

European green crab (EGC) management definitions

Implemented by Washington state EGC Incident Command System in March 2023

Management action type definitions

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

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

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

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

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

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

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

Other definitions

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

- Per 100 traps as calculated to nearest 0.10 CPUE;
- By aggregate or individual trap type; and
- By cumulative Trap set days or Trap check days over the operational period or other defined time span of interest.

Examples:

- 30 EGC caught in 200 shrimp traps and deployed for 1 overnight period then recovered (200 trap set days): $30 \div 200 = 0.15 \times 100 = \mathbf{15.0 \text{ CPUE}}$.
- 30 EGC caught in 200 shrimp traps and deployed for 3 overnight periods then recovered (600 trap set days): $30 \div 600 = 0.05 \times 100 = \mathbf{5.0 \text{ CPUE}}$.

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

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

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

- Regional – this includes states and provinces of Canada along the Pacific coast.
- Statewide – this includes approximately 3,500 miles of coastal area encompassing marine and estuarine habitats where EGC could become established.
- Branch – Statewide operations are divided into Coastal and Salish Sea branches which corresponds to major differences in EGC management strategies due to significant propagule pressures from EGC larvae arriving in Washington State from coastal sources in California, Oregon, and British Columbia.
- Management Area – Branches are further divided into 14 Management Areas based on WDFW's recreational fishing marine areas with 7 Management Areas within the Salish Sea Branch and 7 within the Coastal Branch.
- Coordination Area – Management Areas are further divided into Coordination Areas based on a place name that best describes a sub-Management Area or it may be based on the jurisdictional lead for that area. Delineation of Coordination Areas continues to evolve based on input from local Management Area co-managers and partners.
- Site – Coordination Areas may be further divided into Sites based on a geographic area of connected, similar habitat suitability, or access limitations and where EGC management actions can be expressed as representing the whole geographic area.
- Sub-Site – Sites can be divided into Sub-Sites in more complex situations based on similar habitat or where different operational actions are required.

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

Habitat structure means the composition and arrangement of material, be it natural or man-made, within a habitat (e.g., vegetation, docks, rocks, and woody debris). Most commonly, elements of three-

dimensional (rising off the bottom) and complex (with crevices in which to hide) structure are favorable to green crab survival.

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

Hot Spot means an area with a substantially greater relative abundance of green crab than surrounding areas. Hot spots can be defined at the site level (e.g., a creek mouth within a water body) or at the Coordination Area-level (e.g., Lummi Sea Pond), and can be spatially nested, sites of high density within Coordination Areas of high density.

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

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

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

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

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

Localized detection means an EGC detection occurred in a coordination area or other location (ex. bay, lagoon, estuary, or tidelands) where European green crabs have not previously been confirmed, but is within a management area where EGC have been detected. Localized detections are anticipated during the invasion. WDFW will notify relevant agency staff, co-managers, tribes, partners, tidelands

owners, and other community members. Depending on need, assessment trapping or rapid response may occur to prevent population becoming established and reduce risk of spread into new management areas.

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

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

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

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

- Total set trap days are counted from the day after a trap is set and includes the day the trap is removed. This metric is mostly a qualitative measure of effort during an operational period or season and may be used to estimate a gross level of potential EGC risk/density to help assess if additional support is needed.
 - Example 1 - 50 traps set on Monday, Aug 8, and retrieved Friday, Aug 12: $50 \times 4 = 200$ trap days.
 - Example 2 - 50 traps set on Monday, Aug 8, and retrieved Sunday, Aug 21: $50 \times 13 = 650$ trap days.
 - Example 3 - 50 traps set in a prior OP and to be retrieved in a future OP (example OP is 14 days): $50 \times 14 = 700$ trap days.

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

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



- Example 4 - 50 traps set Monday, Aug 8, and retrieved Friday, Aug 19, and checked every other day, excluding weekends (i.e., Monday, Wednesday, and Friday): $50 \times 5 = 250$ trap check days.
- Example 5 - 50 traps set Monday, Aug 8, and retrieved Sunday, Aug 21, and checked on Wednesdays only and the day the traps are retrieved: $50 \times 3 = 150$ trap check days.

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

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