



State of Washington  
**DEPARTMENT OF FISH AND WILDLIFE**

Mailing Address: Post Office Box 43200 Olympia, WA 98504-3200 • (360) 902-2200 • TDD (360) 902-2207  
Main Office Location: Natural Resources Building, 1111 Washington Street SE, Olympia, WA

December 1, 2023

The Honorable June Robinson  
Chair, Senate Ways and Means  
303 John A. Cherberg Building  
Post Office Box 40438  
Olympia, WA 98504-0438

The Honorable Timm Ormsby  
Chair, House Appropriations  
315 John L. O'Brien Building  
Post Office Box 40600  
Olympia, WA 98504-0600

The Honorable Kevin Van De Wege  
Chair, Senate Agriculture, Water  
Natural Resources, and Parks  
212 John A. Cherberg Building  
Post Office Box 40424  
Olympia, WA 98504-0424

The Honorable Mike Chapman  
Chair, House Rural Development,  
Natural Resources, and Parks  
132B Legislative Building  
Post Office Box 40600  
Olympia, WA 98504-0600

**RE: European Green Crab Quarterly Progress Report – Fall 2023 (July 1 to September 30, 2023)**

Dear Chairs Robinson, Ormsby, Van De Wege, and Chapman,

In 2021, the Washington Department of Fish and Wildlife (WDFW), tribal co-managers, and partners identified an exponential increase of invasive European green crabs (EGC), *Carcinus maenas*, in the Lummi Nation's Sea Pond within the Salish Sea, and in outer coastal areas including Makah Bay, Grays Harbor, and Willapa Bay.

On Dec. 14, 2021, the WDFW Director submitted an emergency measures request under RCW 77.135.090 for EGC response to Governor Jay Inslee. On Jan. 19, 2022, Governor Inslee issued an emergency proclamation (#22-02) to address the exponential increase in EGC populations across Washington's marine shorelines. The proclamation directed WDFW to eradicate, reduce, or contain EGC in Washington, and to increase coordination with partner agencies and Native American tribes.

The Washington State Legislature approved \$8,568,000 in emergency funding during the 2022 Supplemental Budget to facilitate increased EGC management efforts. In response to the legislative budget proviso directive, this report is the fifth in a series of ongoing quarterly progress reports (Q5). The Q5 report outlines the successes and challenges of ongoing EGC emergency response efforts in Washington state from July 1 to September 30, 2023.

Justin Bush, the new WDFW Aquatic Invasive Species Policy Lead, was formerly delegated as Incident Commander by Director Kelly Susewind, effective September 15, 2023.

Trapping activities in Q5 reached their annual peak resulting from warmer weather conditions and increases in EGC activity. As a result, all entities involved in EGC management were in the field with a high level of effort.

During the Q5 period, the collective effort of all organizations resulted in 131,445 EGC removed from Washington state marine waters, with 129,857 from the Coastal Branch and 1,588 from the Salish Sea Branch. Since January 1, 2022, approximately 518,855 EGC have been removed from Washington state marine waters, with 432,160 removed from the Coast Branch, and 86,695 removed from the Salish Sea Branch. In addition to active control trapping, Q5 trap deployment for early detection monitoring occurred in areas where EGC had not previously been detected. EGC has not been detected in the Salish Sea Branch south of the northern Hood Canal. Data on EGC abundance, body size, sex ratios, and reproductive status were collected for future analysis, along with DNA and RNA samples to assess connectivity between EGC populations.

WDFW, WSG, co-managers, tribes, and partners achieved significant progress in EGC management efforts. The EGC Research Task Force continues to coordinate with EGC researchers across the Pacific coast of North America to determine research priorities to support EGC management efforts in Washington state and throughout the region. Additional progress was also made on public education and community engagement to support EGC awareness, with WDFW representatives engaging approximately 1,800 individuals at public events and producing new outreach materials. While challenges remain (e.g., finalizing formal guidelines, refinement of electronic data collection software, creation of a 5-year statewide management plan), the continued efforts of all parties and the clear organizational structure set previously will allow for continued success during the remainder of 2023.

Per RCW 77.135.090, the WDFW Director continues to evaluate the effects of the European Green Crab emergency measures, finds that the emergency continues to persist and advises that all emergency measures should be continued.

If you have any questions about this report or the Department's efforts in this area, please feel free to contact Tom McBride, WDFW's Legislative Director, at (360) 480-1472.

Sincerely,



Justin Bush  
WDFW European Green Crab Incident Commander

cc:

Kelly Susewind, Director, Washington Department of Fish and Wildlife  
Kelly Cunningham, WDFW Fish Program Director  
Ruth Musgrave, Senior Policy Advisor to Governor Jay Inslee

# European Green Crab Quarterly Progress Report – Fall 2023 (July 1 to September 30, 2023)

Washington Department of Fish and Wildlife (WDFW)



Washington  
Department of  
**FISH &  
WILDLIFE**

December 1, 2023

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For more information, see <https://wdfw.wa.gov/accessibility/requests-accommodation>.



# Executive Summary

In response to the ESSB 5693 (2022 c 297) legislative budget proviso directive, this report has been authored as the fifth in a series of ongoing quarterly progress reports (Q5). This report will serve to outline the successes and challenges of ongoing European green crab (EGC) emergency response efforts in Washington state from July 1 to September 30, 2023. In addition, this report will put the work during Q5 in the context of the previous work completed (Q1-Q4).

The previous quarterly progress reports are available at: <https://wdfw.wa.gov/publications> and on WDFW's European green crab [webpage](#).

In 2021, the Washington Department of Fish and Wildlife (WDFW), co-managers, tribes, and partners identified an exponential increase of invasive European green crab, *Carcinus maenas*, in the Lummi Nation's Sea Pond within the Salish Sea, and in outer coastal areas including Grays Harbor, Makah Bay, and Willapa Bay. On Dec. 14, 2021, WDFW Director Susewind submitted an emergency measures request under RCW 77.135.090 for EGC response to Governor Jay Inslee. On Jan. 19, 2022, Governor Jay Inslee issued an emergency proclamation (#22-02) to address the exponential increase in EGC populations across Washington's marine shorelines. The proclamation directed WDFW to eradicate, reduce, or contain EGC in Washington. The Washington State Legislature approved \$8,568,000 in emergency funding during the 2022 Supplemental Budget to facilitate increased EGC management efforts. In response to the legislative budget proviso directive, this report is the fifth in a series of ongoing quarterly progress reports (Q5). The Q5 report will outline the successes and challenges of ongoing EGC emergency response efforts in Washington state from July 1 to Sep. 30, 2023.

An Incident Command System (ICS) was established to deal with the complexities of the EGC management effort. Support for and coordination with co-managers, tribes, and partners is essential, as the scale of the EGC emergency is such that no one entity could ever hope to implement successful statewide management strategies alone. Washington Sea Grant (WSG), the Lummi Nation, the Makah Tribe, the Shoalwater Bay Tribe, shellfish growers and various other entities have continued their ongoing efforts managing EGC populations, closely coordinating with WDFW. The ICS also resulted in the creation and distribution of various updates including reports to the governor every 10 days and Situation Reports (SitReps) based on monthly operational periods to provide information on and ensure transparency regarding management actions taken, grant funding allocations, EGC catch numbers, trapping efforts, media outreach, and other relevant information. These Situation Reports were synthesized for the public, media, and other external audiences in bi-monthly [EGC Public Updates published](#) and distributed through WDFW's EGC Management Updates email list as well as Department webpages, communications, and social media channels.

Representatives from most entities participating in EGC management have joined the ICS Multi-Agency Coordination (MAC) Group. The MAC Group provides a forum for these representatives to share information, establish a common operating picture, develop long-term priorities for the EGC emergency, and commit and allocate funding and other resources to enhance emergency measures responses. In Q5, the EGC MAC Group closed out of Fiscal Year (FY) 2023 Emergency Measures





Strategic Action Plan and began the final stages of review and approval for the FY 2024 Strategic Action Plan.

Trapping activities in Q5 reached their annual peak resulting from warmer weather conditions and increases in EGC activity. As a result, all entities involved in EGC management were in the field with a high level of effort.

During the Q5 period, the collective effort of all organizations resulted in 131,445 EGC removed from Washington state marine waters, with 129,857 from the Coastal Branch and 1,588 from the Salish Sea Branch. Since January 1, 2022, approximately 518,855 EGC have been removed from Washington state marine waters, with 432,160 removed from the Coast Branch, and 86,695 removed from the Salish Sea Branch. In addition to active control trapping, Q5 trap deployment for early detection monitoring occurred in areas where EGC had not previously been detected. EGC has not been detected in the Salish Sea Branch south of the northern Hood Canal. Data on EGC abundance, body size, sex ratios, and reproductive status were collected for future analysis, along with DNA and RNA samples to assess connectivity between EGC populations.

WDFW, WSG, co-managers, tribes, and partners achieved significant progress in EGC management efforts. The EGC Research Task Force continues to coordinate with EGC researchers across the Pacific coast of North America to determine research priorities to support EGC management efforts in Washington state and throughout the region. Additional progress was also made on public education and community engagement to support EGC awareness, with WDFW representatives engaging approximately 1,800 individuals at public events and producing new outreach materials. While challenges remain (e.g., finalizing formal guidelines, refinement of electronic data collection software, creation of a 5-year statewide management plan), the continued efforts of all parties and the clear organizational structure set previously will allow for continued success during the remainder of 2023.

## Background

### European green crab

The European green crab (EGC), *Carcinus maenas*, is a globally damaging invasive species that poses a threat to the ecological, economic, and cultural resources of Washington state. Native to Western Europe and Northwestern Africa, this hardy and voracious predator has since expanded its range throughout the globe (Carlton and Cohen 2003). Green crabs exploit a variety of different habitat types within intertidal and subtidal zones. Along the Pacific Coast of North America, EGC inhabit protected shorelines in unstructured sandy and muddy bottoms, estuaries, saltmarshes and seagrass beds, as well as utilizing woody debris and rocky substrates (Kern et al. 2002). EGC have wide tolerances for salinity (1.4-54 ppt) and temperature (0-35 °C) and can even survive air exposure for several days (Leignel et al. 2014).

In areas where EGC has been able to establish large populations for extended periods of time, they have the potential to negatively impact other species, particularly smaller crabs and bivalves (Jamieson et al. 1998, McDonald et al. 2001). It is estimated that damages to commercial shellfisheries from EGC predation average \$22.6 million per year on the East Coast of the United States (Lovell et al. 2007). Similar losses from EGC predation are possible for Salish Sea shellfish



fisheries (Mach and Chan 2013) and Pacific Coast fisheries are also at risk. Predation on oysters by EGC could negatively impact oyster fisheries, as adult EGC can prey upon young oysters (Dare et al. 1983, Poirier et al. 2017) and have been observed cracking and consuming adult oysters in laboratory settings (Forster, personal communication). Lab work has shown that juvenile EGC outcompeted similar-sized Dungeness crabs for food and shelter and juvenile Dungeness may serve as prey for larger EGC, resulting in potential impacts to wild Dungeness populations. Predation by EGC has led to declines in native bivalve and crab populations in invaded habitats (Grosholz et al. 2000). In addition, burrowing by EGC can have significant negative impacts on eelgrass, estuary, and marsh habitats (Malyshev and Quijón 2011, Matheson et al. 2016, Howard et al. 2019).

Given their history as a prolific invasive species, EGC is classified as a Prohibited Level 1 Invasive Species in Washington (WAC 220-640-030; Appendix A), meaning they may not be possessed, introduced on or into a water body or property, or trafficked (transported, bought, or sold), without department authorization, a permit, or as otherwise provided by rule (RCW 77.135.040; Appendix A). WDFW is currently not asking the public to kill suspected EGC, which may sound counterintuitive but is intended to protect native crabs from cases of mistaken identity (native crabs continue to be commonly misreported as EGC by the public; Flannery, personal communication). EGC is most accurately identified by the 5 large spines, also called marginal teeth, on either side of their forward carapace, a unique pattern for crabs on the Pacific Coast of North America (Figure 1). Despite their name, coloration of green crabs varies from bright green to dark orange, thus color is not a reliable feature to use when distinguishing EGC from native crab species.





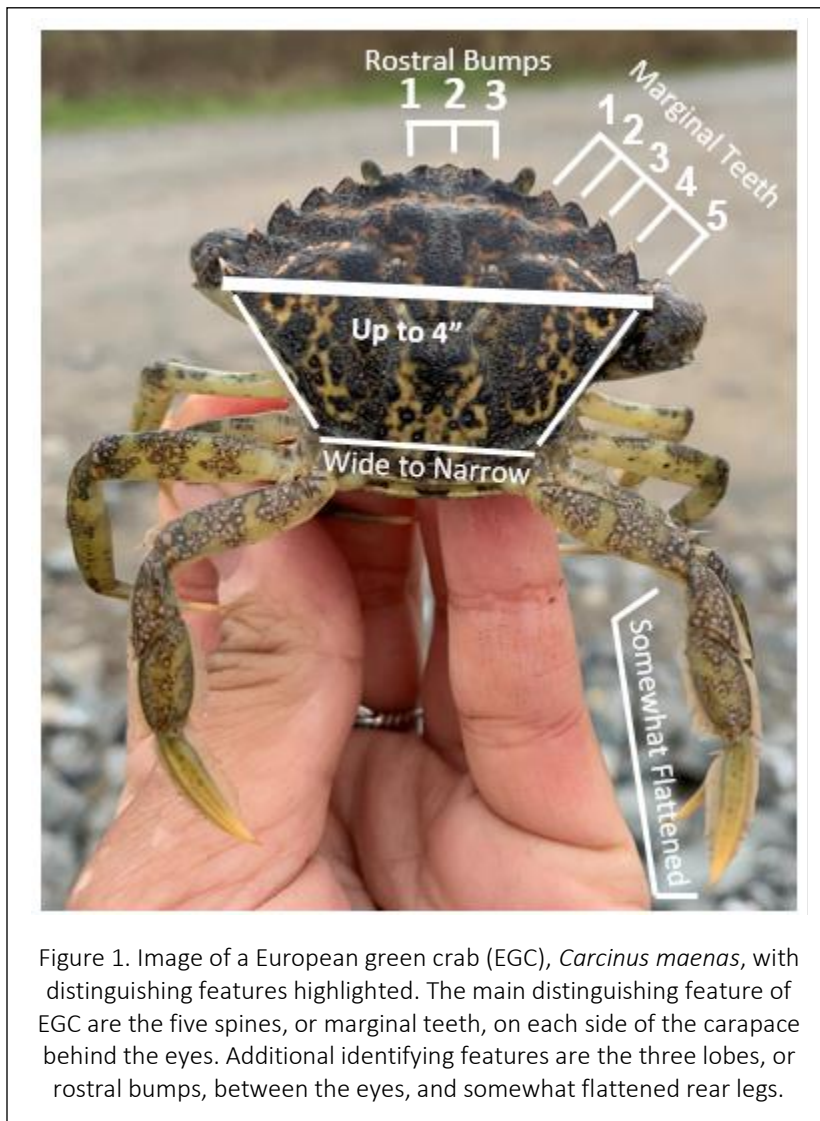


Figure 1. Image of a European green crab (EGC), *Carcinus maenas*, with distinguishing features highlighted. The main distinguishing feature of EGC are the five spines, or marginal teeth, on each side of the carapace behind the eyes. Additional identifying features are the three lobes, or rostral bumps, between the eyes, and somewhat flattened rear legs.

## History of the European green crab in Washington state

The first detection of EGC in the waters of Washington was in 1998 in Willapa Bay and Grays Harbor ([Carlton and Cohen 2003](#)); Table 1; Figure 2). Initial emergency management responses took place but ended after a few years due to a lack of evidence of self-recruitment and fewer EGCs being captured. In 2015, the Washington Department of Fish and Wildlife (WDFW) learned that a population of EGCs was discovered in 2012 in Sooke Basin, British Columbia, Canada (Gillespie et al. 2015). In response over concerns of new EGC introductions within the Washington portion of the Salish Sea, WDFW designated Washington Sea Grant (WSG) to lead an early detection monthly monitoring community science network, also known as the Crab Team. This also marked the beginning of increased communication and collaboration with the Department of Fisheries and Oceans Canada (DFO) to explore transboundary EGC management in the Salish Sea. The first detections of EGC in the Washington region of the Salish Sea occurred in 2016 at Westcott Bay on San Juan Island by the WSG Crab Team and in Padilla Bay by staff at the Padilla Bay National Estuary Research Reserve (Grason et al. 2018). There were additional detections of EGC in 2017 in



Makah Bay by the Makah Tribe and in Dungeness Spit within the Dungeness National Wildlife Refuge, which is managed by the US Fish and Wildlife Service. Since 2018, there have been increasing numbers of EGC detections in the Salish Sea and Pacific coastal regions of Washington. In response to continued EGC presence in the Salish Sea, the Salish Sea Transboundary Action Plan for Invasive European Green Crab was created and signed by representatives of WDFW, WSG, the Puget Sound Partnership, and the DFO in 2019 (Drinkwin et al. 2018).

Table 1 Yearly European green crab captures in Washington from 1998-2022. Data is divided by EGC captured in the Washington State portion of the Salish Sea and EGC captured along the Pacific Coast. Please note that these data only represent crabs captured, not the effort employed. Catch effort (number of traps deployed, number of locations trapped, frequency of trap recovery) varies greatly across years and location.

Year	Salish Sea	Pacific Coast	Total
1998	0	364	364
1999	0	507	507
2000	0	235	235
2001	0	142	142
2002	0	167	167
2003	0	24	24
2004	0	4	4
2005	0	115	115
2006 - 2014	0	68	68
2015	0	8	8
2016	5	19	24
2017	101	64	165
2018	77	1,115	1,192
2019	177	1,766	1,943
2020	2,858	3,971	6,829
2021	86,340	16,825	103,165
2022	81,006	204,274	285,280

## Emergency proclamation and supplemental funding

In 2021, WDFW, co-managers, tribes, and partners identified an exponential increase of invasive EGC in the Lummi Nation’s Sea Pond within the Salish Sea, and in coastal areas including Makah Bay, Grays Harbor, and Willapa Bay. It was concluded that this continuing increase in EGC distribution and abundance posed an imminent threat to Washington’s economic, environmental, and cultural resources. While \$2.3 million was appropriated by the State Legislature for EGC management in the 2021-23 biennium, it was determined to be insufficient to control these exploding populations.

On Dec. 14, 2021, Director Susewind submitted an emergency measures request under RCW 77.135.090 (Appendix A) for EGC response to Governor Jay Inslee. While emergency funding was not immediately available, on Jan. 19, 2022, Gov. Inslee issued an emergency proclamation (#22-02) to address the exponential increase in the EGC population within the Lummi Nation’s Sea Pond



and Pacific coastal areas. The proclamation directs WDFW to implement emergency measures as necessary to affect the eradication of or to prevent the permanent establishment and expansion of EGC in Washington. In addition, the Governor urged the Legislature to provide additional emergency funding as requested by the WDFW as soon as possible.

Working with the Governor's office, the Office of Financial Management, co-managers and tribes including the Lummi Nation, Makah Tribe, and others, along with Washington Sea Grant (WSG), WDFW requested \$8,568,000 from the State Legislature during the 2022 supplemental session to control increasing EGC populations. The Legislature fully-funded this request in the 2022 Supplemental Budget, which was signed by Governor Inslee on March 31, 2022.

In April 2023, the State Legislature and governor designated \$6,082,000 to be appropriated annually for green crab management in the 2023-25 Operating Budget. This amounts to a total of approximately \$13 million for the 2023-25 Biennial Budget. Previously, the Legislature had provided \$2.3 million per biennium ongoing for EGC control in 2021, but this amount was deemed insufficient to match the scale of this growing threat.

### **Governor Proclamation 22-02 Directives**

The following text, taken from "Emergency Proclamation by the Governor 22-02 Green Crab Infestation", outlines the primary directives to WDFW and other state agencies by Governor Jay Inslee regarding EGC management:

"NOW THEREFORE, I, Jay Inslee, Governor of the state of Washington, by virtue of the authority vested in me under RCW 43.06.010(14), as a result of the above-noted situation, and in accordance with RCW 77.135.090, do hereby order the Department of Fish and Wildlife to begin implementation of emergency measures as necessary to effect the eradication of or to prevent the permanent establishment and expansion of European green crab.

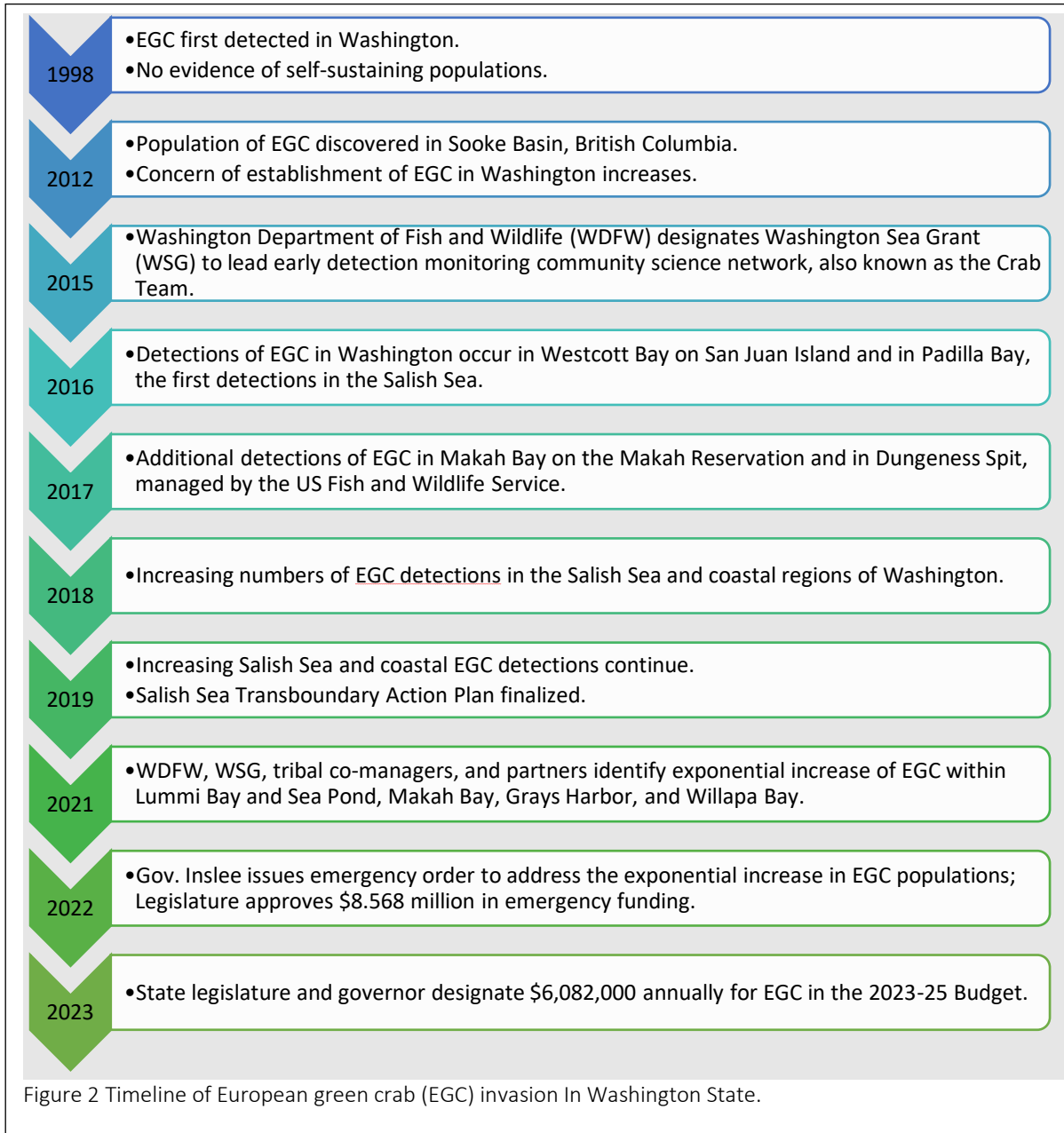
FURTHERMORE, I direct the Department of Ecology, and I ask the Department of Natural Resources and the State Parks and Recreation Commission to identify European green crab management as a high priority on their respective state-owned aquatic lands and to facilitate implementing the emergency measures described herein."

### **Legislative Proviso**

The following text, taken from "ESSB 5693 - Making 2021-2023 fiscal biennium supplemental operating appropriations", Section 308 (Page 552, Line 16) - outlines the primary directives to WDFW by the Washington State Legislature regarding EGC management:

"Implement eradication and control measures on European green crabs through coordination and grants with partner organizations. Provide quarterly progress reports on the success and challenges of the measures to the appropriate committees of the legislature."





# Successes of European green crab management measures

The following is an overview of the major successes related to European green crab (EGC) management actions for the fifth quarter of the emergency, from July 1 to Sep. 30, 2023 (Q5). The success of Q1-Q4 (March 1, 2022 – June 30, 2023) may also be discussed and included for context. A complete list of EGC management actions of Q5 can be found in [Appendix A](#) of this report.

## Incident Command System implementation

The Washington State Emergency Management Division assigned mission #22-1085 on April 18, 2022, for the EGC emergency response. After meeting with other state and federal agencies, the Washington Department of Fish and Wildlife (WDFW) Director Kelly Susewind formally implemented an Incident Command System (ICS) on May 5, 2022, in delegating authority to Allen Pleus, WDFW's Aquatic Invasive Species (AIS) Policy Coordinator, to serve as Incident Commander (Figure 3). This approach provides a clear command structure, as well as standardizing communications and management action implementation across the state. In addition, ICS provides support to federal and tribal participants across the state while they retain their autonomy in EGC management decisions and actions. During Q5, successes of the EGC ICS have included:

- Delegation of Justin Bush, the new WDFW Aquatic Invasive Species Policy Lead, as Incident Commander by Director Kelly Susewind effective September 15, 2023.
- Allen Pleus, the previous WDFW Aquatic Invasive Species Policy Lead and Incident Commander, facilitated the transition of Justin Bush into his new position.
  - Allen Pleus retired in October 2023. We thank him for his service and wish him a relaxing and well-deserved retirement.
- Ensuring that ongoing management actions are guided by the five Incident Objectives developed in Q1:
  - A. Facilitate WDFW implementing Governor's Emergency Proclamation for statewide emergency measures with respect for tribal sovereignty and federal jurisdictions.
  - B. Health and safety of all participants.
  - C. Reduce or contain EGC populations below levels that result in environmental, economic, and cultural resource harm.
  - D. Collaborative and transparent emergency management.
  - E. Post-emergency transition to long-term EGC management by local co-managers, tribes, and partners with WDFW oversight.
- Meetings with co-managers and tribal entities to discuss ICS structure and solicit recommendations on how co-managers and tribes would like to engage on policy and technical levels.
- Regular reports to the governor every 10 days per RCW 77.135.090 on the effects of emergency measures and advising the governor if all or some emergency measures should be discontinued.
- Creation of ICS Situation Reports (SitReps) based on a monthly operational period summarizing the status of Washington state EGC emergency measures including actions



taken, funding allocations, EGC catch numbers, trapping efforts, and other relevant information for dissemination among EGC emergency measure co-managers, tribes, and partners.

- Prior to Q5, operational periods were two weeks during high trapping activity (March – October). However, the quick turnaround for data reporting from co-managers, tribes, and partners and the creation of SitReps by WDFW proved challenging. To address this issue, the MAC group approved the shift to monthly operational periods year-round for the remainder for the emergency.
- Creation of bi-monthly (e.g., January/February) EGC Public Updates that included information about Washington state EGC Emergency measures, highlighting the efforts of co-managers, tribes, and partners, and sharing stories from the field for dissemination to the public and media.
- Continued WDFW internal policy coordination meetings.

An important aspect of the EGC ICS structure is the Multi-Agency Coordination (MAC) Group. The MAC Group consists of representatives from various co-managers, tribes, and partners, including state and federal agencies, and shellfish growers (Table 2). The MAC Group provides a forum for these representatives to share information, establish a common operating picture, and recommend common long-term priorities for the EGC emergency. In addition, the group is tasked with making recommendations to WDFW for emergency funding and may commit and allocate additional or in-kind funding and other resources to enhance emergency measures response. Since its formation on June 8, 2022, the MAC Group has convened twenty-nine times (six times in Q5). During Q5, EGC MAC Group successes have included:

- Rescheduling of MAC Group meetings.
  - The MAC group approved a schedule of a two-hour regular meeting on the second Wednesday of each month from 10 a.m. to 12 p.m., and a one-hour check-in meeting on the fourth Wednesday of each month from 10 a.m. to 11 a.m. This adjustment should improve the efficacy and focus of MAC Group meetings.
- Completion of RCO EGC Emergency Measures Fund contracts, which includes:
  - \$91,316 U.S. National Oceanographic and Atmospheric Administration
  - \$402,220 State of Washington Department of Natural Resources
  - \$99,312 Pacific County Vegetation Management
  - \$75,154 State of Washington Department of Ecology
  - \$30,000 Grays Harbor Conservation District
  - \$90,000 Pacific Conservation District
  - \$70,517 Washington State University (WSU)/Washington Sea Grant (WSG)
  - See previous EGC Legislative Reports for more details.
- Reviewing updates from previously approved RCO EGC Emergency Measures Fund requests, which includes:
  - \$100,000 Lummi Indian Business Council
    - Final Report Due 9/30/2023 – Received at time of writing.
  - \$32,897 US Fish & Wildlife Service (FWS) Dungeness National Wildlife Refuge (NWR)
    - Agreement End Date 12/29/2023; Final Report Due 2/1/2024.
  - \$110,240 US FWS Willapa National Wildlife Refuge





- Final Report Due 1/31/2024
      - See previous EGC Legislative Reports for more details.
    - Close out of Fiscal Year (FY) 2023 Emergency Measures Strategic Action Plan. Identification of FY 2024 Strategic Action Plan gaps.

Table 2 List of European green crab (EGC) Multi-Agency Coordination (MAC) Group member organizations. Representatives of these organizations share information, establish a common operating picture, and develop common long-term priorities for the EGC emergency.

Multi-Agency Coordination group member organizations	
Pacific Coast Shellfish Growers Association	Washington Emergency Management Division
Lummi Nation Business Council	Washington Sea Grant
Puget Sound Partnership	Washington State Department of Agriculture
Shoalwater Bay Tribe	Washington State Department of Fish and Wildlife
U.S. Bureau of Indian Affairs	Washington State Department of Natural Resources
U.S. Environmental Protection Agency	Washington State Parks and Recreation Commission
U.S. Fish and Wildlife Service	Washington State Recreation and Conservation Office
U.S. Geological Survey	Washington State University Extension
U.S. National Oceanographic and Atmospheric Administration	Willapa-Grays Harbor Oyster Growers' Association
Washington Department of Ecology	

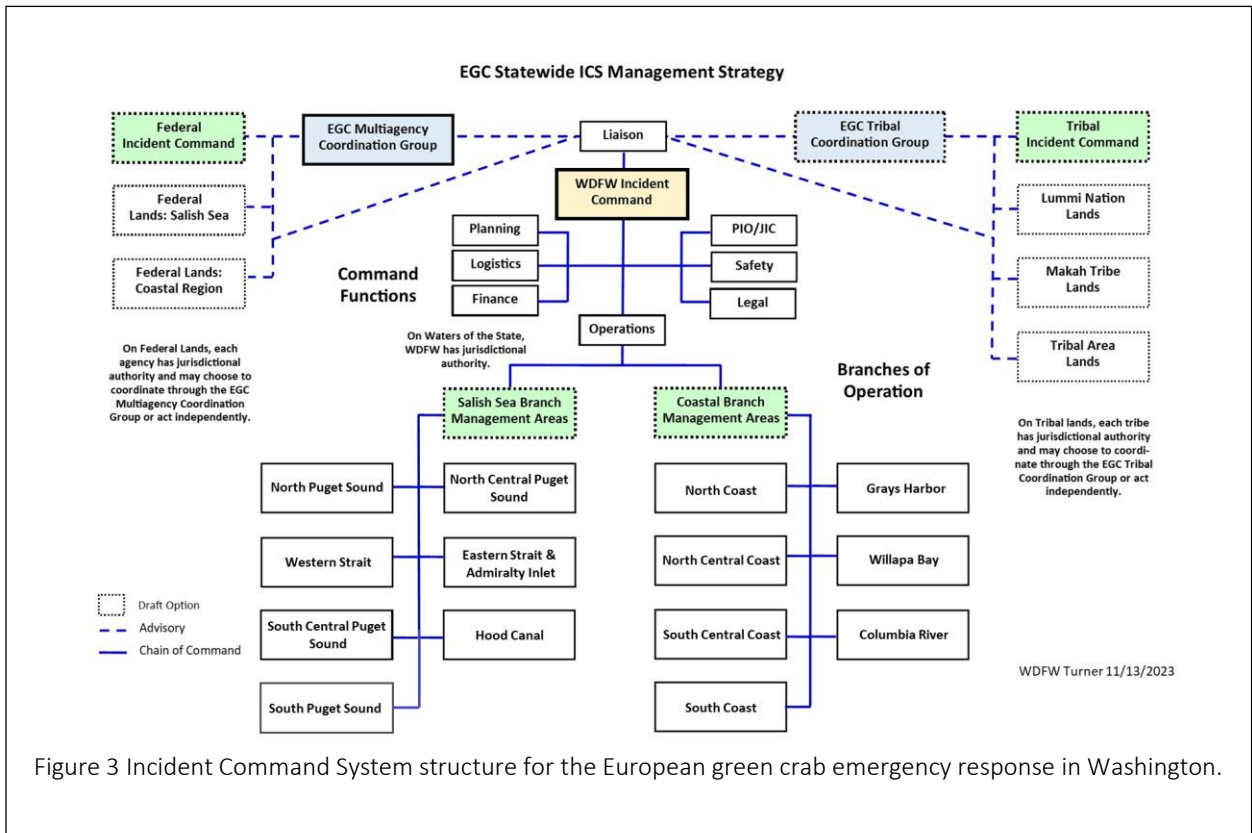


Figure 3 Incident Command System structure for the European green crab emergency response in Washington.





## Coordination with co-managers, tribes, and partners

Perhaps the greatest success of EGC management in Washington are the efforts, both independent and collaborative, of the many co-managers, tribes, and partners within the state (Table 3). The scope of the EGC emergency is such that no one organization can hope to curtail it alone. For years, co-managers, tribes, and partners such as WSG, shellfish growers, and local, state, and federal agencies have worked with WDFW to implement short- and long-term management actions to support statewide efforts in EGC management. The contributions of all entities involved in EGC control cannot be overvalued. While this report does not go into specifics of the contributions of each group, MAC Group member organizations were invited to submit addendums to outline their specific actions and successes in their own words. Addendums submitted to WDFW before publication are included in this document in [Appendix B](#).

Since EGC extend beyond jurisdictional boundaries, management responses require action, collaboration, and coordination between various groups. It is important to note that EGC management is very complex with multiple jurisdictions, varying management priorities, different management types, complex operations, and different resource capacities. Additionally, each organization can have differing goals for sensitive habitats, species protections and aquaculture operation protections. SitReps were disseminated monthly based on ICS operational periods to support meeting the collaboration and transparent emergency management objective. These SitReps included information on management actions taken, grant funding allocations, EGC catch numbers, trapping efforts, media outreach and other relevant information. The first SitRep was disseminated on June 16, 2022, and twenty-six have been completed as of the end of Q5.

On July 31, 2023, WDFW staff completed Scope of Work and deliverables for Washington State Department of Natural Resources (DNR), Pacific Conservation District, and Grays Harbor Conservation District for EGC work in Fiscal Year 2023. On this same day, WDFW hosted National Oceanographic and Atmospheric Administration (NOAA) attorneys, communications staff, and interns at Nick's Lagoon to discuss ESA permitting, co-manager/tribe/partner involvement, and trapping placements within various habitats.

From Aug. 21 to 23, 2023, WDFW, in collaboration with the Puget Sound Partnership and Governor's Salmon Recovery Office, resumed the Natural Resources Agencies' Congressional Staff Tour that was held prior to COVID. The tour's objective was to highlight the importance of partnerships in Puget Sound recovery and to underscore how critical federal funding is to projects and issues in the area. The sites visited demonstrated that the scope, scale, and complexity of projects and issues vary. Many topics were covered, including impacts of and efforts combating EGC. Participants from other state agencies, federal agencies, local governments, and non-governmental organizations attended the tour. Congressional staff from Senator Murray's, Senator Cantwell's, Congressman Larsen, Congresswoman Jayapal, Congressman Kilmer, and Congresswoman McMorris Rodgers offices attended. Additionally, three of the Governor's staff also joined.



Table 3 List of co-managers, tribes, and partner organizations working with WDFW on control and management efforts of the European green crab in Washington. Participants implement short- and long-term management actions to support statewide efforts in EGC control, including independent and WDFW collaborative trapping, outreach and education, field support, and monitoring. These actions are an essential component of the EGC management in Washington.

European green crab management co-managers, tribes, and partner organizations	
Bay Center Farms	Quinault Indian Nation
Brady's Oysters	Samish Indian Nation
Chuckanut Shellfish	Shoalwater Bay Tribe
Drayton Harbor Oyster Co.	Stillaguamish Tribe of Indians
Elkhorn Oyster Co.	Stillwaters Environmental Center
Goose Point Oysters	Suquamish Tribe
Grays Harbor National Wildlife Refuge	Swinomish Indian Tribal Community
Jamestown S'Klallam Tribe	Taylor Shellfish Farms
Lower Elwha Klallam Tribe	Twin Harbors Waterkeeper Alliance
Lummi Nation	United States Fish and Wildlife Service
Makah Tribe	United States Navy
Northwest Straits Commission	Veterans Corps
Pacific County Vegetation Management	Washington Sea Grant
Pacific Seafoods	Washington State Department of Natural Resources
Padilla Bay National Estuarine Research Reserve	Washington State DNR Puget Sound Corps
Pacific States Marine Fisheries Commission	Washington Conservation Corps
Penn Cove Shellfish	Willapa Bay National Wildlife Refuge
Port Gamble S'Klallam Tribe	Willapa-Grays Harbor Oyster Growers' Association
Quileute Tribe	

## Budget allocation

The \$454,362 in funds provided for this report period allowed for the continuation of our management efforts.

- Staff (Salaries + Benefits): \$324,085
  - Funds spent on staff. At the end of Q5, the current active EGC staff to the European Green Crab Project includes a Lead Biologist 4, a Field Ops Biologist 3, three Regional Biologist 2s, a Research Scientist 1, a Communications and Outreach Specialist 3, a portion of a Communications Consultant 5's time (~15%) for efforts as Public Information Officer, and 9 Scientific Technician 2s (2 permanent, 7 seasonal).
- Equipment: \$7,740
  - Funds spent on high value equipment.
- Goods & Services: \$14,437
  - Funds spent on general field supplies and gear such as bait and traps.
- Travel: \$6,000



- Funds spent on motor pool vehicles, per diem and lodging. Aside from trapping efforts, travel funds allowed staff to present at and attend conferences and perform outreach for various stakeholder groups.
- Agency Indirect: \$102,100
  - Funds spent on agency-wide, general administration costs.

## European green crab monitoring and removal

The state is divided into Coastal and Salish Sea Branches to facilitate effective EGC ICS communications and management (Figure 4). These branches are then further divided into fourteen Management Areas (MA) based on WDFW recreational fishing marine areas, with MA's further divided into Coordination Areas. During Q5, the Strait of Juan de Fuca MA was bifurcated to create two distinct MA's: Western Strait MA and Eastern Strait & Admiralty Inlet MA. In addition, some MA boundaries in the Salish Sea Branch were adjusted.

Trapping efforts across the state were undertaken by WDFW, WSG, co-managers, tribes, and partners. The catch numbers presented for Q5 represent the collective effort of all organizations, and those efforts must be recognized.

During Q5, trap deployment across all MA's were at their annual peak due to optimal field conditions (e.g., warmer weather, prolonged daylight hours) and high EGC activity resulting from warm weather. Trapping efforts occurred in all Management Areas except for South Coast. The South Coast Management Area consists of the western coastline of Long Beach Peninsula, which borders the Pacific Ocean. The majority of South Coast is sandy shoreline, except for the rocky shoreline at the southern end around North Head, and the entire area is subject to high wave action. As a result, South Coast is deemed poor habitat for EGC, and there are currently no management actions occurring.

In total, 131,445 EGC were removed in Q5 from Washington state waters, with 129,857 removed from the Coastal Branch and 1,588 removed from the Salish Sea Branch (Table 4). In the Coastal Branch, the majority of EGC were removed from the following Management Areas: Willapa Bay (99,305), followed by Grays Harbor (25,900) and North Coast (4,651), with a single crab collected from Columbia River (1). In the Salish Sea Branch, most EGC were removed from the North Puget Sound Management Area (1,421), with fewer crabs collected in the Eastern Strait and Admiralty Inlet (100) and Hood Canal (67) Management Areas. While trapping occurred in the North Central Coast, North Central Puget Sound, South Central Puget Sound, South Puget Sound, and Western Strait Management Areas, no EGC were captured. To date, EGC have not been detected in the Salish Sea Branch south of northern Hood Canal Management Area, though early-detection monitoring continues across the southerly Management Areas. Data on EGC abundance, body size, sex ratios, and reproductive status were collected for future analysis, along with DNA and RNA samples to assess connectivity between EGC populations. Removed EGC were euthanized following humane best practices.



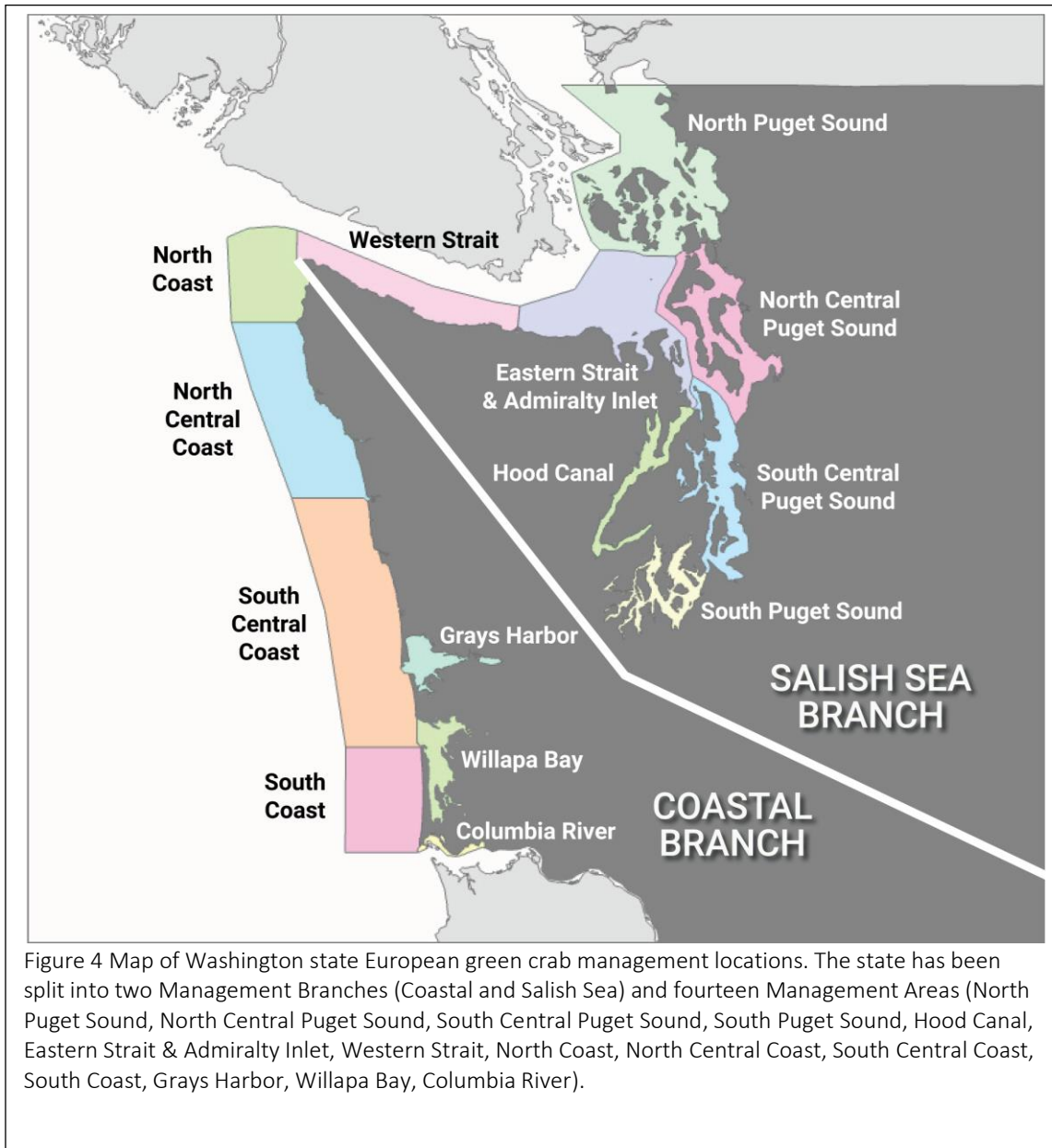


Figure 4 Map of Washington state European green crab management locations. The state has been split into two Management Branches (Coastal and Salish Sea) and fourteen Management Areas (North Puget Sound, North Central Puget Sound, South Central Puget Sound, South Puget Sound, Hood Canal, Eastern Strait & Admiralty Inlet, Western Strait, North Coast, North Central Coast, South Central Coast, South Coast, Grays Harbor, Willapa Bay, Columbia River).

WDFW is partnered with Tidal Grow Agriscience (TGA), an organic fertilizer manufacturer based in Raymond, WA. TGA generously accepts fish waste (i.e., EGC and used bait) from WDFW and participating co-managers, tribes, and partners for processing into a liquid fertilizer (Pacific Gro) free of charge. This partnership allows organic material that would otherwise be dumped in landfills to be put to productive use as outlined in HB 1799 (2022). As of the end of Q5, ~12,000 lbs. (~5,443 kg) of fish waste were delivered to TGA for processing. EGC collected by the Shoalwater Bay Tribe, are utilized directly as fertilizer in their tribal community garden (Pfleeger-Ritzman, personal communication).



Table 4 European green crab (EGC) capture totals for Q1 (Jan. 1 – Sep. 30, 2022), Q2 (Oct. 1 – Dec. 31, 2022), Q3 (Jan. 1 – March 31, 2023), Q4 (April 1 – June 30, 2023), Q5 (July 1 – Sep. 30, 2023) and All (the duration of the EGC management effort) based on SitRep reported catch and trapping effort. These numbers are presented for each Management Branch (Coastal and Salish Sea) and Management Area. These totals include not only removal efforts by Washington Department of Fish and Wildlife, but co-managers, tribes, and partners such as the Washington Sea Grant Crab Team, the Lummi Nation, the Makah Tribe, the Shoalwater Bay Tribe, and participating shellfish growers. \* = No trapping occurred in these Management Areas. Please note that these data only represent crabs captured, not the effort employed. Catch effort (number of traps deployed, number of locations trapped, frequency of trap recovery) varies greatly across years and location.

Branch	Management Area	Q1 Total EGC Captured	Q2 Total EGC Captured	Q3 Total EGC Captured	Q4 Total EGC Captured	Q5 Total EGC Captured	All EGC Captured
Salish Sea	North Puget Sound	75,774	5,126	1,687	2,262	1,421	86,270
Salish Sea	Western Strait	0	0	0	0	0	0
Salish Sea	Eastern Strait & Admiralty Inlet	75	18	2	120	100	315
Salish Sea	Hood Canal	16	0	0	27	67	110
Salish Sea	North Central Puget Sound	0	0	*	0	0	0
Salish Sea	South Central Puget Sound	0	0	*	0	0	0
Salish Sea	South Puget Sound	0	0	*	0	0	0
<b>Salish Sea</b>	<b>All</b>	<b>75,865</b>	<b>5,144</b>	<b>1,689</b>	<b>2,409</b>	<b>1,588</b>	<b>86,695</b>
Coastal	North Coast	19,984	5,125	577	3,234	4,651	33,571
Coastal	North Central Coast	0	0	*	0	0	0
Coastal	South Central Coast	34	0	*	4	0	38
Coastal	South Coast	*	*	*	*	*	*
Coastal	Grays Harbor	6,402	17,862	21,479	12,708	25,900	84,351
Coastal	Willapa Bay	87,304	67,558	13,413	46,613	99,305	314,193
Coastal	Columbia River	5	0	*	1	1	7
<b>Coastal</b>	<b>All</b>	<b>113,729</b>	<b>90,545</b>	<b>35,469</b>	<b>62,560</b>	<b>129,857</b>	<b>432,160</b>
<b>All</b>	<b>All</b>	<b>189,594</b>	<b>95,689</b>	<b>37,158</b>	<b>64,969</b>	<b>131,445</b>	<b>518,855</b>



Initial examination of quarterly trapping data shows evidence for significant trends in relative EGC abundance in several locations. However, the low-resolution data from SitReps is insufficient for a detailed analysis. WDFW plans to collaborate with co-managers, tribes, and partners for the analysis of higher resolution trap data. WDFW wants to ensure that tribal data sovereignty is properly respected and that the analysis of any data provided is mutually agreed upon. The results of these analyses should develop a clearer understanding of the relationship between EGC catch numbers and effort expended.

There has been a clear decline in EGC captures in North Puget Sound MA since the beginning of the EGC emergency, with ~ 6% of all EGC removed occurring in the last nine months (January – September 2023). It should be noted that this is an encouraging sign that intensive trapping efforts, specifically in the Lummi Sea Pond, may be reducing local EGC abundance. However, continued trapping efforts and analysis led by the Lummi Nation are required to determine if this reduction is a long-term change or a temporary shift in EGC abundance. A more detailed analysis of catch data in collaboration with the Lummi Nation may also offer more insight into this observed decline.

In contrast to North Puget Sound, EGC catch numbers are increasing in the Eastern Strait & Admiralty Inlet and Hood Canal MAs. While catch numbers remain relatively low, this increase is concerning. WDFW and local co-managers, tribes, and partners plan to increase trapping efforts in the Eastern Strait & Admiralty Inlet and Hood Canal MAs to increase removal efforts and assess the extent of EGC presence in these MAs.

## Research activity

Effective invasive species management requires a robust understanding of the invader and its impacts. As a prolific global invader, a wealth of research exists regarding EGC. However, many fundamental questions about EGC, particularly regarding their detection, abundance, impacts, and movements in Washington, have yet to be answered.

Meetings of the EGC Research Task Force (RTF) continued in Q5. The RTF underwent a significant restructuring to increase overall efficacy towards accomplishing RTF tasks as laid out in the FY 2024 Emergency Measures Strategic Action Plan. RTF members from WDFW, WSG, and WSU Extension generously volunteered to serve as leaders for specific task groups. These task groups were created to focus on the completion of individual tasks. At the same time, monthly meetings serve as a chance for the RTF to share progress and ongoing EGC research and as a forum for Task Groups to request support and feedback.

On June 11, 2023, Chelsey Buffington, the WDFW EGC Project Lead, presented on EGC data collection and mitigation at the ESRI User Conference in San Diego, CA. Her work on WDFW's data collection and mapping efforts has resulted in the creation of a sharable program that can be utilized for the collection, reporting, and mapping of data in real time. In recognition of her efforts, the "create it once, use it a bunch" nature of this contribution, and the benefits the program will provide to the nation, Chelsey was recognized by the National States Geographic Information Council, who awarded her the Geospatial Excellence Award: Catalyst.

On Sep. 8, 2023, the Northwest Regional Invasive Species and Climate Change Network hosted its annual virtual symposium. Dr. Brian Turner, the WDFW AIS Unit Research scientist, served as a





panel member to discuss potential EGC responses to climate change and how climate change may complicate statewide EGC management efforts. On Sep. 21, 2023, Brian summarized known EGC impacts on Pacific Northwest commercial shellfish species during the Pacific Coast Shellfish Growers Association's (PCSGA) Annual Shellfish Conference and Expo in Seaside, OR.

Several researchers presented their work related to EGC to the MAC Group during Q5. Mary Fisher of the University of Washington provided an overview of her research on EGC diet, which focused on what large male EGC are eating in situ in Willapa Bay. Andy Suhrbier of the Pacific Shellfish Institute presented on efforts to determine the EGC impacts of shellfish in Willapa Bay. While field and video surveys showed little to no evidence of EGC predation, it cannot be dismissed that this might be due to the season and availability of other foods. Cage studies showed predation on oyster seed and manila clams, and EGC prefers manmade structures like oyster seed areas.

## Public communications and outreach efforts

Public education, involvement, and support are essential for effective invasive species management. No matter the effort of government agencies and managers, they will be limited in their ability to monitor and report on the species spread. Public awareness and reporting can complement professional monitoring and allow for earlier detection of species spread. Public awareness, media and external relations also supports effective policymaking and collaboration with local communities, stakeholders, and partners. Highlights for Q5 have included:

### Focused/Local communication

- Outreach representatives from WDFW sharing information and materials on EGC awareness and identification were present at more than a dozen events throughout Washington during Q5, including the Stanwood Camano Community Fair, Duwamish River Festival, Columbia - Pacific Farmers Market, Refuge Outdoors Festival, State Parks Outdoor Discovery Day, Fidalgo Bay Day, PCSGA Annual Conference, and the Seattle Aquarium Summer Camp. More than 1,800 people were reached during these combined outreach efforts.
- Co-managers, tribes, and partners conducted EGC outreach at numerous other public events and community forums.
- All additional communication and outreach efforts are listed in Appendix A. as well as online at: [wdfw.wa.gov/species-habitats/invasive/carcinus-maenas#conservation](https://wdfw.wa.gov/species-habitats/invasive/carcinus-maenas#conservation)

### General public communication

- Media relations and other external affairs activities continued. Current EGC management efforts have been reported in numerous local and national media outlets (Appendix A), though media interest in EGC management has decreased compared to Q4 and earlier stages of the emergency.
- Print and online advertisements supporting EGC identification and reporting continued to run in regional fishing, boating, and other outdoor publications and social media channels.
- During Q5, [EGC rack cards](#) were distributed to all Washington state ferries. The rack cards will be available to riders through June 2024. [An EGC informational poster](#) was placed on multiple locations aboard ferry boats within Washington State Ferries northern routes, running for 4—8 weeks in fall 2024.





- EGC rack cards were translated into [Spanish](#), [Vietnamese](#), [Ukrainian](#), [Somali](#), [Chinese](#), and [Cambodian](#). EGC wallet ID cards were translated into [Spanish](#) and [Vietnamese](#). These translated versions were printed and are being used at events and distributed to partners and marine industry contacts.
- More than 1,100 [EGC rack cards](#) and [wallet identification cards](#) were distributed during Q5. [Materials are hosted online here](#).
- New outreach activities were deployed during Q5, including an EGC identification game, spinning wheel game, and [coloring sheet](#).

## EGC 5-Year Management Plan

WDFW is currently facilitating the development of a 5-year Management Plan for EGC in Washington. This will be a highly collaborative undertaking and every effort will be made to address the goals and issues for each geographic area, co-manager, tribe, and partner involved in EGC management. As of the end of Q5, one-on-one discussions between WDFW and other co-managers, tribes and partners are ongoing. This initial round of discussions is immensely beneficial in outlining objectives, perspectives, and concerns that must be addressed in the plan. The plan is scheduled for completion on Dec. 1, 2024, with initial drafts to be sent out for review in Q6 (Oct. 1 – Dec. 31, 2023).

## Program challenges

WDFW, co-managers, tribes, and partners have achieved significant progress toward the five Incident Objectives in a short timeframe. However, as we continue to progress through the EGC emergency, there are several challenges we must address. These challenges include:

- Finalization of formal documentation for guidelines and protocols. Formal guidelines and protocols for a wide range of topics (e.g., formal data standards, responses to new EGC detections, trapping efforts, eDNA monitoring techniques, boat safety) have been in development for an extended period. This is primarily the result of continuous review and revision to create effective and thorough resources. However, these guidelines and protocols must be finalized as soon as possible to ensure they can be utilized prior to the 2024 field season.
- Determination of WDFW objectives for 2024 and beyond. Upon the completion of the 2023 field season, WDFW is assessing our long-term objectives to inform our actions in 2024 and beyond. Internal discussions as well as feedback and input from co-managers, tribes, and partners will be utilized to develop these objectives.
- Development of 5-year statewide Management Plan. Initial discussions among co-managers, tribes, and partners have highlighted many priorities, but also highlighted sections of the initial draft that will require further development prior to distribution for initial review. To maintain momentum on the plan's development, we will stagger the initial review into a Goals and Objectives Component due for completion by Dec. 1, 2023, and a Guidelines and Structure Component due for completion by Jan. 2, 2024.
- Finding and retaining EGC field staff. WDFW, as well as co-managers, tribes, and partners, continue to experience challenges finding personnel to fill field positions relating to EGC



management activities. In particular, the lack of affordable housing in coastal areas has proven a significant challenge. Discussions are ongoing for options to remove barriers to finding sustainable long-term workforces.

- Washington European Green Crab Management Symposium. The Washington EGC Co-Managers and Partners Meeting has been expanded in scope to a 2-day symposium to take place in late-February 2024. While this will allow for workshops and other events, the increase in scope will require greater planning and coordination.
- Data collection system and data hub implementation. The data collection system developed with Esri was a beneficial tool for the 2023 field season. However, issues occur on occasion with the system and the data hub (<https://wdfw-egc-hub-wdfw.hub.arcgis.com/>). Efforts on ongoing to further refine the system.

## Next steps

The EGC emergency management priority actions for next quarter (Q6: Oct. 31 – Dec. 31, 2023) include:

- Finalization and implementation of the FY 2024 EGC Strategic Action Plan.
- Wrapping up the 2023 field season and beginning planning for 2024.
- Scheduling the 2024 Washington European Green Crab Management Symposium for February 2024.
- Completion of initial draft of 5-year statewide EGC Management Plan, with the Goals and Objectives Component due for completion by Dec. 1, 2023, and the Guidelines and Structure Component due for completion by Jan. 2, 2024.
- Ongoing MAC Group meetings.
- Continued EGC Research Task Force a priority research list for EGC in Washington, discuss EGC research-related issues and develop usable assessment tools by the start of the 2024 field season.
- Development and distribution of monthly SitReps.
- Ongoing advocacy for increasing federal partner support and funding.
- Continued refinement of Esri EGC data collection tools for use in the field.
- Ongoing outreach to co-managers and tribes on policy and technical coordination.

## Glossary

AIS – Aquatic Invasive Species

DFO – Department of Fisheries and Oceans Canada

DNR – Department of Natural Resources

Ecology – Department of Ecology

EDRR – Early Detection Rapid Response



EGC – European green crab (*Carcinus maenas*)

FY – Fiscal Year

ICS – Incident Command System

MA – Management Area

MAC Group – Multi-Agency Coordination Group

NGO – Non-governmental organizations

NOAA – National Oceanographic and Atmospheric Administration

NWR – National Wildlife Refuge

PCSGA – Pacific Coast Shellfish Growers Association

Q1 – First quarterly phase of EGC emergency response (March 1 – Sep. 30, 2022)

Q2 – Second quarterly phase of EGC emergency response (Oct. 1 – Dec. 31, 2022)

Q3 – Third quarterly phase of EGC emergency response (Jan. 1 – March 31, 2023)

Q4 – Fourth quarterly phase of EGC emergency response (April 1 – June 30, 2023)

Q5 – Fifth quarterly phase of EGC emergency response (July 1 – Sep. 30, 2023)

Q6 – Sixth quarterly phase of EGC emergency response (Oct. 1 – Dec. 31, 2023)

RCO – Recreation and Conversation Office

RTF – Research Task Force

SitReps – ICS Situation Reports

WDFW – Washington Department of Fish and Wildlife

WGHOGA – Willapa-Grays Harbor Oyster Growers Association

WSG – Washington Sea Grant

WSU – Washington State University

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## Appendix A

### WAC [220-640-030](#) - Prohibited level 1 species.

The following species are classified as prohibited level 1 species:



(1) Molluscs: Family Dreissenidae: Zebra and quagga mussels: *Dreissena polymorpha* and *Dreissena rostriformis bugensis*.

(2) Crustaceans:

(a) Family Grapsidae: Mitten crabs: All members of the genus *Erochier*.

(b) Family Portunidae: European green crab, *Carcinus maenas*.

(3) Fish:

(a) Family Channidae: China fish, snakeheads: All members of the genus *Channa*.

(b) Family Clariidae: All members of the walking catfish family.

(c) Family Cyprinidae:

(i) Carp, Bighead, *Hypophthalmichthys nobilis*.

(ii) Carp, Black, *Mylopharyngodon piceus*.

(iii) Carp, Silver, *Hypophthalmichthys molitrix*.

(iv) Carp, Largescale Silver, *Hypophthalmichthys harmandi*.

(d) Family Esocidae: Northern pike, *Esox lucius*.

### **RCW [77.135.040](#) - Prohibited and regulated species - Required authorization**

(1) Prohibited level 1, level 2, and level 3 species may not be possessed, introduced on or into a water body or property, or trafficked, without department authorization, a permit, or as otherwise provided by rule.

(2) Regulated type A, type B, and type C species may not be introduced on or into a water body or property without department authorization, a permit, or as otherwise provided by rule.

(3) Regulated type B species, when being actively used for commercial purposes, must be readily and clearly identified in writing by taxonomic species name or subspecies name to distinguish the subspecies from another prohibited species or a regulated type A species. Nothing in this section precludes using additional descriptive language or trade names to describe regulated type B species as long as the labeling requirements of this section are met.

### **RCW [77.135.090](#) - Emergency measures**

(1) If the director finds that there exists an imminent danger of a prohibited level 1 or level 2 species detection that seriously endangers or threatens the environment, economy, human health, or well-being of the state of Washington, the director must ask the governor to order, under RCW [43.06.010](#)(14), emergency measures to prevent or abate the prohibited species. The director's findings must contain an evaluation of the effect of the emergency measures on environmental factors such as fish listed under the endangered species act, economic factors such as public and private access, human health factors such as water quality, or well-being factors such as cultural resources.

(2) If an emergency is declared pursuant to RCW [43.06.010](#)(14), the director may consult with the invasive species council to advise the governor on emergency measures necessary under RCW [43.06.010](#)(14) and this section, and make subsequent recommendations to the governor. The invasive species council must involve owners of the affected water body or property, state and local governments, federal agencies, tribes, public health interests, technical service providers, and environmental organizations, as appropriate.



(3) Upon the governor's approval of emergency measures, the director may implement these measures to prevent, contain, control, or eradicate invasive species that are the subject of the emergency order, notwithstanding the provisions of chapter [15.58](#) or [17.21](#) RCW or any other statute. These measures, after evaluation of all other alternatives, may include the surface and aerial application of pesticides.

(4) The director must continually evaluate the effects of the emergency measures and report these to the governor at intervals of not less than ten days. The director must immediately advise the governor if the director finds that the emergency no longer exists or if certain emergency measures should be discontinued.

## **ESSB 5693 (2022 c 297)- Making 2021-2023 fiscal biennium supplemental operating appropriations**

Section 308. (Page 552, Line 16)

(67) \$2,472,000 of the general fund—state appropriation in fiscal year 2022 and \$6,096,000 of the general fund—state appropriation in fiscal year 2023 are provided solely for the department to implement eradication and control measures on European green crabs through coordination and grants with partner organizations. The department must provide quarterly progress reports on the success and challenges of the measures to the appropriate committees of the legislature by December 1, 2022.23

### **Q1 (March 1 – September 30, 2022) EGC Report**

The Q1 report is available at <https://wdfw.wa.gov/publications/02372> or via this link: [European Green Crab Quarterly Progress Report – Fall 2022](#)

### **Q1 Catch data clarification**

Please note that European green crab (EGC) catch numbers in the Q1 report included EGC caught from Jan. 31 – Feb. 28, 2022. These months fall outside the official duration of Q1 (March 1 – Sep. 30, 2022) but were included to 1) accurately represent EGC removals for 2022 and 2) the submission process for SitRep 1 included co-managers, tribes, and partners submitting catch data from January 1- June 11, 2022, as a single number.



## Q2 (October 1 – December 31, 2022) EGC Report

The Q2 report is available at <https://wdfw.wa.gov/publications/02414> or via this link: [European Green Crab Quarterly Progress Report – Winter 2022](#)

## Q3 (January 1 – March 31, 2023) EGC Report

The Q3 report is available at <https://wdfw.wa.gov/publications/02431> or via this link: [European Green Crab Quarterly Progress Report – Spring 2023](#)

## Q4 (April 1 – June 30, 2023) EGC Report

The Q4 report is available at <https://wdfw.wa.gov/publications/02446> or via this link: [European Green Crab Quarterly Progress Report – Summer 2023](#)

## EGC management Definitions

### Management action type definitions

**Assessment** means periodically checking positive detection EGC areas using trapping methods to assess presence, geographic scope, and numerical scale of a population, at a relatively comprehensive scale. Assessment trapping efforts can occur on the scale of a water body or site, depending on the purpose. The timing and implementation of assessment trapping efforts is generally opportunistic.

**Control** means field activities within a given infested area with the intent of reducing that area's EGC population size.

**Early detection** means field operations in areas that have no prior EGC detections or detections within the past 5 years and with the intent to detect EGC at their earliest point in the invasion process. This includes such activities as trapping and eDNA.

**Emphasis response** means planned management actions including assessment, prospecting, or control effort over a given Site or Coordination Area that brings in a significant increase of resources as would be normal for that situation. It is similar to a rapid response trapping effort except not expedited as a result of a new detection.

**Monitoring** means a systematic and designed sampling effort for information-gathering purposes that is implemented consistently and on a routine schedule. Monitoring protocols are well defined and are relatively stable to evaluate changes over space and time. The specific purpose and geographic scope of any individual monitoring effort might vary to suit the project but should remain internally consistent.

**Prevention** means activities that aim to reduce the arrival of green crabs, either as larvae or adults, resulting from the transport/transfer of green crabs from one location to another – regardless of whether green crabs are present at the receiving location.





**Research** means field, lab, or other scientific actions implemented to investigate an aspect of the EGC invasion and for which the activities do not fall into standard protocols of any of the above management types. Types of research may include improving efficiency/efficacy of priority management actions, increasing biological knowledge, and predicting/assessing EGC or other impacts.

## Other definitions

**Catch Per Unit Effort (CPUE)** is an indirect metric of the abundance of EGC in relation to a defined geographic area and time scale. It is used to indicate the amount of effort undertaken to collect a given number of EGC. For EGC emergency management data consistency purposes, CPUE must be reported and qualified:

- Per 100 traps as calculated to nearest 0.10 CPUE;
- By aggregate or individual trap type; and
- By cumulative Trap set days or Trap check days over the operational period or other defined time span of interest.
  - Example 1 - 30 EGC caught in 200 shrimp traps and deployed for 1 overnight period then recovered (200 trap set days):  $30 \div 200 = 0.15 \times 100 = 15.0$  CPUE.
  - Example 2 - 30 EGC caught in 200 shrimp traps and deployed for 3 overnight periods then recovered (600 trap set days):  $30 \div 600 = 0.05 \times 100 = 5.0$  CPUE.

**Detection** means the new discovery of a live, dead, molt or other remains of an EGC specimen as verified by an EGC expert at a specific geographic location. Life stage or remains of EGC may trigger different management response at different geographic scales. This includes finds at locations where EGC have not been found for more than three years.

**Education/outreach** means providing information on potential pathways of human mediated risk/spread, EGC identification, and EGC reporting to relevant audiences. Examples might include presentations, creating printed collateral/signage, or informal conversations. This category is different from Training in being broader and less targeted in practical applications.

**EGC Management Scale** means a hierarchy of geographically defined areas from largest to smallest scale. This system is used for consistency in communications, planning, operations and other ICS functions including:

- Regional – this includes states and provinces of Canada along the Pacific coast.
- Statewide – this includes approximately 3,500 miles of coastal area encompassing marine and estuarine habitats where EGC could become established.
- Branch – Statewide operations are divided into Coastal and Salish Sea branches which corresponds to major differences in EGC management strategies due to significant propagule pressures from EGC larvae arriving in Washington State from coastal sources in California, Oregon, and British Columbia.
- Management Area – Branches are further divided into 14 Management Areas based on WDFW's recreational fishing marine areas with 7 Management Areas within the Salish Sea Branch and 7 within the Coastal Branch.



- Coordination Area – Management Areas are further divided into Coordination Areas based on a place name that best describes a sub-Management Area or it may be based on the jurisdictional lead for that area. Delineation of Coordination Areas continues to evolve based on input from local Management Area co-managers and partners.
- Site – Coordination Areas may be further divided into Sites based on a geographic area of connected, similar habitat suitability, or access limitations and where EGC management actions can be expressed as representing the whole geographic area.
- Sub-Site – Sites can be divided into Sub-Sites in more complex situations based on similar habitat or where different operational actions are required.

**EGC trap** means one of four types of enclosed spaces that permit entry and prevent exit by EGC. Types used for EGC trapping operations include:

- "Fukui" trap (Fukui, Promar, etc.) means a single piece trap designed for the capture of small fish. Consists of a vinyl covered steel frame (60 × 45 × 20 cm) covered with square, single-knotted, polyethylene mesh (12 mm bar length). There are entrances at either end, with the netting panels forming a "V" shape to allow organisms to enter through slits. The traps can be flattened (collapsed) for easier storage and transport.
- "Minnow" trap means a cylindrical two-piece trap designed for capture of smaller EGC. When both halves are connected, the trap is 50 cm long with a 23 cm diameter and two inverted funnel-entrance holes, one at either end of a rigid mesh cylinder. Those used in EGC management efforts by default have holes 25 mm in diameter and mesh that is 6mm at the widest.
- "Shrimp" trap means a single piece trap for capture of shrimp. Consists of vinyl covered steel box 61 cm X 61 cm X 23 cm with a built-in bait box in the center. Mesh size is variable depending on the brand, though usually 25 mm or 50 mm. There are four rectangular entrances (one in the center of each side), lined by inverted funnels of rigid Vexar mesh.
- Other trap type means any other method utilized for the capture of live EGC. Common examples include pitfall traps (holes dug to allow EGC to fall into for collection) or experimental traps.

**Established** means a population of a EGC where that population is expected to have a sustained presence based on evidence (i.e., three years of capture of multiple age classes and with increasing or relatively stable abundance irrespective of trapping effort intensity).

**Habitat structure** means the composition and arrangement of material, be it natural or man-made, within a habitat (e.g., vegetation, docks, rocks, and woody debris). Most commonly, elements of three-dimensional (rising off the bottom) and complex (with crevices in which to hide) structure are favorable to green crab survival.

**Habitat suitability** means the relative ability of a habitat to support EGC. Characteristics that can be used to assess habitat suitability include physical attributes (e.g., exposure to wave energy, depth, and temperature), chemical attributes (e.g., salinity, pH, oxygen) and biotic attributes (e.g., vegetation, available prey, competitors, and predators).

**Hot Spot** means an area with a substantially greater relative abundance of green crab than surrounding areas. Hot spots can be defined at the site level (e.g., a creek mouth within a water



body) or at the Coordination Area-level (e.g., Lummi Sea Pond), and can be spatially nested, sites of high density within Coordination Areas of high density.

**Incident Action Plan (IAP)** means a concise planning document containing set goals and objectives that guide incident safety, logistics, operations, and other incident actions during a set operational period.

**Incident Commander** means the individual responsible for all EGC emergency measures activities, including the development of strategies and tactics and the ordering and release of resources. The Incident Commander has overall authority and responsibility for conducting EGC emergency measures operations.

**Infested area** means a geographic area that carries or contains EGC at a branch, management area, coordination area, or site scale.

**Localized detection** means EGC detection occurred in a coordination area or other location (ex. bay, lagoon, estuary, or tidelands) where European green crabs have not previously been confirmed, but is within a management area where EGC have been detected. Localized detections are anticipated during the invasion. WDFW will notify relevant agency staff, co-managers, tribes, partners, tidelands owners, and other community members. Depending on need, assessment trapping or rapid response may occur to prevent population becoming established and reduce risk of spread into new management areas.

**Operational Period** means the interval of time scheduled for execution of a given set of EGC management actions as specified by an Incident Commander.

**Rapid response** means expedited management actions based on new detections or the finding of a significantly increased population for the time-sensitive intent of determining scope of EGC invasion and containing or eradicating EGC before it spreads or becomes further established. (RCW 77.135.010(20)). Based on the outcome of rapid response actions, subsequent management action types may be implemented.

**Training** means providing information or instruction on prevention, early detection, rapid response or other EGC emergency management protocols. This category is distinct from Education/outreach in focusing on specific, practical applications.

**Trap set days** means when a trap is set intertidally or sub-tidally for the action of capturing EGC for a single overnight period. Overnight trap days are standard trapping protocols based on known EGC feeding activity patterns. If a trap is set and retrieved within a single calendar day, count it as a single trap day, but be aware that it may be later counted as a portion of a trap day for comparability with a standard overnight trap day.

- Total set trap days are counted from the day after a trap is set and includes the day the trap is removed. This metric is mostly a qualitative measure of effort during an operational period or season and may be used to estimate a gross level of potential EGC risk/density to help assess if additional support is needed.
  - Example 1 - 50 traps set on Monday, Aug 8, and retrieved Friday, Aug 12:  $50 \times 4 = 200$  trap days.



- Example 2 - 50 traps set on Monday, Aug 8, and retrieved Sunday, Aug 21:  $50 \times 13 = 650$  trap days.
- Example 3 - 50 traps set in a prior OP and to be retrieved in a future OP (example OP is 14 days):  $50 \times 14 = 700$  trap days.

**Trap check days** means the number of days within an operational period that a trap is checked for EGC. This metric is mostly a qualitative measure of effort and may be used to estimate a gross level of potential EGC risk/density to help assess if additional support is needed in a given Coordination Area.

- Total trap check days means the cumulative number of traps checked every day the traps are deployed. If traps are checked every day, total trap check days will be the same as total trap days.
  - Example 1 - 50 traps set on Monday, Aug 8, and retrieved Friday, Aug 12, and checked every day:  $50 \times 4 = 200$  trap check days.
  - Example 2 - 50 traps set Monday, Aug 8, and retrieved Sunday, Aug 21, and checked every day:  $50 \times 13 = 650$  trap check days.
  - Example 3 - 50 traps set in a prior OP and to be retrieved in a future OP and checked every day:  $50 \times 14 = 700$  trap check days.
  - Example 4 - 50 traps set Monday, Aug 8, and retrieved Friday, Aug 19, and checked every other day, excluding weekends (i.e., Monday, Wednesday, and Friday):  $50 \times 5 = 250$  trap check days.
  - Example 5 - 50 traps set Monday, Aug 8, and retrieved Sunday, Aug 21, and checked on Wednesdays only and the day the traps are retrieved:  $50 \times 3 = 150$  trap check days.

**Young of the Year (YOY)** means EGC of any life stage that belong to the current-year recruitment cohort of EGC. The size and life stage of those individuals will depend on the time of capture and conditions for the year, locally and regionally. Generally, crabs that are captured in traps under 30mm are safely considered YOY regardless of time of year of capture, but YOY can reach up to ~50mm by the end (fall) of their first year.

**List of Washington European green crab management actions in chronological order for Q5 (July 1 – September 30, 2023) as provided in Situation Reports**

Date	EGC Management Action
7/5/2023	WDFW distributed the May/June European Green Crab Public Update to the EGC email list. The document includes highlights about the EGC Hub and efforts by coastal shellfish growers, tribes, and partners.
7/11/2023	WDFW Region 4 Co-Managers Meeting: Incident Commander Allen Pleus introduced Justin Bush who will be replacing him and provided a brief update on EGC management actions in the North Puget Sound Management Area.



7/11/2023	Esri User Conference Presentation: WDFW EGC Project Lead, Chelsey Buffington, presented on the EGC data collection digital migration and Hub communication platform.
7/12/2023	EGC Multi-Agency Coordination (MAC) Group Regular Meeting: Allie Simpson of the Northwest Straits Commission (NWSC) provided a program overview of the organization's structure and work with EGC trapping, outreach, and community engagement. The Fiscal Year 2024 Strategic Action Plan was provided to group members, and the key objectives and associated tasks were discussed. Proposal 1 for FY24, "Evaluating European Green Crab Impact to Coastal Shellfish Operations" was submitted by Washington State University for the amount of \$39,815 and recommended for approval by the MAC Group.
7/18/2023	Pacific Northwest Economic Region Summit (PNWER): Incident Commander Allen Pleus provided a presentation on the Washington state emergency management response to EGC.
7/18/2023	WDFW and WSG supported Suquamish Tribe with classroom and field training.
7/19/2023	WDFW supported Grays Harbor Conservation District (GHCD) in field training of a new and Willapa-Grays Harbor Oyster Growers Association (WGHOGA) trapping partner, Markham Oyster.
7/26/2023	EGC Multi-Agency Coordination (MAC) Group Check-in Meeting: Dr. Brian Turner provided a brief European Green Crab Management Plan update; work on the five-year plan has begun and will address actions in each management area. Dr. Turner also provided an update on the Research Task Force, outlining task breakouts, the need for technical thresholds, and identifying gaps. This topic prompted significant group discussion. Mary Fisher of the University of Washington provided an overview of her research on European green crab diet, which focused on what large male European green crab are eating in situ in Willapa Bay.
7/28/2023	In late June WDFW purchased two Hobie kayaks and safety gear to loan to partners at the Quileute Tribe for EGC sampling at the Quillayute River estuary. On Friday, July 28th delivery to the Tribe was completed and they look forward to increased EGC monitoring with WDFW soon.
7/31/2023	WDFW staff completed Scope of Work and deliverables for WA State DNR, Pacific Conservation District, and Grays Harbor Conservation District for EGC work in Fiscal Year 23. The Drafts are with RCO getting turned into contracts and then will be sent to the conservation districts and DNR for signature.
7/31/2023	WDFW hosted NOAA attorneys, communications staff, and interns at Nick's Lagoon to discuss ESA permitting, co-manager/tribe/partner involvement, and trapping placements within various habitats.
8/9/2023	EGC Multi-Agency Coordination (MAC) Group Regular Meeting: Stephanie Helms, the new Executive Coordinator for the Washington Invasive Species Council was introduced. Meagan West provided a federal update. The Senate Commerce, Justice, and Science (CJS) Committee's bill provides \$2 million for EGC mitigation. The Senate Interior Proposal provides \$800,000 for EGC research, \$300,000 for EGC eradication efforts on wildlife refuges, and includes some funding following the direction of the Bureau of Indian Affairs (BIA) and USFWS. Conversely, the House appropriations proposals are essentially void of funding. Ms. West noted the push in the House to return funding levels to Fiscal Year (FY) 21 and FY22, so keeping funding at FY23 levels would be considered a success. Alexa Brown of the Washington State Department of Natural Resources provided an overview of past and current work, including some great photos. Jill Silver of the 10,000 Years Institute provided an overview of strategies the Institute uses in providing local management of invasive species.



	The Institute faced many of the same challenges and barriers as EGC co-managers, tribes, and partners and provided some unique solutions and fostered in-depth discussion.
8/22/2023	2023 Congressional Staff Tour: WDFW, in collaboration with the Puget Sound Partnership and Governor's Salmon Recovery Office, resumed the Natural Resources Agencies' Congressional Staff Tour that was held prior to COVID. The tour was held August 21-23 and covered a lot of ground in those three days on various topics including EGC. The tour's objective was to highlight the importance of partnerships in Puget Sound recovery and to underscore how critical federal funding is to projects and issues in the area. The sites we visited demonstrated that the scope, scale, and complexity of projects and issues vary. Topics included but were not limited to the role of habitat restoration in salmon recovery, the effects of 6PPD (a chemical released from tires that kills salmon), and the impacts of and efforts combating European Green Crab. We spoke with staff about funding sources, including those from state and federal appropriations, the Bipartisan Infrastructure Law, and the Inflation Reduction Act. We also talked about how funding has been or is being implemented, as well as identified outstanding needs. This year's partnership and congressional staff attendance was the best that we have ever had. There were usually fifteen to twenty participants from other state agencies, federal agencies, local governments, and Non-Governmental Organizations at every site. Congressional staff from Senator Murray's, Senator Cantwell's, Congressman Larsen, Congresswoman Jayapal, Congressman Kilmer, and Congresswoman McMorris Rodgers offices attended. Additionally, three of the Governor's staff also joined.
8/23/2023	EGC Multi-Agency Coordination (MAC) Group Check-In Meeting: Andy Suhrbier of Pacific Shellfish Institute (PSI) presented a study on protecting shellfish resources from EGC in Grays Harbor and Willapa Bay, which was a shared effort between PSI and Willapa-Grays Harbor Oyster Growers Association (WGHOGA). 75% of growers expressed concern regarding Pacific oysters, and 50% of growers reported loss of Manila clams in Willapa Bay, coinciding with a lack of recruitment. While field and video surveys showed little to no evidence of EGC predation, it cannot be ruled out as this might be due to the season and availability of other foods. Cage studies did show predation on oyster seed and manila clams, and EGC appear to prefer manmade structures like oyster seed areas. Warren Cowell of Willapa Bay Shellfish (WGHOGA) provided an update of trapping efforts in Grays Harbor and Willapa Bay, and sparked discussion regarding the numbers and types of EGC seen at different times of year and in different areas. Mr. Cowell also offered his site to those interested in conducting EGC research and provided contact information.
8/29/2023	Alaska EGC Rapid Response Exercise: Incident Commander Allen Pleus provided a virtual presentation on WDFW authorities and the Washington State emergency management process.
9/13/2023	EGC Multi-Agency Coordination Group (MAC Group) Monthly Meeting: Legislative Tour Update, Washington European Green Crab Management Symposium, Fiscal Year (FY) 23 and FY 24 Strategic Action Plan.
9/14/2023	Justin Bush, WDFW Aquatic Invasive Species Delegated Incident Commander by Director Kelly Susewind effective September 15, 2023.
9/26/2023	WDFW submitted a 10-day emergency measures status update to the Governor's Office and Office of Financial Management advising that all emergency measures should continue.
9/27/2023	EGC MAC Group Check-In Meeting: FY 23 Strategic Action Plan Closeout and Identification of FY 24 Strategic Action Plan Gaps.





**List of media reporting in chronological order related to Washington European green crab management for Q5 (July 1 – Sep. 30, 2023) as provided in Situation Reports**

Date	Outlet	Headline	URL
7/2/2023	The Globe and Mail	The fight against the green crab invasion of B.C.'s coast	<a href="https://www.theglobeandmail.com/canada/article-european-green-crab-bc-invasive/">https://www.theglobeandmail.com/canada/article-european-green-crab-bc-invasive/</a>
7/5/2023	Alaska Public Media	Unalaska readies to deploy traps for invasive European green crabs	<a href="https://alaskapublic.org/2023/07/05/unalaska-readies-to-deploy-traps-for-invasive-european-green-crabs/">https://alaskapublic.org/2023/07/05/unalaska-readies-to-deploy-traps-for-invasive-european-green-crabs/</a>
7/6/2023	KSVR - Skagit Talks	Invasive Green Crab	<a href="https://archive.ksvr.org/">https://archive.ksvr.org/</a>
7/28/2023	The Office of U.S. Senator Patty Murray	Senator Murray Secures Over \$20 Million for WA Environmental Projects, Delivers New Funding for Tribes, & Protects Key Climate Investments in Draft Interior and Environment Appropriations Bill	<a href="https://www.murray.senate.gov/senator-murray-secures-over-20-million-for-wa-environmental-projects-delivers-new-funding-for-tribes-protects-key-climate-investments-in-draft-interior-and-environment-appropriations-bill/">https://www.murray.senate.gov/senator-murray-secures-over-20-million-for-wa-environmental-projects-delivers-new-funding-for-tribes-protects-key-climate-investments-in-draft-interior-and-environment-appropriations-bill/</a>
8/7/2023	The Office of U.S. Senator Patty Murray	Senator Murray Visits Lone Tree Point, Discusses Conservation Efforts with Swinomish Tribe and Northwest Straits Commission	<a href="https://www.murray.senate.gov/senator-murray-visits-lone-tree-point-discusses-conservation-efforts-with-swinomish-tribe-and-northwest-straits-commission/">https://www.murray.senate.gov/senator-murray-visits-lone-tree-point-discusses-conservation-efforts-with-swinomish-tribe-and-northwest-straits-commission/</a>
8/9/2023	KGMI	Virtual European Green Crab Molt Search Training	<a href="https://kgmi.com/events/virtual-european-green-crab-molt-search-training/">https://kgmi.com/events/virtual-european-green-crab-molt-search-training/</a>
8/11/2023	KGMI	Whatcom County issues alert for invasive European green crabs	<a href="https://kgmi.com/news/007700-whatcom-county-issues-alert-for-invasive-european-green-crabs/">https://kgmi.com/news/007700-whatcom-county-issues-alert-for-invasive-european-green-crabs/</a>
8/16/2023	The Northern Light	Scientists monitor juvenile European green crab	<a href="https://www.thenorthernlight.com/stories/scientists-monitor-juvenile-european-green-crab-populations-in-drayton-harbor,27409">https://www.thenorthernlight.com/stories/scientists-monitor-juvenile-european-green-crab-populations-in-drayton-harbor,27409</a>





		populations in Drayton Harbor	
8/25/2023	All Points Bulletin	North Whatcom County focal point for invasive crab hunt	<a href="https://www.allpointbulletin.com/stories/north-whatcom-county-focal-point-for-invasive-crab-hunt,27656">https://www.allpointbulletin.com/stories/north-whatcom-county-focal-point-for-invasive-crab-hunt,27656</a>
9/4/2023	IPBES	Media Release: IPBES Invasive Alien Species Assessment	<a href="https://www.ipbes.net/IASmediarelease">https://www.ipbes.net/IASmediarelease</a>
9/5/2023	UPI	U.N. report: Invasive species emerge as global threat, causing \$423B in losses	<a href="https://www.upi.com/Top_News/World-News/2023/09/05/germany-UN-invasive-alien-species-threat-report/7541693908327/">https://www.upi.com/Top_News/World-News/2023/09/05/germany-UN-invasive-alien-species-threat-report/7541693908327/</a>
9/6/2023	Tri-City Herald	WA state needs public's help to monitor for three invasive species and one plant partner	<a href="https://www.tri-cityherald.com/news/state/washington/article278877394.html">https://www.tri-cityherald.com/news/state/washington/article278877394.html</a>
9/7/2023	Undercurrent News	Meeting called in Alaska to prepare for northward spread of green crabs	<a href="https://www.undercurrentnews.com/2023/09/07/meeting-called-in-alaska-to-prepare-for-northward-spread-of-green-crabs/">https://www.undercurrentnews.com/2023/09/07/meeting-called-in-alaska-to-prepare-for-northward-spread-of-green-crabs/</a>



# Appendix B – Co-manager and partner addendums

## Washington Department of Natural Resources



### Addendum for the Operational Period of July 1<sup>st</sup> – September 30<sup>th</sup>, 2023, for European Green Crab Emergency Measures.

- 1) The two technician positions DNR hired on June 16<sup>th</sup>, 2023, enabled DNR to substantially ramp up trapping efforts on the coast through this operational period. DNR captured 8,990 EGC on the Grays Harbor, Willapa Bay and Coast (be more specific by management area) during this period and one EGC in the Salish Sea at Fidalgo Bay. Total EGC captured by DNR through September 30, 2023, is 9,688.
- 2) DNR EGC Coordinators continue to implement DNR's EGC work plan developed in previous quarters. DNR management actions under this work plan include development of new monitoring sites in or near Aquatic Reserves, assessment, and control trapping at sensitive habitats such as DNR managed Natural Areas and Natural Resource Conservation Areas. Work included weekly trapping events at our coastal sites and bi-weekly trappings in the Salish Sea.
- 3) In September DNR's Salish Sea team completed their first boat-based trapping effort on Aquatic Reserves land in response to the single non-gravid female EGC found in Fidalgo Bay during the Fidalgo Bay Blitz EGC. Trapping. That effort involved partnership with the Northwest Straits Commission, Washington Department of Fish and Wildlife, the Samish Indian Nation, and the Swinomish Indian Tribal Community in August. DNR was assisted by Environmental Monitoring Biologist Dan Sulak with the Swinomish Indian Tribal Community (SITC). With the help of SITC, we tested the efficacy of deploying and checking traps by boat over state-owned aquatic land and will be employing such efforts regularly in the next season.
- 4) In September, Alex Stote from Washington Sea Grant joined DNR assessment trapping effort at the Grays Harbor National Wildlife Refuge (GHNWR) to train Grays Harbor Conservation staff who aided in the trapping the GHNWR. Three volunteers from the GHNWR also joined in the effort and gained skills in EGC trapping.





Figure 1. Tim Teets one of our coastal technicians working with two GHNWR volunteers to check EGC traps.



Figure 2. Tim Teets and Alexa Brown checking EGC traps with our new airboat purchased under project number 22-1970.

## Washington Sea Grant



July 1 - September 30, 2023

### Molt Search Update

- Molt Search received 151 reports from community members in Q5; no green crab molts were detected in the Salish Sea through these efforts.
- Molt Search's "Molt-o-Meter" newsletter of green crab and program updates was distributed monthly to an audience of 329 trained participants.
- 108 participants were trained green crab ID and search protocols during 1.5-2hr sessions held in 6 counties and over Zoom this quarter.

### Monitoring Network (Lisa + Alex)

- In the Salish Sea, three green crabs were captured during monthly monitoring in July: 2 at Dungeness NWR Base Lagoon (88M, 48F, both in Fukui) and 1 at Hancock Lake on Whidbey Island (88M, hand capture, dead).
- Coastal Crab Team sentinel sites captured 130 green crabs in 198 traps during Q5.
- Staff completed 7 site visits throughout the state during the reporting period.
- Crab Team hired a new student assistant.



## Research Updates

- Crab Team conducted a tethering experiment with support from local partners in Willapa Bay to assess green crab impacts on the native hairy shore crab, *Hemigrapsus oregonensis* (HEOR). The experiment found that the number of HEOR consumed had a strong positive correlation with the number of green crab, providing additional evidence that green crab likely has an ecological impact on the native hairy shore crab.
- The manuscript for publication on DNA metabarcoding of green crab gut contents in Willapa Bay was submitted, comparing diets of green crab collected from clam aquaculture sites to those collected from natural sloughs. This research was funded by WDFW's Oyster Reserves grant process in 2021. The study's results are consistent with the observation that green crab is a generalist predator, and only a few aquaculture species were detected in gut contents. Despite crabs being collected on clam beds, Manila clam was very rare in the guts of green crabs (appearing in only one crab). The most common prey item found in green crab stomach contents was HEOR, with additional high prevalence of soft-shell clams.
- Crab Team staff collaborated with UW PI Jennifer Ruesink to support a field study on the association between green crabs and Manila clam mortality in Willapa Bay. This included a field trapping effort, and other components of the project include clam recruitment monitoring, and predator exclosures. Data are still being analyzed to evaluate support for predators as impacting clam abundance and harvest.

## Partner Training, Capacity Support, and Regional Management Support (Alex)

- Crab Team helped plan, design, and execute a training workshop with staff from Suquamish in July. Building on the partner training curriculum designed by WSG, Crab Team co-presented with WDFW staff, and helped plan the field portion of the training in collaboration with WDFW and Suquamish.
- Staff offered in-person field support to the following groups: Lummi Natural Resources (1 day), Shoalwater Bay Indian Tribe (1 day), Grays Harbor Conservation District @ Lytle Seafoods (2 days), Department of Natural Resources (1 day).
- WSG staff onboarded two new technicians during this period, both for the Grays Harbor Conservation District.

## Communications and Outreach (Lisa + Alex)

- Supported the WDFW/RCO Congressional legislative tour to Quilcene in August.
- Supported the UW Legislative tour in August by providing a session on the ongoing scientific and management value of early detection and promoting the new Molt Search program.
- Presented research and monitoring approaches at scientific conferences including those hosted by the Pacific Shellfish Growers Association Conference (PSGA, September).
- WSG staff participated in Camano Island Discovery Day and Conservation Camp at the Seattle Aquarium (with WDFW Outreach staff Jessica Ostfeld).



## Washington State University Extension



WASHINGTON STATE UNIVERSITY  
**EXTENSION**

### Salish Sea

Working with Sea Grant, WSU Extension and our numerous community partners hosted several additional Molt Search events between July 1 and September 30, 2023.

WSU Extension and Sea Grant hosted our first virtual training online via Zoom on August 10, with support from Jessica Ostfeld with the Washington Department of Fish and Wildlife. Seventy-one members of the public attended this event and their feedback on the value of the virtual training was positive.

WSU Extension and Sea Grant also worked with our community partners to offer a slate of Molt Blitz events. During these Molt Blitz events, we trained community members and provided instructional support for them while they conducted a Molt Search on a shoreline area. During many of these Molt Blitzes we also piloted an abbreviated on-the-beach training experience with the intention of reaching people who have less time available for training. Feedback on the shorter on-the-beach training experience was positive.



The following in-person Molt Blitz events were held during this Quarter:

- Sound Water Stewards held an event on Camano Island on August 10,
- The Port Townsend Marine Science Center held an event in Irondale County Park in Jefferson County on August 29,
- WSU Whatcom County Extension held an event at the Point Whitehorn Reserve on September 8,
- The Northwest Straits Commission held an event in Skagit County on September 10,
- WSU Snohomish County Extension held an event at Picnic Point on September 12,
- Washington Sea Grant held an event at the Silverdale Waterfront Park in Kitsap County on September 14,
- Friends of the San Juans held an event at Jackson Beach on San Juan Island, and at Odlin County Park on Lopez Island on September 15 and 17 respectively.

As of mid-September, 308 Washington community members have been trained to conduct a Molt Search and 250 Molt Searches had been completed. San Juan and Jefferson Counties have had the



most active participation thus far. You can view the most recent molt search submissions and a map of all submissions on the MyCoast website: <https://mycoast.org/wa/crab>.

Participants are kept abreast of the Molt Search effort and are encouraged to continue searching via the monthly [Molt-o-Meter newsletter](#).

In September, WSU Extension and Sea Grant began developing our plans to refine the program to reach more residents and get more participation in Molt Search in 2024 and 2025.

## South Coast

The Washington State University Long Beach Research and Extension Unit received funds for a project entitled “Evaluation of European Green Crab impact to coastal shellfish operations through choice and no-choice bioassays.” We hired a nonpermanent full-time pest biologist to complete the research associated with this role. Using the donated shellfish hatchery space from Taylor Shellfish located in Bay Center, we set up the experiment in early August and were able to complete several iterations of choice prey assays in the ongoing experiment. This project involved close partnership with the Willapa Bay and Grays Harbor Oyster Growers’ Association and the Washington Department of Fish and Wildlife Nahcotta Field Lab for providing live European Green Crabs in a variety of sizes for both sexes.

