SAVING MARINE HABITATS

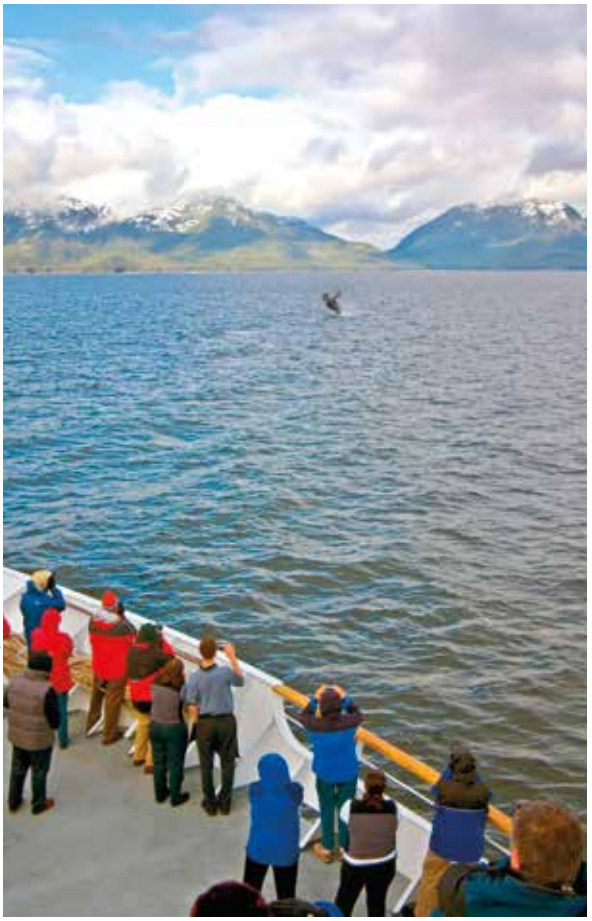
Science, hard work help preserve Pacific treasures

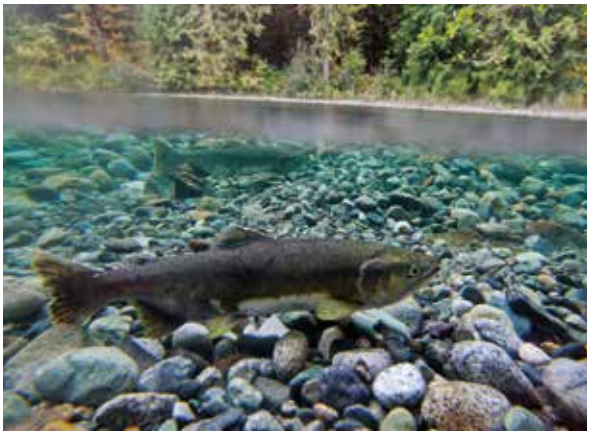
By David Schmidt

COURTESY: JOHN DE MELLO / HAWAI'I TNC

Divers Brian Nelson and Tristan Walker wield The Nature Conservancy's unique reef-cleaning vacuum, the 'Super Sucker.'

CLOCKWISE FROM LEFT: JULIE QUARRY / ALAMY, COURTESY: LAUREN OWENS / WASHINGTON TNC, COURTESY: HAWAI'I TNC





Seeing a humpback whale breach, as this one is doing in Southeast Alaska's Frederick Sound, is a highly sought travel experience that scientists are working to ensure will be available for decades to come. The salmon returning to Washington state's Hoh River (above) benefit from programs to gather up derelict fishing nets. And volunteers plant sea urchins on Hawai'i reefs to keep invasive algae at bay.

Peter Tomozawa didn't know he was embarking on a life-altering experience when he arrived at He'eia Kea pier on O'ahu's Kāne'ohe Bay early one morning last summer. A friend had approached him with the idea of helping The Nature Conservancy (TNC) and its conservation programs in the Aloha State, but rather than simply sign checks, Tomozawa—a former partner and managing director at the Goldman Sachs Group, Inc.—wanted a hands-on experience.

Hands-on, indeed: After a briefing about the impact of invasive, non-native algae species on coral-reef ecosystems, and a tutorial on removing and bagging the invasive flora, he set to work on good, clean fun, ecologically speaking.

"I'm a hand picker," explains Tomozawa. "I swim to the hard-to-reach and fragile spots and hand-pick the algae. If I do it right, it peels off the reef like a pizza pie." Tomozawa's "harvest" goes into The Nature Conservancy's collection barge, moored in the bay, before being brought ashore and repurposed. If left unchecked, the algae quickly grows into thick vegetative mats that choke coral, scatter fish species and render the reef uninhabitable for native species.

The reef-cleaning project is part of TNC's campaign to remove the alien algae—including *Gracilaria*

THE PRIZE IS NATURE—AND A VACATION

Alaska Airlines customers can support The Nature Conservancy's work—and perhaps win a Montana guest ranch vacation—by voting for their favorite TNC project in a new sweepstakes to honor Earth Month. The projects are: preserving prime grizzly bear habitat, and ensuring healthy grasslands for wildlife and family ranchers, in Montana; protecting wild salmon habitat across Alaska; creating "pop-up" habitats for migrating birds in California's Central Valley; restoring coral reefs in Hawai'i; protecting wetlands for wildlife at Utah's Great Salt Lake; and restoring Puget Sound for people, fish and wildlife in Washington. Visit Facebook.com/alaskaairlines for more information on the projects, then vote for your favorite by May 31 for a chance to win. Also visit Facebook.com/alaskaairlines for contest rules and details. The project that receives the most votes will receive a contribution from Alaska Airlines. Each participant garners a chance to win a weeklong vacation for two at the conservancy's Pine Butte Guest Ranch in Montana's Rocky Mountain foothills, including airfare to Great Falls from any Alaska Airlines-served city. The sustainably operated ranch offers riding, hiking, swimming, birdwatching and more, plus luxury rustic accommodations and gourmet

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salicornia and *Eucheuma denticulatum*, both brought to the islands from the Indian and Pacific oceans some 30-plus years ago for aquaculture research—from Hawai'i's native coral reefs using a combination of techniques. Hand pickers such as Tomozawa gently tackle the delicate and difficult sections, while TNC's groundbreaking "Super Sucker" underwater vacuum removes bulk algae without harming corals or other creatures inadvertently swept up in the stream. This state-of-the-art vacuum uses a Venturi system—rather than fans or blades that not only harm bycatch but actually help the algae to reproduce—to create suction, and is powered by a 40-horsepower diesel engine that runs on biodiesel; the device can remove up to 800 pounds of algae per hour.

Next, scientists and volunteers hand-plant algae-eating sea urchins on the freshly cleaned reefs in carefully researched population densities. These urchins serve as reef keepers, thwarting new outbreaks of invasive algae and helping the reef ecosystem recover. Meanwhile, TNC sponsors an onshore program that helps taro farmers turn the algae into fertilizer. The nonprofit has removed more than 50,000 pounds of algae since 2006.

"When you go back to reefs that you've helped clean and see fish in areas where there were no fish before—and you know that you had something to do with it—it's just a wonderful feeling," reflects Tomozawa. Tomozawa continues to help remove algae from reefs, and has joined TNC Hawai'i's Board of Trustees. "It can be physically demanding to be in the water for hours and the bags of algae are pretty heavy, but I just love it," continues Tomozawa. "The reef has a chance to regrow, and that overcomes any weariness and fatigue. Few things in life are win-win situations, but this is one of them."

The Nature Conservancy helps ensure that commercial fishing boats such as these, in Morro Bay, will continue to be able to harvest sustainably managed fish populations in California.

North American marine-conservation efforts delve far deeper into the water column than just algae-infested reefs. The Pacific Ocean is the foundation of much of human life in Western North America—weathermaker, transportation highway, food supplier, atmosphere-maker and more—so the issues aren't trivial. In some cases, the challenge begins with lack of knowledge about the flora and fauna in an important ecosystem; while other areas demand proactive measures, such as removing old fishing nets from salmon-spawning streams, restoring coral reefs after a ship grounding, or working with local fishermen to develop voluntary no-fishing zones and sustainable-catch practices. Fortunately, the same can-do, hands-on spirit that Tomozawa and TNC Hawai'i have demonstrated with their reef-restoration program percolates through the work that's being done elsewhere. Marine conservation and restoration in Hawai'i, Alaska and along the west coast of the United States and Mexico are active and growing enterprises that benefit our lives in many ways.

Alaska, for example, is seen around the world as a forever-wild place where pristine ocean water meets glacier-fed rivers, and where myriad salmon, wolves, grizzly bears, and whales congregate. Fortunately, the country's image of the 49th state, with its vast tracts of

THE ECOLOGICAL ART OF BEACHCOMBING

An Alaska beachcombing expedition mounted last summer by the Anchorage Museum, the Alaska SeaLife Center, the Smithsonian Institution, NOAA and others yielded more than the usual driftwood and glass floats. Scientists gathered 4 tons of ocean-borne trash in one day in Halloo Bay, near Katmai National Park—everything from bottle caps to barrels. Most trash was plastic, and much of it was transformed by expedition artists such as Mark Dion (right, collecting material) into works on display at the Anchorage Museum's new exhibit "Gyre: The Plastic Ocean," which runs through September 6; www.anchoragemuseum.org.

COURTESY: NORTHWEST STRAITS FOUNDATION / TNC WASHINGTON

Quinault tribal fisherman Larry Goodale, Jr., hauls in an abandoned fishing net from Washington's Chehalis River.

protected land, still largely matches reality, including along the state's immense 6,640 miles of coastline.

But ecologists can't protect resources they don't know about. "Years ago, the National Park Service (NPS) began a large-scale inventory program as a way to implement long-term monitoring for vital signs," says Scott Gende, senior science advisor at the NPS' Glacier Bay Field Station. "Different parks have different vital sign species. They help scientists determine when trends are a concern." The impetus to carefully inventory each park's living repository is reverberating across Alaska, which holds more than half the United States' national parkland by area. "We've been working on baseline monitoring since 2007," reports Laura Phillips, an ecologist at Alaska's Kenai Fjords National Park. "We've picked a suite of vital signs to monitor, and we hope that they are linked enough so that we can see causal relationships." For example, Phillips and her colleagues have been studying the park's trophic linkages (food chain feeding patterns and preferences), focusing on sea otters and black oystercatchers—two species that survive on a base prey that affects the entire park's trophic system.

"There's still a lot that we don't know," says Phillips. "But I'm hopeful that we'll have a great data set in 20 years."

One tough-to-track item is the potential effect of cruise ships on whales. "We're unsure of the impact," says Gende. As a result, the NPS has formed an advisory board and a series of partnerships with cruise-ship operators to attempt to qualify and quantify the situation. Glacier Bay is one of the world's leading cruise ship destinations, with 230 ship-calls this year. "Now, we send an observer on the ship who stands at the bow and records surfacing events as whales encounter the ships." This information is used to determine the likelihood of whale/ship collisions and to help protect whales. Perhaps of equal importance, this program represents a strong partnership between the NPS and cruise-ship operators, who are well aware that

healthy whale populations benefit everyone, as sighting a whale is one of the top three desires expressed by Alaska's visitors.

"Alaska's parks are in very good shape, and they are very well managed," says Gende. He and Phillips are both positive about the baseline-inventory work that's taking place in Alaska's parks, and Gende is also optimistic about the increasing populations of some notable "vital signs" such as Steller sea lions, humpback whales and sea otters.

Phillips is also upbeat about the public reaction to the still-pending arrival of debris from the 2011 Japanese tsunami. "People have gone out into the fjords and been shocked at how much debris there is. It's not from the Japanese tsunami—yet—but people became concerned. Now, we have yearly park cleanups."

The California Current originates off the southern coast of British Columbia and flows to the southern Baja Peninsula, triggering significant upwelling en route and creating a marine ecosystem that's rich with seals, whales and a highly productive fishery. Past decades saw significant overfishing activity, but this has stabilized thanks to efforts by both conservationists and commercial fishermen working with regulatory agencies. "We've ended overfishing on the west coast of the United States," declares Paul Dye, TNC Washington's director of marine conservation. "We still have recovering fish stocks, but they're sustainable, provided that we keep the ecosystem healthy."

That's the caveat that still requires attention. Common environmental pressures include growing human populations along the coasts, habitat loss, ocean acidification, and climate change, but even here there's good news. TNC Washington employs Marine Spatial Planning (MSP) as a principal strategy to evaluate the impacts of proposed human activities, for example increased tanker traffic on the Strait of Juan de Fuca. The MSP process is similar to land-use planning in that it brings together the various stakeholders and user groups, and it employs cartography to generate a big-picture view of how and where humans are using a body of water, as well as the natural resources and habitats involved. "It's a way of sorting out human uses in the ocean," explains Dye.

One of the more fruitful partnerships that TNC Washington forged has been with the Quinault Indian Nation, which tired of finding abandoned fishing nets clogging up vital salmon-spawning waterways. Many of these nylon nets were lost long ago, but, tragically, they remained effective at snaring fish, even if no one was reaping the bounty. "We found someone with a forward-looking sonar, we marked the nets' locations, and we provided funding so that the Quinault can retrieve the nets," says Dye. This partnership last year removed 58 nets from near-coastal waters, and some fishermen have started putting beacons on their nets so they can relocate their lost equipment—a benefit to the environment and their bottom line.

Another important TNC partnership has been with fishermen. "We've been working with commercial fishermen for the past nine years," says Mary Gleason,

lead scientist for TNC California's Coastal and Marine Program. "We've helped create no-trawling zones, as well as alternative ways to sustainably catch fish." These techniques include using traps, hooks and line, and seine netting, rather than destructive bottom trawling; TNC has been buying up trawler-fishing permits and leasing them back to fishermen who then voluntarily follow specific TNC-mandated fishing practices. According to Gleason, these new techniques are yielding higher-quality catches, which fetch higher prices than trawler-caught fish.

Restoring marine habitat by establishing designated rehabilitation areas is a time-honored management strategy. To date, 3.8 million acres of California's marine habitat have been protected from ground trawling, and the State of California has created a network of 124 Marine Protected Areas (MPAs), which Gleason calls one of the world's best. For example, the Channel Islands MPA is already experiencing rejuvenated lobster populations. "Recovery of marine species will take time, but ecosystem management is a lot more effective now," says Gleason.

"It's a moonscape," says Matthew Parry, a fisheries biologist at NOAA's Restoration Center in Honolulu, about reefs after a ship-grounding event. "The water is milky with fine-grain sediment."

Parry, who visits reefs following groundings to inspect damage and determine what restoration is needed, says a grounding incident can significantly disrupt a reef ecosystem. Thankfully, reefs have the ability to regenerate, provided that loose debris doesn't deliver a wave-powered pummeling to the surviving coral, and that invasive species don't take root.

"A rolling stone gathers no coral," says Parry, "so we remove the old broken coral to the extent we can." Then the key is to help support or establish healthy populations of native species on the recovering reef. "If it's done right, new coral 'recruits' will arrive on the reef within months, maybe a year." The restoration phase sometimes involves using TNC's "Super Sucker" to remove algae, while loose debris is hand-

bagged and relocated. "It takes a long time, but our systems are working."

While federal law has helped create legal mechanisms for dealing with the costs of cleanup efforts, assessing the total cost of a ship-grounding event involves complex math. If a grounding damages a coral reef that's popular for snorkeling and diving, how many tourist dollars are lost? "Lots of values and goods don't pass through a market," observes John Dixon, former lead environmental economist at the World Bank and a resident of O'ahu. "For example, snorkeling isn't usually captured by traditional market activities."

According to Dixon, all ecosystems have inherent ecological value, but their measured economic value typically increases with greater human activity. One study estimates the value of O'ahu's Hanauma Bay—a world-famous swimming and snorkeling area—at roughly $50 million annually, while a less-visited reef registers lower dollar value. "Economic value is defined by what humans are willing to pay," says Dixon. Considering that Hawaiian tourism attracts 8 million visitors per year and represents an annual $14.2 billion industry, Dixon estimates the value of Hawai'i's marine ecosystems at $400 million to $500 million per year.

While the challenges facing North America's Pacific Rim are complex and dynamic, green shoots of native "recruits" can be seen—literally and metaphorically—throughout near-shore ecosystems. From Peter Tomozawa's volunteer efforts removing algae from Kāne'ohe Bay, to the partnerships that TNC forges with local stakeholders, the great news is that there's an organic upwelling of interest amongst individuals, communities, and organizations to improve the planet's ecological balance sheet. With 8 million people visiting Hawai'i each year, and grassroots efforts achieving positive results in so many places, the Hawai'i tradition of island stewardship has become an important new export product. It's valuable in many lasting and far-reaching ways. ▲

David Schmidt is a Seattle-based writer who concentrates on marine topics.