. Cloacal swabs were collected. All 38 samples were juvenile, sex undetermined.

AI Results: None of the 38 Sharp-tailed Sandpipers samples tested positive for avian influenza.

Table 40. Birds captured, cloacal and fecal swabs collected and avian influenza analytical results from Sharp-tailed Sandpipers collected August through October in Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
Tutakoke	170	0	0
Ugashik	38	0	0
Total	208	0	0

Taxon: Bar-tailed Godwit (*Limosa lapponica*)

Justification: The Bar-tailed Godwit is a high priority species because migrant godwits arriving in Alaska to breed each spring are just days removed from their staging sites along the coast of eastern Asia. The entire population of this species migrates through east Asia and has contact with a known hot spot.

Ranking score: 14

Background: The entire Alaska-breeding race of the Bar-tailed Godwit (*L. l. baueri*) migrates through the east Asian/Australasian flyway (McCaffery and Gill 2001). Each September, tens of thousands depart from their staging grounds in western Alaska on a non-stop, over-water flight of up to 11,000 km to reach their non-breeding range in New Zealand and Australia (Gill et al. 2005). In early April, migrant flocks apparently fly directly from the non-breeding grounds to staging sites in China and the Koreas along the coast of the Yellow Sea (Battley 1997, Wilson and Barter 1998). While spending several weeks in this area, Bar-tailed Godwits feed and roost with many other species of waterbirds that have spent the non-breeding season throughout southeast Asia, Australia, and New Zealand (Barter 2002). Once they have acquired enough fat for their non-stop flight to the breeding grounds, *L. l. baueri* then head north directly to western and northern Alaska (McCaffery and Gill 2001).

Over 750 birds were sampled from Tutakoke, Old Chevak, Egegik, and Cape Avinof. Of those, 166 were live birds and 39 were hunter killed (see Spring Subsistence and Fall Harvest). In addition, 578 fecal samples (considered poor quality samples) from Cape Avinof, Tutakoke and Egegik were archived. Each location is discussed separately and a final table presents the analytical results at the end of this section.

Tutakoke and Old Chevak: Bar-tailed Godwits were captured, sampled and released at Tutakoke and Old Chevak. Both are located along the outer fringe of YDNWR. Tutakoke is near the mouth of the Tutakoke River and Old Chevak is about 4 km SSE of the village Chevak.

Methods: Mist nets were used to obtain cloacal samples from live birds while fecal samples were obtained after carefully observing (through binoculars and spotting scopes) the behavior of an individual bird and noting where it defecated. Droppings were then sampled immediately and a small amount of fecal material placed in vials with preservation media. If a fecal sample did not have either an age or sex associated with a particular sample it was classified as poor quality and archived. Swab samples were

collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 78 Bar-tailed Godwits was sampled at Tutakoke and Old Chevak. Both cloacal and fecal samples were obtained (Table 41). Of those, four were adult females, seven were adult males, two adults, sex undetermined, 63 juvenile, sex undetermined, and two were undetermined for sex and age. Of the 78 samples collected, 18 were cloacal and 60 were fecal. In addition, 30 "poor quality" fecal samples from Tutakoke were archived.

AI Results: Three of the 78 Bar-tailed Godwits cloacal samples tested positive for avian influenza. None of the three samples were H5 or N1 positive. This represents a 33% prevalence of avian influenza in the Old Chevak birds.

Table 41. Birds captured and samples collected from Bar-tailed Godwits at Yukon Delta National Wildlife Refuge, June, August, and September 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Tutakoke	69	0	2	67	69
Old Chevak	9	4	5	0	9
Total	78	4	7	67	78

Other Accomplishments: Two male Bar-tailed Godwits were recaptured; one had been banded in 2005 at Old Chevak (very near to where it was captured in 2006) and one in 2004 on the South Island of New Zealand. Seven Bar-tailed Godwits were fitted with satellite transmitters at Old Chevak. Movements of satellite-tagged birds documented that Bar-tailed Godwits perform the longest non-stop flapping flights of any birds. The flight record from this year's study was a female Bar-tailed Godwit that flew 10,800 km in a single flight over a 9.6-day period. All captured birds were banded, feathers were collected for stable isotope studies, and blood samples were collected for genetic studies.

Egegik: Fall migrant Bar-tailed Godwits were observed and sampled in August and September on the mudflats and sea beaches adjacent to the southern barrier spit of Egegik Bay on the Alaska Peninsula.

Methods: Fecal samples were collected from Bar-tailed Godwits after carefully observing (through binoculars and spotting scopes) the behavior of an individual bird and noting where it defecated. Droppings were then sampled immediately, using the same swabs as those for cloacal sampling, and a small amount of fecal material placed in vials with preservation media. On occasion, fecal samples were obtained from sites where Dunlin were observed roosting in single-species flocks. Samples from roosts were collected while droppings were still fresh. For each sample, species, and when possible,

age and sex were recorded. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 88 Bar-tailed Godwits was observed and fecal samples collected. Of those, three were adult females, three were adult males, five were adult, sex undetermined, one was a juvenile female, nine were juvenile, sex undetermined, and 67 were undetermined for age and sex. The field camp was vacated for a two-week period in late-August while high wind and waves battered the spit; one of the field camp cabins was eventually swept out to sea during a storm tide in early October.

AI Results: None of the 88 Bar-tailed Godwits fecal samples tested positive for avian influenza.

Table 42. Avian influenza analytical results for Bar-tailed Godwits collected in Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
Tutakoke	69	0	0
Old Chevak	9	3	0.33
Egegik	88	0	0
Total	166	3	0.02

Taxon: Ruddy Turnstone (*Arenaria i. interpres*)

Justification: A large proportion of the population of Ruddy Turnstones that occurs in Alaska is distributed during the non-breeding season in parts of Asia having recent outbreaks of Asian H5N1.

Ranking Score: 13

Background: Approximately 40,000 Ruddy Turnstones utilize sites within Alaska during the year (Alaska Shorebird Group 2006–2010). Half of these individuals breed in Chukotka, while half breed at upland tundra sites within the state (Brown et al. 2001). A portion of both breeding groups migrates to locations in eastern and southeastern Asia during the non-breeding season and stops in central east Asia (Bamford et al. 2006). Additionally, each fall Alaska hosts Ruddy Turnstones that breed in Chukotka but stage at sites in western Alaska en route to non-breeding locations in Asia (Thompson 1974). Thus, not only does a percentage of Alaskan-breeding Ruddy Turnstones spend the non-breeding season at sites near outbreaks of H5N1 in Asia, but a high proportion of Asian-breeding turnstones stage at sites in western Alaska.

A total of 30 samples was collected from various areas around the state including the North Slope, Seward Peninsula, Alaska Peninsula and the YDNWR, as well as and four hunter killed samples (see Spring Subsistence). See discussion below. A final table presents the analytical results at the end of this section.

Methods: No single project specifically targeted the capture and sampling of Ruddy Turnstones. Turnstones were captured in conjunction with other avian influenza projects across the state. Birds were captured using mist nets during pre-nesting and bow nets placed over nests.

Results: A total of 26 cloacal samples was collected from eight camps (Table 43). Of those, nine were adult females, 10 adult males, two adult, sex undetermined, and five juvenile, sex undetermined.

Several factors contributed to low capture rates in the NPR-A. Scheduling of transportation to nest sites months in advance of field work prohibited us from accurately timing our capture activities with the nesting cycle. The logistical difficulty in locating nests and capturing birds at 58 sites was also underestimated. Prudhoe Bay's success of capture was also hampered by the activity of a food-conditioned grizzly bear, which necessitated removal of the camp on 18 August, several weeks earlier than planned. The field camp at Egegik was vacated for a two-week period in late August while high wind

and waves battered the spit; one of the field camp cabins was eventually swept out to sea during a storm tide in early October.

AI Results: None of the 30 Ruddy Turnstones tested positive for the avian influenza virus.

Table 43. Birds captured and cloacal swabs collected from Ruddy Turnstones in Alaska, June and August, 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Canning River Delta	7	1	4	2	7
Prudhoe Bay	6	3	3	0	6
NPR-A	4	2	2	0	4
Colville River Delta	2	0	0	2	2
Okpilak Delta	1	0	0	1	1
Wooley Lagoon	4	3	1	0	4
Tutakoke	1	0	0	1	1
Egegik	1	0	0	1	1
Total	26	9	10	7	26

Other Accomplishments: All captured individuals were banded with a metal band, weighed, and measured. In addition, fat index and the stage of molt was recorded. Blood samples were taken for genetic studies and the plasma will be used in hormone studies. Feathers were collected for stable isotope studies.

Table 44. Avian influenza analytical results for Ruddy Turnstones collected in Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
North Slope	20	0	0
Seward Peninsula	4	0	0
Alaska Peninsula	1	0	0
YDNWR	1	0	0
Total	26	0	0

Taxon: Pectoral Sandpiper (*Calidris melanotos*)

Justification: Pectoral Sandpipers are among the high priority species because small numbers winter regularly in southeast Asia and Australasia (mainly Australia and New Zealand), and then migrate through eastern Asia (e.g., Philippines, Taiwan, and Japan) on route to their breeding areas in Siberia.

Ranking score: 13

Background: Roughly half of the world's population of 400,000 Pectoral Sandpipers (Brown et al. 2001) breeds in Siberia; the remainder breeds throughout western and northern Alaska east to Central Canada (Holmes and Pitelka 1998). Most of the Siberian breeding birds are thought to migrate eastward through Alaska to join the common migration route used by the North American breeding birds. In Alaska, birds are observed migrating through Cook Inlet in Anchorage and the YKD in mid-May, presumably on their way to Siberia. Pectoral Sandpipers that stop in Alaska to breed typically do so in mid-May to early June.

Over 500 birds were sampled from Yukon Delta (pre-breeding) and North Slope (breeding and post breeding). Of these, 528 were live bird samples, and 53 hunter-killed samples (see Spring Subsistence). Each sampling stage and its location will be discussed separately and a final table presents the analytical results at the end of this section.

Pre-breeding

Thousands to tens of thousands of Pectoral Sandpipers migrate through the central YKD in mid-May. These birds are believed to be migrants on their way to Siberia to breed.

Yukon Delta NWR: Pectoral Sandpipers were collected and sampled at Kanaryamuit field camp. Three opportunistic samples were collected from the Anchorage Coastal Wildlife Refuge.

Methods: Because migrant Pectoral Sandpipers use ephemeral, rapidly-changing, wetlands, and do not gather in communal roosts at this site, capturing individuals was not possible and specimens were collected. Cloacal swabs were taken immediately after collection, and then transported to the nitrogen shippers for storage. Opportunistic samples were from live captures.

Results: A total of 103 samples was collected. During a 10-day period, 100 Pectoral Sandpipers were collected during the latter half of the migratory period and cloacal swabs

were collected (Table 45). All one hundred samples were adult, sex undetermined. Opportunistic samples collected at Anchorage Coastal Wildlife Refuge consisted of two adult females and one adult male.

AI Results: None of the 103 Pectoral Sandpipers samples tested positive for avian influenza.

Table 45. Birds collected and cloacal swabs collected from pre-breeding Pectoral Sandpipers, May 2006.

Location	Total birds collected	AI samples			Total AI samples
		Female	Male	UNK	
Kanaryamuit	100	0	0	100	100
Anchorage Coastal Wildlife Refuge	3	2	1	0	3
Total	103	2	1	100	103

Other Accomplishments: Morphometric measurements and body mass were recorded for all captured individuals. Blood and tissue samples were collected for use in studies of migration ecology and spatial distribution.

Breeding
The highest breeding densities occur along the Arctic Coastal Plain of northern Alaska and east-central Siberia. Breeding Pectoral Sandpipers are found in good numbers throughout the NPR-A. Moderate densities of birds have been reported at Barrow, Teshekpuk Lake, and Prudhoe Bay (Troy and Wickliffe 1990, R. Lanctot, unpubl. data; J. Liebezeit, unpubl. data).

North Slope: Breeding Pectoral Sandpipers were captured and sampled throughout the North Slope. Barrow, NPR-A, Prudhoe Bay, and the Canning River Delta are all located on the northern coastline of Alaska along the Beaufort Sea.

Methods: At all four breeding sites birds were captured with bow nets while incubating and some were captured with mist nets. Helicopters were used to access remote sites in the NPR-A. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 394 breeding Pectoral Sandpipers was captured, banded, and cloacal swabs collected at four sites on the North Slope (Table 46). Of those, 230 were adult females, 157 were adult males, four were adult, sex undetermined, and two were juvenile, sex undetermined. One sample was invalid.

AI Results: None of the 393 Pectoral Sandpipers samples tested positive for avian influenza.

Table 46. Birds captured and cloacal swabs collected from breeding Pectoral Sandpipers on the North Slope, June 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Barrow	249	126	120	2	249
NPR-A	65	45	20	0	65
Prudhoe Bay	44	37	7	0	44
Canning River Delta	36	22	10	4	36
Total	394	230	157	6	394

Post-breeding

Male Pectoral Sandpipers depart their breeding areas quickly, while females and their offspring congregate in tundra habitats near the coast of the Arctic Ocean (Connors et al. 1979). Juveniles are present in western Alaska in small flocks from September to mid-October where they occur in coastal habitats.

North Slope: Post-breeding Pectoral Sandpipers were sampled at the Okpilak River Delta located along the coastline of the Arctic National Wildlife Refuge. Opportunistic samples were collected from YDNWR and Colville River.

Methods: Post-breeding birds were captured with mist nets. Cloacal swabs were taken on all captured birds. Fecal samples were collected with a swab immediately after observing a bird defecating. Samples were collected and vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 31 post-breeding Pectoral Sandpipers was captured and banded at Okpilak, YDNWR, and Colville River. Both cloacal and fecal swabs were collected (Table 47). All captured birds were banded with metal bands. All bird samples were juvenile, sex undetermined.

AI Results: None of the 31 Pectoral Sandpipers samples tested positive for avian influenza.

Table 47. Birds captured and cloacal and fecal swabs collected from post-breeding juvenile Pectoral Sandpipers, August and September 2006.

Location	Total birds captured	Total AI samples
Okpilak	20	20
Tutakoke	6	6
Ugashik	4	4
Colville River	1	1
Total	31	31

Table 48. Avian influenza analytical results for Pectoral Sandpipers collected in Alaska, 2006.

Location	Season	Total samples	Total AI positive	Prevalence
North Slope	Breeding	394	0	0
YDNWR	Pre-breeding	100	0	0
Anchorage Coastal Wildlife Refuge	Pre-breeding	3	0	0
North Slope	Post-breeding	20	0	0
YDNWR	Post-breeding	6	0	0
Alaska Peninsula	Post-breeding	4	0	0
Colville River	Post-breeding	1		
Total		528	0	0

Taxon: Red Knot (*Calidris canutus rogersi & roselaari*)

Justification: Red Knots are a high priority species because those in Alaska either co-occur with birds coming from Australasia or are part of a population whose breeding range extends to Asia (Wrangel Island).

Ranking score: 12.5

Background: Three subspecies of Red Knots occur in the Australasian flyway. Those breeding on Wrangel Island and likely in northwestern Alaska are recognized as *C. c. roselaari* (Engelmoer and Roselaar 1998). The total population of *roselaari* is estimated at fewer than 50,000 birds (Alaska Shorebird Group, unpublished). The only place in Alaska where they are known to occur in large numbers is on the outer YKD in May (Gill and Handel 1981, 1990). Movement of Red Knots to and from the breeding and non-breeding grounds entails prolonged stays in coastal east Asia, primarily on estuarine habitats.

Over 70 birds were sampled from Tutakoke and Egegik. Of those, 73 were live bird samples, six hunter killed samples (see Spring Subsistence) and one bird was for museum collection. If a fecal sample did not have either an age or sex associated with a particular sample it was classified as "poor quality" and archived. A total of 50 Red Knot fecal samples was archived. Each location is discussed separately and a final table presents the analytical results at the end of this section.

Tutakoke: Red Knots were captured, sampled, and released on intertidal flats and snow-free meadows along the coast of Angyoyaravak Bay near the mouth of the Tutakoke River.

Methods: Red Knots were captured using spring-loaded bow traps and walk-in traps placed in high-use foraging areas and over nests. Researchers slowly herded foraging birds towards traps.

Results: A total of 17 Red Knots was captured and banded at Tutakoke. One additional bird was sampled and collected for a museum specimen. Cloacal swabs were collected from 18 Red Knots.

AI Results: None of the 18 Red Knot samples tested positive for avian influenza.

Egegik: Fall migrant Red Knots were captured in August and September on the mudflats and sea beaches adjacent to the southern barrier spit of Egegik Bay on the Alaska Peninsula.

Methods*:* Fecal samples were collected from individuals at Egegik. Samples were obtained after carefully observing the behavior of an individual bird and noting where it defecated. Droppings were then sampled immediately and a small amount of fecal material placed in vials with preservation media.

Results: Fifty-six Red Knots were sampled via fecal collection at Egegik. Of those, nine were juvenile, sex unidentified and 47 were unidentified for sex and age. The field camp was vacated for a two-week period in late-August due to weather.

AI Results: None of the 56 Red Knots sampled tested positive for avian influenza.

Other Accomplishments: All birds were measured, weighed, banded, and released. Blood and feather samples were collected for DNA and stable isotope analyses. These analyses will allow us to determine sex of individuals and, in some cases, the location of their non-breeding grounds.

Table 49. Birds captured, cloacal and fecal swabs collected and avian influenza analytical results from Red Knots collected May and August in Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
Tutakoke	17	0	0
Egegik	56	0	0
Total	73	0	0

Robert Gill, USGS ASC

Taxon: Long-billed Dowitcher (*Limnodromus scolopaceus*)

Justification: Nearly all the Long-billed Dowitchers that breed in Asia migrate through Alaska en route to non-breeding areas in North and Central America. These birds mix during migration and breeding with other waterfowl and shorebird species from parts of Asia with recent outbreaks of Asian H5N1.

Ranking Score: 12

Background: The Long-billed Dowitcher breeds at high-latitude coastal wetlands in Alaska, Canada, and the Russian Far East (Takekawa and Warnock 2000). About one third of all Long-billed Dowitchers breed in Asia, with the majority of these Asian-breeding dowitchers passing through Alaska during both spring and fall migration (Alaska Shorebird Group 2006–2010).

Over 100 birds were sampled on the YDNWR and the North Slope. Of those, 132 were live bird samples, and 33 hunter-killed samples (see Spring Subsistence). Each location is discussed separately and a final table presents the analytical results at the end of this section.

Yukon Delta NWR: Long-billed Dowitchers were collected and sampled at Kanaryarmuit and captured, sampled and released at Tutakoke on the YDNWR. One opportunistic sample was collected at the Savoonga Airport on St. Lawrence Island.

Methods: Breeding birds were captured with bow nets while incubating and post-breeding birds were captured with mist nets. Non–breeding bird were collected. Cloacal and fecal swabs were collected and air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 85 Long-billed Dowitchers was sampled at Kanaryarmuit and Tutakoke. Cloacal and fecal swabs were collected (Table 50). The sex was undetermined for all 85 Long-billed Dowitchers. Of those, 78 were adult and seven were juvenile.

AI Results: None of the 85 Long-billed Dowitchers samples tested positive for avian influenza.

Table 50. Birds captured and cloacal and fecal swabs collected from Long-billed Dowitchers on the Yukon Delta National Wildlife Refuge and St. Lawrence Island, May and September 2006.

Location	Total birds captured	Total AI samples
Kanaryarmuit	77	77
Tutakoke	7	7
Savoonga airport	1	1
Total	85	85

North Slope: Long-billed Dowitcher were captured, sampled and released at six sites on the North Slope.

Methods: Birds were captured with bow nets while incubating and post-breeding birds were captured with mist nets. Cloacal and fecal swabs were collected and air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 47 Long-billed Dowitchers was sampled at six sites on the North Slope. Cloacal and fecal swabs were collected (Table 51). Of those, 13 were adult females, 18 adult males, six adult, sex unidentified, eight juvenile, sex unidentified, one juvenile female, and one juvenile male.

AI Results: None of the 47 Long-billed Dowitchers samples tested positive for avian influenza.

Table 51. Birds captured and cloacal and fecal swabs collected from Long-billed Dowitchers on the North Slope, June through October 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Barrow	27	10	16	1	27
Prudhoe	6	4	2	0	6
Icy Cape	4	0	0	4	4
NPR-A	1	0	1	0	1
Canning River	5	0	0	5	5
Okpilak	4	0	0	4	4
Total	47	14	19	14	47

Other Accomplishments: All captured birds were banded with a metal band. Biometric measurements, feather samples and blood samples were also collected.

Table 52. Avian influenza analytical results for Long-billed Dowitchers collected in Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
Yukon Delta	84	0	0
St. Lawrence	1	0	0
North Slope	47	0	0
Total	132	0	0

Taxon: Rock Sandpiper (*Calidris ptilocnemis tschuktschorum*)

Justification: This high priority subspecies provides a major migratory link between Asia and North America; about 10,000 birds nest in western Siberia and migrate directly to Alaska in fall.

Ranking score: 11.5

Background: The *tschuktschorum* subspecies of the Rock Sandpiper (*Calidris ptilocnemis*) breeds in coastal mountains and uplands in eastern Russia (Chukotka Peninsula) and western Alaska (from northern Seward Peninsula south throughout Alaska Peninsula) (Gill et al. 2002). The current population is estimated at 50,000 birds with about 10,000 nesting in Russia. During post-breeding (Jul–Oct), the entire population migrates to coastal staging areas in western Alaska (YKD and Bristol Bay) where they molt and associate closely with a variety of other shorebirds, including two other subspecies of Rock Sandpiper.

Over 100 birds were sampled from Tutakoke on the YDNWR and Egegik located on the Alaska Peninsula. In addition, 14 hunter samples were collected (see Spring Subsistence and Fall Harvest). Each location is discussed separately and a final table presents the analytical results at the end of this section.

Tutakoke: Rock Sandpipers were captured, sampled and released at Tutakoke, which is located along the outer fringe of YDNWR, near the mouth of the Tutakoke River. The area contains many shallow ponds, lakes, and a network of tidal sloughs.

Methods: Post-breeding Rock Sandpipers were captured using walk-in traps placed in high-use foraging areas. Cloacal samples were collected and vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: Ninety Rock Sandpipers were captured and banded at Tutakoke. Cloacal swabs were collected. Of those, 79 were adult, sex unidentified, 10 were juvenile, sex unidentified, and one was unidentified for sex and age.

AI Results: None of the 90 Rock Sandpiper samples tested positive for avian influenza.

Other Accomplishments: All birds were measured, weighed, banded, and released. Blood and feather samples were collected for DNA and stable isotope analyses. These analyses will allow determination of sex of individuals and, in some cases, the location of their non-breeding grounds.

Egegik: Post-breeding Rock Sandpipers were captured in September and October on mudflats and sea beaches adjacent to the southern barrier spit of Egegik Bay on the Alaska Peninsula.

Methods: A variety of methods was used to capture birds, including mist nets, walk-in traps, triggered bow traps, and elastically launched "whoosh" nets. The latter proved the most effective at capturing birds in the situations prevalent at Egegik.

Results: A total of 69 Rock Sandpipers was captured and banded at Egegik. Cloacal swabs were collected. Of those, 47 were adult, sex unidentified, 21 were juvenile, sex unidentified, and one was unidentified for sex and age.

AI Results: None of the 69 Rock Sandpiper samples tested positive for avian influenza.

Other Accomplishments: All birds were measured, weighed, banded, and released. Blood and feather samples were collected for DNA and stable isotope analyses.

Table 53. Birds captured, cloacal swabs collected and avian influenza analytical results from Rock Sandpipers collected August and September in Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
Tutakoke	90	0	0
Egegik	69	0	0
Total	159	0	0

Donna Dewhurst, USFWS

Taxon: Pacific Golden-Plover (*Pluvialis fulva*)

Justification: Pacific Golden-Plovers could potentially carry Asian H5N1 to Alaska via three different routes: 1) birds that spend the non-breeding season in east central Asia—some in Asian H5N1 "hotspots"—migrate through Alaska in spring *en route* to Siberian breeding areas, 2) birds that nest (or hatch) in Siberia migrate directly to coastal stopover sites in Alaska in fall (adults and juveniles arrive in two different pulses), and 3) Alaska-breeding birds return to Alaska in spring after co-mingling on non-breeding areas with other *fulva* that have frequented Asian H5N1 "hotspots."

Ranking score: 11.5

Background: Pacific Golden-Plovers breed in tundra habitats from north central Siberia to western Alaska (Johnson and Connors 1996). One population (ca. 100,000 birds) nests in Siberia and spends the non-breeding season in east and southeast Asia, Australia, and Oceania (Bamford et al. 2006, Wetlands International 2002). During both north and south migrations, an unknown portion of this population passes through Alaska. Another population breeds in Alaska and spends the non-breeding season in Oceania (Johnson and Connors 1996), particularly in Hawaii (Johnson et al. 2004), where it associates with plovers that have recently arrived from Asia.

Thirty Pacific Golden-Plovers were sampled. Twenty-nine birds were sampled from the Alaska Peninsula and one sample was from the YDNWR. In addition, 12 hunter samples were collected (see Spring Subsistence).

Alaska Peninsula and Yukon Delta NWR: The majority of Pacific Golden-Plovers were sampled at Egegik on the Alaska Peninsula. One sample was collected from Tutakoke on the YDNWR.

Methods: At Egegik fecal samples were obtained after carefully observing individual birds through binoculars and spotting scopes. Droppings were then sampled immediately and a small amount of fecal material placed in vials with preservation media. One cloacal sample was obtained after capturing the bird on a nearshore pond at Tutakoke.

Results: A total of 30 birds was sampled at Egegik and Tutakoke. Fecal and cloacal swabs were collected (Table 54). All samples were undetermined for sex. Fifteen were adult, fifteen were juvenile, and one was undetermined for age.

AI Results: None of the 30 Pacific Golden-Plover samples tested positive for avian influenza.

Table 54. Birds captured, cloacal and fecal swabs collected and avian influenza analytical results from Pacific Golden-Plovers collected August and September in Alaska, 2006.

Location	Total birds captured	Total AI samples	Total AI positive	Prevalence
Egegik	29	29	0	0.0
Tutakoke	1	1	0	0.0
Total	30	30	0	0.0

Other Accomplishments: All birds were measured, weighed, banded, and released. Blood and feather samples were collected for DNA and stable isotope analyses. These analyses will determine sex of individuals and, in some cases, the location of their non-breeding grounds.

O.W. Johnson, Montana State Univ.

Taxon: Buff-breasted Sandpiper (*Tryngites subruficollis)*

Justification: Buff-breasted Sandpipers are a high priority species because a small portion of the population breeds in Asia on Wrangel Island and western Chukotka mainland and then migrates through Alaska to its non-breeding grounds in southern South America.

Ranking score: 10

Background: A small proportion of the world's population of 15,000 Buff-breasted Sandpipers (Brown et al. 2001) breeds on Wrangel Island and the western Chukotka mainland; the remainder breeds throughout northern Alaska east to Central Canada (Lanctot and Laredo 1994). Portions of the population migrate south along the Pacific and Atlantic coasts. The Chukotka breeding birds are thought to migrate eastward through Alaska to join the common migration route used by the North American breeding birds.

A total of 93 birds was sampled from five sites on the North Slope. Seventy-two were archived and classified as "poor quality fecal samples. One sample was invalid. See discussion below.

North Slope: Buff-breasted Sandpipers were captured, sampled, and released from five sites on the North Slope. Barrow, NPR-A, Prudhoe Bay, Canning River Delta, and the Okpilak Delta camp are all located on the northern coastline of Alaska along the Beaufort Sea.

Methods: At all five sites birds were captured on nests using walk-in and bow traps and with mist nets. Two helicopters were used at the NPR-A site to transport people to sample sites where two-person crews located nests for capture and sampling. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: Ninety-three Buff-breasted Sandpipers were captured and banded at Barrow, throughout the NPR-A, Prudhoe Bay, Canning River Delta, and the Okpilak Delta. Cloacal and fecal swabs were collected (Table 55). Of those, 39 were adult females, 32 were adult males, 12 were sex undetermined adult, two were juvenile, undetermined sex, and eight were undetermined for sex and age. In addition, 72 samples were archived and classified as "poor quality" fecal samples. Total cloacal swabs collected was 89 and total fecal swabs collected was four. One sample was invalid.

AI Results: None of the 93 Buff-breasted Sandpipers samples tested positive for avian influenza.

Table 55. Birds captured, cloacal and fecal swabs collected and avian influenza analytical results from Buff-breasted Sandpipers collected June through August in Alaska, 2006.

Location	Total birds captured	AI samples			Total AI samples	Total AI positive	Prevalence
		Female	Male	UNK			
Barrow	11	11	0	0	11	0	0.0
NPR-A	3	1	1	1	3	0	0.0
Prudhoe Bay	53	26	24	3	53	0	0.0
Canning River Delta	14	1	7	6	14	0	0.0
Okpilak Delta	12	0	0	12	12	0	0.0
Total	93	39	32	22	93	0	0.0

Other Accomplishments: All captured individuals were banded with a metal band weighed, and measured. In addition, fat index and the stage of molt were recorded. Blood samples were taken for genetic studies and feathers were collected for stable isotope studies.

Taxon: Aleutian Tern (*Sterna aleutica*)

Justification: The vast majority of Aleutian Terns breeds in Alaska and migrate to Australasia via the east Asia Flyway.

Ranking score: 13

Background: The Aleutian Tern is a widely distributed colonial nesting seabird that breeds in Alaska and the northern Russian Far East. There are about 10,000 breeding Aleutian Terns at over 50 colonies in Alaska. Aleutian Terns have been sighted in east and southeast Asia during the non-breeding season, but specific non-breeding areas for Alaska's breeding Aleutian Terns in the East Asia Flyway are unknown.

Methods: The sampling project occurred at Blacksand Spit near Yakutat on the northern Gulf of Alaska. Several "live-bird" trapping methods were employed and "treadle" and "hoop" traps proved most effective. The delayed timing of breeding in 2006 made it difficult to synchronize our field season with bird capture. One hundred-two Aleutian Terns were live captured and cloacal samples collected. To meet the target sample size, 200 fresh fecal samples were also obtained. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 102 Aleutian Terns was captured and banded at Blacksand Spit near Yakutat. Cloacal and fecal swabs were collected from 302 Aleutian terns (Table 56). Of those, 299 were adult and three were juvenile. Sex for all 302 samples was undetermined.

AI Results: One of the 302 Aleutian Tern samples tested positive for avian influenza. It was not H5 or N1 positive. The positive sample was from a live bird sample. This represents < 1% prevalence of avian influenza.

Table 56. Birds captured, cloacal and fecal swabs collected, and avian influenza analytical results from Aleutian Terns collected June and July in Yakutat Alaska, 2006.

Location	Total birds captured	Cloacal	Fecal	Total AI samples	Total AI positive	Prevalence
Blacksand Spit	302	102	200	302	1	0.003

Other Accomplishments: The crew ringed and color-banded the 102 Aleutian Terns that were live captured. Feathers were taken from 30 birds for stable isotope analyses.

Taxon: Glaucous Gull (*Larus hyperboreus*)

Justification: Glaucous Gulls are a high priority species because populations in western Alaska migrate to Australasia, winter along the coast and feed in land fills and scavenge dead birds.

Ranking score: 11.5

Background: The Glaucous Gull is often predatory, feeding on birds, small mammals, fish and invertebrates (Gilchrist 2001, Bowman et al. 2004). This species is circumpolar in distribution. In Alaska it breeds coastally from the central Bering Sea to the Beaufort Sea. In Russia Far East they breed in similar latitudes (Harrison 1983, Armstrong 1995, ASIS 2006). Satellite telemetry has shown that birds breeding in Barrow spend much of their winter in coastal Russia as far south as the Kamchatka Peninsula (Troy Ecological Research Associates 2004). About 100,000 birds nest in colonies and singly in Alaska (Gilchrist 2001, Bowman et al. 2004, USFWS 2006).

Three hundred fifty-six birds were sampled from St. Lawrence Island, Barrow and Tutakoke. Of those, 33 were live birds and 106 were hunter killed (see Spring Subsistence and Fall Harvest). In addition, six mortality samples were collected and 211 poor quality environmental samples were archived.

St. Lawrence Island, Barrow and Tutakoke: Glaucous Gull were captured, sampled and released at three locations in Alaska.

Methods: Gulls were primarily trapped with noose-mats on two Minke whale (*Balaenoptera acutorostrata*) carcasses and at the village landfill on St. Lawrence Island. Glaucous Gulls were difficult to capture and responded strongly to human disturbance. After capture of an individual gull, all other gulls would leave the trapping area for 3-8 hours and the trapping location would need to be relocated. Whale carcasses and the landfill were the only places where gulls congregated, limiting options for trapping locations. Cloacal and fecal swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 33 Glaucous Gulls was captured and banded at St. Lawrence Island, Barrow and Tutakoke. Cloacal and fecal swabs were collected (Table 57). All samples were undetermined for sex. Of those, 31 were adult and two were juvenile.

AI Results: None of the 33 Glaucous Gulls samples tested positive for avian influenza.

Table 57. Birds captured, cloacal and fecal swabs collected, and avian influenza analytical results from Glaucous Gulls collected June through July in Alaska, 2006.

Location	Total birds captured	Total AI samples	Total AI positive	Mortality	Prevalence
St. Lawrence	13	13	0	6	0.0
Barrow	17	0	0	0	0.0
Tutakoke	3	0	0	0	0.0
Total	33	33	0	6	0

An additional 106 samples were hunter killed (see Spring Subsistence and Fall Harvest). Five of the samples collected from hunters tested positive for avian influenza. None of the five samples were H5 or N1 positive. This represents a 5% prevalence of avian influenza in the St. Lawrence hunter harvested Glaucous Gulls.

Ted Swem, USFWS

Eastern Yellow Wagtail (Motacilla tschutschenis)

Justification: The Eastern Yellow Wagtail overwinters in southeast Asia and Indonesia.

Ranking score: 17.5

Background: The Eastern Yellow Wagtail is a common breeder on the coastal uplands of western Alaska and the northern foothills of the Brooks Range where they co-occur with other Paleotropic migrants that rank high for surveillance of Asian H5N1. It overwinters in the epicenter of Asian H5N1 outbreaks in southeast Asia and Indonesia where it uses open areas with water, is often associated with agriculture and domestic animals, and congregates into flocks of thousands of birds at evening roosts.

A total of 304 Eastern Yellow Wagtails was sampled from the Askinuk Mountains and the Seward Peninsula. Each location is discussed separately and a final table presents the analytical results at the end of this section. An additional six wagtails were opportunistically captured on the North Slope and YKD during other HPAI sampling projects.

Askinuk Mountains

Methods: Eastern Yellow Wagtails were sampled in the Askinuk Mountains, Alaska, where this species reaches its highest breeding densities in North America (Badyaev et al. 1998). The capture of wagtails was targeted for breeding and post-breeding periods. During the breeding period, adults were captured on or near nests with mist nets or bow traps. During the post-breeding period, staging or migrating adults and juveniles were captured at three arrays of 10–15 mist nests at Kagankaguti Lake. All Eastern Yellow Wagtails captured were aged, sexed, banded, and sampled for HPAI virus. Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results: A total of 124 adults, 133 juvenile, and one unidentified for both sex and age Eastern Yellow Wagtails was captured, banded and sampled at Kagankaguti Lake and Cape Romanzof. Cloacal swabs were collected from 258 Eastern Yellow Wagtails (Table 58). Of those, 65 were adult females, 51 adult males, eight were adult, sex undetermined, 133 were juvenile sex undetermined, and one was undetermined for both sex and age. The majority (93%) of these birds were captured at Kagankaguti Lake as only eight nesting pairs of wagtails were observed at Cape Romanzof in 2006. Most adult wagtails were captured on or near nests.

AI Results: None of the 241 Eastern Yellow Wagtails samples tested positive for avian influenza.

Table 58. Cloacal swabs collected from breeding and post-breeding Eastern Yellow Wagtails in the Askinuk Mountains, June through August 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Kagankaguti Lake	245	56	43	142	241
Cape Romanzof	17	9	8	0	17
Total	262	65	51	142	258

Seward Peninsula

Methods: Five monitoring avian productivity and survivorship (MAPS) stations were operated on the Seward Peninsula to sample multiple target species for HPAI. In addition to sampling at MAPS stations, a team of two field biologists targeted Eastern Yellow Wagtails using playbacks and carved decoys, flushing females from nests into mist nets, and using mist nets. All captured birds of target species were aged, sexed, banded, and sampled for actively-shedding HPAI using fecal or cloacal swabs.

Results: Sixty birds were captured and 46 viable samples obtained and analyzed. A total of fifty-four Eastern Yellow Wagtails was captured and banded on the Seward Peninsula. An additional six birds were sampled opportunistically on the North Slope and YKD. Cloacal and fecal swabs were collected from 46 Eastern Yellow Wagtails (Table 59). Of those, 10 were adult females, five adult males, three were adult, sex undetermined, and 31 were juvenile, sex undetermined.

AI Results: None the 46 Eastern Yellow Wagtails samples tested positive for avian influenza.

Table 59. Samples collected from Eastern Yellow Wagtails at Seward Peninsula, North Slope, and Yukon Delta National Wildlife Refuge, June through August 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Nome	54	9	5	26	40
Colville River	5	1	0	4	5
Tutakoke	1	0	0	1	1
Total	60	10	5	31	46

Other Accomplishments*:* Each adult wagtail was marked with a unique combination of colored-leg bands to enable re-sighting birds in subsequent field seasons to estimate adult survival and dispersal. In addition, tissue and feather samples were also collected for future analyses to aid in determining geographic linkages between breeding and wintering areas using stable isotopes and genetics. On the Seward Peninsula, additional data on productivity were gathered by monitoring Eastern Yellow Wagtail nests and MAPS stations were operated in a "constant-effort" manner for 1,331 net-hours.

Table 60. Avian influenza analytical results for Eastern Yellow Wagtails collected in Alaska, 2006.

Location	Total samples	Total AI positive	Prevalence
Kagankaguti Lake	241	0	0
Cape Romanzof	17	0	0
Nome	40	0	0
Colville River	5	0	0
Tutakoke	1	0	0
Total	304	0	0

Taxon: Arctic Warbler (*Phylloscopus borealis kennicotti*)

Justification: The Alaska subspecies of Arctic Warbler overwinters in the epicenter of Asian H5N1 outbreaks in southeast Asia and Indonesia, where it is abundant in shrub and forest habitats around farms and homes.

Ranking score: 17

Background: In Alaska, the Arctic Warbler is one of the most abundant birds in shrub habitats on the Seward Peninsula, northern Bristol Bay, and central Alaska and central Brooks Range. Areas used by Arctic Warblers on the Seward Peninsula and central Brooks Range also have some of the highest breeding densities of other priority passerines.

A total of 774 Arctic Warblers was sampled from five locations; Dillingham, the Seward Peninsula, Denali National Park and Preserve, and the North Slope. One sample was collected opportunistically at Cape Romanzof on the YKD. Each location is discussed separately and a final table presents the analytical results at the end of this section. The target sample size for Arctic Warbler was reached prior to submission of samples from Bethel and Savoonga. Four samples are currently being archived at the Alaska Science Center and pending analyses for avian influenza viruses.

Methods: Twenty-two MAPS stations were established during summer 2006 (DeSante et al. 2004) with the specific goal of sampling large numbers of individual birds of target species for HPAI. Five stations were operated near Dillingham, five were operated near Umiat on the Colville River, five were operated on the Seward Peninsula, four were operated along the Denali Highway between Paxson and the Maclaren River, and three were operated in Denali National Park and Preserve. In addition to sampling at MAPS stations, Arctic Warblers were netted using song and call playbacks at a variety of locales between, and in the vicinity of, MAPS stations. All captured birds of target species were aged, sexed, banded, and sampled for actively-shedding HPAI using fecal or cloacal swabs.

Results: A total of 774 Arctic Warblers was captured and banded at five locations around the state. Cloacal and fecal swabs were collected from Arctic Warblers (Table 61). Of those, 100 were adult females, 254 were adult males, 167 were adult, sex undetermined, two were juvenile males, 233 were juvenile, sex undetermined and 18 were undetermined for sex and age. Five of the samples were invalid.

AI Results: None of the 774 Arctic Warblers samples tested positive for avian influenza.

Table 61. Birds captured, cloacal and fecal swabs collected and avian influenza analytical results from Arctic Warblers at Dillingham, Seward Peninsula, Denali National Park and Preserve, and the North Slope, June through August 2006.

Location	Total birds captured	AI samples			Total AI samples	Total AI positive
		Female	Male	UNK		
North Slope	359	69	85	205	359	0
Dillingham	137	9	54	74	137	0
Seward Peninsula	115	7	29	79	115	0
Denali National Park	162	15	88	59	162	0
Cape Romanzof	1	0	0	1	1	0
Total	774	100	256	418	774	0

Ted Swem, USFWS

Taxon: Gray-cheeked Thrush (*Catharus minimus*)

Justification: A substantial portion of the Gray-cheeked Thrush breeding population migrates through Alaska and onto breeding areas in northeastern Siberia where they may come in contact with birds that wintered in or migrated through Asia.

Ranking score: 12

Background: The Gray-cheeked Thrush is a common breeder and migrant in shrub habitats throughout Alaska where they co-occur with other Paleotropic migrants. Adult and juvenile Gray-cheeked Thrushes are commonly captured in fall mist-netting efforts aimed at monitoring populations of terrestrial birds.

Over 230 Grey-cheeked Thrushes were sampled from two locations across Alaska. Each location is discussed separately and a final table presents the analytical results at the end of this section. Two hundred and forty-three samples were also collected in conjunction with other avian influenza sampling efforts. The target sample size for Gray-cheeked Thrushes was reached prior to submission of samples from Tok, Bethel, Fairbanks, Nome and Dillingham. Samples are currently being archived at the Alaska Science Center and pending analyses for avian influenza viruses.

Askinuk Mountains

Methods: Gray-cheeked Thrushes were captured using mist nests, sampled and released at Kagankguti Lake. All captured Gray-cheeked Thrushes were aged, sexed, and banded. Swab samples were collected and sample vials were stored in a liquid nitrogen shipper and air freighted to Anchorage.

Results: A total of 131 Gray-cheeked Thrushes was captured and sampled in the Askinuk Mountains. Cloacal swabs were collected (Table 62). Of those, 21 were adult females, 26 adult males, six were adult, sex undetermined, 75 were juvenile, sex undetermined, two were sub-adult males, and one was a sub-adult, sex undetermined.

AI Results: None of the 131 samples tested positive for avian influenza.

Table 62. Gray-cheeked Thrushes captured and cloacal swabs collected in the Askinuk Mountains, June through August 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Kagankaguti Lake	128	21	26	81	128
Cape Ramonzof	3	0	2	1	3
Total	131	21	28	82	131

Colville River North Slope

Methods: Five MAPS stations were operated on the North Slope to sample multiple target species for avian influenza. All captured birds of target species were aged, sexed, banded, and sampled for actively-shedding HPAI using fecal or cloacal swabs.

Results: A total of 81 Gray-cheeked Thrushes was captured and 77 viable samples were obtained and analyzed. Sixty-five cloacal and 12 fecal swabs were collected from Gray-cheeked Thrushes (Table 63). In addition, 11 opportunistic samples were collected from Nome and Dillingham. One of the 77 samples was invalid. Of those, 23 were adult females, 15 adult males, 20 were adult, sex undetermined, and 19 were juvenile sex undetermined.

AI Results: None of the 77 samples tested positive for avian influenza.

Table 63. Cloacal and fecal swabs collected from Gray-cheeked Thrushes on the North Slope, Alaska, 2006.

Location	Total birds captured	AI samples			Total AI samples
		Female	Male	UNK	
Colville River	81	23	15	39	77

Table 64. Avian influenza analytical results for Gray-cheeked Thrushes collected in Alaska, 2006.

Location	Total samples	Mortality	Total AI positive	Prevalence
Kagankaguti Lake	128	1	0	0
Cape Ramonzof	3	0	0	0
Colville River	77	0	0	0
Total	230	1	0	0

HUNTER HARVEST SAMPLING

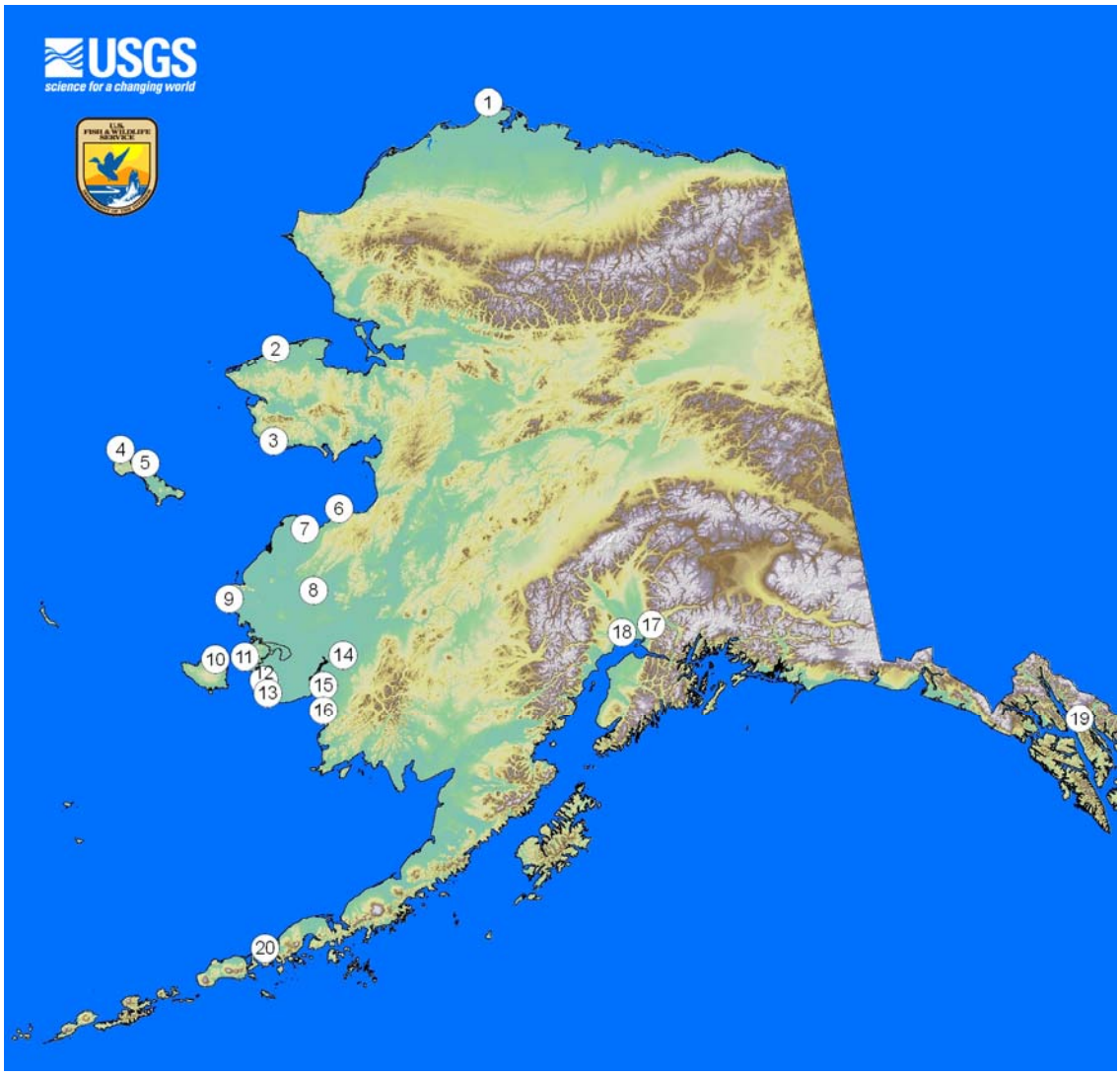
Background: Surveillance of hunter harvested birds was one of three sampling strategies set forth in the Alaska Interagency Sampling protocol for HPAI in wild birds. This strategy included spring subsistence harvested birds and fall hunter harvested birds. The significant annual harvest of migratory birds in Alaska presents an important opportunity to conduct surveillance sampling for AI from spring through winter. Alaska subsistence hunters take over 350,000 migratory birds annually, mostly in rural western and northern Alaska (Paige and Wolfe 1998). The overall proportion of subsistence bird harvest taken from spring to midsummer is about 55%, and as high as 76% in major bird harvest regions (Wolfe et al. 1990). This harvest includes birds that arrive to breed from wintering areas in Asia. The traditional spring harvest of birds is very diverse in species composition, including shorebirds, seabirds, and waterfowl; the composition and timing of harvests are highly variable among regions. Subsistence hunting also occurs from late summer into winter, most significantly in regions south of Bristol Bay, representing birds returning from breeding and molting areas in Asia, as well as birds migrating to wintering areas in southern Alaska and the Pacific Coast.

The primary value of sampling birds harvested in fall is detection of AI in birds migrating south from Alaska through Canada, all four North American flyways, and Mexico. In addition, some species of sea ducks return from Asia to winter in Alaska. The species composition and timing of fall harvest over the season are affected by the phenology of migration which is influenced by weather (e.g., winds and temperature patterns), local habitat conditions, and hunter activity. Seasonal variation in harvest (and access to AI samples) can be significant, especially with species such as pintail that have differential migrations by age and sex classes (i.e., adult males begin migration in August, females and young follow).

Spring Subsistence Sampling

Methods:
Spring Subsistence Sampling—Sampling locations (Fig. 2) for the spring subsistence harvest were chosen based on migratory routes and timing of priority species, past subsistence harvest information, and the ability to obtain samples from Native subsistence users. The YKD was the primary focus for obtaining samples from subsistence harvested birds because of the species composition and volume of the harvest. Ten villages (Chefornak, Eek, Hooper Bay, Kipnuk, Kotlik, Kwethluk, Mekoryuk, Pilot Station, Toksook Bay, Quinhagak) were selected for sampling efforts, with each village contributing up to 300 samples of harvested birds. The regional health provider (Yukon Kuskokwim Health Corporation) was selected to coordinate the sampling effort. The USFWS contracted with Kawerak, Inc. to collect samples in three locations on the Seward Peninsula (Nome, Stebbins, and Shishmaref), each location providing up to 300 spring harvested birds. Spring subsistence samples were also collected from the villages of Gambell and Savoonga on St. Lawrence Island. In all locations, subsistence users were encouraged, through various outreach methods, to provide harvested birds to sample coordinators, who obtained samples via cloacal swabs

Figure 2. Spring subsistence and fall harvest sampling locations for H5N1 Avian Influenza in Alaska, 2006. For specific locations see key following map.



Site #	Village	Season	Site #	Village	Season
1	Barrow	Both	11	Tokosook Bay	Spring
2	Shishmaref	Spring	12	Cherornak	Both
3	Nome	Both	13	Kipnuk	Both
4	Gambell	Both	14	Kwethluk	Spring
5	Savoonga	Both	15	Eek	Spring
6	Stebbins	Spring	16	Quinhagak	Spring
7	Kotlik	Spring	17	Palmer Flats	Fall
8	Pilot Station	Both	18	Susitna Flats	Fall
9	Hooper Bay	Spring	19	Mendenhall	Fall
10	Mekoryuk	Spring	20	Izembek	Fall

of dead birds. Species, age and sex were provided in most cases, as well as an estimate of how long the bird had been dead. Samples were stored in nitrogen vapor shippers and air freighted to Anchorage on a regular basis. Northern Pintails, Black Brant, Emperor Geese, Long-tailed Ducks, Tundra Swans, Lesser Sandhill Cranes, Lesser Snow Geese, Common Eider, and King Eiders were targeted during spring subsistence harvest. However, numerous other species were encountered and sampled during spring subsistence sampling. The majority of samples from Lesser Snow Geese, King Eiders, and Long-tailed Ducks were collected from spring subsistence harvested birds.

Results

Yukon-Kuskokwim Delta: A total of 2,772 samples was collected and analyzed from 56 different species, 19 of which were priority species. Eighty-five of the YKD samples tested positive for avian influenza (Table 65). None of the 85 samples were H5 or N1 positive.

Table 65. Cloacal samples obtained from spring subsistence harvested birds on the Yukon Delta National Wildlife Refuge, Alaska 2006. Priority species are bolded.

Species	Samples Taken	Positive for AI	Prevalence
Emperor Goose	131	11	0.08
Lesser Snow Goose	140	9	0.07
Canada Goose	342	9	0.03
Black Brant	140	6	0.04
Tundra Swan	209	6	0.03
Northern Pintail	89	2	0.02
King Eider	563	5	0.01
Long-tailed Duck	14	1	0.08
Greater White-fronted Goose	692	35	0.05
Mallard	37	1	0.03
Waterfowl	109	0	0.0
Seaducks	83	0	0.0
Shorebirds	68	0	0.0
Seabirds and Gulls	33	0	0.0
Other	122	0	0.0
Total	2,772	85	

Seward Peninsula: A total of 844 samples was collected and analyzed from 27 different species, 18 of which were priority species. Of the 844 samples, 10 were positive for avian influenza (Table 66). None of the 10 samples were H5 or N1 positive.

Table 66. Cloacal samples obtained from spring subsistence harvested birds on the Seward Peninsula, Alaska 2006. Priority species are bolded.

Species	Samples Taken	Positive for AI	Prevalence
Lesser Snow Goose	285	4	0.01
Black Brant	160	1	0.006
Northern Pintail	73	0	0
Long-tailed Duck	26	0	0.0
Sandhill Cranes	17	0	0.0
White-fronted Goose	92	3	0.03
Canada Goose	64	2	0.03
Geese and Swans	48	0	0.0
Waterfowl	35	0	0.0
Shorebirds	44	0	0.0
Total	844	10	

St. Lawrence Island: A total of 621 samples was collected from spring subsistence hunters on St. Lawrence Island and analyzed for avian influenza viruses. Only 175 samples collected on St. Lawrence Island were from priority species. One out of 80 King Eiders tested positive for AI, a prevalence of 0.013%. Thick-billed and Common murres also tested positive for AI (four out of 313); none were positive for the H5 or N1 subtype.

Fall Harvest Sampling

Fall Harvest Sampling—Sampling locations (Fig. 2, pg. 80) were chosen to maximize contacts with hunters for access to adequate samples of harvested birds. Thus, sampling was focused on primary access points during peak periods of hunting at Izembek NWR, Cook Inlet state game refuges, and Mendenhall State Game Refuge in Juneau. In addition, the subsistence harvest was also sampled at three villages on the YKD, Seward Peninsula, North Slope, and St. Lawrence Island. Hunters mostly were contacted in the field by agency personnel, but some hunters (e.g., subsistence) were asked to voluntarily bring birds to central locations for sampling. Hunters were informed about AI sampling and asked for cooperation through agency media releases, local flyers, and brochures about the surveillance program. Cloacal swabs and bird data were obtained from whole carcasses or field dressed birds deemed suitable for sampling. In some cases, field technicians were not skilled in age and sex determination of birds, or encountered very busy periods when supplemental data could not be obtained. A total of 621 samples was archived from fall harvest samples collected on the YKD, North Slope, Seward Peninsula, Alaska Peninsula, and St. Lawrence Island. The majority of these samples were collected from non-priority species. Some archived samples were collected from priority species whose target sample size had been met earlier in the sampling season.

Swab samples were collected and sample vials were air freighted to Anchorage in a liquid nitrogen vapor shipper.

Results

Izembek NWR: A total of 179 Black Brant and 118 Northern Pintails was sampled at Cold Bay during September and October as well as six Eurasian Wigeon that were opportunistic sampled. Of these, all the Black Brant were archived because target sample size was reached in earlier sampling, the six Eurasian Wigeon samples were archived as non-target samples and 99 of the Northern Pintails were analyzed. A total of 191 samples was archived. Of the 118 pintail samples, 19 tested positive for AI and none tested positive for H5N1. This represents a prevalence of 16% for avian influenza in the Northern Pintail samples that were analyzed from Izembek NWR fall hunter harvest samples. Of note, one of the Northern Pintails was banded in Tokyo Harbor, Japan.

Cook Inlet: At the opening of fall waterfowl season on September 1, AI sampling focused on Palmer Hay Flats and Susitna Flats state game refuges, both within 40 km of Anchorage. These areas are the most heavily hunted waterfowl areas in Alaska and hosted hundreds of hunters over a 3-day opening weekend. Historically, these two areas annually produce about 15,000 ducks, including pintails early in the season and primarily mallards later.

Results: A total of 300 AI samples was obtained from the Cook Inlet refuges (Table 67). Ducks comprised 298 of the samples, including 83 Northern Pintails, the primary target species. The species composition of ducks in the early season is quite variable by year, and the 2006 harvest included a lower proportion of pintails than in some years. Twenty from the Cook Inlet refuges samples tested positive for avian influenza. None of the 20 samples was H5 or N1 positive.

Table 67. Avian influenza samples obtained from hunter-shot birds on Susitna Flats and Palmer Hay Flats state game refuges, September 1-3, 2006. Priority species are bolded.

Species	Susitna Flats	Palmer Hay Flats	Total	No. Tested	AI Positive	Prevalence
Northern Pintail	53	30	83	82	3	3.7
Sandhill Crane	0	2	2	2	0	0.0
Greater White-fronted Goose	1	0	1	1	0	0.0
Mallard	52	74	126	121	14	11.6
Northern Shoveler	2	2	4	4	1	25.0
American Green-winged Teal	7	6	13	12	2	16.7
Waterfowl	36	35	71	70	0	0.0
Total	151	149	300	292	20	

Seward Peninsula: One hundred thirty-eight samples were collected from fall hunters on the Seward Peninsula. Only 53 samples from six priority species, in which target sample sizes had not been met, were analyzed for avian influenza. Three of the samples tested positive for avian influenza (Table 68). None of the three samples was H5 or N1 positive. The remaining 85 samples were archived for later analysis.

Table 68. Cloacal samples from priority species obtained from fall hunter harvested birds by species on the Seward Peninsula, Alaska 2006.

Species	Samples Taken	AI Positive	Prevalence
Northern Pintail	29	3	0.103
Long-tailed Duck	5	0	0.0
Bar-tailed Godwit	1	0	0.0
Sharp-tailed Sandpiper	10	0	0.0
Long-billed Dowitcher	1	0	0.0
Sandhill Crane	7	0	0.0
Total	53	3	

St. Lawrence Island*:* Six hundred forty-eight samples were collected from fall subsistence hunters on St. Lawrence Island. Samples from nine priority species, in which target sample sizes had not been met, were analyzed for avian influenza. Ten of the 175 samples were positive for avian influenza (Table 69). None of the ten samples was H5 or N1 positive. The remaining 473 samples were archived for later analysis.

Table 69. Cloacal samples from priority species obtained from fall subsistence harvested birds by species on St Lawrence Island, Alaska 2006.

Species	Samples Taken	AI Positive	Prevalence
Lesser Snow Goose	78	4	0.05
Northern Pintail	2	0	0.0
Spectacled Eider	4	0	0.0
Sandhill Crane	1	0	0.0
Pacific Golden-Plover	7	0	0.0
Rock Sandpiper	2	0	0.0
Sharp-tailed Sandpiper	1	0	0.0
Glaucous Gull	79	6	0.08
Herring Gull	1	0	0.0
Total	175	10	

Mendenhall Wetlands: Mendenhall Flats, along Gastineau Channel, is one of the largest intertidal marshes in southeast Alaska and a staging area for fall migrant waterfowl. This area is mostly within Mendenhall Wetlands State Game Refuge inside

the city of Juneau and is an important fall hunting area. Average annual harvest includes about 4-5,000 ducks, some Canada Geese, and sea ducks that use the surrounding marine waters.

Results: A total of 150 cloacal swab samples was taken from harvested birds on the refuge (Table 70). Sampling was extended through the month of September because the migration of ducks is less concentrated compared to other areas in Alaska, and hunter activity is relatively lower and more protracted. Pintails comprised only a small proportion of the harvest, with Green-winged Teal and wigeon representing the primary dabbling ducks in early September.

Table 70. Avian influenza samples taken and results from hunter-shot birds on Mendenhall Wetlands State Game Refuge, September 2006.

Species	Total Samples	No. Tested	No. AI Positive	Prevalence
Northern Pintail	15	15	1	6.7
Mallard	21	20	4	20.0
American Green-winged Teal	69	68	20	29.4
Blue-winged Teal	1	1	1	100.0
Other Geese and Waterfowl	44	44	0	0.0
Total	150	149	26	

In addition, 95 samples from Yukon Kuskokwim Delta, and 55 samples from North Slope fall hunter harvest were archived.

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Morbidity and Mortality

There were no morbidity or mortality events in Alaska in 2006. There was a shearwater die-off off the coast of Unalaska Island in August and a large number of passerines died near Yakutat in late August, presumably during migration. Carcasses were collected from both episodes and sent to the NWHC for diagnostic evaluation. In total, 95 carcasses were sent to the NWHC for necropsy and HPAI testing. None of these birds was positive for avian influenza.

Literature Cited

Alaska Interagency HPAI Bird Surveillance Working Group. 2006. Sampling protocol for highly pathogenic Asian H5N1 Asian influenza in migratory birds in Alaska. Interagency planning report, Anchorage, AK. (http://alaska.usgs.gov)

Alaska Shorebird Group. 2006–2010. A Conservation Plan for Alaska Shorebirds. Unpublished report, Alaska Shorebird Group. Available through U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska: In print.

Armstrong, R.H. 1995. *Guide to the Birds of Alaska.* Alaska Northwest Books, 4th Ed., Anchorage, Alaska.

Andres, B. A. 1994. Coastal zone use by postbreeding shorebirds in Northern Alaska. Journal of Wildlife Management 58:206–213.

ASIS. 2006. Alaska seabird information Series, Glaucous-winged Gull. 2006. U.S. Fish and Wildlife Service, Migratory Bird Mgmt Rep., U.S. Fish and Wildlife Service, Anchorage, Alaska.

Badyaev, A. V., B. Kessel, and D. D. Gibson. 1998. Yellow Wagtail (*Motacilla flava*). *In* The Birds of North America, No. 382 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Bamford, M., D. Watkins, W. Bancroft, and G. Tischler. 2006. Migratory shorebirds of the East Asian-Australasian Flyway: population estimates and important sites. Wetlands International Oceania. (In press).

Barter, M. A. 2002. Shorebirds of the Yellow Sea: Importance, threats, and conservation status. Wetlands International Global Series 9, International Wader Studies 12, Canberra, Australia.

Battley, P. F. 1997. The northward migration of arctic waders in New Zealand: departure behaviour, timing, and possible migration routes of Red Knots and Bar-tailed Godwits from Farewell Spit, north-west Nelson. Emu 97:108–120.

Bowman, T. D., R. A. Stehn, and K. T. Scribner. 2004. Glaucous Gull predation of goslings on the Yukon-Kuskokwim Delta, Alaska. Condor 106: 288-298.

Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

Butler, D. and J. Ruttimann. 2006. Avian flu and the new world. Nature 441:137-139.

Chen, H., G. J. D. Smith, S. Y. Zhang, K. Qin, J. Wang, K. S. Li, R. G. Webster, J. S. M. Peiris, and Y. Guan. 2005. H5N1 virus outbreak in migratory waterfowl. Nature 436:191-192.

Chen, H., G. J. D. Smith, K. S. Li, J. Wang, X. F. Fan, J. M. Rayner, D. Vijaykrishna, J. X. Zhang, L. J. Zhang, C. T. Guo, C. L. Cheung, K. M. Xu, L. Duan, K. Huang, K. Qin, Y. H. C. Leung, W. L. Wu, H. R. Lu, Y. Chen, N. S. Xia, T. S. P. Naipospos, K. Y. Yuen, S. S. Hassan, S. Bahri, T. D. Nguyen, R. G. Webster, J. S. M. Peiris, and Y. Guan. 2006. Establishment of multiple sublineages of H5N1 influenza virus in Asia: implications for pandemic control. Proceedings of the National Academy of Science, www.pnas.org/cgi/doi/10.1073/pnas.0511120103.

Connors, P.G., J.P. Myers, and F.A. Pitelka. 1979. Seasonal habitat use by arctic Alaskan shorebirds. Studies in Avian Biology 1:307-315.

Dau, C. P. and J. E. Sarvis. 2002. Tundra Swans of the lower Alaska Peninsula: Differences in migratory behavior and productivity. Waterbirds 25 (Special Publication 1):241-249.

Dau, C. P., P. L. Flint and M. R. Petersen. 2000. Distribution of recoveries of Steller's Eiders banded on the lower Alaska Peninsula, Alaska. Journal of Field Ornithology 71:543-550.

Dement'ev, G. P. and N. A. Gladkov, eds. 1967. Birds of the Soviet Union. Israel Program for Scientific Translations, Jerusalem.

Derksen, D.V., K. S. Bollinger, D. H. Ward, J. S. Sedinger, and Y. Miyabayashi. 1996. Black brant from Alaska staging and wintering in Japan. Condor 98:653-657.

DeSante, D. F., J. F. Saracco, D. R. O'Grady, K. M. Burton, and B. L. Walker. 2004. Some methodological considerations of the Monitoring Avian Productivity and Survivorship Program. *In*: Monitoring Bird Populations Using Mist Nets (C. J. Ralph and E. H. Dunn, Editors). Studies in Avian Biology 29:28-45.

Eisenhauer, D. I., and C. M. Kirkpatrick. 1977. Ecology of the emperor geese in Alaska. Wildlife Monographs 57:1-62.

Ely, C. R**.,** D. Douglas, A. Fowler, C. Babcock, D. V. Derksen, and J.Y. Takekawa. 1998. Migration behavior of Tundra Swans from the Yukon-Kuskokwim Delta, Alaska. Wilson Bulletin 109:679-692.

Ely, C. R., Takekawa, J. Y., and M. L. Wege. 1993. Distribution, abundance, and productivity of Wrangel Island Lesser Snow Geese *Anser caerulescens* during autumn migration on the Yukon-Kuskokwim Delta, Alaska. Wildfowl 44:24-32.

Engelmoer, M., and C. Roselaar. 1998. Geographical variation in waders. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Fischer, J. B, R. A. Stehn, T. D. Bowman, and G. Walters. 2005. Nest population size and potential production of geese and spectacled eiders on the Yukon-Kuskokwim Delta, Alaska, 2005. US Fish and Wildlife Service report, Anchorage, AK, 28pp.

Gilbert, M., X. Xiao, J. Domenech, J. Lubroth, V. Martin, and J. Slingenbergh. 2006. Anatidae migration in the Western Palearctic and spread of highly pathogenic avian influenza H5N1 virus. Emerging Infectious Diseases 12:1650-1656.

Gilchrist, H. G. 2001. Glaucous Gull (*Larus hyperboreus*). *In* The Birds of North America, No. 573 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Gill R. E., Jr., and C. M. Handel. 1990. The importance of subarctic intertidal habitats to shorebirds: a study of the central Yukon-Kuskokwim Delta, Alaska. Condor 92:702–725.

Gill, R. E., Jr., and C. M. Handel. 1981. Shorebirds of the eastern Bering Sea, p. 719–738. *In* D. W. Hood and J. A. Calder (eds.) The eastern Bering Sea shelf: Oceanography and resources. Vol. 2. Univ. of Washington Press, Seattle.

Gill, R. E., Jr., T. Piersma, G. Hufford, R. Servranckx, and A. Riegen. 2005. Crossing the ultimate ecological barrier: evidence for an 11,000-km-long nonstop flight from Alaska to New Zealand and eastern Australia by Bar-tailed Godwits. Condor 107:1–20.

Gill, R. E., P. S. Tomkovich, and B. J. McCaffery. 2002. Rock Sandpiper (*Calidris ptilocnemis*). *In* The Birds of North America, No. 686 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Goudie, R. I., G. J. Robertson, and A. Reed. 2000. Common Eider (*Somateria mollissima*). *In* The Birds of North America, No. 546 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Harrison, P. 1983. Seabirds, an identification guide. Houghton Mifflin, Boston.

Higgins, P. J., and S. J. J. F. Davies (eds.). 1996. Handbook of Australian, New Zealand and Antarctic birds. Volume 3: Snipe to Pigeons. Oxford University Press, Melbourne.

Holmes, R.T., and F.A. Pitelka. 1998. Pectoral Sandpiper (*Calidris melanotos*). *In* The Birds of North America, No. 348 (A. Poole, and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Interagency Working Group. 2006. An early detection system for highly pathogenic H5N1 avian influenza in wild migratory birds. U.S. Interagency Strategic Plan. Washington, D.C. (http://alaska.usgs.gov)

Johnsgard, P. 1983. Cranes of the World. Indiana University Press, Bloomington, Indiana, USA.

Johnson, J., T. McKinnon, and B. Andres. 2005. Summary Report: Autumn Migration at the Colville River Delta: Arctic Coastal Plain, Alaska, 25 July–23 August 2005. Unpubl. Report by U.S. Fish and Wildlife Service.

Johnson, O. W., and P. G. Connors. 1996. Pacific Golden-Plover (*Pluvialis fulva*). *In* The Birds of North America, No. 202 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Johnson, O. W., C. D. Adler, L. A. Ayres, M. A. Bishop, J. E. Doster, P. M. Johnson, R. J. Kienholz and S. E. Savage. 2004. Radio-tagged Pacific Golden-Plovers: Further insight concerning the Hawaii-Alaska migratory link. Wilson Bulletin 116: 158–162.

Kear, J., ed. 2005. Ducks, Geese, and Swans, Vol 2. Oxford University Press, Oxford.

Kertell, K. 1991. Disappearance of the Steller's Eider from the Yukon-Kuskokwim Delta, Alaska. Arctic 44:177-187.

Kilpatrick, A.M., A.A. Chmura, D.W. Gibbons, R.C. Fleischer, P.P. Marra, and P. Daszak. 2006. Predicting the global spread of H5N1 avian influenza. Proceedings of the National Academy of Sciences 103:19368-19373.

King, J. G. and J. I. Hodges. 1979. A preliminary analysis of goose banding on Alaska's arctic slope. Pages 176-188 *in* R.L. Jarvis and J. C. Bartonek (eds). Management and Biology of Pacific Flyway Geese. Oregon State University Bookstores, Corvallis.

Lanctot, R.B. and C.D. Laredo. 1994. Buff-breasted Sandpiper (*Tryngites subruficollis*). *In* The Birds of North America, No. 91 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Limpert, R. J. and S. L. Earnst. 1994. Tundra Swan (*Cygnus columbianus*). *In* The Birds of North America, No. 89 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Limpert, R. J., W. J. Sladen, and H. A. Allen, Jr. 1991. Winter distribution of Tundra Swans *Cygnus columbianus columbianus* breeding in Alaska and western Canadain Arctic. Wildfowl Suppl. No.1:78-83.

Martin, P. D., and C. S. Moitoret. 1981. Bird populations and habitat use, Canning River Delta, Alaska. Report to Arctic National Wildlife Refuge by Alaska Cooperative Wildlife Research Unit and Dept of Biological Sciences, University of Alaska Fairbanks.

McCaffery, B., and R. Gill. 2001. Bar-tailed Godwit (*Limosa lapponica*). *In* The Birds of North America, No. 581 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Muzaffar, S.B., R.C. Ydenberg, and I.L. Jones. 2006. Avian influenza: an ecological and evolutionary perspective for waterbird scientists. Waterbirds 29:243-257.

Normile, D. 2005. Avian influenza: are wild birds to blame? Science 310:426-428.

Norton, D. W. 1971. Two Soviet recoveries of Dunlins banded at Point Barrow, Alaska. Auk 88:927.

Paige, A.W. and R.J. Wolfe. 1998. The subsistence harvest of migratory birds in Alaska – 1996 update. Final Draft Report. Alaska Dept. Fish and Game, Div. of Subsistence, Juneau.

Petersen, M. R., J. B. Grand, and C. P. Dau. 2000. Spectacled Eider (*Somateria fischeri*). *In* The birds of North America, No. 547 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Petersen, M. R., W. W. Larned, and D. C. Douglas. 1999. At-sea distribution of spectacled eiders (*Somateria fischeri*): a 120 year-old mystery resolved. Auk 116:1009-1020

Petersen, M.R., J.A. Schmutz, and R.F. Rockwell. 1994. Emperor goose (*Chen canagica*). *In* The birds of North America, No. 97 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Suydam, R. 2000. King Eider (*Somateria spectabilis*). *In* The birds of North America, No. 491 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Tacha, T. C., S. A. Nesbitt, and P. A. Vohs. 1994. Sandhill Crane. Pp. 77-94 In Migratory Shore and Upland Game Bird Management in North America. Allen Press, Lawrence, Kansas.

Takekawa, J. Y., and N. Warnock. 2000. Long-billed Dowitcher (*Limnodromus scolopaceus*). *In* The Birds of North America, No. 493 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Taylor, A. R., A. N. Powell and R. B. Lanctot. In press. Pre-migratory movements and physiology of shorebirds staging on Alaska's North Slope. OCS Study MMS 2006-xxx, Annual Report No. 11, Federal Fiscal Year 2005, pages xxx-xxx.

Thompson, M. C. 1974. Migratory patterns of ruddy turnstones in the central Pacific region. Living Bird 12:5–23.

Troy Ecological Research Associates. 2004. Movements of Glaucous Gull Trapped at the Barrow Landfill. Results from a 2003 Pilot Study. Troy Ecological Research Associates, Anchorage, Alaska.

Troy, D.M. and J.K. Wickliffe. 1990. Trends in bird use of the Pt. McIntyre Reference Area 1981-1989.Unpubl. report by Troy Ecological Research Associates for BP Exploration (Alaska) Inc.

U.S. Fish and Wildlife Service. 2006. Beringian Seabird Colony Catalog -- computer database and Colony Status Record archives. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska.

Van Borm, S., I. Thomas, G. Hanquet, B. Lambrecht, M. Boschmans, G. Dupont, M. Decaestecker, R. Snacken, and T. van den Berg. 2005. Highly pathogenic H5N1 influenza virus in smuggled Thai eagles, Belgium. Emerging Infectious Diseases 11:702-705.

Ward, D. H., D. V. Derksen, S. P. Kharitonov. M. Stishov, and V. Baranyuk. 1993. Status of Pacific black brant *Branta bernicla* on Wrangel Island, Russian Federation. Wildfowl 44:39-48.

Warnock, N. D. and R. E. Gill, Jr. 1996. Dunlin (*Calidris alpina*). *In* The Birds of North America, No. 203 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Webster, R.G. and E. Govorkova. 2006. H5N1 Influenza—continuing evolution and spread. New England Journal of Medicine 355:2174-2177.

Wetlands International. 2002. Waterbird population estimates–Third Edition. Wetlands International Global Series No. 12, Wageningen, The Netherlands.

Wetlands International–Oceania. 2004. Science Action Plan for the Dunlin *Calidris alpina* in the East Asian-Australasian Flyway. Unpubl. report by Wetlands International–Oceania.

Wilson, J. R, and M. A. Barter. 1998. Identification of potentially important staging areas of "long jump" migration waders in the east Asian-Australasian flyway during northward migration. Stilt 32:16–27.

Wolfe, R.J., A.W. Paige, and C.L. Scott. 1990. The subsistence harvest of migratory birds in Alaska. Div. of Subsistence, Tech. Paper No. 197. Alaska Dept. Fish and Game, Juneau.

World Health Organization. 2006. Avian Influenza – situation (birds) in Nigeria. Epidemic and Pandemic Alert and Response, Disease Outbreak News, 8 February 2006.

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