Evaluation of Migratory Shorebird Conservation Plans in the Puget Sound:

2023 Capstone Project and Case Study in Skagit, Washington

SCHOOL OF MARINE AND ENVIRONMENTAL AFFAIRS

COLLEGE OF THE ENVIRONMENT
UNIVERSITY of WASHINGTON

Prepared for and in collaboration with
Audubon Washington

May 23, 2023

Dr. Trina Bayard
Director of Bird Conservation
Audubon Washington

Dear Dr. Bayard,

We are very pleased to share with you the findings of our study on the implementation of migratory shorebird conservation plans which coexist across a multi-level governance framework in the Puget Sound region of Washington. This study was conducted from January 2022 to May 2023. Enclosed in this report you will find a thematic analysis of documents and interviews to assess the implementation of migratory shorebird conservation plans in Skagit Bay, Washington. This report also describes key findings, perceived barriers and opportunities for implementation, and recommendations to further shorebird conservation in Skagit Bay as identified throughout the interview process. Additionally, it includes an analysis of internal documents that guide decision-making processes of interviewees.

Over the last year, we completed the design of the study and submitted it to the Internal Review Board for review. Following the study's IRB approval, we conducted a thematic analysis of the conservation plans and held interviews with individuals involved in their implementation. In November 2022, an overview of the research project was presented to the Skagit Marine Resource Committee, and preliminary findings were presented at the 2022 Annual Meeting of the Pacific Northwest Political Science Association. We also interviewed 19 actors who were identified as potential key informants for their role or interests in shorebird conservation in Skagit Bay, Washington. Lastly, 12 internal documents collected from key informants were analyzed. Results of this study were also presented to the School of Marine and Environmental Affairs in February 2023, as part of our capstone requirement.

The success of the study is largely a result of your contributions in providing key contacts, shorebird ecological knowledge, and assisting in the facilitation of our team outings. We sincerely thank you for your support in our endeavor. It is our goal that this report will serve as a useful and beneficial tool in promoting shorebird conservation in Puget Sound.

Sincerely,

Molly Daly Elley Donnelly Eduardo Gallo-Cajiao Nives Dolšak

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Glossary

Conservation	The act of preserving and managing biodiversity and natural resources.
Conservation plans	A document or strategy which identifies conservation objectives, identifies threats, and provides guidance for management practices to best achieve said objectives.
Migratory shorebirds	Migratory shorebirds, birds that forage along intertidal shores and undertake long-distance migrations.
Pacific Americas Flyway	One of eight major flyways in the world, this migration route for birds extends from Alaska to Patagonia, Chile.
Key informant(s)	Personnel interviewed during the study with practical experience or professional ties to Skagit.
Plan representative(s)	Personnel interviewed during the study with professional ties to the development of a migratory shorebird conservation plan.
Actor(s)	Potential participant in the implementation of migratory shorebird conservation plans.
Street-level bureaucrat(s)	Personnel within any given organization making decisions regarding the interpretation of conservation plans on the ground, with the potential to implement the conservation plans with individual discretion.
Policy	A system of guidelines or set of ideas to guide decisions and achieve certain outcomes which may or may not be legally binding.
Governance	The system by which entities are directed to achieve collective action goals
Internal documents	Guidance or framework created and utilized within an organization or network for guiding management decisions or strategy

Executive Summary

This School of Marine and Environmental Affairs' capstone project evaluates the implementation of migratory shorebird conservation plans for the Puget Sound region by using a qualitative single-case study of Skagit Bay, Washington. This study exemplifies a primarily bottom-up approach to study implementation by interviewing and analyzing documents from personnel and organizations at the ground level.

The conservation of biodiversity and the protection of imperiled species have become critical issues in the face of increasing human activities and climate change. Conservation plans help provide a systematic approach in addressing complex challenges and mitigating impacts on affected species. Understanding the implementation of conservation plans is key within the environmental and conservation field.

Within the Pacific Americas Flyway, the Puget Sound region has three overlapping conservation plans that aim to protect migratory shorebirds: the Pacific Americas Shorebird Conservation Strategy (international level), U.S. Shorebird Conservation Plan (national level), and Northern Pacific Coast Region Shorebird Management Plan (regional level).

Migratory shorebirds, birds that forage along intertidal shores and undertake long-distance migrations (Van de Kam et al. 2004), are experiencing population declines due to anthropogenic disturbances; including prevalent habitat destruction/degradation, hunting, and climate change (Barlein, 2016; Colwell, 2010). Accordingly, the aforementioned conservation plans have been established for the recovery of their populations and the habitat on which they rely, but implementation remains generally unassessed.

To reduce uncertainty of how these migratory shorebird conservation plans are implemented, implementation is evaluated through the following three dimensions: (i) assessing awareness of the three conservation plans; (ii) how, and in what ways, the three conservation plans are referenced in management plan(s) provided by key informants; (iii) and, on-the-ground outcomes enabled by the implementation of these conservation plans.

Awareness of the conservation plans varies amongst key informants even when their organizations conduct actions on-the-ground in the interest of shorebird conservation, suggesting awareness of the conservation plans does not drive or enable the implementation of shorebird conservation strategies. Of the 12 internal documents provided by key informants, only five mentioned shorebirds and one integrated information from the regional-level shorebird conservation plan. A thematic document analysis of the conservation plans and interviews of the plan representatives revealed that presence of certain policy attributes in the plans, or lack thereof, may contribute to issues observed by key informants. Interviews included discussions of perceived factors which limit shorebird conservation and the implementation of the conservation plans; the most frequently discussed factors relate to a lack of funding, the applicability and relevancy of the conservation plans at the site-specific level, and insufficient data regarding shorebird ecology for Skagit Bay.

This information can be used as a resource for engaging actors relevant to the implementation of shorebird conservation locally. Scholarly, this study will contribute to the broader theme of multi-level governance implementation and will provide a framework from which future case studies can be implemented.

Acknowledgements

This report has been prepared by:
Molly Daly
Elley Donnelly
Eduardo Gallo-Cajiao, PhD
Nives Dolšak, PhD
From January 2022 to June 2023

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1. Introduction

Anthropogenic activities have altered the climate and environment, leading to widespread loss of biodiversity that is important to ecosystems and societies alike. Currently, the average rate of extinction is one hundred times higher than the background rate, leading scientists to define this as the sixth mass extinction (Ceballos et al., 2015). The widespread loss of biodiversity has been, and will continue to have, cascading consequences on ecosystem function and services that are vital to people and the planet (Ceballos et al., 2017). For example, wetlands provide important ecological services, yet they are among the most threatened habitats in the world (Colwell, 2010).

Wetlands and estuaries are important throughout most stages of migratory shorebirds' lifecycle and are particularly important stopover sites during migration. Globally, many species of migratory shorebirds are in decline due to habitat degradation and loss, hunting, pollution, and climate change (Bairlein, 2016). As a result, shorebird conservation is becoming a worldwide priority (Peters and Otis, 2007).

Many species of shorebirds undertake annual long-distance migrations (Colwell, 2010). For some species of shorebirds, this journey is across impressively long distances – from the high latitudes of the northern hemisphere to the high latitudes of the southern hemisphere. These migrations necessitate sufficient habitat along the way for shorebird feeding and molting while providing low mortality risk.

Washington's Puget Sound region is located within the Pacific Americas Flyway – a migratory route that spans 120 degrees of latitude from Alaska to Patagonia. Millions of shorebirds migrate through the Pacific Americas Flyway annually. Populations typically breed in the high Arctic and boreal regions and spend most of the northern hemisphere winter in the continental U.S., Central and South America. As they migrate between these two regions, they require stopping sites to rest, feed, and refuel. Skagit Bay provides critically important habitat to imperiled shorebirds, as it was recognized as an Important Bird Area by the National Audubon Society and a Site of Regional Importance by the Western Hemisphere Shorebird Reserve Network (WHSRN) (National Audubon Society, 2018; Western Hemisphere Shorebird Reserve Network, n.d.).

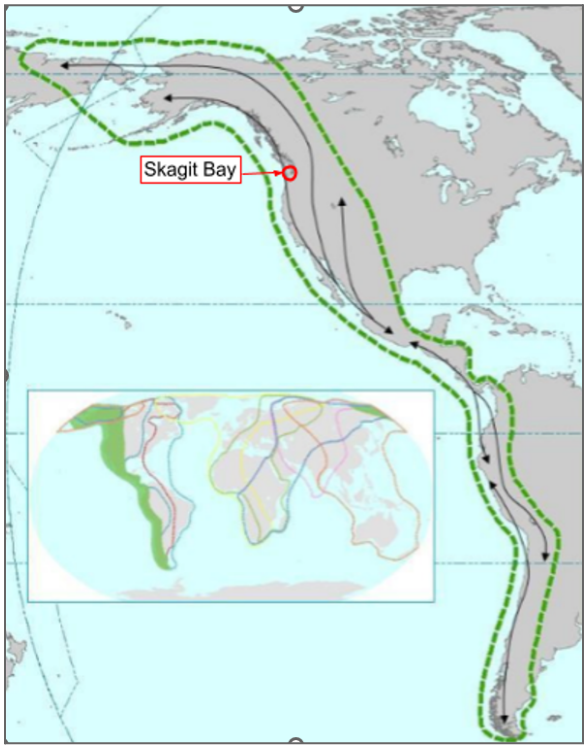


Figure 1: The Pacific Americas Flyway, which spans from Alaska to Patagonia. This image is adapted from the Wild Bird Club of the Philippines (Jakosalem, G., 2013).

One approach to conserving key migratory shorebird habitats is the development of conservation plans. Subsequent implementation of conservation plans can be shaped by the design of the plan (how the plan was intended to be implemented) and by the actors involved in its implementation (who developed the plan

and who is involved in work relevant to the goals of the plan). Habitat management, restoration efforts, and education are just a few examples of the diversity of strategies outlined by the three conservation plans that coexist in the Puget Sound region of the Pacific Americas Flyway and are potentially implemented by actors (Appendix A).

Due to the transboundary nature of flyways, the conservation plans require the coordination of multiple governments and other actors. In the Pacific Americas Flyway, the three conservation plans that aim to protect and recover migratory shorebird populations across a multilevel governance system are the Northern Pacific Coast Regional Shorebird Management Plan ("regional plan"), the US Shorebird Conservation Plan ("national plan"), and the Pacific-Americas Shorebird Conservation Strategy ("international plan").

Policy implementation is dependent on the efforts of public and private actors; and in the realm of shorebird conservation, some of these actors include local, state, and federal government agencies, nongovernmental organizations (NGOs), Tribal governments, and other organizations. When policy is implemented by multiple actors, it can sometimes be unclear which policies are implemented, how and whether they are effective at solving the initial problem. This can, in part be, attributed to the unique goals and priorities of the organization actors represent (Birkland, 2020), and/or the individual discretion used by personnel on the ground (Hill and Hupe, 2022). Implementation may also be facilitated or prohibited by factors such as perceived barriers and opportunities for shorebird conservation, and the strengths and weaknesses of the conservation plans. Further research into the implementation of shorebird conservation policies is necessary to learn more about the effectiveness of those policies, which may inform future strategies for shorebird conservation.

The study's research questions are as follows:

- ***Research Question 1:***
  How are the three conservation plans designed?
- ***Research Question 2:***
  How are these plans implemented?
- ***Research Question 3:***
  What are the perceived factors that enable or limit shorebird conservation and the implementation of shorebird conservation plans?

We seek to understand if and how the three conservation plans have been implemented in the Puget Sound region. The aim of this study is to research the implementation of the three conservation plans through qualitative interviews and document analysis in the following three dimensions: (i) assessing awareness of the three conservation plans; (ii) how, and in what ways, the three conservation plans are referenced in management plan(s) provided by key informants; (iii) and, on-the-ground outcomes enabled by the implementation of these conservation plans. We are using these dimensions as proxies for the policy implementation of the conservation plans.

This research studies if, and how, migratory shorebird conservation plans are implemented by personnel at the ground level by assessing individual awareness of conservation plans, type of actions on-the-ground implemented by organizations, and the inclusion of conservation plans in internal documents that drive an organization's decision-making process. A thematic document analysis of the conservation plans and interviews of representatives of the plans provide insight into how the conservation plans were designed. Furthermore, perceived

factors that limit or enable shorebird conservation and the implementation of shorebird conservation plans may offer additional perspective into how the plans are implemented. This research can be used as a framework for other regions along the Pacific Americas Flyway to identify strengths and weaknesses in the governance for conserving migratory shorebird populations in their respective areas.

2. Conceptual Framework

The three conservation plans included in this analysis represent the structure of multi-level governance; each plan is formulated at a different level of governance, yet they are all interrelated. Multi-level governance refers to a non-hierarchical network between different orders of government that is used to address complex problems that transcend geographical and jurisdictional boundaries (Cairney, 2019). However, these networks can be difficult to manage and can sometimes be as challenging as the problem they are meant to solve (Cepiku and Roberge, 2013).

Conservation plans promote cooperation amongst the many actors of a conservation partnership and establish a framework from which policies and strategies can be enacted to reach a common goal. They can include a a composite of policies and customs, or a set of strategies to reach a common goal. However, many external and internal factors can affect policy implementation, such as unclear goals, spatial mismatches, lack of funding, understanding and awareness of the issue or conservation plan (Agrawal 2001, Sorensen and McCreary 1990; Guerrero et al., 2013).

Policy implementation refers to an adopted policy carried out by administrative units with an associated budget and human resources (Dunn, 2018). Policy implementation research is focused on the evaluation of the transformative activities which occur between policy formation and policy outputs or outcomes (Hill and Hupe, 2022). Implementation success is not necessarily correlated with the success or failure of a policy–it simply means that a policy was implemented as intended. Consequently, evaluating the effectiveness of a policy is not equivalent to analyzing its implementation. Implementation evaluation can be conducted through a top-down or bottom-up approach; the bottom-up approach allows for an investigation of street-level interpretation and implementation of policies.

Policy can be implemented by a number of actors, including organizations that are responsible for integrating conservation plans into management plans, and street-level bureaucrats – professionals that implement actions and policies on-the-ground. Street-level bureaucrats – such as NGO employees, state employees, and land managers – have a “triple identity” as public servants (interfacing with the public is central to their work), as professionals (with specific tasks or training), and are policy co-makers (by demonstrating individual discretion through implementing policy) (Hill and Hupe, 2022). The complexities of the triple identity of street-level bureaucrats, including how and what policies they choose to implement, indicate that qualitative research methods – such as interviews – may prove more useful than a strictly quantitative research approach. Interview studies require intentional thematizing and design, dependent upon the purpose of the investigation and what knowledge the researcher is hoping to obtain. Street-level bureaucrats are one level of actors that lead to the implementation of policy, and that is also true for the implementation of the on-the-ground actions outlined in the three conservation plans.

On-the-ground actions refer to practical work being done in a specific place. While policies may advocate for certain actions to be taken, there is no guarantee that those actions are to be carried out by street-level bureaucrats. Policy evaluation includes determining the extent to which a given policy leads to actions taken by street-level bureaucrats at a given location. In this case, on-the-ground conservation is represented as specific actions taken by actors to preserve and protect shorebirds and their habitat. The three conservation plans include on-the-ground conservation measures which may be conducted by actors to support shorebird conservation efforts. These actions include the construction of roosting sites,

restoration of agricultural or developed land to estuary habitat, removal of invasive species, restoration of native plant vegetation, removal of dikes to restore tidal influence, reduction of silt accumulation in marshlands, enhancement of nesting and foraging habitat quality, estuary zoning to reduce disturbance, and education and outreach for shorebird conservation. Our analysis will evaluate the extent to which the three conservation plans inform on-the-ground conservation strategies in Skagit Bay, Washington.

There is minimal literature on policy implementation evaluation related to migratory shorebird conservation. Franks, et al (2018) reviewed existing literature and created a policy implementation meta-data study. While the scope of this project is quite different from ours, authors cite that successful policy implementation requires the effective use of policy instruments and "meaningful management" (Franks, et al., 2018). Burger and Niles (2012), using qualitative and census data, found that the policy decision to close beaches to conserve shorebird populations was beneficial during key migratory periods and was most successful when stakeholders were included in the decision-making process.

Gallo-Cajiao (2014) provides the strongest framework for our research design. This study analyzed internal documents and interviews with actors to discern systematic issues that emerge across the policy process in relation to migratory shorebirds, and during this process, and information gap was identified surrounding the degree of implementation of migratory shorebird conservation governance frameworks. (Gallo-Cajiao, 2014). Without an understanding of the implementation of shorebird conservation frameworks, it is difficult to determine the contribution of said frameworks to overall migratory shorebird conservation efforts.

As previously stated, there are several ways to assess the implementation of each conservation plan. For the purposes of this analysis, we are using key informant awareness of the conservation plans, the inclusion of the conservation plans in key informants' internal documents, and on-the-ground conservation actions as proxies for the implementation of each of these plans.

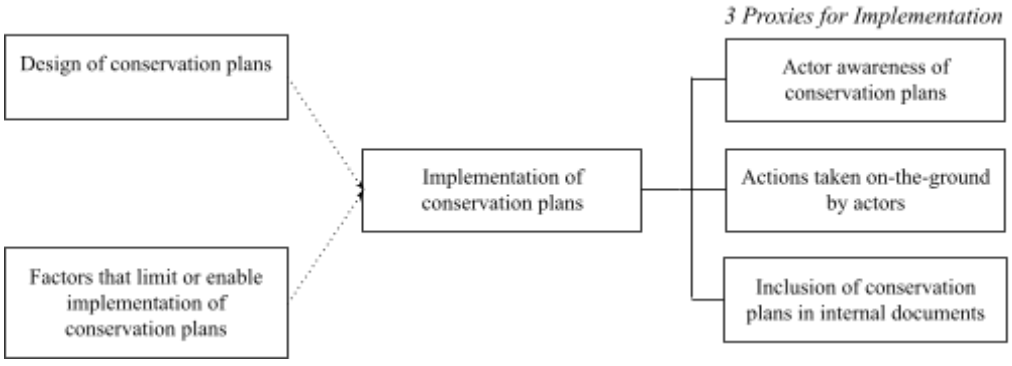


Figure 2: Visual conceptualization of this study's research framework that is used to study implementation of migratory shorebird conservation plans in Skagit Bay, in the North Puget Sound region of Washington. The implementation of migratory shorebird conservation plans is studied through three dimensions: (i) assessing actor awareness of the three conservation plans; (ii) how, and in what ways, the three conservation plans are included in management plan(s) provided by key informants; (iii) and, on-the-ground outcomes enabled by the implementation of these conservation plans. The implementation, or lack thereof, of the conservation plans is also assessed through evaluating the design of the conservation plans, and actor perception of factors that limit or enable implementation.

3. Case Study

Figure 3: Historical extent of estuaries in the Puget Sound region.This study focuses on 14 - Skagit Bay, as noted (Simenstad et al. 2011).

Skagit Bay, located along the Puget Sound in the northwestern region of Washington State, is renowned for its rich natural landscapes and extraordinary biodiversity. This area is characterized by a series of estuaries that support large numbers of wildlife; including shorebirds, waterfowl, songbirds, raptors, salmon (National Audubon Society, 2018). For example, the delta supports the largest concentrations of wintering Tundra and Trumpeter Swans in the state, both of which are listed as priority species by the Washington Department of Fish and Wildlife. Furthermore, it supports federally listed Chinook salmon and other salmon species, shellfish, and forage fish (Western Hemisphere Shorebird Reserve Network, n.d.).

Thus, the estuaries are not only important for species of flora and fauna, but are important to those who have an interest in their survival; such as bird watchers, waterfowl hunters, fisheries, residents, and members of local Tribal governments.

Skagit Bay hosts an impressive array of shorebird species throughout the year, and it serves as a vital breeding ground, wintering habitat, and migratory stopover site for numerous avian species. The area's recognition as an Important Bird Area and a Site of Regional Importance in the Western Hemisphere Reserve Network underscores its significance in avian conservation efforts.

3.1. Site designations

Important Bird Area

As the U.S. partner for BirdLife International, the National Audubon Society (Audubon) helps connect and conserve a network of areas that are considered the most important places for birds (Audubon Washington, 2020). Through this process, sites receive an Important Bird Area (IBA) designation. In Washington state, Audubon launched this program with the assistance of the Washington Department of Fish and Wildlife in 1998 (ibid).

Sites that receive this designation provide essential habitat for one or more species of birds in breeding, wintering or migration. It must provide value to species that are (Audubon, n.d.):

- Threatened or endangered
- Restricted to a particular biome or region
- Restricted to one habitat type
- Occurring at high densities during some portion of the year

10,000 sites worldwide have received an IBA designation, though Skagit Bay is one of 750 to be designated as a IBA of Global Importance (Audubon Washington, 2020). It is also one site

of the 75 in Washington state. The National Audubon Society, as the U.S. partner for BirdLife International, helps oversee this large network of IBAs (ibid).

Site of Regional Importance

The Western Hemisphere Shorebird Reserve Network (WHSRN) began in 1985 and has developed a network for site-specific, hemisphere scale shorebird conservation (WHSRN, 2015). The greater Skagit and Stillaguamish Delta received its designation as a Site of Regional Importance in 2012 based on the following (Western Hemisphere Shorebird Reserve Network, n.d.):

- At least 20,000 shorebirds use the site annually

To receive this site designation, the site landowner must agree to: 1) make shorebird conservation a priority; 2) protect and manage shorebird habitat; and 3) keep WHSRN informed of any changes at the site.

WHSRN identified the site owners of the 37,000 hectares in the greater Skagit and Stillaguamish Delta to be: Washington Dept of Fish and Wildlife, Island County Parks Department, Whidbey Camano Land Trust, Warm Beach Christian Camp, and The Nature Conservancy (Western Hemisphere Shorebird Reserve Network, n.d.).

115 sites in 19 countries have met qualifications from WHSRN and received designation as sites that are either of Landscape, Regional, Hemispheric, or of International Importance. Of these, 51.3% are Sites of Regional Importance (ibid).

3.2. Ecology

Over the past roughly 50 years, scientists have written and rewritten the evolutionary relationships of shorebirds and classifications (Colwell, 2010). These significant scientific findings and discussions have prompted the biologist community to conclude that shorebirds have a mixed evolutionary origin, and that the group is not a cohesive taxon. This means that although shorebirds have some similar attributes, they also can be very distinct from one another.

Past geological events helped shape patterns that we see today; shifting climates altered breeding habits of shorebirds, especially across northern latitudes. Today, on a global scale, shorebirds have a higher diversity in Arctic regions than in tropical (diversity is positively correlated with latitude), and within Arctic regions diversity varies across longitudinal bands. This is largely observed in sandpipers (the most diverse family of shorebirds) and plovers.

Shorebird habitat, species and abundance

Skagit Bay is an estuary ecosystem that contains a system of mudflats and channels that many species of plants and animals rely on. Citizen science data input into eBird from 1987 to 2023 notes that 297 species of birds have been observed in the Skagit Bay IBA (eBird, n.d.).

Aerial surveys of wintering shorebirds in the mid-1990s found that Skagit Bay is one of only four sites in Washington state with seasonal concentrations greater than 20,000 shorebirds on a regular basis (Western Hemisphere Shorebird Reserve Network, n.d.). More recent surveys (2007-2011) showed more than 30,000 shorebirds. In these surveys, Dunlin and Western Sandpiper were observed to be the most dominant.

A Citizen science winter shorebird monitoring effort in Puget Sound – the Puget Sound Shorebird Count[1] – identified 11 species of shorebirds across 22 sites in the Puget Sound on December 4, 2022 (Ecostudies Institute, 2023).

[1] These surveys began in 2012 to contribute to the Pacific Flyway Shorebird Survey – a flyway-wide monitoring effort.

Of these species, Dunlin are consistently the most abundant observed. This monitoring effort has noted an overall decline in abundance of migratory shorebirds in the Puget Sound. Furthermore, at the hemispheric level, while 43% of populations found in the Pacific Americas Flyway have shown to be stable, 11% of shorebird populations are experiencing a long-term decline in population and an additional 46% have unknown population trends (Senner et al., 2016).

Shorebird migration

Many shorebirds will nest at mid to high northern latitudes, and travel south in the winter to find resources (Pacific Shorebird Conservation Initiative, n.d.). In the Pacific Americas Flyway[2] this distance can be thousands of miles spanning along the Pacific Ocean – from the permafrost tundra of the high arctic to Tierra de Fuego, the southernmost tip of the South American mainland (BirdLife International, n.d.).

Though there is a general observed pattern of shorebird migration at the hemispheric scale, migration is a phenomenon that also occurs across a series of different levels – such as with genetics, behaviors, population dynamics, and ecology (Dingle and Drake, 2007). Migration can be seasonal, based on breeding or feeding patterns, may happen once or multiple times a year, and it can also change based on the availability of resources or suitable habitat. It contains both spatial and temporal attributes, is unique between species, and is related to natural selection. Furthermore, migration patterns affect both the individual organism and the population. For example, migration will produce individual behaviors as well as play a role in the population (and ecosystem) as a whole. Referred to as a "behavior-versus-ecology dichotomy", biological research has been undertaken to better understand the individual (physiological, behavioral, genetic) and population (ecological, evolutionary) aspects of migration. Therefore, it is important to note that the migratory behaviors of shorebird species is both complex and unique, which can pose challenges for implementing conservation strategies.

Time, energy, and risk of mortality are the three primary factors which influence a species' migratory pattern (Colwell, 2010):

- **Time**
  The speed and schedule in which a species moves between two locations. This will vary between the breeding nature of different species; for example, males of a monogamous species will typically migrate prior to the females to establish territories. Timing is also affected seasonally, particularly when seasonal weather patterns limit the quality and quantity of food availability.

- **Energy**
  The fuel migrants require for the successful completion of migrations. Finding food is important, but the ability to store energy[3] for endurance flights determines the success of breeding efforts.

- **Risk of mortality**

[2] Flyways encompass the "full range of breeding, stopping/staging, and nonbreeding areas occupied by a population during the annual cycle" (Colwell, 2010)

[3] Shorebird energy is derived from three components: carbohydrates, lipids, and proteins. Carbohydrates are used primarily during takeoff and predator evasion--not for endurance. However, lipids are stored as triglycerides and yield over eight times the chemical energy than that of proteins or carbohydrates of the same mass. This makes lipids useful during long migratory journeys, especially during refueling as they are found in various types of food. Proteins are important in avoiding dehydration; when an individual catabolizes protein during an endurance flight, six times more matter is used than when catabolizing lipids (Colwell, 2010).

The availability of energy to refuel migrating species, and ability to fly and to move quickly to evade predators.

Some migratory species complete nonstop journeys, while others use stopover sites for refueling. The quality of a stopover site can be considered by monitoring migratory shorebirds stopover duration, turnover rate, and length of stay[4] (ibid).

Shorebird behaviors

The diet, foraging maneuvers, and habitat use of shorebirds largely depends on the type of habitat (Colwell, 2010). The type of prey varies with habitat type, spanning from coastal to inland areas. However, overall invertebrates make up the majority of shorebirds' diets. Shorebirds often exhibit specialization, focusing on one species of prey. The type of habitat also determines foraging methods which include plunging, probing, pecking, and gleaning (ibid).

Shorebirds need a large amount of energy and therefore need to spend a significant amount of time foraging to maintain energy reserves for survival and reproduction. Locally, the amount of time shorebirds dedicate to foraging can be impacted by weather patterns (less foraging is permitted during rough weather), and tidal regimes (foraging only permitted during low tides). Some shorebirds will forage for invertebrates (molluscs, annelids, arthropods), as well as grazing for biofilm (microbes and organic detritus held together by a mucilaginous matrix secreted by benthic bacteria) along the surface of intertidal flats (Mathot, et al. 2010; St. Clair et al., 2015). In general, smaller species will forage for longer periods of time.

Threats to shorebirds

Major threats to migratory shorebird species found in the Puget Sound are discussed in the three conservation plans relevant to this study. Therefore, threats to shorebirds can be considered across three spatial levels of scope: at the hemispheric scale (international plan), national scale (national plan), or regional scale (regional plan). The threats at the regional level are also present ing the national and international level plans. The threats identified in these plans are as follows:

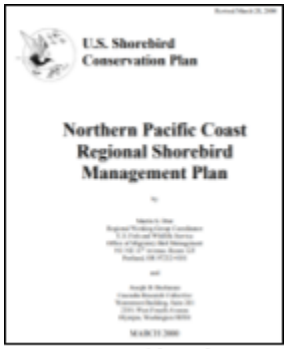
- **Regional level (Drut and Buchanan, 2000)**
  Habitat destruction (development); habitat degradation (pollution, modifications, resource depletion); and human disturbance (recreation, vehicles, pets, hunting).

- **National level (Brown et al., 2001)**
  All threats found at the regional level; increasing threats from predators; and non-native species.

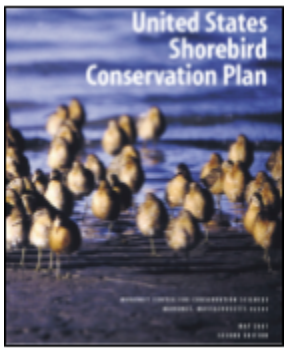
- **International level (Senner et al., 2016)**
  All threats found at the regional level; climate change; invasive species; water use and management; and aquaculture.

[4] Stopover duration refers to the length of time "in which an individual remains at a stopover site", while turnover rate refers to the "percentage of individuals present one day who remain the next day" (Colwell, 2010).

3.3. Migratory shorebird conservation plans for the Puget Sound



Regional (2000)



National (2001)

International (2016)

Figure 4: The three migratory shorebird conservation plans relevant to the Puget Sound region of Washington: the Northern Pacific Coast Regional Shorebird Management Plan (regional), the U.S. Shorebird Conservation Plan (national), and the Pacific-Americas Shorebird Conservation Strategy (international).

The three conservation plans that aim to protect migratory shorebirds in the Puget Sound region are The Northern Pacific Coast Regional Shorebird Management Plan, the US Shorebird Conservation Plan, and the Pacific-Americas Shorebird Conservation Strategy (Figure 4).

Collectively, these conservation plans represent multiple levels of governance: regional, national, and international (respectively). This multi-level governance structure has been previously identified as key to successful conservation policy implementation. These three conservation plans provide a critical framework for the management and conservation of migratory shorebirds in Puget Sound.

3.4. Land use

Most of the land in Skagit Bay is held privately – 90,000 acres of which is classified as farmland in the floodplain of Skagit Valley (Rousso, 2021). Agriculture in the Skagit Bay area is considered highly productive and central to some of the human's population's heritage and culture, with Skagit County being responsible for 3 percent of the state's agricultural sales. Other lands are managed or utilized by Tribal governments[5], County and City governments, the Washington Department of Fish and Wildlife, and nongovernmental organizations. Some of these lands are held for natural resource and conservation purposes.

[5] The authors recognize the Skagit Bay area may or may not include a mix of Tribal governments' ceded and unceded lands.

4. Methods

4.1. Data collection

Data collection for the single case study design included three different sources of data. The first data source was the set of the three conservation plans: the Northern Pacific Coast Regional Shorebird Management Plan, the U.S. Shorebird Conservation Plan, and the Pacific Americas Shorebird Conservation Strategy. Each conservation plan was accompanied by an interview with at least one representative of the plan. The plan representative interviews were semi-structured and held virtually, through Zoom, a video-conferencing platform. The audio recordings of the interviews were transcribed prior to coding.

The second data source was the collection of internal documents provided by various key informants; these were documents used in their decision-making process for project development and organizational management.

The third source of data was the collection of semi-structured key informant interviews. Two sets of interviews were conducted: 1) individuals identified to be representative of one of the three conservation plans ("plan representatives", and 2) of personnel with managerial responsibility, land ownership, or other conservation ties to Skagit Bay ("key informants").

One plan representative was identified for the regional conservation plan, two plan representatives for the national conservation plans, and one representative for the international conservation plan. These plan representatives were contacted through email and interviewed over Zoom.

The selection of key informants was purposive, with an initial list of potential interviewees provided by the client. Additional key informants were identified through snowball sampling. A total of 18 semi-structured interviews were conducted virtually (for a total of 19 key informants) through Zoom. Interview audio was recorded and transcribed prior to the thematic coding process and analysis.

4.2. Data analysis

A qualitative content analysis of the three sources of data was conducted via thematic coding using ATLAS.ti with a combination of top-down and bottom-up research approaches.

The analysis of the conservation plans included thematic coding of conservation plan representatives' interviews in ATLAS.ti and a document content analysis of each of the three conservation plans. The documents were analyzed through a largely top-down approach.

Each of the key informants was asked if they would be willing to share internal documents used by their organization to guide their decision-making process for project development and organization management. There were five types of internal documents by key informants: project management plans, organization management plans, acquisition agreements, area-specific management plans, species-specific management plans. A few key informants referenced the same documents, in which case, the document was only included in the analysis once. Both the interview transcriptions and documents were reviewed using the qualitative coding software ATLAS.ti.

4.3. Key informant engagement and demographics

Potential key informants were contacted via email from the initial list of prospective key

informants provided by Audubon Washington. The interview solicitation included a project overview, consent form, and interview guide. Snowball sampling also occurred; during the interview process, key informants were asked or suggested potential interviewees to participate in the study, as they were also involved in shorebird or estuarine conservation in Skagit Bay.

19 key informants participated in the interview process for this analysis. This group of interviewees represented four different sectors:

- Government
- NGOs
- Tribal governments
- Industry

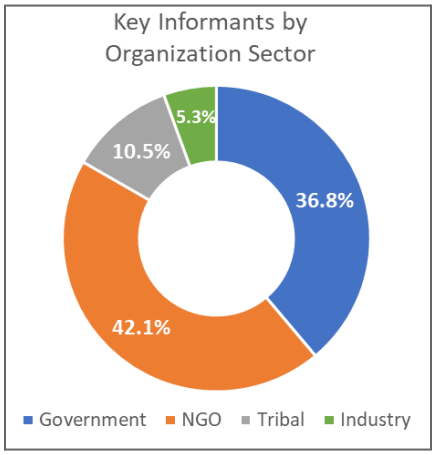


Figure 5: Percentage of 19 key informants in one of the following organization sectors: government, nongovernmental organization (NGO), Tribal government (Tribal), or industry.

Key informants also varied in their position within their individual organizations. Three different levels of position were represented in the study, and the levels are defined as such for the purposes of this analysis:

- **Operational**
  Lower-level employees; individuals actively participating in on-the-ground actions.

- **Management**
  Individual who oversees the job functions of other individuals or teams, but does not hold supervisory authority over the organization.

- **Executive**
  Individual who holds administrative or supervisory authority in an organization.

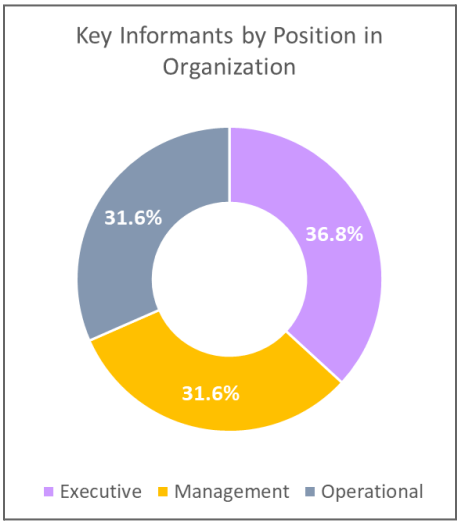


Figure 6: Percentage of 19 key informants that hold one of the three following positions within their organization: executive, management, or operational.

5. Results

5.1. The design of the conservation plans

Research Question 1: How are the three conservation plans designed?

5.1.1. Interviews of conservation plan representatives

During the interview process of representatives for the conservation plans, accounts of the development of the Northern Pacific Coast Regional Shorebird Management Plan, U.S. National Shorebird Conservation Plan, and the Pacific Americas Shorebird Conservation Strategy and their respective goals were in alignment with what was found during the document analysis and thematic coding of the plans. The historical account described how attention was rising in the 1980s to conservation issues for waterfowl and shorebirds.

After the North American Waterfowl Management Plan was passed in 1986, there was a growing interest in developing a similar approach for managing shorebirds and waterbirds. Around 1995, proposals were brought to various state level fish and wildlife agencies and the US National Shorebird Conservation Plan was approved by the U.S. Fish and Wildlife Service's executive committee. This brought grant money, via the Pittman Robertson Act, to develop a national plan. Early in this process, a need for regional planning was realized and the U.S. Fish and Wildlife Service recruited representatives to assist in the development of the regional plan. The national plan was written from 1997 to 2000, and received a slight modification before being approved in 2001. The regional plan was approved in 2000 and was intended to help with identifying where species can be found both geographically and by habitat type, and the trends of such species in those areas.

The U.S. Shorebird Conservation Partnership Council was created to implement the national plan, and it was described to have largely taken an advocacy position, such as submitting letters to weigh in on federal or state issues. The group also did some species monitoring and research activities, which were continued at the regional level. The national plan was also described as having the intent for on-the-ground implementation to be conducted by Migratory Bird Joint Ventures[6]. This way the U.S. Shorebird Conservation Partnership Council can work with the Migratory Bird Joint Ventures "to get more tangible conservation action" rather than spending time on "constantly revising a national plan or the regional plans" or "rehashing priority species".

After the national and regional plans were created, the Pacific Americas Shorebird Conservation Strategy was developed in 2016 with more of a "business model approach". The Pacific Americas Shorebird Conservation Strategy was "specifically modeled" after the Atlantic Flyway Shorebird Initiative Business Plan which was published in February 2016 (Pacific Americas Shorebird Conservation Strategy). The Pacific Americas Shorebird Conservation Strategy was developed by a small

[6] Established under the North American Waterfowl Management Plan in 1986, Migratory Bird Joint Ventures, or JVs, are cooperative, regional partnerships that work to conserve habitat for the benefit of birds, other wildlife, and people. There are currently 22 habitat-based JVs and three species-based JVs; each JV has its own management board and at least one technical body. The JVs are funded by Congressional appropriations through the U.S. Fish and Wildlife Service. (Migratory Bird Joint Venture, 2017)

international steering committee composed of more than 85 individuals representing 53 unique institutions.

During a series of six workshops, the scope and contents of the Pacific Americas Shorebird Conservation Strategy were identified. To do so, the Pacific Americas Flyway was broken in four regions, and a threat analysis was conducted for each. Climate change, development, invasive species and problematic native species, disturbance from recreational activities, water use and management, aquaculture and shoreline and wetland modification were threats that ranked high or very high in the project-wide summary threat rating conducted by the steering committee, and as such are included in the Pacific Americas Shorebird Conservation Strategy. The Pacific Shorebird Conservation Initiative was formed to implement the plan.

Partners (such as the Pacific Birds Habitat Joint Venture and Washington Department of Fish and Wildlife) of the Initiative are funding projects that fall within the international conservation plan's strategies, though none of the projects listed on the Initiative's website are in the state of Washington. The representative stated that efforts in the United States are largely information sharing and engagement at this point in time, due to capacity constraints (staff, time, funding), . The plans were not created to be regulatory in nature – but were designed to be a resource or guideline document to promote shorebird conservation.

5.1.2. Thematic document analysis

A document analysis was conducted to identify plan attributes and assess the design for implementation of each of the conservation plans. Table 1 shows a document comparison table with code occurrence totals for each conservation plan and attribute code, with a zero indicating an absence of the attribute from the conservation plan. Each occurrence represents a single instance of discussion of the indicated attribute within the plan.

Table 1: Document comparison table of the three conservation plans and attributes of the plans. Values indicate the total number of occurrence(s) for each attribute. The three migratory shorebird conservation plans relevant to the Puget Sound region of Washington: the Northern Pacific Coast Regional Shorebird Management Plan (regional, 2000), the U.S. Shorebird Conservation Plan (national. 2001), and the Pacific-Americas Shorebird Conservation Strategy (international, 2016).

	Themes	Northern Pacific Coast Regional Shorebird Management Plan (Regional Plan)	U.S. Shorebird Conservation Plan (National Plan)	Pacific Americas Shorebird Conservation Strategy (International Plan)	Totals
Institutional and Governance Attributes	Formality	0	4	0	4
	Implementation: Governance structures	1	5	9	15
	Implementation: Resources	2	8	11	21
	Implementation: Scientific body	1	4	4	9
	Provisions: Review mechanism	1	2	0	3
Ecological Attributes	Ecological Knowledge: Shorebird habitat	5	4	11	20
	Ecological Knowledge: Shorebird species	3	10	7	20
	Scope: Spatial	3	3	12	18
	Scope: Taxonomic	2	3	5	10
	Threats: Climate change	0	0	7	7
	Threats: Disturbance	2	1	7	10
	Threats: Habitat Loss	4	6	11	21
	Threats: Hunting	1	0	1	2
	Threats: Pollution	1	1	1	3
	Totals	26	51	86	163

5.1.3 Analysis of key institutional and governance attributes of the conservation plans

The thematic document analysis revealed five key institutional and governance attributes of the conservation plans:

- Formality
- Governance structures
- Resources
- Scientific body
- Review mechanism

The presence of these five attributes within a conservation plan are extremely valuable in plan implementation. Observations of discussions within the plans regarding formality, governance structures, resources, scientific bodies, and review mechanisms are included below, as well as attribute-specific comparisons between the plans within each attribute.

Formality

The formality attribute describes the legal standing or regulatory authority of a conservation plan. The U.S. Shorebird Conservation Plan is the only one of the three conservation plans with formality. The national plan was written as a complement to the North American Waterfowl Management Plan, which is a bird conservation partnership signed by the United States and Canada in 1986 and Mexico in 1994. Neither the Northern Pacific Coast Regional Management Plan nor the Pacific Americas Shorebird Conservation Strategy explicitly state their legal status. Interviews with the plan representatives reaffirmed the formality observations made during the thematic document analysis.

Implementation mechanism: governance structures

The Northern Pacific Coast Regional Shorebird Management Plan claimed the Regional Working Group would continue to work with the Pacific Coast Joint Venture on conservation operations ranging from education to habitat restoration. Much of the discussion around governance structures in the regional plan is presented as a goal for the future rather than a declaration.

For the U.S. Shorebird Conservation Strategy, the U.S. Shorebird Plan Council was tasked with coordinating its implementation, and the national-level plan claimed other “major implementation partnerships” would be established with “interested Joint Ventures organized under the North American Waterfowl Management Plan and Partners in Flight” (U.S. Shorebird Conservation Plan).

The Pacific Americas Shorebird Conservation Strategy detailed the significance of its steering committee and planning committee, as well as outlined potential hurdles to the implementation of the plan from a governance standpoint.

Resources

Each of the three conservation plans discusses access to resources, specifically funding, as instrumental in the success of conservation efforts. That being said, the Pacific Americas Shorebird Conservation Strategy discussed funding opportunities more than the regional or national-level conservation plans, mentioning funding on 11 separate occurrences. There are very few mentions of shorebird-specific grants for conservation projects. During their interviews, the regional plan representative and the national plan representative indicated a deficiency of direct funding from the conservation plans.

Implementation mechanism: scientific body

None of the three plans identified a standing body strictly dedicated to the technical or scientific aspects of shorebird conservation. However, the national and international-level plans did emphasize the importance of data sharing and monitoring process standardization

for successful implementation of conservation plan goals.

Review mechanism

Review mechanisms are methods explicitly outlined for the review and reassessment of the document to ensure relevancy, allow for adaptive management, and promote the use of best available science in the management guidance and conservation needs provided by each conservation plan. None of the three conservation plans included an explicit structure or process for the plan's review, however, each of the plans briefly acknowledged the importance of regular review for the success of implementation.

5.2. Implementation of conservation plans

Research Question 2: How are these plans implemented?

5.2.1. Awareness

Key informant awareness of each of the three conservation plans was categorized into one of three levels:

- "**None**": the lowest level of awareness; no familiarity or recognition of the plan in question.
- "**Cursory**": given to key informants who were familiar with the name of the plan, but not of its content.
- "**Comprehension**": highest level of awareness; only attributed to key informants who exhibited an understanding of the scope or purpose of a conservation plan.

Across all three conservation plans, most key informants (48%) have a *cursory* level of awareness. The smallest percentage of key informants (23%) display a *comprehension* level of awareness, while more (29%) key informants have no awareness of the conservation plans.

When evaluating awareness for each plan, both the regional and national have 50% of key informants with *cursory*, 25% with *comprehension*, and 25% with a level of awareness of *none*. Key informants had the lowest level (18.8%) of comprehension with the international plan. The cursory-level awareness for the international plan was 43.8% while 37.4% showed no awareness of the plan.

5.2.2. Actions on-the-ground

Information on all actions taken on-the-ground for each organization was collected through key informant interviews and categorized by type:

- Active land management
- Education and outreach
- Fundraising
- Land acquisition
- Policy
- Research and monitoring

The analysis also captured whether actions conducted on the ground were conducted with the explicit intention of benefiting shorebirds– as indicated by the key informant (Table 2). However, it was observed that key informant awareness of the conservation plans varied and did not drive or enable whether a key informant or their organization implemented strategies for shorebird conservation; one key informant with a none-level of awareness, and three key informants with a cursory-level of awareness of the conservation plans indicated that they or their organization implemented research and monitoring or active land management activities for shorebird conservation.

Out of the 15 organizations interviewed, 22% conduct actions on-the-ground in education and outreach, 21% in active land management, 19% in research and monitoring, 17% in policy, and 5% in land acquisition.

Table 2: Actions on-the-ground (by type) are shown for each of the key informants interviewed. Key informant awareness of the three conservation plans is also shown.
(*) Indicates a key informant for their organization described at least one example of this type of action on-the-ground taken by the organization to be shorebird specific in its intent.

	Awareness of Conservation Plans			Actions on the Ground					
KI #	International	National	Regional	Active Land Management	Education & Outreach	Fundraising	Land Acquisition	Policy	Research & Monitoring
1	Cursory	Cursory	Cursory	X	X				
2	None	None	None	X					
3	None	Comprehension	Comprehension	X			X		X*
4	None	Cursory	None	X	X		X	X	X
5	Cursory	Cursory	Cursory	X	X	X			
6	Cursory	Cursory	Cursory	X	X	X	X		
7	Cursory	None	None		X			X	X
8	None	None	None	X	X				X*
9	Cursory	Cursory	Cursory	X	X			X	X*
10	Comprehension	Comprehension	Comprehension		X	X		X	
11	None	Cursory	Cursory	X*	X	X		X	
12	Cursory	Cursory	Cursory	X	X	X	X	X	X
13	None	None	None	X				X	X
14	Comprehension	Comprehension	Comprehension	X	X	X	X		X*
15	--	--	--	X	X	X		X	X
16	Cursory	Cursory	Cursory	X	X		X	X*	X*
17	Cursory	Cursory	Cursory	X	X		X	X*	X*
18	--	--	--	X					X
19	Comprehension	Comprehension	Comprehension		X*			X	X*

Shorebird-specific actions on-the-ground by type

Six organizations indicated they have implemented shorebird-specific actions on-the-ground. Of these six organizations, three have a key informant in an executive-level position, two organizations have a key informant in management, and one organization has two key informants in an operational-level position within the same organization. Shorebird-specific actions by these organizations are largely in research and monitoring; however, policy, education and outreach, and active land management each had at least one organization indicating this type of action on-the-ground that were shorebird-specific in focus.

Type of actions on-the-ground by sector

The organizations represented by key informants categorized by sector:

- Government: four key informants
- Industry: one key informant
- NGO: eight key informants
- Tribal governments: two key informants

Actions on-the-ground taken by government organizations are equal across active land management, education and outreach, and research and monitoring. The industry organization conducts actions on-the-ground in active land management, education and outreach, fundraising, and policy. For nongovernmental organizations, most actions taken on-the-ground are in education and outreach. Actions taken on-the-ground by tribal organizations are equal across active land management, policy, and research and monitoring.

5.2.3. Internal documents

Four out of the eleven internal documents provided by key informants included the term “shorebird”. Out of these four documents, two

only mentioned shorebirds twice in reference to biodiversity and that shorebirds may be found in the area.

Out of the eleven internal documents reviewed, one referred to a conservation plan. This internal document was an area management plan and referenced the regional shorebird conservation plan. It included information on the goals of the regional conservation plan, and the importance of supporting biodiversity and habitat for migratory species of shorebirds. However, the internal document and its 2017 update do not include references to the national and international-level conservation plans.

5.3. Perceived factors that limit or enable shorebird conservation and implementation of conservation plans

Research Question 3: What are the perceived factors that enable or limit shorebird conservation and the implementation of shorebird conservation plans?

Interviews of key informants were assessed to identify perceived factors that were discussed contextually or identified explicitly to limit or enable shorebird conservation and the actions on-the-ground conducted by their organization. These factors fell into one of four overarching categories:

- **Resources**
  A category which includes internal and external funding sources, personnel, equipment, and land. Resources that are accessible to actors can enable shorebird conservation and implementation of conservation plans, whereas a lack or insufficient amount of available resources can limit it.

- **Interactions with organizations**
  This category includes discussions or examples of engagement and/or collaboration amongst actors. The presence of interactions with organizations can enable shorebird conservation or the implementation of conservation plans, whereas a lack of or insufficient amount can limit it. Insufficiencies can include abundance (number of actors in the space) and diversity (different types of actors in the space).

- **Interactions with policies**
  This category includes discussions or examples of actors implementing or using policies that are relevant to their work. It also includes key informant discussion of interacting with the conservation plans. Policies that support or provide opportunities for the implementation of shorebird conservation or the plans are considered factors that enable, whereas policies that are described as being prohibitive or as posing challenges to the work are considered factors that limit.

- **Knowledge**
  A category which includes key informant knowledge of shorebird ecology. The presence of shorebird knowledge can enable shorebird conservation and the implementation of conservation plans, whereas a lack of knowledge–or a knowledge gap–regarding shorebird ecology is considered a factor that can limit conservation efforts. Subcategories include knowledge or knowledge gaps around shorebird habitat and threats.

Key informants who demonstrated either cursory or comprehension-level awareness of any given plan were asked additional questions regarding their perception of factors that limit or enable the plans implementation or use. This data was included as a separate section of the two-part analysis described below.

5.3.1. Perceived factors enabling shorebird conservation

Table 3: Perceived factors (by type) that enable shorebird conservation in Skagit identified by key informants.

*KI = key informant

	Awareness of Conservation Plans			Perceived factors that enable shorebird conservation			
KI #	International	National	Regional	Resources	Knowledge	Interactions with Organizations	Interactions with Policies
1	Cursory	Cursory	Cursory		X	X	X
2	None	None	None			X	
3	None	Comprehension	Comprehension	X	X	X	X
4	None	Cursory	None	X	X	X	
5	Cursory	Cursory	Cursory	X	X	X	
6	Cursory	Cursory	Cursory	X	X	X	X
7	Cursory	None	None		X		X
8	None	None	None		X		X
9	Cursory	Cursory	Cursory	X	X	X	
10	Comprehension	Comprehension	Comprehension		X	X	X
11	None	Cursory	Cursory	X	X	X	
12	Cursory	Cursory	Cursory		X	X	
13	None	None	None		X	X	
14	Comprehension	Comprehension	Comprehension	X	X	X	X
15	--	--	--				
16	Cursory	Cursory	Cursory	X	X	X	X
17	Cursory	Cursory	Cursory	X	X	X	X
18	--	--	--				
19	Comprehension	Comprehension	Comprehension	X	X	X	X

Resources

Some key informants view the Farming for Wildlife pilot program – where agricultural lands can be temporarily flooded (one to three years) – as a way to provide habitat for shorebird conservation purposes. This was seen as a potential resource as it previously was shown to provide a place for migratory shorebirds, as well as other avian species, to feed[7]. Also, a key informant shared that some salmon restoration projects have secured funding to consider management strategies for additional species, which highlights the potential growing opportunity for shorebird conservation to be included in this type of project moving forward.

[7] The Farming for Wildlife program temporarily floods agricultural lands during scheduled crop rotations to provide habitat for shorebirds and other wetland-dependent avian species. A pilot project was conducted over 200 acres across 3 privately held farms in the Skagit Delta. Monitoring from 2007 to 2009 showed compared to grazed or harvest fields, temporarily flooded fields provided significantly more habitat for shorebirds during the migration periods, including Greater and Lesser Yellowlegs, Long-billed Dowitchers, and Western Sandpipers (Morse, 2013; The Nature Conservancy, 2013).

Knowledge

Most key informants are aware of shorebirds found in Skagit and cited experience with either observing groups of them on their site or in the area.

> ***"Skagit is a great place for shorebirds and especially in the wintertime. You know, you have huge aerial acrobatic flocks of beautiful shorebirds, you know, that are quite mesmerizing"***
> **- Key Informant**

Many key informants also identified threats to migratory shorebirds, including habitat loss and degradation, pollution, invasive species, oil spills, water quality issues, climate change, and avian influenza. Site designations for Skagit by WHSRN and Audubon help increase awareness and knowledge of migratory shorebirds.

Specific sources of data/information for shorebirds used by key informants include relevant scientific literature, eBird, and Cornell Laboratory Ornithology's database. Some key informants discussed monitoring projects that included counting shorebirds on their site.

Another perceived factor relates to salmon restoration projects – a key informant described how large wood is included in salmon restoration strategies within stream channels, and this could potentially benefit shorebirds as roosting habitat. This shows that the key informant is knowledgeable about shorebird ecology and habitat needs, as well as how that might overlap with salmon restoration strategies.

The Northwest Indian Fisheries Commission's monthly newsletter was identified as an important source for information for actors as it may contain relevant information on regional issues and projects. Furthermore, key informants noted Audubon Washington's upcoming Avian Monitoring Framework project as a tool that will help provide them with necessary information to advance shorebird conservation strategies.

Interactions with organizations

Many key informants described person-centric interactions in other organizations as important to learning about migratory shorebirds, strategies for shorebird conservation, and other important resources. Several key informants discussed the reliance on a particular individual and/or organization for shorebird ecological data. Therefore, increasing interactions with organizations might help address knowledge, resource, or other capacity issues actors may experience.

Some key informants said that implementing strategies for migratory shorebirds was not required for their position; however, each described their interest in doing so and considered these person-centric interactions as integral to be able to accomplish the work.

The Puget Sound Partnership was identified as a place for discussions relevant to migratory shorebirds and to interact with other actors. Audubon Washington, the Ecostudies Institute, Pacific Habitat Bird Joint Venture, Washington Department of Fish and Wildlife, and Tribal governments were identified as important organizations to interact with.

For ways to increase the number and diversity of interactions amongst organizations, a key informant perceives there has been an increase in conversations amongst actors around multi-species or multi-benefit approach to management. Additionally, a key informant noted the Farming for Wildlife program as a way to enable shorebird conservation through interacting with the agricultural community in Skagit. Lastly, bird monitoring surveys were noted as a way to interact with other organizations, since it can provide outreach and networking opportunities.

Interactions with policies

As defined for the purposes of this study, a policy is a system of guidelines or set of ideas intended to guide decisions and achieve certain outcomes which may or may not be legally binding. A key informant stated they refer to the North American Wetlands Conservation Act (NAWCA) to implement projects on-the-ground. The Puget Sound Partnership action agenda, local watershed plans, documents from the Pacific Birds Habitat Joint Venture, WDFW, and local Tribal governments are also perceived as important policies to enable shorebird conservation.

5.3.2. Perceived factors enabling the implementation shorebird conservation plans

Resources

The shorebird conservation plans have been used by key informants to acquire additional resources, especially with external funding sources. For example, the shorebird conservation plans were referenced in grant applications by two key informants, either because it is required as part of the application process or it is perceived to provide more legitimacy to the proposal.

> ***"But in that [grant] process- and honestly, I didn't ever reference those plans before. A lot of them are super outdated. But there's just a lot of plans. It's a big mess. There's not like this one plan for this region. It's like, some of the plans I was looking at were like all of North America, and I'm like, 'okay, well, that is just not helpful for me at all'. And I don't see a lot of teeth to these plans. It's just a lot of jargon about what would potentially help the species, and maybe some stated goals…so, yes, we're aware of [the plans] and they have been incorporated into our last grant proposal".***
> **- Key Informant**

Knowledge

One key informant identified the international conservation plan as a resource for information on threats and potential strategies at the hemispheric level that could be relevant to actors.

Interactions with organizations

A key informant identified interactions with an organization as the mode for how they heard of the shorebird conservation plans.

Interactions with policies

A key informant said they previously used the regional and national conservation plans to inform and guide work on coastal areas and wetlands, though also noted that they use the regional plan more than the others. The international plan was described as a good reference by a key informant. A key informant said they use shorebird conservation plans in their management plans, though it was outside of the case study area and not included in document analysis. The regional and international plans were described as helpful for providing "bigger picture ideas", though noted that the scale is too large to be able to implement the plan into strategies without the assistance of experts.

5.3.3. Perceived factors limiting shorebird conservation

Table 4: Perceived factors that limit shorebird conservation in Skagit identified by key informants.

*KI = key informant

	Awareness of Conservation Plans			Perceived factors that limit shorebird conservation			
KI #	International	National	Regional	Resources	Knowledge	Interactions with Organizations	Interactions with Policies
1	Cursory	Cursory	Cursory	X	X	X	X
2	None	None	None	X	X		X
3	None	Comprehension	Comprehension	X	X	X	X
4	None	Cursory	None	X	X		X
5	Cursory	Cursory	Cursory	X	X	X	X
6	Cursory	Cursory	Cursory	X	X	X	X
7	Cursory	None	None		X	X	X
8	None	None	None	X	X		X
9	Cursory	Cursory	Cursory	X	X		X
10	Comprehension	Comprehension	Comprehension	X	X		X
11	None	Cursory	Cursory	X	X		X
12	Cursory	Cursory	Cursory	X	X	X	X
13	None	None	None	X	X	X	X
14	Comprehension	Comprehension	Comprehension	X	X	X	X
15	--	--	--	X	X		X
16	Cursory	Cursory	Cursory	X	X	X	X
17	Cursory	Cursory	Cursory	X	X	X	X
18	--	--	--	X			
19	Comprehension	Comprehension	Comprehension	X	X	X	X

Resources

The factors related to resources that limit shorebird conservation, as identified or described by key informants, were funding-specific, personnel-specific, and land and equipment-specific. Most key informants attributed shorebird conservation challenges to the lack of shorebird-specific grant funding.

Although general grants are available to do work in estuaries, a significant amount of the funding is allocated toward other prominent species in the Skagit area, such as salmon. Additionally, sources of funding for salmon restoration were described as not always allowing for the consideration of shorebird conservation strategies, creating what two key informants referred to as a "silo" for funding.

> ***"Money is for Chinook and only for Chinook, for ducks and only ducks, or snow geese and always snow geese. And you can use it to manage it, you can't use it to buy it. Or you can use it to buy it and not to monitor it. So, the silo funding effect really exacerbates the inability to do ecosystem management out here. And I would argue statewide".***
>
> **- Key Informant**

The absence of shorebird-specific funding is perceived as a lack of prioritization of shorebirds amongst various organizations and might put too much emphasis on single-species management. A key informant described a feedback loop created when there is a lack of funding, it leads to insufficient data collection and even less data analysis, which means there

is not enough information to inform decision-makers and agenda setting for policy, which may impact funding. Several interviewees described insufficient long-term funding and initial funding for early-stage development required to support extensive wetland conservation efforts as an additional resource deficiency. Key informants described difficulties with prioritizing shorebirds or shorebird-related projects due to the unreliability of funding.

The personnel-related resource barriers to shorebird conservation are focused on the need for land managers and the lack of shorebird experts—a need which is currently hindering the operational capacity of several land management organizations. Key informants from different sectors and levels of governance communicated the shortage of land managers and highlighted their importance in wetland restoration efforts which often occur over an extended period. Four key informants identified the absence of shorebird experts as a detriment to the prioritization of shorebird-related conservation projects; many of these key informants rely on one individual and organization to provide guidance and data on shorebirds.

The third resource barrier discussed by key informants is the lack of public lands in Skagit and challenges with equipment[8] availability.

"A lot of shorebird habitat [in western Washington] is provided by lands that are privately owned, and [land managers] have no control over how those are managed."
– Key Informant

With more public land, land managers and other conservation organizations would have greater opportunity and authority to conduct the long-term restoration efforts requisite for effective migratory shorebird conservation. When discussing issues with equipment availability to do work on their site, a key informant discussed how timing issues can occur between personnel, funding, environmental factors (seasons, water availability, migrations), and priorities of the organization.

"There's a lot of equipment capacity there, a far as like having the knowledge and timing of when you might do particular things, or your ability to do things is kind of also driven by the system themselves, as far as restrictions that we have due to federal permitting requirements and the ability to get out there during that time frame because of the tides and that sort of thing... I think it does kind of boil down to like, what are the priorities? And how do the priorities line up with the staff that you have at the time to be able to accomplish it at the time… A lot of it may be very time driven. And then the other aspect is, if you were working in outside of the estuary, and we're working more of the Ag system, you know, basically with inside the dikes, any work that you're going to do, you're gonna be fighting to try to find water during the timeframe with water is not usually available. Because like the timeframe when the birds are coming through is the timeframe, you know, like when the bigger migration time period is here, the ability to find water to put in, you know, ag systems that are heavily drained and also aren't getting rain. You know, that timeframe is really good…You thought you're fighting an uphill battle, basically, because it's dry, and there's very limited water in the system that's easily accessible without intensive pumping, that sort of thing."
– Key Informant

Knowledge

Knowledge gaps related to shorebird ecology were consistently discussed as a shorebird conservation barrier by key informants of all sectors, levels of governance, and levels in organization. Specific knowledge gaps for

[8] Equipment refers to machinery used for land management.

migratory shorebird ecology in Skagit that were identified by key informants include:

- What strategies benefit shorebirds across different land uses
- Threats to shorebirds in Skagit
- Historical reference sites
- Shorebird abundance and species status
- Shorebird feeding and roosting behaviors at the regional level
- Where shorebirds are located at the site level

A knowledge gap also identified by key informants referred to not knowing what actors are doing regionally, including project and monitoring efforts. Many key informants described the barrier of not having enough time or resources to be able to address these complex issues and knowledge gaps, but would like to be provided more information, even though some noted that it is outside of the purview of their role within their organization.

A key informant identified paid data sources as being a barrier to increasing knowledge about shorebirds. Specific knowledge gaps for migratory shorebirds in Skagit that were identified by key informants include: what strategies benefit shorebirds across different land uses; ecological knowledge (threats, abundance and status, feeding and roosting behaviors at the regional level, and where shorebirds are located at the site level).

Several key informants note that even though management strategies may not be implemented with shorebirds as a priority, they still benefit indirectly from these actions – though, some acknowledged that they have not quantified or studied this perception. Five key informants conveyed difficulties with shorebird monitoring, with the acknowledgement that shorebird populations are challenging to monitor (e.g., they are mobile and can use habitat that is hard to get to), as a barrier to shorebird conservation in Skagit.

Several key informants attributed their shorebird monitoring concerns to a lack of standardization with the monitoring process across different sites and the potential difficulty of comparing data without methods being consistent across studies. One key informant discussed a lack of standardization across organizations with the classification of different zonations used by shorebirds–zonations which might dictate where a project takes place.

Several key informants shared their perception of shorebird conservation needs, or lack thereof, due to the size of shorebird murmurations in Skagit and frequency with which these murmurations are observed. With shorebird sightings so frequent, key informants perceived shorebird populations to be stable. Moreover, several key informants did not know about the status of shorebird populations, and one expressed the view that there are too many special status designations for species of shorebirds, which can be too confusing.

Interactions with Organizations

Discussions involving perceived factors that limit shorebird conservation, in relation to interaction with organizations, include level of engagement, diversity of engagement, competing priorities amongst actors, and willingness. A key informant perceives the level of engagement in shorebird conservation to have decreased over time, there is a lack of a collaborative space for actors, and many actors may not have the capacity to engage about shorebird conservation. Some shared the perception that shorebirds are not a priority for actors, which relates to a perception of local pushback, and a lack of willingness to work on shorebird conservation.

Interactions with Policies

Difficulties with permitting and the policy constraints of conducting restoration projects in a salmon-centric area were the two most referenced policy-related barriers to shorebird conservation in Skagit. Several key informants

indicated permitting issues are most frequently encountered at the local and state level and often reveal discrepancies between what is needed for shorebird conservation and what is permitted. The disconnect between the habitat needs of shorebirds and the way state and local laws are written is a significant barrier identified by six of key informants. One key informant expressed their frustrations with local permitting processes and claimed that local government regulations favor process-based wetland restoration, which requires setting the land or area aside and prohibits further human intervention.

> ***"[The] kind of wetlands that shorebirds and ducks and a lot of amphibians really like are these early successional wetlands—if [an organization] restore[s] one of those, in a few years it won't be that."***
> **– Key Informant**

A few key informants acknowledged the permitting process and web of regulation surrounding wetland restoration can quickly become expensive and time consuming, limiting the capacity of smaller organizations to participate in wetland restoration efforts. Stipulations and restrictions set forth by public funding and grants led one key informant to step away from these sources and use private streams instead.

Other key informants who rely on public funding sources describe the inflexibility of these policies. For example, requirements for grant applications through Skagit Watershed Council are limited to salmon-specific strategies, which supports the implementation of the Chinook Recovery Plan. However, some key informants described the requirements as being too restrictive, and if other species management strategies – such as shorebirds – are included, it would result in a negative impact to the scoring of the proposal. Many held the perception that estuary restoration projects, regardless of the project's priority species, would still benefit migratory shorebird populations and other species of wildlife — however, some noted that there is more key informants can do to improve this benefit.

5.3.4. Perceived factors limiting the implementation shorebird conservation plans

Resources

Of the key informants with either cursory or comprehension-level awareness of the conservation plans, many described resource barriers as a hindrance to the implementation of the conservation plans' objectives and suggested actions. Similar to the resource barriers to shorebird conservation efforts, key informants able to answer this interview question claimed the lack of shorebird-specific grants and the lack of public lands in western Washington as the two greatest resource-related conservation plan implementation barriers. Two key informants expressed the plans might be better implemented in areas with more public land, as a lot of the suggested actions are dependent on such.

Knowledge

Many key informants indicated use of the conservation plans as a source for general shorebird information, which could contribute to shorebird knowledge. However, the lack of review and updates to the existing conservation plans lead several key informants to suggest the plans might not have the most accurate information for shorebird conservation in Skagit. Additionally, while the plans' scales were described as being "bigger picture" and a "good read", many key informants noted they are too difficult to use for specific actions on-the-ground.

Interactions with Organizations

According to several key informants, engagement in discussions on migratory shorebird conservation and the conservation

plans has decreased over time across all levels of governance, but especially at the national level. The national conservation plan has slightly more regulatory capacity than the regional conservation plan and the international

conservation plan, but there is little interaction between organizations at the national level per one key informant. The interviewees who claimed engagement is declining also suggested the use of Joint Ventures and a top-down implementation method could assist in bolstering engagement across organizations from all sectors and levels of governance. There is little inclusion of local practitioners in the networks set up by the conservation plans, which has resulted in a disconnect between the representatives of the conservation plans and the operational level actors.

Interactions with Policies

Key informants communicated diminishing relevance of the strategies at the site-specific level as the most prominent perceived barrier to the implementation of the shorebird conservation plans.

> ***"A lot of those strategies feel more applicable to Central and South America, as we've been looking through it."***
> **– Key Informant**

Difficulty scaling down the conservation plans impedes the use of the plans by land and area managers at the site-specific level, particularly in an area with a perceived shortage of public lands such as western Washington.

A key informant identified the lack of state or federal protections of threatened or imperiled species of shorebirds as an issue. It was viewed that these protections would help with implementing policies for shorebird conservation, including those in the shorebird conservation plans.

6. Recommendations from key informants

6.1. Knowledge Sharing

Key informants provided recommendations for bolstering shorebird conservation efforts and the potential implementation of the three conservation plans. One of the most frequently discussed recommendations is the desire for short, concise, Skagit Bay-specific information communicated in a way that can be digested by all audiences such as:

- Actionable items
- Shorebird habitat data and shorebird population data
- Limiting factors such as culverts
- Voluntary conservation opportunities for landowners to prevent habitat fragmentation
- Ongoing programs at multi-levels of governance, including opportunities for resources and strategies
    - e.g. Farming for Wildlife

6.2. Networking

Key informants value networking opportunities for their knowledge and resource-sharing benefits. Several recommendations from key informants included a need for information about existing and ongoing projects in Skagit Bay to gain a regional perspective of shorebird conservation efforts and how it may relate to the big picture. Another component of networking key informants want to improve is sharing research and monitoring frameworks to ensure on-the-ground actions are conducted with the best available science.

Many of the key informants want to understand how shorebirds fit into the larger ecological picture of estuary ecosystems in Skagit Bay. With this knowledge and an understanding of other organizations' agendas, inter-organization cooperation can further collective goals. Shifting from a single-species management approach to the implementation of a multi-benefit and ecosystem-based approach–which includes humans in the ecosystem–will be influential in promoting shorebird conservation according to key informants.

> ***"So if…one of the other landowners was like, 'Yeah, we want a shorebird project'. That would be something that we can provide…I could see if there was a more dedicated and clearly-articulated shorebird emphasis from our partners. [L]ike we're concentrating on spotted frogs, and we're not a spotted frog organization…but we recognize the benefit to waterfowl. I think the same argument could be done with shorebirds, so if there's like, 'oh, we need shorebird habitat here and this is what it looks like,' that's something that [organization redacted] is interested in supporting–because it closely aligns with what we're trying to do."***
>
> **-Key Informant**

(See Appendix B for a comprehensive list of key informant recommendations).

7. Study limitations

Although virtual interviews allowed for a greater range of interviewees, the data might have been enriched by conducting interviews on-site. Due to time constraints, the research team decided to complete interviews through Zoom. Each interview was initiated, scheduled, and audio recorded according to a pre-established process for interviewee engagement to mitigate potential technological difficulties.

Two of the key informants were not asked interview questions pertaining to their level of awareness of the conservation plans. These questions were not pertinent to the interviewee; however, the data provided in the interviews remained in the analysis due to the insightful and important information that the individual contributed to our research.

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Appendix A: Overview of Goals/Objectives of the Three conservation plans

International:Pacific Americas Shorebird Conservation Strategy (Senner et al., 2016)

1. Manage and conserve existing habitat
2. Cultivate and empower conservation constituencies
3. Create conservation initiatives with natural resource industries
4. Strengthen compliance and enforcement
5. Develop environmental and wildlife protection policies
6. Improve knowledge of present and future habitats
7. Increase partner and stakeholder capacity

National: U.S. Shorebird Conservation Plan (Brown et al., 2001)

1. Restore and maintain populations within the Western Hemisphere
    a. Develop monitoring programs, research limiting factors that limit populations and focus conservation in these areas, coordinate internationally
2. Stabilize population in decline in the US
    a. Integrate regional management, identify limiting factors in US and management actions to ameliorate them
3. Provide high quality habitat and integrate these efforts into multiple species management initiatives where appropriate, and increase understanding of effects on habitat
    a. Identify landscape variables that affect use of region, monitor shorebird use of habitat, establish a habitat budget, promote dynamic use of wetlands, encourage management strategies that clarify the most important determinants of shorebird use of particular habitats

Regional: Northern Pacific Coast Region Shorebird Management Plan (Drut and Buchanan, 2000)

1. Population goals
    a. Measurably increase populations in decline, stabilize current levels of breeding, wintering and migrating populations
2. Monitoring and research
    a. Monitor breeding, wintering and migratory populations to determine trends
    b. Working group research goals: population status, habitat status, contaminants, and general shorebird ecology
3. Habitat
    a. Protect, restore and enhance
4. Management effectiveness and coordination
    a. Develop comprehensive management plans, refine strategies to reduce threats, integrate conservation strategies amongst multiple partners, use a variety of techniques to enhance/restore/protect habitat, improve communication
5. Outreach and education
    a. Provide information on shorebird conservation and management issues to land managers and owners
6. Funding
    a. Substantial levels of funding are required to support two management biologists, research and monitoring efforts, on-the-ground habitat management, and acquisition

Appendix B: Comprehensive Quotation List of Recommendations Made by All Key Informants

Quotation No.	*Quotation Content*
1	“So a Regional Fishery Enhancement Group is this semi governmental organization, kind of like conservation districts that were established, and they have seed money, but they're a nonprofit. And what they do is they try to find work that advances salmon recovery in their basin. So they're organized usually by the WRIAS, the water resource inventory area. And they are this little, kind of grassroots organization that usually they're planting trees, sometimes they're putting in wood, a lot of times they're taking out invasive vegetation, they do a lot of outreach and education. We don't have anything for that, like that for birds. And the thing is, those aren't tied to the land. They're not tied to a specific property, right, they can operate with it wherever they want in the watershed. So if we did something similar in the state for birds, and in the Skagit, they might have access to a marsh master so they can go out and work in the wetlands and take out invasive canary grass, or they might have equipment that they can read to farmers and they might be trained to do beaver management on farmland. So that, you know, the schedule group would look like one thing that group in Seattle would be detention ponds, working with the cities, and educating people. So if you had something like that for birds, you might be able to have the muscle to do a lot of the management because most of the habitat the shorebirds and ducks rely on needs some kind of constant intervention.”
2	“I think a limiting factor is that, and this is coming from having worked on shorebirds for such a long time, and that I think they're the coolest kinds of birds around, is it not everybody feels that way. And so a limiting factor is the shorebird forward approach. That it may be about keeping farmers farming or clean water. And that kind of perspective could actually do more for sure for conservation than making sure that everybody understands what a shorebird is and what they need. Now, it's hard to wrap your brain around when you're trained as a biologist.”
3	“I think the other piece that's important is like not, we also run the risk of like, we just focus on shorebirds. We lose a lot of leverage or a lot of synergy with other birds, waterfowl, or other Western species such as salmon. Well, I think, you know, I wish there is a way we could think about, think about it a little more holistically, and how those how those things interconnect and help benefit salmon, Chinook salmon benefit shorebirds, or waterfowl, that that would give a little more power to the conservation strategies that I think are often shared amongst those species.”
4	“There's been a lot of discussions in Skagit County too about, people love to come birdwatch here, and then just how to like, do that respectfully, when you're adjacent to private property. So maybe just more information for tourists or people who are out and about, you know, where they can access birding areas or habitat areas.”
5	“So I think [what’s hard about] a lot of these plans is just integrating all those different data sets. And I know it would be impossible to probably... not impossible but probably not worth it... to completely integrate all the plans, but having some cheat sheets where they overlap and where there's some conflict would be really nice.“
6	“I think birds are really hard to monitor. Right? And so correlating them very, trying to identify habitats that they use. As a habitat bio. I'm really focused on the land, it doesn't move around. Right? And so if there was a way to really get at the uses of different types of habitat, as opposed to trying to

	track the birds, I think that would be really useful for me. Like if, if I know with some level of certainty, if we restored this, I'm looking at this many duck use days or, or use days or however that that can be defined. That gives me a way to evaluate different conservation projects that I can go after."
7	"I guess if there was a dedicated pot of money So DFW, or one of our other landowners was like, 'Yeah, we want a shorebird project.' That would be something that we can provide. It's going to have waterfowl benefits. And we are primarily trying to help the conditions that we're trying to make duck habitat right, right and shorebird habitats usually duck habitat. So I see if there was a more dedicated and clear, clearly articulated shorebird emphasis from our partners. We definitely… like we're concentrating on spotted frogs and we're not a spotted frog organization. But we recognize the benefit to waterfowl. I think the same argument could be done with shorebirds so if there's like, 'oh, we need shorebird habitat here and this is what it looks like', that's something that Ducks Unlimited is interested in supporting because it closely aligns with what we're trying to do."
8	"So one thing that would influence our ability to conserve shortlands is Skagit Valley is really two things, right? We've mentioned, agriculture is not just a way to feed people here, but it's also a big part of the culture. And granted, farming culture is not as old as indigenous culture. But it is and you know, AG has been here and as part of the, the bones of a lot of families for many generations. And the potential conflict between habitat restoration, conversion of farmland to wetland, and agricultural land use can be contentious. There's a lot of concern. There's an organization here called Skagitonians to Preserve Farmlands, it's an advocacy group for agriculture. And so there is a concern in this area of losing ag lands, not just from the food production standpoint, but from an economical standpoint and the culture of it. So that's one thing, depending on how much that sways one way or the other that can influence our land restoration or habitat reservation and kind of restoration and conservation."
9	"The other thing that is even more important than that, we haven't mentioned all, is partnerships and engagement with tribes. So restoration projects can move forward or not move forward depending on the support or lack of support from the tribe. So we work really closely with our local Sammamish and Swinomish tribes when we are working on restoration projects and ideas. We connect with them and say, How does this meet? You know, Does this meet your needs? [Does] this help support your goals for the region? Is this you know, we are in the lands and waters that have been tribal since time immemorial…So that's really important to us, as to me as a person and as a director and our reserve is making sure that we are being stewards for our environment here and that we were stewarding in a way that is aligned with for indigenous communities, because we recognize that before this land was a reserve, and before it was farmland, it was the home of all the indigenous coastal Salish people here. And so I take that very seriously. And so we want to make sure that we work with our tribal partners, as we approach any kind of restoration. So those are the two farming and tribes."
10	"You also have interplay of shorebirds on agricultural ground. And yeah, I, you know, to me, it's, you witness the birds utilizing those areas during the right conditions. But yeah, I mean, what's the value of the, I guess I'll say agricultural ground. Being that it makes up a tremendous amount here in the valley, as compared to the marsh, it's, it's that little. Yeah, being able to have a better understanding of how important this area is for shorebirds. And I guess I'll say give each different habitat type its value for us to be able to, you know, continue to manage, manage it the way we are, make changes into the future. Yeah, I mean, that's kind of the thing that it needs to advance. For, you know, I guess I'd say habitat managers to be able to include and look how we can, you know, provide aspects of it into that talk."
11	"I think when we talked about shorebird stuff or waterfowl stuff, I think it's important for land owners, land managers to just know, you know, try to keep up to date on what's going on around around their property if they're doing habitat management, because I think obtaining data that can be used by everyone is super important."
12	"Are there any benefits that the ag fields have? And is there anything that farmers can do? You

	know, they're not going to breach land and make it estuary. But is there something that they can do to make their lands a little more favorable to shorebirds and, and it's been pretty amazing how many shorebirds we've seen using flooded ag fields, and even the irrigation ditches and if it's something as simple as drawing your water down, and your irrigation ditch to allow for access to this silt and sediment that's on the sides in the bottom that can include source for shorebirds, especially during high tide. I think that's a big data gap."
13	"When it comes to wildlife work, we can say that with every project we work on is money, and having enough of it, so making sure there's funding that, you know, it's always this species centric, no damage funding. And that's great. And it's done a lot of benefit. But if we could take an ecosystem approach, and really attack the restoration projects with a broader lens and look at shorebirds and waterfowl, and even songbirds and small mammals, you know, if we could, if we can try to incorporate some wildlife management into our, into these funding sources, I think that would be good to not have to constantly try to convince them that it's worthwhile"
14	"I think awareness in terms of why these species are important, and what they represent even. Like I mentioned before, the different habitat benefits. But yeah, just like, you know, there's, obviously salmon is an economic driver. And there's a reason for where we are with recovery today. And that's that there's been a story developed over time of what the population used to be the cause of the decline. And gathering that for migratory shorebirds I think is something that's really important to kind of have that awareness"
15	"include what landowners do on a voluntary basis to do little improvements that would be huge for shorebird species and other species and there's things that they're doing without even knowing it or beneficial and I guess communicating that to them because there are a lot of farmers who are interested in that and would be willing to do small voluntary if it would benefit other species, especially during their offseason"
16	"I think people are pretty- they have a job, they're pretty focused on what they're supposed to do. It's hard to add things to people's jobs effectively. And so the easier that the shorebird people or any other type of people could bring their information to us and share it so that we can use it, you know, the more likely it is that we would"
17	"So, you know, are there summary documents about, you know, shorebirds EDCs? And which ones are in the worst shape? And what kind of habitats do they need? And what kind of, you know, projects are the most beneficial for them. And, you know, even down, like what's on schedule that you care about. So I mean, if people communicate that stuff in a way that's easy to access and digest, I have a feeling, you know, people can get educated. And that could become part of the sort of lexicon and the process and all of that. So I just don't know if that's really ever been done before."
18	"Tell us what you want, in terms of habitat, we can provide it on a temporal basis as part of this crop rotation system."
19	"But we're shorebird habitat, this is what we proved, right? You can temporarily flood a field for three, four years. And, as part of our crop rotation system here, provide the habitat. And if you have enough farmers participating, we can provide 15,000 acres of shorebird habitat annually. But it would be provided on a temporal basis, because it would be part of our crop rotation system. So if you need it for one year, and I think this is what the TNC study said, the biggest benefit for

	shorebirds was the flooding benefit after year one, year two. But after two years, then you know nature...succession, you know, cattails move in and become more marshy then and become more duck habitat right? And shorebirds want more open water that is shallow and run around…So I think what they found was one to three years max for shorebird habitat. And that's perfect, a lot of crops fit into that rotation".
20	"If [habitat was] provided on a temporal basis as part of [the] crop rotation system, would that suffice? Can we pay farmers to grow habit? And then at the end of the two year cycle, a three year cycle, in the case of the locking wetlands, you drain it and farmed again, put your primary crop in and then it will be eligible again for shorebird habitat the next year again or two years later. But we can keep 15,000 acres of sharp additional shorebird habitat in Skagit Valley. It just rotates around".
21	"From a general public policy level, I'm moderately aware of some of these competing resource management objectives, I guess, and that the era of single species management needs to end. And we're not going to get out of these resource management issues until we [first] accept that humans are part of the ecosystem. And that we have to figure out management strategies that include the human footprint. Because right now, everything that I've seen is trying to mitigate for the human footprint, and that's exacerbating the problem. And then the second thing is it all continues to be single species focused, and there's not enough money, land, time in the world to deal with it this way. So, how I mean, I don't care if you're right of center, left of center, whatever. But somehow we have vilified the human footprint. Until we figure out population control, which no one wants to talk about, then we've got to come up with a better resource management, philosophy and framework, because it's clearly not working".
22	"I think it would be great to know how our [salmon restoration] work is identified in those kinds of plans".
23	"We're always about this whole multi species approach. And if there's either specific actions we can do on the properties we're doing, or things that we could talk about the actions we're already doing and how they may benefit shorebirds, I'd love to know more of that so that we can inform people. And to be totally honest, I'll admit that I don't know that much about those status of shorebirds in Skagit."
24	"Yeah, so more about what types of habitat are limiting shorebirds would be good to know. And I think also just more about the status of shorebirds- which ones or what needs assistance as far as habitat goes"
25	"We have a riparian workgroup that meets locally. And we have a workshop every year. And, you know, there's a lot of local knowledge that goes into improving how restoration science and projects are developed and implemented. Yeah. A lot of on the ground learning and sharing."
26	"Like, you know, during the winter timeframe, when there's not necessarily crops on the field, and as those fields become, you know, kind of flooded as the season goes, then that would provide habitat for shorebirds to be able to use."
27	"Oh, I mean, any of the Birds of North America inormation, all of the shorebird plans, you know, we know how to find those and get those, but I think where the hard part is how does this apply to this piece of grant? You know, because we're usually thinking of it through our little lens of 'Yeah, but how you apply that on the Skagit?' There's so much of stuff that's outside of our system that we can't control, but like even looking at, 'okay, how would we make things better for birds in the system in particular?' I think that that would be kind of the struggle. For me, to be able to figure out

	how you might do things better, you almost have to understand the system better – because there's just so much that we don't know about our the birds use and forage different zones within the estuary and all of that. We don't you know. We we know that use it, but how are they using it? Where are they using it? What, are they using it for a minute, are there ways that we could enhance what they're using it for in other areas? Those are the things that we don't know."
28	"I think some of the opportunities are more related to how we think about like, like you said, some of the multiple species benefits as far as trying to help us figure out how to do that. If there were ways to look at different types of rotations within existing ag systems and places like that- I mean, it would be like a much bigger picture conversation. And, I just don't know how- I don't know if there's the capacity within the community to support that as the problem because…that's the thing with private land in this area in particular – they feel like they're being pulled in all different directions to try to meet everybody else's needs than maybe their own. So you know, their willingness to maybe have conversations about how we work together to meet multiple habitat objectives is a difficult thing. But I mean, I'm still hopeful that stuff like that can occur even though it's outside my purview of the job".
29	"We're not aware of shorebirds being in trouble. Maybe they are, but we're not aware of it. So, if they are in trouble, I'd be interested to know about that. And I'm interested in working with people who care about that stuff and to the degree that I can and help out with habitat related issues….I'm interested in how the whole system works together, and shorebirds are part of that system. So, I'm interested in them in a general and a generic kind of way. It's, again, it wouldn't be a focus of our management. You know, we're interested in restoring whole landscapes or ecosystems, not just specifically for Chinook salmon, but for all the estuarine fish and wildlife that would benefit, including shorebirds".