FRIENDS OF DUNGENESS NATIONAL WILDLIFE REFUGE

THE BRANT

Yellow sand verbena, *Abronia latifolia*

SPRING FRIENDS OF DUNGENESS NATIONAL WILDLIFE REFUGE 2023

Refuge Volunteer Teams Help Rein In Ecosystem Invaders

Text and photos by Laura Davis

Looking at satellite imagery, we get a glimpse into the perspective and collective memory of migrating birds: the Dungeness Spit is such a marvelous, dynamic masterpiece of water and sediment flows – with the biological richness that comes from life growing from life, and the long-term development of ecosystems. The Dungeness National Wildlife Refuge was established in 1915 as a "refuge, preserve, and breeding ground for native birds." The Refuge's eelgrass beds are important winter and migration-staging areas for Brant. Numerous others stop on the Refuge during migration or over winter. It also provides breeding and rearing habitat to many species.

Crab-team members cross a distinctive Graveyard Spit plant community in the low light of an early September morning.

Branching south off Dungeness Spit, Graveyard Spit was designated as a Research Natural Area due to the quality of its coastal-strand native plant community, high salinity barrier lagoon, and salt marsh. Year-round closure protects native strand plants and provide refugia for wildlife. Access here is limited to invasive species management.

Above: This gravid European green crab (EGC) female trapped on May 5, plus another on June 8, are the first indications that we have a breeding population at the Refuge.

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Maxwell Awards Presented

Friends have selected two Sequim High School seniors as recipients for this year's Maxwell Awards. Sammie Bacon and Jenna Finley will each receive a $1,500 scholarship toward their college education. Sammie is pursuing a career as a wildlife biologist and hopes to work at Olympic National Park. Jenna is interested in a wildlife ecology career. Congratulations Sammie and Jenna!

Friends Host Volunteer Training

Friends hosted the 2023 Refuge Volunteer Training sessions for both new and returning volunteers on April 6th. Dave Falzetti presented updated information, while Jennifer and Lorenz provided updates about the Refuge. Both sessions were recorded for staff to provide training to those who could not attend the live event. If you missed the training, please contact Dave for a link to the video.

Fee Collection By Ellie Ausmus

Here is a great sequence of Dave Falzetti emptying and then replacing the fee canister at the kiosk. He worked on tall ships (in a previous life) and installed heavy-duty nautical hardware at the kiosk to lift the inner canister. (Visitors are fascinated by the set-up and we constantly have to tell kids to please not hang on the handle.) Dave can then tip the canister on its side for easy access to the fee envelope, and any loose bills and change. His system eliminated the need to crouch on hands and knees to reach through the hole at the bottom, unlock the door at the bottom of the inner canister, and blindly pull out the contents from above. Sheer genius!

Photos: Ellie Ausmus

CONTACTS

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The fee can was recently refreshed by new Volunteer Doug Dammarell.

New Refuge Staff Members

Marie Lewis *Administrative Assistant*

I was born in Port Angeles, but moved all over with my father being in the Air Force. I moved to Sequim at the end of January 2023, glad to be near my father, three sons, and two grandchildren . I lived in the Mojave Desert for the past 20 years, working for the DOD on Marine Corps Logistics Base Barstow. I am happy to be apart of the Fish and Wildlife as an Administrative Assistant.

Marie Lewis

Sarah-Kate Rines

Sarah-Kate Rines *Invasive Species Field Crew Leader*

Sarah-Kate was born and raised in East Tennessee in the foothills of the Smokey Mountains. She received a Bachelor's degree for Environmental Studies from Stetson University in Florida where she was a recruited member of Stetson Women's Rowing. After graduation she had an environmental science internship in private sector, then landed in the Florida Department of Environmental Protection in the Florida Keys doing Environmental law and policy work. Passionate about conservation and habitat restoration, she wanted to get more hands on in the field. The opportunity for the Invasive Species Field Crew Leader (for European Green Crabs) became available through the Student Conservation Association, and it would provide the career shift needed to really break into the conservation field at the level that she wanted. The location on the Olympic Peninsula was a great draw as well, it being one of the most environmentally spectacular and protected areas of the country. She also likes to enjoy nature in her free time through hiking, paddling, and SCUBA.

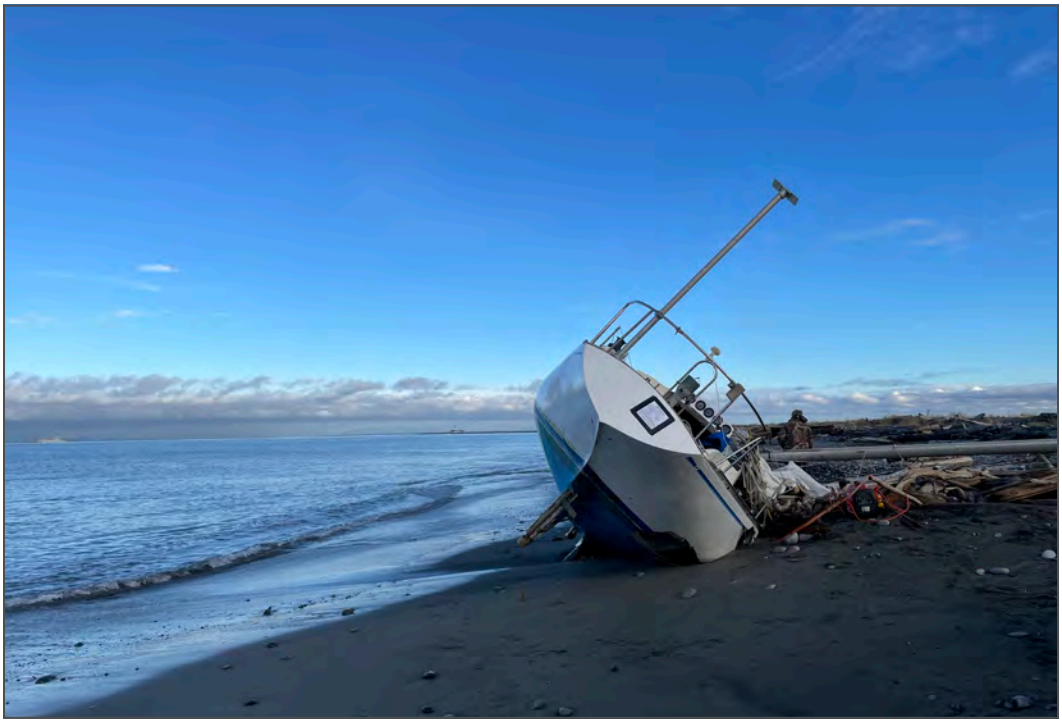
Adam Gilles *Restoration Technician*

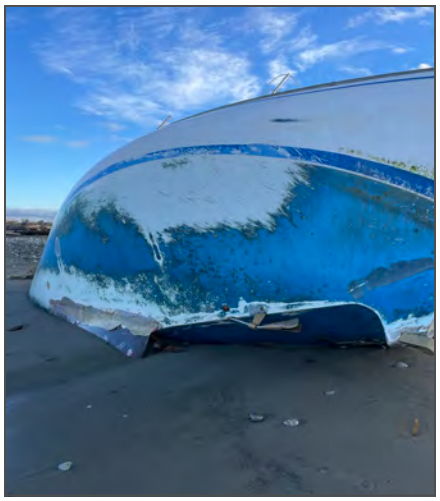
I have worked in federal land management since 2016 as a range technician, ecologist, and wildland firefighter (read cows, paperwork, and burning things). I'm a Sequim native and moved back in 2019 with my wife and daughters. I started working at Washington Maritime this past January as a restoration technician (read jack of all trades) for Protection Island NWR. I'm enjoying working for Fish and Wildlife and I look forward to continuing to meet and work with the myriad of excellent volunteer staff at the complex.

Adam Gilles

Shipwreck on Dungeness Spit

In the autumn of 2022 a sailboat ran aground on Dungeness Spit. After it was determined it could not be saved, it was removed by Washington Department of Natural Resources contractors in January 2023. The process required that it to be broken into pieces to be hauled out of the Refuge. An excavator filled five dump truck loads of debris.





Photos: Patrick Rennaker, USFWS

Ecosystem Invaders, *continued from page 1*

All National Wildlife Refuges (NWRs) are set aside for "wildlife first" and select the best possible approaches to wildlife, plant, and habitat conservation, while providing for compatible wildlife-dependent recreation opportunities. Each Refuge unit was established for specific purposes, which form the basis for management goals and objectives, and their prioritization. These are described in the Comprehensive Conservation Plans for each unit, available online.

The U.S. Department of the Interior defines invasive species as "a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health." Our monitoring and removal activities at the Refuge help keep troublesome populations – whether pest plants or animals – from establishing a foothold that can change the form of the environment, change the dynamics of the ecosystem, and affect other species. Removing the invader and preventing damage gets the primary focus of our attention. Invasive species can negatively impact native species. Thus far, the Refuge is fortunate that no habitat type has been severely altered by any single invasive species, however the threat posed by existing invasives requires regular monitoring, and responsive and proactive treatment.

Our actions or lack of action can affect each ecosystem up and down the flyway, the rivers, the forests... across the range of all our resident or transient species.

Frequently, our work is out of public view, so we take every opportunity to engage visitors with the Refuge's natural resources and conservation efforts. Here, Jac shows a European green crab and talks about the trapping.

The back channel between the Dungeness and Graveyard spits meanders through a sandy substrate topped by a salt-marsh plant community dominated by pickleweed *(Sarcocornia perennis),* which nourishes the residents and sequesters carbon in the soil.

At right: this colorful crab is quite a treat to find in our Dungeness traps, however, the native purple shore crab is sometimes simply green. If it isn't purple or polka-dotted, just a few other features help easily distinguish it from hairy shore crab or EGC.

Dungeness released from our traps

Alan with filamentous green algae

Native Pacific rock crab

Native purple shore crab

Invader: European Green Crab

The European green crab (EGC) is considered one of the world's worst invasive species. It is successful, difficult to control and damages ecosystems. It has few predators and eats a broad variety of prey including juvenile salmon, smaller crabs, and less aggressive crab species. It destroys seagrass and outcompetes local species for food and habitat, including the native Dungeness crab, which can be twice its size.

Sue, Susan and Warrren pose next to the crab mobile after checking the traps. The vehicle offers fresh air and a scenic ride to our entry trail about 3.5 miles along the spit. We drive cautiously by visitors and wildlife, and always have extra room in the back to pick up refuse from the beach.

Sculpted by erosion and tidal flows, and stabilized by logs and strand vegetation, the Dungeness Spit provides diverse and abundant habitats. Eelgrass beds shelter fish and small crustaceans that feed other animals, including the migratory Black Brant that the Dungeness Refuge was founded to protect. Aggressive foraging by European green crab uproots and destroys the eelgrass habitat that larval fish use to hide from predators. Further, their burrows can undermine the stability of vegetated banks.

The European green crab is a shore crab. Here in the Pacific Northwest, EGC are often found in muddy shoreline habitats, salt marshes and pocket estuaries, where they are protected from larger crabs that prey on smaller ones. They tolerate a wider range of water salinity and temperature than our Dungeness crabs.

At left and below: large colorful European green crabs at Neah Bay. Several of our Refuge volunteers bring experience from other EGC activities, including the Makah projects in Neah Bay, as well as trap sites around the region organized by Washington Sea Grant (WSG) for the Washington Department of Fish and Wildlife.

Carol inspects the catch in the Tsoo-Yess River on the outer coast.

Due to the species' potential harmful effects on ecosystems, various efforts have been made to control introduced populations. As of 2022, the Dungeness Spit had not become a breeding site, however, we found our first female European green crab carrying fertilized eggs in early May of this year. She was found in a trap set to monitor lucrative locations; this one is where tide water flows in through the inner Dungeness Bay back to enter the meandering channel through the salt marsh between Graveyard Spit and the main Dungeness Spit. One month later, we trapped a second gravid female in the eelgrass further out along the channel, about 100 feet away.

Carried in the ballast water of European merchant ships, this global invader was first observed on the North American Atlantic coast in 1817. Broadly native from Iceland and Norway south to the North African coast and east to the Baltic Sea, the EGC reached the Pacific coast and San Francisco Bay in 1989. Presumably, they had also hitched that ride in ballast water. Ever drifting with the currents, they progressed north to Washington State and British Columbia by 1998 and 1999, and the first crab was sighted in southeast Alaska in 2022.

DNA tests of our local crabs can trace the path of their invasion. It was the northerly flows of El Niño that in 2016 floated the crab larvae up the west coast and then eastward along the south side of the Strait of Juan de Fuca to reach the Refuge. This is counter to the typical clockwise flow through the strait and Salish Sea. Although Refuge staff and volunteers had been monitoring since 2000, our first catch of European green crabs at Dungeness Spit occurred the following spring 2017.

The Refuge's Early Detection, Rapid Assessment and Rapid Response is a preventive approach to removing crabs from the environment. We set traps on as many days as tides and people-power make it possible. With a dedicated crab-team coordinator and a rich community of Refuge volunteers, our local program has many advantages. However we are in need of more hands. Although, at this time, the low catches bear no resemblance to the huge numbers seen in a few other areas along Washington's outer coast and in the Salish Sea, our catches have been higher this year than in the last three years.

With a second male nearby, this EGC thinks I am not looking and tries to crawl out off the dishpan, and back into the water. We minimize handling and are gentle with all our inhabitants. After gathering data, he is put in the freezer.

Below: Sue and Mike measure crabs for the Washington Sea Grant monthly monitoring protocol at the East Lagoon, just east of where Graveyard Spit joins the main spit. Although it is suitable as EGC habitat, none have been found here to date. Most of our volunteers are WSG trained, but it is not a requirement for new team members.

EGC removals from the Dungeness NWR

Year	Total EGC Caught	Percent female	Total Traps Set	EGC caught per 100 traps
2017	96	43%	3,762	2.55
2018	69	32%	2,679	2.58
2019	57	25%	2,444	2.33
2020	3	0%	1,883	0.16
2021	8	13%	839	0.95
2022	14	29%	860	1.63
2023, to June 8	50	20%	790	6.33
Cumulative total	**297**	31%	**13,257**	2.24

The majority of captures have been at the beginning of the season, April to May. After fewer captures in the summer months, they pick up again at the end of the season, September.

Despite a high trapping effort through the 2020 season, there were clearly fewer crabs. Fewer crabs per trap and COVID-19 protocols could not justify the same level of effort in 2021 and 2022. With the increase in catches and signs of a breeding population, we test new possible trap sites and will be interested to compare the full season results.

European Green Crab Ventral Color Guide

At right: Hairy shore crabs are often numerous in our traps, here, together with a European green crab. We do not see crab mortalities in our traps due to predation.

Above: Recently molted individuals are LIGHT GREEN on the ventral side and may have a few dark spots on abdomen.

YELLOW, above, is observed in males with a few dark spots on abdomen and orange on joints, while the DARK GREEN coloration, at left, is more often observed in females. With some yellow, they have very dark abdomen and leg joints.

RED/ORANGE, below, have orange to red coloration and joints appear red. Females (right) have darker abdomen and red on face, chest, and limbs.

NOT SO GREEN...

Although European green crab are often referred to simply as "green crab," there are greener crabs out there and the EGC are not always green! Adults are generally mottled dark green to brown, with small yellow patches. They may have orange at the joints. The ventral color indicates how recently the crabs have molted. Juveniles can match their surroundings each time they molt. Since crabs constantly outgrow their shells, molt, and grow new ones, crabs of any size can display these colors.

KEYS TO I.D.

5 marginal teeth, 3 rostral bumps

Barnacles may grow on crabs with older shells, this one near Makah Bay.

Near the former Dawley residence, Tom targets fruiting shrubs that are spreading into the surrounding woods. Adaptive management allows for response as new invaders are recognized.

You can always find Pat in the thick of it. Here, she cuts back blackberry canes in the San Juan Islands unit of the Refuge. We combine IPM invasive-plant treatment, signage updates and marine debris removal. Widely spread by birds, control of blackberry is of high priority throughout the Refuge units.

Controlling Invasive Plants in Nearshore Habitats

The work of the Weed Warriors team has a terrestrial plant focus. We support three units of the Washington Maritime National Wildlife Refuge Complex: the Dungeness NWR, Protection Island NWR, and San Juans Islands National Wildlife Refuge. Tackling infestations and preventing the spread of invasive plant species dominates the work. We also help propagate and plant native species and assist the Refuge Deputy Project Leader Lorenz Sollmann on related work tasks. In the Dungeness NWR, the work takes us between the fir–hemlock forest above the Dungeness Spit, the oak savannah restoration site behind the Refuge office, the coastal-strand community on Graveyard Spit, and the Dawley property, which extends uphill from the west side of Sequim Bay. On Protection Island (P.I.) we currently work on a large bluff-top meadow at the island's sand-sculpted west side; work tasks closer to home prepare native plants for later transplanting on P.I. Occasional multi-day invasive-species control projects in the San Juan Islands NWR take us in spring and fall to some of the 83 rocks, reefs and islands contained within that Refuge unit, most designated as wilderness. The photos on these pages show a sample of the Weed Warriors volunteer projects.

In Washington state, "noxious weed" is the legal term for plants that harm local ecosystems and agricultural production. If left unchecked, invasive plant species can crowd out native vegetation; alter the structure of vegetative communities; affect insect, fish and animal food webs; and modify ecosystem processes.

Bull thistle on Graveyard Spit.

We often find English holly well camouflaged amongst ferns and other small shrubs. Fruit-eating birds drop the seeds from tree branches above and then the plants spread further by underground runners.

Taking turns with the hand saw, Pat gives a remote English holly tree near the bluff the final bite.

Left: Annie, Janet, Lynn D. and Pat help collect and propagate American dunegrass *(Leymus mollis)* for autumn planting on Protection Island. The network of this species' spreading, fibrous roots will help bind the sandy soil and prevent erosion. These plants are key structural members to support a diverse plant community.

A strand native: large-headed sedge

Eight volunteers gave these deltoid balsamroot *(Balsamorhiza deltoidea)* more space to grow their roots at Dave Allen's Shore Road Nursery. They'll be planted on Protection Island next autumn as rains begin to wet the soil. Here: Chris, Laura, Janet and Maryann.

Dalmatian toadflax: Controlling this noxious weed is required by state law. Annual removal efforts on Graveyard Spit have dramatically reduced the population and its extent. Its tiny wind-dispersed seeds can remain viable in the soil for ten years. The plants root deeply, but also sprout robustly from laterally running roots and avoid capture amongst small shrubs, roots and rubble. Persistent monitoring and removal efforts are essential; this is the one plant-oriented project regularly permitted to allow our access to Graveyard Spit. In July 2022, we found primarily non-flowering plants. While over 800 plants total, we are on the path to eradication.

Here in the oak prairie restoration project at the Refuge headquarters, we remove a perennial noxious weed with dandelion-like flowers, the common catsear, *Hypochaeris radicata.* The bright yellow flowers help target our work during the exuberant July bloom of fireweed, *Chamerion angustifolium.* Lynn C. at right; Pat and Jessie, below.

Left: Deer and winds on Protection Island demand team perseverance. Without deer fencing, plants would be uprooted or over grazed by the always foraging deer and have no chance to establish. The black-tailed deer are able to swim the 1.5 miles from the Miller Peninsula.

Below: Marking locations of new plants. Kathy secures temporary fencing to help shelter the new plantings.

A tranquil spring day on Protection Island.

Inset left: My first batch of native bulbs ready for planting included camas, Brodiaea and Allium species.

Right: Imagining the balsamroot flowering on this upland prairie.

Lorenz and Janet disassemble an old collapsed cabin on Protection Island.

Adam and Chris carry away the pieces.

Many nonnative plant species alter ecosystem processes and directly outcompete native plant species by capturing water and nutrients and reducing light at the ground level. They change ground-level microclimates, increase nitrogen in the soil, and alter fire regimes.

Where infestations have caused ecosystem damage, planting species suited to current site conditions helps advance natural processes and return the site to the desired habitat. The goals and objectives of restoration work plans and volunteer activities are informed by historic resources and sites with similar conditions, so-called "reference sites".

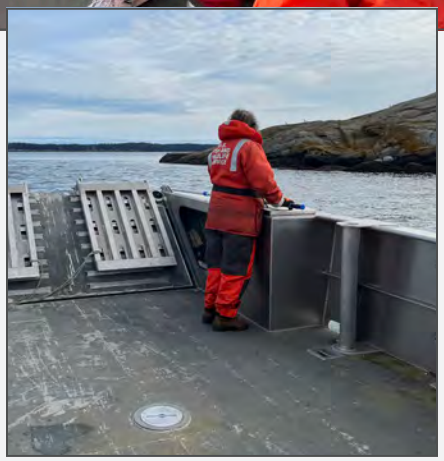
If you are interested in volunteering with Weed Warriors, the Crab Team or any other Refuge volunteer groups, please talk to Dave Falzetti or one of the teams' volunteers. They can direct you to the team's contact person. The plant-oriented team typically works on Tuesday mornings well into the cool season; the Crab Team offers a few trapping shifts per week from April into September. Sign-up for either typically occurs the previous week. These teams offer volunteers flexibility and a chance to engage and contribute toward the Refuge's conservation goals.

When air plus water temperatures aren't warm enough to use simple life vests, we sport these colorful head-to-toe coveralls for our water crossings.

Below: Pat and Laura lash down mustard plants then unload to a pile for burning. Three species of mustards take over bare ground here, outcompete new plants, blow and tumble with the wind, and damage the deer fencing.

Although there are vehicles to transport staff and volunteers, we sometimes enjoy the walk back to the boat. At day's end, Chris and I walk down the road to the harbor. Frequently enough, we are racing the tide conditions right for the crossing. But today, there is time.

In late April, San Juan County (SJC) Noxious Weed Board Program Coordinator Jason Ontjes and his assistant joined Lorenz Sollmann and the Weed Warriors team for work in the San Juans. In the boathouse here, Cathy Lucero, recently retired in the same role as Jason for Clallam County, volunteered again with the team. Together, Jason and Cathy advised on specific treatments for plant invasives on the SJI Refuge islands.



Above: The boat's two ramps lower, unfold and rest atop island rocks for nimble scrambling onto these remote SJI Refuge islets. Photo: Jason Ontjes

The native broadleaved stonecrop *(Sedum spathulifolium)* and Roemer's fescue *(Festuca idahoensis ssp. Roemeri)* above high tideline on a rocky shoreline.

Near left: The boat waits for the combined team off shore from this rocky San Juan island.

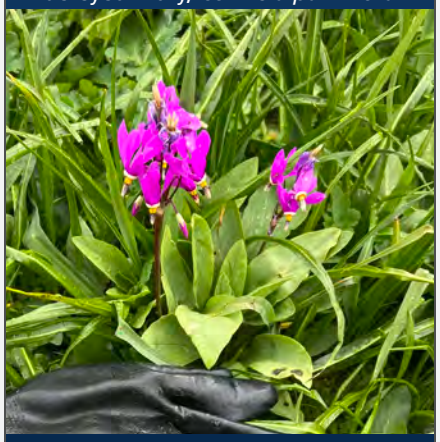
Far left: Different island, similar geology. Native coastal gumweed *(Grindelia integrifolia)* and a blackberry seek out water in the same fissure.

Photos: Laura Davis

Lynn D. under junipers atop a SJI islet.

Monkey flower, *Erythranthe guttata*

Blue-eyed Mary, *Collinsia parviflora*

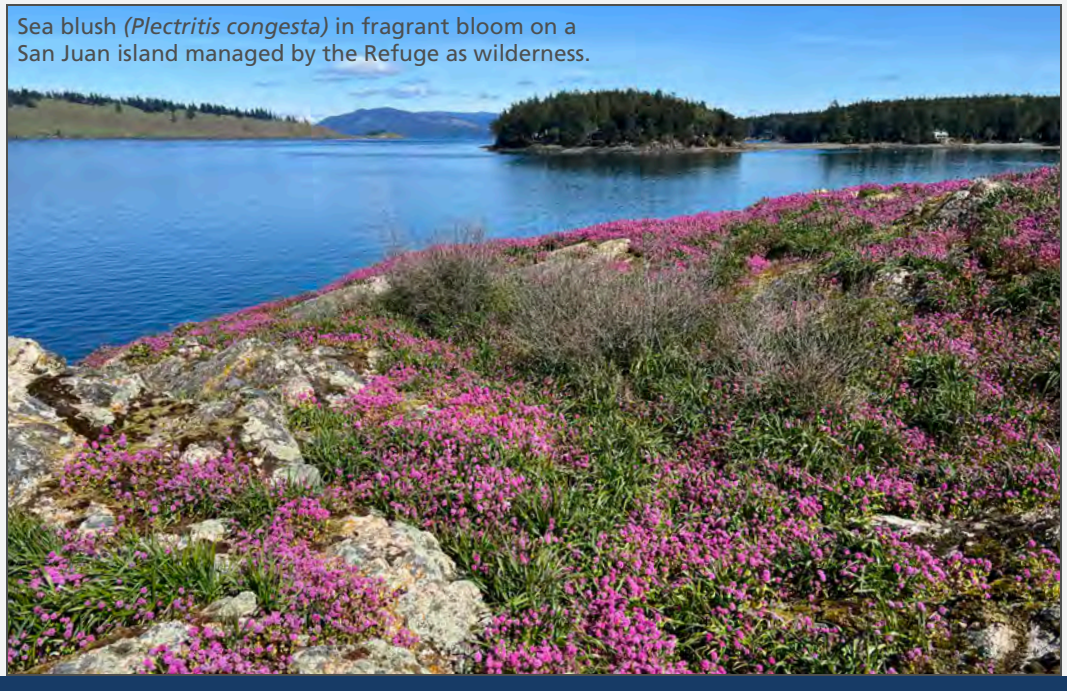


Shooting star, *Dodecatheon pulchellum*

Annie, Pat and Janet take a much-needed sandwich break before heading back to work.

Canada goose nests are abundant on the islands, amongst well nibbled Camas leaves.

SJC employee Jason Ontjes sprays broad-leaf invasive plants. Using a variety of IPM methods, we found and treated thirty non-native invasive species on ten Refuge islands this spring.

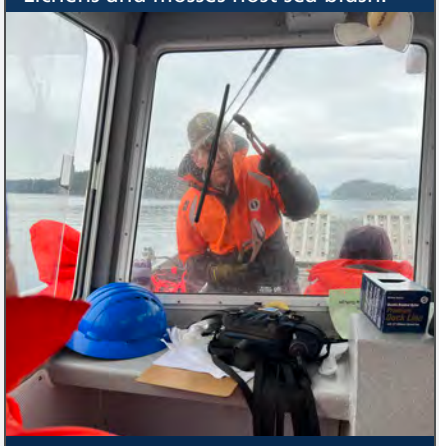


Sea blush *(Plectritis congesta)* in fragrant bloom on a San Juan island managed by the Refuge as wilderness.

Chocolate lily. Photo: Annie Cortez

Laura cuts away blackberry canes before spraying. Photo: Jason Ontjes

Lichens and mosses host sea blush.



Glenn repairs the wipers in light rain.

Photos: Laura Davis