



State of Washington
DEPARTMENT OF FISH AND WILDLIFE

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May 31, 2024

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

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

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

The Honorable Mike Chapman
Chair, House Agriculture and Natural Resources
132B Legislative Building
Post Office Box 40600
Olympia, WA 98504

RE: European Green Crab Quarterly Progress Report – Spring 2024 (January 1 to March 31, 2024)

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

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 December 14, 2021, the WDFW Director submitted an emergency measures request under Revised Code of Washington (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 seventh in a series of ongoing quarterly progress reports (Q7). The Q7 report outlines the successes and challenges of ongoing EGC emergency response efforts in Washington state from January 1, 2024 to March 31, 2024.

Since January 1, 2022, approximately 677,601 EGC have been removed from Washington state marine waters, with 590,180 removed from the Coast Branch, and 87,421 removed from the Salish Sea Branch. During the Q7 period, the collective effort of all organizations resulted in approximately 31,025 EGC

removed from Washington state marine waters, with 30,940 from the Coastal Branch and 85 from the Salish Sea Branch.

Since January 1, 2022, approximately 677,601 EGC have been removed from Washington state marine waters, with 590,180 removed from the Coast Branch, and 87,421 removed from the Salish Sea Branch.

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 advance 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 individuals at public events and producing new outreach materials. While challenges remain (e.g., preparing for the 2024 field season, completion of the 6-year statewide management plan), the continued efforts of all parties and the clear organizational structure set previously will allow for continued success through 2024.

Per RCW 77.135.090, the WDFW Director continues to evaluate the effects of the European Green Crab emergency measures, finding 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 WDFW efforts to address this emergency, please contact Tom McBride, WDFW's Legislative Director, at (360) 480-1472.

Sincerely,

A handwritten signature in black ink, appearing to read "Justin D. Bush". The signature is fluid and cursive, with the first name being the most prominent.

Justin D. Bush
WDFW European Green Crab Incident Commander

CC:

Kelly Susewind, Director, WDFW
Kelly Cunningham, WDFW Fish Program Director
Ruth Musgrave, Senior Policy Advisor to Governor Jay Inslee

European Green Crab Quarterly Progress Report – Spring 2024 (January 1 to March 31, 2024)

Washington Department of Fish and Wildlife



European Green Crab Quarterly Progress Report – Spring 2024 (January 1 to March 31, 2024)

Author

Brian Christopher Turner

Report acknowledgements

Addendums were provided by Alexa Brown from the Washington Department of Natural Resources and Emily Grason from Washington Sea Grant. We greatly appreciate their contribution.

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Acknowledging the Indigenous People of the Pacific Northwest

Since time immemorial, Indigenous People have lived in the Pacific Northwest and hunted, fished, and gathered natural resources, traditional foods, and medicinal plants to support their diverse cultures. They were the original occupants and stewards of this land that all Washingtonians enjoy today.

The very survival of the Pacific Northwest Tribes is a testament of resiliency of what they have endured and continue to endure throughout generations on this landscape. Through many historical encounters of massacre, renunciation of religious freedom, systemic racism, cultural assimilation of native children through institutional residential schools, and the fight for their inherent rights and liberties, they have prevailed. Throughout this painful history brought by colonization, abrogated treaties, infringement of civil rights, and the salmon protests of the 1960s, the Northwest Tribes and the Washington Department of Fish and Wildlife (WDFW) have founded a commitment of respect, unity, and alliance informed by the realities of the past.

Today, tribal governments and WDFW work collaboratively to conserve and manage aquatic and terrestrial resources statewide and practice sound science to guide management decisions. The Tribes and WDFW work together to ensure the sustainability of fish, wildlife, ecosystems, and culture for the next seven generations and beyond.

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Executive Summary

In response to the ESSB 5693 (2022 c 297) legislative budget proviso directive, this report has been authored as the seventh in a series of ongoing quarterly progress reports (Q7). This report will serve to outline the successes and challenges of ongoing European green crab (EGC) emergency response efforts in Washington state from Jan. 1 to Mar. 31, 2024. In addition, this report will put the work during Q7 in the context of the previous work completed (Q1-Q6).

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 seventh in a series of ongoing quarterly progress reports (Q7). The Q7 report will outline the successes and challenges of ongoing EGC emergency response efforts in Washington state from Jan. 1 to Mar. 31, 2024.

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 many 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.

Trapping activities in Q7 were greatly reduced in response to colder weather and reduced EGC activity. However, some co-managers, tribes, and partners (CMTP) maintained reduced boat-based trapping efforts due to the surprisingly high catch levels from trapping in deeper water during the limited cold weather trapping in 2023.

During the Q7 period, the collective effort of all organizations resulted in approximately 31,025 EGC removed from Washington state marine waters, with 30,940 from the Coastal Branch and 85 from the Salish Sea Branch. Since January 1, 2022, approximately 677,601 EGC have been removed from Washington state marine waters, with 590,180 removed from the Coast Branch, and 87,421 removed from the Salish Sea Branch. In addition to active control trapping, Q7 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 advance 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 individuals at public events and producing new outreach materials. While challenges remain (e.g., preparing for the 2024 field season, completion of the 6-year statewide management plan), the continued efforts of all parties and the clear organizational structure set previously will allow for continued success through 2024.

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). 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 (McDonald et al. 2001). 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	81,009	204,274	285,283
2023	6,327	354,966	361,293

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:

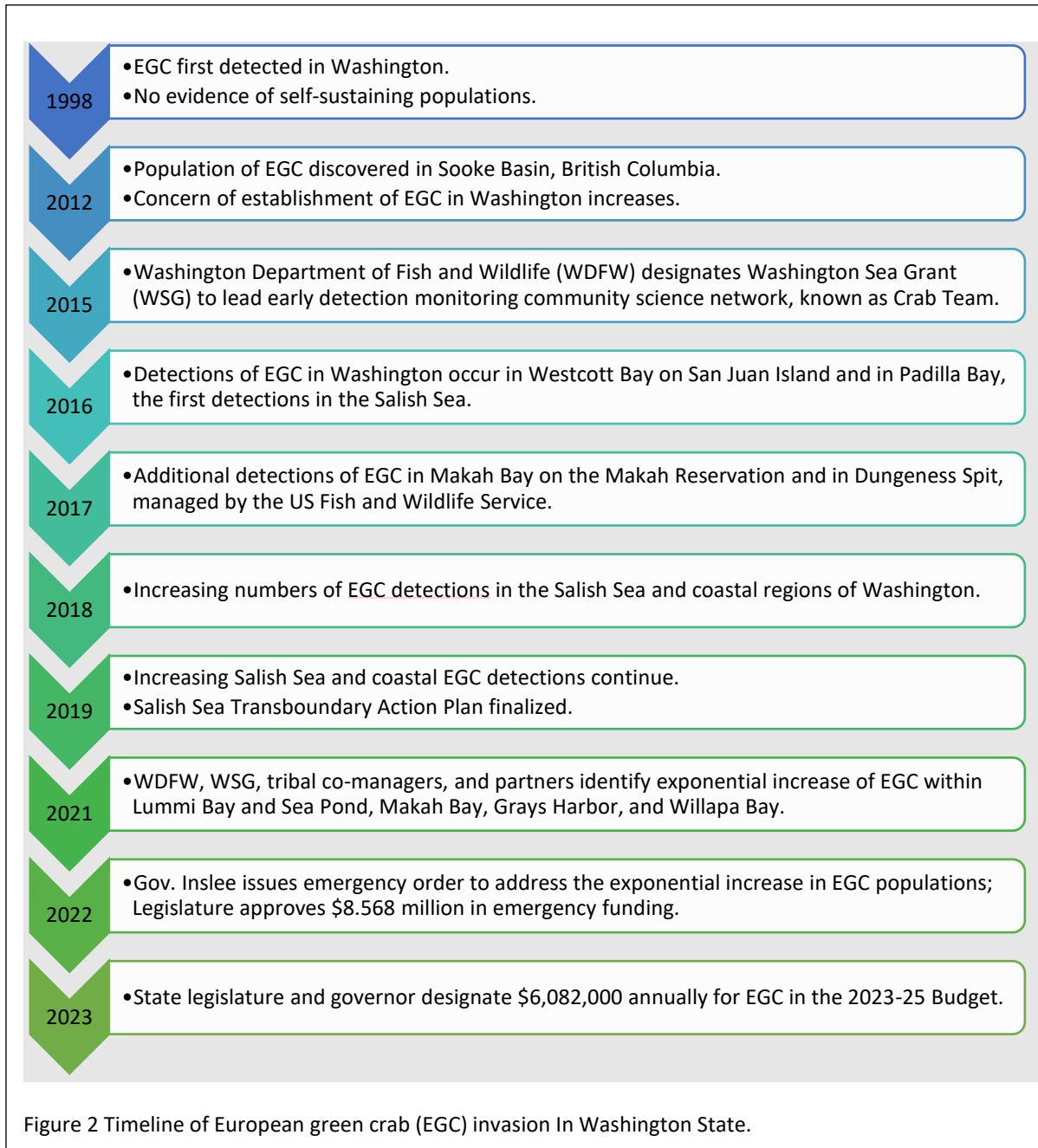
"NOW THEREFORE, I, Jay Inslee, Governor of the state of Washington, by virtue of the authority vested in me under RCW 43.06.010(14), as a result of the above-noted situation, and in accordance with RCW 77.135.090, do hereby order the Department of Fish and Wildlife to begin implementation of emergency 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 seventh quarter of the emergency, from Jan. 1 to March. 31, 2024 (Q7). The success of Q1-Q6 (March 1, 2022 – Dec. 31, 2024) may also be discussed and included for context. A complete list of EGC management actions of Q7 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 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 Q7, successes of the EGC ICS have included:

- 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.

- 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 thirty-five times (four times in Q7). During Q7, EGC MAC Group successes have included:

- 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)
 - \$100,000 Lummi Indian Business Council
 - \$32,897 US Fish & Wildlife Service (FWS) Dungeness National Wildlife Refuge (NWR)
 - See previous EGC Legislative Reports for more details.
- Reviewing updates from previously approved RCO EGC Emergency Measures Fund requests, which includes:
 - \$110,240 US FWS Willapa National Wildlife Refuge
 - This agreement was paid in advance per federal requirements, there is no funding remaining. Work is track. A no-cost extension has been approved to 6/30/2024, to leverage additional funds.
 - Final Report Due 6/30/2024
 - See previous EGC Legislative Reports for more details.

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	

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 (CMTP) 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. It should be noted that due to unforeseen circumstances, Addendums submitted to WDFW before publication are included in this document in [Appendix B](#).

On Feb. 21-22, 2024, WDFW and RCO hosted the 2024 EGC Manager’s Symposium. This two-day event brought together over ~80 representatives from CMPT across Washington and individuals involved in Oregon EGC management to discuss EGC issues. Representatives and researchers from Alaska, California, Canada, and Massachusetts contributed posters, but could not attend in-person due to travel limitations. Day One provided updates on the Washington State management plan, funding, communications and outreach, information on the status and trends of EGC populations, the Research Task Force, and talks from EGC researchers discussing their recent work (see [Research activity](#) for more details). For Day Two, WDFW led workshops to discuss management and coordination area technical planning; data standards, research, and analysis; best practices, decontamination, and data app/Hub

demonstrations; and general knowledge. These large-scale gatherings of CMPTs to discuss ongoing activities are invaluable for the continued success of the statewide collaboration.

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 thirty-two have been completed as of the end of Q7.

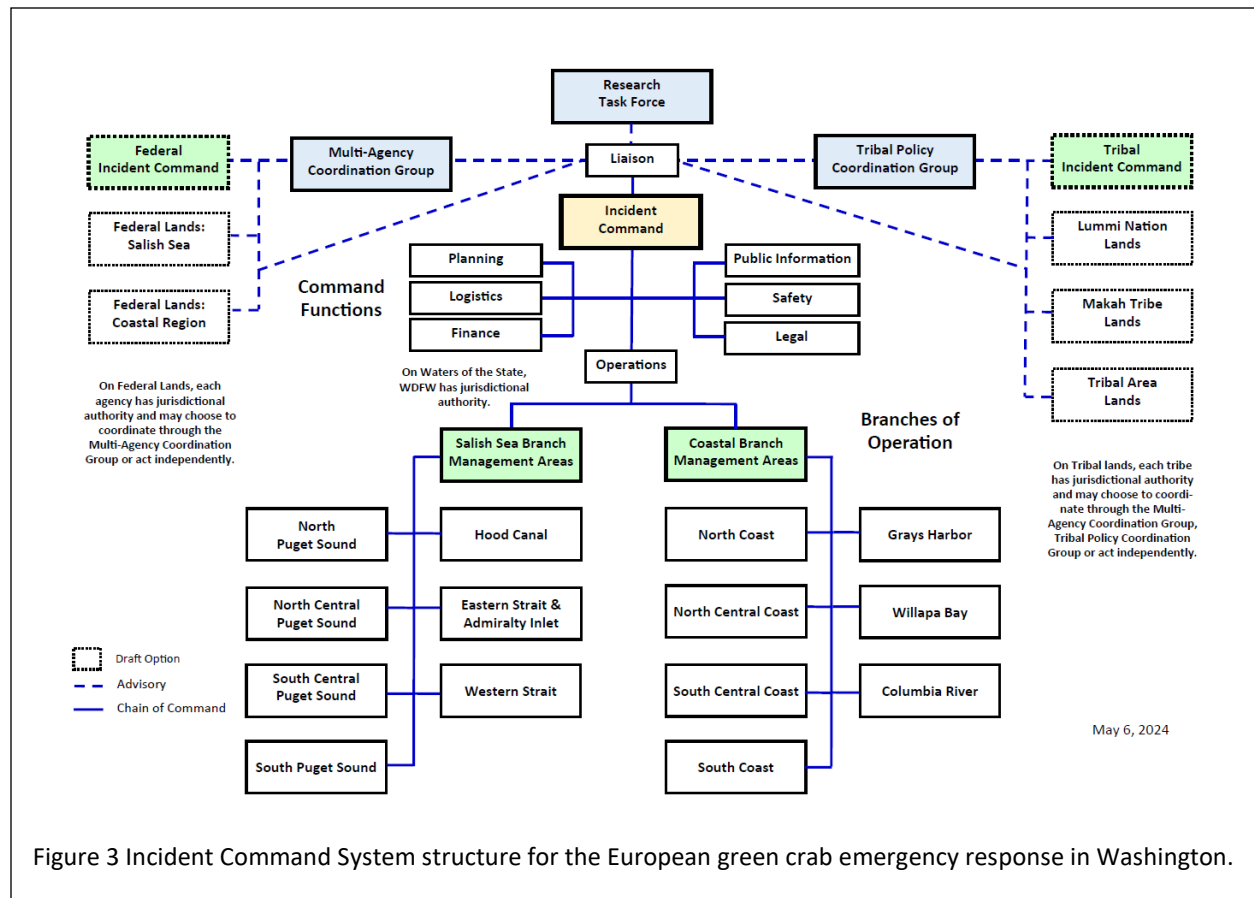


Figure 3 Incident Command System structure for the European green crab emergency response in Washington.

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	Tulalip Tribes
Lower Elwha Klallam Tribe	Taylor Shellfish Farms
Lummi Nation	Twin Harbors Waterkeeper Alliance
Makah Tribe	United States Fish and Wildlife Service
Northwest Straits Commission	United States Navy
Pacific County Vegetation Management	Veterans Corps
Pacific Seafoods	Washington Sea Grant
Padilla Bay National Estuarine Research Reserve	Washington State Department of Natural Resources
Pacific States Marine Fisheries Commission	Washington State DNR Puget Sound Corps
Penn Cove Shellfish	Washington Conservation Corps
Port Gamble S'Klallam Tribe	Willapa Bay National Wildlife Refuge
Quileute Tribe	Willapa-Grays Harbor Oyster Growers' Association

Budget allocation

The \$1,628,980 in funds provided for this report period allowed for the continuation of our management efforts.

- Staff (Salaries + Benefits): \$146,308
 - Funds spent on staff. At the end of Q7, the current active EGC staff to the European Green Crab Project includes a Lead Biologist 4, a Field Ops Biologist 3, two Regional Biologist 2s, a Research Scientist 1, a portion of a Communications Consultant 5's time (~15%) for efforts as Public Information Officer, and 2 Scientific Technician 2s (2 permanent).

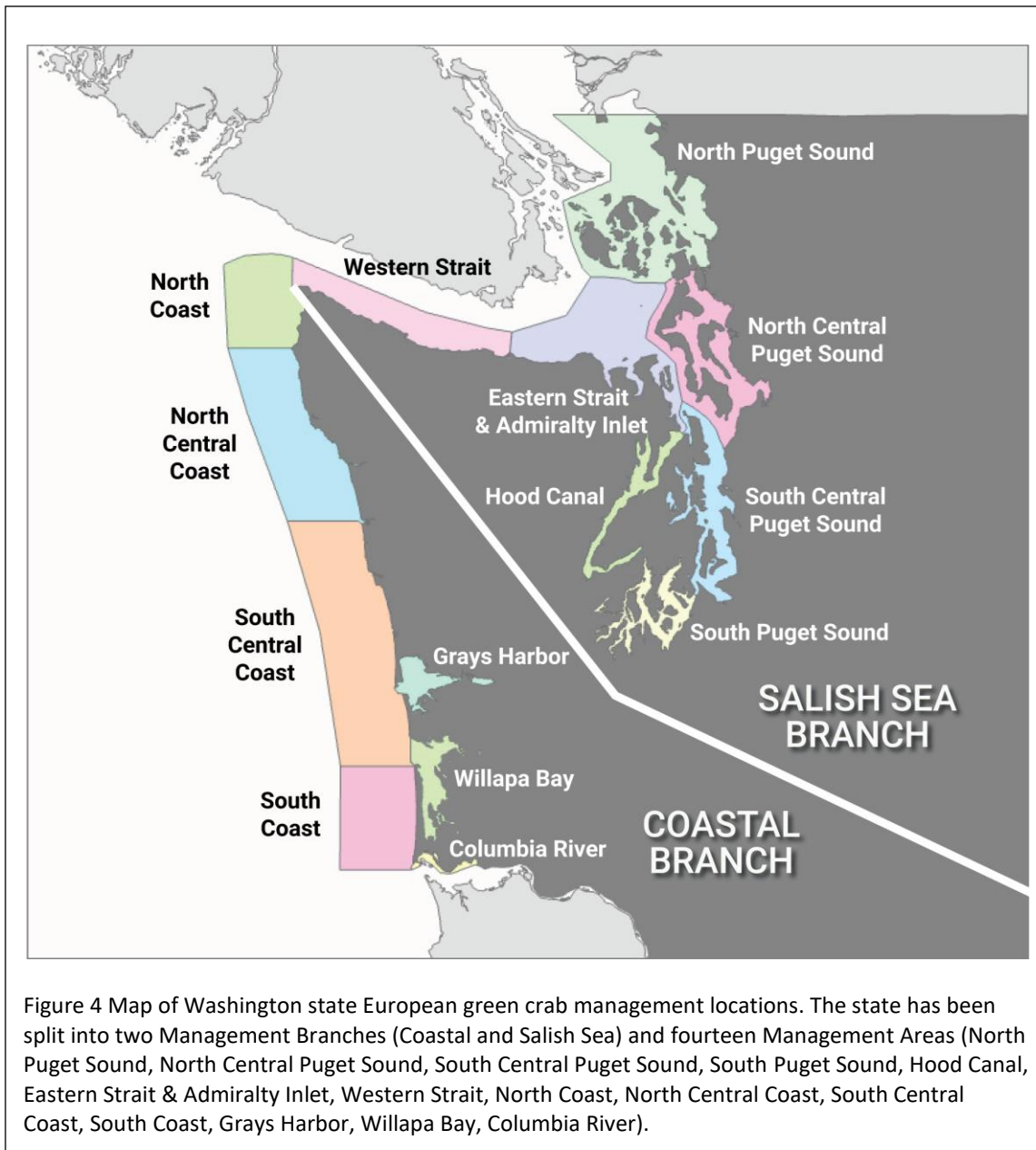
- Contractual Services: \$1,249,057
 - Funds spent on pass through contracts for various co-managers, tribes, and partners including WSG, Lummi Nation, Makah Tribe, and funding awarded through the WDFW Coastal EGC Local Management Grant and the RCO EGC Emergency Measures Grant programs.
- Goods & Services: \$540
 - Funds spent on general field supplies and gear such as bait and traps.
- Travel: \$1,475
 - 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: \$231,600
 - 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.

Trapping efforts across the state were undertaken by WDFW, WSG, co-managers, tribes, and partners. The catch numbers presented for Q7 represent the collective effort of all organizations, and those efforts must be recognized. During Q7, trap deployment across all MA's were reduced due to decreasing temperatures and the start of winter. Traditionally, trapping was not advised during colder weather due to decreased EGC activity and poor weather conditions. However, in recent years trappers in WA have found that EGC captures remain high in deeper water facilitated by boat-based trap deployment. Some CMTP now maintain their trapping efforts in winter months, though the general trend is a decline in trapping activity.

In total, 31,025 EGC were removed in Q7 from Washington state waters, with 30,940 removed from the Coastal Branch and 84 removed from the Salish Sea Branch (Table 4). In the Coastal Branch, the majority of EGC were removed from the following MA's: Willapa Bay (19,706), followed by Grays Harbor (10,980) and North Coast (254). In the Salish Sea Branch, most EGC were removed from the North Puget Sound MA (84), with a single crab collected in the Western Strait (1) MA. No trapping occurred in the Columbia River, Eastern Strait & Admiralty Inlet, Hood Canal, North Central Coast, North Central Puget Sound, South Central Coast, South Central Puget Sound, South Coast, and South Puget Sound Management Areas. 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 MA's. 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.



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). 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), Q6 (Oct. 1 – Dec. 31, 2023), Q7 (Jan. 1 – March 31, 2024) 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 time 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	Q6 Total EGC Captured	Q7 Total EGC Captured	All EGC Captured
Salish Sea	North Puget Sound	75,774	5,126	1,687	2,262	1,422	555	84	86,910
Salish Sea	Western Strait	0	0	0	0	0	18	1	19
Salish Sea	Eastern Strait & Admiralty Inlet	75	18	2	122	102	44	*	363
Salish Sea	Hood Canal	16	0	0	27	67	19	*	129
Salish Sea	North Central Puget Sound	0	*	*	0	0	*	*	0
Salish Sea	South Central Puget Sound	0	*	*	0	0	*	*	0
Salish Sea	South Puget Sound	0	*	*	0	0	*	*	0
Salish Sea	All	75,865	5,144	1,689	2,411	1,591	636	85	87,421
Coastal	North Coast	20,002	5,107	577	3,234	4,622	978	254	34,774
Coastal	North Central Coast	0	0	*	0	0	*	*	0
Coastal	South Central Coast	34	*	*	4	0	*	*	38
Coastal	South Coast	*	*	*	*	*	*	*	0
Coastal	Grays Harbor	6,402	17,862	21,479	12,708	25,901	25,476	10,980	120,808
Coastal	Willapa Bay	87,304	67,558	13,413	46,613	99,370	100,589	19,706	434,553
Coastal	Columbia River	5	*	*	1	1	*	*	7
Coastal	All	113,747	90,527	35,469	62,560	129,894	127,043	30,940	590,180
All	All	189,612	95,671	37,158	64,971	131,485	127,679	31,025	677,601

Far fewer EGC were collected in Q7 (Jan. 1 – Mar. 31, 2024) compared to Q6 (Oct. 1 – Dec. 31, 2023). The end of October marks the end of EGC trapping efforts by WDFW and many other CMTP until the following April. Trapping efforts by active CMTP were greatly reduced in Q7, with a corresponding decrease in EGC catch numbers. The exception was the Makah Tribe in the North Coast MA, which continued trapping efforts at Q6 levels while catching ~700 fewer EGC. The reduced catch at North Coast is unsurprising as cold weather reduces EGC activity and there is evidence of decreasing EGC abundance at sites trapped by the Makah Tribe (see the [Q6 Legislative Report](#) for more details).

The South Coast MA remains the only MA in WA where no EGC management activities have occurred. South Coast consists of the western coastline of Long Beach Peninsula, which borders the Pacific Ocean. Most of the South Coast MA 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, the South Coast MA is deemed a poor habitat for EGC. Starting this year, WDFW will lead an annual discussion with interested CMTP to determine if management actions are necessary for the South Coast MA.

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.

Monthly meetings of the EGC Research Task Force (RTF) continued in Q7 but are shifting to bi-monthly (every other month) for the duration of the field season (Apr. – Oct. 2024). Several Washington members assumed informal advisory roles due to capacity constraints. However, new members from Oregon and Washington have since joined in to fill these vacancies. While progress is ongoing for all RTF Tasks, notable progress includes:

- The continued compilation and distribution of EGC research among CMTP.
- Creating long-term monitoring and methods for EGC population status and trends. WDFW will pilot these methods over the 2024 field season, after which the RTF will revisit the methods for further refinement. The RTF and WSG are collaborating to ensure these methods complement the long-running Crab Team monitoring program.
- A review of research relating to EGC impacts, with a particular focus on the Pacific Northwest, is underway. Afterward, the focus will shift to identifying and developing protocols for a few target organisms (hairy shore crabs, eelgrass, oyster spat) that EGC is known to impact. Ultimately, the aim is to develop, and pilot methods for assessing EGC impacts on these target organisms by the end of the 2024 field season.
- A review of early detection methods for EGC is underway to compare the various approaches. The goal is to determine which approaches can be utilized for different situations and how CMTP can utilize multiple early-detection tools in tandem to increase the capacity and coverage of early detection in Washington.

- An initial assessment of ballast water and biofouling as a potential vector for EGC was completed. Various knowledge gaps have been identified regarding the relative risk of EGC spread via commercial shipping vs. currents. For each knowledge gap, data sources are proposed, and guidance is provided on whether the gap might be closed by supervised volunteers/fellows or by a funded professional study.
- A review of tools for the management of EGC is underway to examine efficacy, feasibility, and knowledge gaps for various approaches. The goal is to determine when/if tools other than trapping are feasible and what steps are necessary to develop potential tools in the long term.

Several EGC researchers presented their work during the 2024 EGC Manager’s Symposium. Adrienne Akmajian, Marine Ecologist with the Makah Tribe, presented on tagging and movement of European green crab in Makah Estuaries. Alexis Anaya, with the Washington State University Long Beach Research and Extension Unit, presented the results of a choice/no-choice assay evaluating the impacts of EGC on Washington shellfish species. Ben Rubinoff, with the University of Washington and Washington Sea Grant, presented on their recent work evaluating the ecological impacts of EGC in Washington. Lastly, with USGS WFRC, Carl Ostberg shared the results of recent work on early detection and monitoring of EGC with a particular focus on eDNA. On Day 2, a poster session included posters from researchers and managers from Washington, Alaska, Oregon, California, Massachusetts, and British Columbia (see [Appendix A](#) for a complete list).

On Jan. 31 – Feb. 2, Padilla Bay NERR hosted a workshop on EGC larval identification, which included speakers and breakout groups to determine future directions for studying the movements and behavior of larval EGC. In the wake of this workshop, discussions are ongoing on the implementation of a light trap project in coordination with WDFW, Portland State University, Padilla Bay National Estuarine Research Reserve, Port Gamble S’Klallam Tribe, USGS, and the Pacific Northwest Crab Research Group.

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 Q7 have included:

European Green Crab Outreach Specialist Position

- Jessica Ostfeld, our European Green Crab (EGC) Outreach Specialist since 2022, began a new position as WDFW’s Events Coordinator, supporting programs statewide. We thank Jessica for her hard work and dedication. At time of writing, the position has been filled, with an expected start date for May 15th.
- WDFW published a 7th grade lesson plan, [Green Crab Alert: Invasion in Washington's Waters](#), through the Department’s Wild Washington Youth Education program. This “mini unit” is

certified by the Office of Superintendent of Public Education and supplements the state's OpenSci Education unit 7.5 Ecosystem Dynamics: "How does changing an ecosystem affect what lives there?". The lesson plan was developed by Jessica Ostfeld, EGC Outreach Specialist, and Autumn Eckenrod, Conservation Education Curriculum Developer in coordination with Dr. Brian Turner and Aquatic Invasive Unit staff. Please share the lesson plan with interested teachers, students, families, or organizations.

Focused/Local communication

- WDFW Aquatic Invasive Species, Communications and Public Engagement (CAPE) and other staff conducted outreach about EGC management, identification, and reporting at numerous events including the Washington Sportsmen's Show in Puyallup, Seattle Boat Show, Pacific Northwest Sportsmen's Show in Portland, the Annual Invasive Species Exotic Pest Workshop in Stevenson, the Ocean Shores Razor Clam festival, the Penn Cove Mussel Fest on Whidbey Island, and several local environmental education events.
- WDFW staff responded to several media inquiries from Olympic Peninsula and coastal newspapers, resulting in quality coverage. A KIRO/MyNorthwest article required follow-up for important corrections regarding inaccurate statements made about retaining European green crabs.
- On Feb. 21-22, WDFW CAPE staff supported the EGC Managers Symposium, including a presentation on communications, outreach, and working with the public to support EGC identification and reporting. WDFW's Public Information Officer, Incident Commander and WDFW Aquatic Invasive Species Enforcement Captain also supported outreach at the Capitol Building on Feb. 29.
- On Feb. 28, WDFW and Washington Invasive Species Council hosted a European Green Crab Public Update Webinar to provide updates to the public on European green crabs and management efforts to control this invasive species in Washington state. [The recording is available on YouTube.](#)
- On March 13, Public Information Officer Chase Gunnell presented on EGC for the North Kitsap County Chapter of Puget Sound Anglers (PSA) at the Driftwood Key Marina clubhouse on Hood Canal, including identification, reporting, management, and detection updates, and how to get involved. More than 100 people attended, many of them active boaters and recreational anglers, and there was positive conversation and Q&A about EGC management as well as offers of access and support to trap for EGC on private tidelands and at the marina on northern Hood Canal.
- On March 21, Public Information Officer Chase Gunnell presented on EGC communications for the Washington Invasive Species Council in Olympia, including the "public awareness campaign" model this work follows, and 2024 priorities in the EGC communications and outreach plan.
- WDFW fielded several reports from the public of suspected European green crabs that turned out to be native helmet crabs, including nine helmet crabs collected from Hood Canal. These reports serve as a reminder regarding the current recommendations to photograph and report

suspected EGC at <https://wdfw.wa.gov/species-habitats/invasive/greatest-concern/egc>, returning the crab in question unharmed where it was found.

- 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: <https://wdfw.wa.gov/species-habitats/invasive/carcinus-maenas#conservation>.

General public communication

- A map of European green crab (EGC) detections in Washington in 2023 was created and [posted](#) to the Resources section of the WDFW EGC species webpage. Regular updates are also available at the [WDFW EGC Hub](#) page.
- EGC rack cards are running on all Washington State Ferries and will be available to riders through June 2024. EGC [identification signs](#), rack cards (in [English](#), [Spanish](#), [Vietnamese](#), [Ukrainian](#), [Somali](#), [Mandarin](#), and [Cantonese](#)), wallet-sized ID cards (in [English](#), [Spanish](#), and [Vietnamese](#)), [informational posters](#), and other materials were mailed to numerous marinas, ports, and other partners. A list of all EGC outreach materials is available on the [WDFW EGC webpage](#) under the “[Resources](#)” tab.
- Media relations and other external affairs activities continued. Current EGC management efforts have been reported in numerous local and national media outlets ([Appendix A](#)).
- Print and online advertisements supporting EGC identification and reporting continued to run in regional fishing, boating, and other outdoor publications and social media channels.

EGC 6-Year Management Plan

WDFW is currently facilitating the development of a 6-year Management Plan for EGC in Washington. This is a collaborative undertaking, and every effort is being made to address the goals and issues for each geographic area, co-manager, tribe, and partner involved in EGC management. The plan has gone through several iterations thus far, with co-managers, tribes, and partners (CMTP) reviewing and providing feedback throughout. While substantial work remains, the plan is on track to follow the established schedule (Table 5).

During Q7, WDFW received the following guidance from the governor and legislature regarding the plan via a legislative proviso:

“The plan must identify where permanent trapping efforts should occur, where efficiencies over current operations may be achieved, which agencies, tribes, or organizations require ongoing funding to support the state’s eradication and control measures, and the potential for federal funding for control efforts, and include a recommended funding level to implement the plan in the 2025-2027 biennium. The plan shall be submitted to the governor and legislature by October 1, 2024.”

In response to these changes to the plan scope and schedule, WDFW has executed a contract with [Samara Group](#), an environmental consulting firm and Washington-certified disadvantaged business, to

assist with assessing financial information and compiling it so WDFW can develop funding recommendations associated with the management plan actions. In addition, Samara Group will facilitate the compilation and review of feedback from CMTF on drafts of the plan and provide support for the development of the plan.

WDFW staff joined in discussions regarding Oregon's EGC management plan and to share progress on Washington's long term management plan. By participating in these meetings, WDFW hopes to foster collaboration and communication on EGC management between our two states.

Table 5 Schedule for the development of the EGC 6-Year Management Plan.

Step	Release by WDFW	Review and Return By
Draft Review by CMTF	March 29, 2024	April 19, 2024
Draft Review by CMTF	May 17, 2024	June 7, 2024
Draft Review by CMTF	July 5, 2024	July 26, 2024
WDFW Directors Review	Aug. 23, 2024	Sept. 13, 2024
Final Document Publication	Oct. 1, 2024	

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:

- Piloting of EGC monitoring methods. WDFW is piloting several new EGC monitoring methods during the 2024 field season, including light traps to collect larvae, benthic samplers to collect newly settled juveniles, and RTF developed long-term monitoring protocols. WDFW staff will require a learning period for these new procedures, and refinement of formal protocols will likely be necessary.
- 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.
- Development of 6-year statewide Management Plan. While significant progress has been made on the plan, several aspects are incomplete. In addition, WDFW must adjust to the updated timeline and additional elements from the legislative proviso. WDFW will continue to collaborate with other co-managers, tribes, and partners (CMTF) to ensure the plan's success.
- Documentation of current CMTF funding and identification of funding gaps. Per the guidance from the governor and legislature, WDFW is working with (CMTF) to identify what funding gaps exist between planned/proposed actions and current funding levels. WDFW is working with

Samara Group to ensure that this process is informative but not burdensome on CMTP, while considering the difficulty inherent in establishing a budget for activities that will occur years from now that will be heavily influenced by conditions at the time.

- Increasing communication and coordination of ongoing activities. The increasing number of CMTPs actively involved in EGC management activities and the expanding scope of those activities necessitates more effective communication and coordination to avoid potential interference and redundancies.
- Increased opportunities for in-person collaboration and coordination. The enthusiastic responses and productive discussions resulting from events like the 2023 Trappers Summit and 2024 Management Symposium highlight the benefit of in-person gatherings for facilitating collaboration among CMTP. Finding opportunities for these events, while challenging, remains a high priority.

Next Steps

The EGC emergency management priority actions for next quarter (Q8: Apr. 1 – June 30, 2024) include:

- Start of the 2024 EGC field season.
- Filling vacancies in permanent and seasonal EGC staff.
- Onboarding new staff.
- Continuation of creation and revision of the 6-year statewide EGC Management Plan in coordination with CMTP.
- 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 during the 2024 field season.
- Development and distribution of monthly SitReps.
- Ongoing advocacy for increasing federal partner support and funding.
- 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)

Q7 – Seventh quarterly phase of EGC emergency response (Jan. 1 – March 31, 2024)

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](#)

Q5 (July 1 – September 30, 2023) EGC Report

The Q5 report is available at <https://wdfw.wa.gov/publications/02460> or via this link: [European Green Crab Quarterly Progress Report – Fall 2023](#)

Q6 (October 1 – December 31, 2023) EGC Report

The Q5 report is available at <https://wdfw.wa.gov/publications/02491> or via this link: [European Green Crab Quarterly Progress Report – Winter 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 Q7 (January 1 – March 31, 2024) as provided in Situation Reports

Date	EGC Management Action
1/8/2024	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.
1/10/2024	European Green Crab Multi-Agency Coordination Group Meeting: Washington State Department of Natural Resources Decision Package, Governor’s Proposed Budget Guidance to Long-Term Management Plan, Draft Revised National European Green Crab Management and Control Plan Open Comment Period.
1/11/2024	Lummi Nation and Washington Department of Fish and Wildlife 2024 European green crab planning meeting.
1/12/2024	Washington Department of Ecology, Padilla Bay National Estuarine Research Reserve, Northwest Straits Commission, and Washington Department of Fish and Wildlife 2024 European green crab planning meeting.
1/18/2024	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.
1/28/2024	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.
2/7/2024	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.
2/12/2024	Following reports from the public of misidentified helmet crabs retained and reported as EGC, WDFW published a blog post titled : Cases of mistaken crab identity underscore request to report and release suspected European green crabs.
2/14/2024	European Green Crab Multi-Agency Coordination Group Meeting: European green crab impacts and captive diet study, and long-term management plan update.
2/16/2024	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.
2/21/24- 2/22/24	European Green Crab Manager’s Symposium
1/28/2024	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.
2/7/2024	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.
2/12/2024	Following reports from the public of misidentified helmet crabs retained and reported as EGC, WDFW published a blog post titled : Cases of mistaken crab identity underscore request to report and release suspected European green crabs.
2/14/2024	European Green Crab Multi-Agency Coordination Group Meeting: European green crab impacts and captive diet study, and long-term management plan update.

2/16/2024	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.
2/21/24- 2/22/24	European Green Crab Manager's Symposium
2/27/2024	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.
2/28/2024	European Green Crab Multi-Agency Coordination Group Special Meeting: Boat-based trapping best practices and recommended operations.
2/28/2024	European Green Crab Public Update Webinar
3/8/2024	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, as well as other priority EGC updates.
3/13/2024	European Green Crab Multi-Agency Coordination Group Meeting: EGC Manager's Symposium and Invasive Species Awareness Week Debriefing, Quinault Business Committee EGC State of Emergency, Proposed State Budget Update.
3/18/2024	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, as well as other priority EGC updates.
3/26/2024	WDFW published a 7th grade lesson plan, Green Crab Alert: Invasion in Washington's Waters , through the Department's Wild Washington Youth Education program. This "mini unit" is certified by the Office of Superintendent of Public Education and supplements the state's OpenSci Education unit 7.5 Ecosystem Dynamics: "How does changing an ecosystem affect what lives there?". The lesson plan was developed by Jessica Ostfeld, EGC Outreach Specialist, and Autumn Eckenrod, Conservation Education Curriculum Developer in coordination with Dr. Brian Turner and Aquatic Invasive Unit staff. Please share the lesson plan with interested teachers, students, families, or organizations.
3/26/2024	European Green Crab and Marine Invasive Species Update to Bureau of Indian Affairs, Washington Invasive Species Council and Washington State University 2024 Invasive Species Workshop for Tribal Audiences. Part of the 2024 Invasive Species Workshops and Webinars for Tribal Audience series.
3/27/2024	European Green Crab Multi-Agency Coordination Group Special Meeting: Federal funding opportunities including: WDFW Federal Appropriations Requests, Bureau of Indian Affairs Invasive Species Grant Program, and National Fish and Wildlife Foundation America the Beautiful Challenge Grant Program.
3/28/2024	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, as well as other priority EGC updates.

List of media reporting in chronological order related to Washington European green crab management for Q7 (January 1 – March 31, 2024) as provided in Situation Reports

Date	Outlet	Headline	URL
1/1/2024	Chinook Observer	From green crab to golden sunsets: A pictorial look back on Pacific County life in 2023	https://www.chinookobserver.com/news/from-green-crab-to-golden-sunsets-a-pictorial-look-back-on-pacific-county-life-in/article_7b27b5e0-a8d8-11ee-9226-a3832f18c9ab.html
1/2/2024	Shoreline Area News	Wildlife Wednesday Speaker Series: European Green Crabs and Puget Sound	https://www.shorelineareanews.com/2023/12/wildlife-wednesday-speaker-series.html
1/3/2024	Oregon Public Broadcasting (OPB)	Green crabs are invading the Pacific Northwest coast Oregon Field Guide	https://www.opb.org/article/2024/01/04/invasive-european-green-crabs-threaten-northwest-shellfish-industries/
1/4/2024	OPB/PBS	Oregon Field Guide: Green Crab Invasion	https://www.pbs.org/video/green-crab-invasion-ejybxw/
1/5/2024	The Daily World	Coastal lawmakers meet in Aberdeen ahead of session	https://www.thedailyworld.com/news/coastal-lawmakers-meet-in-aberdeen-ahead-of-session/
1/5/2024	Portland Mercury	Good Morning, News: Arctic Blast Incoming, Colonizing Crustaceans, and Watch Out for Respiratory Illness!	https://www.portlandmercury.com/good-morning-news/2024/01/05/46964316/good-morning-news-arctic-blast-incoming-colonizing-crustaceans-and-watch-out-for-respiratory-illness
1/10/2024	The Northern Light	2023 Year in Review: A look back at the year that was ... (July-December)	https://www.thenorthernlight.com/stories/2023-year-in-review-a-look-back-at-the-year-that-was-july-december,29970
1/11/2024	News Times	Invasive crabs threaten local	https://www.newportnewstimes.com/business/invasive-crabs-threaten-local-shellfish-

		shellfish industries	industries/article_e8866f46-af45-11ee-8e23-d36705072a89.html
1/24/2024	Peninsula Daily News / Sequim Gazette	Makah Tribe goes to year-round green crab trapping as invasive species is found within Neah Bay	https://www.sequimgazette.com/news/makah-tribe-goes-to-year-round-green-crab-trapping-as-invasive-species-is-found-within-neh-bay/
2/3/2024	Yahoo News	Invasive European green crabs could devastate local seafood industry	https://news.yahoo.com/invasive-european-green-crabs-could-015010676.html
2/3/2024	KIRO / MyNorthwest	Invasive European green crabs could devastate local seafood industry (correction issued)	https://www.kiro7.com/news/local/invasive-european-green-crab-could-devastate-local-seafood-industry/TQYZK5RSY5FOPPALTDXIACXGY/
2/15/2024	YachatsNews (Oregon)	Despite attempts to control invasive green crabs in Oregon’s coastal waters, researchers say “they are here to stay”	https://yachatsnews.com/states-fight-invasive-green-crabs/
2/16/2024	Whidbey News-Times	Whidbey is part of fight against invasive species	https://www.whidbeynewstimes.com/news/whidbey-is-part-of-fight-against-invasive-species/
2/27/2024	UW Magazine	UW-based team monitors the green crab invasion	https://magazine.washington.edu/feature/uw-based-team-monitors-the-green-crab-invasion/

2024 European Green Crab Manager’s Symposium Research and Data Poster Session – List of Posters

Poster Title	Authors	Affiliations
The transition from resistance to acceptance: managing a marine invasive species in a changing world	Abigail G. Keller ¹ , Timothy D. Counihan ² , Edwin D. Grosholz ³ , Carl Boettiger ¹	¹ Department of Environment Science, Policy, and Management, University of California, Berkeley, ² U.S. Geological Survey, Western Fisheries Research Center, ³ Department of Environmental Science and Policy, University of California, Davis,

Using prey selectivity and density-dependent predation to identify biological indicators for adaptive green crab management	Brett R. Howard ¹ , Katie S.P. Gale ¹ , Isabel Gregr ² , Thomas W. Therriault ¹	¹ Fisheries and Oceans Canada, ² University of Victoria
Genomics shows (mostly) high connectivity among green crab populations in Washington and beyond	Carolyn Tepolt ¹ , P. Sean McDonald ^{2,3} , Emily Grason ²	¹ Woods Hole Oceanographic Institution Department of Biology, ² Washington Sea Grant, ³ University of Washington
Impact of Individual Plasticity and Genotype on <i>C. maenas</i> Heat Wave Response	Julia Kelso ¹ , Carolyn Tepolt ² , Yaamini R. Venkataraman ²	¹ Cornell University, ² Woods Hole Oceanographic Institution Department of Biology
Like Attracts Like? Using Green Crab as Bait for Green Crab Removal Trapping	Laney Keyes , Ethan Gonzales, Dawson Little, Annie Cavanaugh, Cole Svec, Adrienne Akmajian	Makah Fisheries Management
Southeast Alaska Invasive European Green Crab Workshop	Linda Shaw ¹ , Sunny Rice ² , Ginny Eckert ² , Dunstin Winter ³ , Genelle Winter ³ , Taylor Stumpf ³ , Kari Lanphier ⁴ , Tammy Davis ⁵ , Carol Fletcher ⁶ , Emily Grason ⁷	¹ NOAA Fisheries Habitat Conservation Division, ² Alaska Sea Grant, ³ Metlakatla Indian Community, ⁴ Southeast Alaska Tribal Ocean Research, ⁵ Alaska Department of Fish and Game, ⁶ Organized Village of Kasaan, ⁷ Washington Sea Grant
Pacific States Marine Fisheries Commission West Coast European Green Crab Database	Leanne Cohn , Kate Sherman	Pacific States Marine Fisheries Commission
Invasive European green crab (<i>Carcinus maenas</i>) predation in a Washington State estuary	Mary C Fisher ¹ , Emily W. Grason ² , Alex Stote ² , Ryan P. Kelly ³ , Kate Litle ² , P. Sean McDonald ^{4,5}	¹ School of Environmental and Forest Sciences, University of Washington, ² Washington Sea Grant, University of Washington, ³ School of Marine and Environmental Affairs, University of Washington, ⁴ Program on the Environment, University of Washington, ⁵ School of Aquatic and Fishery Sciences, University of Washington
A genetic toolkit for understanding rapid expansion of European green crabs in the northeast Pacific	Mikayla Newbrey ^{1,2} , Sara Shapiro ¹ , Carolyn Tepolt ¹	¹ Woods Hole Oceanographic Institution Department of Biology, ² University of Massachusetts Amhurst
European Green Crab Larvae: Rearing, Identification, and Collaboration	Nicole Burnett , Heath Bohlmann, Sylvia Yang	Padilla Bay National Estuarine Research Reserve

Appendix B – Co-manager and partner addendums

Washington Department of Natural Resources



Washington Department of Natural Resources (DNR) – Addendum for the Operational Period of January 1 through March 31, 2024, for European Green Crab Emergency Measures.

- 1) DNR captured 1,438 EGC from Willapa Bay and Grays Harbor during this operational period, nearly eleven times the amount of EGC captured from the same operational period last year. The purchase of our airboat under project number 22-1970 and funding for two scientific technicians allowed DNR to increase our effort from 330 trap set days to 542 and increased our efficiency of capturing EGC.
- 2) EGC captured from this operational period came from DNR managed Natural Areas and Natural Resource Conservation Areas. Work included trapping events at our coastal sites. We performed five trappings within Grays Harbor resulting in 1,113 EGC captured and 317 EGC in Willapa Bay over three separate trapping events. Inclement weather kept us from trapping every week.
- 3) DNR was present at the invasive species table at the Legislative Building during Invasive Species Week and provided outreach materials on EGC. DNR also performed a classroom Molt Search training in Puget Sound with nine participants from the Fidalgo Bay Aquatic Reserve Citizen Science Committee and a follow up training in the field.
- 4) During the next operational period DNR will participate in two emphasis response trappings in Grays Harbor partnering with Washington Department of Fish and Wildlife (WDFW), Grays Harbor Conservation District, Washington Sea Grant, Quinault Indian Nation, and Taholah High School. DNR will also perform joint trappings with WDFW at our Aquatic Reserves in the Puget Sound and lead the annual Fidalgo Bay Blitz where partners come together to deploy numerous traps within Fidalgo Bay.



Clockwise from upper left: Kelsey Sapp with shrimp trap at Grays harbor ANeMoNe site; Alexa Brown and Tim Teets with airboat at John’s River; Kelsey Sapp, Tim Teets, and Alexa Brown trapping from the airboat Crab’n Fever; Kelsey Sapp with a gravid EGC.

Washington Sea Grant



January 1 - March 31, 2024

WSG Crab Team continued to work through the winter season on supporting statewide capacity to manage green crab through activities related to the Molt Search and monitoring network programs,

advancing green crab research, and contributing to public awareness and manager technical capacity through scientific support, training, and outreach.

Monitoring Network

In this quarter, WSG completed the annual launch of the monitoring network, kicking off the *10th season of Crab Team monitoring* by recruiting and onboarding new monitors and resupplying and refreshing returning teams with gear and guidance. During this period:

- 48 new participants were trained to join the Crab Team network as monitors, attending 2 Virtual sessions and one of 5 in-person training sessions offered across the region.
- 80 returning monitors represented their team at one of 5 in-person continuing education workshops. These sessions included a review of ESA permitting requirements, an enhanced protocol review, and overview of the EGC emergency declaration and statewide management structure.
- A cohort of 10 representatives from Alaska also attended Crab Team's new and returning monitor trainings and were led by Crab Team staff through planning conversations about developing and strengthening their own monitoring network.
- Staff delivered a total of 22 hours of training to new and returning monitors (and Alaska representatives) combined.
- Crab Team hired an additional student assistant.
- Crab Team also hosted a winter seminar series for returning participants of the Crab Team monitoring network, including two presentations in this quarter:
 - Crab Team 2023 Season Reflection & Synthesis (1/17/24)
 - European green crab on the East Coast (2/16/24)

Molt Search

WSG continued to work with WSU Extension to implement the Molt Search program by designing a new framework for partnership engagement, refining training materials, and engaging new organizations in the training process to expand the program's reach. Reporting and training continued this quarter, including the following highlights:

- Molt Search received 30 reports from community members in Q7; no green crab molts were detected in the Salish Sea through these efforts.
- 44 participants were trained on green crab ID and search protocols during 1.5-2hr sessions held for educators and community members in three counties this quarter.

Research Updates

Crab Team continues an active and productive research program that prioritizes projects that will inform management actions. By collaborating with researchers across the region and country, these projects leverage the expertise of specialists in genetics, parasites, etc.

- Crab Team submitted a manuscript on research on a collaboration (with UW Biology) on clam recruitment and mortality in Willapa Bay for publication in *Aquaculture Research*. The paper

documents recruitment and survival patterns, and sources and stages of mortality, for Manila and soft shell clams, including green crab predation across a tidal gradient. This will contribute to the understanding of emerging impacts of green crabs.

- Crab Team prepared, inventoried, and shipped roughly 600 cataloged crabs, and 150 tissue samples from 2023 to Carolyn Tepolt at Woods Hole to support population genetics research.

Partner Training, Capacity Support, and Regional Management Support

Crab Team plays a critical role in building statewide and regional technical capacity to address the green crab invasion. With experience in training monitors across a wide range of backgrounds, Crab Team works with WDFW to train partners interested in trapping for green crab, and provides scientific consultation on trends and trapping strategies for these groups. Cumulatively, capacity building activities have dramatically increased the collective regional expertise over the past decade, and this trend continues through participation in and accessibility to several management-support groups.

- Crab Team supported the WDFW Managers Symposium in January by:
 - Providing two program presentations: 1. Status and Trends of green crab in Washington in 2023 by Sean McDonald and Emily Grason; 2. Evidence for green crab impacts by Ben Rubinoff.
 - Bringing and sharing several posters at the research and status breakout groups, with research on population genetics and gut contents, as well as results from Crab Team network trapping and the Molt Search program.
- Crab Team post doctoral fellow Ben Rubinoff presented research on assessment of green crab impacts to the MAC group.
- Staff participated in the NERR Science Collaborative workshop led by the Kachemak Bay NERR and presented a transfer of knowledge on partnership development and monitoring protocols.
- Crab Team staff consulted with several groups interested in starting or continuing trapping in 2024, advising on planning for training, strategy for efforts, and trapping techniques, including Squaxin, Samish, and Nisqually tribes. Coastal groups included the Willapa Bay Planning meeting and monthly Grays Harbor coordination meetings.
- Staff participated in the PBNERR-led Larval ID and research workshop, helping discuss the advancement of research on green crab larvae.
- Crab Team staff participated in the WDFW green crab research taskforce, and led two research task force subgroups, Green crab impacts and Early detection methods evaluation. Work on both groups is anticipated to result in technical reports surveying the state of knowledge in both areas that will support decision making regionally and beyond.

Communications and Outreach

With WSG's history of experience and scientific expertise on green crab, program staff support statewide efforts through presentations that interpret and synthesize status and trends of green crab populations and invasion management as the data permit, as well as presentations that provide insights into trapping best practices. This information is extremely important to enable managers to track and

understand the status of the invasion on a regional scale and understand notable trends or changes. This year, Crab Team provided such presentations at the following events:

- WDFW Annual Statewide Update meeting (2/21/24)
- Kachemak Bay NERR Science Collaborative Project (3/27/24)

Outreach is an ongoing role WSG plays in engaging and educating members of the public in green crab efforts. During this period, WSG provided outreach presentations in the following venues:

- Salish Sea Stewards Training (2/27/24)