

A large stack of fishing pots, likely for shellfish, is the central focus of the image. The pots are made of metal frames with fine mesh netting. They are stacked vertically, with some pots having blue and yellow painted sections. The background shows a sunset over a body of water, with a boat visible in the distance. The sky is filled with soft, golden light and scattered clouds.

Puget Sound Lost Shellfish Pot Prevention Plan

March 31, 2024



The background of the document is a photograph of several large, cylindrical metal mesh pots stacked on the deck of a boat. The pots are made of silver metal mesh and have blue and yellow floats attached to them. The scene is set at sunset or sunrise, with a warm, golden light illuminating the sky and the water. The sky is filled with soft, white clouds. In the distance, a white boat is visible on the water.

Puget Sound Lost Shellfish Pot Prevention Plan

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Prepared for:

Ocean Conservancy/Global Ghost Gear Initiative

March 31, 2024

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The plan was developed through a collaborative process and informed by a steering committee. Steering committee members devoted a substantial amount of time preparing for and attending meetings and in-person workshops. They provided valuable insights and reviews of this plan. The authors wish to thank each steering committee member for their time, expertise, and dedication.

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- Daniel Sund, Washington Department of Fish and Wildlife
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The plan was further informed by two workshops held to gather input and advice from people familiar with and affected by the issue of lost shellfish pots in Puget Sound. In attendance at these workshops were tribal and non-tribal commercial fishers, recreation fishers, tribal and state fisheries managers, maritime traffic interests, fishing gear manufacturers, researchers, and marine resources committee representatives. The authors would like to thank these individuals for their time and valuable insights.

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Project Purpose

The purpose of the *Puget Sound Lost Shellfish Pot Prevention Plan* is to guide strategic action to both prevent the accumulation of and minimize the harm caused by lost shellfish pots in Puget Sound.

This 2024 plan is designed to be implemented within three years, with periodic reviews. It is designed to be used by any organization, business, or agency that can take action to reduce the problem of lost shellfish pots.

The following are the desired outcomes of the plan's actions.

- Reduced crab mortality and other unobserved mortality caused by lost shellfish pots
- Increased crab harvest opportunities
- Reduced marine habitat damage caused by lost shellfish pots
- Reduced repair/maintenance costs for vessels caused by conflicts with shellfish gear and lost shellfish pots
- Reduced marine pollution

Introduction and Background

In this document, the term *lost fishing gear* is any fishing gear, such as nets, lines, and shellfish pots, that is lost, discarded, or abandoned in the marine environment. In many intergovernmental organizations, such as the United Nations Environmental Program, derelict fishing gear is referred to as *abandoned, lost, or discarded fishing gear*, or ALDFG. It is recognized as a global problem (GESAMP, 2021). In Puget Sound,¹ lost fishing gear mostly consists of gillnets and shellfish pots but also includes trawl and purse seine nets, aquaculture nets, and recreational fishing lines and lures.

In 1999, the Northwest Straits Marine Conservation Initiative (NWSI) identified the problem of lost fishing gear in Puget Sound and subsequently worked cooperatively with the Washington Department of Fish and Wildlife (WDFW), tribes, and other partners to pass state legislation establishing a WDFW approval process for lost fishing gear removal operations. Protocols for lost fishing gear removals and a no-fault reporting system were established. These collaborative actions set in motion the successful Northwest Straits Initiative Derelict Fishing Gear Program, run today by the Northwest Straits Foundation (NWSF).

This *Puget Sound Lost Shellfish Pot Prevention Plan* updates and refines the 2016 *Puget Sound Lost Crab Pot Prevention Plan* (Drinkwin, 2016). This refinement builds on the successes and challenges of implementing the 2016 plan.² Most importantly, the 2024 plan fully incorporates issues of lost shrimp pots into its recommended actions rather than focusing only on crab pots. The new plan incorporates a greater understanding of the known causes of shellfish pot loss and the harm caused by lost shellfish pots on the marine environment, species, fishing, and maritime vessel safety. It identifies ways to both reduce shellfish pot loss and reduce the associated harm caused by lost pots.

Development of the lost shellfish pot prevention plan

The 2024 *Puget Sound Lost Shellfish Pot Prevention Plan* was developed through a collaborative process begun in 2023 by gathering advice from steering committee members over many months before launching the plan's formal development process (see [Acknowledgments](#)). The steering committee developed a list of advisors to be invited to planned workshops and to be consulted as the plan was developed. These advisers included individuals from the fishing industry, recreational fishers, fisheries co-managers, vessel



Figure 1. Biodegradable cotton twine attached to escape hatch on recreational crab pot. (All attributions are available in the Photo Credits section at the end of this document.)

¹ In this document, the term *Puget Sound* is used to refer to the portion of the Salish Sea that falls within Washington State's borders, including the Strait of Juan de Fuca to and including Neah Bay. The term Puget Sound is used to be consistent with the naming of catch management areas used by fisheries co-managers.

² This plan's appendix illustrates progress on actions identified in the 2016 plan.

traffic authorities, the maritime industry, marine resources committees (MRCs), nongovernmental organizations, and government agencies.

Two in-person workshops were held in April 2023, bringing together individuals and representatives of organizations identified by the steering committee. Before the first workshop, a series of fact sheets and other background information, including published literature, were provided to the workshop invitees to ensure an equal understanding of the issues around lost shellfish pots before the meeting. Between the first and second workshops, an online survey was sent to all identified advisers to gather recommended actions to be discussed at the second workshop and included in the final plan.

The plan's recommendations are informed by the following key considerations developed at the planning workshops and agreed to by the steering committee. Each recommended action was evaluated against these considerations before being included in the plan.

Key considerations

- Respect for tribal treaty rights
- Support for sustainable commercial and recreational fishing
- Protection of marine habitats
- Feasibility
 - Cost-effective
 - Acceptable
 - Achievable
- Evidence-based

The development of this *Puget Sound Lost Shellfish Pot Prevention Plan* was informed by the experience and expertise of members of the steering committee as well as other advisors. The plan was developed and designed to be used by any and all community members or organizations affected by this problem in Puget Sound. It will take many collaborators to eliminate the harm caused by lost shellfish pots in Puget Sound.



Figure 2. Spot prawn (*Pandalus platyceros*), a valued species for the U.S. West Coast shrimp fishery. Spot prawns are actually a species of shrimp and are found from the waters off Alaska to southern California, including in Puget Sound.

Implementation and monitoring of the lost crab pot prevention plan

A variety of partners will implement the *Puget Sound Lost Shellfish Pot Prevention Plan* over the next three years. The plan recommends actions and identifies leaders and potential collaborating partners. The NWSF is committed to assisting with all identified actions to the extent possible with existing funding and capacity. The NWSF will coordinate any needed working groups required to move identified actions from concept to conclusion.

The NWSF will monitor the progress of action implementation over the next three years. Also, the NWSF will reconvene the steering committee after the three-year implementation period to revisit the plan and update it as needed.



Lost Shellfish Pots in Puget Sound

Puget Sound shellfish fisheries

Puget Sound shellfish fisheries are co-managed by the state of Washington (WDFW) and treaty tribes, with the harvest split evenly between the state and tribal fisheries.³ The state fisheries are further divided between commercial and recreational sectors. Management regions and catch reporting areas are used to geographically divide catch and quota between sectors, while the recreational fisheries are managed by Marine Areas. Seasons and quotas are set using data collected during test fisheries conducted by WDFW and participating treaty tribes.

Since 2010, the total commercial harvest of Dungeness crab in Puget Sound has ranged from 7.08 million pounds to 9.13 million pounds, with the highest total ex-vessel value of commercial landing exceeding \$43 million in 2015. The state commercial sector is a limited-access fishery consisting of 248 transferable licenses, with no new licenses issued since 1980 (WDFW, n.d.). The state sells approximately 200,000 crab endorsements (i.e., crab fishing licenses) per year in the state-managed recreational crab fishery. The tribal fleet includes approximately 550 active vessels split between 14 tribes throughout Puget Sound (Antonelis et al., 2023).

The state-managed commercial shrimp fishery, limited to 18 licenses, takes place from June through September. The state-managed recreational fishery occurs on specific days in May, and the number of days

³ The 1994 Federal District Court ruling by Judge Edward Rafeedie, known as the Rafeedie Decision, recognized tribal harvest rights to half of all shellfish from treaty tribes' usual and accustomed areas (*United States vs. State of Washington*, 1994).

varies between management regions. The tribal fishery now includes just under 200 fishers who participate each year. The tribal fishery occurs over a relatively short period, mostly in April and May, oftentimes with openings lasting only a few hours (Antonelis et al., 2018).

The predominant gear type for the crab fisheries is a *pot* (also called a *trap*) connected by a single vertical line to a floating buoy. Pots are baited and are deployed from vessels and rest on the sea floor, where the target species can enter the pot and become trapped. The recreational shrimp fishery also uses single pots with vertical lines attached to floating buoys. But the commercial and tribal shrimp fisheries are fished in strings of multiple pots from a common groundline. The groundline is anchored at each end and a vertical line is attached to a floating buoy on each end of the string. Pots in all shellfish fisheries are required to have *escape hatches* held closed with biodegradable twine (e.g., cotton, hemp), which will eventually degrade if the pot is lost, thus opening the escape hatch to allow any animal trapped in the pot to escape.

Shellfish pot loss

An estimated average loss rate in the Puget Sound commercial crab pot fisheries is 4.7%, or 1,483 pots lost. An estimated 9,299 pots are lost annually in the recreational fishery (Natural Resources Consultants [NRC], 2021). The locations of pots reported lost to the NWSF and to WDFW have been mapped. This mapping shows that pot loss is widespread, with some areas of defined concentration. See Figure 3. This map is consistent with findings from targeted lost crab pot removal operations conducted by the NWSF. The estimated average rate of pot loss in the recreational shrimp pot fishery was 2.33% in 2012 and 2013, for an average of 793 traps lost per year (Antonelis et al., 2018). Currently, there is no consistent data on the loss rate for commercial shrimp pots.

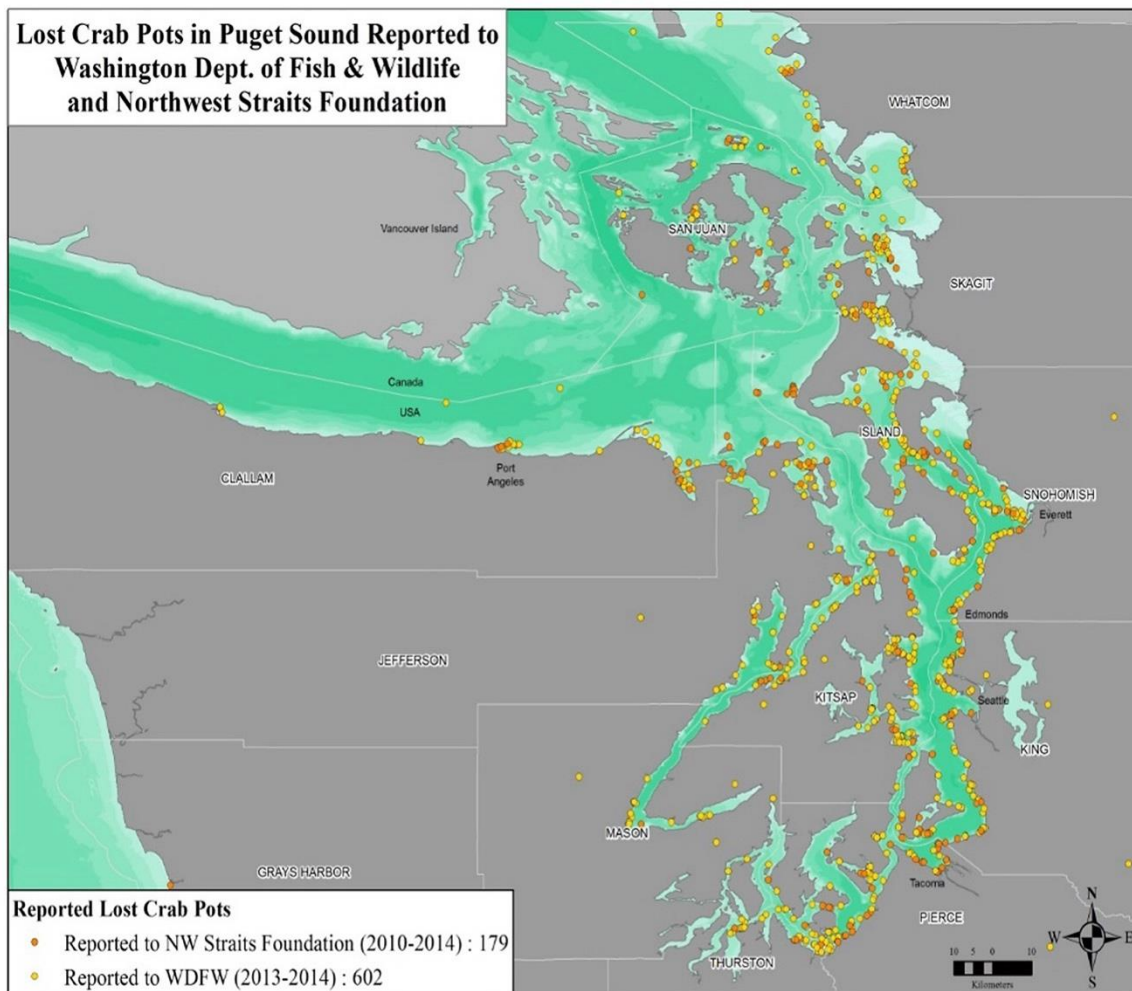


Figure 3. Locations of lost crab pots reported to WDFW and NWSF, 2010-2014

Harm caused by lost shellfish pots

The harmful effects of lost crab pots are well known, and derelict shrimp pots in Puget Sound are recognized as stressors to federally listed bocaccio rockfish and yelloweye rockfish (National Marine Fisheries Service, 2014, 2017).

Harm from lost shellfish pots in Puget Sound takes a number of forms, the most damaging of which are crab mortality in lost pots, lost harvest revenue, and degraded marine habitat. Based on observations that not all pots become disabled after the escape cord degrades and based on gear loss estimates, NRC (2021) estimates the five-year average loss of Dungeness crab due to derelict crab pots is 142,935 crabs, weighing 271,576 lb and with a commercial ex-vessel value of over \$1.26 million. Other key findings from a 2010 study of lost crab pots in Puget Sound found that a lost pot with an escape cord continues to fish for an average of 126 days, a lost pot without an escape cord fishes for an average of 2.2 years, and crab mortality occurs within 51.5 days after initial capture (Antonelis et al., 2011). Longer fishing times (up to seven years) have been documented in other similar marine areas (Maselko et al., 2013).



Figure 4. Derelict shellfish pots removed from the water during a retrieval operation.

Lost crab pot surveys and removal operations conducted by the NWSF have focused on locations with high fishing effort and covered hundreds of square kilometers, with some locations covered multiple times. Since 2002, over 6,200 derelict Dungeness crab pots have been removed from Puget Sound marine waters. Hundreds of Dungeness crab and red rock crab were found in removed lost pots. Of the Dungeness crab found, males accounted for 75% of all Dungeness crab encountered, while females made up 13%, and the gender of 12% was unknown. These observed impacts represent only a snapshot of the long-term impacts of lost crab pots. Ninety percent of all pots were removed from a substrate type dominated by mud, sand, and gravel, with an average depth of 46.5 ft (NWSF, 2023).

During removal operations, even crab pots equipped with escape cords that had disintegrated before removal were observed to have newly entrapped crabs. This finding suggests that the problem of ghost fishing is not solved with current strategies, which rely on the timely disintegration of escape cords and on the ability of trapped crabs to escape through pot escape hatches. A study conducted by the NWSF and NRC showed that some commonly used recreational crab pots employ escape-hatch designs that do not effectively allow crabs to escape (Antonelis et al., 2023).

Vessel entanglement with shellfish pot buoy lines poses a hazard to vessel operations and human safety. Buoy lines may become entangled in a vessel's propeller or rudder, resulting in a loss of control of the vessel until the line has been removed. Vessel operators may be forced to shut down their engine and work to untangle the line while drifting with the currents without the ability to steer the vessel. Entanglement may additionally cause damage to propellers and driveshafts, requiring costly repairs. Towboats can become entangled in crab lines up to twice weekly in the Anacortes, Bellingham, and Ferndale areas during crabbing season (Jack Sanford, pers. comm., May 10, 2016).

The Washington State Ferries (WSF) has documented costs associated with shellfish pot gear encounters. One of the main issues is the shellfish pots impacting vessels' stern tubes and stern tube seals. Since

2017, WSF has issued 14 purchase orders for divers to inspect damage suspected to be from crab pots. Within the last five years, WSF has had two emergency dry docks and one repair in water for stern tube seals, potentially attributable to crab pots. WSF port engineers estimate that the costs for repairs associated with conflicts with shellfish gear reach almost \$100,000 a year, given the expense of these repairs (Kevin Bartoy, Chief Sustainability Officer, WSF, pers. comm. January 14, 2024). Ferries have also been grounded because of entanglements with shellfish gear, causing scheduling delays and inconvenience for travelers (Pilling, 2019; Thompson, 2018). In 2017, three Washington State ferries were temporarily disabled from propeller entanglement with crab pot lines. The disabling of one vessel (*Salish*) resulted in the loss of 800 sailings (Thompson, 2018).

In general, maritime vessel entanglements with crab pots involve actively fishing crab pots rather than lost pots that still retain buoys and lines. Therefore, vessel entanglements and their resultant costs to the vessel cannot be considered a direct impact of lost crab pots. However, the interactions cause pots to become lost, often resulting in the impacts noted. Therefore, vessel interactions will be addressed in the following section related to the causes of crab pot loss.

Causes of shellfish pot loss

Shellfish pots are lost for a variety of reasons. Causes for loss generally fall into three categories: vessel interaction (both recreational and commercial vessels); improperly configured gear, including improperly tied knots; and improperly placed gear. All these categories usually include a degree of user error, either on the part of the fisher or on the part of the boater or vessel operator.

In the recreational shellfish fisheries, the leading identified causes of pot loss are

- User error, including a mismatch between line length to water depth, pots floating away because they are incorrectly weighted, and incorrectly tied knots;
- Conflicts with vessels; and
- Tampering or sabotage.

In the commercial shellfish fisheries, the leading identified causes of pot loss are

- Conflicts with vessels; and
- Tampering or sabotage.

Improperly configured pots include improperly tied knots and improperly placed buoys, the use of floating lines, inadequate lengths of lines, the use of inappropriate buoys that are difficult to see, and a failure to weight the crab pots, especially in areas with strong tidal or current action.

Improperly placed pots include placing pots in known vessel transit zones, such as ferry lanes, or placing pots too close to other pots or other obstructions, such as docks or marker buoys. Also, pots are placed inappropriately because of a general lack of knowledge about water depth, tidal action, and currents. Generally, this lack of knowledge causes a fisher to use a line that is too short and to improperly weight pots to prevent them from being carried away by the tides and currents.

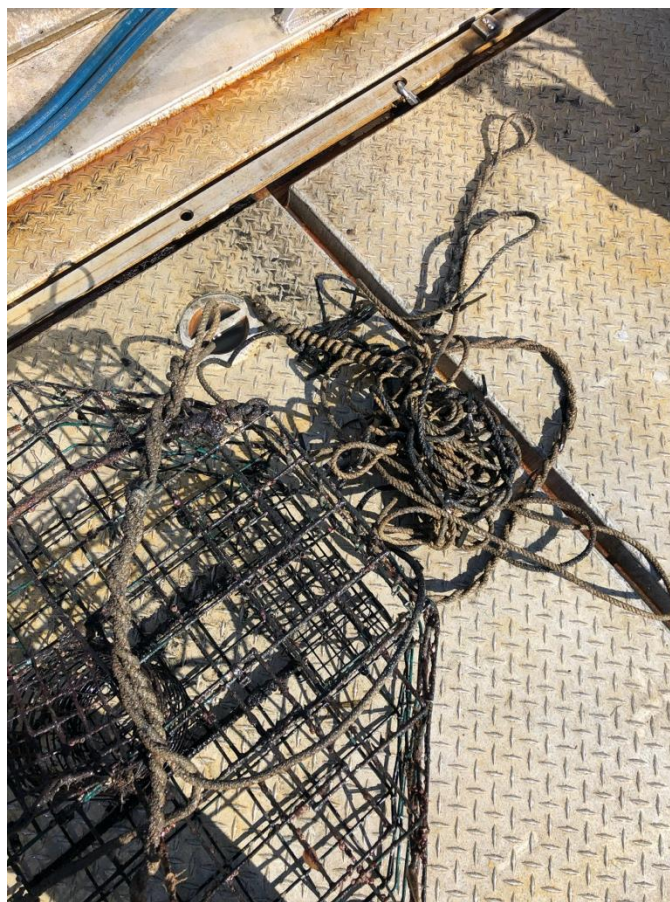


Figure 5. Derelict crab pot with a rope showing signs of having been twisted by a propeller.

The NWSI has investigated the causes of pot loss through several means. Enhanced data collection on board lost crab pot removal operations began in 2013 to try to discern why recovered pots were lost. In 2014, the NWSF interviewed recreational crabbers whose pots were retrieved by WDFW during closed crabbing days. In addition, reports of lost pots provided to the NWSF reporting system and to the WDFW reporting system have been analyzed. In 2015, the NWSF commissioned 20 intercept interviews with recreational crabbers at the Seattle Boat Show to better understand the extent of and reasons for pot loss.

Unfortunately, many crabbers who have lost their pots mistakenly think their pots have been stolen. This misunderstanding was evident in interviews conducted with crabbers whose pots were collected by WDFW during closed days in the 2014 summer crabbing season. Most of the 40 people interviewed thought their pots had been stolen. Their pots were collected by WDFW from locations very close to where they had been deployed, suggesting that they had not been stolen. Instead, it is likely that the owners were unable to locate their pots because they were not clearly marked or visible, the buoy was submerged at the time they were trying to locate the pots, or the pots had been moved by the wind, tides, or currents.

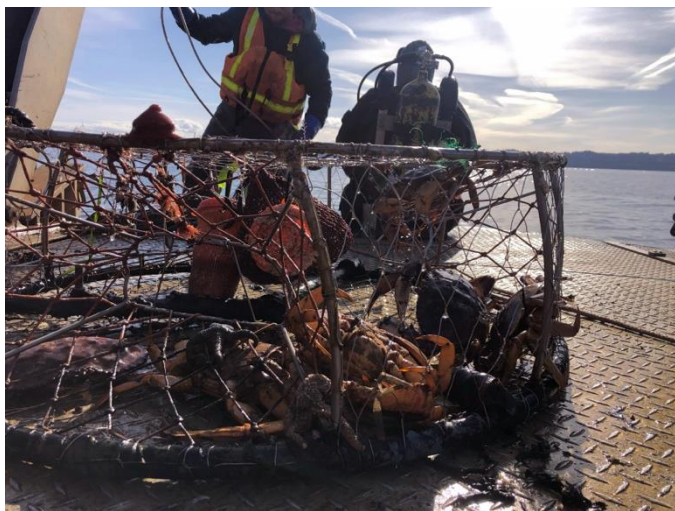


Figure 6. A diver preparing to dive during a removal operation, with a derelict crab pot in the foreground.

Data on the reason why a pot was lost is collected during systematic lost pot removal operations conducted by the NWSF and its partners. Of the 947 crab pots for which loss information was reported or inferred during removal operations, 56% were determined to have been lost due to some reason associated with user error: loose knots, incorrect gear setup, line length that is too short, unweighted line or pot, or improper placement (too close to other gear, etc.). Furthermore, 26% were determined to have been lost due to vessel interactions, with another 10% lost due to sabotage.

Vessel interactions cause pot loss by severing buoy lines, by moving the pot so that the owner cannot find it, and by carrying the pot away. These are problems both for the crabber and for the boater or commercial vessel owner. Commercial

vessel interactions can be caused by pots placed in vessel transit zones or by vessels operating outside vessel transit zones. Recreational vessel interactions can be caused by floating lines, low-visibility buoys, and submerged buoys (line length is too short).

Surveys of commercial Puget Sound Dungeness crab fishers conducted in 2022 identified conflicts with vessels as a substantial cause of crabbing gear loss (Drinkwin and Antonelis, 2022). Conflicts between vessels and shellfish gear usually involve active fishing gear that subsequently becomes lost as a result of the conflict (Kevin M. Bartoy, Chief Sustainability Officer, WSF, pers. comm. December 12, 2023). Occasionally, vessel conflicts involve already-lost gear that may have drifted off its deployment location. It is sometimes impossible to determine whether the fishing gear that becomes entangled with vessels was actively fishing or derelict. Similar to managing whale entanglements in fishing gear, the distinction between vessel conflicts with lost or active fishing gear is important because it informs the management actions needed to prevent and reduce conflicts (Gilman et al., 2022).



Current Actions to Prevent and Reduce Harm From Lost Pots

Current efforts are extensive to reduce shellfish pot loss and harm from lost shellfish pots. Many of these efforts have been informed by recommended actions in the 2016 *Puget Sound Lost Crab Pot Prevention Plan*. Others were ongoing before the 2016 plan was created or respond to new information and opportunities. The 2016 plan recommended more than 25 actions to be led by fisheries co-managers, the NWSF, MRCs, and vessel traffic interests. The cost of its implementation for just WDFW and the NWSF over three years was estimated at approximately \$750,000.

Of the actions recommended in the 2016 plan, more than half have been at least partially implemented, and many are established, ongoing actions regularly implemented by partners. See this document's [appendix](#) for the status of the actions from the 2016 plan. Many of these existing actions are effective and should be continued and, where possible, increased and enhanced. The goals, strategies, and actions recommended here in the 2024 plan are intended to augment current actions rather than replace them.

Highlights of the implementation of the 2016 plan are described below. However, these descriptions are not exhaustive.

Prevention efforts

To reduce shellfish pot loss from user error in the recreational fishery, the NWSF has implemented a multifaceted communication and outreach program aimed at recreational crab fisheries. The program includes short educational videos shared on social media and through other outlets, along with educational materials (such as posters) shared at retail stores and on ferries, social media advertisements, in-person

education events with fishing groups, and dockside education efforts. These efforts have been ongoing and growing since 2015 and have reached more than 200,000 people each year.

Likewise, WDFW has made improvements to its website and is planning more improvements to build awareness of how to prevent fishing gear loss and to report lost gear.

To reduce shellfish pot loss from vessel traffic conflicts, some tribal fisheries managers have developed communication processes with marine traffic interests (U.S. Navy, ports, etc.) to share information about potential heavy vessel traffic, fishing openings, and other events that could lead to vessel/gear conflicts.

A vessel traffic roundtable was held on December 12, 2023, and brought together a diverse set of representatives of the vessel traffic sector interested in reducing the incidences of conflicts between shellfish pots and vessels. Participants included representatives from tribal fisheries, state-managed fisheries, recreational boaters, Puget Sound pilots, WSF, the NWSF, towing companies, ports, and the Marine Exchange of Puget Sound. Participants engaged in collaborative discussions and provided their perspectives on the causes of and solutions to the conflicts. The roundtables yielded potential solutions to conflicts between vessel traffic and fishing gear, including creating an information hub that integrates information about fishing openers and vessel traffic.

Highly visible buoys are required by fisheries co-managers in all shellfish fisheries.

Mitigation strategies

For many years, state and tribal fisheries managers have required pots to use biodegradable escape cords on escape hatches to reduce the harm caused by lost shellfish pots.

The NWSF and WDFW have also included in their outreach efforts information about which pot designs allow more effective escapement if pots are lost. Newly published research provides guidance on which designs are more effective at allowing crabs to escape if the pots are lost, such as with escape hatches abutting the lids and designs where large portions of the pots automatically open (Antonelis et al., 2023). And the NWSF, NRC, and WDFW have been exploring a change in the required size of the escape cord. Research indicates that reducing the cord's size from 120 thread count to 30 thread count could reduce by 29% and 23% the number of crabs killed in lost recreational crab pots and lost commercial crab pots, respectively (NRC, 2021). New regulations in the recreational fishery sector are currently being explored.

Lost pot removals

Removing lost shellfish pots from Puget Sound is the only way to eliminate continued habitat damage and potential ghost fishing. A focused effort to remove lost fishing gear from Puget Sound began in 2002 and was executed by the NWSI, WDFW, the Washington Department of Natural Resources, tribes, and other governmental and private partners. Also in 2002, the Washington State legislature passed legislation to



Figure 7. A happy recreational crabber.

develop safe, effective methods to remove lost fishing gear, eliminate regulatory barriers to gear removal, and discourage future losses of fishing gear. This new law (Derelict Fishing Gear [RCW 77.12.865], 2002/2010) required WDFW, in partnership with the NWSI, to develop guidelines for derelict fishing gear removal. WDFW adopted these guidelines in 2002 (WDFW, 2002). Since the establishment of 2002 guidelines, over 6,200 lost Dungeness crab pots have been removed from Puget Sound marine waters. Removal protocols generally involve using side-scan sonar to locate concentrations of pots, as well as divers to remove them. Operations have targeted suspected concentrations of lost pots based on known crab fishing activity. Every location surveyed contained some level of lost crab pot concentrations, leading to the conclusion that no area where crabbing occurs is free from the impacts of lost crab pots.

To facilitate the removal of lost shellfish pots, WDFW administers a fund in the state wildlife account reserved to pay for removal operations. WDFW requires recreational fishers to purchase a crab endorsement if they intend to harvest crab. One dollar of the funds received from the sale of each Dungeness crab endorsement is placed into the wildlife account and used for the removal and disposal of lost shellfish gear either directly by WDFW or under contract with a third party (Catch Record Card [RCW 77.32.430(5)(a)], 1998/2020).

The NWSF, partnering with NRC, has continued to implement annual lost crab pot removal efforts with funding from the crab endorsement fees collected by WDFW through recreational fishing license sales and other sources. Other parties, such as the Swinomish Indian Tribal Community and Clallam MRC, have supported lost crab pot removals, as well.

Enforcement sweeps of shellfishing grounds during closed days and post-season are also effective processes for removing lost shellfish pots and eliminating their negative impacts. WDFW regularly completes sweeps of recreational shellfishing areas during closed days of the season. From 2017-2022, WDFW Enforcement and Shellfish staff removed 7,360 lost shellfish pots during enforcement sweeps, or 1,228 each year on average. They spent from 37 to 68 boat days from 2019-2022 on these enforcement sweeps (WDFW, 2023).

WDFW and tribal fisheries co-managers also conduct regular enforcement activities, including closed-season sweeps, in the commercial and tribal shellfish fisheries.



Figure 8. WDFW enforcement personnel with lost shellfish pots collected during closed-day sweeps.



2024 Plan Goals, Strategies, and Actions

The following goals for the Lost Shellfish Pot Prevention Plan were developed through the planning process and agreed upon by the steering committee and advisors. Each goal directly relates to an impact of lost crab pots or to a cause of crab pot loss. They are designed to lead to desired outcomes.

The agreed-upon overarching goals and objectives are as follows, with details in Table 1:

1. Reduce shellfish pot loss in the commercial sector
 - 1.1. Reduce vessel interactions with active commercial shellfish fishing gear
 - 1.2. Reduce tampering and sabotage of active commercial shellfish fishing gear
 - 1.3. Reduce conflicts between different fishing gears
2. Reduce shellfish pot loss in the recreational sector
 - 2.1. Improve recreational shellfish fishing regulations and licensing
 - 2.2. Reduce user error in recreational shellfish fishing
3. Mitigate impacts on species, habitat, and harvest after shellfish pots are lost
 - 3.1. Improve shellfish fishing gear setup and design to reduce negative impacts of lost pots
 - 3.2. Remove lost shellfish pots from the marine environment

The following are the desired outcomes of the plan actions.

- Reduced crab mortality and other unobserved mortality caused by lost shellfish pots
- Increased crab harvest opportunities
- Reduced marine habitat damage caused by lost shellfish pots
- Reduced repair/maintenance costs for vessels caused by conflicts with shellfish gear and lost shellfish pots
- Reduced marine pollution

Table 1. Lost Shellfish Pot Prevention Recommended Actions

Action #	Strategies & Recommended Actions	Lead Implementers and Partners	Completion Year
Goal 1: Reduce shellfish pot loss in the commercial sector			
Objective 1.1: Reduce vessel interactions with active commercial shellfish fishing gear			
1.1.1	Establish a working group with shipping industry and crab fleet to address overlapping issues and promote communication.	WDFW, Tribes, Puget Sound Harbor Safety Committee	2024
1.1.2	Consider formalized communication plans between commercial vessels and commercial fisheries for areas where conflict is probable.	Harbor Safety Committee	2025
1.1.3	Create a memorandum of understanding for communication to ensure durability/succession.	WDFW, Tribes, Harbor Safety Committee	2025
1.1.4	Publicize the existing (or create a new) communication system to alert fishers when towing vessels and tugs are scheduled for transit.	WDFW, Tribes	2026
1.1.5	Provide web-based and/or smartphone maps/apps that help commercial and recreational fishers know and identify locations of hazards (high currents, inclement weather incoming, vessel traffic, anchorages, etc.).	WDFW, Tribes, Harbor Safety Committee	2026
1.1.6	Create a notification system for changes in maritime traffic: the use of nonconventional or unestablished anchorages and/or the development of new tow lanes or shipping types.	Harbor Safety Committee	2027
Objective 1.2: Reduce tampering and sabotage of active commercial shellfish fishing gear			
1.2.1	Increase cooperative state/tribal patrols.	WDFW, Tribes	2027
1.2.2	Increase coordination between state and tribal sectors to avoid fleet interactions.	WDFW, Tribes	2027
Objective 1.3: Reduce conflicts between different fishing gears			
1.3.1	Increase sweeps of buoyed lost gear after fisheries openings (during low tide).	WDFW, Tribes, NWSF	2025
Goal 2. Reduce shellfish pot loss in the recreational sector			
Objective 2.1: Improve recreational shellfish fishing regulations and licensing			
2.1.1	Require that recreational shrimp pots be removed from the water during hours of darkness.	WDFW	2027
2.1.2	Require a competency quiz/test on best practices at the point of sale for a recreational license.	WDFW	2027

Action #	Strategies & Recommended Actions	Lead Implementers and Partners	Completion Year
2.1.3	Provide recreational crabbers with two pot tags/licenses and charge a fee for replacement tags. (Tags are on the buoy.)	WDFW	2027
2.1.4	Require seasonal tags for recreational pots.	WDFW	2027
2.1.5	Require phone number labeling on recreational marker buoys.	WDFW	2026
Objective 2.2: Reduce user error in recreational shellfish fishing			
2.2.1	Require that gear set up in stores before being sold is set up correctly.	WDFW	2027
2.2.2	Publicize best fishing practices related to avoiding vessel traffic and avoiding other fishing gear.	to be determined (TBD)	2025
2.2.3	Educate boaters about how to avoid conflicts with shellfish fishing gear. (Include information on different sector seasons.)	TBD	2025
2.2.4	Provide web-based and/or smartphone maps/apps that help commercial and recreational fishers know and identify locations of hazards (high currents, inclement weather incoming, vessel traffic, anchorages, etc.).	WDFW, Tribes, NWSF	2026
2.2.5	Create a smartphone and web app with all information (links to informational videos, WDFW regulations, catch card) for recreational fishers. Improve the functionality of the Fish Washington app (maybe with a separate one for crabbing and shrimping).	WDFW, NWSF	2025
2.2.6	Publish “best crabbing” and “best shrimping” maps that communicate recommended fishing windows (based on tides and currents) and identify high-risk areas, including vessel traffic lanes.	WDFW, NWSF, MRCs	2026
2.2.7	Increase crabber education events.	WDFW, NWSF, MRCs	2025
2.2.8	Create standardized crabbing best-practice videos to be featured on the websites of agencies and entities supporting derelict gear removal. Share widely with local/regional resource groups. Include information about the (GPS) capabilities of smartphones to aid in gear relocation.	NWSF, MRCs	2026

Goal 3. Mitigate impacts on species, habitat, and harvest after shellfish pots are lost

Objective 3.1: Improve shellfish fishing gear setup and design to reduce negative impacts of lost pots

3.1.1	Reduce rot-cord thickness from 120 thread count (30 or 60 thread count; potentially sector dependent).	WDFW; Tribes	2025
3.1.2	Require the sale and use of crab pots with the most effective escape routes (require modification of gear design/permissible gear).	WDFW	2027
3.1.3	Develop a program to permit others to assist with sweeping recreational crab pots from crabbing areas during off-crabbing days or postseason. (Revise sections of the Revised Code of Washington [RCWs] to allow WDFW increased ability to remove gear / enforce closed days.)	WDFW	2027
3.1.4	Encourage the use of alternative shellfish fishing techniques not involving pots (crab rings, snorkeling).	WDFW, NWSF	2027

Objective 3.2: Remove lost shellfish pots from the marine environment

3.2.1	Conduct removals of lost crab pots in areas of high crabbing concentration.	NWSF, WDFW, Tribes, MRCs, NRC	2025
3.2.2	Increase closed-day gear sweeps (for all sectors).	WDFW, Tribes	2025

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Appendix: Status of Actions Listed in the 2016 Puget Sound Lost Crab Pot Prevention Plan

Goal	Action #	Strategies & Recommended Actions	Lead Implementers and Partners	Completion Date	Status 2022	Status 2023
1: Reduce pots lost from vessel interactions in the commercial sector	Strategy 1.1: Maintain separation between commercial crab fleet and vessels – voluntary actions					
	1.1.1	Publicize use of existing app showing large vessel traffic: marinetraffic.com	TBD	June 2019		Links to vessel traffic websites and apps are on NWSF's catchmorecrab.org page.
	1.1.2	Systematize communication between major towing companies and commercial crabbers to give notice when vessels will be transiting; publicize VHS frequencies	Towing companies; WDFW; Tribes	June 2019	Dunlop texts crabbers and posts schedule on website.	NRC convened a Vessel Traffic Roundtable in 2023 with help from the Puget Sound Harbor Safety Committee and Marine Exchange. Next steps were recommended and incorporated into the 2024 plan's actions.
	1.1.3	Investigate replicating in Puget Sound the nonmandatory system of vessel traffic lanes for towboats that is in place on the West Coast	Ports; Washington State Department of Transportation; refineries	June 2019	This action was not supported by interested parties.	
	Strategy 1.2: Revise required pot configuration					
	1.2.1	Prohibit use of floating line except for a length TBD at pot end	WDFW; Tribes	phase in over 3 years		WDFW regulations require line to be sufficiently weighted to remain submerged at all times. (Commercial Crab Fishery

Goal	Action #	Strategies & Recommended Actions	Lead Implementers and Partners	Completion Date	Status 2022	Status 2023
						[WAC 220-340-430(5)(b)], 2023).
2: Reduce commercial pots lost due to tampering and sabotage	Strategy 2.1: Increase enforcement of current laws prohibiting tampering and sabotage					
	2.1.1	Increase cooperative state/tribal patrols	WDFW; Tribes	ongoing		
3: Reduce crab pot loss by improving regulations in the recreational sector	Strategy 3.1: Improve crab fishing endorsement licensing process					
	3.1.1	Convert to all online licensing and provide incentives to crabbers to learn about crabbing best practices	WDFW	phase in over 3 years		A crabber quiz on the WDFW crab page has questions designed to promote best practices to prevent pot loss and related crab mortality. Licensing is currently available online and at dealers.
	Strategy 3.2: Improve pot configuration requirements					
	3.2.1	Add language in fishing pamphlet encouraging more visible, customized buoy configurations	WDFW	2017 pamphlet		
	3.2.2	Require weighted line except for a length TBD at pot end	WDFW; Tribes	phase in over 3 years		Weighted or sinking line is still the recreational rule.
3.2.3	Require minimum weight per pot in recreational fishery	WDFW	phase in over 3 years		Not yet implemented.	

Goal	Action #	Strategies & Recommended Actions	Lead Implementers and Partners	Completion Date	Status 2022	Status 2023
4: Reduce crab pot loss resulting from user error (improperly configured gear and improperly placed gear) in the recreational sector	Strategy 4.1: Implement a comprehensive, social-science-based education program designed to improve crabbing practices and reduce the loss of crab pots in the recreational crabbing fleet					
	4.1.1	Implement currently planned social-science-based education program involving social media, videos, and website advertisements	NWSF; Northwest Straits Commission; MRCs; WDFW; Northwest Indian Fisheries Commission	start in 2016; ongoing thereafter	Facebook ads and short videos produced and distributed.	The NWSF completes this action annually.
	4.1.2	Implement point-of-gear-sale and point-of-licensing education	WDFW; NWSF; MRCs	June 2019	Some citizen groups are doing this in Clallam County.	MRCs distribute NWSF rack cards at locations annually.
	4.1.3	Increase crabber education events	NWSC; partners; NWSF; MRCs; Puget Sound Anglers; WDFW	June 2019	Events held regularly.	The NWSF, MRCs, and WDFW host annually.
	4.1.4	Publicize the location plotting (GPS) capabilities of smartphones	NWSC	June 2016		
	Strategy 4.2: Improve WDFW crabbing web page					
	4.2.1	Make WDFW crabbing web page more engaging and accessible	WDFW; other partners	June 2019		Voluntary crabber quiz included on https://wdfw.wa.gov/fishing/shellfishing-regulations/crab
	4.2.2	Include links to educational videos and vessel traffic websites; include information about vessel transit notification system on WDFW crabbing web page	NWSF; WDFW; NWSC; MRCs	June 2019	Links to videos are online at https://wdfw.wa.gov/fishing/shellfishing-regulations/crab	Links to videos are online at https://wdfw.wa.gov/fishing/shellfishing-regulations/crab

Goal	Action #	Strategies & Recommended Actions	Lead Implementers and Partners	Completion Date	Status 2022	Status 2023
5: Reduce crab pot loss from vessel interaction in the recreational sector	Strategy 5.1: Reduce recreational boater interactions					
	5.1.1	Include avoidance of crab pots in boater education	NWSF; MRCs; Power Squadron; U.S. Coast Guard Auxiliary	2017		
	Strategy 5.2: Reduce interactions with commercial vessel traffic					
	5.2.1	Publicize current vessel traffic maps and smartphone applications: marinetraffic.com , shipfinder.co , etc.	TBD	June 2019		The apps are publicized on the NWSF website .
	5.2.2	Publicize existing (or create new) communication system to alert crabbers when towing vessels and tugs are scheduled to transit	TBD	June 2019		On WDFW commercial crab page (https://wdfw.wa.gov/fishing/commercial/crab/pugetsound/vessel-traffic) but need link to recreational page.
Goal 6: Prevent impacts to species, habitat, and harvest after pots are lost	Strategy 6.1: Remove lost crab pots from the marine environment within the same season they are lost					
	6.1.1	Increase sweeps of remaining crab pots from crabbing areas during off-crabbing days	WDFW; Tribes	2017	WDFW sweeps have increased.	WDFW closed-day gear sweeps have continued each year. Since 2018, between 1,200 to 1,600 pots have been removed each year.
	6.1.2	Develop program to permit others to assist with sweeping crab pots from crabbing areas during off-crabbing days	WDFW; Tribes	2017		The NWSF has proposed this action to WDFW. Currently, it is not allowed by enforcement. Not currently allowed due to private property laws; enforcement is open to this action but needs an

Goal	Action #	Strategies & Recommended Actions	Lead Implementers and Partners	Completion Date	Status 2022	Status 2023
						amendment to private property status of lost gear accessible on the surface or to the authority of who can recover it.
	6.1.3	Conduct removal of lost crab pots in areas of high crabbing concentration	NWSF; Tribes	ongoing	Completed annually by the NWSF and NRC.	Completed annually by the NWSF and NRC.
Strategy 6. 2: Decrease numbers of crabs mortally trapped in lost crab pots						
	6.2.1	Decrease thread count of required biodegradable escape cord	WDFW; Tribes	phase in over 3 years	Policy updates are in process.	No changes yet to the WDFW rule.
	6.2.2	Encourage use of crab pots with most effective escape routes	NWSF; WDFW	start in 2016	Policy updates are in process.	
	6.2.3	Encourage manufacture of crab pots with most effective escape routes	NWSF; WDFW	start in 2016	Policy updates are in process.	
	6.2.4	Encourage low-cost retrofits of crab pots to increase escapement effectiveness	NWSF; WDFW	start in 2016	Videos have been created on retrofits.	Videos have been publicized.