

DISTURBANCE MONITORING IN SMITH AND MINOR ISLANDS WASHINGTON
DEPARTMENT OF NATURAL RESOURCES AQUATIC RESERVE

FINAL MONITORING REPORT

Grant #: PC-00J29801-0: Ensuring regulatory effectiveness in
Puget Sound's most special places

Prepared for:

Smith and Minor Islands Aquatic Reserve Citizen Stewardship Committee

Washington Department of Natural Resources



Prepared by:

Robin Clark

Whidbey Watershed Stewards

And

Jerry Joyce

Washington Environmental Council

September 2014

PUBLICATION INFORMATION

This project has been funded wholly or in part by National Estuary Program (NEP) of the United States Environmental Protection Agency (EPA) under assistance agreement PC-00J29801-0 to Washington Department of Natural Resources (WDNR).

This report describes monitoring of human activities in the Smith and Minor Island Aquatic Reserve. However, the contents of this report do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Copies of this final project report will be available from the Washington State Department of Natural Resources at

http://www.dnr.wa.gov/ResearchScience/Topics/AquaticHabitats/Pages/aqr_rsve_aquatic_reserves_program.aspx and at the Aquatic Reserves website <http://www.aquaticreserves.org/resources/>

AUTHOR AND CONTACT INFORMATION

Robin Clark
Whidbey Watershed Stewards
P.O. Box 617
Langely, WA 98236
robin@whidbeywatersheds.org

Jerry Joyce
Washington Environmental Council
1402 Third Avenue
Seattle, WA 98101
206-440-8688
JerryJoyce@MoonJoyce.com

TABLE OF CONTENTS

Figures	iv
Tables	iv
Abstract	5
Introduction	5
The WDNR Aquatic Reserves Program	9
Study Goals and Objectives.....	9
Disturbance Studies	10
Sampling Design and Procedures	10
Sampling locations.....	11
Sampling frequency	12
Parameters to be determined.....	13
Training	13
Results	14
Disturbances	16
Discussion	17
Completeness of the Survey	19
Assessment of the feasibility of this study	19
Recommendations for any modification of the overall program	19
Conclusions	20
References	21
Appendix A: Data Field Card	23
Appendix B: Bird Disturbance Field Guide and ARW Protocol	26
Appendix C: Disturbance Description Table	29
Appendix D: Smith and Minor Island Brochure	35
Appendix E: Acknowledgments of Volunteers and Others	37

FIGURES

Figure 1: Details of the Smith and Minor Islands Aquatic Reserve	7
Figure 2: Aerial map showing the Smith and Minor Islands Aquatic Reserve area	8
Figure 3: Smith and Minor Island Aquatic Reserve beaches.	11

TABLES

Table 1: Number of visits per access site broken down by time blocks	12
Table 2: All visits broken down by time block	13
Table 3: Observations by Time of Day	15
Table 4: Bird Observations by Month	16
Table 5: The number of disturbance records and total birds per month of the survey.....	16
Table 6: Recorded Disturbance by Type and Number of Occurrences.....	17

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ABSTRACT

The Smith and Minor Islands Aquatic Reserve Citizen Committee instituted a project to monitor the human uses of the shores of the reserve and to describe the interactions people were having with wildlife for four months in the spring and summer of 2014. Volunteers monitored beaches for 30 minutes and recorded activities they observed on a field card and subsequently uploaded the data onto a Google doc. The monitoring is intended to provide a baseline for the types and amount of uses in and adjacent the reserve as well as describing the variety of disturbances to wildlife and to detect patterns. Acquired baseline information can be used for development of reserve management planning, future monitoring projects, and the protection of critical habitats and protected species.

Although the reserve offers much space and solitude, there is considerable use of the shoreline. There were 73 monitoring visits made during the study and 689 people were observed on the beaches of the reserve. An extrapolation of daily weekend and weekday usage yields estimate of 1,409 people visiting the reserve weekly during spring and summer. Use was most frequent during morning and midday and greater on weekends. Of these visitors, 15% were observed walking with dogs. Other popular uses of the shoreline included collecting seaweed, surfing, and recreational motorized boating. Aircraft are frequently seen from the nearby Naval Air Station and occasional small private planes and commercial boat traffic ere also observed. There were 37 recorded instances of bird disturbance behaviors from interactions associate with people walking with or without dogs, boaters, and aircraft. Dogs off-leash and aircraft produced the highest rates of observed disturbances. The largest marine bird occurrence in this area is in late winter and spring so this may be a critical period to do further monitoring and outreach to the public.

INTRODUCTION

The Smith and Minor Islands Aquatic Disturbance Survey was conducted from April–July 2014. As the proposed visitor use and wildlife disturbance project evolved to its final form, it was named the Aquatic Reserve Watch (ARW). This project was selected by the Smith and Minor Islands Aquatic Reserve Citizen Stewardship Committee (SMIARCSC) in partnerships with the Whidbey Watershed Stewards (WWS), the Washington Environmental Council (WEC), and in

association with the Washington Department of Natural Resources (WDNR) and Washington Department of Fish & Wildlife (WDFW). The intent of this study is to collect basic data that can be used to scope the nature and extent of human-disturbance effects on the wildlife of the reserve and to evaluate if management actions need to be developed. The monitoring protocol focuses on birds, as birds are predominantly viewable, and subject to disturbance by human use of the beach. Marine mammals were also included in the survey if they were observed. A Quality Assurance Project Plan (QAPP) was prepared as required by EPA and Washington Department of Ecology. This QAPP (Clark & Joyce, 2013) details the structure and functioning of this study and provides rationale, goals, objectives, and quality assurance measures for the study.

The Smith & Minor Islands Aquatic Reserve (SMIAR) was designated as a WDNR Aquatic Reserve in 2010. The management plan for the reserve was released in October 2010 (WDNR, 2010). The reserve encompasses approximately 36,308 acres of state-owned WDNR-managed tidelands and bedlands. The aquatic reserve is located in the Salish Sea with the boundary along the west coast of Whidbey Island, Washington from the northern boundary of Joseph Whidbey State Park to just south of the southern boundary of Fort Ebey State Park. Figure 1 shows the boundaries of the aquatic reserve in association to the geographic and manmade features and Figure 2 shows a regional view of the area.

Smith and Minor Islands Aquatic Reserve is designated as an Environmental and Scientific Reserve. One of the main reasons for the Environmental Reserve designation is to protect areas of bull kelp, especially since there has been a large reduction of bull kelp in the nearby Protection Island Aquatic Reserve. The bull kelp bed west of Smith Island is the largest bed in the state. The area also supports a large number of seabirds, including nesting colonies on Smith Island. Smith and Minor islands are part of the San Juan National Wildlife Refuge and the island land is managed under restricted use by US Fish & Wildlife with a 200-yard buffer around the islands. One of the primary reasons that the area is designated as a Scientific Reserve is because of the continuing monitoring and research being conducted near and on Smith and Minor Islands.

Most of the hydraulic processes, including intact drift cells and sediment transport and deposition, are functional and mostly undisturbed, except by some limited shoreline armoring. Numerous feeder bluffs are intact and sediment transport and deposition are functional. The area is strongly influenced by the confluence of waters from the Strait of Juan de Fuca, Admiralty Inlet, and Rosario Strait.



Figure 1: Details of the Smith and Minor Islands Aquatic Reserve (Source: WDNR, 2010)

The management plan identifies four main goals for the reserve:

Goal One: Preserve, restore, and enhance the functions and natural processes of aquatic nearshore and subtidal ecosystems of the aquatic reserve.

Goal Two: Identify, survey, and monitor sensitive habitats, species and natural processes and provide and support opportunities for scientific research.

Goal Three: Support and provide opportunities for outdoor education and interpretive studies.

Goal Four: Collaborate with other reserve management partners, programs, and management actions to ensure connectivity across the Aquatic Reserve Program.

This monitoring program was developed to address goals Two through Four.

The relative isolation of areas within the reserve provides substantial attraction and sanctuary to numerous bird and marine mammals, including several species that are threatened or

endangered. Several seabird and shorebird species have been identified as nesting adjacent to the reserve (on Smith Island) including: Glaucous-winged Gulls, Double-crested Cormorants, Pigeon Guillemots, Black Oystercatchers, Tufted Puffins, and Rhinoceros Auklets. Of the bird species observed within the aquatic reserve, the following are identified as threatened or endangered: Tufted Puffin, the Common Loon, Brandt's Cormorant, Bald Eagle, Peregrine Falcon, Great Blue Heron, Osprey, Common Murre, Western Grebe, and Marbled Murrelet. (WDNR, 2010).

Marine mammals known to use the reserve include harbor seal, elephant seal, Steller and California sea lions, Dall porpoise, harbor porpoise, killer whales (including members of the endangered southern resident population), grey whales, and minke whales.

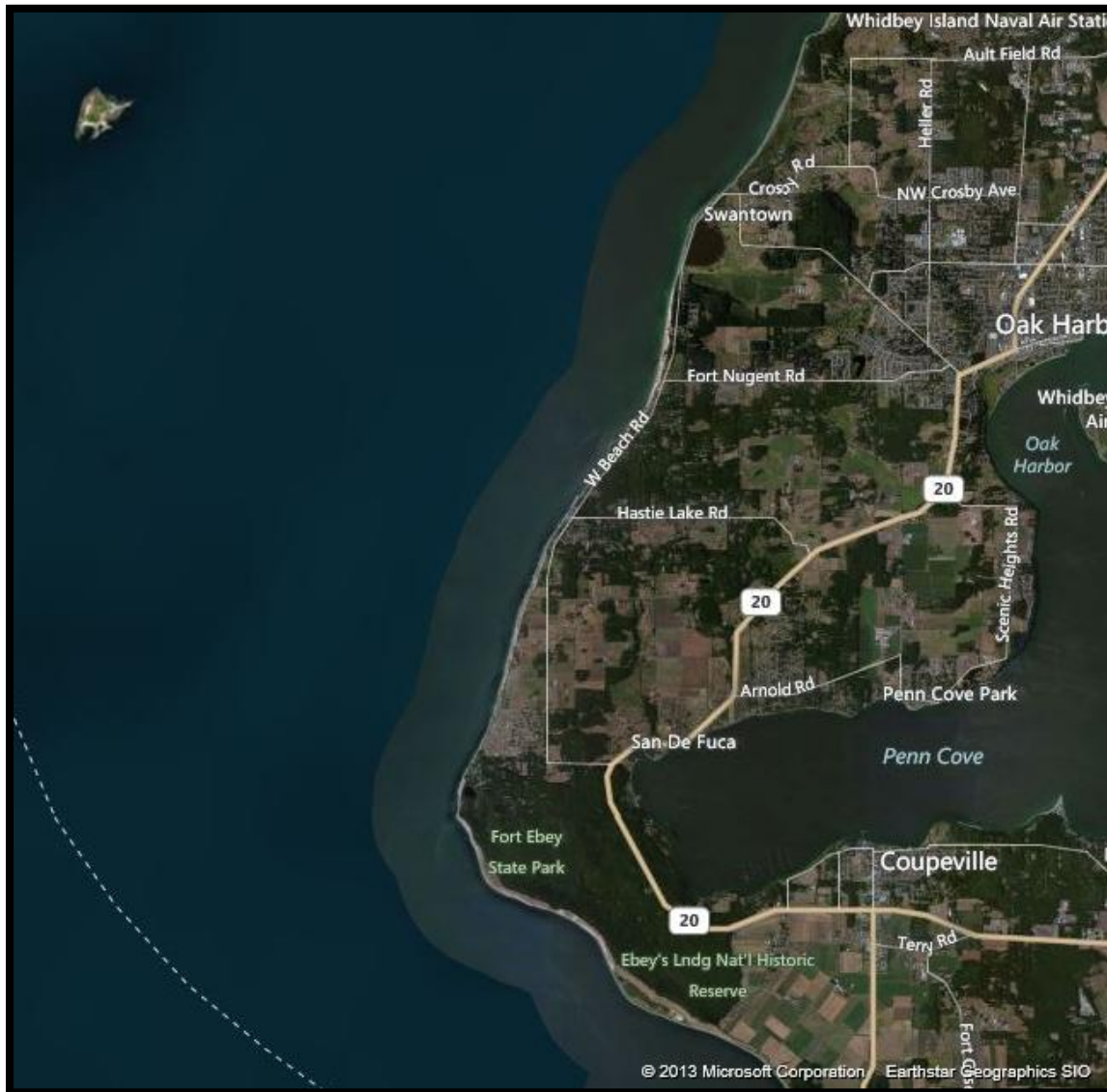


Figure 2: Aerial map showing the Smith and Minor Islands Aquatic Reserve and surrounding areas (Source: Bing maps)

THE WDNR AQUATIC RESERVES PROGRAM

The WDNR is steward of more than 2.6 million acres of aquatic lands. As steward, WDNR established aquatic reserves throughout Puget Sound to protect important native ecosystems. The Aquatic Reserves Program focus is to conserve high –quality native ecosystems in both freshwater and marine environments. It is an effort to promote the preservation, restoration, and enhancement of state-owned aquatic lands that are of special educational, scientific, or environmental interest.

The benefit of the Aquatic Reserve Program is the partnerships WDNR establishes to aid in development and implementation of site-specific aquatic reserve management plans. WDNR works with federal, state, local, tribal, non-governmental organizations, and private citizens in an effort to identify and manage important resources for conservation at each reserve. An additional benefit of Aquatic Reserve designations is that management plans can be designed to complement other protective measures within or adjacent to the site. Some of the anticipated benefits of these aquatic reserves include:

- Ensuring environmental protection through site-based preservation, restoration, and enhancement.
- Ensure the health of native marine and freshwater aquatic habitats, the fish, and the wildlife that depends on them.
- Encourage public use and access.

STUDY GOALS AND OBJECTIVES

This project is a citizen-science based study sampling anthropogenic activities that may impact birds and marine mammals in the aquatic reserve.

The project goals are:

- To create a baseline data set on human use and associated disturbance of wildlife in the aquatic reserve.
- To involve, educate, and train citizen scientists to monitor the human and wildlife activities and interactions.

The project objectives are:

- Train at least 12 citizen scientists to identify and monitor human and wildlife presence and any interactions between them.
- Record weekly observations of human activities, induced disturbances, and presence of at least ten bird species and common marine mammals at five or more sites, as described in the QAPP.
- Compile field data and analyze the data, as described in the QAPP.

- Distribute data or results to appropriate local and state agencies and the public, via website and conduct other outreach, such as presentations to community groups.
- Make recommendations to the public to avoid disturbance of wildlife.

DISTURBANCE STUDIES

In other regions, managers of beaches and shorelines tend to approach human-related disturbance through management actions—e.g. closing beaches or critical areas during breeding or migration periods. Others utilize enforcement actions by rangers or officers, while including public education and outreach. Human activity has been found to disturb wildlife in numerous scientific studies. For example, Burger (2004) monitored human activities and shorebirds responses in Delaware Bay, USA and found that birds flew away and did not return to forage in 58% of human disturbances. Verlando and Munilla (2011) found that an increase in boat traffic decreased the foraging activities of seabirds and that in areas of little or no boat activity, seabirds had greater aggregations. Bellefleur, et al (2009) found that out of the 7,500 interactions with Marbled Murrelets in British Columbia, Canada, 11.7% flew, 30.8% dove, and 58.1% exhibited no flushing reaction. Additionally, they found that reactions were affected by the distance between the birds and boats and the speed a boat was traveling.

While there are several studies on bird and mammal disturbances associated with human activities, the amount and type of human use was not documented for SMIAR and the types of interactions with wildlife populations were not known. The area is rural in character and use is periodic. There are seven access points to the beaches in the reserve, and use varies among these points. While there are numerous protective laws for the many of the species of concern (e.g. the Marine Mammal Protection Act, Migratory Bird Treaty Act, and the Endangered Species Act), in most cases the area is unmonitored and has no enforcement for these laws.

SAMPLING DESIGN AND PROCEDURES

A custom sampling design was developed due to the relatively remote physical nature of the area and the lack of comparable studies. The intent of this study was to document the types of human uses that were occurring on the reserve, the number of people using the reserve and their activities, and the disturbances the various uses caused to wildlife. The sampling design was not intended to provide a population census for bird species, but to give a sense of how many birds were seen and the type and quantity of disturbances that were observed. Some of the design is based on procedures that were used in other studies (i.e. Verlando and Munilla, 2011; Burger, 2004). Additional information on data collection, recording, and verification are provided in the QAPP (Clark & Joyce, 2013).

SAMPLING LOCATIONS

Sampling locations were on beaches adjacent to the reserve, located near the public access points. All observation locations were above the intertidal zone, and the area observed included the area of sight from the access point, extending to boats within the easily observable offshore waters. Figure 3 shows the seven access points to the Aquatic Reserve. Of the seven access points, two were deemed less important to monitor: Ebey's Bluff that has a high bluff inhibiting access to the beach and Libby Beach that has a rocky substrate and narrow beach access limiting use of the beach. Much of the use at Libby Beach is limited to people viewing the beach from their cars or on the viewing platform. We did not attempt to quantify this use.



Figure 3: Smith and Minor Island Aquatic Reserve Beaches.

SAMPLING FREQUENCY

Each sampling visit was at least 30 minutes in duration. Sampling visits were on both weekdays and weekends, and distributed throughout the day from 8 am-6 pm. There were approximately 12 weeks of sampling, with an effort to include at least one weekday and one weekend day throughout the sampling period, although there was variation due to volunteer availability. The number of visits to each access point and the time of day is documented in Table 1.

In all, 73 sampling periods were made during the period of the monitoring project from April 4th through July 30 2014.

Table 1: Number of visits per access site broken down by time blocks

Site	Time of day	Visits per time of day
1 Ebey's Landing	8-12AM	6
	12-3PM	5
	3-6PM	2
total visits		13
2 Fort Ebey Bluff	3-6PM	2
	total visits	2
3 Fort Ebey	8-12AM	6
	3-6PM	5
	total visits	11
4 Libby Beach	8-12AM	2
	total visits	2
5 Hastie Lake	8-12AM	3
	12-3PM	9
	3-6PM	4
	total visits	16
6 West Beach	8-12AM	4
	12-3PM	4
	3-6PM	2
	total visits	10
7 Joseph Whidbey	8-12AM	11
	12-3PM	4
	3-6PM	4
	total visits	19
Grand Total		73

The distribution of sampling throughout the day was also intended to cover all time periods but with some variation. In Table 2, the number of samples is shown by time of day. This effort depended on the schedules of the volunteers, and overall there was a preference for monitoring in the morning hours, especially when compared to the later evening hours. The survey was also intended to spread effort out over both weekend and holiday days, and of the 73 visits, 24 of them occurred during the weekend while the remaining 49 visits took place during weekdays.

Table 2: All visits broken down by time block

Time of day	Total visits per time of day
8-12AM	32
12-3PM	22
3-6PM	19

PARAMETERS TO BE DETERMINED

The parameters that were included are the following:

- The number of humans, dogs on leash, dogs off leash
- Description of other activities not specifically called out on the field card
- The classification of boat types (motor powered, under sail, or hand powered). Visual estimates of the boundary of the reserve were necessary to include only vessels that were in the reserve. This tended to be defined by excluding the shipping lanes that were frequented by large container and cruise ships.
- Time of, duration, and cause of disturbances
- Type of behavioral response by wildlife
- Species and number of birds in area
- Wildlife interactions, such as shorebird reaction to the presence of bald eagles

All data were recorded on the field data cards by volunteers. The data from the field card were then entered into a Google docs spreadsheet for development of summary analysis. The field cards were then mailed in for archiving.

The field guide and protocol for making and recording observations along with the field card are shown in Appendix A and B.

TRAINING

WWS conducted two training sessions and consulted with WDNR and WEC during development of the project planning. The two training events occurred on April 9th and 13th. Overall 13 people were trained and performed monitoring (Wendy Visconty, Emma Ruggiero, Steve Ellis,

Jenny Brown, Bob Gentz, Lee Chavez, Kelly Keith, Gary Rassner-Donovan, Maddie Rose, Marilyn Thomas, Ginger Reed, Sandy Shipley, and Joanne McMillen).

Training included familiarization with the protocol, identification of ten important nearshore bird species, types of disturbance behaviors (flight, foot waging, diving, and other signs of agitation), identification of commonly occurring marine mammals, details on recording data, and safety considerations. Steve Ellis, a local bird expert, prepared handouts and provided training on bird identification and disturbance behaviors.

All participants were given training packets to use in the field that included a set of Smith and Minor Island Aquatic Reserve brochures to distribute when interactions with the public occurred, a set of data sheets, a map describing the locations, and a description of the protocol. The brochures are shown in Appendix D. The contents of the packet were also available on two websites: Aquaticreserves.org and Whidbeywatersheds.org to allow volunteers electronic access to the information and to be able to print out new data sheets as needed.

RESULTS

Overall, there were 2,630 minutes of observation, and 698 people were observed using the beaches of the Aquatic Reserve during the period from April-July. In addition, 67 boats (motorized and hand-powered) were observed in the waters of the reserve.

To arrive at some estimates of human use on the beach, we can break down the weekend vs weekday use for this period to derive an observed rate:

weekday beach use rate– 1,750 observation minutes, 417 people = .2383 people/min

weekend beach use rate – 880 observation minutes, 281 people = .3193 people/min

Using the observation period of 8AM-6PM for a typical daily use, this would yield 10 hours or 600 minutes of use per day. Over this period of four months, there were 122 weekdays and 34 weekend days, so the total expected use would be:

estimated weekday beach use - .2383 people/min x 600 mins x 122 weekdays= 17,442 people

estimated weekend beach use - .3193people/min x 600 mins x 34 days = 6,514 people

Therefore, there would be 23,956 total people visiting the reserve over these 4 months. Assuming a relatively even amount of visitation, since the survey covered both summer and spring months, an average weekly visitation rate would be 1,409 people per week along the Aquatic Reserve beaches.

It is also useful to note that when we group the observations by time of day, and look at both weekend and weekday usage, there is a higher number of people visiting the beaches during the middle of the day as shown in Table 3.

Table 3: Observations by Time of Day

Time of day	Observation minutes	Number of people	People per minute	People per time block
8-12AM	1180	291	.2466	592
12-3PM	698	233	.3338	601
3-6PM	752	174	.2314	417

The types of usage of the beach along the reserve was recorded, and of the 698 people observed, there were also 101 dogs observed; 61 dogs on leash and 40 dogs observed walking off leash. This means that 40% of the dogs taken on walks during our surveys were off-leash in the reserve. However, assuming a single dog per person, about 15% of the usage was by people walking dogs, so the vast majority of people were walking without dogs. This is probably a slightly low estimate, since it's not possible to assign groups of people (such as a family) who were with a pet, but it does give a sense of the proportion of usage by people simply walking on the beach.

Other activities noted on the beaches of the reserve included: swimming, making fires, throwing sticks or skipping rocks, trash pickup, collecting seaweed, dumping yard waste, and surfing. Surfing occurs mostly at the Hastie Lake access point. It isn't possible to estimate surfing use for the whole reserve from this location, but it is notable there. Also, seaweed collecting did not appear very significant in our data, but we noted substantial activity at the Fort Ebey access in particular. The activity (harvest quantity, effort or conformity to regulation) wasn't quantified or described in detail, but should be further investigated to determine the impact on the reserve.

Boats and aircraft are often observed along the reserve. There were 64 motored boats in our observations and just four hand-powered boats. The low number of hand-powered boats is likely indicative of the high energy environment of the west side of Whidbey. There were also 12 aircraft, two civilian fixed-wing and 10 military aircraft of various types. Disturbances to birds were recorded in four of the aircraft instances and in one of the boating encounters close to shore. Distance seems to be the important factor in these disturbances. The closer to shore the air or water craft was, and in the case of aircraft, the closer to the surface of the water, the more likely it was to cause disturbance behaviors.

The number of birds encountered is a reflection of the time of year. Typically Whidbey Island is home to many overwintering ducks and shorebirds and some populations of migratory birds in spring. As the spring wears on, there tends to be fewer waterfowl and this is reflected in the data. For non-resident birds, this is fortunate since human usage of the beach picks up during warm weather. Table 4 shows the number of birds by species without accounting for effort and

the numbers seem typical. We would therefore expect disturbances to reduce as summer proceeds.

Table 4: Bird Observations by Month

Date of observation	Harlequin Duck	Long-tailed Duck	Buff-headed	Common Loon	Horned Grebe	Double-crested Cormorant	Black Oystercatcher	Sanderling	Glaucous-winged Gull	Pigeon Guillemot	Ducks	Raptors	Shorebirds	Gulls	Loons	Cormorants	Geese	Unknown	Grand Total
APRIL	15	6	65	22	50	18	33	44	152	73	168	4	115	90	8	17	20	259	1159
MAY	4	0	7	6	14	9	28	0	80	20	298	1	13	132	2	27	0	24	665
JUNE	4	8	30	28	38	15	36	0	67	57	154	8	5	136	1	15	2	0	604
JULY	6	0	0	1	5	1	0	0	17	1	15	3	0	4	0	6	0	0	59
TOTALS	29	14	102	57	107	43	97	44	316	151	635	16	133	362	11	65	22	283	2487

DISTURBANCES

The goal of the survey was to describe the types of disturbances being seen on the beach and to give managers a snapshot of the use of the reserve shoreline and the types of disturbances to wildlife that were occurring. The number of disturbance events during each month may reflect a decreasing number of birds present in the nearshore, and Table 5 compares the observed bird population with the number of disturbances recorded, and the number of people. While the survey did not go through the entire summer, it's well known that the population of users increases during the summer as the population on the island increases, and the estimates of use take into account the level of observation effort. The numbers below in Table 5 represent only the observed number of people.

Table 5: The number of disturbance records and total birds per month of the survey

Month	Number of disturbances recorded	Number of birds recorded	Number of people on beach
April	22	1159	126
May	6	665	300
June	7	604	127
July	2	59	145

One of the goals of this survey is to describe the types of disturbances to marine wildlife that could be observed. Over the 73 surveys, there were 37 occurrences of observable disturbances to birds by humans, and none to marine mammals that could be seen. These bird behaviors included diving, flying, foot waging (loons), and running. The severity of the responses was described by the whether the bird returned to previous behavior quickly (less than 10 minutes) or if the reaction was longer in duration, and how direct the interaction was. The descriptions of all the disturbances recorded are found in Appendix C. There were also seven records of birds being disturbed by Bald Eagles. The number of disturbance behaviors recorded and the number of observations of those activities are summarized in Table 6.

Table 6: Recorded Disturbance by Type and Number of Occurrences

	Number of Disturbances Recorded	Number of Occurrences Recorded	Percentage of Disturbances
Aircraft	4	12	33%
Walkers	12	597	2%
Dogs on leash with walker	4	61	7%
Dogs off leash with walker	6	40	15%
Boats	11	68	16%

DISCUSSION

This study was land-based which is good for monitoring human activities and is adequate to observe the boating activity near shore. However, it is recognized that not all wildlife responses in the water can be observed. The size of the reserve is also challenging for both adequate observations over the water and for distinguishing the exact boundaries of the reserve.

Volunteers generally used their ability to see along the beach and out to sea, recognizing the shipping lanes are beyond the boundaries of the reserve, but important areas near and beyond Smith and Minor Islands could not be included in this study.

We started the study with the assumption that the main usage of the reserve would include dogs on the beach (on or off leash), human activity on the beach (including walking and playing), airplane traffic, and boat activity. People also engaged in seaweed harvesting, and surfing, and these activities were included in the notes sections of the field card. We did not note enough of these activities to form an impression of their impacts, but these activities could be looked at more closely.

We allowed space for volunteers to describe any wildlife they observed, and there were also seven instances of Bald Eagles disturbing other birds in the reserve. The significance of this finding is not known, as we did not intend to measure impacts of Bald Eagles. Bald Eagle interactions with bird populations have been shown to have a detrimental effect on common murre (Parrish et al, 2001), so it is possible that these observed disturbances and an increase in Bald Eagle populations might also have some effect on our local seabird populations.

By far the most common use of the beach was for walking without a pet. Despite a perception that there are many dogs on the beach, at least in this aquatic reserve, the use is a small percentage overall. Of the dogs on the beach however, approximately 40% of them were off-leash. We found that dogs were also about twice as likely to cause a reaction from wildlife when they were off-leash. Other beaches on Whidbey, such as Double Bluff County Park, are designated for off-leash dog walking. This area is heavily used by dog-walkers and more defined areas for this activity in or near the SMIAR, combined with outreach, may be helpful to avoid conflicts in sensitive areas.

The higher concentration of bird species that are part of the winter marine bird assemblages (Bower, 2009) may make winter and early spring more important times for outreach to visitors, and dog owners in particular. It is fortunate that the higher use months are also times with fewer birds, but the late winter and spring may be critical times for birds to use the beaches and nearshore areas for resting and feeding. Also, visitation was highest during the morning and middle of the day. Outreach efforts should focus on the morning through mid afternoon to capture the greatest number of people.

While all activities caused some disturbances, the proximity of the activity appears to be the crucial factor in whether a bird reacted to the presence of people on the beach or in boats and planes. Aircraft were most likely to cause disturbance, but these were of short duration and birds quickly return to pre-disturbance behavior once the airplane had passed. Boats distant from birds also did not cause disturbances and, if they quickly pass, so did the disturbance

behavior. There was not an observable absolute distance that seems to be protective of birds, but flocks using nearshore waters could be further protected by buffer distances.

COMPLETENESS OF THE SURVEY

The target for completeness in this study is to collect beach data for 80% of the planned weekly sampling events. We collected samples in each week, except one, for a total of 95% complete. We exceeded the expectation of one sampling effort per week for most of the weeks. We collected both weekend and weekday data, but the level of effort over weekends were uneven and there were no sampling efforts over seven of the weekends during the study. We did not have goals for disturbance effort across the access points and, of the seven access points, we sampled five consistently. The two access points we sampled twice were Libby Beach and Fort Ebey. The Libby Beach access point seems to be most often used by people that remain in their cars and the access at the Fort Ebey's Bluff is high above the beach and people very rarely get down to the shoreline.

There is an interest in understanding the use of the reserve around Smith and Minor Islands. The kelp bed there is of Statewide significance, and it is not possible to observe uses there from the shore of Whidbey. The Refuge also has a 200-yard limit for usage around the islands, and it is not possible to estimate the compliance with this regulation from the beach or from other vantage points on West Whidbey.

ASSESSMENT OF THE FEASIBILITY OF THIS STUDY

This study was an excellent first attempt to describe the activities and quantity of usage on the beaches of the reserve. We know of no dataset for the whole reserve, although the Nature Conservancy does regular usage counts at Ebey's Landing. The flexible nature of the study meant that it was easy for motivated volunteers to do the survey and the type of data that was being collected was appropriate for the volunteer corps. It would be possible to implement a more structured study at fixed times of day, but it would take a larger volunteer pool and more coordination which was not ideal for this effort.

RECOMMENDATIONS FOR ANY MODIFICATION OF THE OVERALL PROGRAM

If ongoing monitoring of visitation is desired, it would be good to implement a structured visitor use monitoring program. This survey was meant to capture both interactions and types of usage and was intended to survey current uses and the effects to gauge if there were unknown problems occurring. The use information was collected over four months, but since there is a large variation throughout the year, additional monitoring through other months would give a better overall estimate of annual use. Establishing larger monitoring times, and filtering the

reserve by site would also add to the precision of the data. Targeting monitoring in winter and early spring when the bird populations are higher might also yield important information.

Specific areas to further investigate might be to implement programs to interact with users such as dog walkers, or seaweed harvesters. Working with WDFW, State Parks, The Nature Conservancy, and the National Park Service to implement programs in a coordinated way to further understand resource uses would make these studies more robust and connected to other efforts.

CONCLUSIONS

It is our hope that this study provides estimates of recreational usage along the reserve, illuminates the types of uses and impacts for managers of the WDNR Aquatic Reserve Program who are based far from the reserve itself. Further understanding the impacts of kelp harvesting activities and outreach to affected user groups is the primary finding for further study, but more work to understand the timing and impacts of disturbances to birdlife given the falling populations and impacts of climate change may be important for the survival of birds visiting the shorelines of the reserve. Further interest in the area around Smith and Minor Islands would entail a boat-based survey or an effort to include monitoring from the islands themselves, and further exploration of the need for this type of monitoring with realistic goals for citizen groups should be pursued.

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APPENDIX A: DATA FIELD CARD

Disturbance 1, describe briefly

Time

Duration

Behavior type

Evaluate Severity of Response, Circle
1 or 2

Evaluate Your Confidence, Circle
1, 2 or 3

Disturbance 2, describe briefly

Time

Duration

Behavior type

Evaluate Severity of Response, Circle
1 or 2

Evaluate Your Confidence, Circle
1, 2 or 3

Disturbance 3, describe briefly

Time

Duration

Behavior type

Evaluate Severity of Response, Circle
1 or 2

Evaluate Your Confidence, Circle
1, 2 or 3

Disturbance 4, describe briefly

Time

Duration

Behavior type

Evaluate Severity of Response, Circle
1 or 2

Evaluate Your Confidence, Circle
1, 2 or 3

Birds (#):

Unknown_____

Harlequin Duck_____

Long-tailed Duck_____

Bufflehead_____

Common Loon_____

Horned Grebe_____

Double-crested Cormorant_____

Black Oystercatcher_____

Sanderling_____

Glaucous-winged Gull_____

Pigeon Guillemot_____

Group (sea birds, gulls, raptors)_____

Describe any wildlife interactions

Smith and Minor Island
Use and Disturbance Protocol

Notes:

Site: _____

Date: _____

Observer: _____

Observer e-mail: _____

Observer phone: _____

Time arrive: _____ Time depart: _____

Weather: _____

Visibility: _____

Tidal elevation _____

Number Humans _____

Number Dogs on Leash _____

Number Dogs off Leash _____

Number Boaters, motored _____

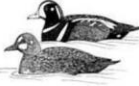

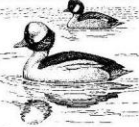


Number Boaters, under sail _____






Number Boaters, hand-powered _____

APPENDIX B: BIRD DISTURBANCE FIELD GUIDE AND ARW PROTOCOL

SMITH & MINOR ISLAND AQUATIC RESERVE

Bird Disturbance ID Basics

<p>HARLEQUIN DUCK: 15-18". Often close to shore. Males: Dark grayish-blue body with chestnut sides. Head: white stripes and spot, along with chestnut stripe. Females: Overall brown, with three white facial marks.</p>	
<p>LONG-TAILED DUCK: 16-21". Slim appearance. Males: White head; cheek grayish. Back brown and white. White upper breast; lower breast blackish. Long tail feathers. White body. Females: White face; dark brown top of head. Breast and body light brown.</p>	
<p>BUFFLEHEAD: 13-15". Small; chunky appearance. Males: Blackish head with white wedge on back and sides of face. Body dark above, white below. Females: Overall dark above and white below. Elongated white patch on face.</p>	
<p>COMMON LOON: 28-35". Usually alone or in pairs. Often rides low in water. Genders alike. Heavy bill. Non-breeding: Dark above, light below. White "notch" along neck. Breeding: Dark greenish head and collar. Dark above with white spotting on back.</p>	
<p>HORNED GREBE: 12-15". Alone or in groups. Genders alike. Non-breeding: Dark crown, nape and upper parts; light below. Breeding: Black cheek and forehead; gold ear tufts; rufous on neck and flanks.</p>	

<p>DOUBLE-CRESTED CORMORANT: 26-32". Flocks may fly in loose formation. Long-necked. Genders alike. Overall blackish; yellowish throat patch.</p>	
<p>BLACK OYSTERCATCHER: 16-18". In flocks, usually on rocky shore. Genders alike. Brownish-black body; long, straight, blood-red bill, red eye ring. Repeated flight call, "Wheep wheep wheep."</p>	
<p>SANDERLING: 7-8". In groups, following and retreating from waves on sandy shores. Genders alike. Black bill. Non-breeding: Pale gray above; white below. Breeding: Rusty orange head. In Flight: Gray upper wing with dark edges and white stripe. Underwing white with gray edges.</p>	
<p>GLAUCOUS-WINGED GULL: 24-27" Large, heavy-set, big-billed. Genders alike. Non-breeding adult: Dingy head, neck, and upper breast. Breeding adult: Head and neck white. All plumages: adults have grayish wings, yellow bills, pink legs. Hybrids have varying black on wingtips.</p>	
<p>PIGEON GUILLEMOT: 13-14". Very active during courtship; often far offshore in winter. Genders alike. Non-breeding: White head, neck, and underparts. Mottled gray and white crown and back. Breeding: Overall black with large white wing patch.</p>	

Steve Ellis, Whidbey Audubon Society, April 2014

AQUATIC RESERVE WATCH

FIELD GUIDE AND PROTOCOL

The goal of the Aquatic Reserve Watch monitoring program is to assess the human usage of the Smith and Minor Island Aquatic Reserve, and to record disturbances and the presence of birds and marine mammals when they occur. Volunteers will be trained to observe and collect unbiased data on coastal marine resources which will provide important information to understand how people are using the newly established Aquatic Reserves, and to help inform the management of the Aquatic Reserve by the Washington Dept. of Natural Resources (WDNR). Training will begin in September of 2013. The protocol and data storage are expected to be adjusted as needed throughout the first summer of implementation.

The Smith and Minor Island Aquatic Reserve was created by the WDNR in 2010. The Citizen Stewardship Committee is implementing several of the goals of the plan, and monitoring of use and effects is one of the main gaps in information for the reserve. Aquatic Reserve Watch volunteers are observing and recording both consumptive and non-consumptive offshore and onshore activities in the Reserve, which will provide important information to understand how people are using these newly protected areas. Examples of activities volunteers record include consumptive activities such as commercial fishing by boat or shore fishing, and non-consumptive activities such as swimming, dog walking or wildlife watching.

Aquatic Reserve Watch volunteers are out observing and recording beach and ocean activities they see taking place from a stationary location. Volunteers will be trained to identify 10 important bird species, and will report bird and mammal sightings to their best ability. This data will help with interpretation of biological data being taken by other groups, and may augment population studies.

Survey the site once a week for 30-60 minutes.

- Begin the survey at least once each month between 9 a.m. and noon, once between noon and 3 p.m. and once between 3 p.m. and 6 p.m. In the summer you may want to do a survey in the early evening.
- Survey at least once each month on a weekday and once on a weekend or holiday.
- Find a comfortable place to sit where you can see the entire beach. You may want to bring a beach chair.

- Count the number of humans, dogs on leash, dogs off leash and boaters regardless of whether they are causing a disturbance. Describe activities that you see.
- Classify the boaters according to motor powered, under sail or hand powered. Count only the boaters that appear to be in the reserve. Most large ships (freighters, cruise ships and tugs) will not pass through the reserve area.
- Briefly note time and length of any disturbance; i.e., dogs chasing birds, walkers causing shorebirds to take flight.
- Note the behavior type caused by the disturbance (birds, flight/diving/running/fighting; mammals, return to water/diving/fighting or return to forest.
- Evaluate the response, on the field card circle:
 - 1 if flew or dove and quickly returned.
 - 2 if flew or dove but did not return quickly.
- Evaluate your confidence, on the field card circle:
 - 1 if you are not sure or disturbance was causal.
 - 2 if disturbance was likely.
 - 3 if there was pursuit or a direct correlation.
- Count birds and list species by group (gulls or shorebirds), unknown, Harlequin Duck, Long-tailed Duck, Bufflehead, Common Loon, Horned Grebe, Double-crested Cormorant, Black Oystercatcher, Sanderling, Glaucous-winged Gull and Pigeon Guillemot. Record the maximum number of each species.
- Note any wildlife interactions; i.e. Bald Eagle caused shorebirds to fly.
- Put any additional observations in the notes section.
- Take copies of the Reserve Brochure to give to interested parties on the beach. Try to interest them in the goals of the Aquatic Reserve.
- Retain a copy of each report.
- At the end of each month, send the reports via mail to Whidbey Watershed Stewards

APPENDIX C: DISTURBANCE DESCRIPTION TABLE

	Incident	Observation	Date
1	A helicopter flew low (100 ft?) over near shore, from north to south, possibly from NAS.	A mixed flock of about 20 birds took off, but quickly returned.	4/4/2014
2	large ship towing barge	flew and quickly returned	4/17/2014
3	person walking on beach	flew and did not return immediately	4/17/2014
4	large power boat--pleasure/fishing	flew and did not return immediately	4/17/2014
5	Tug boat near shore	Birds flew and dove, did not return immediately	4/22/2014
6	A P-3 aircraft overhead	Birds display anxious behavior but did not flee or dive	4/22/2014
7	A person walking toward beach.	Four shorebirds flew approx. 200 yards down beach. Did not come back.	4/23/2014
8	off leash dog ran past on beach.	1 bufflehead ~15 feet from shore dove and then resurfaced about ~30 feet from shore and swam to about 40 feet from shore. Moved back to its previous position near shore once dog was gone.	4/23/2014
9	Tug with a barge came near.	Scattered Surf Scoters and Double-crested Cormorants. The birds flew off a short distance.	4/23/2014
10	A fishing-type boat passed a Common Loon.	The loon started the foot wagging and wing stretching as the boat neared. It turned on 1 side and then the other.	4/23/2014
11	2 adults walking along shoreline with dog off leash	Birds flew and dove, not returning quickly	4/25/2014
12	kids walking along shoreline on driftwood	Birds flew and dove, returned quickly	4/25/2014

	Incident	Observation	Date
13	3 adults shouting, laughing and walking with dog and then throwing rocks	flew and dove and did not return immediately	4/26/2014
14	2 dogs, 2 children, 1 dog walking on beach	flew or dove and did not return immediately	4/26/2014
15	two groups of people throwing rocks on water's edge	Birds flew and dove, not returning quickly	4/26/2014
16	seaplane flying over sanctuary	flew and dove and quickly returned	4/27/2014
17	couple with dog on trail behind me on beach	flew and did not return immediately	4/27/2014
18	people walking on beach with dogs flock of shorebirds never did land, but returned and then flew back over water	flew and dove and did not return immediately	4/27/2014
19	fishing boat could not see inhabitants on boat	flew or dove and did not return immediately	4/27/2014
20	fishing boat one individual throwing something overboard on side facing away from beach. Saw a small yellow float but it disappeared.	flew and dove and did not return immediately	4/27/2014
21	2 adults walking with dogs that were let off leashes	flew or dove and did not return immediately	4/27/2014
22	humans walked by	Sanderlings (44) flew down beach did not return	4/27/2014
23	NAS jet takeoff and flight	Birds flew and returned quickly to water	5/1/2014
24	People throwing sticks in the water for off-leash dogs to retrieve.	2 loons 75' from shore dove and left area first time dogs went in for sticks. Traveled very long before resurfacing. Did not return to area during survey.	5/22/2014
25	group of 7 people walked on beach, then 3 people from group began throwing rocks in water (not at birds), were standing 25' from the flock.	flew and did not return immediately. and birds called loudly and ran farther down the beach.	5/24/2014

	Incident	Observation	Date
		This caused oystercatchers to call loudly and fly to other edge of rocky area to feed. Did not return to original location.	
26	2 people walking on beach.	past 3 oystercatchers caused them to fly from where they were feeding to 100 yards down the beach where another flock was feeding. Flew and did not return immediately to feeding location.	5/30/2014
27	two people walked past 4 scoters water 10' from shore	when people walked past eh scoters moved to 25' from shore, returned as soon as people passed.	5/30/2014
28	two people walked past small flock of guillemots on the water near shore that had been flying up to burrows.	While people were walking past burrows 3 guillemots flew up near bluff and then circled and did not land on the bluff or in burrows. Resumed going to burrows when people had walked past.	5/30/2014
29	Person walking down beach	caused 1 whimbrel to run up beach ahead of person. After 2mins. the whimbrel stopped running and the person walked past it. Bird resumed feeding within 30 secs. after person had walked past.	6/4/2014
30	small group of people walked past on upper beach,.	3 oystercatchers on rocks near water stopped feeding and moved closer to water as people past. Immediately returned to	6/8/2014

	Incident	Observation	Date
		feeding once people were past	
31	two boys throwing sticks out into water for their off leash dog	Great blue heron in tideline disturbed and flew and did not return immediately	6/8/2014
32	As people with an unleashed dog walked past guillemot burrows	the birds stopped flying up to burrows and some flew up to cliff but circled back to water w/o entering burrows. Returned to normal activity.	6/20/2014
33	Lone kayaker paddled by.	Horned Grebes dove, buffleheads (15) and surf scoters and gulls flew. Both flew and dove and quickly returned	6/24/2014
34	Tug with barge passed through.	Several birds flew: 6 surf scoters and 4-5 double crested cormorants. flew or dove and quickly returned	6/25/2014
35	Fishing boat motored through.	Common loon displayed excessive foot waging and wing stretching.	6/25/2014
36	One walker on the beach	causing one shorebird to take flight and did not return immediately	7/7/2014
37	Walker on beach.	causing bald eagle to take flight, did not return immediately	7/8/2014

APPENDIX D: SMITH AND MINOR ISLAND BROCHURE

Interested in protecting the Smith and Minor Islands Aquatic Reserve?

Join the Smith and Minor Islands Citizen Stewardship Committee!



What is an Aquatic Reserve?

Aquatic Reserves are state-owned aquatic lands of exceptional biodiversity and productivity. Created and managed by Washington's Department of Natural Resources's (WA DNR) in 2004, the Aquatic Reserve Program brings together local and state governments, non-governmental organizations, Tribes, and citizens interested in preserving and restoring these ecologically important areas.

To date, seven areas have been designated Aquatic Reserves in Washington, all within the Puget Sound region. The designation process encourages public engagement, which helps to preserve the environmental, scientific and educational value of these public lands without diminishing the ability of individuals to fish, boat or recreate in these areas. To learn more visit <http://www.dnr.wa.gov> and search for Aquatic Reserve Program.

Visit the Smith and Minor Islands Aquatic Reserve

Protect Our Important Aquatic Ecosystem

The Smith and Minor Islands Aquatic Reserve

To increase public participation in the Aquatic Reserve process, the Smith and Minor Islands Citizen Stewardship Committee was created. This group works with DNR's Aquatic Reserve program to implement actions at the Reserve that help it stay healthy and protected.

Opportunities for involvement include...

Learn about the Reserve: Committee members offer free presentations about the Aquatic Reserve to community groups and classrooms.

Education Projects: We make presentations to community groups and classrooms, design interpretive signs, webpages and fliers. We can use help with any of these tasks. Do you have other education ideas? Contact us or attend our next meeting and share your ideas!

Citizen Science Projects: Our volunteers are currently performing shoreline sediments sampling to investigate the location of forage fish spawning grounds. We are also surveying disturbances to birds and mammals in the Reserve.

Regulatory review projects: We watch for activities that may affect the Reserve's shorelines and habitats and provide policy recommendations as needed. This could include mapping and reporting marine debris or commenting on a proposed project.

Contact Robin Clark at Robin@whidbeywatersheds.org to request a presentation, learn more about the committee and for more information about our projects!

This project is funded by a grant from the Environmental Protection Agency, the Washington Department of Fish and Wildlife, and Department of Natural Resources.



Map Key
○ Aquatic reserve boundary
● Public access point



Photo: WNM Field Conservancy

To get involved in any of our projects or the Citizen Committee itself please contact:

Robin Clark- Robin@whidbeywatersheds.org - (206) 235-3321
 or
 Maddie Fouch- maddie@wecprotects.org - (206)-631-2644




What makes our Smith and Minor Islands Aquatic Reserve so special?

Interesting Features




Photo: WDNR




Photo: John F. Williams

Diversity of Wildlife




Photo: USGS by David Ayers




Photo: Wild Fish Conservancy




Photo: USFW by Naylor Taylor




Photo: Kimberle Stark

- Productive habitat:** The reserve includes nursery and feeding areas for migrating, nesting, and foraging birds, fish, and marine mammals including nutrient-rich shallow, deep, and open-water habitats, high bluffs and a variety of beach types, from large rocky cobbles to sandy flats.
- Smith and Minor Islands** are surrounded by the Aquatic Reserve. (Image 1 is the view of Smith Island from Whidbey).
- Over 300 species** of macro algae, including Washington State's largest kelp forest (Image 2).
- Surf Smelt (Image 3)** is a type of forage fish, use the beaches as spawning grounds. Forage fish are a very important food source for marine birds, salmon, and other large marine predators.
- Smith and Minor Islands** are part of the San Juan National Wildlife Refuge due to the nesting, breeding, feeding, and resting grounds for many bird species including the Tufted Puffin (Image 4).
- Four species of salmon** (Chum, Coho, Pink, and Chinook) use the shallows of the Reserve as rearing habitat (a place for juveniles to feed and adjust to salt water) before heading out to the ocean. (Image 5 is a juvenile Chinook salmon.)
- Marine mammal sightings** occur often in the Reserve, especially in the summer months when the resident *Otca* pods travel through the area. Smith Island also provides harbor seals (Image 6) with a haul out and pupping site.

Threats to our Reserve




Photo: WDOI by Hugh Shippman




Photo: Michael Kyle

Threats facing the Smith and Minor Islands Aquatic Reserve's natural resources include:

Pollution: Marine debris, both floating in the water column and washed up on shore threaten all types of life in the Reserve. Potential oil spills by vessels using the major shipping lanes adjacent to and within the Reserve is another threat to this productive marine ecosystem. Recreational use of boats also increases the risk of litter and chemical pollution.

Shoreline modification: Construction of hard shoreline armoring (Image 7) and overwater structures are ecological concerns. These activities reduce the amount of suitable habitat for forage fish spawning, nesting for birds, and riparian vegetation along the shoreline, which provides critical shading of the nearshore habitat during the summer.

Climate change: If climate scientists' prediction of sea level rise, ocean acidification, increased storms, and coastal flooding is correct, the Reserve will be severely impacted by greater erosion, loss of bird nesting and seal haul out pupping habitat, and kelp beds no longer supportive of calcium-bodied life, the base of the marine food chain.

Invasive species: Due to the large amount of vessel traffic, especially from international waters, ballast water containing invasive species is a concern. Additionally, invasive species that are already present at the Reserve pose a threat to native species as their presence forces competition for habitat and food (Image 8).

APPENDIX E: ACKNOWLEDGMENTS OF VOLUNTEERS AND OTHERS

We would like to thank the efforts of the Smith and Minor Citizen Committee for supporting education and projects related to the Aquatic Reserve Program. Particularly we would like to thank Dr. Phyllis Kind who provided insight and expertise on development of the field card and the sampling protocol. Steve Ellis also provided invaluable resources for input on bird identification, and behavior, volunteer training and development of the protocol.

We wish to thank the volunteers who made the project possible: Wendy Visconty, Emma Ruggiero, Steve Ellis, Jenny Brown, Bob Gentz, Lee Chavez, Kelly Keith, Gary Rassner-Donovan, Maddie Rose, Marilyn Thomas, Ginger Reed, Sandy Shipley, and Joanne McMillen