Pacific Services Center

History, Mission and Accomplishments

NOAA

NOAA, the National Oceanic and Atmospheric Administration, established the Pacific Services Center (PSC) in 2001 to serve the unique ocean and resource management needs of the Pacific Island region. Located in downtown Honolulu, Hawai'i, PSC, a regional office of the NOAA Coastal Services Center, offers a regional perspective tailored to the localized needs and conditions of the Pacific. Our island-based philosophy and collaboration with partners, clients, and other NOAA offices ensure that our products and services reflect local diversity combined with global perspectives. This, in turn, enables NOAA to develop and distribute information and services specifically for the coastal resource management communities in the State of Hawai'i, the territories of American Samoa and Guam, and the Commonwealth of the Northern Mariana Islands (CNMI).

PSC's approach to addressing the Pacific Island region's unique ocean and resource management needs is to foster communication, coordination, and collaboration among the various parts of NOAA throughout the Pacific. As such, the PSC offices include staff members from other parts of NOAA. It is through this collaborative, crosscutting approach that PSC is able to enhance NOAA's ability to deliver products and services that address the islands' unique needs on a regional scale. Through leveraging of both funds and the human capital represented by NOAA's Pacific assets, PSC is able to help NOAA achieve its vision of "an informed society that uses a comprehensive understanding of the role of oceans, coasts, and atmosphere in the global ecosystem to make the best social and economic decisions." PSC's vision is one where it will be the regional focal point for dialogue, information, and collaboration for resilient and sustainable Pacific coastal and ocean communities.

In attaining this vision, PSC advances the following key strategic themes:

- Risk Management
- Geospatial Technology
- Safe Navigation
- Environmental Literacy
- Coastal and Marine Natural Resources

The following are highlights of PSC's accomplishments since its inception. The establishment of PSC has allowed NOAA to improve the delivery of its products and services at a regional scale. These themes, programs, and projects are the result of PSC's integral role—through funding, personnel, and the leveraging of resources—and the efforts of its partners in ensuring that the ocean and resource management needs of the Pacific region are addressed.

"Pūpūkahi i holomua"

Hawaiian: "Unite to move forward"

Risk Management

Mitigating coastal hazards so communities can reduce their vulnerability and respond immediately when disasters strike.

The Samoan proverb, "Ua logo le fu'a ma le pa'o" translates to "the rustle of the banners and the beating of the drums were heard." This ancient Samoan saying conveys the value of communication and the sharing of information. When dealing with life-threatening issues such as natural hazards and risk management, clear and effective communication and information sharing is vital. PSC is developing innovative ways to communicate information, tools, and techniques that will reduce the vulnerability of communities during coastal hazards such as storms and tsunamis. PSC is also working to enhance the ability of coastal communities in American Samoa, CNMI, Guam, and Hawai'i to mitigate the impacts of catastrophic and chronic natural hazards through partnership development, information exchange, and decision-support tools.

As the Earth's climate changes, Pacific islands are especially vulnerable to sea-level rise, droughts, and extreme weather events. These changes threaten such resources as freshwater, public health and safety, and ecosystems. PSC works collaboratively to improve the resilience and adaptive capabilities of ocean and coastal communities in preparing for and addressing the risks associated with climate change and variability.

• Technical Assistance for Building Resilience

The staff at PSC provides its NOAA and external partners with valuable technical assistance related to coastal hazards and building resilient island communities. Such activities include contributing expertise to post-disaster evaluations, policy and plan review, geographic information system (GIS) and Global Positioning System (GPS) technical support, and data sharing.

• Increased Awareness of Coastal Hazards

PSC recognizes the importance of an educated and informed public that understands risks to life and property from coastal hazards and has the information it needs to respond appropriately. PSC increases awareness and educates individuals and organizations through participating in media broadcasts, developing outreach materials on coastal hazards, documenting stories from tsunami survivors, serving as guest lecturers, and participating in school and community events.

• *Hawai'i Coastal Hazard Mitigation Guidebook*

In partnership with the State of Hawai'i and the University of Hawai'i Sea Grant College Program, PSC supported the development of the *Hawai'i Coastal Hazard Mitigation Guidebook*, a comprehensive reference manual for safe coastal development. This is widely used throughout Hawai'i and is being used as a template by other states for their hazard mitigation planning.

• Hazard Education and Awareness Tool

The Hazard Education and Awareness Tool (HEAT) is a free, template-based Web tool that merges Google Map technology with local hazard evacuation zones and other awareness information. The State of Hawai'i used the HEAT template to develop the Hawai'i Tsunami Hazard Information Service to help planners and decision-makers address tsunami risk throughout the state. This service allows tsunami evacuation zones to be viewed on-line along with information about

Increased awareness of natural hazards and extreme weather can help save both lives and property. PSC and its partners are working to increase community resilience in the Pacific.

tsunami preparedness, warnings, and evacuations. The service can be accessed from many of the state and local partners' websites. In its first year of use, the website was accessed by over 15,000 individuals. PSC and its partners are tracking the tool's use to determine how often it is used for decision-making versus informational purposes. To view this innovative tool, visit *www.csc.noaa.gov/psc/tsunami/*.

• Flood Response Tool

PSC is partnered with the City and County of Honolulu's Department of Emergency Management to develop the Hawai'i Flood Response Tool–O'ahu Pilot. The tool employs free GIS software, ESRI's ArcGIS Explorer, and allows users to interact with locally stored GIS data along with numerous real-time data sets from NOAA and the U.S. Geograpical Survey. The flood tool assists emergency managers and other first responders with decision-support tools that combine real-time flood warnings, observation data, and forecasts with GIS data sets to be better prepared to react in the event of an emergency.

• Hazard Assessment Tool

The Tutuila Hazard Assessment Tool (T-HAT) is a GIS-based Internet-mapping application developed for the American Samoa Coastal Management Program to assist with its planning and permitting processes. T-HAT is used daily to identify potential multihazard risks, including flood, landslide, earthquake, and tsunami, for any location in Tutuila. It has been used to provide the government and the public with hazard-risk information for over 1,000 permits and drastically reduced the cost and staff time of processing permits.

• The Kaua'i On-line Hazard Assessment (KOHA)

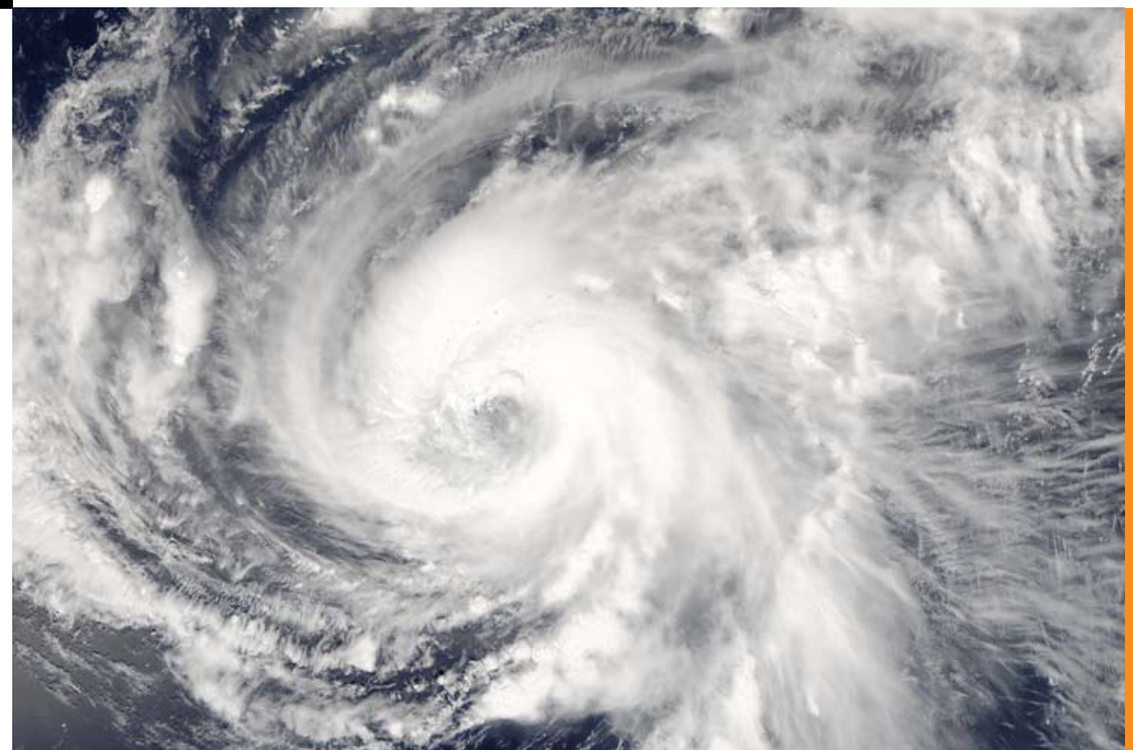
KOHA is a GIS-based Internet-mapping application developed to support Kaua'i County's planning and permitting activities related to natural hazards, as well as to provide residents with easy access to information about hazard risks in their communities.

• Pacific Risk Management *'Ohana* (PRiMO)

PRiMO is a multiagency, multiorganizational, multinational working group of representatives from federal, state, territorial, county, private, academic, and nongovernmental organizations from the U.S. and Pacific Island nations working to enhance hazard resilience in the Pacific Islands. PRiMO includes a Navigators' Council and a variety of *hui o hana,* or working groups, to support the development and delivery of risk management-related products and services. As the institutional incubator, PSC has nurtured PRiMO from a loosely connected network of professionals into a collaborative organization committed to service in the Pacific Islands. For more information, visit *www.primohui.org.*

• Indian Ocean Tsunami Warning System

The U.S. Agency for International Development (USAID) launched the U.S. government's Indian Ocean Tsunami Warning System (IOTWS) program in response to the December 2004 tsunami disaster. PSC, along with several other NOAA offices and U.S agencies, helped to support the U.S. contribution to the IOTWS program by sharing its technical expertise, providing guidance, and helping to build early warning capacity within the Indian Ocean region. The U.S. IOTWS partners include USAID, NOAA, U.S. Geological Survey, U.S. Forest Service, and U.S. Trade and Development Agency. These agencies are working closely with the Intergovernmental Oceanographic Commission to ensure



This is a detailed satellite view of typhoon *Tingting* in 2004. The Northern Mariana Islands (CNMI) and Guam were declared disaster areas by the United States government.

Photo courtesy of NASA.

(Top) The community resilience GPS and GIS mapping project in Waipio Valley, on the island of Hawai`i, provided an opportunity to work with local elders and gather knowledge about local historic floods, tsunamis, earthquakes, and landslides.

(Above) NOAA Tsunami buoys are a vital part of the Indian Ocean Tsunami Warning System.

that governments and communities will be able to detect and prepare for tsunamis and related coastal hazards. For more information on this project, visit *www.iotws.org*.

• Coastal Community Resilience Guide

As part of the Indian Ocean Tsunami Warning System program, PSC worked with the U.S. Agency for International Development and other regional partners including the Asian Disaster Preparedness Center, University of Rhode Island's Coastal Resources Center, Tetra Tech EM Inc., and The Nature Conservancy to author a guide entitled *How Resilient is Your Coastal Community? A Guide for Evaluating Coastal Community Resilience to Tsunamis and Other Hazards.* The guide presents a framework for connecting disaster management, coastal resource management, and community development activities in a meaningful way to promote safe and healthy communities.

• Building Capacity for Managing Risk Information

As part of the Indian Ocean Tsunami Warning System program, PSC worked with regional partners to build the capacity of regional organizations in the use of GIS. This will contribute to improvements in the accessibility, sharing, and utilization of spatial information for decision-making.

• Tsunami Inundation Modeling in the Pacific Islands

PSC is working in partnership with NOAA's Pacific Marine Environmental Laboratory, based in Seattle, Washington, to provide tsunami modeling and prediction tools to the Pacific region. Armed with reliable predictions of potential tsunami inundation, local communities are able to improve planning, preparedness, and mitigation activities to reduce risks to life and property.

• National Tsunami Hazard Mitigation Program

PSC participates in the National Tsunami Hazard Mitigation Program (NTHMP), a program designed to reduce the impact of tsunamis through hazard assessment, warning guidance, and mitigation. The NTHMP effort is being coordinated by a steering committee composed of representatives from NOAA, the Federal Emergency Management Agency, United States Geologic Survey, National Science Foundation, U.S. coastal states, Pacific territories and commonwealths, Puerto Rico, and the U.S. Virgin Islands. For more information visit *http://nthmp.tsunami.gov/*.

• Natural Hazard Risk Management Project Opportunities in U.S. Flag Pacific Islands

PSC completed the "Natural Hazard Risk Management Project Opportunities in the U.S. Flag Pacific Islands" report that identifies two strategies to manage risks from natural hazards: 1) support partnership development, facilitate information sharing, and promote the integration of products and services on a regional level; and 2) support planning efforts at the community and village level through the development and implementation of locally customized, regionally replicable decision-support tools. The report describes recommended projects in these two priority areas.

• Oil Spill Response Training

PSC worked with NOAA's Office of Response and Restoration to coordinate and plan the Tropical Oil Spill Response and Damage Assessment Training for American Samoa, Guam, and the CNMI. The training was held in Guam in March 2004 and helped local decision-makers and responders learn about the consequences and response options for spills that could affect coastal resources.

• Technical Assistance in Hazard Mitigation

PSC supports ongoing regional efforts in hazard mitigation. In Maui County, Hawai'i, PSC partnered with county planners to develop a series of GIS-based queries to determine the impact of changing shoreline setback rules. Because the proposed changes raised concerns about the effect on public property rights, PSC also provided a technical review of Maui County's coastal erosion assessment methodology.

• Wai'anae Ecological Characterization (WEC)

As a regional office of NOAA's Coastal Services Center, PSC was able to leverage its resources as well as partner with the Hawai'i Coastal Zone Management Program to develop an ecological characterization of the Wai'anae region of the island of O'ahu in Hawai'i. The characterization includes a GIS-based tool, the Nonpoint-Source Pollution and Erosion Comparison Tool (N-SPECT), that examines the relationships between land cover, nonpoint source pollution, and erosion in the Wai'anae area. The WEC is helping the Wai'anae community build partnerships with local, state, and federal organizations to develop local land use and watershed management strategies.

• Disaster Management and Humanitarian Assistance

PSC has been providing support for the development of the University of Hawai'i Certificate Program in Disaster Management and Humanitarian Assistance (DMHA). PSC provided staff support to the overall DMHA program manager to develop and facilitate the implementation of an effective curriculum. PSC also created and funded a PRiMO Fellowship Program to provide guidance, funding, office space, and additional resources for DMHA graduate students working on hazard resilience research in the U.S. Pacific islands.

As part of the Indian Ocean Tsunami Warning System, PSC is working to connect disaster management, coastal resource management, and community development to promote safe and healthy communities.

Geospatial Technology

Supporting the application of advanced technology for visualizing, measuring, and analyzing our islands and coastal waters.

'Aha is a traditional Hawaiian cord made from twisted coconut husk fibers. Individually, the fibers are easily broken, but woven together they are strong enough to be used as a cohesive rope. Like the 'aha, PSC weaves together many layers of knowledge, expertise, and geospatial technology to help build community capacity and resilience, as well as to honor the past, care for the present, and provide for the future.

Working together, respecting the individual and honoring the group, helps to preserve our Pacific Island natural resources and promotes the well-being of local communities. Incorporating these values and knowledge is of paramount importance.

Geospatial technology refers to the modern tools, such as satellite images, geographic information systems (GIS), and the Global Positioning System (GPS), that allow for visualization, measurement, and analysis of features or phenomena that occur on the Earth. Geospatial technologies can provide compelling visual proof to corroborate on-the-ground reporting of the state of the environment, as well as natural disasters affecting the environment. PSC supports the application of this advanced technology to help its Pacific Island partners manage their coastal and marine natural resources more efficiently and effectively.

• Spatial Data Acquisition and Management

PSC has worked with its federal, state, local, and private-sector partners to develop and acquire a significant amount of spatial data needed by decision-makers in the Pacific. PSC currently manages over 3,700 geospatial data sets for the Pacific region, including satellite-based images, high-accuracy elevation data, and information on coastal resources, which it distributes to its partners so that they may effectively manage their coastal resources. PSC's data managers also provide technical assistance for these geospatial resources.

• Coastal Elevation Mapping Project

The NOAA Coastal Elevation Mapping project collects and distributes high-resolution topographic and bathymetric data sets to meet the needs of the coastal resource management community for accurate, timely information in the coastal regions. Airborne-derived topographic data obtained for Hawai'i include light detection and ranging (lidar) and interferometric synthetic aperture radar (IfSAR) data.

• Coastal Change Analysis Program

NOAA Coastal Change Analysis Program (C-CAP) products are part of a nationally standardized database of land cover and change information developed using remotely sensed imagery. PSC has supported the development of moderate- and high-resolution land cover and impervious surface data. C-CAP data are used to aid coastal resource management decisions at the state and local levels.

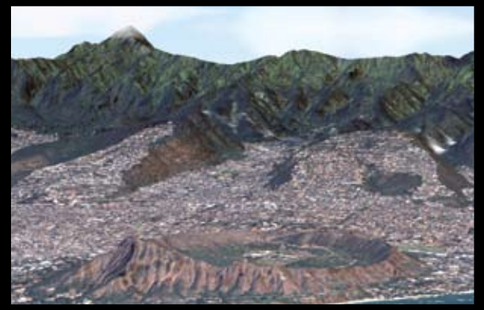
• Hawai'i's Spatial Data Implementation Plan

The State of Hawai'i is involved in a federal effort to document its spatial data needs. PSC has supported the state's efforts by leading the development of the marine data chapter of the Hawai'i Spatial Data Implementation Plan and organizing workshops of local professionals to discuss relevant data issues for inclusion. The plan can be viewed on-line at *www.higicc.org*.

• Internet-Based Decision-Support Tools for Coastal Management

PSC works with local agencies throughout the Pacific region to develop and implement GIS-based tools for the Internet

High-resolution topographic and bathymetric data aid coastal resource management decisions at the state and local levels.



These images of Diamond Head, O'ahu were created using land cover data and high resolution satellite imagery provided by the Coastal Change Analysis Program (C-CAP). C-CAP data can be used to aid coastal resource management decisions.

to support decision-making. The tools PSC has developed improve access to critical information necessary for decision-making and directly support management functions such as floodplain management, permit review, and emergency preparedness and response, and provide users with significant savings in time and money. Decision-support tools developed by PSC are currently being used in Hawai'i, American Samoa, Guam, and shortly in the CNMI.

• Nonpoint Source Pollution and Erosion Comparison Tool (N-SPECT)

N-SPECT is a GIS-based decision-support tool that helps resource managers examine the relationships between land cover, nonpoint source pollution, and erosion in coastal watersheds. PSC supported the development and evaluation of N-SPECT for use in Hawai'i. N-SPECT is being applied across the region to assist managers with planning and development decisions.

• Pacific Islands Assistantship Program and Geospatial Technology Training

Between 2001 and 2006, PSC supported the placement of 11 associates with GIS and technical backgrounds into two-year positions within coastal resource management agencies in Hawai'i, Guam, American Samoa, and the CNMI. The assistantship program focused on providing technical expertise and training in geospatial technology to Pacific Island coastal and ocean communities, while providing participants with an opportunity to learn coastal zone management through hands-on experience.

PSC also provides technical training and educational opportunities for professionals working in the coastal management field in the U.S. Pacific Island region. In partnership with local hosts, NOAA trainers develop and deliver courses and workshops to build local capacity in spatial technologies used in coastal management. Training topics include geodetic control, metadata creation, use of the GPS, remote sensing for coastal management, and introductory, intermediate, and advanced GIS for coastal management.

• Training and Outreach in Geodetic Control

In partnership with the State of Hawai'i, PSC supports the National Geodetic Survey (NGS) geodetic advisor for the Pacific region. The advisor provides hands-on technical training and workshops on GPS and datum transformations to government agencies, trade groups, and nongovernmental organizations across the state, including the Hawai'i Association of Land Surveyors. The advisor also regularly gives presentations and hosts workshops around the region on the role of NGS in the Pacific and on GPS processing and coordinate transformations.

National Geodetic Survey markers like this one in American Samoa, help maintain the national datum reference system.

Safe Navigation

Promoting safe navigation – accurate and timely navigation services are critical to safety, economic productivity, and environmental protection.

In the past several decades, maritime activity and scale have grown exponentially: seagoing commerce has tripled and the average size of ships has doubled. This remarkable growth brings increasing concerns about homeland security since roughly half the cargo transported through U.S. waters consists of hazardous materials. These "lifelines" of transportation and communication are of utmost importance to people living on islands. These systems rely on accurate and up-to-date information and are vulnerable to natural and man-made hazards.

With more growth on the horizon, PSC is committed to facing this increasing challenge with the collaboration of local, national, and international organizations to ensure the continued safety of Pacific Ocean commerce. This is a daunting task, but "A lohe hana nui ke alu like kākou" ("no task is too large if we all work together").

PSC supports activities that enhance the integrity of lifelines and reduce their vulnerability through improved, effective, and appropriate products and services that contribute to a safe, efficient channel through ports and waterways, including information, tools, and services to support efficient marine navigation. This encompasses local surveying, updating shoreline information for nautical charting (electronic, paper, and raster), and working to improve regional height modernization efforts and the National Spatial Reference System.

• Technical Assistance in Geospatial Positioning

NOAA's only regional geodetic advisor is housed at PSC. The products and services provided are the foundation of much of the decision-making and work that others do to make transportation, charting, and safe navigation possible. This work addresses the needs of federal and local governments and the private sector for improved accuracy of geospatial positioning to support geographic information system (GIS), engineering, geophysical, charting, and mapping applications in Hawai'i and the Pacific region. The advisor educates and trains state personnel in preparing data for inclusion in the National Spatial Reference System, assists in planning and coordinating field surveys, provides quality assurance, and serves as the primary contact for relating user needs to the National Geodetic Survey and transferring new technical developments to the local users.

• Ground Control Surveys in Partnership with Federal and Local Government Agencies

The NOAA regional geodetic advisor assisted with the use of the Global Positioning System (GPS) in a variety of applications vital to decision-making, planning, and emergency response planning. These applications included coral reef mapping with the government of Palau, determining the orthometric height of monitoring wells on Maui with the U.S. Geological Survey Water Resources Division, and determining forestry boundaries with the State of Hawai'i Division of Forestry and Wildlife.

• Improved Three-Dimensional Positioning Capabilities in Guam and the CNMI

The Continuously Operating Reference Station (CORS) system enables positioning accuracies that approach a few centimeters, both horizontally and vertically, relative to the National Spatial Reference System. The Natonal Geodetic Survey and PSC partnered with local government agencies to install a new CORS system in Guam and to move and reinstall the CORS system in the CNMI. This information will support the diversity of local and federal government efforts in GIS, engineering, charting, and mapping requirements for planning.

• Nautical Charts and *Coast Pilot* Updates

The safe transport of goods and services is dependent on nautical chart and *Coast Pilot* updates for the main Hawaiian Islands, and initiated updates in the CNMI, Northwestern Hawaiian Islands, and American Samoa. PSC is working with contractors in the CNMI and American Samoa to gather information needed to complete this update. PSC, in partnership with NOAA's Office of Coastal Survey, provides regularly updated charts for all the U.S. Pacific islands. Before PSC's existence, some charts had not been updated since the early part of the 20th century.

• Hawai'i Height Modernization Forum

Height modernization is vital to economic sustainability, as well as resilience. Accurate measurements of heights relative to sea level, as well as the relative movement of the land (plate tectonics) in this geologically dynamic environment, is essential to all aspects of community planning and construction, including the proper siting and alignment of roads, harbors, and airports. PSC supports NOAA's height modernization efforts in Hawai'i through a partnership with the National Geodetic Survey (NGS) Height Modernization Program and the geodetic advisor. Led by NGS, height modernization primarily has been implemented in congressionally designated states that receive funding through the NOAA Geodesy program. The State of Hawai'i, NOAA, and PSC are working collaboratively to promote height modernization and the accurate height information obtained by integrating GPS technology with existing survey techniques. Implementation of height modernization improves the survey network so that GPS technology is used more effectively (and at less cost) in the creation of more accurate mapping products. This also will enhance the state's ability to manage assets, respond to disasters and emergencies, mitigate flood impacts, and plan for the future.

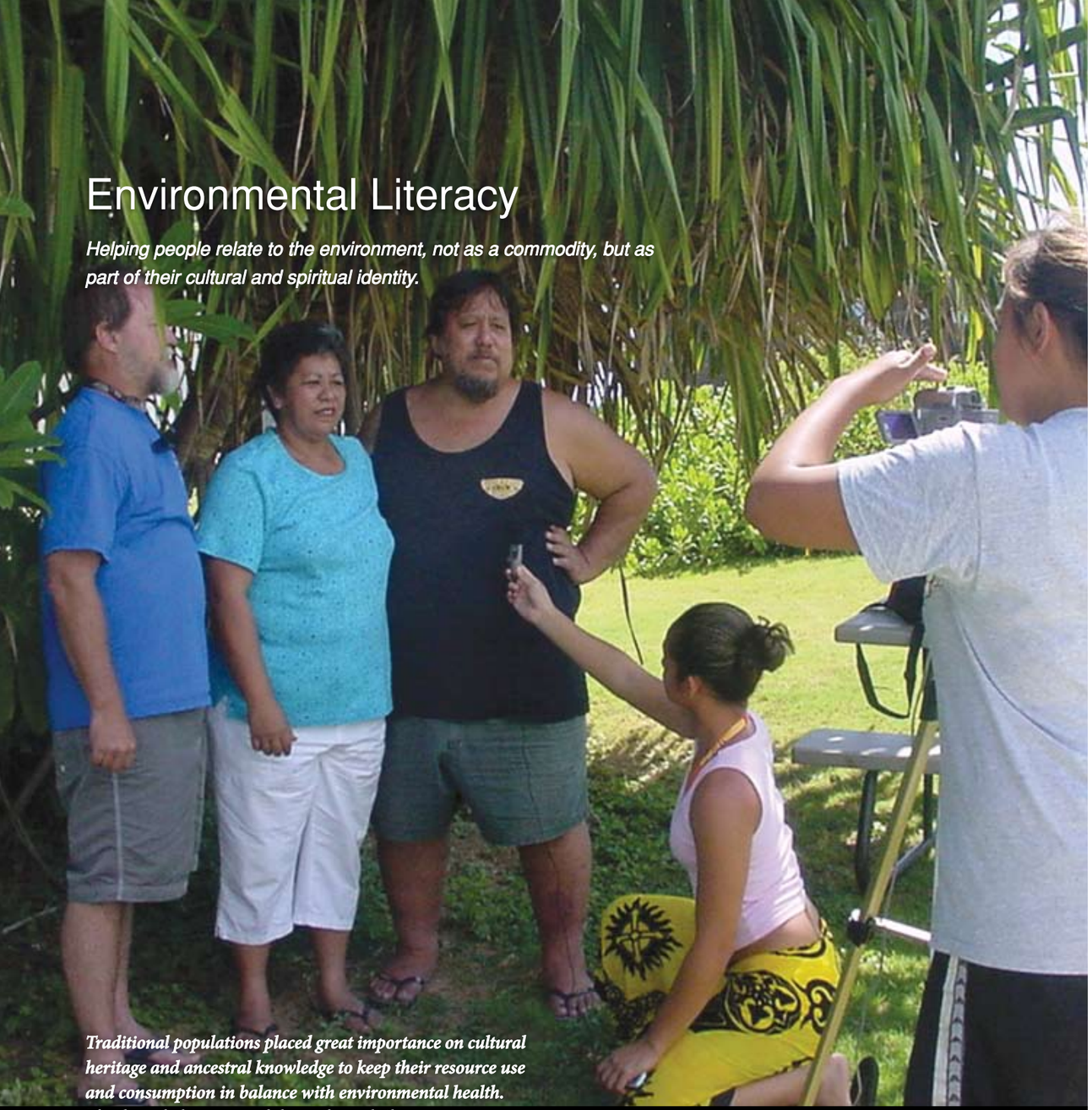
In 2005, the first Hawai'i Height Modernization Forum, co-hosted by PSC and NGS, was held in Honolulu, with over 35 delegates attending from private, city, state, and federal agencies. The delegates met to discuss how height modernization would benefit the entire community by saving lives, money, time, and resources.

PSC and its partners provide technical training, workshops, and hands-on demonstrations to help local decision-makers understand and use GPS-based products.

(Facing page) PSC staff assisted with field tests in Samoa for the NGS Shallow Water Positioning System (SWaPS). This new system provides precise horizontal positions for visible underwater features. Imagery is recorded and entered into a GIS, where data can be viewed, archived, and monitored for changes.

Environmental Literacy

Helping people relate to the environment, not as a commodity, but as part of their cultural and spiritual identity.



Traditional populations placed great importance on cultural heritage and ancestral knowledge to keep their resource use and consumption in balance with environmental health. This knowledge is passed down through the generations by working side-by-side with the elders. By merging traditional knowledge and practices with current education tools and resources, PSC is helping to build and increase the environmental literacy of today and tomorrow while respecting the foundations of yesterday. As we embark on the 21st century, it is important for people to think about long-term resource sustainability and how to respond to environmental changes.

Understanding our Earth and our role as "stewards" requires "a fundamental understanding of the systems of the natural world, the relationships and interactions between the living and non-living environment, and the ability to deal sensibly with problems that involve scientific evidence, uncertainty, and economic, aesthetic, and ethical considerations," according to NOAA's Environmental Literacy Council. PSC's environmental literacy efforts help foster this understanding by serving both the science and education communities, as well as catalyzing NOAA's efforts in the Pacific to educate present and future generations about the changing Earth and its processes, to inspire our nation's youth to pursue scientific careers, and to improve the public's understanding and appreciation of NOAA's missions.

• Advancing NOAA Priorities through Regional Collaboration

This NOAA-wide initiative builds on existing NOAA coordination efforts by combining internal regional coordination with external regional collaboration. To implement this effort, NOAA appointed geographically-based working groups to promote "oneNOAA" thinking, create an organizing principle to encourage cross-NOAA integration, and provide focus for targeted, effective outreach. PSC leads the Pacific Region Team (PRT) efforts to engage diverse programs across the agency and agency partners within the region to address regionally distinct priorities with the full breadth of NOAA's abilities. As part of this effort, NOAA's Pacific region, through PSC's leadership, developed work plans and outreach and communication strategies that build upon internal and external partnerships. As the regional team lead of the PRT, PSC provides leadership and oversight to two Pacific region groups:

The Pacific Region Grants Cooperative (PRGC) is an initiative of federal grant personnel from NOAA offices within the Pacific region. The group uses its experience and resources to benefit Pacific Island constituencies and advance NOAA's mission and goals regionally. The PRGC provides best management practices, training for NOAA grantees, useful information, tools, and resources for financial management, and a means for collaborating, coordinating, and communicating regularly among NOAA line office grants personnel in the Pacific Islands.

The Pacific Regional Outreach Group (PROG) is an initiative of NOAA public affairs, education, and outreach practitioners representing the NOAA offices within Hawai'i. The PROG is promotes "oneNOAA" outreach activities in the region.

PSC employees believe strongly in community involvement. Every year employees and their families participate in marine debris and coastal clean-ups.

• Hawai'i Science and Engineering Fair

The NOAA Pacific region and PSC were major sponsors of the 51st Annual State of Hawai'i Science and Engineering Fair. NOAA personnel from across line offices served as science fair judges and presented 14 awards for agency-related science projects, including the Discover Your World with NOAA award—a trip to a NOAA research facility to meet with agency scientists and researchers. PSC, a proponent of community involvement, also sponsored presentations and displays on three technology platforms: NOAA Second Life, TERRI the interactive artificial-intelligence robot, and Spherical Science on the Go! Students, teachers, and attendees were excited to learn about the innovative NOAA science technology products.

• Kids Day

In partnership with the *Honolulu Advertiser,* Newspapers in Education, and NOAA in the Pacific, PSC sponsored the annual local Kids Day special edition newspaper. Kids Day is

Engaging students at all levels through tailored, hands-on programs encourages environmental stewardship for our coastal zones and the ocean resources.

an annual event in the State of Hawai'i to celebrate kids with an educational theme. The 2008 theme was "The Ocean and Me," focusing on people, the ocean, and coastal issues, and is a celebration of the International Year of the Reef. The special edition newspaper included marine science and ocean-related educational activities, articles, and safety information for kids. Schools received the special edition for use in the classroom.

• "The Living Reef" Commemorates the International Year of the Reef

PSC partnered with The Nature Conservancy and the *Honolulu Advertiser* to print "The Living Reef," a special-edition newspaper insert. The publication commemorated Hawai'i's celebration of the International Year of the Reef. It was distributed to 200 schools statewide for use as a teaching resource.

• Marine Debris Awareness

NOAA's Marine Debris Program and PSC improved the coordination of marine debris activities and strategy planning in Hawai'i, both within NOAA and across federal, state, and county agencies, nongovernmenetal agencies, academia, and the private sector. PSC also co-funded and implemented a project to develop outreach materials on marine debris. These materials incorporate traditional Hawaiian cultural values and are used to raise awareness statewide.

• Student Geographic Information System (GIS) Trainings

PSC partnered with GEAR UP Hawai'i (Gaining Early Awareness and Readiness for Undergraduate Programs), a state program whose mission is to increase significantly the number of low-income students prepared to enter and succeed in post-secondary education. Through this partnership, over 180 middle school students from Kālakaua Middle School in the Kalihi area of O'ahu were provided with hands-on experience in applying advanced technology to create campus maps using GIS and Global Positioning System (GPS) techniques. The successful pilot project resulted in the development of classroom materials that are made available to teachers to incorporate into their lesson plans.

• Marine Science Curriculum

PSC is working with the Hawai'i Department of Education to develop a standards-based marine science curriculum. This initiative will provide local educators with access to NOAA's cutting-edge science and technology through grade-appropriate education resources and experiences. PSC's staff is providing a wide range of resources such as outreach, education, and decision support to state partners. Current curriculum offerings include resources for grades three to five, with additional grades to be completed as funding allows.

Experiential learning such as the deployment of this unmanned sea robot is a vivid example of the hands-on approach to environmental sciences that PSC has fostered through B-Wet Hawai`i.

• Sea Camp

Sea Camp is a pilot initiative for PSC. Participants will learn about the island's unique ecosystems through hands-on activities and experience-based learning. Scientists from NOAA's various disciplines will also be on-site to interact with students and encourage their interest in science.

• Visually Engaging Educational Tools

PSC works with a variety of visually engaging educational tools to show patterns and global events, including the following:

Science on a Sphere (SOS) is a large visualization system that uses computers and video projectors to display animated data onto a six-foot sphere, thus creating an illuminated globe with dynamic, moving images of the atmosphere, oceans, and topography of a planet. SOS is also an outreach tool used by NOAA to describe the environmental processes of the Earth. PSC uses SOS to support NOAA educational initiatives, primarily in informal educational venues such the Bishop Museum in Honolulu and the 'Imiloa Astronomy Center of Hawai'i in Hilo. This unique educational tool amazes audiences of all ages.

Spherical Science on the Go! program is a compelling and interactive way to connect people with the world around them. Using the Magic Planet platform developed by Global Imagination on a smaller self-contained platform, Spherical Science on the Go! displays environmental data and visualizations to allow people to watch weather patterns, sea surface temperature shifts, ocean currents, and more. The stunning visual impact, compact size, and ease of use make it the ideal tool for use in a multi-island state or geographically dispersed region like the Pacific. PSC uses this educational tool as a platform to showcase NOAA data to students in classrooms and to the public at community events, workshops, and exhibits. Data sets and the accompanying descriptive narratives provide viewers with a bird's-eye view of the Earth, various global systems, and events such as climate change, hazards, and natural resource activities.

• B-Wet Hawai'i

The Bay Watershed Education and Training (B-WET) Program–Hawai'i started in 2002 to promote environmental literacy through community and grassroots education opportunities. B-WET Hawai'i assists with development of new science programs, encourages innovative partnerships among environmental education programs throughout the state, and supports environmental education efforts that complement curriculum standards and requirements. From 2004 to 2007, PSC awarded over $2.1 million in grants to local community groups, schools, and organizations for environmental education projects. This innovative program is currently available in three states—California, Maryland, and Hawai'i. PSC manages the Hawai'i B-WET program. Primary recipients include K-12 public and independent schools and school systems, institutions of higher education, commercial and nonprofit organizations, community organizations, and state and local governments. A few of PSC's most successful B-Wet programs to date include the following:

• Watershed to Coral Health

(O'ahu, awarded 2004, 2005, 2006)

The University of Hawai'i, Hawai'i Institute of Marine Biology, developed the Watershed to Coral Health (WAtCH) program to teach students to assess and monitor coral reef health and to familiarize them with coral research efforts in Kāne'ohe Bay, Hawai'i—the largest protected bay in the state. Working in teams, students focus on the impacts of coral bleaching, pollution, invasive algae, and terrestrial-based human activities.

• *Waihona Mau a Mau* (Moloka'i, awarded 2004)

The Nature Conservancy of Hawai'i and Moloka'i High School developed the *Waihona Mau a Mau* ("For an Everlasting Resource Base") project to provide meaningful outdoor experiences for local students. The program incorporates native Hawaiian knowledge and environmental practices to encourage local environmental awareness and stewardship for Moloka'i's marine, estuary, and watershed ecosystems. Students collected data to assess the environmental health of streams, forests, and shorelines. The results were shared with other schools and the community through presentations, print, multimedia formats, and native Hawaiian cultural practices and art forms.

• *Kūpuna* Wisdom Project (Island of Hawai'i, O'ahu, Kaua'i, Moloka'i, Maui, awarded 2004, 2005, 2006)

The Community Conservation Network partnered native Hawaiian *kūpuna*, or elders, with elementary, middle, and high school students for the *Kūpuna* Wisdom Project. This unique project encouraged *kūpuna* to share their traditional knowledge and environmental practices with students participating in environmental stewardship projects. Students used multimedia technology to document interviews with the *kūpuna* and then applied the traditional practices to marine management and stewardship activities. By combining traditional and modern strategies, students learned about environmental decision-making and the importance of balancing the past with the present and future.

• Understanding the Past, Connecting to the Present, and Leading the Future

(Kaua'i, awarded 2006)

Kapa'a Elementary School students learned about ecology through hands-on science activities designed to link the past, present, and future. Participating students studied the Keālia and Kapa'a river system and bays, and contributed to restoration activities. They assessed and monitored local river systems and bays to measure, survey, and test factors that indicate a healthy or impacted environment.

• Waihe'e Watershed Outdoor Experience

(Maui, awarded 2006, 2007)

The Maui Coastal Land Trust developed integrated ecosystem activities for use at the Waihe'e Refuge outdoor laboratory. The refuge includes a variety of protected ecosystems: coastal dune, riparian, wetland, and coastal strand environments. Participants use innovative technology in the field and classroom to monitor, evaluate, analyze, and communicate watershed data and observations from both environmental and cultural perspectives.

• RELATE Program (Island of Hawai'i, awarded 2006)

The University of Hawai'i at Hilo's River Environment, Land Use and Ahupua'a Technologies (RELATE) program encouraged local students to incorporate local cultural practices into environmental awareness and watershed stewardship. Program participants studied the characteristics of the Wailuku River contamination through a variety of scientific investigations, including geospatial technology and human–land interactions in Hilo Bay.

Coastal and Marine Natural Resources

Sustaining the coastal habitat – the coast is highly valued for the services it provides, but is vulnerable to degradation.

The integration of social, cultural, and economic considerations into resource stewardship is of paramount importance to everything PSC does. The original natives of Guam and the Mariana Islands, the Chamorro, said "I kantun tasi ta, i futurata." This Chamorro saying conveys the sentiment, "our coasts, our future." On most Pacific islands, 100 percent of the land is in the coastal zone, making the connection between land and ocean close and indisputable. The health and vitality of the coastal zone have a direct impact on the lives and livelihoods of the people who live there. With increasing coastal population growth and development, the need for creative approaches to achieving sustainable island communities is now more important than ever. PSC embraces this sentiment and is working with its partners to increase public understanding and awareness of coastal habitats and threats in order to protect, enhance, and restore these critical areas.

The natural resource base on which island livelihoods and quality of life depend is vulnerable to human-induced impacts, including hazardous materials releases, ship groundings, invasive species threats, and impacts related to coastal population growth, such as recreational overuse and land-based pollution.

PSC supports activities that help Pacific coastal and ocean agencies, organizations, and communities plan for and respond to such impacts, as well as protect resources for future generations.

• American Samoa Economic Valuation Study of Coral Reefs and Nearshore Coral Resources

PSC worked with NOAA's Office of Ocean and Coastal Resource Management (OCRM) to commission local economic valuation studies of coral reefs and nearshore coastal resources in American Samoa and the Commonwealth of the Northern Mariana Islands (CNMI). Economists funded by PSC and OCRM met with local coral reef and coastal managers to design a study to investigate priority local management questions. These studies were the first of their kind in these territories.

• Hawai'i Contaminated Sites

PSC and NOAA's Office of Response and Restoration (OR&R) initiated a partnership with the State of Hawai'i to help Pacific Island agencies investigate, characterize, remediate, restore, and redevelop contaminated sites, including Formerly Used Defense (FUD) sites, Superfund sites, and brownfields. The partnership works to match OR&R and PSC's combined technical expertise on contaminated sites to local needs. One of the major action areas the partners identified is the need to enhance the brownfields geographic information system

Coral reefs are vital to the local economies in the Pacific region. This "Feather Duster" worm is commonly found on local coral reefs.

(GIS) database. While plans for this larger effort continue, OR&R is assisting the Hawai'i Department of Health in assessing and improving its contaminated sites database.

• Damage Assessment, Remediation, and Restoration Workshops

PSC partnered with NOAA's Damage Assessment, Remediation, and Restoration Program to offer two workshops on natural resource damage assessment (NRDA)—one for managers and one for practitioners in Honolulu, Hawai'i. The workshops introduced participants to the principles of NRDA, discussed examples of acute and chronic damage events keyed to the Pacific Islands, and helped build local capacity for response. Participants from Hawai'i, Guam, CNMI, American Samoa, and California drew upon experience and workshop presentations to develop NRDA plans and processes for a vessel grounding and oil spill case study. Workshop organizers included staff members from the OR&R Restoration Center and NOAA's Office of General Counsel.

PSC activities in the Pacific Region help communities manage and protect marine and coastal resources to support community resilience and ensure resource availability for future generations.

Marine Debris is a major issue in the Pacific. PSC is working with partners to identify areas at risk to help understand the far-reaching implications of this issue.

PSC supports activities that help Pacific coastal and ocean agencies, organizations, and communities plan for and respond to threats to natural resources.

• Hawai'i Ocean Resource Management Plan

PSC supported the Hawai'i Coastal Zone Management Program in furthering the development of the state's Ocean Resources Management Plan. This collaboration primarily focused on supporting the implementation of the Summit-to-Sea Conference in 2004. The conference focused on implementation tools and strategies necessary to develop an effective ocean resources management program, as well as on statewide ocean and coastal issues.

• Environmental Sensitivity Mapping

PSC worked with OR&R to create draft Environmental Sensitivity Index (ESI) maps for American Samoa and to update the ESI maps for Guam and the CNMI. All maps include geologic information on shoreline types, biological resources in coastal areas, and information from NOAA's recent coral surveys, and will be used in responses to oil and chemical spills and for response planning. Detailed information of this type is vital to protecting valuable resources in the waters of the Pacific islands.

• Pacific GIS Support

PSC staff members provided GIS support to the National Marine Sanctuary Program to assist sanctuaries in the Pacific

Maps created in this effort are used to support the management plan review process. Sample maps follow:

- Data set showing surface density of humpback whales in the main Hawaiian Islands from multiple aerial surveys, 1993-2003
- A full set of maps displaying data on sanctuary boundaries, bathymetry, marine animal distributions, corals, and human use for the sanctuary five-year management plan reviews
- Pacific Island region maps of Maritime Heritage sites in Hawai'i
- A GIS Atlas for Fagetele Bay National Marine Sanctuary in American Samoa
- Data layers for Maritime Heritage site in American Samoa

• Economics of Marine Protected Areas

In partnership with OCRM, PSC coordinated and chaired the 2004 Program Managers' Meeting session on the economics of marine protected areas. The session featured speakers from

the World Bank, NOAA's Special Projects Office, the University of Miami, and NOAA's International Program Office, with presentations on topics ranging from site selection to monitoring and enforcement.

• Guam and American Samoa National Marine Managed Area Inventory

The NOAA National Marine Protected Areas Center conducted a national Marine Managed Area (MMA) inventory. In partnership with OCRM, PSC assisted this effort by gathering the information for all territorial sites in Guam and American Samoa. A coral-reef managed area summary report was created using this inventory and additional collected information. The report examines the management status of individual managed areas and identifies challenges and solutions using a qualitative comparison of different management approaches. Preliminary findings for this report, including those for Guam and American Samoa, were presented by OCRM at the U.S. Coral Reef Task Force Meeting in 2003. The information may be viewed at *www.mpa.gov.*

• Coral Reef Conservation Grant Program Effectiveness Report to Congress

The Coral Reef Conservation Grant Program was developed by NOAA to respond to the needs of coral reef jurisdictions in developing and implementing coral reef conservation projects and activities. The program allocated grants from 2001 to 2003. PSC worked with the program to promote and highlight NOAA's coral activities in the region through the congressional report on grant activities, highlights, achievements, and preliminary assessment of the program's effectiveness.

• Teamwork and Information Sharing Is the Philosophical Basis for PSC: *"Ka mana o nā hui"*… "the power of partnerships."

The PSC staff regularly gives presentations and serves on professional and academic conference panels on merging traditional knowledge with resource management. Examples of presentation titles and their corresponding sessions follow:

• "Incorporating Traditional and Local Knowledge into Crosscutting Coastal Management," in the session on Local Knowledge and Island Resource Management: Island Challenges in Resource Management

NOAA divers use transects and grids to collect important monitoring and baseline data vital to managing the coastal and marine resources in the Pacific Region.

• "NOAA Pacific Services Center Natural Hazards-Related Partnership and Tools Development," in the session on Science and Island Resource Policies: Coastal Hazards

• "Pacific Services Center Partnerships in the Region," in the session on Partnerships in Island Resource Management: Enhancing Local, State, and Federal Collaboration

• "Changing Oceans: The Commissions' Reports," in the session on Partnerships in Island Resource Management: Enhancing Regional Island Partnerships (Pacific and Caribbean Islands Alliance)

Mission

Our Hawaiian ancestors knew the importance of working together toward a common goal. For instance, Hawaiian elders say *"pūpūkahi i holomua"* which means "unite to move forward." This concept encourages us to respect each individual, while honoring the magnitude and power of the group. By fostering partnerships with organizations at all levels of government and the private sector, PSC provides information, tools, and services to assist in the sustainable development, management, and preservation of Pacific Island natural resources and to promote the well-being of local communities. Our locally based staff is poised to efficiently and effectively respond to NOAA's regional environmental information and management needs.

In Hawai'i, our *kūpuna* (elders) say "*Ka me heuheu no ia mai na kūpuna,"* which means "the customary way handed down from our ancestors." This sentiment is shared throughout all Pacific Island communities. Respecting the tradition and culture of these islands, as well as the knowledge and practices that have been passed down and refined from generation to generation—and then incorporating these values and this knowledge into the working philosophy of PSC—is of paramount importance to accomplishing our goals and in achieving the larger NOAA mission.

Our mission, to provide integrated, locally relevant services and information that support the well-being of Pacific coastal and ocean communities, economies, and natural resources and our vision are informed by our core values. Although these values are articulated below in the Hawaiian language, they are universal throughout the Pacific region:

Mālama (MAH-la-mah): Care, respect, stewardship
The Hawaiian word *mālama* expresses a value that PSC adopts from Pacific island cultures: the inseparability of humans from the environment and our obligation to care for both. We will deliver products and services to foster effective stewardship of the Pacific coastal and ocean natural resources while promoting care and respect for people, knowledge, traditions, and culture.

Kulia i ka nu'u (koo-LEE-uh ee kah NOO-oo): Excellence, innovation, discovery
The Hawaiian phrase *kulia i ka nu'u*, "strive for the highest," expresses our approach to setting personal and organizational goals and standards. We will view the pursuit of our goals as a journey of discovery, characterized by creativity, learning, and growth.

Pau 'ākoakoa (pow AH-ko-ah-ko-ah): Collaboration, engagement, equity
The phrase "all gathered together," from the Hawaiian *pau 'ākoakoa*, explains PSC's approach to accomplishing its objectives. We will form effective and equitable partnerships that encourage the active and valued involvement of diverse voices and perspectives.

"I kantun tasi ta, i futurata"

Chamorro: "Our coasts, our future"

The mission and work of the Pacific Services Center is best summed up as a commitment to serving the ocean and resource management needs of the Pacific while understanding and respecting the traditions of the past, connecting with the present, and helping to pave the way to a future that retains local diversity and incorporates global perspectives.

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