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To: [BrownScott, Jennifer](#); [Sollmann, Lorenz](#)
Subject: 2016 Annual Narrative
Date: Thursday, December 13, 2018 12:40:24 PM
Attachments: [2016 WMNWRC Biological Program Activities 12_13_18.docx](#)

Okay, warts and all, this one's done. Not looking at it any more. Nope, no sir eee...

2017 should be done tomorrow then on to JST stuff.

Sue

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Washington Maritime NWRC 2016 Biological Program Activities

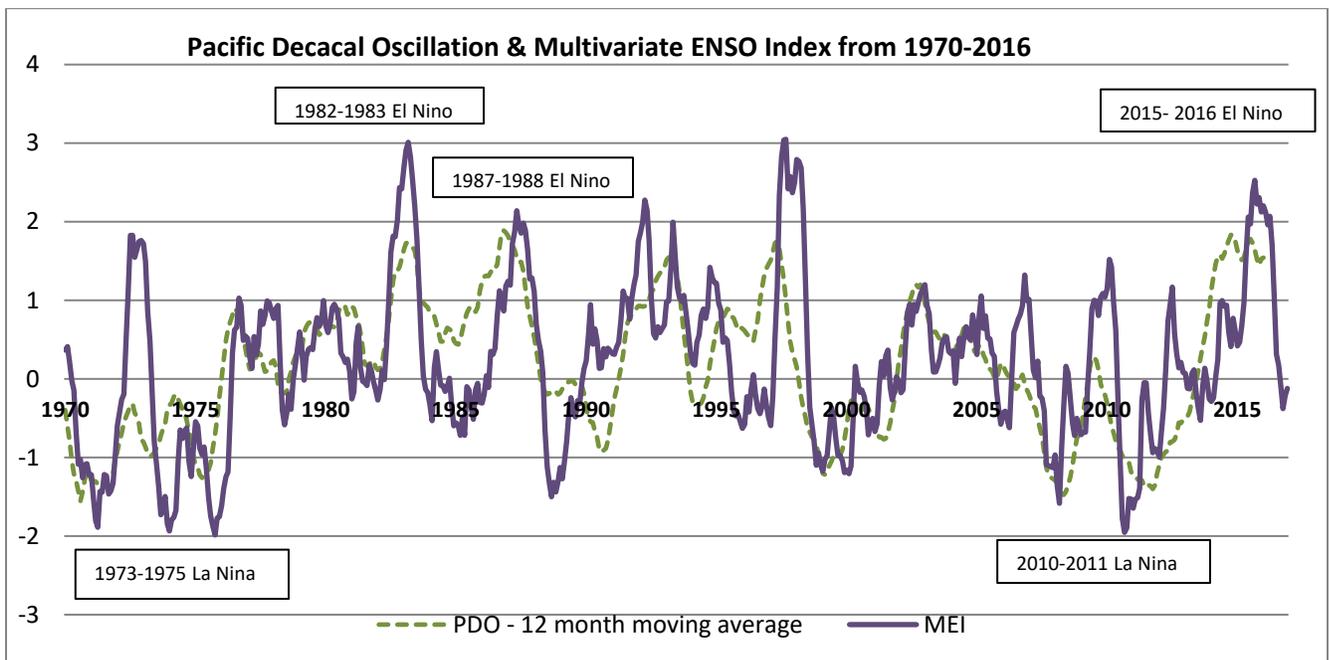


Sue Thomas, Wildlife Biologist 12/12/18

2016 CLIMACTIC SUMMARY

The 2015-2016 El Nino event has been classified by the Office of the State Climatologist as the strongest El Nino event in 18 years and within the 3 strongest events on record (since 1950; <http://www.climate.washington.edu/events/2016winter/>). This event began to subside in the summer of 2016 and remained neutral through the end of the year. Conditions during warm-phase, El Nino years can lead to reduced productivity of zooplankton, squid and fish. Seabird response to this short-term shift in marine conditions can vary considerably depending on the speed severity of the change from normal conditions and the degree of plasticity in their diet. They may not have the resources to raise young and/or adult survivorship may be negatively affected as shown by Wilson (1991). He analyzed Washington seabird colony data collected between 1979-1990 (including 1982, one of the strongest El Nino events in recorded history) and found that cormorant nesting and murre numbers are depressed during severe El Nino events. The graph below illustrates the sheer magnitude of this year's El Nino compared to other strong El Nino events.

The Pacific Decadal Oscillation (PDO) characterizes sea surface temperature and degree of mixing of ocean currents in the Pacific over the course of 20 to 30 years. It represents another index that significantly effects a seabird's marine environment but over the long term compared to El Nino/La Nina. The PDO remained strongly positive (warm) throughout 2016 and reached values similar to those recorded during the 1997-1998 El Nino but over a longer timeframe. The PDO can significantly affect availability of marine forage fish and subsequent conditions of seabird populations that prey on them. Seabirds will often experience breeding failure (e.g. Brown Pelicans), low adult survivorship or may not breed in years with low fish availability. Over successive years of low or no marine forage fish availability and low reproductive rate, populations may decline as recruitment rate drops.



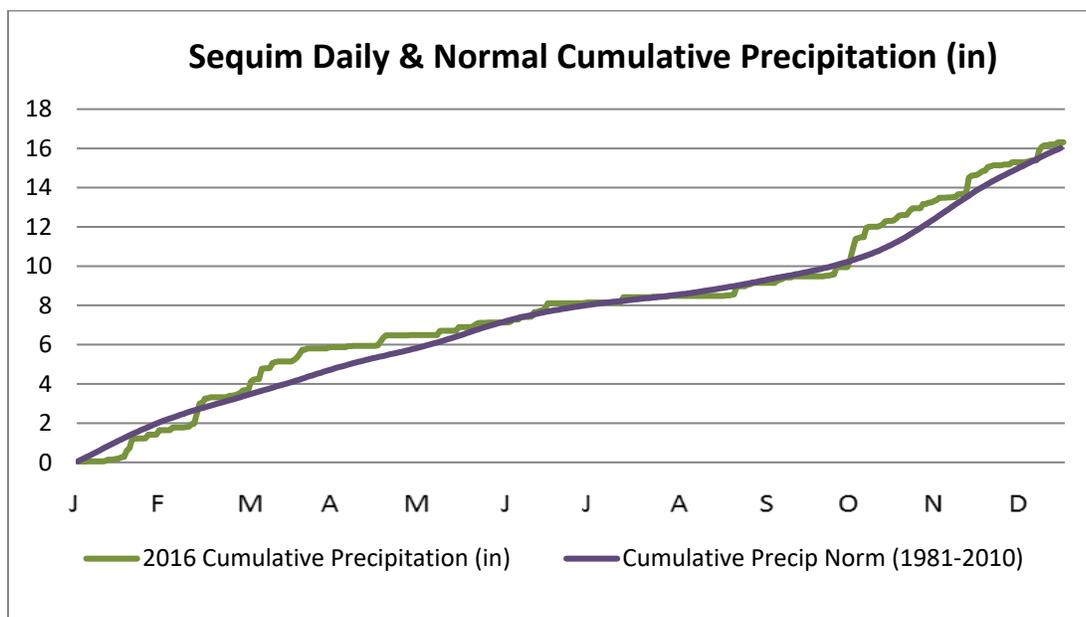
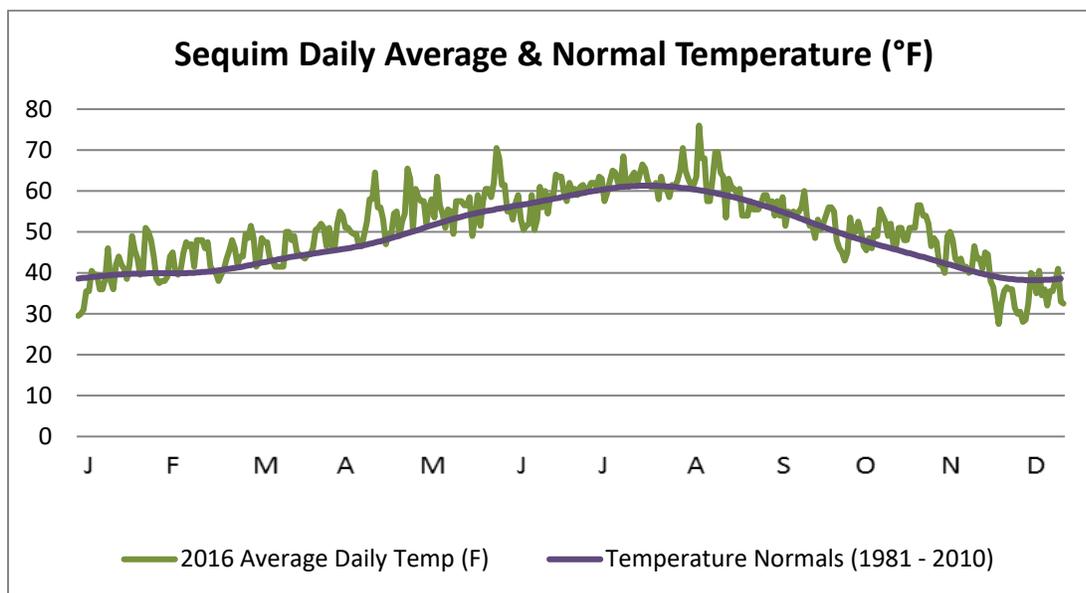
An anomalously warm water mass, dubbed the Blob, continued through 2016. Following higher than average downwelling in the winter of 2015-2016, the upwelling season began (spring transition) on 23 March, 2016 at 45N which is very early compared to the 40-year climatological mean of 13 April. Although early, upwelling was weak until mid-April. After mid-April, the cumulative upwelling was just above average until it ended in late September, slightly earlier compared to the 40-year climatology. Despite the early onset and end to the upwelling season, the total amount of upwelling in 2016 was just above average. Also of note, the Biological Spring Transition, or date when a northern (cold-water) copepod community first appear, never occurred in 2016 likely due to the warm water anomaly (<https://www.nwfsc.noaa.gov/research/divisions/fe/estuarine/oeip/ec-biological-spring-trans.cfm>).

Although no direct link has been made between ocean conditions and the event, Refuge staff and partners began to report Rhinoceros Auklets (*Cerorhinca monocerata*) carcasses washing ashore on beaches throughout the eastern end of the Strait of Juan de Fuca, with a concentration close to Protection Island beginning in late May 2016. Over 95% of the North American population of Rhinoceros Auklets occurs in Washington State, with an estimated 72,000 breeding on Protection Island, the third largest colony in North America. In total, approximately 793 carcasses including both adults and juvenile were reported predominantly by the Coastal Observation and Seabird Survey Team (COASST) and the British Columbia Beached Bird Survey (BCBBS) two organizations that took the lead in coordinating response and monitoring throughout the Salish Sea. More intensive monitoring was completed on DNWR by the Biologist and Refuge Caretaker. From June 14 – Sept 29, 189 dead auklets were observed on the Spit.

During the first week of the event, Refuge Staff submitted 8 carcasses collected on Dungeness NWR to the NWHC for necropsy. In total, post-mortem exams were conducted on 44 birds in Canada and 11 birds in the US. Carcasses examined in the US were emaciated and died from bacterial septicemia while carcasses examined in Canada were in fair body condition but also died from bacterial septicemia. Bacterial culture yielded growth from Bisgaard taxon 14, 32 and 40, within the Pasteurellaceae family. The taxa involved are poorly characterized, however, Bisgaard taxon 40 have been found previously in gulls, Bisgaard taxon 14 in ducks, and Bisgaard taxon 32 in hawks. To our knowledge, these taxa have not been involved in past seabird mortality events. Investigation into this event is ongoing. Tests for avian influenza and poisoning due to harmful algae (saxitoxin and domoic acid) yielded negative results. No other species were associated with this event. Although the numbers of returning birds and eggs hatched was not different from past years on Protection Island, chick growth rate was delayed and researchers expected low productivity given that delayed or failed breeding is a common response in seabirds during years of food scarcity.



Refuges in the Salish Sea, as represented by Sequim in the figures below, experienced warmer and wetter conditions compared to climate normal data from 1981-2010. This is a typical occurrence during warm, El Nino years on the Olympic Peninsula.



For conditions along the outer coast go to: S:\Biological_Program\Annual Narratives\2016



2016 SURVEY EFFORT SUMMARY

Summary results of 11 of 14 wildlife surveys identified in the Inventory and Monitoring Plan for Washington Maritime NWRC completed by Refuge staff are reported in this document, including brief reports on 5 Cooperative Monitoring Efforts Managed by Partners. Three surveys were not completed including: Pacific Flyway Shorebird Survey – no suitable tides within survey window; Pigeon Guillemot Burrow Counts and Purple Martin BBS – injury and scheduling conflicts.

Summary of 2016 IMP Survey Effort by Refuge

	Copalis	Quillayute Needles	Flattery Rocks	Dungeness	Protection Island	San Juan Islands
Cormorant Monitoring (1)						√
Deer Monitoring (1)					√	
Rhinoceros Auklet Population Monitoring (1)	√	√	√		√	√
Surface-nesting Seabird Monitoring (1)	√	√	√			
Surface-nesting Seabird/Shorebird Monitoring - Early Breeding Species (1)					√	√
Tufted Puffin Monitoring (1)	√	√	√		NS	NS
DNWR Shoreline Survey (2)				√		
Pigeon Guillemot Burrow Count (Smith) (2)						NS
Purple Martin Breeding Bird Survey (2)					NS	
Sea Otter Monitoring (2)	√	√	√			
Winter Wildlife Survey (3)					√	√
Audubon's Christmas Bird Count (R/N)				√	√	
Mid-Winter Waterfowl Survey (R/N)				√		
Pacific Flyway Shorebird Survey (R/N)				NS		

(#) - Priority Tier #: 1 - highest, 2 - moderate, 3 - low, R/N - Regional/National

NS - not surveyed

Note: The following IMP monitoring efforts are reported elsewhere: Grasslands/ Savannah Restoration Test Plots (1); IPM: Invasive Plant Surveys (1); Rare Plant Inventory (3); Creosote-covered log deposition (3). Contact Lorenz_Sollmann@fws.gov for information.



Mid-Winter Waterfowl Survey (January 4, 2016) - Dungeness NWR

OBJECTIVE: To obtain an annual wintering waterfowl population index for the Dungeness Basin in cooperation with WDFW biologists. This is also the only regular survey of wintering waterfowl on this Refuge, known to support high concentrations within Washington.

CCP OBJECTIVE: Dungeness NWR CCP and EA objectives 2.3 and 4.1

IMP TIER: N

TARGET SPECIES: All waterfowl species

OBSERVERS: Sue Thomas, Lorenz Sollmann

ENVIRONMENTAL CONDITIONS: Counting conditions were mostly favorable with a relatively calm sea state, 80-100% cloud cover and calm to light winds. Yet in order to access the spit during suitable winter tides (<6') the survey period was pushed up to sunset. As a result, visibility began to deteriorate by the last hour (3:00). Due to poor light conditions and low cloud cover, a small proportion of birds farthest from observation points at the last 2 points (mm 0 & 1) were identified by silhouette or listed as unknown. Very little open water or forage was available inland due to two weeks of freezing conditions prior to the survey, but the anticipate buildup of waterfowl was observed further to the southeast in Dungeness Bay, off refuge.

METHODOLOGY: This is a standard survey conducted throughout the Pacific Flyway following long-established procedures. NWRS staff coordinate with WDFW staff to conduct surveys within the Dungeness Basin in one day. Counts within Dungeness NWR are conducted over 3 hours ideally on an incoming tide between 3.5 and 5' using 10x40x binoculars and a 20-60x spotting scope.

STUDY AREA: The survey area consists of all nearshore habitat of Dungeness NWR. Additional survey areas covered by staff off refuge include Kitchen Dick Rd, Cays/Dickenson Rd, Woodcock/Kerner, Olympic Game Farm and the adjacent Hunt Club and Port Angeles Harbor.

RESULTS: A total of 4,148 waterfowl were counted on DNWR this year. The following results are presented for the NWR only. For data from other waterfowl use areas in Clallam Co, contact Anita McMillan, WDFW.

20-year Trend in Midwinter counts and Proportion of Basin-wide total on Dungeness NWR

	20 yr av 1995	2016	% Change	Proportion of Dungeness Basin
Ducks	5,352	2,861	-47%	22%
Brant	840	1,287	53%	48%
Total Waterfowl	6,193	4,148	-33%	26%

DISCUSSION: At times, the refuge can support a high proportion of waterfowl throughout the Dungeness Basin, particularly Brant. This year, roughly half of Brant counted were located on Dungeness NWR and other waterfowl were much more dispersed. Inhospitable weather conditions inland typically pushes dabbling ducks to salt water habitats; however, we did not observe this buildup on DNWR this year. Incidentally, we observed two



eagles hunting over Graveyard Lagoon during the survey period. They flushed all waterfowl out of the lagoon on Graveyard Spit; however we estimate that approximately 80% of the flushed birds settled on the east side of Graveyard Spit and were counted on survey.

LOCATION OF DATA: S:\Biological_Program\Surveys\Waterfowl\Midwinter\

NOTES AND INCIDENTAL OBSERVATIONS:

DEER MONITORING (MARCH 7, 2016) – PROTECTION ISLAND NWR



Survey areas and primary observation points on Protection Island NWR and Zella Schultz Seabird Sanctuary

OBJECTIVE: To obtain an annual count of Columbian Black-tailed Deer on Protection Island.

CCP OBJECTIVE: Protection Island and San Juan Islands National Wildlife Refuges CCP and San Juan Islands Wilderness Stewardship Plan objective 9.2.

IMP TIER: 1

TARGET SPECIES: Columbian Black-tailed Deer

OBSERVERS: Sue Thomas, Lorenz Sollmann, Grant Rollins, and Brian Ellis.

ENVIRONMENTAL CONDITIONS: ESE winds 8-10mph, 100% cloud cover, 51°

METHODOLOGY: The Island is divided in half by an east/west count line and a primary observer counts the majority of deer from two vantage points (see map). Secondary observers assist as follows:



- The eastern end of the island is counted first with two secondary observers checking Violet Spit and the bluffs overlooking the marina. They then walk through the forested habitat each loosely following a road searching all areas off road by following deer trails. Either the deer are flushed from the forested habitat out into the open where the primary observer can count them or they are counted by the secondary observer upon reconciliation with the primary observer based on time observed. An additional team surveys the shrub habitat adjacent to the north bluffs along the central portion of the upland plateau. In this area, one stationary observer watches the edges to make sure that deer flushed from the shrub area are either counted by the primary observer on the east end of the island or have moved off into the western end of the island to be counted later. This portion of the survey lasts for 45-75 minutes depending on how quickly secondary observers can cover the terrain within the forested habitat.
- The western end of the island is counted next. Again, the primary observer counts the majority of the deer while secondary observers walk from the western end of the plateau, east through areas not readily visible from the primary observer's vantage point. One secondary observer first counts any deer along Kanem Spit and the west-facing bluffs and then walks along the northern, high, side of the west end. Two additional observers walked along the southern side of the west end through the shrubby area around the caretaker cabin and either counts deer that move away from the primary observer's vantage point or keeps track of deer that are moving toward the primary observer to make sure they are counted. This portion of the survey takes up to 30 minutes.
- The north bluff area, not readily visible from the northern side of the island, is checked by boat to determine if deer are using the bluffs during the count.

STUDY AREA: Protection Island including the Zella Schultz Seabird Sanctuary.

RESULTS: A total of 69 live and 6 dead deer were counted. Of the total, 41 deer were counted on the east side while 28 were counted on the west.

	East	West	Total	M	F	Density (km ²)
2/8/10	nr	nr	71	nr	nr	48.2
3/5/11	nr	nr	78	nr	nr	53
2/15/12	43	27	70	nr	nr	47.5
2/27/13	42	22	64	nr	nr	43.4
2014	ns	ns	ns	ns	ns	ns
1/28/15	41	45	86	nr	nr	58.4
3/7/16	41	28	69	nr	nr	46.8

Note: Protection Island is 364 acres or 1.47305 km² / 0.56875 mi²

nr = not recorded; ns = not surveyed

DISCUSSION: This count represents the second lowest count since regular surveys began, but overall very little change has been observed in the density of deer over that period. The population may well have reached carrying capacity on the island. This density is typically considered high by ungulate biologists.

The survey time (1:06) and survey area (95% of island covered) were comparable to efforts from 2013 & 2015. The only areas not adequately covered were those that deer and surveyors could not easily access (e.g. dense understory



within the forested or shrub habitats).

LOCATION OF DATA: S:\Biological_Program\Surveys\Deer

NOTES AND INCIDENTAL OBSERVATIONS: Due to scheduling conflicts and a short weather window, total observer participation was minimal. However, 4-5 observers appears to be an optimal minimal number of observers because less people moving about the island disturb and potentially ‘move’ less deer and it is easier to reconcile #s counted between observers.

WINTER WILDLIFE SURVEY (MARCH 16, 2016) – SAN JUAN ISLANDS NWR



OBJECTIVES: Continue baseline monitoring of Refuge islands located on the Strait of Juan de Fuca and Rosario Strait with an added emphasis on Bald Eagle nesting islands and marine mammal haul outs throughout the Refuge. Additional objectives include assessing species richness on islands monitored and noting condition of habitat and refuge signs.

CCP OBJECTIVE: Protection Island and San Juan Islands National Wildlife Refuges CCP and San Juan Islands Wilderness Stewardship Plan objective 9.3.

IMP TIER: 3

TARGET SPECIES: Bald Eagle & Steller Sea Lion

ASSOCIATED SPECIES: All species observed with emphasis on marine species

OBSERVERS: Sue Thomas and Lorenz Sollmann (WMNWRC)

ENVIRONMENTAL CONDITIONS: Beaufort 3, NW wind 9 mph, rippled sea state, 42°, tide 7' and falling throughout the day.

METHODOLOGY: Surveys were conducted aboard a 31' rigid-hull Safeboat. The boat operator attempted to maintain a boat speed of 2-5 knots at approximately 200 yards off shore, depending on currents and obstructions.



Each island was circumnavigated once regardless of whether wildlife were present unless obstructions under water prevented full circumnavigation. All wildlife within 200 yards of the islands were counted and wildlife observed in the water were recorded separately.

STUDY AREA: Eleven islands known to support nesting Bald Eagles or Steller Sea Lion haul outs were selected from 83 Refuge islands. They include Battleship, Flattop, Lone Tree, Matia, Minor, Puffin, Skipjack, Smith, Turn, Willow, Bird Rocks and select islands nearby within the San Juan Island NWR.

RESULTS: A total of 19 species were observed with the highest abundance and diversity of species observed on Smith Island. One Bald Eagle nest was confirmed as active during this survey and 2 additional were confirmed as active in May including nests on Puffin, Smith and Willow. Approximately 2,340 Dunlin were observed on Smith, Minor and Bird Rocks this year; an uncommon size of flock for this species in the San Juan Islands NWR. In addition, a large flock of oystercatchers (22) was noted on Smith Island.

DISCUSSION: This survey was expanded in 2016 to include confirmation of eagle nesting activity on refuge islands known to support active eagle nests historically or through incidental observations during the Surface-nesting Seabird/Shorebird survey conducting in May. Five new islands were added to the list of islands targeted for this survey effort in addition to conducting surveys on refuge islands within the Strait of Juan de Fuca and Rosario Strait. While only one nest was confirmed during this survey, the two monitoring efforts in March and May provide a better window to confirm eagle nesting activity.

LOCATION OF DATA: S:\Biological_Program\Surveys\Baseline SJI Survey\Winter Surveys

NOTES AND INCIDENTAL OBSERVATIONS:

DNWR SHORELINE SURVEY (APRIL - SEPT, 2016) – DUNGENESS NWR

OBJECTIVES: The objective of this survey effort is to collect baseline data on marine wildlife on Dungeness NWR from October through April for use in marine spatial planning and to inform management decisions.

CCP OBJECTIVE: 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).

IMP TIER: 2

TARGET SPECIES: All species observed with emphasis on marine species

ASSOCIATED SPECIES: NA

OBSERVERS: Sue Thomas (WMNWRC)

ENVIRONMENTAL CONDITIONS: varied



METHODOLOGY: This is a point count survey that follows the methodology developed for the Puget Sound Seabird Survey with a few basic exceptions (focus on mm 2 - 4 within a tidal range of 1-5.5'). When time allows, this effort will be conducted frequently over spring migration and opportunistically during fall and winter given restrictions on access due to the lack of daylight low tides. To avoid double counts or missed individuals, one primary observer is responsible for the count, while the secondary observer records data and alerts the primary observer to movements in to or out of the count area. Additional survey information recorded include: cloud cover, precipitation, sea state, Beaufort wind scale, visibility, tidal stage, disturbance, effects of disturbance, and conditions prior to the survey that may have affected results.

STUDY AREA: Between mm 2-3 on the Harbor shore of the Spit.

RESULTS: Six surveys were conducted in spring between 4/21 – 5/11 and one in fall (9/29). During the spring counts, an average of 354 (9-1,600) aquatic birds were observed along the shoreline adjacent to the JST Aquaculture plot markers. An average of 50 (15-94) birds were observed in the water above the aquaculture plot. A total of 199 birds were recorded on the shoreline between mile 2 and 3 with 62 birds counted in the open water adjacent to the shoreline in September. One Harbor Seal (during three surveys) and one Coyote (1 survey) were observed in the plot and along the shoreline respectively. The primary species observed included gulls, Dunlin, Western and Least Sandpipers, Red-breasted Merganser, Bufflehead, and Surf Scoter.

DISCUSSION: Density within the open water or mudflats averages to about one bird per acre, while that along the shoreline would vary based on the amount of shoreline available. However approximate density during the spring migration is 15.4 birds/ac and 8.6 birds/ac in fall.

LOCATION OF DATA: S:\Biological Program\Surveys\DNWR Shoreline Survey

NOTES AND INCIDENTAL OBSERVATIONS: If time allows, additional surveys are recommended during peak months of winter for waterfowl and shorebirds. Often this is precluded by high daylight high tides in winter. Water levels were up to 1.5' higher than predicted during the spring period

SURFACE-NESTING SEABIRD/SHOREBIRD SURVEY – EARLY BREEDING SPECIES (MAY 16-17, 31 & JUNE 2, 2016) – SAN JUAN ISLANDS NWR



OBJECTIVES: This survey stems from the traditional San Juan Summer Survey, which was conducted in June or July to provide staff presence in the San Juan Islands NWR during the busy summer months. To more accurately



reflect abundance of breeding species, this survey was divided into two separate surveys (Surface-nesting Seabird/Shorebird and Cormorant Monitoring). The primary objectives of the Surface-nesting Seabird/Shorebird Survey are to determine the current distribution and abundance of breeding seabirds (primarily Pigeon Guillemots) and shorebirds (Black Oystercatchers) on refuge islands, document species diversity for wilderness character monitoring and document nest location (oystercatchers) to manage impacts of site visits for management or research. This year's focus was placed on checking status of oystercatcher nests sites especially those that have not been confirmed since repeat counts between 2005-2006 or for which IPM activities are planned in the future.

CCP OBJECTIVE: Protection Island and San Juan Islands National Wildlife Refuges CCP and San Juan Islands Wilderness Stewardship Plan objective 9.3.

IMP TIER: 1

TARGET SPECIES: Black Oystercatchers (nest site documentation)

ASSOCIATED SPECIES: All other species observed (diversity)

OBSERVERS: Sue Thomas and Lorenz Sollmann (Observers), Chris Columbus (boat operator)

ENVIRONMENTAL CONDITIONS: Conditions varied between 30-100% cloud cover, 0-10 mph winds from multiple directions each day, with a calm to rippled sea state (except on 6/2 when a choppy seas prevailed).

METHODOLOGY: Surveys were conducted aboard a 31' rigid-hull Safeboat. Each island was circumnavigated at 5 knots from 200 yards off shore if currents and underwater obstructions allowed and all visible birds and marine mammals were counted. Depending on the size of the island, observers spent up to 15 minutes scanning the island for oystercatcher nests beginning with known nest locations. If passive observation was not enough to locate a nest, and predators were absent, observers briefly played an oystercatcher alarm call on the boat's hailing device to aid in locating difficult to detect nests. This has been shown to illicit immediate response by nesting oystercatchers while nonbreeders rarely respond. Those incubating, return to the nest within 1-3 minutes of the call. Nest locations are then photographed and location details are recorded for future use if needed. All birds and marine mammals visible from the boat were noted during this survey for assessment of diversity as part of the San Juan Islands Wilderness Character Monitoring Plan.

STUDY AREA: Refuge islands known to support Black Oystercatcher nest sites and targeted islands identified for annual diversity monitoring within the San Juan Islands NWR.

RESULTS: Of 56 islands targeted for Black Oystercatcher nest site surveys, refuge staff completed surveys on 53 Refuge islands. A total of 45 nests were observed on refuge islands. Seven additional potential nests were noted but breeding status was not confirmed due to poor visibility or the observers could not determine breeding status based on behavior. Of the 45, 11 nest sites were noted as active that had not been confirmed since 2005-2006 when WDFW conducted up to 3 surveys per year per nest site. This total is similar to that observed in 2003 (41 nests) but falls short of the high counts reported between 2005-2006 (61-71 nests on Refuge islands).

A total of 29 species were observed on 59 islands targeted to monitor diversity. Results reflect a Shannon-Weiner Species Diversity Index of 1.82 which equates to an Effective Number of Species (ENS) of 6.17. The ENS provides a true measure of diversity, particularly in communities where all species are not equally common (more at: <http://www.loujost.com/Statistics%20and%20Physics/Diversity%20and%20Similarity/EffectiveNumberOfSpecies.h>



tm). One Mink was observed on Buck Island this year, close to the oystercatcher nest site (adults were in attendance). In addition, several interesting marine mammals were observed hauled out on refuge islands including: Elephant Seal (Smith Is), Steller Sea Lion (Bird Rocks) and a California Sea Lion (Unnamed [S. Long] #20).

DISCUSSION: The disparity between oystercatcher nest counts 10 years ago and now can be attributed to the minimum survey effort we are able to dedicate to oystercatcher nest surveys due to funding limitations. Historic surveys traditionally were conducted 2-3 times per year with changes in nest locations and nesting attempts noted between years for comparison. Given funding limitations, we feel our efforts provide the best possible information for management of sensitive areas particularly in planning site visits for habitat management or research during the nesting season. Since this species is so highly site faithful and long-lived, multiple year's survey efforts to confirm nesting on all known nesting islands provides a good balance between information needs (access/oil spill) and annual funding limitations.

Species richness (total of species observed) was slightly higher than that for 2014-2015 yet greater coverage of the islands was obtained this year. However, the ENS was very similar to the past two years when surveys were conducted during the same time frame.

Year	Richness	Diversity (ENS)	# Islands Surveyed
2016	29	6.17	59
2015	21	5.16	40
2014	25	5.87	39

LOCATION OF DATA: S:\Biological_Program\Surveys\Baseline SJI Survey\Surface-nesting Seabird-Shorebird

NOTES AND INCIDENTAL OBSERVATIONS: One Charter boat was fishing within 100 ' of the nw shore of Matia Island during our survey. When approach the owner was dismissive of the request to move off. This was reported to USFWS Law Enforcement.

SURFACE-NESTING SEABIRD/SHOREBIRD SURVEY – EARLY BREEDING SPECIES (MAY 25, 2016) – PROTECTION ISLAND NWR & ZELLA SCHULTZ SEABIRD SANCTUARY

OBJECTIVES: The primary objective of the Surface-nesting Seabird/Shorebird Survey is to determine the current distribution and abundance of seabirds (primarily Pigeon Guillemots) and shorebirds (Black Oystercatchers) during the breeding season on the island and document nest location (oystercatchers) to manage impacts of site visits for management.

CCP OBJECTIVE: Protection Island and San Juan Islands National Wildlife Refuges CCP and San Juan Islands Wilderness Stewardship Plan objective 9.3.



IMP TIER: 1

TARGET SPECIES: Black Oystercatchers and Pigeon Guillemots.

ASSOCIATED SPECIES: All other species observed (diversity)

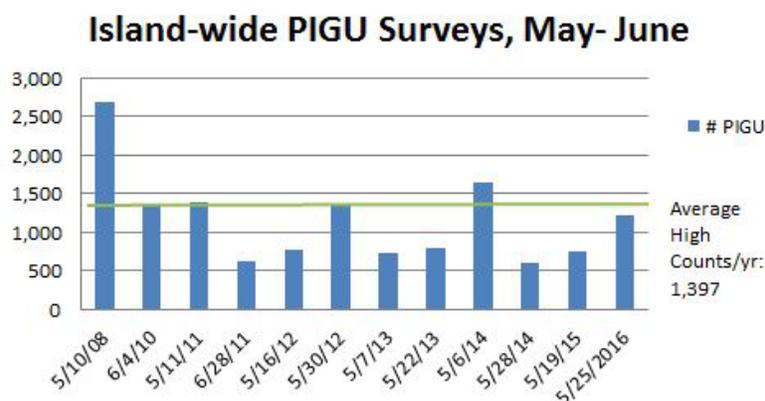
OBSERVERS: Sue Thomas (Observer) and Lorenz Sollmann (Boat Operator, Observer)

ENVIRONMENTAL CONDITIONS: Beaufort 2 (west wind at 9mph & rippled sea state), 70% cloud cover, 44° made for good environmental conditions to conduct the survey.

METHODOLOGY: The survey methodology is the same as that described for Surface Nesting Seabird/Shorebird survey for the San Juan Islands NWR except that the boat operator counted all guillemots off the starboard/off island side of the boat.

STUDY AREA: The study area consists of the shoreline and off shore waters of Protection Island.

RESULTS: One survey was conducted around Protection Island in 2016 with 1207 guillemots observed. Seven Black Oystercatchers were observed on the south shoreline of the island; no nests or nesting behavior was observed.



DISCUSSION: Guillemot abundance during the survey was slightly below the average of high counts/yr (1397). A second survey is recommended each year but workload and timing of the survey precluded a second survey. Incidentally, 16 species were observed; well within the range of species (14-21) observed during this survey since 2011 when most species were count. The exception are deer and gulls, a large proportion of which are not visible from the boat. One elephant seal was again observed on the south side of Kanem Spit in May.

LOCATION OF DATA: S:\Biological_Program\Surveys\Baseline PI Surveys

NOTES AND INCIDENTAL OBSERVATIONS:



SURFACE-NESTING SEABIRD MONITORING (JULY 6 & 18, 2016) - FLATTERY ROCKS, QUILLAYUTE NEEDLES, COPALIS NWRs



Common Murre colony on White Rock, Flattery Rocks NWR

OBJECTIVE: To assess abundance and distribution of Common Murre and select surface nesting seabirds on Refuge islands.

CCP OBJECTIVE: Washington Island NWRs CCP and EA objective RA2

IMP TIER: 1

TARGET SPECIES: Common Murre; Double-crested, Brandt's and Pelagic Cormorants; Glaucous-winged/Western hybrid gulls

ASSOCIATED SPECIES: Sea Otters and pinnepeds

OBSERVERS: Sue Thomas and Lorenz Sollmann (WMNWRC); Pilot: Mike Neering (NW Helicopters)

ENVIRONMENTAL CONDITIONS: The survey on 7/6 was delayed due to fog until 11 am, however once it cleared visibility remained high throughout the flight. Conditions on both days were good for aerial photography with high ceilings, unlimited visibility, 30-100% cloud cover and relatively calm winds ranging from 2-12 knots from the W-NW.

METHODOLOGY: This survey is part of a larger effort to assess abundance and distribution of seabird colonies along the Northern Pacific Coast; the same survey methodology is followed along the Oregon coast. Aerial surveys are conducted aboard a Bell 206 B3 helicopter from 700-900' AGL. The pilot circled each island or headland from approximately ¼ - ½ mile offshore until staff captured images of all surfaces where surface-nesting seabirds might be observed. Color photographs were taken using Cannon EOS 5D Mark II digital cameras with a 21.1 MP resolution with a 100-400mm f/4.5-5.6L IS USM zoom lens by both observers. Observers photographed all target islands regardless of whether seabirds are visible.



Three to six photos were processed into panoramas using Adobe Photoshop CS4 to reduce the time necessary to reconcile overlapping photos and the potential for double counting. ArcMap v10.1 was used to manually count individual birds as point feature classes within panoramas or individual photos to account for birds in areas that did not appear in the panoramas.

STUDY AREA: Due to funding limitations, the number of islands surveyed was reduced to the bare minimum based on presence of murres in past survey efforts between 1999–2001 & 2010–2015 along with 12 islands that have supported cormorants between 2010 and 2015 as well as two islands requested by USFWS - MBHP for historic cormorant surveys. Additional sites were photographed if murres or large numbers of cormorants were observed during the survey effort.

RESULTS: The total survey flight time was 4.3 hours (including 1.8-2 hours transit time between Olympia and Forks) for each flight. Thirty three islands were photographed during each flight.

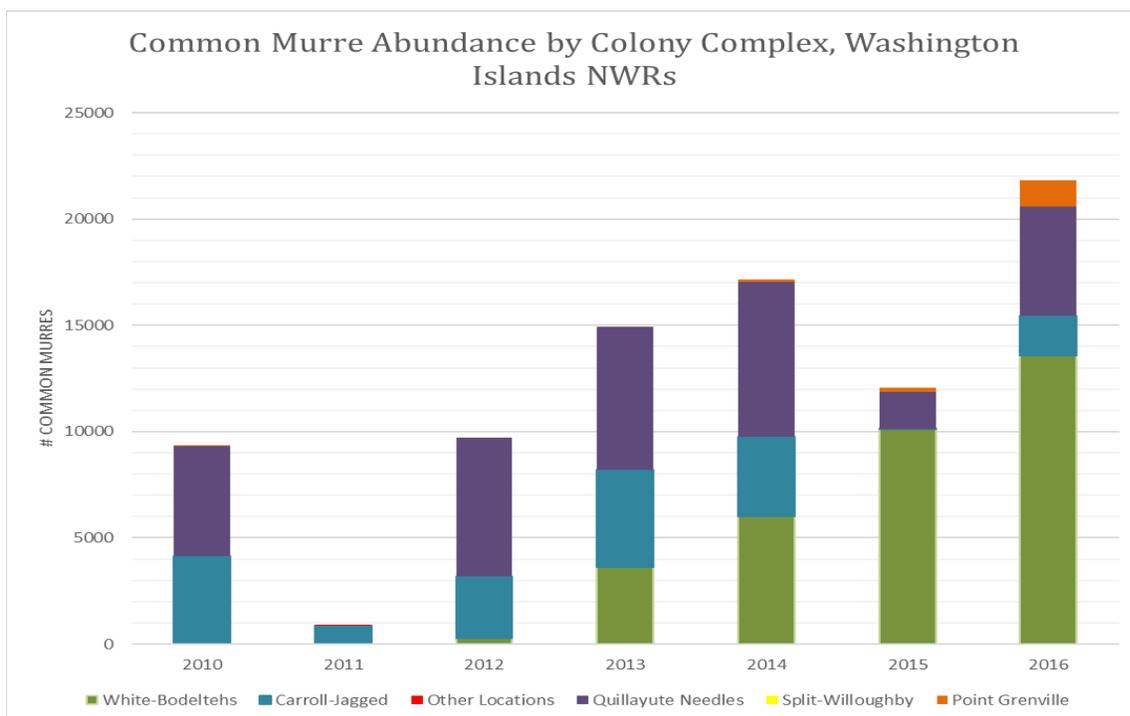
Below is a list of counts of target species or their nests as well as data for incidental species. It must be noted that use of raw data for incidental species is very limited since this survey was not designed to capture the true abundance or distribution of those species. For instance, aerial surveys for puffins not recommended; the survey does not adequately cover even a minimum of habitat for sea otters or occur at the right time of year for oystercatcher or guillemots. As a result, they are provided here only to give a limited indication of occurrence.

	7/18/2016	7/6/2016
Target Species		
# COMU	21807	16876
# BRAC Nests	126	82
# DCCO Nests	110	125
# PECO Nests	2134	1692
Incidental Species		
WGWH Nests	483	748
TUPU	777	171
PEFA	4	2
BAEA	16	35
BRPE	223	0
ELSE	0	1
STSE	599	693
CASE	2	0
HASE	924	521
SEOT	17	9
# Islands Surveyed	33	34



DISCUSSION: Trends for all 2010-2015 murre data along with past, unpublished data from 1996-2001 have been analyzed and presented in a manuscript titled *Population trends and distribution of Common Murre (Uria aalge) colonies in Washington, 1996-2015* published in *Marine Ornithology* 45:95-102 in 2017. From this analysis, we found that murre populations in the survey area have increased by almost 9% per year between 1996 – 2015, yet abundance remains below levels reported in the 1970's. In contrast to the declining trend observed in Washington between 1979 and 1995 (-13.3% per year, 95% CI [-20.2% – -5.7%]), we found an increasing trend of 8.8% per year. The decline in the 1980s and early 1990s was attributed to a significant decline in the southern colonies of 25% per year, while the northern colonies declined at a slower rate of 4% per year (also excluding Tatoosh Island). We found a continuing decline in southern colonies (-15% per year) but an increase of nearly 11% per year in the northern colonies. During 1996–2015, the northernmost colonies on White Rock and West Bodeltch have shown the greatest increase (approximately 80% and 135% annually for the entire period and recent years, respectively), and ranked among the top three colonies in recent years. During 1979–1995, these colonies were sparsely attended. The largest southern colonies in 1979 (Grenville Arch, Radio Stack, Split, Willoughby, and Rounded) have been inactive between 2010 and 2015, and only a small number of murrens have been in attendance at the smaller colonies (Erin and Erin's Bride) during that time. Although methods have varied over time and not every colony in the survey area was monitored regularly, historic data from Washington provide further evidence for great variability in the spatial distribution of colonies over time.

Below is a simple graph showing abundance of murrens on refuge islands in Washington from 2010-2016. The distribution of murrens was noticeably different this year than in past years with almost twice the number typically observed at White Rock and colonies on Cake and Grenville Pillar not observed since 2001.



In addition, a small colony of Brandt's Cormorants were observed nesting near the new murre colony on Cake Rock for the first time. Very few murrees were noted at West Bodelteh, Carroll Island and Pillar, Jagged, Huntington, Cakesosta and Table.

LOCATION OF DATA: Photographs and subsequent analysis will be stored at S:\Biological Program\Aerial_Seabird_Survey. In addition, back-up files will be saved to an external hard drive, and stored off site. Additional procedural notes can be found at S:\Biological_Program\Washington Maritime NWRC I&M Procedures.docx

NOTES AND INCIDENTAL OBSERVATIONS: All data from this effort between 2010-2015 have been formatted and will be sent to the Washington Seabird Colony Catalog. The USFWS is now working with partners to standardize methods for monitoring murre and Brandt's Cormorant abundance and distribution. Once completed, this document will be posted on the USFWS ServCat.

We maintained a higher overall altitude above all colonies (700-800 AGL; 900' above the Needles Archipelago) than in past years to reduce the potential for disturbance. We observed very little disturbance due to the overflight other than at Needles which would suggest the need for a higher flight altitude in future years over colonies there. During past boat-based and aerial surveys, we have noted a great deal of eagle disturbance around these colonies and presumably surface-nesting seabirds there are more sensitive to aerial disturbance.

TUFTED PUFFIN MONITORING & BURROW COUNT PILOT PROJECT (JULY 11-13, 2016) – QUILLAYUTE NEEDLES NWR

Detailed information regarding this survey and pilot project can be found at S:\Biological_Program\Surveys\TUPU\2016 Burrow Counts_Mapping.

CCP OBJECTIVE: Washington Islands NWRs CCP objectives: SS1 to continue coordination with others to monitor federal or state listed species; CP2 to continue joint surveys with WDFW, particularly TES; and RA2 to explore *“low impact methods of determining population sizes of tufted puffin...at key refuge breeding colonies.”*

IMP TIER: 1

CORMORANT MONITORING (JULY 28, 2016) – SAN JUAN ISLANDS NWR



OBJECTIVE: Assess abundance, distribution and breeding status of Double-crested, Pelagic and Brandt's Cormorants on Refuge islands

CCP OBJECTIVE: Protection Island and San Juan Islands National Wildlife Refuges CCP and San Juan Islands Wilderness Stewardship Plan objective 1.3.

IMP TIER: 1

TARGET SPECIES: Double-crested, Pelagic and Brandt's Cormorants

OBSERVERS: Lorenz Sollmann & Jennifer Brown Scott (Observers), and Sue Thomas (Counter), WMNWRC

ENVIRONMENTAL CONDITIONS: Good conditions for photography including winds at 0-4 mph, calm seas and 10% cloud cover.

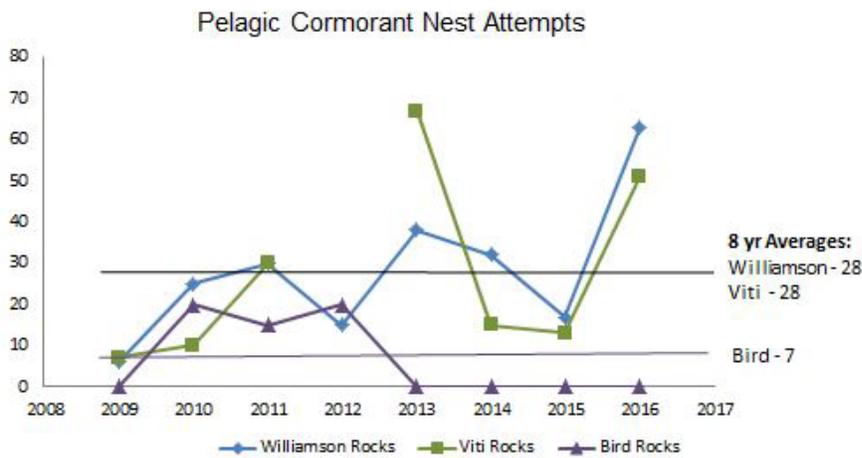
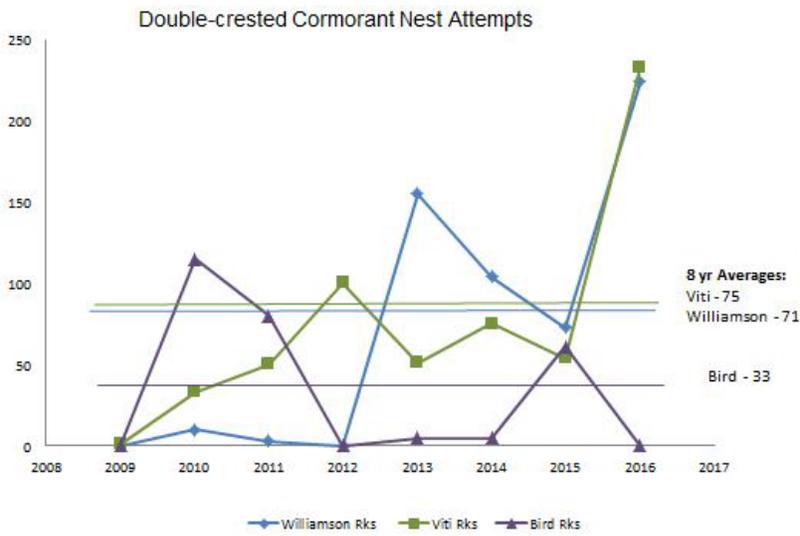
METHODOLOGY: Surveys are conducted by boat cruising at a speed of 2-5 knots from a distance of 200 yards offshore, depending on currents and obstructions. Each island is circumnavigated and photographs are taken of all cormorants and nests. There have been no restrictions placed on the daily timing of this survey, however due to prevailing marine conditions that deteriorate throughout the day in this area, surveys are typically conducted from 8:30 am and 2 pm. The methodology developed by the Pacific Flyway Council's Double-crested Cormorant Monitoring Strategy is essentially the same as that followed by Refuge staff since 2009 when conducting cormorant surveys with the addition of photo documentation of colonies. More information on the Double-crested Cormorant Monitoring protocol can be found online at http://pacificflyway.gov/Documents/Dcc_strategy.pdf.

STUDY AREA: The survey area consists of the following small, rocky islands: Bird, Williamson and Viti rocks which have consistently supported nesting cormorants since monitoring began in the 1970s as well as Smith, Minor and Hall islands which can support relatively high numbers for this area given minimal human or eagle disturbance.

RESULTS: The number of nest attempts was well above average for Pelagic Cormorants on Viti and Williamson. Although adults were present during the last three years, nesting was not recorded for the 4th consecutive year at Bird (see figures below for islands consistently surveyed in the past 8 years). The number of Double-crested cormorant nest attempts were also well above average for Williamson and Viti. Nesting was above average at Hall Island, but sporadic; no Double-crested Cormorants nested at Bird Rocks or Minor Island (for the first time since the colony formed in 2011). Two Brandt's Cormorant nests were observed on Williamson Rocks this year, the fourth year since 2009 that nests of this species have been noted on the San Juan Islands NWR.

DISCUSSION: Cormorants nesting on both Smith and Minor islands are subject to a high amount of disturbance from Bald Eagles since 1-2 eagle nests are active on Smith and or Minor islands each year and numerous eagles can be found foraging or roosting on either island.





LOCATION OF DATA: S:\Biological_Program\Surveys\Cormorants\2015SJINWR Cormorant Monitoring

NOTES AND INCIDENTAL OBSERVATIONS: Of interest in 2016, a banded Double-crested Cormorant (Red: Metal) was observed on Viti Island during this survey. Photos were sent to Dan Roby’s Lab at OSU, but they could not identify the code on the color band (and thus the original banding location) due to poor photo quality.



RESEARCH & COOPERATIVE MONITORING EFFORTS ON REFUGES (PROPOSALS AND REPORTS FILED IN S:\SUP\)

PROTECTION ISLAND NWR

- Rhinoceros Auklet Population Monitoring– Pearson/WDFW, Hodum/UPS and Good/NOAA – Data for assessing rhinoceros auklet diet and reproductive success on Protection, Smith and Destruction islands are currently under analysis. In addition, data from geo locators are still under analysis to identify the non-breeding distributions of rhinoceros auklets breeding at Protection and Destruction Islands. In addition, blood samples collected to develop health-based indicators of population health are currently under analysis. This effort is geared toward meeting Protection Island and San Juan Islands National Wildlife Refuges CCP and San Juan Islands Wilderness Stewardship Plan objective 9.2 and meets an IMP Tier 1 survey effort.
- Forage Fish Research – Bookheim/DNR - DNR conducted two forage fish (spawn) and habitat surveys on Protection Island on 7/19/16 and 11/30/16. The two forage fish species of interest, Pacific sand lance and surf smelt, are known to spawn in the intertidal area of sand or gravel beaches between mid-November and through February, however no eggs were observed in samples. In addition, samples were analyzed for contaminants. No contaminant loading above approved limits was reported, in fact Refuge shoreline samples were lowest of all samples collected.
- Glaucous-winged Gull Research – Hayward/Andrews Univ –The methodology for the annual nest census on Violet Spit was significantly improved this year. All nest locations were recorded with a GPS unit and marked with a swig of native vegetation to avoid double counting. A total of 2,461 nests were recorded, up from 1,787 however this data is the result of improved monitoring techniques and comparable to past years due to the potential for double counting. Vegetation mapping was conducted on Violet Spit and analysis of data is currently under way. Despite slightly higher Sea Surface Temperatures (SST; 10.2 vs 10.1 °C) in 2016 compared to 2015, there was a 30% decrease in the number of cannibal specialist territories and a 60% decrease in the number of eggs cannibalized in 2016 compared to 2015. Moreover, the average number of eggs taken by egg cannibal specialists in 2016 dropped to only 32% of the average number taken by egg cannibal specialists in 2015. Compared to the three year dataset, the breeding season of 2016 was highly unusual and did not fit the cannibalism pattern observed during previous years. There appeared to be abundant young herring close to the surface and the surface-feeding gulls seemed to have ample resources. However, during this time an unusual mortality event was occurring with Rhinoceros Auklets (which feed in deeper waters), the majority of which were in emaciated condition. Yet, gulls are generalist foragers and may have been able to supplement their diet more readily than the auklets. Additional analysis of cannibalism and hatching success data revealed that these variables were best predicted by the average SST computed from September–October prior to the late May–June egg-laying season. Early autumn sea surface temperatures prior to the breeding season appeared to be particularly crucial to breeding success. The results are likely species and location specific. This effort is geared toward meeting Protection Island and San Juan Islands National Wildlife Refuges CCP and San Juan Islands Wilderness Stewardship Plan objective 9.2.

DUNGENESS NWR



Washington Maritime NWRC 2016 Biological Program Activities



- Elwha/Dungeness Longshore Drift Assessment – Parks/DNR - Topographic beach profiles and benthic collections of old MESA sites on DNWR and assessing sediment loading primarily. Surveys were conducted on 6/6/16 and 8/2/16. Data from this study (2010-2017) will be fully analyzed in winter 2017/2018. This effort is geared toward meeting Dungeness NWR Draft CCP and EA objectives 2.2 and 4.2.
- Shoreline Monitoring Program for the Olympic Peninsula – Miller/CCMRC - This is primarily designed as a long-term study of shoreline change relative to projected sea level rise increases in storm events and/or wave height as well as other aspects of climate change to be conducted when time and funding allow. These data will be published to NANOOS and can be referenced as a baseline for long-term quantitative change. Other benefits are anticipated that are relevant to contemporary management - for example these profiles will indicate patterns of shoreline variability over shorter time scales that may help to address management questions regarding the connectivity of features like spits to sediment sources like eroding bluffs. One beach profile survey was conducted on 6/6/16. Results to date indicate: 1) Erosion at the end of Dungeness Spit between 2012-2016, 2) Possible landward movement of the distal end of Dungeness Spit and 3) Short-term stability along the proximal “strand” of Dungeness Spit.
- Dawley Shoreline Restoration Forage Fish Monitoring – Faulkner/WDFW - The purpose of this study is to monitor the effects of shoreline restoration, via the removal of armoring, on forage fish and whether the processes that create and maintain key elements of the nearshore habitat on the Dawley property are affected. No forage fish eggs were encountered during the initial survey effort. Future surveys are planned to assess whether the restoration project benefited forage fish.

WASHINGTON ISLANDS NWRS

- Rhinoceros Auklet Population Monitoring– Pearson/WDFW, Hodum/UPS and Good/NOAA – Data for assessing rhinoceros auklet diet and reproductive success on Protection, Smith and Destruction islands are currently under analysis. In addition, data from geo locators are still under analysis to identify the non-breeding distributions of rhinoceros auklets breeding at Protection and Destruction Islands. In addition, blood samples collected to develop health-based indicators of population health are currently under analysis.
- Sea Otter Monitoring – Lynch/USFWS - Refuge staff participated in the annual Sea Otter survey from June 28-July 1 this year with an estimate population total of 1,806 obtained on the 30 June survey. This total included 426 otters in the north segment (La Push to the Strait of Juan de Fuca) and 1,380 otters in the south segment (La Push to Pt Grenville). The count includes 104 pups, 61 in the north and 43 in the south. For comparative purposes, the estimates for the Washington sea otter population in 2013, 2014 and 2015 were 1,272, 1,573 and 1,394 otters respectively. This effort is geared toward meeting Washington Island NWRS CCP and EA objective CP2; it is considered an IMP Tier 2 survey. Due to aviation restrictions, refuge staff were not able to participate in the aerial survey effort, but served as ground crew at Sand Point, Ozette Lake.
- Steller Sea Lion Research – Garin/NOAA, Jeffries/WDFW and Scordino/Makah – In 2016, 106 Steller pups were counted during a vessel survey on July 21, 2016. This count included 71 at Carroll Island and 35 at Sea Lion Rock. An aerial survey by the Washington Department of Fish and Wildlife on 1 July 2016, counted 107 Steller pups at Carroll Island and Sea Lion Rock. This count compares closely with the maximum count



recorded in 2015 (110). Remote cameras were installed on East Bodeltch Island and Sea Lion Rock this year to document resights of sea lion brands. While the camera was damaged on Sea Lion Rock, analysis of photos collected between 2014 - 2016 have been analyzed resulting in 317 Steller sea lion and 312 California sea lion brand resights. Scat are currently under analysis.

SAN JUAN ISLANDS NWR

- Rhinoceros Auklet Population Monitoring– Pearson/WDFW, Hodum/UPS and Good/NOAA – Due to logistical issues, no work was completed on Smith Island this year.

MISCELLANEOUS OBSERVATIONS AND DISCRETE SURVEY EFFORTS

PROTECTION ISLAND NWR

- No activity was noted in the eagle nest trees along the north road within the forested habitat on 3/7/16. In addition, the second historic nesting territory was inactive and no sign of the nest found within the shrub habitat later in the season.
- Only one Black Oystercatcher nest with three eggs was observed on the island on the west shoreline of the canal leading to the marina.
- The Regional Refuge Biologist completed analysis of the Bee Fauna Inventory conducted on PI in 2014 and 2015. Results can be found at S:\Biological_Program\Surveys\Inverts\Bee Fauna Inventory\R1 Monitoring.

DUNGENESS NWR

- No Caspian Terns were observed on the colony between 4/21- 6/14 although they were seen foraging in the Harbor during that time. One pair of territorial Arctic Terns were observed on 6/14 & 6/22.
- Caspian Tern Breeding Survey - OSU researchers conducted aerial surveys for Caspian Terns on 6/15 however no terns were observed on Dungeness NWR.
- One pair of territorial and two non-territorial pairs of Black Oystercatchers were observed on the inside of the Spit along the Bay side on 6/14. No response to calls was noted along the Harbor side.
- One live seal pup was reported at mm 4.5 on 7/25/16. Given the distance from the trailhead, the Seal Team was not engaged. A dead pup was noted on 9/25/16 at mm 2.5. A dead adult female Olive Ridley Sea Turtle was observed on 12/3/16 near the lighthouse with a 7 cm J hook lodged in its esophagus and abrasions on the shell. It was transferred to WDFW for necropsy.

SAN JUAN ISLANDS NWR

- Caspian Tern Breeding Survey - OSU researchers conducted an aerial survey for Caspian Terns on 6/15 however no terns were observed on Smith or Minor Islands.
- A scheduled Pigeon Guillemot burrow count on Smith Island was canceled this year due to injury and scheduling conflicts.

WASHINGTON ISLANDS NWRS



- Few murre were noted on Carroll Island and Pillar, Jagged, Cake and the Quillayute Needles during Tufted Puffin surveys on 7/11-13/16.

CITIZEN SCIENCE PROJECTS

- COASST (monthly, 2016) – Dungeness NWR
- Seal Team (summer, 2016) – Dungeness NWR – no pups within two miles of the base of the spit this year
- Green Crab Surveys (spring/summer, 2016) – Dungeness & Protection Island NWRs – no Green Crabs observed
- Audubon PUMA Nest Boxes (spring/summer, 2016) – Protection Island NWR - 6 nest boxes were installed (3 tubes/3 boxes) on pilings in the marina and above the office, 21 eggs were laid and an estimated 15 chicks fledged
- Pidgeon Guillemot Burrow Monitoring (summer, 2016) – Dungeness NWR
- Christmas Bird Count (December, 2016) - Dungeness & Protection Island NWRs

