

From: [Thomas, Sue](#)
To: [Bob Boekelheide](#)
Cc: [BrownScott, Jennifer](#); [Sollmann, Lorenz](#)
Subject: Re: [EXTERNAL] Dungeness Spit Christmas Bird Count data
Date: Tuesday, December 4, 2018 2:33:16 PM
Attachments: [Midwinter 2010-2018 DNWR.xlsx](#)
[WMNWRC ISI Midwinter Waterfowl Survey.pdf](#)
[DNWR PacFlySshorebirdSurvey 3 12 18.xlsx](#)
[WMNWRC ISI PacificFlyShorebirdSurv.pdf](#)
[DNWR Avian Shoreline Survey 3-14-18.xlsx](#)
[WMNWRC ISI AvianShoreline 2 27 18.pdf](#)

Why that's the nicest Christmas present I've ever received ;) Thank you Bob!

Attached are the data we shared with the tribe, including what you shared earlier for CBC. The only question there was the extent of their survey effort. Is their survey area, particularly on the water, defined by a distance restriction or, better yet, do they work off of a map showing the extent?

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On Mon, Dec 3, 2018 at 9:16 PM B Boekelheide <bboek@olympus.net> wrote:

Hello,

Here's a Christmas present for you. :)

I've gone through the Christmas Bird Count data since 2001 and separated out the data collected by our Dungeness Spit party. Here is a table showing the species and numbers seen from 2001-2017 (excluding 2012, when bad weather prevented counters on the spit). I believe I've sent you these data in separate years, but this table shows it all in one place. Sorry the print is so small, but I tried to put it all in one page.

Obviously there is huge variability between years, because, as you know too well, conditions on the spit change a lot from day to day as well as from year to year. We schedule the CBC months in advance, so we're stuck doing the count on a specific day regardless of weather. But the average number in the far right column gives a reasonably good idea of typical numbers counted by the spit walkers over the last 17 years. The list obviously includes birds on both sides of the spit, but you know the species that spend more time on the south side.

I'm also sending this to Liz Tobin at the JST, who as you know has asked about bird use pertaining to their proposed oyster farm. Clearly the most important species are those occurring every year, so I will emphasize to her those species that predictably occur every late fall/early winter in Dungeness Harbor, particularly Brant and several species of dabbling and diving ducks. I believe they are the species that will be most disturbed by extra oyster

boat traffic and people walking on the mudflats of Dungeness Harbor during winter.

Unfortunately, we don't have similar data for other times of the year. Do you have bird counts for Dungeness Harbor for migration periods or through the summer? I could get something from eBird data, but it's not very complete, I'm afraid.

Thanks!

Bob

Dungeness NWR Midwinter Counts

	1986	1988	1989	1990	1991	1992
MALLARD	1265	4	35	0	95	35
Black/Mottled						
GADWALL	55	0	0	0	150	0
WIGEON	3445	3083	2718	313	225	1250
GWTEAL	325	0	85	0	0	60
BCTEAL	0	0	0	0	0	0
SHOVELER	38	0	0	0	0	0
PINTAIL	380	0	15	0	45	0
WOODDUCK	0	0	0	0	0	0
Whistling						
Sub Dabblers	5508	3087	2853	313	515	1345
REDHEAD	0	0	0	0	0	0
CANBACK	0	0	0	0	0	0
SCAUP	627	182	245	142	35	85
RINGNECK	0	0	0	0	0	0
GOLDNEYE	38	93	152	367	235	115
BUFFHEAD	219	461	285	1306	870	950
RUDDY	0	0	0	0	0	0
Sub Divers	884	736	682	1815	1140	1150
EIDER	0	0	0	0	0	0
SCOTER	294	385	86	496	620	1250
OLDSQUAW	85	4	0	33	0	0
HARLQUIN	4	3	0	0	0	0
Sub Seaducks	383	392	86	529	620	1250
MERGANSR	30	72	25	88	23	70
UNID	0	0	0	0	0	0
Misc						
Total Ducks	6805	4287	3646	2745	2298	3815
SNOGOOSE	0	0	0	0	0	0
BLUGOOSE	0	0	0	0	0	0
ROSGOOSE	0	0	0	0	0	0
Snow/Ross's						
Sub White G	0	0	0	0	0	0
WFGOOSE	0	0	0	0	0	0
WECG	0	0	0	0	0	0
LTCG	0	0	0	0	0	0
CACG	0	0	0	0	0	0
DUCG	0	0	0	0	0	0
ALCG	0	0	0	0	0	0
UNCG	52	0	0	0	0	0
Sub Canada	52	0	0	0	0	0
BRANT	78	435	675	140	100	150
Total Geese	130	435	675	140	100	150
TUNDRASW	0	0	0	0	0	0

TRUMPSW	0	0	0	0	0	0
MUTESW	0	0	0	0	0	0
UNKSWAN	0	0	0	0	0	0
Total Swans	0	0	0	0	0	0
Grand Total	6935	4722	4321	2885	2398	3965
COOT	0	0	0	0	0	0
SANDHILL	0	0	0	0	0	0

0	14	0	0	4	19	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	14	0	0	4	19	0	0
3354	8523	10152	9202	6069	6731	5746	1877
0	4	0	0	0	10	0	0
0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
13910	6819	6804	1323	18,308	3,494	4,149	4,884
0	0	0	0				0
0	0	0	0	0	0	0	0
				0	0	0	0

0
0
0
0

4,288

Midwinter Waterfowl Survey (N)

Survey Name: Midwinter Waterfowl Survey

Refuge(s): Dungeness NWR

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Background: The predominant wildlife use of DNWR occurs during the winter months when visitation is significantly reduced and consists mainly of waterfowl. As a result, the Midwinter Waterfowl survey has been conducted on the Refuge for centuries with a more recent emphasis on coordinating surveys with WDFW to count all waterfowl in the Dungeness Valley in one day. Data from this survey has been used to manage public use of the refuge as well as inform hunting regulations throughout the state. The southern shoreline of Dungeness Bay and Harbor contain several private hunt clubs and land occasionally open to hunting as well as one WDFW refuge open to the public hunting. In addition, the State manages two boat-based hunt programs for sea ducks and, since 2018, Brant. Given the amount of hunting in the area, this effort provides key information on waterfowl use of the Dungeness Basin which is especially important given the daily movement of waterfowl around in the area in response to environmental conditions and human activity. It also provides Refuge management with an indication of the importance of the refuge as a refugia for waterfowl.

Survey Objective(s): The objective of this survey effort is to count all waterfowl overwintering in the Dungeness Valley in one day. These data will assist State and Federal waterfowl population managers in assessing overwintering waterfowl populations in the U.S., particularly necessary for species in which no breeding population estimates are available due to the remote nature of their breeding grounds in the Arctic. It meets CCP objectives 2.3, 4.1, particularly monitoring waterfowl use of Dungeness Bay and Harbor.

Survey Design: This is a national cooperative baseline monitoring effort consists of a simple area search methodology with standardized ground-based points as the base of operations year to year on the refuge. The attribute of interest is the number of waterfowl/species/survey area (e.g. Dungeness Harbor and Bay).

Survey Methods: This survey is linked to a National survey effort, which is scheduled during the first two weeks of January every year. Nation-wide, this survey is conducted mainly by fixed-wing aircraft, however ground- and boat-based surveys are also conducted and appear to provide a finer level of detail for site management.

There are no standardized ground-count protocols in Washington, however since 2009, surveys on Dungeness NWR have become more standardized as a result of coordinating basin-wide survey efforts with partners. Traditionally, data were summarized by broader geographic areas (i.e. DNWR or, less frequently, Bay, Harbor and Strait sides of the Spit). More recently, these observations are made from fixed base points approximately 1 mile apart at mile markers along the Spit with data recorded separately from the Harbor/Bay (south) and Strait (north) sides at each mile marker (see map). Observations are made with a spotting scope with 10-60x zoom lens up to 1 mile out unless adjacent areas are covered by another observer (e.g. Marine Drive survey area along the south side of Dungeness

Harbor; see map). Only birds on land or in the water are counted; however, birds in flight are noted only if they land in the survey area during the count. In that case, the time, species, # and direction of approach if known are noted and observers from adjacent areas compare notes to assure they have not been counted in adjacent areas. Whenever possible observers on the north and south side of the Harbor attempt to count at the same time of day. Observers count birds with hand-held tally counters and use visual cues either on shore (ie. Driftwood) or at sea (buoys or boundary markers) to roughly delineate survey areas. Observations typically take approximately 15 minutes except in the most densely used portions of the survey area (e.g. Graveyard Lagoon and MM3 Harbor) where total observation time can take up to 30 minutes.

Due to the bathymetry of the Harbor, waterfowl can be found in the waters surrounding the Refuge in highest abundance from 3-5'. However, access via a UTV or ATV along the Spit is restricted to tidal heights below 6' for the duration of the survey. Since the predominant daytime tidal elevations tend to be high in the winter months, this limits the number of days we can access the spit to count. Also, westerly winds push waves further on to shore and/or a strong low pressure over the area can cause the water level to rise by as much as 1-2' higher than predicted. Thus, very few days are suitable within the survey window and, in some years, we have been unable to conduct the survey within the window due to storm events prior to or on the day of the survey.

Additional species recorded include seabirds, waterbirds, shorebirds raptors and mammals for Refuge management purposes. Additional environmental data is collected including tidal condition (height and activity – raising, falling), % cloud cover, precipitation, wind speed and direction.

Personnel: Sue Thomas, Wildlife Biologist, WMNWRC coordinates with partners, conducts the survey, processes data, analyzes results, provides a report and archives data. Lorenz Sollmann, Deputy Project Leader, WMNWRC helps conduct the survey and serves as an additional team lead/UTV operator when available.

Data Management and Analysis: The number of ducks, brant and total waterfowl counted on the Refuge is compared to the 20-year average on-refuge and, since 2016, the corresponding number for the Dungeness Valley to calculate the proportion using the Refuge. Data are processed in Excel; stored on the main server for the Complex office; and backed up monthly by the Regional Office.

Other Important Information:

USFWS (U.S. Fish and Wildlife Service). 2012b. Draft 2011–12 review of the Midwinter Waterfowl Survey. Arlington, Virginia: USDI Fish and Wildlife Service. Unpublished report. 80 p. Available: http://www.fwspubs.org/doi/suppl/10.3996/062012-JFWM-054/suppl_file/10.3996_062012-jfwm-054.s14.pdf (March 2015).

Equipment:

Field forms & clip board with elastic band to secure data sheets in the wind
Pencils
Binoculars, Scope and tripod
Tally counters
Watch

Sunscreen
Water
Field guide
Survey Area Map(s)
Gloves, hat, hand warmers

Survey Area	Date	Month	Year	Start Time	End Time	Species Code
Cline Split	12/5/2012	December	2012	1329	1353	DUNL
Cline Split	12/5/2012	December	2012	1329	1353	SAND
DNWR - GYLN	12/5/2012	December	2012	1548	1600	BBPL
DNWR - GYLN	12/5/2012	December	2012	1548	1600	DUNL
DNWR - GYLS	12/5/2012	December	2012	1525	1541	BBPL
DNWR - GYLS	12/5/2012	December	2012	1525	1541	DUNL
DNWR - HSM H	12/5/2012	December	2012	1613	1625	BBPL
DNWR - HSM H	12/5/2012	December	2012	1613	1625	DUNL
DNWR - HSM H	12/5/2012	December	2012	1613	1625	SAND
DNWR - NEGY	12/5/2012	December	2012	1413	1443	BBPL
DNWR - NEGY	12/5/2012	December	2012	1413	1443	DUNL
DNWR - NEGY	12/5/2012	December	2012	1413	1443	NOHA
DNWR - NEGY	12/5/2012	December	2012	1413	1443	SAND
DNWR - SEGY	12/5/2012	December	2012	1454	1518	DUNL
DNWR - SEGY	12/5/2012	December	2012	1454	1518	PEFA
DNWR - SEGY	12/5/2012	December	2012	1454	1518	SAND
DNWR - SPIT	12/5/2012	December	2012	1438	1628	BAEA
DNWR - SPIT	12/5/2012	December	2012	1438	1628	BBPL
DNWR - SPIT	12/5/2012	December	2012	1438	1628	DUNL
DNWR - SPIT	12/5/2012	December	2012	1438	1628	NOHA
DNWR - SPIT	12/5/2012	December	2012	1438	1628	SAND
DNWR - SPIT	12/5/2012	December	2012	1438	1628	SNOW
DNWR - TODS	12/5/2012	December	2012	1347	1428	SAND
DNWR - TODS	12/5/2012	December	2012	1347	1428	SNOW
Cline Split	3/4/2013	March	2013	1401	1418	NB
DNWR - D Spit	3/4/2013	March	2013	1608	1710	BAEA
DNWR - D Spit	3/4/2013	March	2013	1608	1710	BLOY
DNWR - GY Lagr	3/4/2013	March	2013	1703	1711	NB
DNWR - GY Lagr	3/4/2013	March	2013	1602	1613	NB
DNWR - MM3	3/4/2013	March	2013	1631	1648	Unk Sm Shorebi
DNWR - NE GY S	3/4/2013	March	2013	1515	1530	BAEA
DNWR - SE GY S	3/4/2013	March	2013	1545	1600	BAEA
DNWR - Tip of I	3/4/2013	March	2013	1511	1554	BAEA
DNWR - GY Lagr	4/24/2013	April	2013	1235	1250	BAEA
DNWR - GY Lagr	4/24/2013	April	2013	1235	1250	GRYE
DNWR - GY Lagr	4/24/2013	April	2013	1215	1225	BAEA
DNWR - NE GY S	4/24/2013	April	2013	1130	1150	BAEA
DNWR - NE GY S	4/24/2013	April	2013	1130	1150	BBPL
DNWR - NE GY S	4/24/2013	April	2013	1130	1150	DUNL
DNWR - SE GY S	4/24/2013	April	2013	1155	1205	NB
DNWR - GY Lagr	4/26/2013	April	2013	1450	1515	NB
DNWR - GY Lagr	4/26/2013	April	2013	1525	1536	NB
DNWR - NE GY S	4/26/2013	April	2013	1441	1447	BAEA
DNWR - NE GY S	4/26/2013	April	2013	1441	1447	BBPL

DNWR - GY Lagr	4/30/2013	April	2013	1155	1205	NB
DNWR - GY Lagr	4/30/2013	April	2013	1130	1140	NB
DNWR - MM3	4/30/2013	April	2013	956	1006	BBPL
DNWR - NE GY S	4/30/2013	April	2013	1045	1055	BBPL
DNWR - SE GY S	4/30/2013	April	2013	1110	1120	BAEA
DNWR - SE GY S	4/30/2013	April	2013	1110	1120	BBPL
DNWR - GY Lagr	5/1/2013	May	2013	950	1000	BBPL
DNWR - GY Lagr	5/1/2013	May	2013	950	1000	SAND
DNWR - GY Lagr	5/1/2013	May	2013	925	935	Dow sp.
DNWR - GY Lagr	5/1/2013	May	2013	925	935	SAND
DNWR - MM3	5/1/2013	May	2013	755	805	BAEA
DNWR - MM3	5/1/2013	May	2013	755	805	DUNL
DNWR - NE GY S	5/1/2013	May	2013	845	945	BBPL
DNWR - NE GY S	5/1/2013	May	2013	845	945	DUNL
DNWR - NE GY S	5/1/2013	May	2013	845	945	SAND
DNWR - NE GY S	5/1/2013	May	2013	845	945	WESA
DNWR - SE GY S	5/1/2013	May	2013	910	920	NB
Cline Spit	12/10/2013	December	2013	1450	1454	KILL
DNWR - D Spit	12/10/2013	December	2013	1515	1637	NB
DNWR - GY Lagr	12/10/2013	December	2013	1440	1458	BBPL
DNWR - GY Lagr	12/10/2013	December	2013	1440	1458	DUNL
DNWR - GY Lagr	12/10/2013	December	2013	1440	1458	SAND
DNWR - GY Lagr	12/10/2013	December	2013	1512	1530	NOHA
DNWR - MM3	12/10/2013	December	2013	1435	1457	BBPL
DNWR - MM3	12/10/2013	December	2013	1435	1457	BLOY
DNWR - MM3	12/10/2013	December	2013	1435	1457	DUNL
DNWR - NE GY S	12/10/2013	December	2013	1600	1615	BBPL
DNWR - NE GY S	12/10/2013	December	2013	1600	1615	DUNL
DNWR - SE GY S	12/10/2013	December	2013	1535	1545	DUNL
DNWR - Tip of I	12/10/2013	December	2013	1450	1550	BAEA
DNWR - GYLS	4/21/2014	April	2014	1235	1300	BBPL
DNWR - GYLS	4/21/2014	April	2014	1235	1300	DUNL
DNWR - GYLS	4/21/2014	April	2014	1235	1300	WESA/LESA
DNWR - SPIT (nr	4/21/2014	April	2014	1130	1230	BAEA
DNWR - SPIT (nr	4/21/2014	April	2014	1130	1230	BBPL
DNWR - SPIT (nr	4/21/2014	April	2014	1130	1230	BLOY
DNWR - SPIT (nr	4/21/2014	April	2014	1130	1230	DUNL
DNWR - SPIT (nr	4/21/2014	April	2014	1130	1230	WESA/LESA
DNWR - GYLN	4/23/2014	April	2014	1340	1355	BAEA
DNWR - GYLN	4/23/2014	April	2014	1340	1355	BBPL
DNWR - GYLS	4/23/2014	April	2014	1400	1425	DUNL
DNWR - GYLS	4/23/2014	April	2014	1400	1425	GRYE
DNWR - GYLS	4/23/2014	April	2014	1400	1425	PEFA
DNWR - GYLS	4/23/2014	April	2014	1400	1425	WESA/LESA
DNWR - HSM H	4/23/2014	April	2014	1500	1515	BBPL
DNWR - HSM H	4/23/2014	April	2014	1500	1515	Dow sp.
DNWR - HSM H	4/23/2014	April	2014	1500	1515	DUNL

DNWR - HSM H	4/23/2014	April	2014	1500	1515	WESA/LESA
DNWR - NEGY	4/23/2014	April	2014	1430	1440	BLOY
DNWR - SPIT	4/23/2014	April	2014	1340	1350	DUNL
DNWR - SPIT	4/23/2014	April	2014	1340	1350	WESA/LESA
DNWR - GYL (N	4/24/2014	April	2014	1520	1545	BBPL
DNWR - GYL (N	4/24/2014	April	2014	1520	1545	DUNL
DNWR - GYL (N	4/24/2014	April	2014	1520	1545	WESA/LESA
DNWR - MM3	4/24/2014	April	2014	1425	1430	BBPL
DNWR - TODS	4/24/2014	April	2014	1445	1500	DUNL
DNWR - TODS	4/24/2014	April	2014	1445	1500	SEPL
DNWR - TODS	4/24/2014	April	2014	1445	1500	WESA/LESA
NEGY	4/24/2014	April	2014	1520	1545	BBPL
NEGY	4/24/2014	April	2014	1520	1545	BLOY
NEGY	4/24/2014	April	2014	1520	1545	DUNL
DNWR - GYL	4/27/2014	April	2014	1255	1305	DUNL
DNWR - GYL	4/27/2014	April	2014	1255	1305	NOHA
DNWR - GYL	4/27/2014	April	2014	1255	1305	SEPL
DNWR - GYL	4/27/2014	April	2014	1255	1305	WESA/LESA
DNWR - SPIT	4/27/2014	April	2014	1125	1225	BLOY
MM2	4/27/2014	April	2014	1125	1225	BAEA
MM2	4/27/2014	April	2014	1125	1225	CATE
MM2	4/27/2014	April	2014	1125	1225	DUNL
MM3	4/27/2014	April	2014	1125	1225	BBPL
MM3	4/27/2014	April	2014	1125	1225	Dow sp.
MM3	4/27/2014	April	2014	1125	1225	DUNL
MM3	4/27/2014	April	2014	1125	1225	WESA/LESA
DNWR - GYL (N	4/28/2014	April	2014	1330	1350	NB
DNWR - MM3	4/28/2014	April	2014	1300	1355	DUNL
DNWR - MM3	4/28/2014	April	2014	1300	1355	LESA
DNWR - MM3	4/28/2014	April	2014	1300	1355	SAND
DNWR - MM3	4/28/2014	April	2014	1300	1355	WESA/LESA
DNWR - NEGY	4/28/2014	April	2014	1240	1300	NB
Dungeness Lagc	4/28/2014	April	2014	1215	1255	DUNL
MM 2-3	4/28/2014	April	2014	1215	1255	DUNL
TODS	4/28/2014	April	2014	1215	1255	BLOY
TODS	4/28/2014	April	2014	1215	1255	SAND
TODS	4/28/2014	April	2014	1215	1255	WESA/LESA
TODS	4/28/2014	April	2014	1215	1255	WHIM
MM 3	4/30/2014	April	2014	1400	1510	BBPL
MM 3	4/30/2014	April	2014	1400	1510	DUNL
MM 3	4/30/2014	April	2014	1400	1510	WESA
MM 5.5	4/30/2014	April	2014	1400	1510	DUNL
MM 5.5	4/30/2014	April	2014	1400	1510	WHIM
MM2.5	4/30/2014	April	2014	1400	1510	Unk Lg Shorebir
MM2.6	4/30/2014	April	2014	1400	1510	UNK. Shorebird
DNWR - MM2.5	5/1/2014	May	2014	1530	1610	BAEA
GYLN	5/1/2014	May	2014	1530	1610	Unk Sm Shorebi

MM 2.5	5/1/2014	May	2014	1530	1610	BBPL
MM 2.5	5/1/2014	May	2014	1530	1610	CATE
MM 2.5	5/1/2014	May	2014	1530	1610	Dow sp.
MM 2.5	5/1/2014	May	2014	1530	1610	DUNL
MM 2.5	5/1/2014	May	2014	1530	1610	SEPL
MM 2.5	5/1/2014	May	2014	1530	1610	WESA/LESA
MM 3	5/1/2014	May	2014	1530	1610	BBPL
MM 3	5/1/2014	May	2014	1530	1610	Dow sp.
MM 3	5/1/2014	May	2014	1530	1610	DUNL
MM 3	5/1/2014	May	2014	1530	1610	SEPL
MM 3	5/1/2014	May	2014	1530	1610	WESA
DNWR - MM3	5/2/2014	May	2014	1600	1630	BBPL
DNWR - MM3	5/2/2014	May	2014	1600	1630	Dow sp.
DNWR - MM3	5/2/2014	May	2014	1600	1630	DUNL
DNWR - MM3	5/2/2014	May	2014	1600	1630	LESA
DNWR - MM3	5/2/2014	May	2014	1600	1630	PEFA
DNWR - MM3	5/2/2014	May	2014	1600	1630	SAND
DNWR - MM3	5/2/2014	May	2014	1600	1630	WESA
NEGY	5/2/2014	May	2014	1530	1545	BLOY
DNWR - D Spit (	5/5/2014	May	2014	915	1150	BBPL
DNWR - D Spit (	5/5/2014	May	2014	915	1150	DUNL
DNWR - D Spit (	5/5/2014	May	2014	915	1150	KILL
DNWR - D Spit (	5/5/2014	May	2014	915	1150	RUTU
DNWR - D Spit (	5/5/2014	May	2014	915	1150	SAND
DNWR - D Spit (	5/5/2014	May	2014	915	1150	SEPL
DNWR - D Spit (	5/5/2014	May	2014	915	1150	WESA
DNWR - D Spit (	5/5/2014	May	2014	915	1150	WHIM
DNWR - MM3	5/5/2014	May	2014	1150	1230	Dow sp.
DNWR - MM3	5/5/2014	May	2014	1150	1230	MERL
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	BAEA
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	BBPL
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	BLTU
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	DUNL
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	KILL
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	REKN
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	RUTU
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	SAND
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	SEPL
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	Unk Sm Shorebi
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	WESA
DNWR - D Spit (	5/7/2014	May	2014	1007	1300	WHIM
DNWR - MM3	5/7/2014	May	2014	1215	1255	WESA
DNWR - MM3	12/15/2014	December	2014	1520	1535	BBPL
DNWR - MM3	12/15/2014	December	2014	1520	1535	DUNL
DNWR - MM3	12/15/2014	December	2014	1520	1535	SAND
MM2	12/15/2014	December	2014	1250	1505	BBPL

MM4	12/15/2014	December	2014	1250	1505	DUNL
DNWR - GY Lagr	2/3/2017	February	2017	1430	1439	BBPL
DNWR - GY Lagr	2/3/2017	February	2017	1430	1439	DUNL
DNWR - GY Lagr	2/3/2017	February	2017	1430	1439	SAND
DNWR - GYLS	2/3/2017	February	2017	1420	1425	BBPL
DNWR - GYLS	2/3/2017	February	2017	1420	1425	DUNL
DNWR - HSM H	2/3/2017	February	2017	1505	1517	BBPL
DNWR - HSM H	2/3/2017	February	2017	1505	1517	DUNL
DNWR - HSM H	2/3/2017	February	2017	1505	1517	SAND
DNWR - NEGY	2/3/2017	February	2017	1350	1400	NB
DNWR - SEGY	2/3/2017	February	2017	1400	1410	NOHA
DNWR - TODS	2/3/2017	February	2017	1242	1315	BAEA
DNWR-MM 0 -2	2/3/2017	February	2017	1304	1517	BBPL
DNWR-MM 0 -2	2/3/2017	February	2017	1304	1517	DUNL
DNWR-MM 0 -2	2/3/2017	February	2017	1304	1517	SAND

Species Name	Species Category	Count	Cloud Cover	Tide	Temp	Wind Speed MPH
		25	80%	4.6 Feet, Almos	NA	4-7 mph
		3	80%	4.6 Feet, Almos	NA	4-7 mph
		2	100%	4.3 Feet, Low	NA	4-7 mph
		84	100%	4.3 Feet, Low	NA	4-7 mph
		3	100%	4.2, Feet, Low	NA	4-7 mph
		258	100%	4.2, Feet, Low	NA	4-7 mph
		2	100%	4.3 Feet, Low	NA	4-7 mph
		110	100%	4.3 Feet, Low	NA	4-7 mph
		6	100%	4.3 Feet, Low	NA	4-7 mph
		2	98%	4.4 Feet, Almos	NA	1-3 mph
		4	98%	4.4 Feet, Almos	NA	1-3 mph
		1	98%	4.4 Feet, Almos	NA	1-3 mph
		3	98%	4.4 Feet, Almos	NA	1-3 mph
		45	100%	4.3 Feet, Almos	NA	1-3 mph
		1	100%	4.3 Feet, Almos	NA	1-3 mph
		4	100%	4.3 Feet, Almos	NA	1-3 mph
		2	70%	Half tide falling	NA	19-24 mph
		25	70%	Half tide falling	NA	19-24 mph
		103	70%	Half tide falling	NA	19-24 mph
		1	70%	Half tide falling	NA	19-24 mph
		3	70%	Half tide falling	NA	19-24 mph
		1	70%	Half tide falling	NA	19-24 mph
		8	60%	Half tide falling	NA	13-18 mph
		3	60%	Half tide falling	NA	13-18 mph
No Birds Observed	NA		60%	NA	NA	8-12 mph
		1	95%	NA	NA	13-18 mph
		1	95%	NA	NA	13-18 mph
No Birds Observed	NA		15%	NA	NA	13-21 mph
No Birds Observed	NA		15%	6-8"	NA	19 – 24 mph
ird		500	95%	NA	NA	13-18 mph
		1	10%	NA	NA	13-21 mph
		3	15%	NA	NA	19 – 24 mph
		1	95%	0.5	NA	13-18 mph
		2	70%	3.5-4.1 Feet	NA	4 – 7 mph
		1	70%	3.5-4.1 Feet	NA	4 – 7 mph
		3	75%	3.1-3.4 Feet	NA	4 – 7 mph
		1	65%	2.1-2.6 Feet	NA	4 – 7 mph
		6	65%	2.1-2.6 Feet	NA	4 – 7 mph
		2	65%	2.1-2.6 Feet	NA	4 – 7 mph
No Birds Observed	NA		70%	2.6-2.9 Feet	NA	4 – 7 mph
No Birds Observed	NA		0%	NA	NA	4 – 7 mph
No Birds Observed	NA		100%	NA	NA	4 – 7 mph
		1	100%	NA	NA	4 – 7 mph
		1	100%	NA	NA	4 – 7 mph

No Birds Observed	NA		40% 0.18 Feet	NA	4 – 7 mph
No Birds Observed	NA		30% 0.56 Feet	NA	8-12 mph
		2	50% 3.2 Feet	NA	4 – 7 mph
		5	40% 2 Feet	NA	13 – 18 mph
		1	40% 1.11 Feet	NA	4 – 7 mph
		1	40% 1.11 Feet	NA	4 – 7 mph
		3	30% 4.8 Feet, almost	NA	4 – 7 mph
		79	30% 4.8 Feet, almost	NA	4 – 7 mph
		3	40% 5.3 Feet	NA	4 – 7 mph
		42	40% 5.3 Feet	NA	4 – 7 mph
		1	5% 6.2 Feet	NA	1 – 3 mph
		54	5% 6.2 Feet	NA	1 – 3 mph
		1	15% 5.9 Feet	NA	<1 mph
		18	15% 5.9 Feet	NA	<1 mph
		11	15% 5.9 Feet	NA	<1 mph
		3	15% 5.9 Feet	NA	<1 mph
No Birds Observed	NA		25% 5.54 Feet	NA	1 – 3 mph
		1	100% NA	NA	<1 mph
No Birds Observed	NA		100% NA	NA	1 – 3 mph
		12	100% NA	NA	1 – 3 mph
		38	100% NA	NA	1 – 3 mph
		3	100% NA	NA	1 – 3 mph
		1	100% NA	NA	1 – 3 mph
		10	100% NA	NA	1 – 3 mph
		1	100% NA	NA	1 – 3 mph
		71	100% NA	NA	1 – 3 mph
		2	100% NA	NA	4-7 mph
		12	100% NA	NA	4-7 mph
		5	100% NA	NA	1 – 3 mph
		2	98% NA	NA	8-12 mph
		2	100% 1.4 Feet, almost	NA	8-12 mph
		80	100% 1.4 Feet, almost	NA	8-12 mph
		40	100% 1.4 Feet, almost	NA	8-12 mph
		3	100% 2.9-1.2 Feet	NA	8-12 mph
		22	100% 2.9-1.2 Feet	NA	8-12 mph
		3	100% 2.9-1.2 Feet	NA	8-12 mph
		27	100% 2.9-1.2 Feet	NA	8-12 mph
		15	100% 2.9-1.2 Feet	NA	8-12 mph
		2	100% 3.0 Feet, Half time	NA	8-12 mph
		1	100% 3.0 Feet, Half time	NA	8-12 mph
		144	100% 3.0 Feet, Half time	NA	8-12 mph
		1	100% 3.0 Feet, Half time	NA	8-12 mph
		1	100% 3.0 Feet, Half time	NA	8-12 mph
		216	100% 3.0 Feet, Half time	NA	8-12 mph
		4	100% 4.1 Feet, Half time	NA	13 – 18 mph
		3	100% 4.1 Feet, Half time	NA	13 – 18 mph
		152	100% 4.1 Feet, Half time	NA	13 – 18 mph

		228	100% 4.1 Feet, Half ti NA	13 – 18 mph
		2	100% 2.6 Feet, half tic NA	13 – 18 mph
		30	100% Almost high, an NA	8-12 mph
		75	100% Almost high, an NA	8-12 mph
		20	95% 3.0 Feet, half tic NA	8-12 mph
		257	95% 3.0 Feet, half tic NA	8-12 mph
		93	95% 3.0 Feet, half tic NA	8-12 mph
		5	100% 4.3 Feet, half tic NA	8-12 mph
		28	100% 3.9 Feet, Half ti NA	8-12 mph
		2	100% 3.9 Feet, Half ti NA	8-12 mph
		30	100% 3.9 Feet, Half ti NA	8-12 mph
		1 NA	NA NA NA	NA
		2 NA	NA NA NA	NA
		1 NA	NA NA NA	NA
		60	100% 3.7 Feet, almosi NA	8-12 mph
		1	100% 3.7 Feet, almosi NA	8-12 mph
		1	100% 3.7 Feet, almosi NA	8-12 mph
		90	100% 3.7 Feet, almosi NA	8-12 mph
		2	100% 2.5-2.6 Feet, alr NA	1 – 3 mph
		6	100% 2.5-2.6 Feet, alr NA	1 – 3 mph
		1	100% 2.5-2.6 Feet, alr NA	1 – 3 mph
		5	100% 2.5-2.6 Feet, alr NA	1 – 3 mph
		10	100% 2.5-2.6 Feet, alr NA	1 – 3 mph
		1	100% 2.5-2.6 Feet, alr NA	1 – 3 mph
		475	100% 2.5-2.6 Feet, alr NA	1 – 3 mph
		475	100% 2.5-2.6 Feet, alr NA	1 – 3 mph
No Birds Observed	NA		20% 2.6 Feet, almosi NA	8-12 mph
		500	40% 3.2 Feet, almosi NA	8-12 mph
		5	40% 3.2 Feet, almosi NA	8-12 mph
		23	40% 3.2 Feet, almosi NA	8-12 mph
		332	40% 3.2 Feet, almosi NA	8-12 mph
No Birds Observed	NA		20% 4.0 Feet, half tid NA	8-12 mph
		5	40% 2.17 Feet, almo NA	8-12 mph
		55	40% 2.17 Feet, almo NA	8-12 mph
		1	40% 2.17 Feet, almo NA	8-12 mph
		1	40% 2.17 Feet, almo NA	8-12 mph
		15	40% 2.17 Feet, almo NA	8-12 mph
		3	40% 2.17 Feet, almo NA	8-12 mph
		2	30% 4.1 Feet, almosi NA	4-7 mph
		600	30% 4.1 Feet, almosi NA	4-7 mph
		150	30% 4.1 Feet, almosi NA	4-7 mph
		3	30% 4.1 Feet, almosi NA	4-7 mph
		4	30% 4.1 Feet, almosi NA	4-7 mph
d		503	30% 4.1 Feet, almosi NA	4-7 mph
		3500	30% 4.1 Feet, almosi NA	4-7 mph
		1	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
ird		1125	25% 3.9-4.9 Feet, ha NA	1 – 3 mph

5	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
15	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
5	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
140	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
8	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
140	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
39	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
2	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
1650	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
6	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
1100	25% 3.9-4.9 Feet, ha NA	1 – 3 mph
49	100% 3.0 Feet, half tic NA	8-12 mph
15	100% 3.0 Feet, half tic NA	8-12 mph
611	100% 3.0 Feet, half tic NA	8-12 mph
78	100% 3.0 Feet, half tic NA	8-12 mph
1	100% 3.0 Feet, half tic NA	8-12 mph
3	100% 3.0 Feet, half tic NA	8-12 mph
611	100% 3.0 Feet, half tic NA	8-12 mph
2	100% 2.0 Feet, half tic NA	8-12 mph
4	80% Almost high, an NA	1 – 3 mph
116	80% Almost high, an NA	1 – 3 mph
3	80% Almost high, an NA	1 – 3 mph
2	80% Almost high, an NA	1 – 3 mph
15	80% Almost high, an NA	1 – 3 mph
12	80% Almost high, an NA	1 – 3 mph
58	80% Almost high, an NA	1 – 3 mph
8	80% Almost high, an NA	1 – 3 mph
1	80% Almost high, an NA	1 – 3 mph
1	80% Almost high, an NA	1 – 3 mph
8	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
7	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
2	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
45	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
1	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
1	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
2	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
1	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
10	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
30	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
36	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
1	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
15	90% 4.7-3.4 Feet Aln NA	1 – 3 mph, variæ
15	90% Half tide falling NA	8-12 mph
182	90% Half tide falling NA	8-12 mph
1	90% Half tide falling NA	8-12 mph
6	90% Half tide falling NA	8-12 mph

ird

		6	90% Half tide falling	NA	8-12 mph
		21	100% 1.8, Low	NA	8-12 mph
		251	100% 1.8, Low	NA	8-12 mph
		3	100% 1.8, Low	NA	8-12 mph
		3	100% Low	NA	8-12 mph
		373	100% Low	NA	8-12 mph
		8	100% 1.8, Low	NA	4 – 7 mph
		595	100% 1.8, Low	NA	4 – 7 mph
		12	100% 1.8, Low	NA	4 – 7 mph
No Birds Observed	NA		100% 2.3 Feet, Low	NA	4 – 7 mph
		1	100% 2.3 Feet, Low	NA	4 – 7 mph
		1	100% 3.8 Feet, half tide	NA	4 – 7 mph
		2	100% Half tide falling	NA	4 – 7 mph
		82	100% Half tide falling	NA	4 – 7 mph
		12	100% Half tide falling	NA	4 – 7 mph

E	None	2014 PFSS	2/28/2018
NA	Steady rain	2014 PFSS	2/28/2018
NA	Steady rain	2014 PFSS	2/28/2018
NA	Steady rain	2014 PFSS	2/28/2018
E	Steady rain	2014 PFSS	2/28/2018
E	Steady rain	2014 PFSS	2/28/2018
ESE	None	2014 PFSS	2/28/2018
ESE	None	2014 PFSS	2/28/2018
ESE	None	2014 PFSS	2/28/2018
E	Light intermittent; mist, sprinkle	2014 PFSS	2/28/2018
E	Light intermittent; mist, sprinkle	2014 PFSS	2/28/2018
E	None	2014 PFSS	2/28/2018
E	Light intermittent; mist, sprinkle	2014 PFSS	2/28/2018
E	Light intermittent; mist, sprinkle	2014 PFSS	2/28/2018
E	Light intermittent; mist, sprinkle	2014 PFSS	2/28/2018

Pacific Flyway Shorebird Survey (R)

<http://data.prbo.org/apps/pfss/index.php?page=resources>)

Survey Name: Pacific Flyway Shorebird Survey

Refuge(s): Dungeness NWR

Primary Refuge Staff Contact Information: Sue Thomas, Wildlife Biologist, Sue_Thomas@fws.gov, 360-457-8451

Background: This is a regional cooperative baseline monitoring effort coordinated by Point Blue Conservation Science throughout the Pacific Flyway. The protocol, species identification guides and field forms can be found at <http://www.migratoryshorebirdproject.org/english/resources-2/training-resources>. We follow their protocol with the exception of timing as the survey window between mid-November and mid-December often does not allow for suitable daylight low tides on the Refuge. However a few days are usually suitable in February and March, thus this survey effort is targeted to that time (with concurrence of Point Blue).

Peak shorebird use on the Refuge occurs during spring and fall migration with up to 15,000-20,000 birds (1990's-2000) while up to 8,000 shorebirds have been counted on the Refuge in one day during the winter months more recently. However, winter abundance is more stable for flyway wide counts. Management of approximately 400 acres of barrier lagoon and mudflat habitats on the refuge is currently focused on invasive species (e.g. *Spartina*) monitoring and removal as well as removal of creosote covered driftwood and management of public use through seasonal closures. These objectives are geared to benefit overwintering shorebirds as well as the habitats themselves. This is particularly important given increasing pressure for public use of these habitats as well as threats from contaminants and invasive species. Monitoring overwintering shorebird use helps inform those management objectives although, given the fluid nature of their use of these habitats throughout the Dungeness Basin, it must be assessed in coordination with other monitoring efforts (waterfowl, invasive species, etc.).

Survey Objective(s): The overall objectives are to obtain annual variation, long-term trends, and habitat associations of wintering shorebirds in coastal estuaries. This survey meets CCP objectives 2.3 and 4.1 to monitor overwintering shorebird use of barrier lagoons and mudflats of Dungeness Harbor and Bay.

Survey Design: This is a simple area search of predefined survey areas during the same tidal conditions each year conducted from standardized observation points.

Survey Methods: Survey areas are delineated based on the maximum recommended viewing distance of 300m surrounding a point located at each mile marker on Dungeness Spit (SPIT) as well as 4 areas on Graveyard Spit (SEGY, NEGY, GYLN, GYLS; see table below). If time and conditions allow, another section east of the New Dungeness Light House (TODS) is also monitored (provided that a key marine mammal haul out on the tip of the spit is not occupied at the time). The overall protocol requires a well defined survey area. This along with standardized observation points allows for a more standardized assessment of the amount of area visible since these habitats do not vary significantly annually. Selecting standardized observation points allow for identifying the most appropriate place to view and delineate water levels and visual obstructions (e.g. driftwood).

PFSS Area Code	Habitat	% Visible	Latitude	Longitude
DNWR - TODS	Beach/Rocky Beach	100	48.183024	-123.109145
DNWR - NEGY	Rocky Beach/Tidal Mud Flat	100	48.173431	-123.13483
DNWR - SEGY	Rocky Beach/Tidal Mud Flat	100	48.16883	-123.13793
DNWR - GYLN	Tidal Mud Flat	95 (berm)	48.17256	-123.13674
DNWR - GYLS	Tidal Mud Flat	100	48.16879	-123.13962
DNWR - HSM Harbor Mudflat (MM3)	Tidal Mud Flat	100	48.175358	-123.145243
DNWR - SPIT	Beach	100	48.182697	-123.109847

Optimally, shorebirds are counted on an incoming tide to allow for closer observation. The best tidal heights range from 2-4' (expanding to 1.5-4.8' if optimal conditions are limited) and surveys should last no longer than 3 hours if tidal heights allow. One observer and one data recorder are suggested per team. If the tidal window is short and two UTV drivers are available, two teams may be needed to fully cover the area. Whenever possible the observer will count individuals/species, however it is best to get a quick estimate of the flock or individuals in the area before counting due to the frequency of disturbance that can cause birds to flush repeatedly. Binoculars and a spotting scope with 10x60 zoom is recommended to allow for close study of similar species. Hand tally counters are used to count individuals, groups of 2,5 or 10/species.

Shorebirds and any raptors are counted and noted on field forms along with the following information: Beaufort Wind Scale, % cloud cover, precipitation, tidal conditions, habitat characteristics (type, % flooded, % bare ground, % vegetation and height).

Personnel: Sue Thomas, Wildlife Biologist, WMNWRC coordinates with partners, conducts the survey, processes data, analyzes results, provides a report and archives data. Lorenz Sollmann, Deputy Project Leader, WMNWRC helps conduct the survey and serves as an additional team lead/UTV operator when available.

Data Management and Analysis: Data are entered onto www.prbo.org/cadc and analyzed by Point Blue Conservation Science. The data can be found at <http://www.migratoryshorebirdproject.org/datamap>.

Other Important Information:

Maps and an excel database for DNWR can be found at
S:\Biological_Program\Surveys\Shorebirds\Pacific Flyway Shorebird

Equipment:

Survey Area Map(s)	Pencils and marker (to annotate maps)
GPS unit	Binoculars, Scope and tripod
Protocol & field forms	Tally counters
Datasheets & clip board with elastic band to hold down data sheets in the wind	Watch
	Sunscreen

Water
Field guide

Gloves, hat, hand warmers

DNWR Avian Shoreline Survey Data (300m radius Point Count)

Survey Area	Date	Species Name	Count	Compiled 3/12/2018
1 mi Harbor	11/24/2013	American Wigeon	12	QAQC
1 mi Harbor	11/24/2013	Bufflehead	7	
1 mi Harbor	11/24/2013	Common Goldeneye	2	
1 mi Harbor	11/24/2013	Double-crested Cormorant	1	
1 mi Harbor	11/24/2013	Glaucous-winged Gull	1	
1 mi Strait	11/24/2013	Glaucous-winged Gull	1	
1 mi Strait	11/24/2013	Harbor Seal	2	
1 mi Strait	11/24/2013	Horned Grebe	7	
1 mi Strait	11/24/2013	Long-tailed Duck	7	
2 mi Harbor	11/24/2013	American Wigeon	66	
2 mi Harbor	11/24/2013	Bufflehead	15	
2 mi Harbor	11/24/2013	Common Goldeneye	1	
2 mi Harbor	11/24/2013	Dunlin	74	
2 mi Harbor	11/24/2013	Glaucous-winged Gull	3	
2 mi Harbor	11/24/2013	Mallard	18	
2 mi Harbor	11/24/2013	Northern Pintail	1	
2 mi Strait	11/24/2013	Common Loon	3	
2 mi Strait	11/24/2013	Double-crested Cormorant	1	
2 mi Strait	11/24/2013	Harbor Seal	1	
2 mi Strait	11/24/2013	Horned Grebe	5	
2 mi Strait	11/24/2013	Long-tailed Duck	6	
2 mi Strait	11/24/2013	Surf Scoter	2	
3 mi Harbor	11/24/2013	American Wigeon	500	
3 mi Harbor	11/24/2013	Brant	800	
3 mi Harbor	11/24/2013	Mallard	60	
3 mi Strait	11/24/2013	Bufflehead	6	
3 mi Strait	11/24/2013	Common Loon	3	
3 mi Strait	11/24/2013	Glaucous-winged Gull	1	
3 mi Strait	11/24/2013	Long-tailed Duck	15	
3 mi Strait	11/24/2013	Pelagic Cormorant	5	
3 mi Strait	11/24/2013	Pigeon Guillemot	17	
3 mi Strait	11/24/2013	Red-breasted Merganser	2	
4 mi Bay	11/24/2013	American Wigeon	30	
4 mi Bay	11/24/2013	Bufflehead	9	
4 mi Bay	11/24/2013	Great Blue Heron	1	
4 mi Bay	11/24/2013	Mallard	33	
4 mi Bay	11/24/2013	Northern Harrier	1	
4 mi Bay	11/24/2013	Peregrine Falcon	1	
4 mi Strait	11/24/2013	Bufflehead	12	
4 mi Strait	11/24/2013	Common Loon	2	
4 mi Strait	11/24/2013	Glaucous-winged Gull	1	
4 mi Strait	11/24/2013	Harbor Seal	2	
4 mi Strait	11/24/2013	Horned Grebe	1	
4 mi Strait	11/24/2013	Pelagic Cormorant	2	
4 mi Strait	11/24/2013	Surf Scoter	6	

4 mi Strait	11/24/2013	White-winged Scoter	3
5 mi Bay	11/24/2013	American Wigeon	17
5 mi Bay	11/24/2013	Black-bellied Plover	2
5 mi Bay	11/24/2013	Bufflehead	2
5 mi Bay	11/24/2013	Dunlin	20
5 mi Bay	11/24/2013	Red-breasted Merganser	17
5 mi Bay	11/24/2013	Sanderling	40
5 mi Bay	11/24/2013	Surf Scoter	2
5 mi Strait	11/24/2013	Bufflehead	5
5 mi Strait	11/24/2013	Common Loom	1
5 mi Strait	11/24/2013	Double-crested Cormorant	1
5 mi Strait	11/24/2013	Harbor Seal	1
5 mi Strait	11/24/2013	Harlequin Duck	2
D Tip Bay	11/24/2013	Double-crested Cormorant	62
D Tip Bay	11/24/2013	Glaucous-winged Gull	80
D Tip Bay	11/24/2013	Harbor Seal	6
D Tip Bay	11/24/2013	Long-tailed Duck	3
D Tip Bay	11/24/2013	Mew Gull	42
D Tip Bay	11/24/2013	Surf Scoter	11
1 mi Harbor	12/24/2013	Bufflehead	5
1 mi Harbor	12/24/2013	Common Goldeneye	2
1 mi Harbor	12/24/2013	Glaucous-winged Gull	4
1 mi Harbor	12/24/2013	Red-throated Loon	1
1 mi Strait	12/24/2013	Harbor Seal	1
1 mi Strait	12/24/2013	Horned Grebe	7
1 mi Strait	12/24/2013	Long-tailed Duck	2
1 mi Strait	12/24/2013	Red-breasted Merganser	27
1 mi Strait	12/24/2013	Red-necked Grebe	4
1 mi Strait	12/24/2013	Red-throated Loon	2
2 mi Harbor	12/24/2013	American Wigeon	15
2 mi Harbor	12/24/2013	Bufflehead	24
2 mi Harbor	12/24/2013	Common Goldeneye	2
2 mi Harbor	12/24/2013	Glaucous-winged Gull	6
2 mi Harbor	12/24/2013	Mallard	2
2 mi Harbor	12/24/2013	Surf Scoter	4
2 mi Harbor	12/24/2013	Unidentified Scaup Species	4
2 mi Strait	12/24/2013	Black Scoter	1
2 mi Strait	12/24/2013	Bufflehead	1
2 mi Strait	12/24/2013	Common Goldeneye	1
2 mi Strait	12/24/2013	Common Loon	2
2 mi Strait	12/24/2013	Double-crested Cormorant	1
2 mi Strait	12/24/2013	Horned Grebe	4
2 mi Strait	12/24/2013	Long-tailed Duck	6
2 mi Strait	12/24/2013	Pelagic Cormorant	1
2 mi Strait	12/24/2013	Pigeon Guillemot	3
2 mi Strait	12/24/2013	Red-breasted Merganser	5
2 mi Strait	12/24/2013	Red-throated Loon	1

2 mi Strait	12/24/2013	Surf Scoter	7
1 mi Harbor	1/23/2014	American Wigeon	12
1 mi Harbor	1/23/2014	Black Oystercatcher	1
1 mi Harbor	1/23/2014	Bufflehead	12
1 mi Harbor	1/23/2014	Glaucous-winged Gull	3
1 mi Harbor	1/23/2014	Horned Grebe	1
1 mi Harbor	1/23/2014	Mallard	2
1 mi Harbor	1/23/2014	Scaup sp.	8
1 mi Strait	1/23/2014	Harbor Seal	1
1 mi Strait	1/23/2014	Horned Grebe	3
1 mi Strait	1/23/2014	Long-tailed Duck	4
1 mi Strait	1/23/2014	Red-breasted Merganser	3
1 mi Strait	1/23/2014	Red-throated Loon	1
1 mi Strait	1/23/2014	Surf Scoter	4
1 mi Strait	1/23/2014	White-winged Scoter	2
2 mi Harbor	1/23/2014	Brant	3
2 mi Harbor	1/23/2014	Bufflehead	72
2 mi Harbor	1/23/2014	Common Goldeneye	2
2 mi Harbor	1/23/2014	Glaucous-winged Gull	25
2 mi Strait	1/23/2014	Black Scoter	2
2 mi Strait	1/23/2014	Common Loon	1
2 mi Strait	1/23/2014	Pelagic Cormorant	1
2 mi Strait	1/23/2014	Pigeon Guillemot	1
2 mi Strait	1/23/2014	Red-breasted Merganser	10
2 mi Strait	1/23/2014	Red-throated Loon	1
2 mi Strait	1/23/2014	Surf Scoter	5
3 mi Harbor	1/23/2014	American Wigeon	45
3 mi Harbor	1/23/2014	Bald Eagle	3
3 mi Harbor	1/23/2014	Black-bellied Plover	5
3 mi Harbor	1/23/2014	Brant	2
3 mi Harbor	1/23/2014	Dunlin	16
3 mi Harbor	1/23/2014	Glaucous-winged Gull	15
3 mi Harbor	1/23/2014	Mew Gull	53
3 mi Harbor	1/23/2014	Northern Pintail	70
3 mi Harbor	1/23/2014	Sanderling	3
3 mi Strait	1/23/2014	Bufflehead	8
3 mi Strait	1/23/2014	Common Loon	3
3 mi Strait	1/23/2014	Harlequin Duck	2
3 mi Strait	1/23/2014	Horned Grebe	2
3 mi Strait	1/23/2014	Long-tailed Duck	3
3 mi Strait	1/23/2014	Pelagic Cormorant	1
3 mi Strait	1/23/2014	Pigeon Guillemot	1
3 mi Strait	1/23/2014	Red-breasted Merganser	3
3 mi Strait	1/23/2014	Surf Scoter	6
4 mi Bay	1/24/2014	American Wigeon	2
4 mi Bay	1/24/2014	Brant	2
4 mi Bay	1/24/2014	Bufflehead	13

4 mi Bay	1/24/2014	Common Goldeneye	1
4 mi Bay	1/24/2014	Mallard	4
4 mi Bay	1/24/2014	Pelagic Cormorant	1
4 mi Bay	1/24/2014	Red-breasted Merganser	1
4 mi Bay	1/24/2014	Scaup sp.	4
4 mi Strait	1/24/2014	Black Scoter	3
4 mi Strait	1/24/2014	Bufflehead	12
4 mi Strait	1/24/2014	Common Loon	3
4 mi Strait	1/24/2014	Double-crested Cormorant	2
4 mi Strait	1/24/2014	Great Blue Heron	1
4 mi Strait	1/24/2014	Harlequin Duck	2
4 mi Strait	1/24/2014	Horned Grebe	5
4 mi Strait	1/24/2014	Marbled Murrelet	1
4 mi Strait	1/24/2014	Pelagic Cormorant	3
4 mi Strait	1/24/2014	Pigeon Guillemot	1
4 mi Strait	1/24/2014	Red-breasted Merganser	15
4 mi Strait	1/24/2014	Surf Scoter	2
5 mi Bay	1/24/2014	American Wigeon	6
5 mi Bay	1/24/2014	Bufflehead	4
5 mi Bay	1/24/2014	Dunlin	6
5 mi Bay	1/24/2014	Glaucous-winged Gull	3
5 mi Bay	1/24/2014	Harbor Seal	3
5 mi Bay	1/24/2014	Harlequin Duck	1
5 mi Bay	1/24/2014	Red-breasted Merganser	3
5 mi Bay	1/24/2014	Sanderling	12
5 mi Strait	1/24/2014	Black-bellied Plover	1
5 mi Strait	1/24/2014	Bufflehead	6
5 mi Strait	1/24/2014	Common Loon	2
5 mi Strait	1/24/2014	Harlequin Duck	6
5 mi Strait	1/24/2014	Long-tailed Duck	12
5 mi Strait	1/24/2014	Marbled Murrelet	1
5 mi Strait	1/24/2014	Surf Scoter	2
D Tip Bay	1/24/2014	Bufflehead	2
D Tip Bay	1/24/2014	Double-crested Cormorant	1
D Tip Bay	1/24/2014	Glaucous-winged Gull	7
D Tip Bay	1/24/2014	Harlequin Duck	4
D Tip Bay	1/24/2014	Long-tailed Duck	14
D Tip Bay	1/24/2014	Red-breasted Merganser	4
D Tip Bay	1/24/2014	Red-throated Loon	1
D Tip Bay	1/24/2014	Surf Scoter	8
1 mi Harbor	3/18/2014	American Wigeon	12
1 mi Harbor	3/18/2014	Black-bellied Plover	47
1 mi Harbor	3/18/2014	Bufflehead	10
1 mi Harbor	3/18/2014	Horned Grebe	1
1 mi Harbor	3/18/2014	Red-breasted Merganser	2
1 mi Harbor	3/18/2014	Surf Scoter	1
1 mi Strait	3/18/2014	Common Loon	2

1 mi Strait	3/18/2014	Horned Grebe	6
1 mi Strait	3/18/2014	Long-tailed Duck	2
1 mi Strait	3/18/2014	Red-breasted Merganser	7
1 mi Strait	3/18/2014	Red-necked Grebe	1
1 mi Strait	3/18/2014	Red-throated Loon	2
1 mi Strait	3/18/2014	Surf Scoter	1
2 mi Harbor	3/18/2014	American Wigeon	11
2 mi Harbor	3/18/2014	Bald Eagle	4
2 mi Harbor	3/18/2014	Bufflehead	17
2 mi Harbor	3/18/2014	Red-breasted Merganser	23
2 mi Strait	3/18/2014	Bufflehead	2
2 mi Strait	3/18/2014	Common Goldeneye	2
2 mi Strait	3/18/2014	Common Loon	4
2 mi Strait	3/18/2014	Double-crested Cormorant	1
2 mi Strait	3/18/2014	Glaucous-winged Gull	4
2 mi Strait	3/18/2014	Horned Grebe	2
2 mi Strait	3/18/2014	Long-tailed Duck	7
2 mi Strait	3/18/2014	Pigeon Guillemot	2
2 mi Strait	3/18/2014	White-winged Scoter	4
3 mi Harbor	3/18/2014	American Wigeon	200
3 mi Harbor	3/18/2014	Bald Eagle	3
3 mi Harbor	3/18/2014	Bufflehead	14
3 mi Harbor	3/18/2014	Glaucous-winged Gull	60
3 mi Harbor	3/18/2014	Mew Gull	10
3 mi Harbor	3/18/2014	Northern Pintail	6
3 mi Harbor	3/18/2014	Scaup sp.	2
3 mi Strait	3/18/2014	Bufflehead	5
3 mi Strait	3/18/2014	Common Loon	2
3 mi Strait	3/18/2014	Harbor Seal	1
3 mi Strait	3/18/2014	Horned Grebe	4
3 mi Strait	3/18/2014	Long-tailed Duck	3
3 mi Strait	3/18/2014	Pelagic Cormorant	2
3 mi Strait	3/18/2014	Red-breasted Merganser	3
3 mi Strait	3/18/2014	Red-throated Loon	2
3 mi Strait	3/18/2014	Surf Scoter	1
3 mi Strait	3/18/2014	White-winged Scoter	1
4 mi Bay	3/18/2014	American Wigeon	39
4 mi Bay	3/18/2014	Bald Eagle	1
4 mi Bay	3/18/2014	Brant	40
4 mi Bay	3/18/2014	Bufflehead	12
4 mi Bay	3/18/2014	Common Goldeneye	5
4 mi Bay	3/18/2014	Common Loon	2
4 mi Bay	3/18/2014	Glaucous-winged Gull	8
4 mi Bay	3/18/2014	Horned Grebe	8
4 mi Bay	3/18/2014	Long-tailed Duck	5
4 mi Bay	3/18/2014	Mallard	2
4 mi Bay	3/18/2014	Pelagic Cormorant	1

4 mi Bay	3/18/2014	Pigeon Guillemot	1
4 mi Bay	3/18/2014	Red-breasted Merganser	12
4 mi Bay	3/18/2014	Red-necked Grebe	1
4 mi Bay	3/18/2014	Scaup sp.	3
4 mi Strait	3/18/2014	Bufflehead	7
4 mi Strait	3/18/2014	Double-crested Cormorant	1
4 mi Strait	3/18/2014	Glaucous-winged Gull	9
4 mi Strait	3/18/2014	Harbor Seal	1
4 mi Strait	3/18/2014	Harlequin Duck	1
4 mi Strait	3/18/2014	Long-tailed Duck	6
4 mi Strait	3/18/2014	Red-breasted Merganser	3
4 mi Strait	3/18/2014	Surf Scoter	5
4 mi Strait	3/18/2014	White-winged Scoter	18
5 mi Bay	3/18/2014	American Wigeon	4
5 mi Bay	3/18/2014	Bald Eagle	2
5 mi Bay	3/18/2014	Black-bellied Plover	4
5 mi Bay	3/18/2014	Brant	188
5 mi Bay	3/18/2014	Bufflehead	2
5 mi Bay	3/18/2014	Common Loon	5
5 mi Bay	3/18/2014	Glaucous-winged Gull	3
5 mi Bay	3/18/2014	Harbor Seal	1
5 mi Bay	3/18/2014	Pigeon Guillemot	4
5 mi Bay	3/18/2014	Red-breasted Merganser	10
5 mi Bay	3/18/2014	Sanderling	2
5 mi Bay	3/18/2014	Surf Scoter	1
5 mi Strait	3/18/2014	Bufflehead	5
5 mi Strait	3/18/2014	Glaucous-winged Gull	1
5 mi Strait	3/18/2014	Harlequin Duck	7
5 mi Strait	3/18/2014	Horned Grebe	1
5 mi Strait	3/18/2014	Pelagic Cormorant	1
5 mi Strait	3/18/2014	Pigeon Guillemot	4
5 mi Strait	3/18/2014	Red-breasted Merganser	7
5 mi Strait	3/18/2014	Red-throated Loon	1
5 mi Strait	3/18/2014	Surf Scoter	13
D Tip Bay	3/18/2014	Bald Eagle	8
D Tip Bay	3/18/2014	Black-bellied Plover	9
D Tip Bay	3/18/2014	Double-crested Cormorant	1
D Tip Bay	3/18/2014	Glaucous-winged Gull	7
D Tip Bay	3/18/2014	Harbor Seal	1
D Tip Bay	3/18/2014	Horned Grebe	2
D Tip Bay	3/18/2014	Long-tailed Duck	5
D Tip Bay	3/18/2014	Pigeon Guillemot	3
D Tip Bay	3/18/2014	Red-breasted Merganser	9
D Tip Bay	3/18/2014	Red-necked Grebe	1
D Tip Bay	3/18/2014	Surf Scoter	5
1 mi Harbor	4/1/2014	Black-bellied Plover	11
1 mi Harbor	4/1/2014	Brant	23

1 mi Harbor	4/1/2014	Bufflehead	12
1 mi Harbor	4/1/2014	Dunlin	8
1 mi Harbor	4/1/2014	Horned Grebe	1
1 mi Harbor	4/1/2014	Red-breasted Merganser	16
1 mi Harbor	4/1/2014	Red-throated Loon	1
1 mi Harbor	4/1/2014	Scaup sp.	1
1 mi Strait	4/1/2014	Black Scoter	1
1 mi Strait	4/1/2014	Horned Grebe	3
1 mi Strait	4/1/2014	Surf Scoter	1
2 mi Harbor	4/1/2014	Brant	51
2 mi Harbor	4/1/2014	Bufflehead	31
2 mi Harbor	4/1/2014	Dunlin	67
2 mi Harbor	4/1/2014	Red-breasted Merganser	2
2 mi Harbor	4/1/2014	Scaup sp.	15
2 mi Strait	4/1/2014	Black Scoter	1
2 mi Strait	4/1/2014	Common Loon	1
2 mi Strait	4/1/2014	Horned Grebe	3
2 mi Strait	4/1/2014	Long-tailed Duck	5
2 mi Strait	4/1/2014	Red-breasted Merganser	3
2 mi Strait	4/1/2014	Red-necked Grebe	2
2 mi Strait	4/1/2014	Red-throated Loon	1
2 mi Strait	4/1/2014	Sanderling	1
2 mi Strait	4/1/2014	White-winged Scoter	3
3 mi Harbor	4/1/2014	Bufflehead	5
3 mi Harbor	4/1/2014	Dunlin	150
3 mi Harbor	4/1/2014	Glaucous-winged Gull	35
3 mi Harbor	4/1/2014	Mew Gull	1
3 mi Harbor	4/1/2014	Northern Pintail	30
3 mi Strait	4/1/2014	Bufflehead	2
3 mi Strait	4/1/2014	Common Goldeneye	2
3 mi Strait	4/1/2014	Common Loon	1
3 mi Strait	4/1/2014	Double-crested Cormorant	1
3 mi Strait	4/1/2014	Dunlin	150
3 mi Strait	4/1/2014	Harbor Seal	1
3 mi Strait	4/1/2014	Horned Grebe	2
3 mi Strait	4/1/2014	Long-tailed Duck	2
3 mi Strait	4/1/2014	Pigeon Guillemot	1
3 mi Strait	4/1/2014	Red-breasted Merganser	3
3 mi Strait	4/1/2014	Surf Scoter	2
4 mi Bay	4/1/2014	American Wigeon	4
4 mi Bay	4/1/2014	Bufflehead	6
4 mi Bay	4/1/2014	Scaup sp.	9
4 mi Strait	4/1/2014	Black Scoter	5
4 mi Strait	4/1/2014	Common Loon	2
4 mi Strait	4/1/2014	Harbor Seal	1
4 mi Strait	4/1/2014	Harlequin Duck	1
4 mi Strait	4/1/2014	Horned Grebe	2

4 mi Strait	4/1/2014	Long-tailed Duck	7
4 mi Strait	4/1/2014	Pigeon Guillemot	1
4 mi Strait	4/1/2014	Red-breasted Merganser	3
4 mi Strait	4/1/2014	Surf Scoter	8
5 mi Bay	4/1/2014	Bald Eagle	2
5 mi Bay	4/1/2014	Black Oystercatcher	2
5 mi Bay	4/1/2014	Black-bellied Plover	200
5 mi Bay	4/1/2014	Brant	7
5 mi Bay	4/1/2014	Common Loon	2
5 mi Bay	4/1/2014	Dunlin	50
5 mi Bay	4/1/2014	Sanderling	12
5 mi Strait	4/1/2014	Black Scoter	2
5 mi Strait	4/1/2014	Common Loon	2
5 mi Strait	4/1/2014	Harbor Seal	1
5 mi Strait	4/1/2014	Horned Grebe	1
5 mi Strait	4/1/2014	Long-tailed Duck	3
5 mi Strait	4/1/2014	Pigeon Guillemot	1
5 mi Strait	4/1/2014	Surf Scoter	5
D Tip Bay	4/1/2014	Bald Eagle	2
D Tip Bay	4/1/2014	Common Loon	2
D Tip Bay	4/1/2014	Harbor Seal	1
D Tip Bay	4/1/2014	Long-tailed Duck	5
D Tip Bay	4/1/2014	Pigeon Guillemot	1
D Tip Bay	4/1/2014	Surf Scoter	5
1 mi Harbor	5/12/2014	Whimbrel	1
1 mi Strait	5/12/2014	Red-breasted Merganser	3
1 mi Strait	5/12/2014	Rhinoceros Auklet	5
1 mi Strait	5/12/2014	Surf Scoter	43
2 mi Harbor	5/12/2014	NA	NA
2 mi Strait	5/12/2014	Red-breasted Merganser	1
2 mi Strait	5/12/2014	Surf Scoter	2
2 mi Strait	5/12/2014	White-winged Scoter	6
3 mi Harbor	5/12/2014	Glaucous-winged Gull	65
3 mi Strait	5/12/2014	California Sea Lion	1
3 mi Strait	5/12/2014	Common Loon	1
3 mi Strait	5/12/2014	Marbled Murrelet	1
3 mi Strait	5/12/2014	Red-breasted Merganser	3
3 mi Strait	5/12/2014	Red-throated Loon	1
3 mi Strait	5/12/2014	Rhinoceros Auklet	10
3 mi Strait	5/12/2014	Surf Scoter	4
3 mi Strait	5/12/2014	Whimbrel	4
4 mi Bay	5/12/2014	Glaucous-winged Gull	7
4 mi Bay	5/12/2014	River Otter	1
4 mi Bay	5/12/2014	Scaup sp.	10
4 mi Strait	5/12/2014	Black Oystercatcher	2
4 mi Strait	5/12/2014	Common Loon	1
4 mi Strait	5/12/2014	Glaucous-winged Gull	3

4 mi Strait	5/12/2014	Harlequin Duck	4
4 mi Strait	5/12/2014	Pigeon Guillemot	2
4 mi Strait	5/12/2014	Rhinoceros Auklet	1
4 mi Strait	5/12/2014	Surf Scoter	2
5 mi Bay	5/12/2014	Bald Eagle	3
5 mi Bay	5/12/2014	Black-bellied Plover	10
5 mi Bay	5/12/2014	Common Loon	1
5 mi Bay	5/12/2014	Dunlin	1
5 mi Bay	5/12/2014	Glaucous-winged Gull	4
5 mi Bay	5/12/2014	Harbor Seal	2
5 mi Bay	5/12/2014	Red Knot	6
5 mi Bay	5/12/2014	Sanderling	1
5 mi Strait	5/12/2014	Glaucous-winged Gull	3
5 mi Strait	5/12/2014	Harbor Seal	1
5 mi Strait	5/12/2014	Long-tailed Duck	6
5 mi Strait	5/12/2014	Marbled Murrelet	4
5 mi Strait	5/12/2014	Pigeon Guillemot	1
5 mi Strait	5/12/2014	Rhinoceros Auklet	2
5 mi Strait	5/12/2014	Surf Scoter	2
1 mi Harbor	7/21/2014	California Gull	26
1 mi Harbor	7/21/2014	Double-crested Cormorant	1
1 mi Harbor	7/21/2014	Glaucous-winged Gull	5
1 mi Harbor	7/21/2014	Heermann's Gull	28
1 mi Harbor	7/21/2014	Short-billed Dowitcher	2
1 mi Strait	7/21/2014	Glaucous-winged Gull	126
1 mi Strait	7/21/2014	Harbor Seal	1
1 mi Strait	7/21/2014	Marbled Murrelet	1
1 mi Strait	7/21/2014	Pigeon Guillemot	2
1 mi Strait	7/21/2014	Rhinoceros Auklet	133
1 mi Strait	7/21/2014	Ring-billed Gull	1
1 mi Strait	7/21/2014	Sanderling	18
1 mi Strait	7/21/2014	Short-billed Dowitcher	3
1 mi Strait	7/21/2014	Western Sandpiper	7
2 mi Harbor	7/21/2014	Harbor Seal	1
2 mi Harbor	7/21/2014	Scaup sp.	2
2 mi Harbor	7/21/2014	Short-billed Dowitcher	3
2 mi Harbor	7/21/2014	Western Sandpiper	1
2 mi Strait	7/21/2014	California Gull	10
2 mi Strait	7/21/2014	Common Loon	1
2 mi Strait	7/21/2014	Glaucous-winged Gull	80
2 mi Strait	7/21/2014	Heermann's Gull	21
2 mi Strait	7/21/2014	Marbled Murrelet	1
2 mi Strait	7/21/2014	Pigeon Guillemot	28
2 mi Strait	7/21/2014	Rhinoceros Auklet	10
2 mi Strait	7/21/2014	Surf Scoter	2
3 mi Harbor	7/21/2014	Black-bellied Plover	4
3 mi Harbor	7/21/2014	Ruddy Turnstone	1

3 mi Harbor	7/21/2014	Sanderling	2
3 mi Harbor	7/21/2014	Semipalmated Plover	8
3 mi Harbor	7/21/2014	Short-billed Dowitcher	1
3 mi Harbor	7/21/2014	Western Sandpiper	16
3 mi Harbor	7/21/2014	Whimbrel	5
3 mi Strait	7/21/2014	California Gull	1
3 mi Strait	7/21/2014	Glaucous-winged Gull	1
3 mi Strait	7/21/2014	Marbled Murrelet	8
3 mi Strait	7/21/2014	Pelagic Cormorant	1
3 mi Strait	7/21/2014	Pigeon Guillemot	1
3 mi Strait	7/21/2014	Semipalmated Plover	1
3 mi Strait	7/21/2014	Semipalmated Sandpiper	1
3 mi Strait	7/21/2014	Surf Scoter	1
4 mi Bay; May include g	7/21/2014	Black Oystercatcher	2
4 mi Bay; May include g	7/21/2014	Black-bellied Plover	71
4 mi Bay; May include g	7/21/2014	California Gull	16
4 mi Bay; May include g	7/21/2014	Caspian Tern	20
4 mi Bay; May include g	7/21/2014	Common Merganser	5
4 mi Bay; May include g	7/21/2014	Glaucous-winged Gull	100
4 mi Bay; May include g	7/21/2014	Harlequin Duck	2
4 mi Bay; May include g	7/21/2014	Heermann's Gull	20
4 mi Bay; May include g	7/21/2014	Rhinoceros Auklet	3
4 mi Bay; May include g	7/21/2014	Semipalmated Plover	11
4 mi Bay; May include g	7/21/2014	Short-billed Dowitcher	90
4 mi Bay; May include g	7/21/2014	Western Sandpiper	63
4 mi Bay; May include g	7/21/2014	Whimbrel	12
4 mi Strait	7/21/2014	Glaucous-winged Gull	1
4 mi Strait	7/21/2014	Marbled Murrelet	4
4 mi Strait	7/21/2014	Pigeon Guillemot	1
4 mi Strait	7/21/2014	Red-throated Loon	1
4 mi Strait	7/21/2014	Ruddy Turnstone	1
4 mi Strait	7/21/2014	Sanderling	13
4 mi Strait	7/21/2014	Semipalmated Plover	5
4 mi Strait	7/21/2014	Surf Scoter	3
4 mi Strait	7/21/2014	Western Sandpiper	4
4 mi Strait	7/21/2014	Whimbrel	7
5 mi Bay	7/21/2014	Barn Swallow	2
5 mi Bay	7/21/2014	Black Turnstone	1
5 mi Bay	7/21/2014	Black-bellied Plover	23
5 mi Bay	7/21/2014	Glaucous-winged Gull	3
5 mi Bay	7/21/2014	Harbor Seal	1
5 mi Bay	7/21/2014	Harlequin Duck	5
5 mi Bay	7/21/2014	Killdeer	1
5 mi Bay	7/21/2014	Pelagic Cormorant	2
5 mi Bay	7/21/2014	Pigeon Guillemot	2
5 mi Bay	7/21/2014	Rhinoceros Auklet	1
5 mi Bay	7/21/2014	Sanderling	9

5 mi Bay	7/21/2014	Western Sandpiper	75
5 mi Bay	7/21/2014	White-crowned Sparrow	1
5 mi Strait	7/21/2014	Black-bellied Plover	25
5 mi Strait	7/21/2014	Killdeer	2
5 mi Strait	7/21/2014	Marbled Godwit	2
5 mi Strait	7/21/2014	Marbled Murrelet	2
5 mi Strait	7/21/2014	Pelagic Cormorant	2
5 mi Strait	7/21/2014	Pigeon Guillemot	1
5 mi Strait	7/21/2014	Rhinoceros Auklet	2
5 mi Strait	7/21/2014	Ruddy Turnstone	1
5 mi Strait	7/21/2014	Sanderling	2
5 mi Strait	7/21/2014	Semipalmated Plover	7
5 mi Strait	7/21/2014	Short-billed Dowitcher	1
5 mi Strait	7/21/2014	Surf Scoter	20
5 mi Strait	7/21/2014	Whimbrel	4
5 mi Strait	7/21/2014	White-winged Scoter	1
0 mi Strait	10/21/2014	Common Loon	4
0 mi Strait	10/21/2014	Glaucous-winged/Western Hybrid	3
0 mi Strait	10/21/2014	Horned Grebe	4
0 mi Strait	10/21/2014	Pacific Loon	3
0 mi Strait	10/21/2014	Pelagic Cormorant	4
0 mi Strait	10/21/2014	Red-necked Grebe	5
0 mi Strait	10/21/2014	Red-throated Loon	1
0 mi Strait	10/21/2014	Rhinoceros Auklet	3
0 mi Strait	10/21/2014	Western Grebe	2
1 mi Harbor	10/21/2014	Black-bellied Plover	9
1 mi Harbor	10/21/2014	Dunlin	15
1 mi Harbor	10/21/2014	Western Sandpiper	11
1 mi Strait	10/21/2014	Common Loon	1
1 mi Strait	10/21/2014	Glaucous-winged/Western Hybrid	2
1 mi Strait	10/21/2014	Horned Grebe	4
1 mi Strait	10/21/2014	Pacific Loon	3
1 mi Strait	10/21/2014	Pelagic Cormorant	2
1 mi Strait	10/21/2014	Red-necked Grebe	2
1 mi Strait	10/21/2014	Red-throated Loon	2
1 mi Strait	10/21/2014	Surf Scoter	5
1 mi Strait	10/21/2014	Western Grebe	3
1 mi Strait	10/21/2014	White-winged Scoter	1
2 mi Harbor	10/21/2014	No Birds Observed	
2 mi Strait	10/21/2014	Common Loon	2
2 mi Strait	10/21/2014	Common Murre	84
2 mi Strait	10/21/2014	Double-crested Cormorant	1
2 mi Strait	10/21/2014	Glaucous-winged/Western Hybrid	4
2 mi Strait	10/21/2014	Harbor Seal	1
2 mi Strait	10/21/2014	Heermann's Gull	46
2 mi Strait	10/21/2014	Horned Grebe	3
2 mi Strait	10/21/2014	Marbled Murrelet	2

2 mi Strait	10/21/2014	Pacific Loon	1
2 mi Strait	10/21/2014	Pelagic Cormorant	1
2 mi Strait	10/21/2014	Red-breasted Merganser	4
2 mi Strait	10/21/2014	Red-throated Loon	1
2 mi Strait	10/21/2014	Rhinoceros Auklet	4
2 mi Strait	10/21/2014	Surf Scoter	3
2 mi Strait	10/21/2014	Western Grebe	1
2 mi Strait	10/21/2014	White-winged Scoter	2
3 mi Harbor	10/21/2014	American Wigeon	1878
3 mi Harbor	10/21/2014	Bald Eagle	1
3 mi Harbor	10/21/2014	Great Blue Heron	2
3 mi Harbor	10/21/2014	Mallard	940
3 mi Harbor	10/21/2014	Northern Pintail	313
3 mi Harbor	10/21/2014	Northern Shoveler	10
3 mi Strait	10/21/2014	Glaucous-winged/Western Hybrid	2
3 mi Strait	10/21/2014	Harbor Seal	1
3 mi Strait	10/21/2014	Horned Grebe	1
3 mi Strait	10/21/2014	Pacific Loon	1
3 mi Strait	10/21/2014	Red-throated Loon	2
3 mi Strait	10/21/2014	White-winged Scoter	10
4 mi Bay	10/21/2014	American Wigeon	28
4 mi Bay	10/21/2014	Dunlin	5
4 mi Bay	10/21/2014	Glaucous-winged/Western Hybrid	120
4 mi Bay	10/21/2014	Great Blue Heron	2
4 mi Bay	10/21/2014	Harlequin Duck	10
4 mi Bay	10/21/2014	Heermann's Gull	23
4 mi Bay	10/21/2014	Mallard	96
4 mi Bay	10/21/2014	Mew Gull	2
4 mi Bay	10/21/2014	Red-breasted Merganser	1
4 mi Strait	10/21/2014	Double-crested Cormorant	1
4 mi Strait	10/21/2014	Glaucous-winged/Western Hybrid	1
4 mi Strait	10/21/2014	Harbor Seal	1
4 mi Strait	10/21/2014	Horned Grebe	3
4 mi Strait	10/21/2014	Peregrine Falcon	1
4 mi Strait	10/21/2014	Red-throated Loon	1
4 mi Strait	10/21/2014	Western Grebe	1
4 mi Strait	10/21/2014	White-winged Scoter	4
5 mi Strait	10/21/2014	Common Murre	1
5 mi Strait	10/21/2014	Glaucous-winged/Western Hybrid	25
5 mi Strait	10/21/2014	Harbor Seal	7
5 mi Strait	10/21/2014	Heermann's Gull	2
5 mi Strait	10/21/2014	Horned Grebe	2
5 mi Strait	10/21/2014	Pelagic Cormorant	1
5 mi Strait	10/21/2014	Western Grebe	1
5 mi Strait	10/21/2014	White-winged Scoter	4
0 mi Harbor	12/15/2014	American Wigeon	57
0 mi Harbor	12/15/2014	Bufflehead	1

0 mi Harbor	12/15/2014	Mallard	17
0 mi Strait	12/15/2014	Common Loon	1
0 mi Strait	12/15/2014	Long-tailed Duck	2
0 mi Strait	12/15/2014	Pelagic Cormorant	1
0 mi Strait	12/15/2014	Red-necked Grebe	1
0 mi Strait	12/15/2014	Red-throated Loon	1
0 mi Strait	12/15/2014	Surf Scoter	3
1 mi Harbor	12/15/2014	Bufflehead	6
1 mi Harbor	12/15/2014	Common Goldeneye	2
1 mi Harbor	12/15/2014	Mew Gull	2
1 mi Harbor	12/15/2014	Ring-billed Gull	1
1 mi Strait	12/15/2014	Brandt's Cormorant	1
1 mi Strait	12/15/2014	Bufflehead	2
1 mi Strait	12/15/2014	Common Goldeneye	2
1 mi Strait	12/15/2014	Common Loon	2
1 mi Strait	12/15/2014	Long-tailed Duck	2
1 mi Strait	12/15/2014	Pacific Loon	3
2 mi Harbor	12/15/2014	Black-bellied Plover	6
2 mi Harbor	12/15/2014	Brant	17
2 mi Harbor	12/15/2014	Bufflehead	88
2 mi Harbor	12/15/2014	Common Goldeneye	9
2 mi Harbor	12/15/2014	Scaup sp.	61
2 mi Harbor	12/15/2014	Surf Scoter	1
2 mi Strait	12/15/2014	Common Goldeneye	1
2 mi Strait	12/15/2014	Common Loon	2
2 mi Strait	12/15/2014	Double-crested Cormorant	1
2 mi Strait	12/15/2014	Eared Grebe	3
2 mi Strait	12/15/2014	Glaucous-winged/Western Hybrid	1
2 mi Strait	12/15/2014	Long-tailed Duck	2
2 mi Strait	12/15/2014	Red-throated Loon	1
2 mi Strait	12/15/2014	Surf Scoter	1
3 mi Harbor	12/15/2014	American Wigeon	115
3 mi Harbor	12/15/2014	Black-bellied Plover	15
3 mi Harbor	12/15/2014	Brant	16
3 mi Harbor	12/15/2014	Bufflehead	14
3 mi Harbor	12/15/2014	Dunlin	182
3 mi Harbor	12/15/2014	Glaucous-winged/Western Hybrid	4
3 mi Harbor	12/15/2014	Mallard	12
3 mi Harbor	12/15/2014	Northern Pintail	98
3 mi Harbor	12/15/2014	Sanderling	1
3 mi Harbor	12/15/2014	Scaup sp.	26
3 mi Harbor	12/15/2014	Surf Scoter	39
3 mi Strait	12/15/2014	Bufflehead	1
3 mi Strait	12/15/2014	Double-crested Cormorant	1
3 mi Strait	12/15/2014	Glaucous-winged/Western Hybrid	2
3 mi Strait	12/15/2014	Harlequin Duck	2
3 mi Strait	12/15/2014	Pacific Loon	1

3 mi Strait	12/15/2014	Pelagic Cormorant	3
3 mi Strait	12/15/2014	Red-throated Loon	1
3 mi Strait	12/15/2014	Surf Scoter	4
4 mi Bay	12/15/2014	American Wigeon	29
4 mi Bay	12/15/2014	Barrow's Goldeneye	2
4 mi Bay	12/15/2014	Brant	50
4 mi Bay	12/15/2014	Bufflehead	10
4 mi Bay	12/15/2014	Double-crested Cormorant	1
4 mi Bay	12/15/2014	Dunlin	6
4 mi Bay	12/15/2014	Glaucous-winged/Western Hybrid	9
4 mi Bay	12/15/2014	Mallard	28
4 mi Bay	12/15/2014	Pacific Loon	1
4 mi Strait	12/15/2014	Black Scoter	9
4 mi Strait	12/15/2014	Brandt's Cormorant	1
4 mi Strait	12/15/2014	Bufflehead	10
4 mi Strait	12/15/2014	Common Goldeneye	2
4 mi Strait	12/15/2014	Glaucous-winged/Western Hybrid	2
4 mi Strait	12/15/2014	Harlequin Duck	6
4 mi Strait	12/15/2014	Pacific Loon	1
4 mi Strait	12/15/2014	Red-breasted Merganser	2
4 mi Strait	12/15/2014	Surf Scoter	6
5 mi Strait	12/15/2014	Glaucous-winged/Western Hybrid	3
5 mi Strait	12/15/2014	Harbor Seal	1
5 mi Strait	12/15/2014	Horned Grebe	3
5 mi Strait	12/15/2014	Long-tailed Duck	1
5 mi Strait	12/15/2014	Pacific Loon	2
5 mi Strait	12/15/2014	Pelagic Cormorant	3
5 mi Strait	12/15/2014	Pigeon Guillemot	1
5 mi Strait	12/15/2014	Surf Scoter	3
0 mi Harbor	1/12/2015	American Wigeon	16
0 mi Harbor	1/12/2015	Bufflehead	2
0 mi Harbor	1/12/2015	Green-Wing Teal	2
0 mi Harbor	1/12/2015	Mallard	5
0 mi Strait	1/12/2015	Common Goldeneye	2
0 mi Strait	1/12/2015	Common Loon	3
0 mi Strait	1/12/2015	Common Murre	1
0 mi Strait	1/12/2015	Glaucous-winged/Western Hybrid	1
0 mi Strait	1/12/2015	Horned Grebe	1
0 mi Strait	1/12/2015	Long-tailed Duck	1
0 mi Strait	1/12/2015	Pigeon Guillemot	1
0 mi Strait	1/12/2015	Red-breasted Merganser	3
0 mi Strait	1/12/2015	Surf Scoter	3
1 mi Harbor	1/12/2015	Brant	4
1 mi Harbor	1/12/2015	Bufflehead	13
1 mi Harbor	1/12/2015	Common Goldeneye	5
1 mi Harbor	1/12/2015	Double-crested Cormorant	25
1 mi Harbor	1/12/2015	Glaucous-winged/Western Hybrid	4

1 mi Harbor	1/12/2015	Pacific Loon	1
1 mi Harbor	1/12/2015	Red-breasted Merganser	5
1 mi Harbor	1/12/2015	Western Grebe	2
1 mi Strait	1/12/2015	Bufflehead	1
1 mi Strait	1/12/2015	Horned Grebe	1
1 mi Strait	1/12/2015	Long-tailed Duck	4
1 mi Strait	1/12/2015	Red-throated Loon	2
2 mi Harbor	1/12/2015	American Wigeon	105
2 mi Harbor	1/12/2015	Black-bellied Plover	3
2 mi Harbor	1/12/2015	Brant	60
2 mi Harbor	1/12/2015	Bufflehead	133
2 mi Harbor	1/12/2015	Common Goldeneye	6
2 mi Harbor	1/12/2015	Dunlin	69
2 mi Harbor	1/12/2015	Glaucous-winged/Western Hybrid	4
2 mi Harbor	1/12/2015	Mallard	15
2 mi Harbor	1/12/2015	Sanderling	5
2 mi Harbor	1/12/2015	Scaup sp.	10
2 mi Harbor	1/12/2015	Surf Scoter	21
2 mi Strait	1/12/2015	Bufflehead	15
2 mi Strait	1/12/2015	Common Goldeneye	2
2 mi Strait	1/12/2015	Common Loon	1
2 mi Strait	1/12/2015	Horned Grebe	4
2 mi Strait	1/12/2015	Pacific Loon	1
2 mi Strait	1/12/2015	Red-breasted Merganser	6
2 mi Strait	1/12/2015	Surf Scoter	1
3 mi Harbor	1/12/2015	American Wigeon	175
3 mi Harbor	1/12/2015	Bald Eagle	3
3 mi Harbor	1/12/2015	Brant	136
3 mi Harbor	1/12/2015	Bufflehead	90
3 mi Harbor	1/12/2015	Common Goldeneye	6
3 mi Harbor	1/12/2015	Dunlin	30
3 mi Harbor	1/12/2015	Glaucous-winged/Western Hybrid	12
3 mi Harbor	1/12/2015	Mallard	50
3 mi Harbor	1/12/2015	Northern Pintail	169
3 mi Harbor	1/12/2015	Red-breasted Merganser	4
3 mi Harbor	1/12/2015	Scaup sp.	20
3 mi Harbor	1/12/2015	Surf Scoter	8
3 mi Strait	1/12/2015	Bufflehead	5
3 mi Strait	1/12/2015	Common Goldeneye	1
3 mi Strait	1/12/2015	Common Loon	1
3 mi Strait	1/12/2015	Common Merganser	2
3 mi Strait	1/12/2015	Eared Grebe	1
3 mi Strait	1/12/2015	Red-breasted Merganser	2
3 mi Strait	1/12/2015	Surf Scoter	9
3 mi Strait	1/12/2015	White-winged Scoter	1
4 mi Bay	1/12/2015	American Wigeon	130
4 mi Bay	1/12/2015	Bufflehead	16

4 mi Bay	1/12/2015	Common Murre	28
4 mi Bay	1/12/2015	Glaucous-winged/Western Hyb	3
4 mi Bay	1/12/2015	Horned Grebe	3
4 mi Bay	1/12/2015	Mallard	187
4 mi Bay	1/12/2015	Northern Pintail	16
4 mi Bay	1/12/2015	Surf Scoter	6
4 mi Strait	1/12/2015	Bufflehead	14
4 mi Strait	1/12/2015	Common Goldeneye	2
4 mi Strait	1/12/2015	Double-crested Cormorant	3
4 mi Strait	1/12/2015	Eared Grebe	1
4 mi Strait	1/12/2015	Harlequin Duck	6
4 mi Strait	1/12/2015	Horned Grebe	6
4 mi Strait	1/12/2015	Long-tailed Duck	2
4 mi Strait	1/12/2015	Pacific Loon	2
4 mi Strait	1/12/2015	Pigeon Guillemot	2
4 mi Strait	1/12/2015	Surf Scoter	5
5 mi Strait	1/12/2015	Double-crested Cormorant	1
5 mi Strait	1/12/2015	Glaucous-winged/Western Hyb	5
5 mi Strait	1/12/2015	Harlequin Duck	16
5 mi Strait	1/12/2015	Pacific Loon	2
5 mi Strait	1/12/2015	Pigeon Guillemot	2
5 mi Strait	1/12/2015	Surf Scoter	11



U.S. Fish and Wildlife Service
WASHINGTON MARITIME NATIONAL WILDLIFE REFUGE COMPLEX -
Refuge Specific Initial Survey Instructions
2/27/18 update



Avian Shoreline Survey (T2)

Refuge(s): Dungeness NWR

Primary Refuge Staff Contact Information: Sue Thomas, Wildlife Biologist, Sue_Thomas@fws.gov, 360-457-8451

Background: According to the U.S. Coast Guard, Dungeness Spit (Spit) is one of the top five high-risk areas in the U.S. for oil spill events due, in part, to its prominent location within the Strait of Juan de Fuca and proximity to the high level of shipping traffic within the Salish Sea (Krusmann 2001). Approximately 17 billion gallons of oil are shipped through the Strait of Juan de Fuca each year in over 1,000 tankers; any spill from these tankers could potentially be devastating to refuge wildlife and habitats. In fact, predominantly westerly currents transported oil and/or oiled birds to the Refuge during the most recent spill in Port Angeles Harbor from the T/V Arco Anchorage in 1985.

Various surveys have been conducted within the nearshore habitat of DNWR. Those include the Marine Ecosystems Analysis (MESA) surveys conducted from 1978-1979, staff surveys conducted between 1977 and 1994 and the Puget Sound Seabird Survey (PSSS) in 2014. Due to the large spatial scale of the PSSS, it consistently under-represents diversity and abundance of overwintering wildlife on DNWR. This is mainly because the PSSS defined a survey window of 4 hours around high tide. However for land-based surveys, the Spit is essentially inaccessible at tidal levels above 6'. In addition, it identified three survey points on DNWR near the base of the Spit which do not accurately represent diversity or abundance of most species that use the nearshore habitats on the Refuge. Finally, the PSSS focuses on seabirds while this survey is designed to collect data on all birds and marine mammals using the nearshore habitat around the refuge. While staff surveys conducted between 1977-1994 were more representative of the abundance and diversity of wildlife on the refuge, the methodology was not recorded and cannot be repeated.

Survey Objective(s): The objective of this survey effort is to collect baseline data on marine wildlife use of Dungeness NWR from October through April for use in marine spatial planning and to support Natural Resource Damage Assessment mitigation and restoration actions. This survey effort helps to meet two objectives within the Dungeness NWR CCP: 2.3 Protect and maintain barrier lagoons and mudflats of Dungeness Harbor and Dungeness Bay and 2.2 Protect and maintain the barrier beaches on Dungeness and Graveyard spits by providing current data for rapid response in the event of an oil spill (USFWS 2013). Results from this survey will provide a broader scope of inference when combined with the Midwinter Waterfowl Survey on DNWR by expanding the focus of that survey to all overwintering birds using nearshore habitats during the nonbreeding period. In addition, it provides data for use in assessing effects of the public use closure in these habitats.

Survey Design: This is a point count survey conducted once per month from October – April. Survey points are located at 1-mile increments which correspond to established mile marker (MM) signs 1-4, as well at one point at the base of the trail (MM0) and one point 0.8 miles east of MM4 (MM5; see coordinates below). In order to limit human disturbance on this refuge, the survey point at MM5 is

located in a closed area yet out of sight of a known marine mammal haul out. No other closed areas are included in this survey effort. It is highly recommended that the surveyor have a GPS unit available to accurately locate the “MM5” point as well as other mm in which signs may have been washed away.

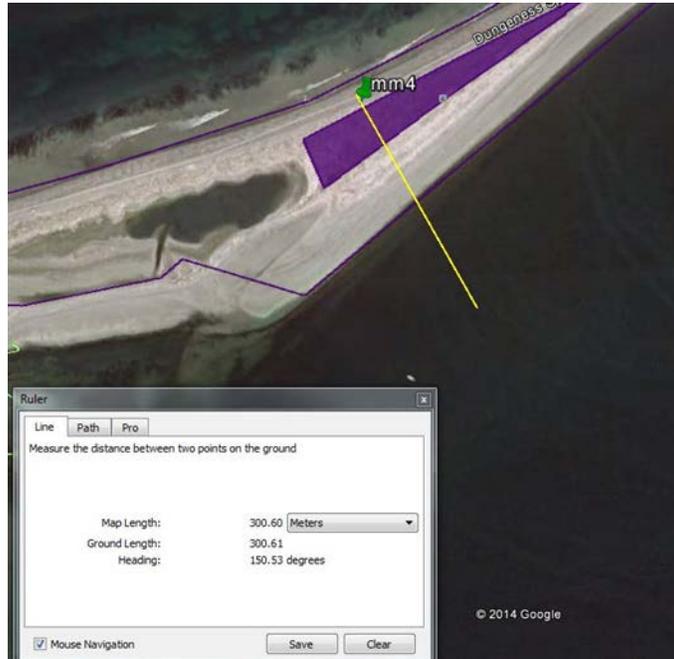
Survey Point	Lat	Long	Areas
MM5	48.183800°	-123.105360°	Strait only; @ 4.8 mi, shy of tip to reduce disturbance to haul out
MM4	48.177850°	-123.123680°	Strait & Bay
MM3	48.175358°	-123.145230°	Strait & Harbor
MM2	48.167350°	-123.160790°	Strait & Harbor
MM1	48.156790°	-123.175060°	Strait & Harbor
MM0	48.145790°	-123.187680°	Strait only

Survey Methods: The survey follows the methodology developed for the PSSS with a few basic exceptions (conducted at every mm along the Spit and within a tidal range of 2.5-6’).

Survey points are divided into Strait or Bay/Harbor areas following the table below. The Strait and Bay/Harbor side of each mm are surveyed separately to reduce the potential to miss a bird landing in the survey area or under water. A primary observer counts wildlife within a 300 m radius of the point, including all birds or marine mammals on land and in the water, for a maximum of 15 minutes each (i.e. 30 minutes and MM 4 = 15 minutes on the Strait and 15 minutes on the Bay side). Since birds in flight cannot necessarily be attributed to use of the land or water adjacent to the Refuge, do not spend time counting them unless they land in the current survey area. If a dedicated recorder is available, they should try to keep track of movement in the larger (Bay/Harbor area) noting approximate number, species, time and direction flown. This can then help reconciled birds already counted in one area that have flown to an adjacent, uncounted area.

This effort will be conducted once per month when the tidal window allows access to the Spit for 4 hours during the day. Given the restriction on access, the best survey conditions occur during an incoming tide between 2-5.5/6’. Optimally, surveyors will begin at MM5 on an incoming tide and work toward the base of the spit so that if the water levels are higher than expected, they will not be stranded. To avoid double counts or missed individuals, one primary observer is responsible for the count, while the secondary observer will record data and alert the primary observer to movements in to or out of the radius of the count circle. Or, if time and optimum tidal conditions are limited, two observers could survey the count circle together with each taking a side (Strait or Bay/Harbor) and acting as their own recorders.

Each observer should familiarized themselves with 300m distance on shore using a measuring tape and/or selected permanent markers (i.e. Refuge sign and piling) to visually mark 300m prior to participating in the survey for the first i.e. This distance estimation can be tricky to remember every month, especially over the open water. It is highly recommended to recalibrate your visual estimation of 300m using a measuring tape or pre-established permanent markers. A 50m measuring tape is available from the office for this use.



If at all possible, surveyors should use a pair of binoculars of 8-10x or better along with a spotting scope of 20X or better to positively identify similar species at the extent of the 300m radius.

Every effort should be made to avoid double counting:

- Whenever possible, birds should be differentiated by distinguishing features and location.
 - Distance from shore or other marker and direction of drift/movement
 - Group size, species richness
 - Proportion of adults vs juveniles
- If a movement of birds occurred, only those birds within 300m should be recorded and only if the observer was reasonably certain that they were not counted previously.
- Wait to record birds in flight until after the survey period and only record them below the count totals on the spreadsheet.

In addition, record the following survey conditions were recorded for the entire survey period (not each point):

- Weather: Clear, Partly Cloudy, Overcast, Fog
- Precipitation: Rain, Snow, None
- Sea State: Calm, Rippled, Choppy, Wavy, Rough
- Beaufort Wind Scale
- Visibility: Excellent - able to count and id all; Good - able to count and accurately id most except for large flocks, birds at limit of range or similar species; Poor - unable to id or count accurately.

- o Reason: Glare, Sea State, Weather, Other _____
- Tidal Movement: Low, Low Raising, Low Falling, Mid, Mid Raising (see figure below)
- Disturbance: List disturbance factors noted (e.g. walkers, power boat, kayak or hunting raptors).
- Effects of Disturbance: Provide a very general description of the response from the majority of the birds to the disturbance (e.g. none; birds move away or flush gradually; flush and return).
- Conditions prior to survey that may have affected results: Note passage of storms prior to survey that may have altered abundance (ice storm; wind storm; 4-day storm).

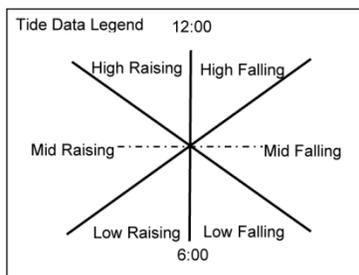
It can be difficult to see birds in rough, stormy waters. If possible, reschedule your survey effort to another day.

Figure. Beaufort Wind Scale

Force	Speed			Name	Conditions at Sea	Conditions on Land
	knots	km/h	mi/h			
0	< 1	< 2	< 1	Calm	Sea like a mirror.	Smoke rises vertically.
1	1-3	1-5	1-4	Light air	Ripples only.	Smoke drifts and leaves rustle.
2	4-6	6-11	5-7	Light breeze	Small wavelets (0.2 m). Crests have a glassy appearance.	Wind felt on face.
3	7-10	12-19	8-11	Gentle breeze	Large wavelets (0.6 m), crests begin to break.	Flags extended, leaves move.
4	11-16	20-29	12-18	Moderate breeze	Small waves (1 m), some whitecaps.	Dust and small branches move.
5	17-21	30-39	19-24	Fresh breeze	Moderate waves (1.8 m), many whitecaps.	Small trees begin to sway.
6	22-27	40-50	25-31	Strong breeze	Large waves (3 m), probably some spray.	Large branches move, wires whistle, umbrellas are difficult to control.
7	28-33	51-61	32-38	Near gale	Mounting sea (4 m) with foam blown in streaks downwind.	Whole trees in motion, inconvenience in walking.
8	34-40	62-74	39-46	Gale	Moderately high waves (5.5 m), crests break into spindrift.	Difficult to walk against wind. Twigs and small branches blown off trees.
9	41-47	76-87	47-54	Strong gale	High waves (7 m), dense foam, visibility affected.	Minor structural damage may occur (shingles blown off roofs).
10	48-55	88-102	55-63	Storm	Very high waves (9 m), heavy sea roll, visibility impaired. Surface generally white.	Trees uprooted, structural damage likely.

11	56-63	103-118	64-73	Violent storm	Exceptionally high waves (11 m), visibility poor.	Widespread damage to structures.
12	64+	119+	74+	Hurricane	14 m waves, air filled with foam and spray, visibility bad.	Severe structural damage to buildings, wide spread devastation.

Figure. Tidal stage chart used for the DNWR Avian Shoreline Survey.



Personnel: Sue Thomas, Wildlife Biologist, coordinates the survey and refuge volunteer involvement, serves as the primary observer, compiles and processes data. Refuge volunteers help conduct the survey as secondary observers. Roughly 2/3rds of early surveys conducted by Refuge volunteers & OPAS members.

Data Management and Analysis: Metrics: Index counts of all shorebird, waterbird, waterfowl, avian predators and marine mammal species within the surveyed areas on DNWR barrier beach and mudflat habitats, including open water within a 300m radius. Data are processed in an Excel database and saved to the main server for the Complex office. This server is backed up monthly to an external hard drive.

Other Important Information:

PSSS -

<http://www.seattleaudubon.org/sas/WhatWeDo/Science/CitizenScience/PugetSoundSeabirdSurvey.asp>
[x](#)

Equipment:

- Protocol & Survey Area Map(s)
- Datasheets & clip board with elastic band to hold down data sheets in the wind
- Pencils or Permanent Ink Pen
- Binoculars, Scope and tripod
- GPS and/or measuring tape
- Tally Counter
- Watch
- Sunscreen
- Water
- Field guide
- Gloves, hat, hand warmers

Krusmann, J. 2001. Final CAP report for the Dungeness National Wildlife Refuge. Sequim, Washington: USDI Fish and Wildlife Service. Unpublished report. 10 p.

USFWS. 2013. Dungeness National Wildlife Refuge comprehensive conservation plan. Portland, Oregon: USDI Fish and Wildlife Service, Region 1. Available:

<http://www.fws.gov/pacific/planning/main/docs/wa/docsdungeness.htm>