



State of Washington
DEPARTMENT OF FISH AND WILDLIFE

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March 1, 2023

The Honorable Christine Rolfes
Chair, Senate Ways and Means
303 John A. Cherberg Building
Post Office Box 40466
Olympia, WA 98504-0466

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

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

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

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

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

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

The Washington State Legislature approved \$8,568,000 in emergency funding during the 2022 Supplemental Budget to facilitate increased EGC management efforts. In response to the legislative budget proviso directive, this report is the second in a series of ongoing quarterly progress reports (Q2). The Q2 report will outline the successes and challenges of ongoing EGC emergency response efforts in Washington state from October 1 to December 31, 2022.

Actions taken in Q2 were reduced in comparison to Q1 with the end of many entities' EGC trapping seasons. However, trapping continued in several areas resulting in the removal of EGC until the end of 2022. The collective effort of all organizations involved in EGC management resulted in the removal of 96,156 additional EGC from Washington state marine waters, with 67,615 from the Coastal Branch and 5,154 from the Salish Sea Branch. In total for calendar year 2022, there were 286,444 EGC removed from Washington state marine waters, with 205,433 removed from the Coast Branch and 81,011 removed from the Salish Sea Branch.

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WDFW, tribal co-managers and partners achieved significant progress in EGC management efforts in a short timeframe. To date, EGC have not been detected in the Salish Sea Branch south of northern Hood Canal. While challenges remain, the continued efforts of all parties and the clear organizational structure set in Q2 will allow for continued success in Q3.

Additional information on European green crab in Washington and regular updates are available at: wdfw.wa.gov/species-habitats/invasive/carcinus-maenas.

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

Sincerely,



Allen Pleus

WDFW European Green Crab Incident Commander

cc:

Kelly Susewind, Director, Washington Department of Fish and Wildlife

Kelly Cunningham, WDFW Fish Program Director

Ruth Musgrave, Senior Policy Advisor to Governor Jay Inslee

European Green Crab Quarterly Progress Report – Winter 2022 (October 1 to December 31, 2022)

Washington Department of Fish and Wildlife (WDFW)



Washington
Department of
**FISH and
WILDLIFE**

March 1, 2023

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



Executive Summary

In response to the legislative budget proviso directive in ESSB 5693 (2022 c 297), this report has been authored as the second in a series of ongoing quarterly progress reports (Q2). This report will serve to outline the successes and challenges of ongoing European green crab (EGC) emergency response efforts in Washington state from October 1 to December 31, 2022. In addition, this report will put the work during Q2 in the context of the work completed in Q1 (March 1 to September 30, 2022).

The Q1 report (European Green Crab Quarterly Progress Report – Fall 2022) is available at: <https://wdfw.wa.gov/publications/02372> and on WDFW's European green crab [webpage](#).

In 2021, the Washington Department of Fish and Wildlife (WDFW), tribal co-managers, and partners identified an exponential increase of invasive European green crab (EGC), *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.

An Incident Command System (ICS) was then established to deal with the complexities of the EGC management effort. Support for and coordination with our partners and tribal co-managers 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 operational periods (bi-weekly September and October, then monthly in November and December) 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 [EGC Public Updates published](#) in October and bi-monthly for November/December distributed through WDFW's EGC Management Updates email list as well as Department webpages, communications, and social media channels.

Representatives from most entities participating in EGC management have joined the ICS Multi-Agency Coordination (MAC) group. The MAC group provides a forum for these representatives to share information, establish a common operating picture, develop long-term priorities for the EGC emergency, and commit and allocate funding and other resources to enhance emergency measures responses. In Q2, the EGC MAC group continued to meet and review/recommend new Washington State Recreation and Conservation Office (RCO) EGC Emergency Measures Fund request for proposals. In addition, the EGC MAC group continued development of the Fiscal Year 2023 EGC



Emergency Measures Strategic Action Plan, including establishing priority tasks to be addressed (this plan has since been completed and distributed).

Actions taken in Q2 were reduced in comparison to Q1 with the end of many entities' EGC trapping seasons. However, trapping continued in several areas resulting in the removal of EGC until the end of 2022. Pass-through funding and allocation of equipment provided support for tribal co-managers and partners. Increased communication efforts (e.g., public updates, EGC Management Updates email list, numerous [online resources](#) for identification and reporting) and focused outreach (e.g., signage and outreach materials, public presentations, tabling at events including the Pacific Marine Expo) have enhanced public awareness and EGC reporting potential.

During the Q2 period, the collective effort of all organizations involved in EGC management resulted in the removal of 96,156 additional EGC from Washington state marine waters, with 67,615 from the Coastal Branch and 5,154 from the Salish Sea Branch. In total for calendar year 2022, there were 286,444 EGC removed from Washington state marine waters, with 205,433 removed from the Coast Branch and 81,011 removed from the Salish Sea Branch. In addition to active removal trapping, Q2 trap deployment occurred in areas where EGC had not previously been detected for early-detection monitoring. To date, EGC have not been detected in the Salish Sea Branch south of northern Hood Canal. Data on EGC abundance, body size, sex ratios, and reproductive status were collected along with DNA and RNA samples to assess connectivity between EGC populations. Analysis of this data will be provided in subsequent quarterly reports after compilation and quality assurance measures implemented.

WDFW, tribal co-managers, and partners achieved significant progress in EGC management efforts in a short timeframe. Progress was also made on public education and community engagement to support EGC awareness, with many attendees at outreach events such as the Pacific Marine Expo reporting they had heard about EGC in the news or from the state, tribes, or partners, and now have a baseline of understanding about this invasive species, why it is harmful, and that emergency measures have been deployed for EGC monitoring and control. While challenges remain (e.g., implementing standardized electronic trapping data submission, hiring staff and transition into Fiscal Year 2023 Strategic Action Plan), the continued efforts of all parties and the clear organizational structure set in 2022 will allow for continued success in the coming year.

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). Green crab has wide tolerances for salinity (1.4-54 ppt) and temperature (0-35 °C) and can even survive air exposure for several days (Leignel et al. 2014).



In areas where EGC has been able to establish large populations for extended periods of time, they have the potential to negatively impact other species, particularly smaller crabs and bivalves (Jamieson et al. 1998, McDonald et al. 2001). It is estimated that damages to commercial shellfisheries from EGC predation average \$22.6 million per year on the East Coast of the United States (Lovell et al. 2007). Similar losses from EGC predation are possible for Salish Sea shellfish fisheries (Mach and Chan 2013) and Pacific Coast fisheries are also at risk. Predation on oysters by EGC could negatively impact oyster fisheries, as adult EGC can prey upon young oysters (Dare et al. 1983, Poirier et al. 2017) and have been observed cracking and consuming adult oysters in laboratory settings (Forster, personal communication). Lab work has shown that juvenile EGC outcompeted similar-sized Dungeness crabs for food and shelter and juvenile Dungeness may serve as prey for larger EGC, resulting in potential impacts to wild Dungeness populations. Predation by EGC has led to declines in native bivalve and crab populations in invaded habitats (Grosholz et al. 2000). In addition, burrowing by EGC can have significant negative impacts on eelgrass, estuary, and marsh habitats (Malyshev and Quijón 2011, Matheson et al. 2016, Howard et al. 2019).

Given their history as a prolific invasive species, EGC is classified as a Prohibited Level 1 Invasive Species in Washington (WAC 220-640-030; Appendix A), meaning they may not be possessed, introduced on or into a water body or property, or trafficked (transported, bought, or sold), without department authorization, a permit, or as otherwise provided by rule (RCW 77.135.040; Appendix A). We are 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 or marginal teeth on either side of their forward carapace, a unique pattern for crabs on the Pacific coast of North America (Fig. 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.

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; Fig. 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

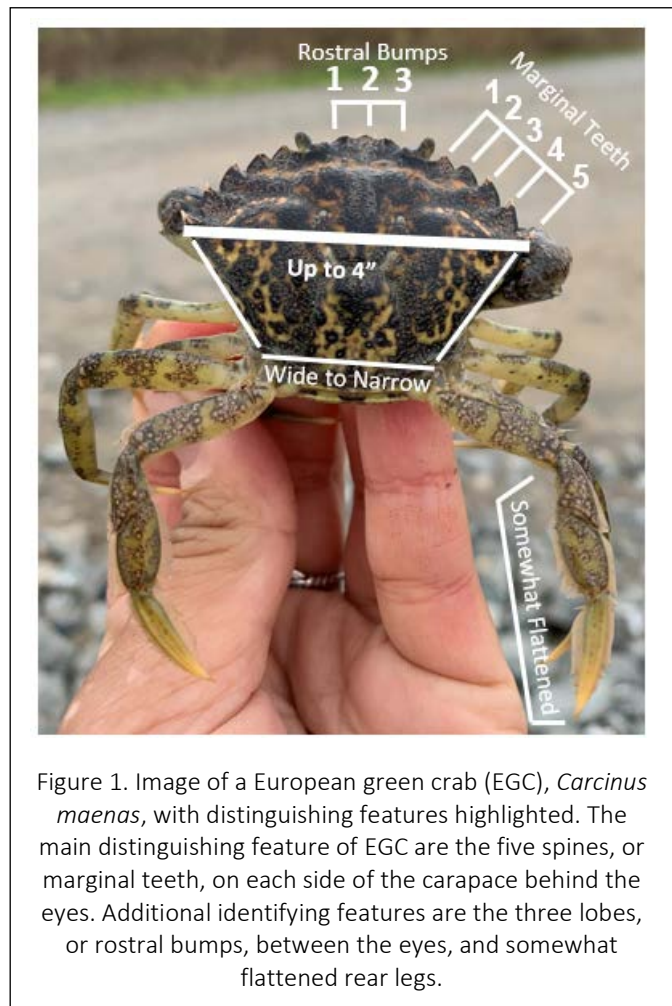


Figure 1. Image of a European green crab (EGC), *Carcinus maenas*, with distinguishing features highlighted. The main distinguishing feature of EGC are the five spines, or marginal teeth, on each side of the carapace behind the eyes. Additional identifying features are the three lobes, or rostral bumps,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



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 - known as the Crab Team. This also marked the beginning of increased communication and collaboration with the Department of Fisheries and Oceans Canada 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 Department of Fisheries and Oceans Canada in 2019 (Drinkwin et al. 2018).

Table 1 Yearly European green crab captures in Washington from 1998-2021. 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 this data only represents crabs captured, not the effort employed. Catch effort (number of traps deployed, number of locations trapped, frequency of trap recovery) varies greatly across years.

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





Emergency Proclamation and Supplemental Funding

In 2021, WDFW, tribal co-managers, 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, tribal co-managers including the Lummi Nation, Makah Tribe, and others, and 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.

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 (2022 c 297) (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 second quarter of the emergency, from October 1 to December 31, 2022 (Q2). The success of Q1 (March 1 – September 30, 2022) will also be discussed and included for context. A complete list of EGC management actions of Q1 and Q2 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 in delegating authority to Allen Pleus, WDFW's Aquatic Invasive Species (AIS) Unit Manager, to serve as Incident Commander (Fig. 3).

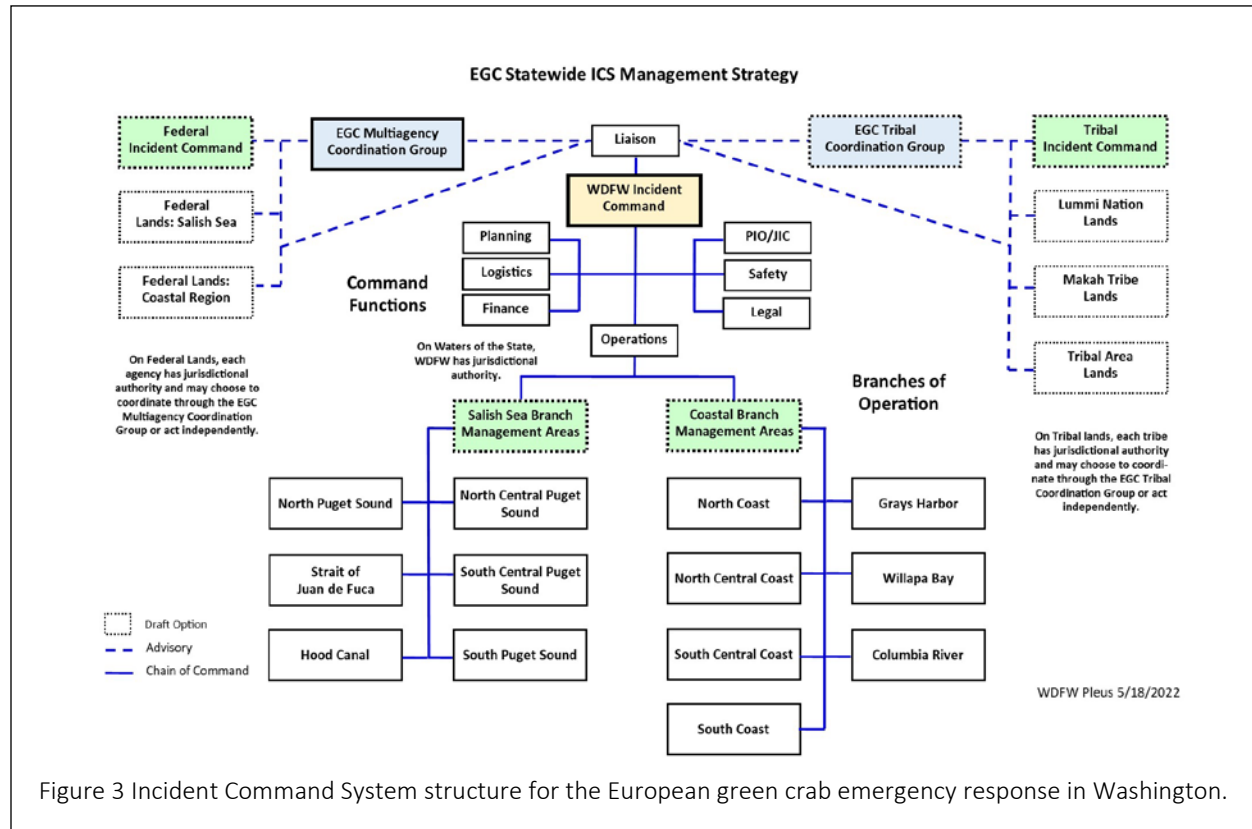


Figure 3 Incident Command System structure for the European green crab emergency response in Washington.

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 Q2, 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 tribal co-managers and partners with WDFW oversight.



- Meetings with tribal co-managers and other federally recognized tribes to discuss ICS structure and solicit recommendations on how 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 two-week 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 tribal co-managers and partners.
 - During months of reduced trapping activity resulting from winter conditions (November - February), SitReps are created on a monthly operational period.
- Creation of monthly EGC Public Updates updating on Washington State EGC Emergency measures, highlighting the efforts of agencies, tribes and partners, and sharing stories from the field for dissemination to the public and media.
 - During months of reduced trapping activity resulting from winter conditions (November - February), Public Updates are created on a bi-monthly period.
- 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 tribal co-managers and partners including state and federal agencies, and shellfish growers (Table 2).

Table 2 List of European green crab (EGC) Multi-Agency Coordination (MAC) group member organizations during the Q2 period. 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	
Chelsea Farms	Washington Department of Ecology
Lummi Nation Business Council	Washington Department of Fish and Wildlife
Puget Sound Partnership	Washington Department of Natural Resources
Shoalwater Bay Tribe	Washington Emergency Management Division
U.S. Bureau of Indian Affairs	Washington Recreation and Conservation Office
U.S. Environmental Protection Agency	Washington Sea Grant
U.S. Fish and Wildlife Service	Washington State Department of Agriculture
U.S. Geological Survey	Washington State Parks and Recreation Commission
U.S. National Oceanographic and Atmospheric Administration	Willapa Grays Harbor Oyster Growers' Association

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 8th, 2022, the MAC group has convened thirteen times (four times in Q2). During Q2, the EGC MAC group successes have included:



- Aided in the development of The Washington State Recreation and Conservation Office (RCO) EGC Emergency Measures Fund request for proposals.
- Reviewed and recommended RCO EGC Emergency Measures Fund requests of:
 - \$110,240 US Fish & Wildlife Service Willapa National Wildlife Refuge (NWR) funding to provide the Willapa NWR with continuity in maintaining trained, airboat certified staff to access pertinent Refuge lands, increase availability of staff to collaborate with entities conducting management efforts on- and off-Refuge lands, and to permit Willapa NWR to conduct management efforts when necessary.
 - \$70,517 Washington State University (WSU)/Washington Sea Grant (WSG) funding to develop and deliver an outreach program to engage residents around Puget Sound and the Strait of Juan de Fuca in providing early detection of EGC in locations currently not being monitored.
 - These recommendations are in addition to those from Q1, which includes:
 - \$91,316 U.S. National Oceanographic and Atmospheric Administration
 - \$402,220 State of Washington Department of Natural Resources
 - \$100,000 Lummi Indian Business Council
 - \$99,312 Pacific County Vegetation Management
 - \$75,154 State of Washington Department of Ecology
 - \$32,897 US Fish & Wildlife Service Dungeness NWR
 - See [Q1 EGC Legislative Report](#) for more details
- Continued development of the Fiscal Year 2023 EGC Emergency Measures Strategic Action Plan, including establishing priority tasks to be addressed. The plan was scheduled for completion by mid-January 2023 (please note that by the time of writing the plan has been completed and distributed).

Coordination with tribal co-managers and partner organizations

Perhaps the greatest success of EGC management in Washington are the efforts, both independent and collaborative, of the many tribal co-managers 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, tribal co-managers and partners such as the Washington Sea Grant (WSG), local, state, federal agencies, shellfish growers have worked with WDFW to implement short- and long-term management actions to support statewide efforts in EGC management. The contributions of all entities involved in EGC control cannot be overvalued. While this report does not go into specifics of the contributions of each group, MAC group member organizations were invited to submit addendums to outline their specific actions and successes in their own words. Addendums submitted to WDFW before publication are included in this document in [Appendix B](#).

Since EGC extend beyond jurisdictional boundaries, management responses require action, collaboration, and coordination between various groups. It is important to note that EGC management is very complex with multiple jurisdictions, varying management priorities, different management types, complex operations, and different resource capacities. Additionally, each organization can have differing goals for sensitive habitats, species protections and aquaculture operation protections. SitReps were disseminated every two weeks based on ICS operational periods to support meeting the collaboration and transparent emergency management objective. During months of reduced trapping activity resulting from winter conditions (November - February), SitReps dissemination was shifted to a monthly operational period. 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, with four SitReps completed in Q2, and a total of thirteen for 2022.

Table 3 List of tribal co-managers 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 tribal co-managers and partner organizations	
Bay Center Farms	Quinault Indian Nation
Brady's Oysters	Samish Indian Nation
Chuckanut Shellfish	Shoalwater Bay Tribe
Drayton Harbor Oyster Co.	Stillaguamish Tribe of Indians
Elkhorn Oyster Co.	Stillwaters Environmental Center
Goose Point Oysters	Suquamish Tribe
Grays Harbor National Wildlife Refuge	Swinomish Indian Tribal Community
Jamestown S'Klallam Tribe	Taylor Shellfish Farms
Lower Elwha Klallam Tribe	Twin Harbors Waterkeeper Alliance
Lummi Nation	United States Fish and Wildlife Service
Makah Tribe	United States Navy
Northwest Straits Commission	Veterans Corps
Pacific County Vegetation Management	Washington Sea Grant
Pacific Seafoods	Washington State Department of Natural Resources
Padilla Bay National Estuarine Research Reserve	Washington State DNR Puget Sound Corps
Pacific States Marine Fisheries Commission	Washington Conservation Corps
Penn Cove Shellfish	Willapa Bay National Wildlife Refuge
Port Gamble S'Klallam Tribe	Willapa-Grays Harbor Oyster Growers' Association
Quileute Tribe	

Budget allocation

The \$1,140,703 in funds provided for this report period allowed for the continuation of our management efforts.

- Staff (Salaries + Benefits): \$153,861
 - Funds spent on staff. During Q2, our staff was reduced due to the seasonal nature of most of our Scientific Technician positions. However, four seasonal Scientific Technician were updated to year-round positions to allow a year-round field presence and preparation for the 2023 field season.
- Equipment: \$254
 - Funds spent on high value equipment.
- Goods & Services: \$8,776
 - Funds spent on general field supplies and gear such as bait and traps.



- Travel: \$12,770
 - 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.
- Contractual Services: \$853,542
 - Funds spent on pass through contracts for our various partners included Washington Sea Grant, Lummi Nation, Makah Tribe, and funding awarded through the WDFW Coastal EGC Local Management Grant and the RCO EGC Emergency Measures Grant programs.
- Agency Indirect: \$111,500
 - Funds spent on agency-wide, general administration costs.

Along with the \$2,960,000 in funds utilized in Q1, a total of \$4,100,703 in funds have been utilized for EGC management since March 1st, 2022.

European green crab monitoring and removal

As described in Q1, the state was divided into Coastal and Salish Sea Branches to facilitate effective EGC ICS communications and management (Fig. 4). These branches were then further divided into 13 Management Areas based on WDFW recreational fishing marine areas.

Traps were deployed across Washington’s Management Areas, with trapping efforts highest in locations where available observations indicated EGC were likely most abundant or where relative catch per unit effort was high (Lummi Sea Pond in the North Puget Sound Management Area, Willapa Bay Management Area, etc.). However, traps were also deployed to monitor Management Area locations where EGC had not been detected previously, but where conditions were suitable for EGC establishment. This system provides the basis for rapid response actions if new EGC populations were detected.

As with previous years and during Q1, trapping efforts were undertaken by WDFW, WSG, tribal co-managers and other partner organizations. The catch numbers presented for Q2 represent the

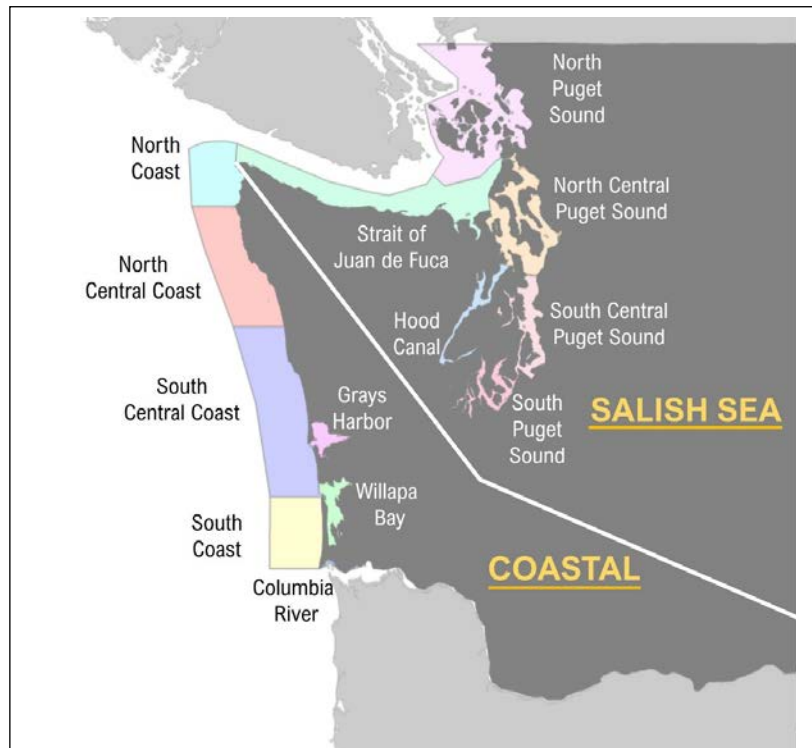


Figure 4. Map of Washington state European green crab management locations. The state has been split into two Management Regions (Coastal and Salish Sea) and thirteen Management Areas (North Puget Sound, Strait of Juan de Fuca, Hood Canal, North Central Puget Sound, South Central Puget Sound, South Puget Sound, North Coast, North Central Coast, South Central Coast, South Coast, Grays Harbor, Willapa Bay, Columbia River).



collective effort of all organizations, and those efforts must be recognized. In total, 96,156 EGC were removed in Q2 from Washington state waters, with 91,002 removed from the Coastal Branch and 5,154 removed from the Salish Sea Branch (Table 4).

Table 4. European green crab capture totals for Q1 (January 1, 2022 – September 30, 2022), Q2 (October 1, 2022 – December 31, 2022) and the whole of 2022 based on SitRep reported catch. These numbers are presented for each Branch (Coastal and Salish Sea) and Management Area. Please note the Q1 dates for catch data include trapping efforts in 2022 that predate the Emergency Declaration. These totals include not only removal efforts by Washington Department of Fish and Wildlife, but partners and tribal co-managers such as the Washington Sea Grant Crab Team, the Lummi Nation, the Makah Tribe, the Shoalwater Bay Tribe, and participating shellfish growers. Please note that a catch number of zero is not an indication of zero trapping/monitoring effort, but rather that no EGC were captured/detected within that Management Area.

Branch	Management Area	Q1 Total EGC Captured	Q2 Total EGC Captured	2022 Total EGC Captured
Salish Sea	North Puget Sound	75,766	5,134	80,900
Salish Sea	Strait of Juan de Fuca	73	20	93
Salish Sea	Hood Canal	18	0	28
Salish Sea	North Central Puget Sound	0	0	0
Salish Sea	South Central Puget Sound	0	0	0
Salish Sea	South Puget Sound	0	0	0
Salish Sea	All	75,857	5,154	81,021
Coastal	North Coast	20,786	5,482	26,268
Coastal	North Central Coast	0	0	0
Coastal	South Central Coast	34	0	34
Coastal	South Coast	0	0	0
Coastal	Grays Harbor	6,359	17,905	24,264
Coastal	Willapa Bay	87,247	67,615	154,862
Coastal	Columbia River	5	0	5
Coastal	All	114,431	91,002	205,433
All	All	190,288	96,156	286,444

In the Coastal Branch, the majority of EGC were removed from Willapa Bay (67,615), followed by the Grays Harbor (17,905) and North Coast (5,482) Management Areas. In the Salish Sea Branch, almost all removed EGC were from the North Puget Sound (5,134), followed by the Strait of Juan de Fuca (20) Management Areas. No EGC were captured/detected in the remaining Management Areas in Q2 (Hood Canal, North Central Puget Sound, South Central Puget Sound, South Puget Sound, North Central Coast, South Central Coast, South Coast, Columbia River). To date, EGC have not been detected in the Salish Sea Branch south of northern Hood Canal, though early-detection monitoring continues across the southerly Management Areas. Data on EGC abundance, body size, sex ratios, and reproductive status were collected for future analysis, along with DNA and RNA samples to assess connectivity between EGC populations. Removed EGC were euthanized following humane best practices and disposed of within local landfills or, in the case of EGC collected by the Shoalwater Bay Tribe, utilized as fertilizer in their tribal community garden (Pfleeger-Ritzman, personal communication).



Overall, EGC catch numbers were lower in Q2 compared to Q1. This is likely the result of the shorter duration of Q2 and reduced capture efforts at most Management Areas due to winter conditions. Partner and co-manager EGC capture efforts continued in earnest in Willapa Bay, Grays Harbor, and North Coast, while trapping was reduced, infrequent, or halted at all other Management Areas. Q2 trapping efforts by Pacific Shellfish increased significantly in Grays Harbor Management Area, which likely accounts for the increased number of crabs removed in Q2 compared with Q1.

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 also supports effective policymaking and collaboration with local communities, stakeholders and partners. Successes by WDFW to enhance public awareness and reporting potential for Q2 have included:

General public communication

- General information on EGC such as identification and public reporting is posted at: <https://wdfw.wa.gov/greencrab>
- Creation of monthly or bi-monthly Public Updates regarding Washington State EGC Emergency measures, including updates distributed to relevant media outlets: <https://wdfw.wa.gov/species-habitats/invasive/carcinus-maenas#conservation>
- Detailed information on EGC ecology and identification, webinar recordings of stakeholder meetings, and an archive of ICS Public Updates are posted on this webpage for EGC practitioners and the general public: <https://wdfw.wa.gov/species-habitats/invasive/carcinus-maenas>
- WDFW mailing list for EGC Management updates to provide regular updates and other news regarding coordinated efforts to monitor and control invasive EGC in Washington waters. There are currently ~500 subscribers and average mail traffic is 1-2emails per month: <https://wdfw.wa.gov/about/lists>.
- Current EGC management efforts have been reported in numerous local and national media outlets (Appendix A).



Focused/Local communication

- WDFW in conjunction with the Washington Invasive Species Council have produced EGC identification and outreach signage/materials and distributes free of charge to raise awareness of the EGC emergency and promote reporting of potential detections (Fig. 5).
- WDFW staff have presented at various professional and public meetings on the status of the EGC in Washington and the WDFW EGC program.
- Attendees at public outreach and community engagement events during Q2 generally reported awareness about EGC in Washington that was not observed earlier in 2022, an encouraging sign of progress for EGC communications and outreach.

Program challenges

WDFW, tribal co-managers and partners have achieved significant progress towards the five Incident Objectives in a short timeframe. However, as we progress through the initial stages of the EGC emergency, there are several challenges we must address. These challenges include:

- Completing the scope of a Fiscal Year 2023 Strategic Action Plan to meet Incident Objectives (accomplished at time of writing the Q2 report) and identifying the statewide and Management Area leadership required to implement plan tasks and the resources required to support them.
- Continuing the work of completing the implementation of a standardized electronic trapping data submission system for use across all participating entities. Working with Esri, a geographic information system (GIS) company, WDFW is developing software to allow direct uploading of catch data in real time to greatly enhance our data collection capability, while also eliminating errors resulting from data transfers from physical to digital formats.
- Continuing to establish relationships with community partners for the use of euthanized EGC as compost. We believe landfill disposal of EGC to be a waste of a potentially valuable resource and counter to HB 1799 (2022) relating to diversion of organic materials to productive uses. Examples of successful alternative use of EGC include use as agricultural compost by farmers in California (Turner, personal communication) and utilized as



Figure 5 European green crab outreach signage. This durable, informative, and visually striking sign is provided to State Parks, NGOs and other potential partners to increase public awareness of the green crab emergency and promote reporting potential detections.



fertilizer in the Shoalwater Bay Tribe's tribal community garden (Pfleeger-Ritzman, personal communication).

- Continuing to create opportunities for community engagement in EGC management with WDFW. While WSG's Crab Team has been actively engaged in successful outreach and community science efforts, members of the public and educational institutions have also expressed interest in working directly with WDFW on EGC activities. To further support the goals of local EGC management, WDFW is working with WSG's Crab Team on exploring opportunities for safe and productive opportunities for the community to assist us with our ongoing management efforts.

Next steps

The EGC emergency management priority actions for next quarter (January 1, 2023, to March 31, 2023) include:

- Implementation of the Fiscal Year 2023 EGC Emergency Measures Strategic Action Plan based on the five Incident Objectives.
- Ramping up capacity for the 2023 EGC trapping field season. This includes preparing for new and returning WDFW staff, assembling and maintaining field equipment, vehicle maintenance, and logistical planning to ensure effective execution of statewide actions.
- Ongoing MAC Group meetings with one in January and every two weeks in February and March.
- Initial meeting of the EGC Research Task Force to facilitate regional, national and international communication among EGC researchers and identifying priority EGC research efforts for WA.
- Development and distribution of Situation Reports (SitReps) once per month in January and February and increasing to bi-weekly reports starting in March.
- Ongoing advocacy for increasing federal partner support and funding.
- Continue development of an online reporting tool for efficient EGC data management.
- Identifying additional proposals for FY 24 emergency measure grants.
- Ongoing outreach to tribal co-managers on policy and technical coordination.
- Initial drafting of a 2022 EGC annual report.
- Development of updated and expanded EGC in WA public outreach and identification materials, to be [posted online](#) and distributed to tribes, partners, and water access areas.
- Preparing a 2023 co-managers and partners meeting to discuss the state of EGC management efforts in WA, as well as funding, research, permitting, and outreach efforts.



Glossary

AIS – Aquatic Invasive Species

DNR – Department of Natural Resources

Ecology – Department of Ecology

EDRR – Early Detection Rapid Response

EGC – European green crab (*Carcinus maenas*)

ICS – Incident Command System

MAC Group – Multi-Agency Coordination Group

NGO - Non-governmental organizations

NOAA – National Oceanographic and Atmospheric Administration

NWR – National Wildlife Refuge

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

Q2 – Second quarterly phase of EGC emergency response (October 1 – December 31, 2022)

RCO – Recreation and Conversation Office

SitReps – ICS Situation Reports

WDFW – Washington Department of Fish and Wildlife

WSG – Washington Sea Grant

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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 January 31 – February 28, 2022. These months fall outside the official duration of Q1 (March 1 – September 30, 2022) but were included to 1) accurately represent EGC removals for 2022 and 2) the submission process for SitRep 1 included partners and co-managers submitting catch data from January 1- June 11, 2022 as a single number.



List of Washington European green crab management actions in chronological order for Q2 (October 1 – December 31, 2022) as provided in Situation Reports

Date	Q2 EGC Management Action
10/3/2022	Incident Commander Allen Pleus presented on European Green Crab efforts to the Senate Agriculture, Water, Natural Resources and Parks (AWNRP) Committee. Senators Van De Wege, Rolfes, Stanford, Salomon and Warnick attended, along with committee and caucus staff. Along with thanking the Legislature for ongoing funding, Allen addressed the regional approach to managing European Green Crabs – and emphasized that it will be ongoing work and not something we can terminate. The presentation occurred at the Burlington Public Library.
10/3/2022	AWNRP Committee field tour of Lummi Sea Pond hosted by Lummi Nation Chairman William Jones Jr., Lummi Business Council members, and Lummi Natural Resources Staff. Incident Commander Pleus was on site as well as WDFW EGC field staff that spoke about our roles in supporting the Lummi Nation’s efforts.
10/5/2022	EGC MAC Group Meeting: MAC Group met virtually on October 5th. The MAC Group members provided agency updates and discussed resource prioritization and needs. Of \$1.1 million available in FY 2023 through Recreation and Conservation Office (RCO) EGC interagency agreements, approximately \$300,000 remains unobligated. The MAC Group reviewed an RCO funding request by the U.S. Fish and Wildlife Willapa National Wildlife Refuge, with a recommendation of full support for the \$110,240 request. The MAC Group discussed additional funding needs and opportunities, including a partnership between Washington Sea Grant Crab Team and Washington State University Extension to develop an “Eyes on the Beach” community science early detection program focusing on EGC molt surveys.
10/10/2022	The Association of Fish and Wildlife Agencies posted links to EGC management in Washington state on their October invasive species newsletter including the following: Encourage students to learn about these invasive species and to take action. Here are some sample lesson plans developed by Maryland via a MidAtlantic Panel on Aquatic Invasive Species grant: <ul style="list-style-type: none"> • Crab Controversy -- Grades 3-5 Students will actively simulate how invasive Green Crabs impact soft-shell clam fisheries. • Green Crab Round Robin -- Grades 9-12 Students will learn about the issues with Green Crab invasion and will represent different stakeholders in the Chesapeake Bay to understand how Green Crabs threaten their livelihoods. • Green Crabs Bring in the \$Green\$ - Grades 6-8 Students will learn about the issues with Green Crab invasion and will create a marketing campaign to make the harvest of Green Crabs profitable.
10/10/2022	Reminder that WDFW also has European green crab environmental education resources and curriculum available for classrooms, teachers and parents on this webpage .
10/11/2022	[Lummi Nation] “Chairman William Jones Jr. and Lummi Indian Business Council (LIBC) members led Senator Maria Cantwell and her team on a tour of the Lummi Nation. The tour included stops at [many locations and] the Lummi Bay Sea Ponds... At the sea ponds, Cantwell put on a pair of boots and witnessed the work of our European green crab team and their efforts to eradicate the invasive species.” From October 13, 2022 Lummi Nation press release “ Senator Maria Cantwell Visits the Lummi Nation. ”



Date	Q2 EGC Management Action
10/17/2022	WDFW met with DNR for initial EGC coordination and planning meeting.
10/17-10/31/2022	WDFW Shellfish Unit conducted training of new Disease and Pest Control Unit staff.
10/18/2022	Gray Harbor EGC fall/winter technical coordination meeting.
10/19/2022	EGC MAC Group Meeting: MAC group met virtually, provided agency updates and addressed previously identified priority gaps and leads in the FY23 Strategic Acton Plan; tasks A.1d, A.1e, and A.1i were discussed in depth. An update from the Bureau of Indian Affairs was provided on their Invasive Species Grant Program.
10/25/2022	Willapa Bay EGC fall/winter technical coordination meeting.
10/26/2022	WDFW met with EGC colleagues from the Department of Fisheries & Oceans (DFO) Canada, WA Sea Grant, the University of Washington, and the Puget Sound Partnership to discuss next steps in reviving Salish Sea Transboundary Action Plan communications and coordination. DFO has been invited to give a briefing to the EGC MAC Group at their Nov 16th meeting on EGC management status in Canada and opportunities for continued collaborative management.
10/26/2022	WDFW EGC presentation to second-year Washington Conservation Crews at CISPUS annual meeting.
10/27-10/31/2022	WDFW Shellfish Unit annual tribal co-management fisheries plan development and discussion of EGC measures.
10/28/2022	10 of WDFW EGC seasonal technical staff demobilized and off for winter season. WDFW retains 4 permanent technical staff for year-round support.
10/31/2022	WDFW EGC Outreach Specialist (COEES3) hired to ramp up and coordinate community engagement and public outreach. Will begin on Nov. 16, collaborating with Public Information Officer, Aquatic Invasive Species, and Conservation Education staff as well as tribes, partners and stakeholders as opportunities arise.
11/1/-11/30/2022	Ongoing weekly technical meetings with Esri contractor working on developing an online data portal and hub.
11/1/2022	Distribution of the review draft for the first quarterly EGC Progress Report to the state legislature.



Date	Q2 EGC Management Action
11/9/2022	Federal EGC Caucus meeting to discuss FY23 Strategic Action Plan and ICS Organizational Assignments process.
11/9/2022	State EGC Caucus meeting to discuss FY23 Strategic Action Plan and ICS Organizational Assignments process.
11/16/2022	EGC MAC Group Meeting: The European Green Crab (EGC) Multi-Agency Coordination Group (MAC Group) met virtually on November 16th. The MAC Group members provided agency updates and addressed previously identified priority gaps and leads. An outreach proposal, "Citizen Engagement in European Green Crab Early Detection," was submitted by WSU-UW and voted on by the members of the MAC Group. The proposal was accepted with no dissenting votes. Of \$1.1 million available through Recreation and Conservation Office (RCO) EGC interagency agreements available in FY 2023, approximately \$118,344 remains unobligated.
11/16/2022	Jessica Ostfeld hired as WDFW's European Green Crab Outreach Specialist; will ramp up public education and community engagement efforts, coordinating with PIO and ICS/AIS staff to support EGC communications, outreach, and events.
11/18/2022	WDFW AIS and Communications staff joined Washington Sea Grant and Pacific States Marine Fishery Commission booths at the 2022 Pacific Marine Expo at Lumen Field Event Center. Staff talked with more than 60 people about EGC, passing out stickers, fliers, and other outreach materials. EGC identification signs were also distributed to local shellfish growers, NOAA staff, and other groups at the event.
11/18/2022	Aquatic Nuisance Species Task Force monthly meeting for revising the 2002 national EGC Management Plan.
11/22/2022	WDFW EGC Policy Team meeting to discuss FY23 Strategic Action Plan and ICS Organizational Assignments process.
11/28/2022	EGC Public Update published , including October trapping updates, Lummi Nation Field Highlight and Partner Highlights on DNR, USFWS, RCO, PBNERR and State Parks. Also posted to WDFW blog and social media.
12/1/2022	The European Green Crab Quarterly Progress Report – Fall 2022 was published and submitted to the Washington State Legislature on Dec. 1.
12/2/2022	Washington State Legislature House of Representatives Rural Development, Agriculture & Natural Resources Committee update on Invasive EGC Response.
12/6/2022	EGC update presented at the quarterly Columbia River Basin Team meeting in Spokane, Washington.
12/11/2022	WDFW Enforcement confiscated approximately 30 lbs. of live European green crab from a Seattle seafood market. Statement released by WDFW addressing the situation.



Date	Q2 EGC Management Action
12/14/2022	The EGC MAC meeting was held only once in the month of December, and several presentations were made. Renny Talbot of Department of Fisheries & Oceans Canada provided an update on Canadian EGC efforts, Chelsey Buffington and Chris Marsh presented on recent ESRI updates, Jesse Schultz gave a brief overview of Endangered Species Act permitting processes, and Chase Gunnell introduced new EGC Outreach Specialist Jessica Ostfeld and provided a communications update.
12/15/2022	Update to the Washington Invasive Species Council.
12/15/2022	Grays Harbor Conservation District led a winter meeting for interested local partners. Those invited included Port of Grays Harbor, Quinault Indian Nation, Westport Seafood, Ocean Gold, Westport Marina, USFWS Grays Harbor National Wildlife Refuge (NWR), and WA Crabbers Association. WDFW, WA Sea Grant, and the Grays Harbor Conservation District presented and discussed with partners the Coastal Grant Program, funding options, capacity building, EGC biology, current trapping status, and trapping alternatives. Grays Harbor Conservation District, who is administering the Coastal Management Grant in Grays Harbor, continues to gauge local interest and facilitate participation.
12/21/2022	WDFW Fish and Wildlife Field Operations Lead Biologist and Salish Sea/Puget Sound Regional Biologist job announcements were posted.
12/29/2022	EGC Public Update published , including November and December trapping updates, Field Highlight on EGC confiscated from a Seattle seafood market, and Partner Highlight on the EGC Coastal Management Grant Program. The EGC Public Update was also posted to WDFW blog and social media. EGC updates and tips for identification and reporting were also featured in WDFW's January 2023 Weekender Report email newsletter .

List of media reporting in chronological order related to Washington European green crab management for Q2 (October 1 – December 31, 2022) as provided in Situation Reports

Date	Outlet	Headline	URL
10/4/2022	Indian Country Today Newscast	Northwest battles an invasive species	https://indiancountrytoday.com/newscasts/10-04-22-northwest-battles-an-invasive-species
10/6/2022	KRBD Alaska Public Radio	Months after first sighting, Metlakatla is now catching dozens of invasive green crabs a day	https://www.krbd.org/2022/10/05/months-after-first-sighting-metlakatla-is-now-catching-dozens-of-invasive-green-crabs-a-day/



Date	Outlet	Headline	URL
10/10/2022	KTOO Alaska Public Radio	Metlakatla is now catching dozens of invasive green crabs each day	https://www.ktoo.org/2022/10/11/metlakatla-is-now-catching-dozens-of-invasive-green-crabs-each-day/
10/24/2022	Chinook Observer	Willapa Bay green crab war enters new phase	https://www.chinookobserver.com/news/willapa-bay-green-crab-war-enters-new-phase/article_c1dbe004-53cc-11ed-965a-bf9fa9f8082f.html
11/1/2022	Skagit Valley Herald	Invasive green crab numbers soar, trapping efforts wrapping up	https://www.goskagit.com/townnews/hydrography/invasive-green-crab-numbers-soar-trapping-efforts-wrapping-up/article_1b79b400-5487-11ed-ac44-935a5096b261.html
11/9/2022	KING 5	Invasive crab threatening shellfish industry, salmon found in another western Washington bay	https://www.king5.com/article/tech/science/environment/european-green-crab-found-in-skagit-county-samish-bay/281-f14cd761-15b0-4bf9-baf4-89d9a38f3990
11/27/2022	Sierra Magazine	European Green Crab Populations Are Exploding in Washington State	https://www.sierraclub.org/sierra/european-green-crab-populations-are-exploding-washington-state
11/28/2022	Fox 13	WDFW: Nearly 250,000 invasive European green crabs removed from Washington waters	https://www.q13fox.com/news/wdfw-nearly-250000-invasive-european-green-crabs-removed-from-washington-waters
11/28/2022	KUOW	Invasive crab population keeps booming in Washington	https://www.kuow.org/stories/invasive-crab-population-booming-in-washington
11/29/2022	KGMI	New report highlights invasive green crab population in Washington waters	https://kgmi.com/news/007700-new-report-highlights-invasive-green-crab-population-in-washington-waters/



Date	Outlet	Headline	URL
11/29/2022	KPUG	New report highlights invasive green crab population in Washington waters	https://kpug1170.com/news/007700-new-report-highlights-invasive-green-crab-population-in-washington-waters/
11/30/2022	Undercurrent News	Washington state making good progress in stemming green crab invasion	https://www.undercurrentnews.com/2022/11/30/washington-state-making-good-progress-in-stemming-green-crab-invasion/
11/30/2022	The Daily World	Invasive green crab booming in Willapa Bay	https://www.thedailyworld.com/news/invasive-green-crab-booming-in-willapa-bay/
12/5/2022	KXRO	Latest European green crab updates	https://www.kxro.com/latest-european-green-crab-updates/
12/5/2022	USFWS	An Ode to Jacks	https://www.fws.gov/story/2022-12/ode-jacks
12/8/2022	Tacoma Daily Index	Green crab invasion	https://www.tacomadailyindex.com/blog/green-crab-invasion/2462861/
12/8/2022	KUOW	Green crabs are not giving Washington a break: Today So Far	https://www.kuow.org/stories/green-crabs-are-not-giving-washington-a-break-today-so-far
12/8/2022	The Fishing Wire	The Little Jacks that Could	https://thefishingwire.com/the-little-jacks-that-could/
12/29/2022	FOX 13	WDFW: 30 pounds of invasive green crab confiscated from Seattle seafood market	https://www.q13fox.com/news/wdfw-30-pounds-of-invasive-green-crab-confiscated-from-seattle-seafood-market
12/30/2022	MyNorthwest	Green crabs illegally sold at a Seattle market confiscated	https://mynorthwest.com/3764233/green-crabs-illegally-sold-at-pike-place-market-confiscated/



Date	Outlet	Headline	URL
12/30/2022	Seattle Times	Invasive European green crabs found for sale at Seattle market	https://www.seattletimes.com/seattle-news/invasive-european-green-crabs-found-for-sale-at-seattle-market/
12/30/2022	Chinook Observer	Quarter-million invasive crab trapped in 2022	https://www.chinookobserver.com/news/local/quarter-million-invasive-crab-trapped-in-2022/article_765788fc-8858-11ed-b15f-57b5cbf29d46.html



Appendix B – Co-manager and partner addendums

The following addendums are presented in alphabetical order by co-manager or partner name.

Lummi Indian Business Council



Lummi Nation Emergency Measures Response

Legislative report for period of March 1 through December 31, 2022

Introduction

The invasive European green crab (EGC) was first detected on Lummi Reservation tidelands in the fall of 2019. Given the multiple threats that the EGC poses to the Lummi People's way of life and the shared resources of the Salish Sea, immediately following first detection, the Lummi Indian Business Council (LIBC), the governing body of the Lummi Nation, declared EGC as a serious environmental threat (LIBC Resolution 2020-032). This paved the way for the Lummi Natural Resources Department (LNR) to begin collaborating with other government agencies. A partnership with the Washington Department of Fish and Wildlife (WDFW) commenced in January 2020, and the two agencies, with help from others (e.g., Washington Sea Grant) have worked together on the problem ever since. Having established this nascent multiagency approach before the population explosion of EGC inside of the Lummi Sea Pond (LSP) in 2021, which resulted in the Lummi Nation's subsequent disaster declaration (LIBC Resolution 2021-158) and the ensuing emergency proclamation by Washington State Governor Jay Inslee (Proclamation 22-02 Green Crab Infestation), an existing cooperative approach Washington Department of Fish and Wildlife was already in place, which contributed to the success of emergency measures when enacted in the spring of 2022.

The Aquatic Invasive Species (AIS) Division has two teams, one dedicated to the LSP and the other, the prospecting team, to all the tidelands outside the LSP. The Lummi AIS, LSP team consisted of a lead biologist, a field biologist, 2 field technicians, and 3 90-day seasonal field technicians. The team operates one 18' boat which is used to facilitate trapping in the deep areas in the aquaculture pond as well as a team that traps by foot around the entire out edge of the 750-acre pond. Our team has contacted local tribal commercial fishermen to trap green crabs inside the sea pond as well (started in October). The contracted fishermen team consists of 3 boats and a total of 6 crew members. That team is responsible for processing 250 shrimp traps daily. The Lummi AIS prospecting team consisted of a lead biologist, a field biologist (filled in October), and a field technician. The biologists coordinated three youth workers funded by LIBC and four interns sponsored by the Northwest



Indian College between July and August. An EGC prospecting watercraft was secured in July to increase access to remote trapping locations, including Portage Bay which had not been trapped since 2019.

Hiring

By July 2022, LNR's EGC response grew from three dedicated staff to an AIS Division of 12 people. Karl Mueller selflessly postponed his retirement plans to scale the LIBC's response to the EGC invasion to the appropriate level and was finally able to retire with the hiring of his replacement Shawn Evenson on Oct. 31. Job interviews were conducted in February to fill the three full-time Field Technician positions and we are happy to announce those opens are now filled. In the coming weeks, we will announce the opening of three seasonal field tech positions.

Supplies/Equipment

During the Oct. 1- Dec. 31 quarter to date, no new capital assets were purchased but the Lummi AIS division took full advantage of the low EGC activity in the off-season to refit and refurbish all of the traps, replace consumables, QAQC data and maintain vehicles. By spring the AIS division will be at full strength and ready to go. With the development of the statewide response and the strategic shift of state assets, Lummi AIS may well have to acquire an additional boat-truck combination to maintain the appropriate amount of pressure on the EGC on the Lummi Reservation and outfit the crew with the required gear.

Trap Effort/Catch

At first detection in 2019, LNR removed only tens of EGC from Lummi Reservation tidelands, including the LSP. In 2020, the department removed hundreds – even thousands – of EGC with help from its partners at WDFW and WSG. By the close of the 2021 trapping season, a multiagency response inside of the LSP resulted in tens of thousands, 86,000, of EGC being removed. Based on the previous trapping efforts, the initial projections were that 100,000s of EGC would be trapped in 2022. During peak season the numbers caught were on track with projections, the primary difference being the population's composition. The majority of the 2022 catch consists of adult crabs; the opposite of the 2021 catch which was over 70% young-of-year (YOY). As the 2022 season ended the expected pulse of YOY never materialize leaving the catch totals around 80,000.

The LSP team checked 13,975 traps inside the Lummi Sea Pond during this quarter, Oct. 1 – Dec. 31, and fished 57,750 traps-nights. The majority of the trapping during this time of year was completed by boat using 10 trap groundlines that were constructed using shrimp traps. The catch rates inside the LSP have dropped during the winter months although we continue to catch a steady number of green crabs. During this quarter, 4,363 EGC were trapped and removed from the Lummi Sea Pond. By the end of 2022, the LSP accounted for in total, 78,820 EGC caught.

The prospecting team checked more than 3500 traps across 16 distinct areas on Lummi Reservation Tidelands; most of these locations are part of a consistent and regular trapping schedule. Like inside LSP, shrimp traps with buoy lines have been deployed on a semi-permanent basis in the Distributary, the Casino Wetland Mitigation Site (northern slough adjacent to Lummi Sea Pond), and in the channels exiting from the sea pond tide gates, which are checked daily or weekly.



Relative catches of EGC outside of Lummi Sea Pond were low compared to Lummi Sea Pond (976 EGC total for 2022, <10 gravid EGC), and distribution was mainly limited to the outer perimeter of Lummi Sea Pond in Lummi Bay. However, during QT. 2, young-of-the-year EGC were captured (~80 EGC) between October and November in the Northern Lummi River Distributary, which is separated from central Lummi Bay via a tide gate. Since the discovery of EGC in the Distributary, we have requested and increased access to trapping alongside the Sandy Point Heights Golf Course channel.

Conclusion/Summary

To reiterate, the 2022 emergency measures ostensibly kept EGC catch rates to 2021 levels, and by proxy, the size of the EGC population to the same, the Lummi Nation's experience indicates that nothing short of a sustained, intense, largescale trapping effort will keep the highly invasive EGC in check on reservation tidelands. All it took was a single season to reach exponential expansion of the LSP EGC population. Consequently, the Lummi AIS team continues trapping EGC on Lummi Reservation tidelands through the winter months, maintaining its pressure on the EGC population into spring 2023. Helping with the effort inside of the LSP is a small group of Lummi fishers working together as a single contractor. While the contractor was brought on before the end of the calendar year 2022, its full impact will not be felt until 2023. We have high expectations as the Lummi fishers bring their skills to bear. The tide gates of the LSP are being studied by engineers to bring about functionality that will fit into long-term EGC management. Our biologists have several studies and experiments ready to answer questions that will help drive the EGC population toward functional eradication.

Makah Tribe



MAKAH TRIBE
P.O. BOX 115 • NEAH BAY, WA 98357 • 360-645-2201



European Green Crab Legislative Report (March 1, 2022 – December 31, 2022)

Trap Effort/Catch

At the start of this reporting period, data entry was finalized for the 2021 season and planning was conducted for the 2022 field season. Trapping began in early April and was conducted weekly or biweekly through mid-December. Trapping was conducted in Makah Bay (Wa'atch and Tsoo-Yess Rivers) and Neah Bay; however, no green crab have been caught in Neah Bay to date. In total, we caught 25,093 green crab between January and December; this is significantly more than any other single year of trapping since first detecting crabs in 2017. 22,548 were caught in 2,664 trap sets and 2,505 were caught by hand. Among those, 14,553 were males and 10,496 females. We caught a large number of small, young-of-year crabs including 1,136 crabs that measured less than 25 mm carapace width. Young-of-year crabs <10 mm were observed between March and mid-May and again in August. Juveniles <15 mm continued to be observed throughout the season until the month



of September. Number and size of crabs caught varied by trap type, with the majority of crabs being caught in minnow and shrimp traps (1" and ½" mesh). This year, we observed increased numbers of green crab in rocky intertidal areas within Makah Bay. In early August and mid-October, we hosted two trapping blitzes on the reservation to bring together various trappers and volunteers from around the state to maximize trap effort and remove as many crabs as possible in a 5-day period. These events showed us the substantial number of crabs present in the rivers at those times resulting in increased trapping effort in August-October.

Supplies/Equipment

We purchased equipment and supplies for conducting trapping including a new work truck (Toyota Tundra with 8-ft bed) for transporting personnel and traps. We also purchased and tested new trap types. We purchased multiple ½ inch mesh shrimp traps and several more minnow traps. The ½ inch mesh shrimp traps proved very productive for catching small young-of-year crabs. Additionally, we outfitted our new research vessel with a davit and hauler as we began marine trapping in Makah Bay deploying crab traps by boat. This included the purchase and construction of crab buoys to help identify and locate traps deployed by Makah Fisheries.

Hiring

In March, we hired for a Marine Ecology Technician III position who started work in early April largely assisting in the green crab trapping program. We also hired several seasonal technicians in May and June to help with field work. In July, we posted and interviewed for a Green Crab Biologist position. The Biologist was hired in July and started work the next month. In August, we posted and interviewed for two full-time Technician II positions. One Technician began work in September and the other not until November. Throughout the trapping season, we also had a wide network of volunteers who have helped with trapping on a regular basis. These have included staff from Washington Department of Fish and Wildlife, Washington Sea Grant, and the Northwest Indian Fisheries Commission in addition to volunteers from local communities.

Research

In July-September, we conducted an experiment using Baited Remote Underwater Video (BRUV) to study behavioral interactions between European green crab and Dungeness crab in the Tsoo-Yess and Wa'atch rivers. In July, we coordinated a project using a mark-recapture experimental design to evaluate population size estimates and crab movement through Makah waterways. In September, we began mapping native eelgrass beds in the Tsoo-Yess River using Real-Time Kinematic (RTK) surveying techniques.

Challenges

Throughout this reporting period, multiple challenges have presented themselves as we continue to develop our green crab trapping methods. A primary contributor to this is the large increase in the number of green crab we have seen. This year, we have caught over 25,000 green crab compared to 1,500 during the entirety of the year of 2021. Because of this vast increase, we have had to adjust our trapping efforts appropriately by purchasing more equipment and hiring additional staff to most effectively trap for green crab. While our increased trapping efforts have been fruitful with regards to the total amount of green crab we are able to remove, they have brought their own obstacles. This includes the securement of long-term funding to hire an adequate number of staff to



deploy our traps on a regular basis. We have often found ourselves limited by the number of traps we are able to deploy because of the number of part-time and full-time staff that we are able to support.

United States Geological Survey Western Fisheries Science Center



The Western Fisheries Research Center (WFRC) falls under the US Geological Survey's Ecosystem Mission Area (EMA). One of EMA's primary mandates is to deliver science to protect public safety, property, and ecosystems from invasive plants and animals and fish and wildlife diseases that pose significant ecologic and economic threats to the resources of the United States. WFRC significantly increased engagement in invasive European Green Crab research after last year's (winter 2021-22) emergency declarations by Lummi Nation and Washington State. In coordination with Washington State via the Multi-Agency Coordination group, the US Fish and Wildlife Service and Bureau of Indian Affairs within the Department of Interior, and the rest of the federal family (NOAA, EPA, etc.) via the Puget Sound Federal Task Force, WFRC is:

- Studying novel approaches and technologies to improve the efficacy of early detection strategies that will help control the spread of green crab.
- Creating a tool to help state and tribal managers, as well as the commercial aquaculture industry and citizen groups, determine how best to allocate limited resources to adequately control green crab.
- Assessing the impacts of climate change on the productivity of green crab versus our precious native Dungeness crab.

Initial funding was provided through EMA and EPA. WFRC endeavors to continue to support Washington State with our scientific expertise.

United States Fish and Wildlife Service



US FISH AND WILDLIFE SERVICE

Working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

For more than 150 years, the U.S. Fish and Wildlife Service has collaborated with partners across the country and around the globe to fulfill our mission of "working with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people." To conserve our Nation's natural resources, the Service administers and enforces an array of environmental laws and treaties including the Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), and the Lacey Act. The Service has a wide range of programs, offices, and



activities that help fulfill these and other statutory responsibilities. We oversee a network of more than 560 national wildlife refuges, national fish hatcheries, and other federal facilities located in all 50 States, the Commonwealth of Puerto Rico, and the U.S. Territories. These important public lands and waters are managed for the benefit of fish, wildlife, and plants and their habitats, and they provide premier recreational and educational opportunities to the public. We also work with partners across the country to advance shared conservation priorities for some of our nation's most treasured landscapes. Beyond our nation's borders, many of our programs have international responsibilities, partnering with other countries to conserve international species of interest to the American people. Invasive species pose a significant threat to the ecological, economic, and cultural integrity of America's lands and waters and the communities they support.

In Washington, the U.S. Fish and Wildlife Service manages nearly 400,000 acres on 23 National Wildlife Refuges that welcomed over 1.2 million visitors in 2022. These visitors enjoyed activities such as hunting, fishing, bird watching, and hiking. Long-term conservation of these important public lands and the critical habitats they protect are threatened by invasive species. The Service actively works to prevent and manage invasive species through many actions in the state, including serving on the Washington Invasive Species Council. The U.S. Fish and Wildlife Service has three national wildlife refuges that are addressing the European green crab (EGC) emergency in Washington: Dungeness, Grays Harbor, and Willapa Bay NWRs. Staff at Dungeness NWR have conducted annual surveillance trapping for EGC since 2000 and were the first to report the occurrence of EGC on the Olympia Peninsula in 2017. This capture initiated a rapid response effort on refuge lands and in the surrounding area which led to the capture of 96 EGCs from April through October of that year. Since this response, the Service increased both surveillance and trapping efforts, using standard protocols adopted by partners and co-managers engaged on EGC work. Monthly monitoring and removal trapping expanded to multiple sites and continues to occur at three sentinel sites within the Refuge annually from April to October. Quilcene National Fish Hatchery has provided salmon jacks for bait. In total, 247 EGCs have been captured using 12,953 trap deployments and an investment of 4,138 staff hours and 4,634 volunteer hours. Eight EGCs were captured in 2021 and fourteen were caught in 2022.

One sentinel site was established within Grays Harbor NWR in 2021, which is co-managed by multiple Service Programs including Refuges, Ecological Services (ES), and Fish and Aquatic Conservation (FAC). Staff from WDFW, Washington Sea Grant (WSG), and FWS-FAC also assisted the Refuge in deploying two assessment trapping transects in the mud flats approximately 500 meters from the Refuge's high marsh. At the sentinel site, three EGCs were captured in 2021 and five in 2022. The assessment traps yielded 29 EGCs in 2021 (with three collected by hand prior to trap deployment). In total, 40 EGCs have been removed from Grays Harbor NWR to date.

One sentinel site (Cutthroat Creek) was established within Willapa Bay NWR in 2021 and a second was added in 2022 (Dohman Creek). In addition to these sites, the Refuge also collaborated with WDFW and WSG to conduct large-scale assessment trapping at Greenhead Slough and Leadbetter Point in 2022. This involved deploying 100 traps over two 23.5-hour tide windows for each effort to determine hot spots and patterns of distribution. At the sentinel sites, four EGCs were captured in 2021 and two in 2022. None were caught at Dohman Creek in 2022. In contrast, the 2022 assessment traps yielded 466 EGCs.

In this effort to control EGC, partners have provided staff, trapping supplies, and data management assistance. Dungeness, Grays Harbor, and Willapa Bay NWRs and other FWS programs have



contributed staff and volunteers, equipment (including airboats), and other supplies. Long-term datasets from Dungeness NWR have been important in assessing aspects of EGC management in the state, and data collected at refuge sites is shared with co-managers and partners as seen in the Emergency Response Situation Reports and summary tables of crab captures. The Service continues to support this and other local, regional, and national conservation work as it leverages resources to bolster programs, practices, and services necessary to reduce the negative impacts of invasive species such as EGC.

Washington Department of Natural Resources



The Washington Department of Natural Resources (DNR) hired Alexa Brown as their coastal region European green crab (EGC) coordinator, who's first day was the third of October 2022. Alexa will be the primary point person within DNR for EGC and will be based out of the Montesano WDFW office thanks to Les Holcomb and the WDFW team. The EGC program is in the process of purchasing a landing craft to be used for EGC trapping that will be delivered in February to March 2023. This boat will mostly be used in the Puget Sound but can support trapping efforts along the coast. The EGC program has also placed an order for an airboat to be used specifically for EGC trapping on the coast.

We are building strong relationships with those executing EGC management in Grays Harbor and Willapa Bay including but not limited to WDFW, USFWS, Washington Sea Grant, Pacific Seafood, Shoalwater Bay Tribe, Pacific County Vegetation Management, Pacific Conservation District, Quinault Indian Nation, and Grays Harbor Conservation District. We are developing work plans for both the coastal and Puget Sound regions. In building these work plans, the EGC program is reaching out to partners and discovering gaps and trapping locations where the DNR can help fill without duplicating efforts. These work plans will be fully developed by March 2023.

Alexa has initiated training for DNR staff so they can follow the trapping guidelines set out by Washington Sea Grant and WDFW. The EGC program has also applied for their AIS permit so that we can start our own trapping as winter weather and tides allow, this permit will be issued early 2023. DNR will be hiring a EGC coordinator for the Puget Sound and have submitted a temporary ESA permit to cover their trapping areas as well as Baker Bay on the coast. The DNR EGC program is partnering with USFW to establish a centralized shop location to house traps, freezers, washing station, and boat for EGC trapping efforts in Willapa Bay and Grays Harbor. We are working to acquire the necessary gear for the EGC program and currently have 20 shrimp pots and are borrowing 30 minnow, 30 Fukui, and 30 shrimp pots from WDFW.

Alexa has joined Pacific Seafood, Shoalwater Bay Tribe, and Pacific Vegetation Management to witness their trapping efforts and share knowledge and practices regarding EGC trapping. DNR staff joined Alexa for a morning of trapping with Pacific Vegetation Management. We have established



that Pacific Gro in Raymond will take our frozen dead EGC to turn them into fertilizer. Blain Reeves at the DNR holds a position on the MAC group and Alexa will be his alternate.

Washington Sea Grant Crab Team



European Green Crab Control Support

During this reporting year, WSG continued to act as a critical resource to trapping groups statewide by providing consultation, coordination, and training with these groups to support trapping efforts. Given the dramatic increase in trapping efforts statewide, this was a significant activity for WSG in 2022.

Salish Sea Support

The ongoing expansion of technical staff capacity within the Northwest Straits Commission provided an opportunity to add local coordination focus in Skagit County to their previous capacity centered in Drayton Harbor. WSG supported new and continuing NWSC staff in developing trapping plans by providing NWSC with a list of sites in Whatcom and Skagit counties prioritized based on trapping activity, developing or revising control trapping plans for Samish Bay and Drayton Harbor, and providing connections and context of existing local partnerships that would facilitate management efforts. A major activity of 2022 in this regard was the support of the new NWSC staff in planning and executing a large multi-agency assessment effort in Fidalgo Bay. WSG convened relevant partners that had expressed interest in this event and helped, together with WDFW, advise NWSC through the planning process, including facilitating contacts for access, logistics, media, etc. Ultimately the assessment brought together staff from 7 groups/agencies, set more than 700 traps, and trained several technical staff from DNR, WSG, Swinomish Indian Tribal Community, and WDFW in assessment leadership, planning, and execution.

In addition to this large capacity building contribution in the northern Puget Sound management area, WSG engaged in a number advising, planning, and coordination meetings to discuss growing capacity in new trapping groups, including the Suquamish Tribe, Tulalip Tribes, US Navy, Hama Hama Oyster Company, the Snohomish and Clallam County MRCs, and the Hood Canal Environmental Council. These discussions around what priority activities would benefit geographies of interest, how to select sites and budget staff and funds for trapping, and what training activities would be needed to support management goals, all set the stage for these groups to become more involved in the mud in 2023.

Crab Team also worked to coordinate the ongoing monitoring efforts of the inland trapping network with the growing list of new partners. Because consistent monitoring is needed to track changes over time, continued monthly monitoring of Crab Team sites remains a priority activity within the evolving landscape of management efforts. As new groups develop local trapping efforts,



early in consultation and planning conversation, WSG initiates a discussion about coordinating timing and geographic scope of local trapping efforts to avoid on the ground conflicts with the trapping network. Ensuring communication lines remain open and plans are effectively coordinated often requires several conversations and check-ins, with both partners and Crab Team monitors, and WSG is grateful for the transparency and communication of all partners in this way, which enables us to collectively maximize the scope of management efforts.

Data and Information Sharing / Scientific Advising

WSG draws on and contributes to the strong culture of data and information sharing among green crab trapping partners to help provide support for adaptive management goals. During this period, WSG provided data review and analysis to partners on green crab status and trends within the Salish Sea via both formal and informal venues. Formal presentations disseminating updates on green crab populations, invasion status, and science-based decision making included:

- Four presentations during the WDFW-hosted informational webinars
 - Green Crab Status and Trends (Inland and Coastal focused)
 - Interpretation and management options for inland European green crab invasion (Inland and Coastal focused)
- NWSC Science Advisory Panel
- Washington Invasive Species Council on genetics tools, techniques and information
- National Shellfisheries Assn/Pacific Coast Shellfish Growers Assn
- Workshop on population genetics with WDFW staff with collaborator Carolyn Tepolt
- Blog post on status of Salish Sea captured in 2022

In addition, WSG regularly advises partners on strategies for information gathering that can help improve removal efforts. In particular, as trapping partners in some locations increasingly focus on control trapping, prioritizing effort toward trap sets, it is still critical to obtain enough consistent data from efforts to be able to evaluate changes over space and time, and subsequently determine the impact of trapping efforts on green crab populations. This year, WSG developed and help to launch index monitoring stations within Lummi Sea Pond, to complement the extraordinarily large scale of removal trapping within the sea pond. WDFW staff were trained on monitoring protocols and led bimonthly sampling of 5 such index sites (4 on the perimeter of the sea pond and 1 in the center), through the fall season, at which time Lummi Natural Resources took over for the winter season. These data will be critical in observing seasonal and interannual changes in green crab populations, spatial patterns of migration and recruitment across the site, as well as gear-specific catch rates.

Scientific advising was also provided via informal conversation and consultation with partners throughout the season. Close working relationships with trappers at, for instance, US Fish and Wildlife Service (Dungeness NWR), Jamestown S’Klallam Tribe, NWSC, Lower Elwha Klallam, all create connection opportunities that greatly expedite information sharing, and responsiveness. WSG currently collects and accounts for every single green crab captured (excepting those captured on Lummi reservation tidelands), and this communication and specimen tracking provides a very high quality of data, as well as opportune conversations on the timing of seasonal phenomena, such as the arrival of the young of the year cohort, or spatial changes in habitat use. These conversations



often generate new trapping ideas for local groups, such as changing gear type or location to capitalize off these seasonal developments.

WSG provided review and recommendations on several management plans related to inland Washington waters, including consultation with the following groups on specific 2022 actions or the development of plans to guide future management actions:

- Northwest Straits Commission - 2022 updates to Drayton trapping plans and development of work plan for Skagit County
- WDFW - Consultation on 2023 Strategic Action Plan
- WDFW - Consultation on update to Salish Sea Transboundary Action Plan
- Lummi Tribe - Support for development of 2022 workplan

Amidst other activities, and even down 1 FTE for half of the year, WSG was able to provide substantial on the ground field assistance to WDFW and other trapping partners, in service of supporting the effectiveness and efficiency of rapid assessment and control trapping efforts. The largest such effort was in response to the capture of the first green crab detected in Hood Canal by Crab Team volunteers in Seabeck in May. Because WSG staff happened to be in the field with WDFW staff elsewhere in the state at the time, planning for a response started literally within minutes of the report. Over the next week, WSG and WDFW held conversations on site prioritization and access for the assessment, as well as a workshop on the potential use of environmental DNA as a detection technique. WSG has been working with collaborators to develop eDNA detection tools, and provided recommendations for piloting the use of eDNA in this assessment. WSG staff helped secure site access, notify local groups, and provided one day of field assistance during the initial assessment. WSG conducted a follow up trapping effort targeting Nick’s Lagoon, the observed hotspot in the Seabeck area, in September, during which 6 staff days of WSG effort resulted in the capture of two green crabs.

Field support for removal or assessment efforts in 2022 across inland waters are detailed below. Activities from Q2 are indicated in gray:

Site	Lummi Sea Pond	Nick’s Lagoon	Makah Bay*	Fidalgo Bay	Nick’s Lagoon	Drayton Harbor	Makah Bay*
Type	Control	Rapid Response	Control	Assessment	Control	Control	Control
Dates	5/16-5/17	5/27	8/1-8/4	8/22- 8/23	8/31-9/1	10/5	10/10-10/12
WSG Personnel	1	1	2	2	3	3	2
WSG Field Staff Days	2	1	7	4	6	3	7
Personnel trained	☒		☒	☒		☒	

*Additional Makah support activities detailed in section on task 2 focused on coastal management.

Coastal Support

In 2022, WSG worked with WDFW to support trapping efforts in Washington coastal estuaries. Activities included everything from field support and training to leading facilitation of monthly



coastal technical working group meetings to scientific advising on trapping and data best practices. Highlights are below, with Q2 are in gray:

- Development of standardized Trapping Program Framework to help orient, onboard, and train new trapping groups
- Three field days conducting outreach with shellfish growers
- Led Congressional aides in site visit and educational session in Ocean Shores
- Ongoing consultation provided to Shoalwater Bay Indian Tribe, Pacific County Vegetation Management, WGHOGA, Pacific Shellfish
- Applied new Trapping Program Framework to onboarding/training DNR and Grays Harbor Conservation District
 - DNR consultation included advisement on program development; feedback on coastal work plan; two site scouting days (one in Willapa Bay and one in Grays Harbor); green crab history and orientation training, field planning training session
 - Grays Harbor Conservation District consultation included assistance with grant proposal; feedback on workplan; and additional consultation during Conservation District staff transition
- Worked with Willapa Bay Grays Harbor Oyster Growers Association to support data management and reporting
- Planned and facilitated coastal technical working group meetings
 - WSG organized meetings once per month for Grays/Willapa trapping groups (April through October)
- Large Fall/Winter coordination workshop held in November

WSG coordinated a total of 10 sentinel sites in 2022: 5 in Willapa Bay, 4 in Grays Harbor, and 1 in Makah Bay. This work includes training new monitors (3 virtual sessions, 2 full day in-person trainings), providing “refresher” trainings for returning monitors (1 full day in-person session), completing 9 site visits during the monitoring season, and providing outreach and support throughout the year. The data analysis is ongoing, with a complete sentinel site executive summary expected in late February 2023.

In 2022, the Crab Team sentinel site network achieved a 100% sample rate, meaning that monitors completed sampling at all 10 active sites for the full 6-month monitoring period since the program’s inception in 2020. WSG was successful in adding a new sentinel site to the network this year in south Willapa Bay, on Willapa National Wildlife Refuge land. The new site, Dohman Creek, is the furthest south in the network, and represents the only sentinel site that has not captured a green crab during regular sentinel site monitoring. Crab Team was able to add all sentinel site data (2020-2022) to our [Tableau Dashboard](#), giving us new ways to visualize the data. Prior to the release of a more complete report, we are happy to share the following summary statistics:

Table 1. European green crab summary count, by site.

Year	2022	2021	2020*
Stackpole	36	23**	14
Paul’s Slough	182	72	6
Tokeland Hotel	17	47***	2
Ocean Shores	46	56	12
Makah Bay	16	4****	3



Brady's Oysters	42	41	N/A
Grays Harbor Nat'l Wildlife Refuge	5	3	N/A
Aberdeen	10	28	N/A
Bay Center	(inactive)	13	N/A
Cutthroat Creek	2	4	N/A
Dohman Creek	0	N/A	N/A

*2020 – only August and September were sampled in this pilot year

**Stackpole sampled 5/6 months in 2021

***Modified minnow traps were used for sampling at Tokeland in August + September

****Makah sampled 1/6 months in 2021

Washington Sea Grant coordinated and co-led two large scale assessments (Elk River Natural Area Preserve, Greenhead Slough), and helped to design and coordinate a third (Ledbetter Point State Park) in 2022. Each of these days involved a site scouting day (3 WSG staff days total). The Elk River and Greenhead Slough assessments doubled as field training opportunities for new WDFW technicians, DNR staff, and Willapa National Wildlife Refuge (WNWR) staff. These multi-day efforts each required 2 advance planning meetings to coordinate logistics and align training goals. They resulted in a total of 10 new staff and technicians trained in trapping and data collection protocols, plus field safety and crab handling best practices. The WNWR staff co-planned and led one more large assessment during the field season, representing an increase in the capacity of partners trapping on the ground in Willapa Bay.

A summary table of these trapping efforts is provided below:

Site	Elk River	Greenhead Slough	Leadbetter Point
Dates	6/15-17	6/27-29	9/20-22
Collaborators	WSG (2), WDFW (6), DNR (2)	WSG (2), WDFW (5), WNWR (4)	WDFW, WNWR
Personnel trained	WSG (1), WDFW (5), DNR (2)	WDFW (4), WNWR (4)	N/A
Habitat types			
Areas where there are currently spatial gaps in trapping data	☒		☒
Areas of particular interest to partners	☒	☒	☒
Areas where Spartina was previously abundant	☒	☒	☒
Areas representing the variety of shellfish aquaculture gear types in the coastal estuaries	(not addressed here, but addressed through the independent trapping program)		
Areas to increase temporal resolution of trapping data	☒	☒	☒



Areas of suspected larval retention	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Areas of critical habitat	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Trap data			
EGC captured	115	29	408
Trap days	189	210	220
CPUE (# crabs / 100 trap days)	146	14	182

Washington State Parks and Recreation Commission



Washington State
Parks and Recreation
Commission

Washington State Parks has continued to work with partner agencies to evaluate and develop the most effective and efficient response to the European green crab emergency. Washington State Parks has a limited number of staff dedicated to natural resources stewardship and no staff who are specifically trained and allocated for working in aquatic resources management. State Parks has determined that it can most effectively respond to the European green crab emergency through facilitating WDFW trapping efforts in State Parks, training staff to assist with trapping by WDFW staff and partner organizations, and assisting with public education efforts (e.g., posters at parks and social media posts.)

< END Q2 Report >

