Appendix A

Jamestown S'Klallam Tribe Technical Memorandum
DNWR Bird Survey Data

Bird Distribution Patterns in Dungeness Bay

Introduction

The Jamestown S'Klallam Tribe is seeking to reestablish a Pacific oyster farm in Dungeness Bay. The 50-acre Department of Natural Resource shellfish aquaculture lease site is located within Inner Dungeness Bay and within the bounds of the Dungeness National Wildlife Refuge. This exact lease parcel had been used for oyster farming for approximately 40 years prior to being forced to cease operations in 2005 due to declining water quality within the Bay. Thirty-four acres of the 50-acre lease parcel is available for shellfish cultivation which accounts for ~3% of the more than 1,100 acres encompassed by Dungeness Harbor, and ~7% of the 500+ acres of prime bird use habitat (i.e., mudflats, wetlands and eelgrass) located within the Refuge.

The Jamestown S'Klallam Tribe anticipates oyster farm activities to have no more than minimal impacts on birds and for several reasons: 1) all shellfish activities will occur within the 34 acres of the lease site on the same footprint which pacific oyster cultivation previously occurred for nearly 40 years (see JARPA for site history); 2) eelgrass habitat will be protected by establishing a 25 ft. unvegetated buffer from farm activity; 3) all oyster cultivation will be done by hand; no mechanical equipment will be used beyond lifting stacked oyster bags onto a small marine vessel (similar to crab pot pullers) during high tide; 4) noise reduction strategies will be put in place to keep boat motor noise levels to $\leq$ 50 decibels; 5) there will be no hazing of wildlife or use of pesticides; 6) farm site access follows established subtidal channels that experience seasonal recreational and commercial boating activity; and 7) farm boats will maintain no-wake speeds within in the Harbor to minimize disturbance. The purpose of this technical report is to better understand bird distributions within Dungeness Bay and potential interactions with shellfish activities.

Here we examine the bird survey data provided to the Jamestown S'Klallam Tribe (here-in "The Tribe") by United States Fish and Wildlife Service (USFWS) on 7/9/2018 to acquire information on bird use within and adjacent to the aquaculture lease site. Bird observations made from several USFWS surveys, spanning the mid 1990's to 2018, were investigated to gain insight on bird distributions within Dungeness Bay. Site-specific bird count data was used to determine which observations are of relevance to the oyster farm site and to address comments submitted by USFWS to Clallam County and U.S. Army Corps of Engineers in Feb/March 2019 and May 22, 2019.

USFWS Dungeness National Wildlife Refuge bird survey data

Datasets acquired from USFWS

Bird survey datasets provided to The Tribe by USFWS included: (1) Midwinter Waterfowl Survey (2010 – 2018), (2) Pacific Flyway Shorebird Survey (2012 – 2017), (3) Avian Shoreline Survey (2013 – 2015), (4) Dungeness Wildlife Refuge "Legacy Data" (1994 – 1999) and (5) Christmas Bird Counts (1975 – 2010). Site-specific information about bird observer locations within the Refuge were included for the Midwinter Waterfowl, Avian Shoreline, Pacific Flyway Shorebird and Legacy datasets, allowing for a more focused assessment of bird distributions in

relation to the oyster farm site. The Christmas Bird Counts did not provide any site-specific information, nor could it be verified that the counts provided were specific to Dungeness Bay, so it was not included in the analysis.

Data selection

Survey instructions and rationale were provided for three of the acquired datasets: Midwinter Waterfowl, Avian Shoreline and Pacific Flyway. The Midwinter Waterfowl Survey occurs annually to assess populations of overwintering waterfowl (i.e., ducks, geese and swans) in Dungeness Basin. All waterfowl observed over a single day are counted within in Dungeness Bay in January or February, and survey data is "used to manage public use of the refuge as well as inform hunting regulations" (DNWR Midwinter Waterfowl Survey (N) instructions). The Avian Shoreline Survey was established "to collect baseline data on marine wildlife use of the Dungeness NWR from October through April and the results are intended to "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…." (DNWR Avian Shoreline Survey (T2) instructions). The Midwinter Waterfowl and Avian Shoreline Surveys use the same observer locations along Dungeness Spit for bird counts. Midwinter Waterfowl Survey instructions state that "observations are made with a spotting scope up to 1 mile out unless adjacent areas are covered by another observer" (DNWR Midwinter Waterfowl Survey (N) instructions). Given the spacing between observer locations, the observation radius of the Midwinter Waterfowl Surveys was estimated to be 730 m (Figure 1). The Avian Shoreline Survey methods state that observer bird counts occur within a 300 m radius from each survey point at each mile marker on Dungeness Spit. Observer locations were also provided for the Pacific Flyway Shorebird Survey; however, data recording was inconsistent and bird counts appeared to be arbitrarily combined and split among observer sites from year-to-year making site-specific assessment difficult. Due to the inconsistencies in data recording, the Tribe elected not to include the DNWR Pacific Flyway Shorebird survey data in this analysis. Mapping the observation radius for the applicable datasets indicate that **bird counts associated with the mile marker 2 (MM2) observation point within Dungeness Harbor is most relevant to the oyster farm site (Figure 1).**

No survey protocols were provided for the DNWR Legacy Data (1994 – 1999). However, a map was provided showing how the Dungeness Bay Wildlife Refuge was broken up into wildlife survey areas. Each bird count was associated with a specific survey area so the Tribe georeferenced this map to identify which survey areas corresponded with project site. **Bird counts collected in Legacy Data survey areas #14 and #15 are associated with the oyster farm site (Figure 2).** Bird counts were made throughout all months of the year. The Legacy data provides useful insight as to bird use within and adjacent to the project site when ~20 acres of the lease site was actively being used for oyster farming by the Tribe in the mid-1990s.

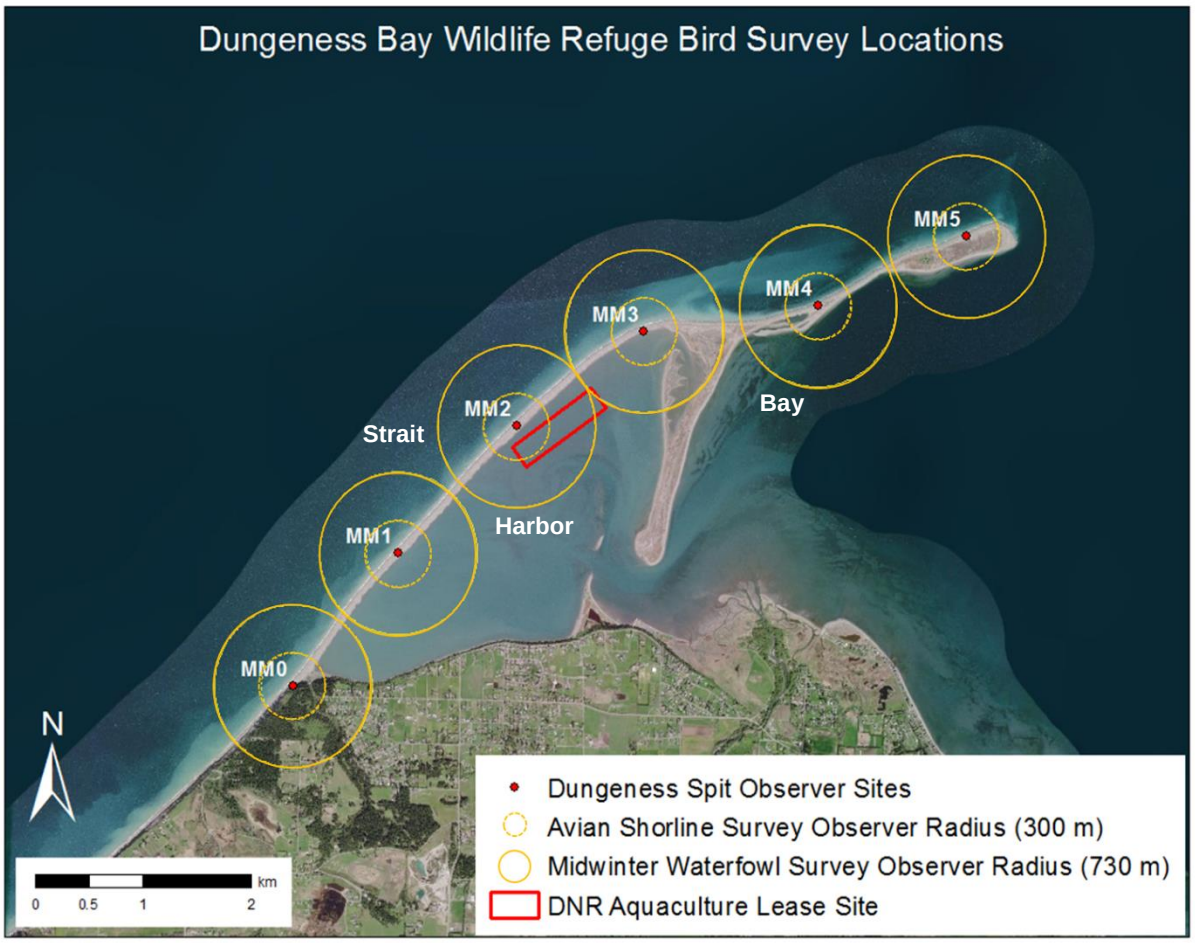

Figure 1. Map of observer locations and observation radius for the Avian Shoreline (2013 – 2015) and Midwinter Waterfowl (2014 – 2018) surveys.

Spatial patterns of bird use in Dungeness Bay.
Bird distributions were first identified for major subregions, as designated by USFWS, of Dungeness Bay: Harbor (inside Graveyard Spit), Bay (outside Graveyard Spit) and Strait (Table 1). The Legacy Data and Avian Shoreline surveys provide more comprehensive datasets that include counts of all bird species across several months of the year. The Midwinter Waterfowl data is limited to single-day wintertime observations of waterfowl only. The Legacy and Avian Shoreline datasets are therefore more directly comparable and show similar distribution patterns with the greatest proportion of birds (65-66%) within in the Harbor subregion (Table 1). Given the 14-year lapse between data collection periods, such distribution patterns may be reflect typical bird use in Dungeness Bay. The Midwinter Waterfowl dataset also supports that waterfowl use is highest (88%) in the Harbor during the winter (Table 1). However, this broad-scale distribution should be interpreted with caution as bird counts associated with each subregion were not standardized by unit area of observation (i.e., more area was observed in the Harbor subregion compared to the Bay).

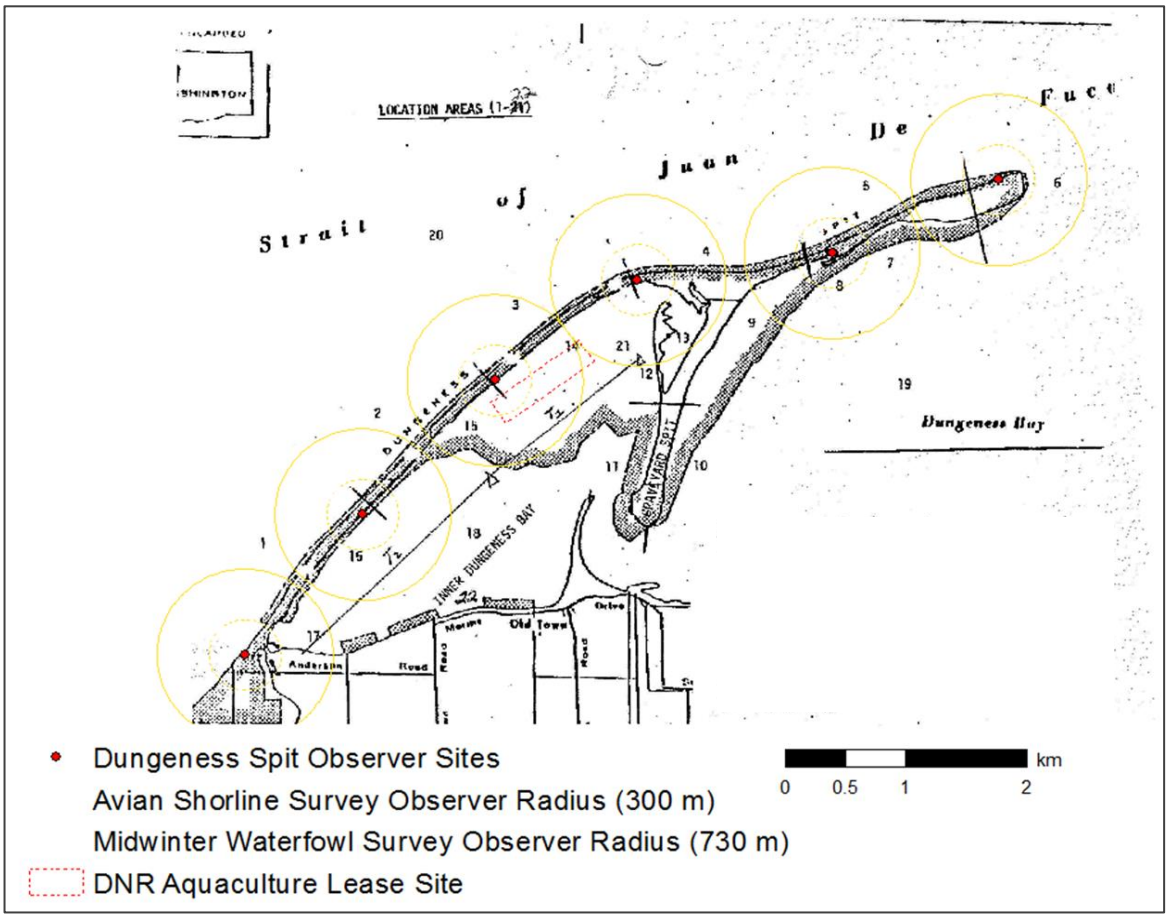

Figure 2. Georeferenced map of USFWS Legacy data (1994 – 1999) survey areas. The observer locations for the more recent Midwinter Waterfowl and Avian Shoreline surveys are shown for comparison as is the location of the oyster farm lease site.

Table 1. Bird distributions for subregions of Dungeness Bay

Survey	Harbor	Bay	Strait
Legacy Data (1994 – 1999)	65%	18%	17%
Avian Shoreline (2013 – 2015)	66%	16%	18%
Midwinter Waterfowl (2010 – 2018)	88%	10%	1%

For each dataset referenced in Table 1, bird distributions within the high use Harbor subregion were more closely examined and referenced in association with habitat type as documented by USFWS (Figure 3) and the oyster farm location. The more recent Avian Shoreline and Midwinter Waterfowl surveys show the greatest proportion (80-83%) of birds are observed from the mile marker 3 (MM3) observer location (Figure 4b & c, blue), which is associated with the

lagoon/saltmarsh area and intertidal mudflats adjacent to Graveyard Spit (see Figures 2 & 3). Examination of the Legacy Data further supports that the lagoon/saltmarsh area (survey areas #13, #12 & #21; Figure 2), has long been the highest bird use area, accounting for 57% of bird observation made within the Harbor subregion (Figure 4a, blue).

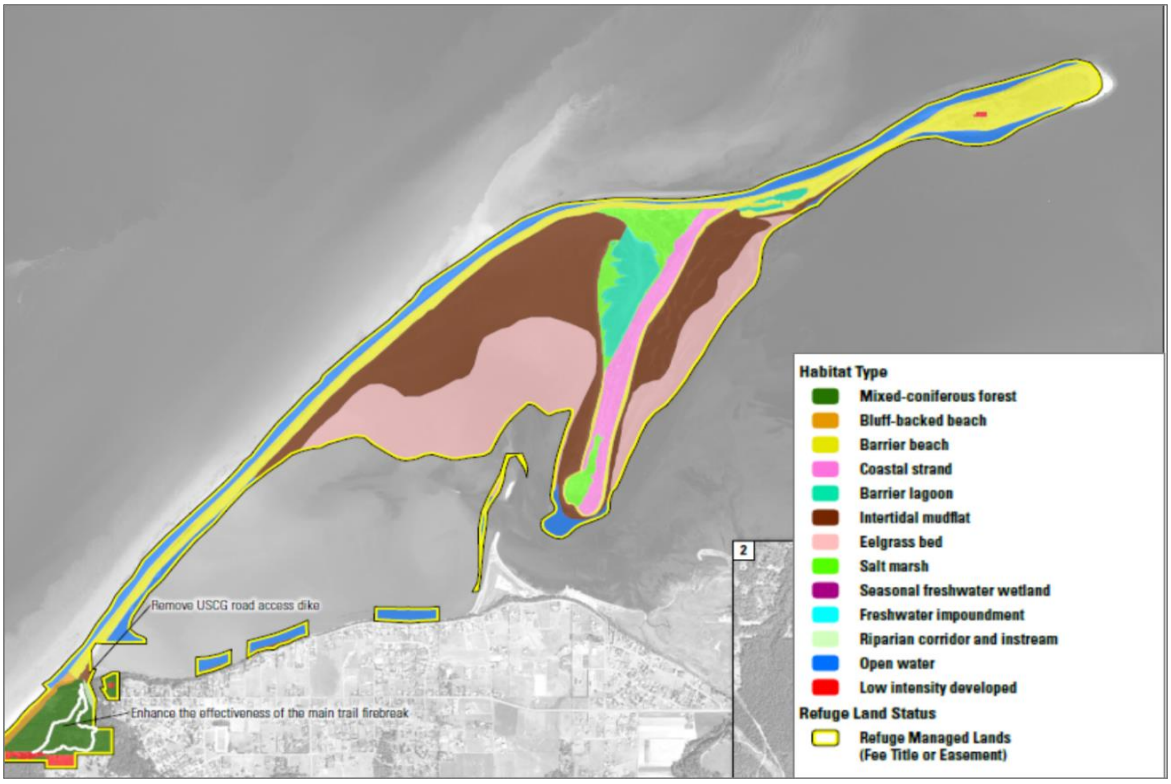

Figure 3. Habitat Type within the Dungeness National Wildlife Refuge. Source: USFWS 2015.

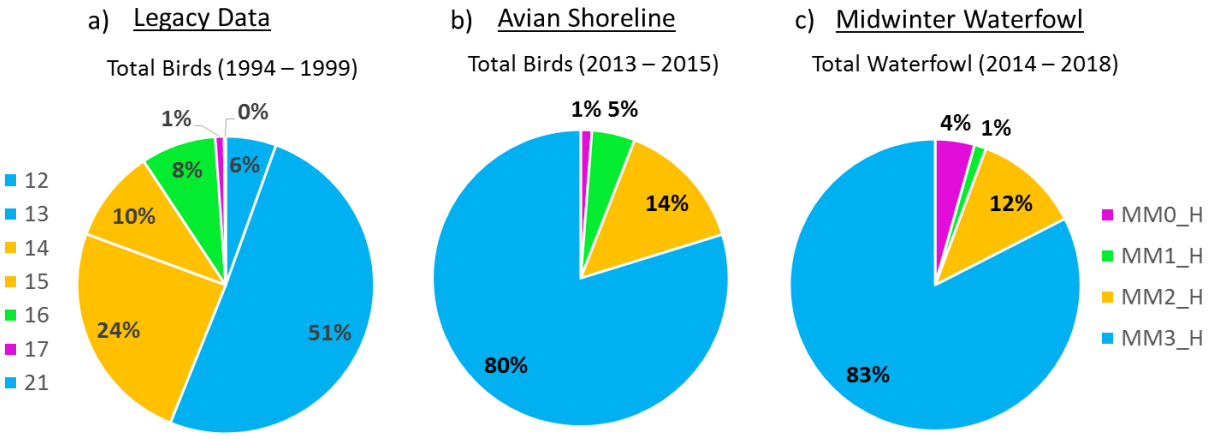

Figure 4. Proportion of birds counted in each survey area (Legacy Data) or mile marker "MM" observation location (Midwinter Waterfowl & Avian Shoreline Surveys) within the Harbor subregion of Dungeness Bay. Color coding shows which Legacy survey areas are associated with more recent MM observer locations.

The Legacy and the Avian Shoreline surveys were used to identify highest use areas by different categories of birds: ducks, geese, seabirds and shorebirds, within the harbor subregion (Figure 5). Distinct differences in bird distributions between past and more recent observations are identified. The historic Legacy data identifies a greater proportion of geese, shorebirds and seabirds utilized the intertidal mudflat area associated with the oyster farm site (survey areas #14 & #15; Figure 5: yellow bars) compared to more recent observations where highest bird use is associated with the lagoon/saltmarsh and mudflats near Graveyard Spit (MM3: Figure 5: blue bars) – this observation is particularly notable for geese which are primarily (≥ 95%) represented by Black Brant. While shifts in preferred use areas are identified for geese, shorebirds and seabirds, both past and recent surveys indicate that the lagoon/saltmarsh and mudflat area near Graveyard Spit is the preferred use site for ducks (Figure 5).

We would like to highlight that the Legacy data from the mid 1990's, which indicates that both shorebirds and geese were preferentially distributed within and directly adjacent to the oyster farm area, was collected when ~20 acres of pacific oyster cultivation was actively occurring at the lease site. In contrast, the more recent Avian Shoreline survey data, which shows greater shorebirds and geese counts in proximity to Graveyard Spit, represents a time period when no oyster farm activities were occurring. While it cannot be determined conclusively what drove this apparent shift in habitat use by shorebirds and geese over the two time periods, it cannot be ruled out that the presence of oyster cultivation enhanced bird use in that area of the Refuge. At the very least, this observation indicates that oyster cultivation activities did not deter or negatively impact shorebirds or geese near the farm site.

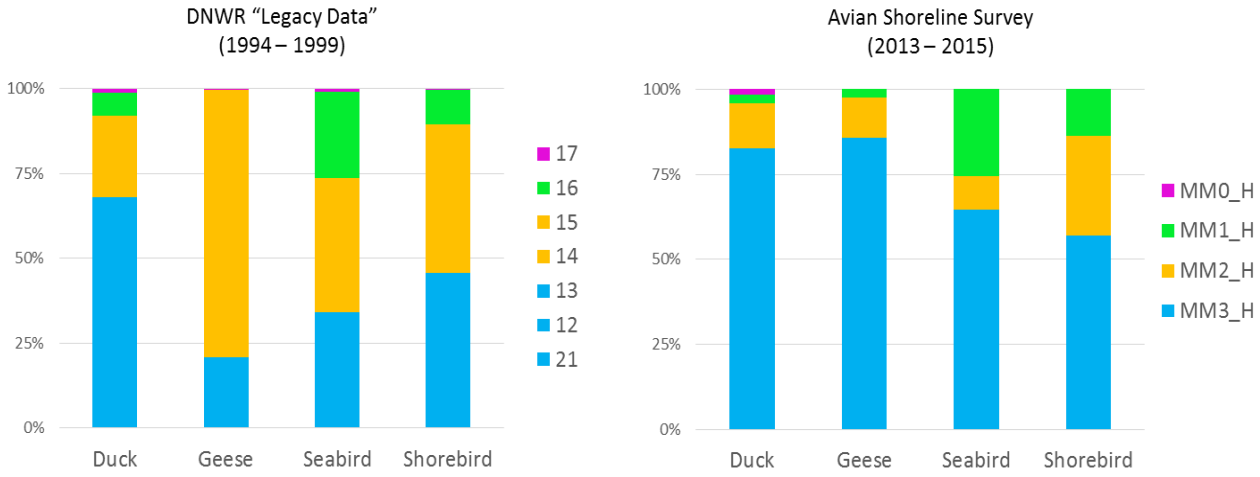

Figure 5. Preferential use areas by different categories of birds in Dungeness Harbor.

Table 2. Maximum daily bird count by season for each survey

	Spring (Mar - May)	Summer (Jun - Aug)	Fall (Sept - Nov)	Winter (Dec - Feb)
Legacy Data (1994 – 1999)				
Shorebirds	6510 (n = 42)	5088 (n = 33)	3637 (n = 40)	4390 (n = 30)
Brants	988	45	144	492
Avian Shoreline (2013 – 2015)				
Shorebirds	651 (n = 3)	505 (n = 1)	136 (n = 2)	210 (n = 4)
Brants	288	0	800	200
Midwinter Waterfowl (2010 – 2018)				
Shorebirds	NA	NA	NA	NA
Brants	--	--	--	2714 (n = 8)
Pacific Flyway Shorebird (2014 – 2017)				
Shorebirds	4762 (n = 15)	--	--	1364 (n = 5)
Brants	NA	NA	NA	NA

n = total number of observations made during that season.
"--" = no observations were made that season
"NA" = survey not applicable.

DNWR Bird Survey Data

Summary figures showing bird distribution patterns in relation to the Tribe's the oyster farm site.

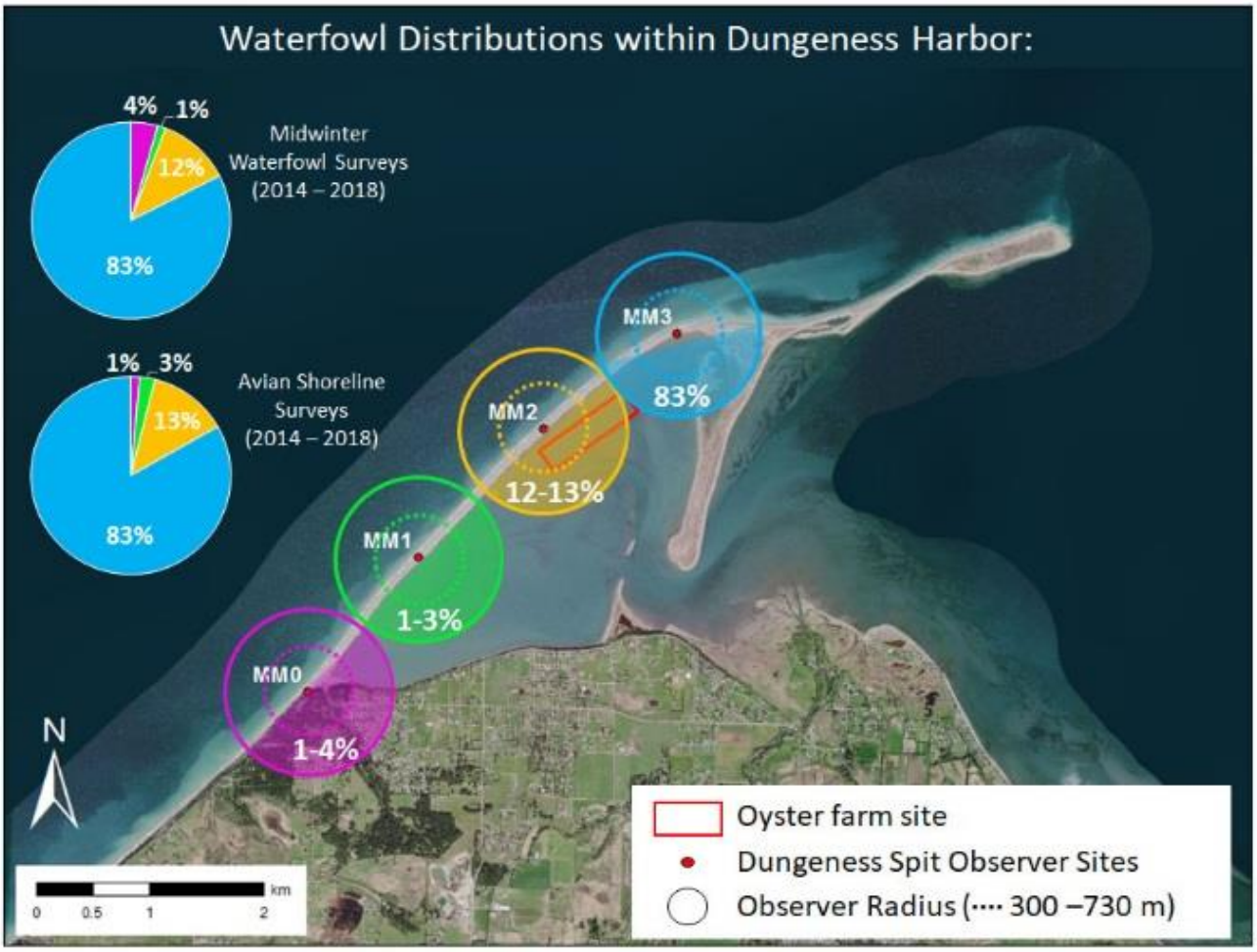

Figure 6: Waterfowl distributions within Dungeness Harbor. Waterfowl counts were made from four observed stations (MM0-MM3) along Dungeness spit over a distance of 300 m for the Avian Shoreline survey and an estimated 730 m for the Midwinter Waterfowl surveys.

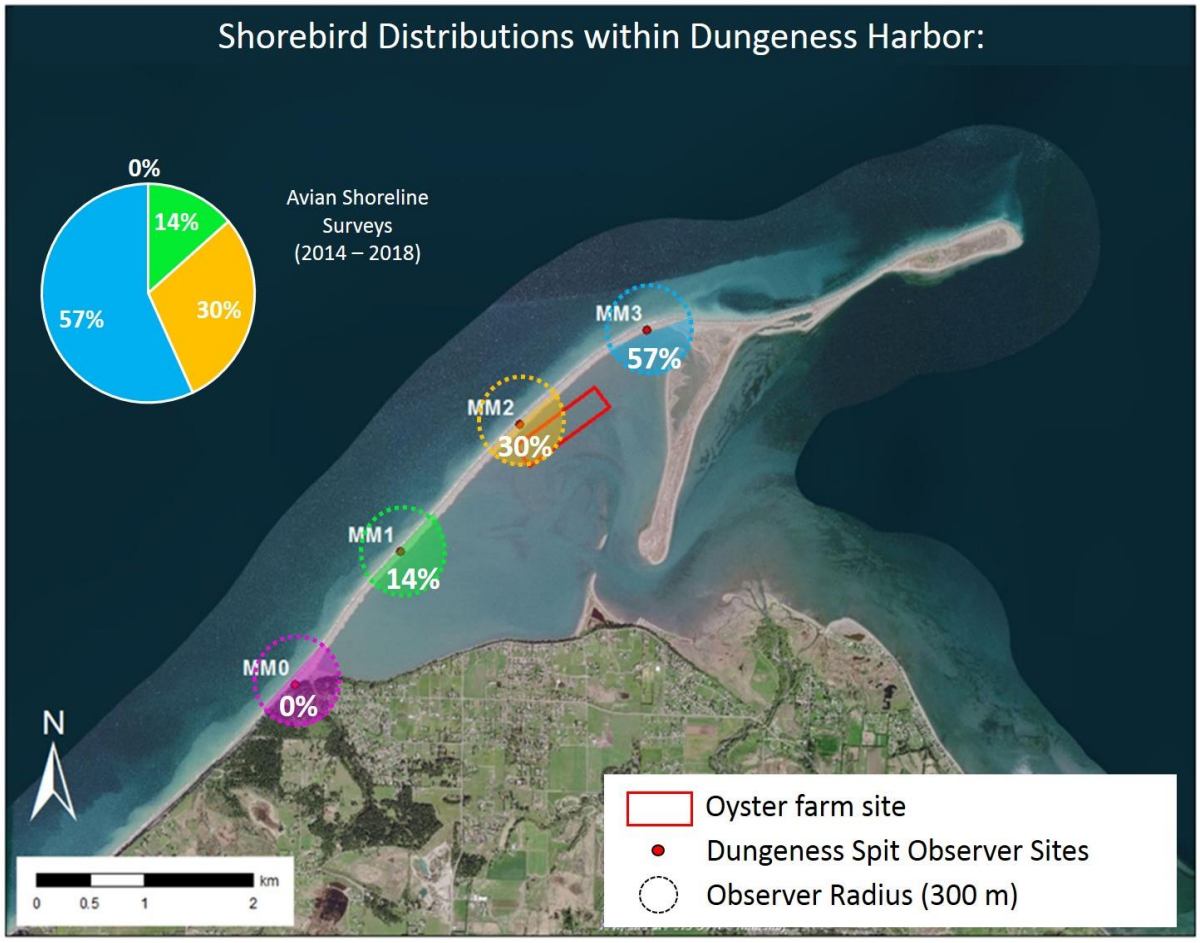

Figure 7: Shorebird distributions within Dungeness Harbor. Shorebird counts were made from four observed stations (MM0-MM3) along Dungeness spit over a distance of 300 m for the Avian Shoreline survey.

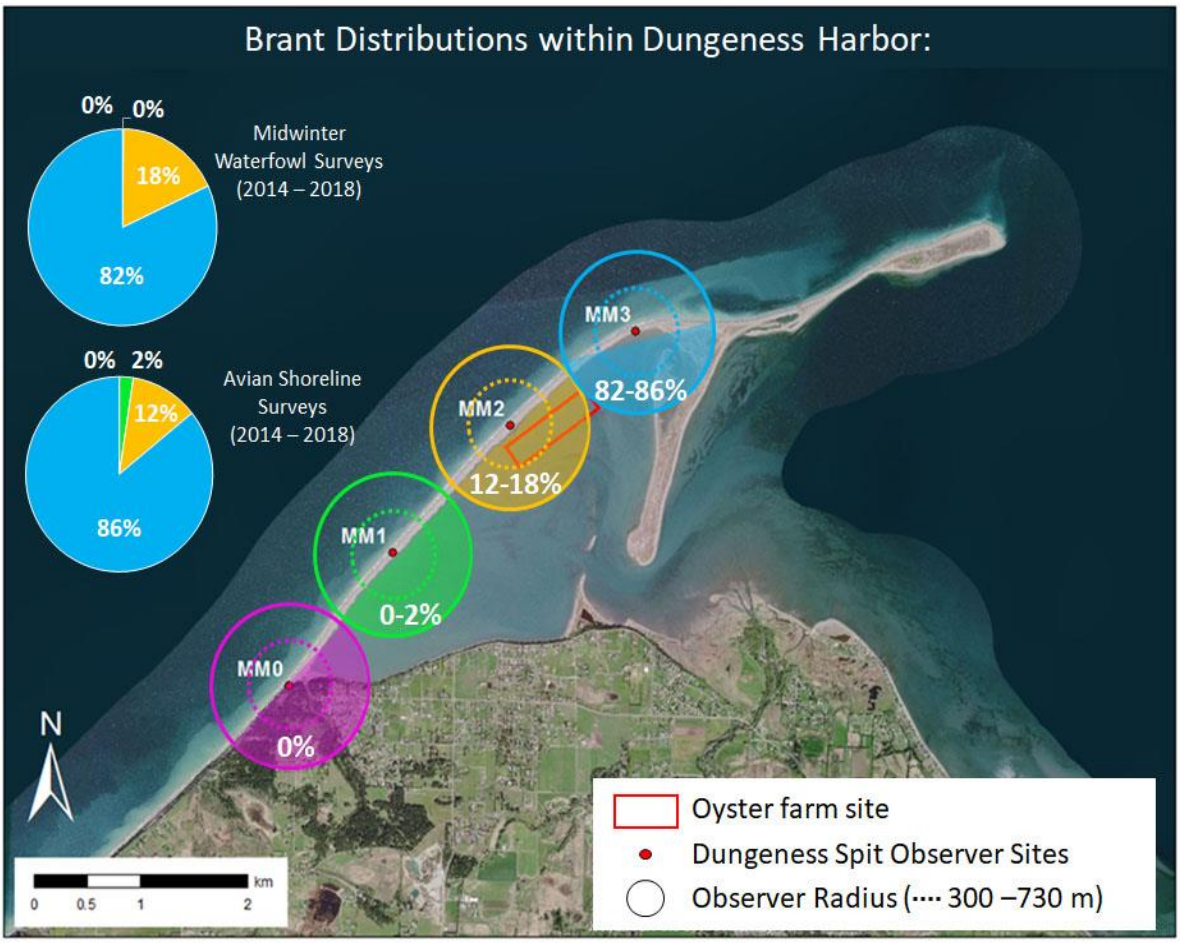

Figure 8: Brant distributions within Dungeness Harbor. Brant counts were made from four observed stations (MM0-MM3) along Dungeness spit over a distance of 300 m for the Avian Shoreline survey and an estimated 730 m for the Midwinter Waterfowl surveys.

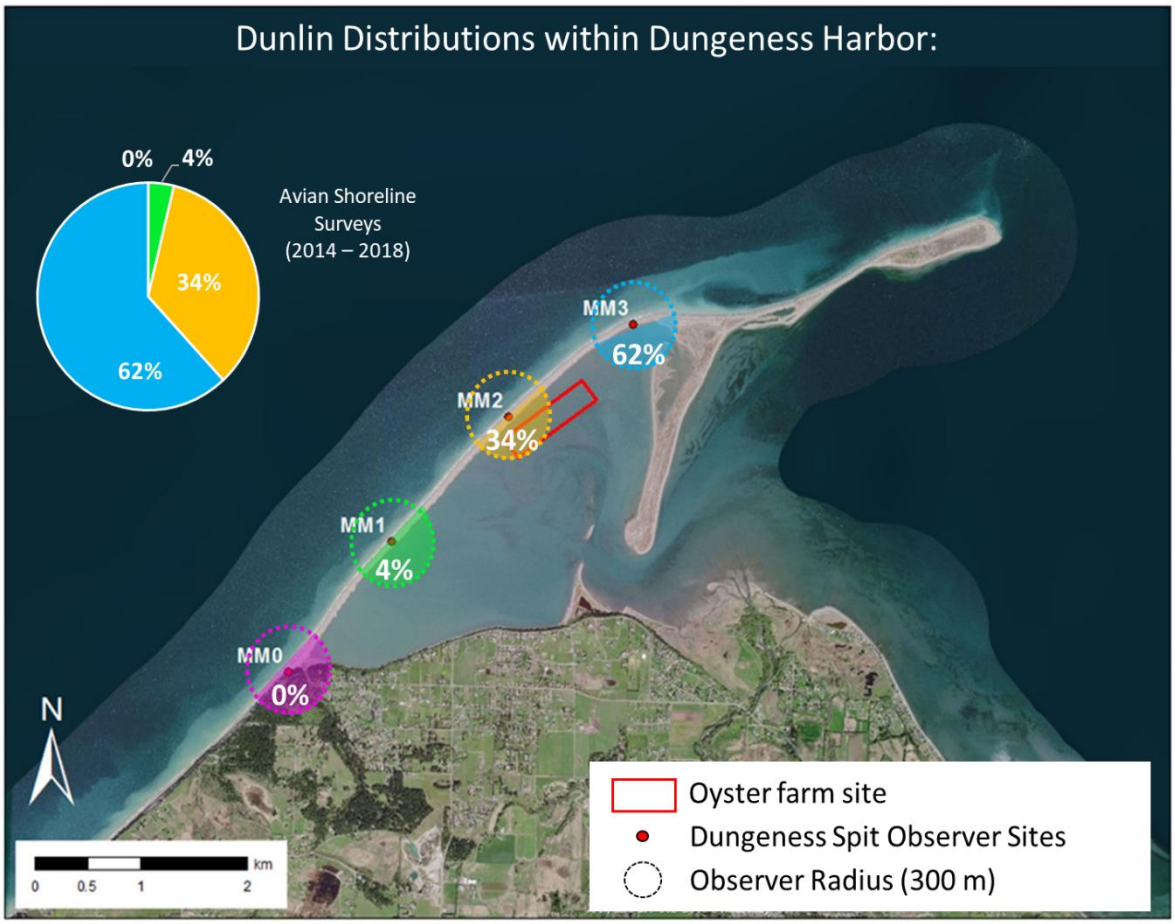

Figure 9: Dunlin distributions within Dungeness Harbor. Dunlin counts were made from four observed stations (MM0-MM3) along Dungeness spit over a distance of 300 m for the Avian Shoreline survey.