Forage Fish Community Science Workshop
Summary and Synthesis

Prepared by
Emily Bishop, Westward Ecology
Kirk Larsen, Island County MRC
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Group photo of participants at the Forage Fish Community Science Workshop on April 27th, 2026 at the Cornet Bay Retreat Center

Executive Summary

Forage fishes (including Pacific herring, surf smelt, and sand lance, among others) play a critical role in nearshore ecosystems and marine food webs. At the same time, shoreline management decisions, local policy, and conservation planning increasingly rely on high-quality ecological data. Community and citizen science initiatives present an opportunity to expand monitoring capacity, deepen public engagement, strengthen place-based education, and inform local management. To that end, the Island County Marine Resources Committee (MRC) aims to develop new directions and establish connections for community members in the Salish Sea region to engage with forage fish.

This initiative, called Forage Fish FOCUS (Finding Opportunities for Communities Utilizing Science), began with a one-day collaborative workshop on April 27th, 2026 at the Cornet Bay Retreat Center in Deception Pass State Park that brought together scientists, community members, educators, and resource managers. Workshop participants co-developed short lists of recommended priority action themes for citizen scientists in breakout groups, then reported the top recommendations back to the broader group. This list of top priority forage fish research and action themes to be addressed by community scientists included:

- Improve spatial and temporal understanding of spawning
- Address data and analysis bottlenecks, including reducing turnaround time from sample collection to usable results
- Identify ways to engage with more communities and age groups
- Work with local communities to establish priority functions for their beaches and determine how to support those functions
- Develop a communication plan for forage fish to empower more community scientists to conduct outreach and advocacy

These action themes were prioritized relative to other action themes that breakout groups identified, but the items within this list are not prioritized relative to each other. Rather, this list can serve as a guide for interested citizen scientists to identify actions that align with their specific interests and strengths. Two of the above action themes acknowledge that understanding forage fish life cycles is important for management and recovery efforts, but the current framework for sample processing in Washington State has limited capacity. Addressing this bottleneck would enable increased sampling efforts to address more questions about forage fish life cycles. Other action themes relate to increasing awareness about forage fish to empower communities as stewards of their local beaches.

These action themes will be used as the basis to inform the future directions of Forage Fish FOCUS to expand forage fish community science in the Salish Sea. Next steps include leveraging the Puget Sound Ecosystem Monitoring Program (PSEMP) Forage Fish & Food Webs workgroup as a venue to continue dialog and following up with small groups of key workshop participants to define concrete actions under these themes.

Context

Forage fish play a critical role in Salish Sea marine food webs, serving as a connection between lower trophic levels and culturally iconic species like Pacific Salmon. This group, which includes Pacific herring, surf smelt, longfin smelt, Pacific sand lance, Northern anchovy, and Pacific sardines was once abundant throughout the Salish Sea, but experienced declines over the 20th century. Over the same period, shorelines in this region underwent extensive modification. In the 1970s, scientists at the Washington Department of Fish and Wildlife (WDFW) recognized the need to learn more about the drivers of forage fish populations, particularly the spawning habitat of species that lay eggs on beaches. In 2001, WDFW published a field manual for conducting beach surveys for forage fish eggs and since that time there has been an expansive network of citizen scientists who participate in collecting samples.

Beach sampling for forage fish eggs provides an opportunity for community members to engage with stewardship of their local shorelines. Citizen scientists who participate in forage fish egg sample collection often do so through organizations like Marine Resources Committees and Sound Water Stewards in Washington State and the Peninsula Stream Society in British Columbia. These groups provide equipment and training for volunteers to sample at local beaches, usually at regular intervals, following standardized sampling protocols. In many areas, citizen scientists have the capacity and interest in expanding surveys. Moreover, citizen scientists have recently expressed interest in developing new data collection efforts and outreach projects, to supplement existing surveys, that are scientifically meaningful and locally impactful.

Citizen science functions best when community members have the opportunity to make meaningful contributions to address locally-relevant knowledge gaps. Citizen scientists therefore rely on researchers to identify important knowledge gaps. At the same time, scientists rely on community members to identify what questions they find most relevant to local priorities, while being accessible given volunteer resources and capabilities. One solution to this dynamic is knowledge co-production, where groups come together and co-create priorities that are informed by a diverse range of perspectives. By enabling knowledge sharing

between groups, new and expanded projects led by citizen scientists are more likely to be impactful and sustainable.

The Forage Fish FOCUS (Finding Opportunities for Communities Utilizing Science) initiative aims to address the intersection of forage fish science and citizen science by bringing together community members and scientists to establish key knowledge gaps and identify opportunities for citizen scientists to meaningfully contribute to addressing those gaps. Specifically, it aims to connect with local policy and management needs, particularly how this work informs decisions about local shorelines. Forage Fish FOCUS began with a workshop to bring together local community members and regional professionals interested in forage fishes to identify priority action themes that address these goals. The following report presents the format and results from this workshop.

Objectives of the Workshop

The goals of this workshop were to:

- Develop collectively prioritized research and action themes for citizen and community science in forage fish monitoring
- Identify collaboration and partnership opportunities, including potential funding pathways and resource-sharing arrangements
- Establish a plan for sharing, sustaining, and advancing workshop outputs

Workshop Structure

The workshop took place on April 27th, 2026 at the Cornet Bay Retreat Center and included 56 participants, all from the US waters of the Salish Sea, representing a diverse set of experiences and affiliations (Appendix A). In the workshop opening remarks, participants were encouraged to share their diverse perspectives. “Being an expert” was not a pre-requisite for participation in co-production of citizen science priorities.

Photo showing opening remarks at the Forage Fish Community Science Workshop

Multiple formats were used to provide opportunities for participants with different communication styles to give feedback, including writing and speaking in small and large group settings. Throughout the day, attendees were encouraged to visit stations around the room, where posters offered different prompts. These included:

"I Wish We Could…"

- What's one forage fish project or question you wish existed in your community?
- Think: monitoring, education, restoration, storytelling, youth engagement, etc.

"I Need…"

- What's one specific resource or support you need to make a project happen?
- Examples: funding, equipment, partners, training, curriculum, data

"I Can Offer…"

- What's one specific resource or support you need to make a project happen?
- Examples: funding, equipment, partners, training, curriculum, data

"Let's Connect"

- Who would you like to collaborate with? Or, what kind of partner are you looking for?
- Add your name/org if you're open to being contacted

An additional station included a knowledge map that asked "Where do you see yourself in the forage fish space?" This gave participants an opportunity to visualize the range of perspectives represented in the room, all of which contribute to collective forage fish knowledge. Participants were also asked to identify groups that were not represented at the workshop in the knowledge map.

The morning session of the workshop was dedicated to context-setting presentations, including twelve in-person talks by workshop attendees and two virtual presentations from partners in British Columbia. The goal of this session was to establish common knowledge by providing an overview of what research projects related to forage fish have occurred, are occurring, or are planned in the near term in the Salish Sea. Talks also addressed education programming, including examples of effective education programs and best practices for engaging with schools. Additionally, talks addressed some of the capabilities and manpower of citizen scientists in this region. The full workshop agenda with presentation titles is available in Appendix B.

The remainder of the day was dedicated to addressing four guiding questions. These questions were aimed at envisioning the future we are working towards, understanding the strengths of community-led science in working towards that future, establishing criteria to prioritize actions for citizen scientists, and finally creating a prioritized list of actions. The questions were posed prior to lunch, to facilitate organic conversations about these topics. After lunch, participants were given worksheets with the four questions listed and asked to silently brainstorm their own answers for 5 minutes. These worksheets were kept by workshop participants to reference during small group breakouts.

Participants were pre-assigned into six breakout groups, which consisted of 7-10 participants each, including a volunteer facilitator and note taker. The group assignments were curated to include a diverse mix of citizen scientists, academics, educators, state employees, Tribal staff, and community members. Volunteer facilitators were tasked with leading participants through conversations addressing each of the four guiding questions over the course of about 90 minutes. Note takers captured summaries of key points and documented how discussions evolved over time. Each group was given a poster to record their co-created answers to the questions, as a supplement to the detailed notes.

Photo showing one of the afternoon breakout groups where participants discussed priority actions for citizen scientists

At the end of the day, all participants came together and shared key takeaways from their group discussions, using the posters as visual aides. The top priority action reported for each group was collected in a list, and participants were then asked to reflect on the list and discuss avenues for continuing momentum for this work.

Summary of the Group Discussions

Q1: What does a successful future for forage fish look like in 10–20 years (ecologically, socially, and in terms of management or monitoring)?

This question established a shared vision of the future for citizen scientists to work towards. Workshop participants identified abundant forage fish populations as an important part of a successful future, specifically having enough fish to support fisheries and abundant food sources. Participants also noted that abundant populations are critically important to marine ecosystem function. Forage fish play a key role in the Salish Sea food web and there should be enough fish to support both the marine ecosystem and harvest by local communities. Stock assessments are fisheries management tools that can inform sustainable harvest levels, but there are currently no stock assessments for any forage fish species in Washington State. Participants acknowledged that more research questions need to be addressed before we can establish indicators of healthy populations that can be used in stock assessments. A successful future therefore includes a better understanding of forage fish life cycles, what drives

population fluctuations, and what types of habitat are needed for spawning success. Filling these gaps would also inform where to direct restoration efforts.

Participants envisioned a successful future for forage fish where citizen scientists meaningfully contribute to knowledge and understanding of forage fish populations with standardized, co-developed protocols for assessing progress and success. In this future, citizen scientists also contribute to increased awareness and engagement about forage fish with local communities so that community members of all ages recognize that forage fishes are ecosystem indicators and there is a cultural awareness for the role they play in the ecosystem. Some of this awareness stems from opportunities for kids to have hands-on educational experiences in classrooms. This increased awareness is also visible in protections for forage fishes that are codified into law, where legislation (some participants coined the "FFPA: Forage Fish Protection Act") includes more protections of shorelines through the permitting process. In this successful future, citizen scientists are engaged with politicians and planners to translate local priorities and knowledge into policy decisions.

Q2: Where can community science meaningfully contribute to this future, and why are those areas a good fit (e.g., data gaps, scalability, community engagement, cost-effectiveness)?

Participants identified five key strengths that will help citizen science contribute to a successful future for forage fish:

Community members have **eyes on the beach**. Members of the community that frequent shorelines have a huge capacity to report observations for spawning events and other notable forage fish happenings. Government agencies do not have the capacity to monitor all shorelines all the time, and citizen scientists can meaningfully contribute to our understanding of where spawning occurs by reporting observations. Different user groups, including birders, anglers, and citizen scientists participating in other projects like toxics monitoring can all make observations about the functioning of local shorelines.

Citizen scientists are **skilled at data collection**. Many groups are highly trained on existing protocols and have many years of experience.

Data collected by citizen scientists can have more **spatial and temporal coverage** than data collected by agency or academic scientists. Citizen scientists can do consistent sampling spatially and temporally, and those who sample at the same site repeatedly over time also have deeper local context than samplers who only visit sites occasionally.

Within a network of community scientists, individuals can engage with **outreach in their local communities and connect with local decision makers**. Citizen scientists are embedded in their communities and can use their diverse roles to engage others. They can act as community advocates of change, using evidence-based advocacy drawing from their own observations.

Citizen science can generate stewardship and **provide hope**. This is particularly important as people often feel helpless in the face of climate change. Increased involvement in the scientific process can have positive feedback where consistent sampling over time leads to meaningful results and a meaningful contribution towards a broader goal. People feel better when they have opportunities to contribute to the future they want to see.

Q3: What criteria should we use to prioritize actions, including what makes an action feasible and appropriate for citizen scientists?

Actions that are appropriate for citizen scientists are safe, accessible, driven by local people and priorities, and have a high impact. Participants acknowledged the balance between identifying projects that address a broader question or goal, while also keeping citizen scientists engaged. These projects should be simple to execute and have a low barrier to entry, while being relevant to pressing scientific questions. To increase engagement, the scientific questions that are addressed should also be relevant to local people and priorities. Volunteers should see the connection between the data they are collecting and how that information will be used for stewardship. There also needs to be funding and institutional support for this work.

Q4: Based on these criteria, what 2–4 specific actions should be prioritized that citizen scientists can realistically take on or contribute to in the near term?

The top priority actions identified among breakout groups were:

- Improve spatial and temporal understanding of spawning
- Address data and analysis bottlenecks, including reducing turnaround time from sample collection to usable results
- Identify ways to engage with more communities and age groups
- Work with local communities to establish priority functions for their beaches and determine how to support those functions
- Develop a communication plan for forage fish to empower more community scientists to conduct outreach and advocacy

The first two action themes address ways that citizen scientists can increase our understanding of forage fish life history. Participants of the workshop generally acknowledge the power that

citizen scientists have to increase spatial and temporal sample collection, beyond what government agencies can achieve through their own research and monitoring programs. Currently, samples of beach sediment that are collected to test for presence of forage fish eggs in Washington State are processed or quality controlled by the WDFW forage fish team and included in the state spawning map. Quality control for these samples is important because the state forage fish spawning map is used in regulatory processes. Both WDFW employees and volunteers who collect samples acknowledge that there is limited capacity to process these samples. Given the number of unknowns in our understanding of when and where forage fish spawn, there are calls to collect more samples and yet the processing of more samples by the state may prove infeasible. Therefore, in order to have a framework to increase the number of samples being collected, citizen scientists could create a system for processing samples and hosting data outside of the state spawning map. Workshop participants acknowledged that a sample can still be high quality and useful for answering scientific questions even if it does not meet the criteria to be used for regulatory processes.

Other priority action themes relate to communication and outreach. These actions reflect themes identified throughout the day, including increased engagement between the general public and forage fishes. By identifying new ways to communicate the role of forage fish in the ecosystem to members of the public of all ages, citizen scientists can increase capacity to effectively raise awareness for the value of these fishes. Doing so in a very place-based framework will also help foster strong connections. By creating priorities for beaches at a very local level, there is a greater chance that members of the public will be interested in stewarding their local resources. Developing a communication strategy (e.g., an elevator pitch) to share within the network of forage fish citizen scientists will empower them to advocate for forage fishes in conversations with other community members.

In addition to the prioritized actions summarized above, workshop participants identified a range of additional opportunities, research questions, resources, and potential partnerships that may inform future work (Appendix C).

Conclusions

The above action themes were identified as top priority relative to other action themes discussed by breakout groups, but they are not prioritized relative to each other. As a collective, they provide direction for continued discussions and prioritization of next steps to the Forage Fish FOCUS initiative. Within each theme, community members and forage fish experts can collaboratively dig deeper into feasibility, funding, and ways to build momentum in carrying this work forward.

As the Forage Fish FOCUS initiative continues, it will benefit from input by policymakers, which were not represented at this workshop despite personalized invitations to join. Finding ways to include policymakers in ongoing discussions will help ensure that project outcomes are relevant to local shoreline management. Additionally, while a need for more funding was highlighted by responses at the poster stations, no new funding pathways were captured in the notes from discussions. Identifying funding pathways will be an important element of sustaining this work. Another consideration moving forward is that many discussions centered around collecting egg samples from beach spawning species, but forage fishes include other species, like Pacific herring and anchovy, that spawn in subtidal habitats. Continuing conversations should consider opportunities for citizen scientists to engage with life history questions about all forage fish species when identifying avenues to expand sample collection and processing within the priority action themes.

Recommended future directions for citizen scientists include exploring ways to increase capacity for processing sediment samples to address questions about forage fish life histories. This process would involve identifying equipment needs, training needs, and a framework for housing these data outside of the WDFW forage fish spawning map (e.g., on the Northwest Straits Commission's SoundIQ or the Pacific Salmon Foundation's forage fish dashboard). Importantly, this will involve conversations about data standardization and data sovereignty. Without the constraints of generating ideas for new projects through the lens of what is possible within WDFW sample processing capabilities, citizen scientists can collaborate on more expansive research efforts.

Recommended future directions for increasing community engagement include developing a succinct and engaging communication strategy to describe why the public should care about forage fish. Doing so will enable citizen scientists to promote interest in forage fish work within their communities, and by increasing education on these topics, communities will be empowered to develop local research and restoration priorities.

Next steps for this work include leveraging the Puget Sound Ecosystem Monitoring Program (PSEMP) Forage Fish & Food Webs Workgroup and the annual Northwest Straits MRC conference as venues for continued knowledge sharing and dialogue. These conversations will identify specific next steps within the priority action themes developed by workshop participants.

Appendix A. Affiliations of Workshop Participants

Clallam County Marine Resources Committee
Washington Department of Natural Resources
Fidalgo Bay Aquatic Reserve
Friends of the San Juans
Island County Marine Resources Committee
Jefferson County Marine Resources Committee
Kwaiht
Lower Elwha Klallam Tribe Natural Resources
Lummi Natural Resources
National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center
Northwest Indian College, Salish Sea Research Center
Northwest Straits Commission
Padilla Bay National Estuarine Research Reserve
Peninsula College
Salish Sea Stewards
Skagit Fisheries Enhancement Group
Skagit County Marine Resources Committee
Snohomish County Marine Resources Committee
Sound Water Stewards
Tagal Oceanic
Tulalip Tribes
University of Washington
Washington Department of Fish and Wildlife
Whatcom County Marine Resources Committee
Whidbey Audubon
Washington Sea Grant
Western Washington University

Appendix B. Workshop Agenda

Forage Fish Community Science Workshop

Hosted by the Island County Marine Resources Committee
April 27, 2026
Cornet Bay Retreat Center
Deception Pass State Park
400 Cornet Bay Rd, Oak Harbor, WA 98277

Funding provided by the Northwest Straits Commission

9:00 am	*Doors Open - Coffee & Check-in*
9:30	**Welcome & Meeting Overview**
9:40	**Ongoing and upcoming regional forage fish research** 'Standing up for the little guys' - *Phill Dionne (WA Dept. of Fish and Wildlife)* 'Long-term surf smelt spawning trends in Washington State' - *Brian Ulaski (WA Dept. of Fish and Wildlife)* 'Shoreline Monitoring Database: Restoration Effectiveness and Incorporation of Forage Fish Egg Data' - *Jason Toft (University of Washington, Puget Sound Ecosystem Monitoring Program) and Morgan Arrington (University of Washington)* 'Forage fish in space and time: how genetics (and you) can inform management and conservation' - *Lorenz Hauser (University of Washington)* 'Fish Out of Water: The Future of Surf Smelt in Puget Sound' - *John Proefrock (University of Washington)* 'Larval Forage Fish in Possession Sound: A New Monitoring Effort' - *Heidi Stewart (Tulalip Tribes)* 'Thermal stress impacts on surf smelt early development' - *Faith Chamberlain (University of Western Washington)*
11:00	***Break***

11:15	***Research cont'd & connecting with community science*** 'Monitoring for Forage Fish Beach Spawning on Vancouver Island' - *Chloe Kraemer (Peninsula Streams Society)* *'*Investigating the importance of forage fish in the diets of recreationally caught Chinook and coho salmon in BC' - *Nathanael Tabert (University of Victoria)* *'*Monitoring forage fish trophic dynamics in the Salish Sea' - *Russel Barsch (Kwaiht)* *'*Small Fish, Big Impact: The Forage Fish Friends Initiative. Bridging Government, Academia, and Citizen Science.' - *Mark Tagal (Tagal Oceanic)* Community science programs at Skagit Fisheries - *Kelly Williams (Skagit Fisheries)* *'*Community-driven marine conservation with the Northwest Straits Commission and Marine Resources Committees' - *Leah Skare (Northwest Straits Commission)* Forage fish education vignettes - *Pete Haase (Skagit MRC), Chelsea Korbulic (Clallam MRC), Andi Kopit (Island MRC)*
12:25 pm	**Conversation starters** - *FF Workshop Team*
12:30	***Lunch (provided)***
1:20	**Overview of the breakout groups** - *FF Workshop Team*
1:30	**Breakout discussion groups I**
2:30	**Break**
2:45	**Breakout discussion groups II**
3:15	**Group discussion** ● *Synthesize ideas, prioritize key themes and actions, and outline next steps*
4:00	**Adjourn** *Optional walk to Hoypus Point*

Appendix C. Additional Opportunities and Potential Partnerships Identified During the Workshop

Questions related to the forage fish life cycle that came up in discussions:

- Do surf smelt/Pacific sand lance prefer certain moon cycles? (potential graduate student project)
- Are beach spawn sites specific to certain groups of surf smelt, or not?
- Why are Pacific herring spawning in different locations?
- Why are sand lance spawning in different habitats? How can we mitigate the impacts that are influencing these factors?

Other actions that were given priority (but not top priority) by breakout groups include:

- Expand spawning event reporting tools & increase outreach for these tools
- Leverage other groups (anglers, other citizen science programs) for data collection. Examples include:
    - Pigeon guillemot surveyors could get more training on identifying different forage fish
    - Surf smelt fishers are targeting fish while they're spawning and could contribute fish samples to larger data collection efforts
- Leverage other groups for lay knowledge (e.g., interviewing anglers)
- Create a place to connect citizen scientists with people who need volunteers (e.g., a volunteer database)
- Define a pipeline to give feedback to citizen scientists. This will help them identify new survey sites and learn how their sampling efforts have addressed knowledge gaps

Examples of partnerships and opportunities to collaborate that were identified through discussions include:

- WDFW directs interested volunteers to MRCs because the process for registering to volunteer directly with the state is extensive and presents a high barrier to entry
- Community scientists learned about the mapping work being done by Brian Ulaski in the WDFW habitat program, and can use areas marked as "uncertain" to identify new survey locations. Ongoing genetics work (in Lorenz Hauser's lab at UW) can also inform site selection

Potential resource pathways include:

- Sound Water Stewards have interest and volunteer manpower to sample more sites, if the bottleneck for data processing is addressed
- Mark Tagal has experience connecting with the general public, talking about seafood tie-ins, and can offer larval rearing training to researchers
- Recreational fishers are a huge potential source of forage fish knowledge
- Private landowners might be willing to collect data on their beaches