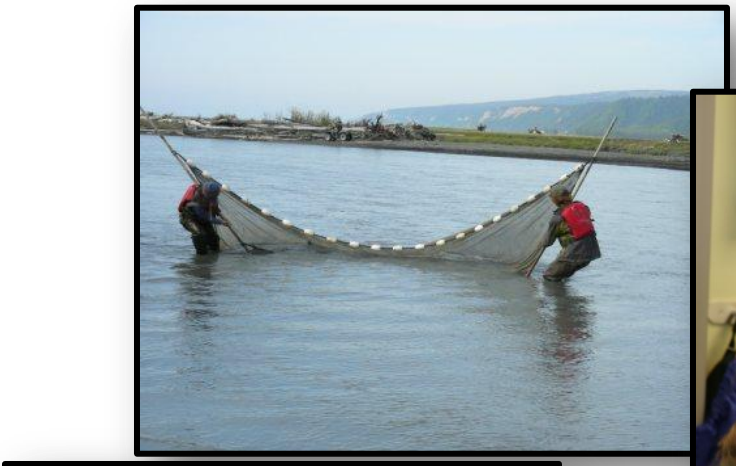
MANAGEMENT PLAN
2012 - 2017

KACHEMAK BAY
NATIONAL ESTUARINE RESEARCH RESERVE



This management plan has been developed in accordance with NOAA regulations, including all provisions for public involvement. It is consistent with the congressional intent of Section 315 of the Coastal Zone Management Act of 1972, as amended.

The Alaska Department of Fish and Game, Kachemak Bay National Estuarine Research Reserve is part of the National Estuarine Research Reserve System (NERRS), established by Section 315 of the Coastal Zone Management Act, as amended. Additional information about the System can be obtained from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 1305 East West Highway – N/ORM5, Silver Spring, MD 20910.

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ACRONYMS

AAC	Alaska Administrative Code
ACMP	Alaska Coastal Management Program
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ADOT	Alaska Department of Transportation
ADPOR	Alaska Division of Parks and Outdoor Recreation, ADNR
AIOVC	Alaska Islands and Ocean Visitor Center
AMNWR	Alaska Maritime National Wildlife Refuge
AOOS	Alaska Ocean Observing System
AS	Alaska Statute
ATV	All-Terrain Vehicle
B-WET	Bay-Watershed Education and Training
CCFHR	Center for Coastal Fisheries and Habitat Research
CDMO	Centralized Data Management Office, NERRS
CFR	Code of Federal Regulations
CHA	Critical Habitat Area
CIAA	Cook Inlet Aquaculture Association
CIRCAC	Cook Inlet Regional Citizens Advisory Council
CISPRI	Cook Inlet Spill Prevention and Response, Inc.
COSEE	Centers for Ocean Sciences Education Excellence
CSC	Coastal Services Center, NOAA

CTP	Coastal Training Program
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DCF	Division of Commercial Fisheries, ADF&G
DML&W	Division of Mining, Land and Water, ADNR
DSF	Division of Sport Fish, ADF&G
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERD	Estuarine Reserves Division
EVOS	*Exxon Valdez* Oil Spill
EVOSTC	Exxon-Valdez Oil Spill Trustee Council
GIS	Geographic Information System
GRF	Graduate Research Fellowship
HAB	Harmful Algal Bloom
KBEEA	Kachemak Bay Environmental Education Alliance
KBL	Kasitsna Bay Laboratory
KBNERR	Kachemak Bay National Estuarine Research Reserve
KBSP	Kachemak Bay State Park
KEEP	K-12 Estuarine Education Program
KHLT	Kachemak Heritage Land Trust
KPB	Kenai Peninsula Borough
KPBSD	Kenai Peninsula Borough School District

KPC	Kenai Peninsula College
KPFHP	Kenai Peninsula Fish Habitat Partnership
LiDAR	Light Detection and Ranging
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NANOOS	Northwest Association of Networked Ocean Observing Systems
NCCOS	National Center for Coastal and Ocean Sciences, NOAA
NERR	National Estuarine Research Reserve
NERRS	National Estuarine Research Reserve System
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service, NOAA
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NWR	National Wildlife Refuge
OCRM	Office of Ocean and Coastal Resource Management, NOAA
PAC	Procurement, Acquisition, Construction
PWS	Prince William Sound
PWSRCAC	Prince William Sound Regional Citizens Advisory Council
RSA	Reimbursable Services Agreement
SCUBA	Self Contained Underwater Breathing Apparatus
SERC	Smithsonian Environmental Research Center
SNAI	Seldovia Native Association, Inc.

SOC	Species of Concern
STEM	Science, Technology, Engineering, Math
SVT	Seldovia Village Tribe
SWMP	System-Wide Monitoring Program
TOTE	Teachers On The Estuary
UAA	University of Alaska, Anchorage
UAF	University of Alaska, Fairbanks
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USF	University of South Florida
USFWS	United States Fish and Wildlife Service
WHSRN	Western Hemisphere Shorebird Reserve Network

ACKNOWLEDGEMENTS

This Management Plan was written by the staff of the Kachemak Bay National Estuarine Research Reserve. As Manager of the Reserve, I would like to thank the KBNERR team for their commitment of time and forethought that went in to the writing of the Plan. From drafting individual chapters, to assisting with graphics and editing, everyone stepped up and contributed when asked. This collaborative effort and commitment is what will make this Plan successful over the coming years. Beyond our Reserve Team, a warm thank you is also extended to our federal partners at the Estuarine Reserves Division at NOAA, as well as our co-workers at the Alaska Department of Fish and Game – Sport Fish Division.

EXECUTIVE SUMMARY

The Kachemak Bay National Estuarine Research Reserve (KBNERR), located in Homer, Alaska and established in 1999, is one of 28 National Estuarine Research Reserves (NERR) designated by the National Oceanic and Atmospheric Administration (NOAA) to promote informed management of the Nation's estuaries and coastal habitats. Located in the fjord biogeographic region, KBNERR is the only fjord in the National Estuarine Research Reserve system. Like other NERRs, KBNERR is a state/federal partnership which, in Alaska, brings together the Alaska Department of Fish and Game, Division of Sport Fish, and the Estuarine Reserves Division within NOAA. The mission of KBNERR is to enhance understanding and appreciation of the Kachemak Bay estuary and adjacent waters to ensure that these ecosystems remain healthy and productive.

Over the next five years of this 2012 - 2017 Management Plan, KBNERR will focus its programmatic energy on two priorities being driven by local and regional needs, as well as data gaps identified by Reserve staff and local stakeholders: climate change and harvested species. These two areas dovetail closely with KBNERR's state and federal partners' areas of emphasis, with the Division of Sport Fish focusing on sport harvested fish and shellfish species, and NOAA emphasizing an understanding of climate change, and addressing questions of adaptation and mitigation.

Scientific evidence that climate change is occurring throughout Alaska is shown in warming temperatures, changing precipitation patterns, altered stream flows, loss of sea ice, increased fire regimes, thawing permafrost, changing ocean salinity, and coastal erosion (ACIA 2004). Kachemak Bay NERR, the only subarctic reserve in the NERR system, is at the front lines of climate change. Locally, environmental change is evidenced by glacial retreat and the resultant land level changes due to isostatic rebound, continued bluff erosion within Reserve boundaries, and documented ocean acidification in Alaska waters that pulse seasonally into the Bay. These and other changes are a daily reminder that the coastal environment is changing. As an emerging regional sentinel site, the Kachemak Bay NERR is poised to help detect environmental change and provide scientifically sound information to coastal resource managers, decision-makers and local residents who live and work in such a dynamic environment.

Alaskans' lives are intimately tied to harvested fish and wildlife resources. Locally, fisheries are a driving force of both natural systems and the economy. People are dependent on these resources for food, jobs, and the role they play in binding diverse cultures. It is imperative that changes to landscapes and habitats that are critical to all life stages of fisheries be studied and

analyzed, and the results communicated to resource managers, coastal decision-makers, and local communities.

This Management Plan addresses five specific goals and related key objectives. Each goal is inclusive of all KBNERR programmatic sectors (e.g. research, monitoring, education, coastal training and administration) in support of the Reserve's mission. Specific KBNERR goals identified in this Plan:

Goal 1. Research, Education and Administration staff function as integrated teams to foster informed coastal decision making

Goal 2. Conduct, collaborate on, and encourage research and monitoring of ecosystems in the Kachemak Bay region that informs decision-making on climate change and harvested species

Goal 3. Foster coastal stewardship actions and inform coastal management through research, training and public education

Goal 4. Increase Kachemak Bay NERR's recognition as a leader in coastal research, training, and education, locally, regionally, and nationally

Goal 5. Provide support and resources to the KBNERR workforce to attain the Reserve's vision and mission of an engaged community which makes informed coastal decisions about Kachemak Bay and adjacent waters

This Plan is only that, a plan on how KBNERR will focus their programmatic energies over the coming five years. The success of the Plan is dependent on the skills and creativity of Reserve staff, with support from its state and federal partners, who will use this guiding document as a road map towards implementation and success in achieving the stated mission. Through commitment to this Plan, KBNERR will continue to be a leader in coastal research, monitoring, education and training throughout Southcentral Alaska.

1.0 INTRODUCTION

1.1 Purpose and Scope of Plan

The National Estuarine Research Reserve System (NERRS or reserve system) is a network of protected areas, which, in partnership with coastal states, are established to provide opportunities for long-term estuarine research, monitoring, education and interpretation, leading to informed coastal stewardship and management. The Kachemak Bay National Estuarine Research Reserve (KBNERR or Kachemak Bay NERR) located in Homer, Alaska is one of 28 reserves designated by the National Oceanic and Atmospheric Administration (NOAA) (Figure 1.). Designated in 1999, the Kachemak Bay NERR is required by NOAA to complete or update a Management Plan for the site every five years, as outlined in the NERR Program Regulations (15 Code of Federal Regulation [CFR] Part 921 – Appendix 1). This five-year document is an update of the previously approved 2005- 2010 Kachemak Bay NERR Management Plan.

Located in the Aleutian sub-region of the fjord biogeographic region, the Kachemak Bay National Estuarine Research Reserve is the only fjord in the National Estuarine Research Reserve system. Like other NERRs, the KBNERR is a state/federal partnership which, in Alaska, brings together the Alaska Department of Fish and Game, Division of Sport Fish, and the federal National Oceanic and Atmospheric Administration, National Ocean Service, Estuarine Reserves Division. While part of a larger state agency, KBNERR has always maintained close working ties with the local communities of Homer, Seldovia, Port Graham and Nanwalek. Over the next five years, the Reserve hopes to strengthen relationships with the local Russian Old Believer villages of Voznesenka, Kachemak Selo, and Razdolna.

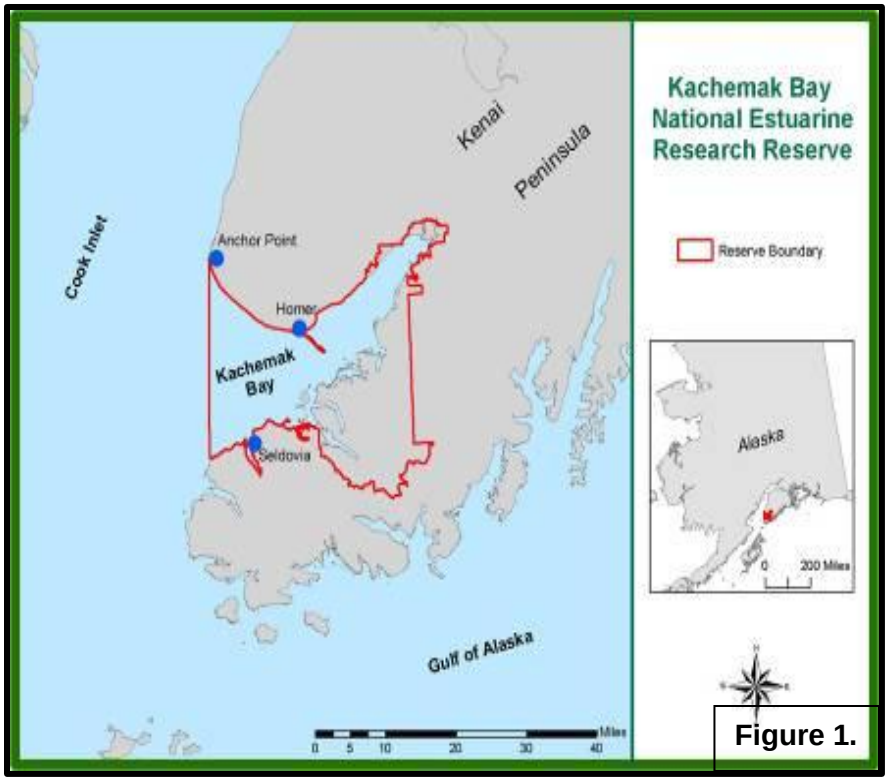


Figure 1.

KBNERR includes approximately 1,500 km2 (372,000 acres) of terrestrial and marine habitats, making it the largest reserve by acreage in the NERR system. The Reserve extends from the Fox River Flats at the head of the Bay, to Point Pogibshi and Anchor Point at the mouth.

This Management Plan for Kachemak Bay NERR builds upon past Reserve successes, and outlines a programmatic vision that builds upon these successes. It challenges Reserve staff to achieve programmatic excellence over the next five years by identifying new goals, objectives and strategies. Over the past five years, Reserve core leadership positions stabilized, leading to consistency in staffing and roles. This organizational stability allowed staff to address on-going funding challenges through competitive grant writing during a time of level or functionally declining state and federal funding. Stability in Reserve leadership also provided all staff with time to focus on the tasks at hand, and to think of future programmatic opportunities and partnerships. As the Reserve moves into its next five years, staff will strive to accomplish the goals outlined in this Plan, while continuing to further refine the Reserve's vision that continues to shape its future direction.

The 2012- 2017 Management Plan is an ambitious vision for the Reserve's programs, but one that is achievable over the coming years. The Plan provides numerous opportunities to challenge Reserve staff professionally toward programmatic excellence. Goals are written to encourage and foster appropriate partnerships which have long been a programmatic strength of KBNERR. Built over the past 12 years, the Reserve has a strong network of existing research, education and training partners, and is always seeking new strategic partnerships.

Given the pursuit of an ambitious 5-year plan, it is reasonable to expect that external factors beyond the Reserve's control, such as funding and staffing fluctuations, may impact the implementation of specific strategies outlined in this document. As much as possible, the Reserve will work with its state and federal partners to accommodate these fluctuations, and, when necessary, adapt the Plan to these changes while maintaining its mission to ensure the long-term health, sustainability, and appreciation of the Kachemak Bay ecosystem.
Over the next five years, KBNERR will focus its programmatic energy on two areas being driven by local and regional needs, as well as data gaps identified by Reserve staff and local stakeholders: climate change and harvested species. These two areas dovetail closely with KBNERR's state and federal partners' areas of emphasis, with the Sport Fish Division focusing on sport harvested fish and shellfish species, and NOAA emphasizing climate change (e.g. understanding, adaptation, and mitigation).

1.2 KBNERR Strategic Focus Areas: 2012 - 2017

Scientific evidence that climate change is occurring throughout Alaska is shown in warming temperatures, changing precipitation patterns, altered stream flows, loss of sea ice, increased fire regimes, thawing permafrost, changing ocean salinity and coastal erosion (ACIA 2004).

Kachemak Bay NERR, the only subarctic reserve in the NERR system, is at the front lines of climate change. Locally, environmental change is evidenced by glacial retreat and the resultant land level changes due to isostatic rebound; bluff erosion continues to occur within Reserve boundaries; and ocean acidification is being documented in Alaska waters that pulse seasonally into the Bay. These and other changes remind us daily that our coastal environment is changing. The Kachemak Bay NERR, as it moves towards functioning as a regional sentinel site,* is poised to help detect environmental change and provide scientifically sound information about sea and land level changes to coastal resource managers, decision-makers and local residents who live and work in such a dynamic environment. All aspects of Alaskans' lives are intimately tied to harvested fish and wildlife resources. Locally, fisheries are a driving force of both our natural systems and the economy. People are dependent on these resources for food, the jobs they provide to local economies, and the role they play as the thread that binds diverse cultures. It is imperative that changes to landscapes and habitats that are critical to all life stages of fisheries be studied, analyzed and the results communicated to resource managers, coastal decision-makers, and our local communities. KBNERR, working with its state partner, the Alaska Department of Fish and Game – Sport Fish Division, will continue to provide scientifically sound data and analysis that can be used by local and regional resource managers and permitting agencies as they work to sustain regional fishery resources.

As a subarctic sentinel site, KBNERR will work over the next five years as part of an integrated team to conduct studies that clarify broad-scale ecological patterns, and to monitor long-term trends in the Bay that have relevance to the broader region of Cook Inlet and the Gulf of Alaska by detecting and monitoring short-term variability and long-term environmental change. These activities will assist KBNERR, the State of Alaska and the entire NERR System to detect changes across time and space. This integrated team will also focus its education and outreach efforts to provide opportunities for local communities and students to learn about climate research being conducted by KBNERR and other regional scientists. In addition, the KBNERR Coastal Training Program will continue to provide science-based climate trainings for our various target audiences.

Over the next five years, the integrated team of KBNERR researchers, educators and science translators will be focusing our efforts on coastal habitats, which are critical in the life histories of state-managed harvested species of anadromous and resident fish, and local shellfish. State and federal fish and wildlife managers will continue to be a primary training audience of the Coastal Training Program, and KBNERR CTP will work closely with the Reserve's research

* Sentinel site defined: Areas in coastal and marine environments that have the operational capacity for intensive study and sustained observations to detect and understand changes in the ecosystems they represent. Observational data are collected at discrete instruments and measurement stations (platforms and sensors) within each site, providing information and data that can be synthesized to provide an understanding of the ecological status and trends in physical and biological variables of interest. (2011, NERRS Sentinel Sites Program: A guidance document.)

team to outreach findings to this audience. The KBNERR education team will continue to provide education and outreach activities that foster participation in, and stewardship of sport and personal use fisheries. They will work closely with the research team and CTP to integrate KBNERR research findings into K-12 classroom and field activities, and programs targeted at the general public. And, they will assist in the outreach of Reserve activities through various media outlets and public events.

1.3 Summary of KBNERR Accomplishments: 2005-2011

The time period covered by the previous management plan saw significant accomplishments from all programmatic sectors within KBNERR. The following are representative accomplishments by program category (sector).

1.3.1 Administration and Staffing

- Programmatic oversight and integration into the Division of Sport Fish was strengthened. Additional financial support was committed by the Division, which brought a level of stability to the administration, research and education (community monitoring) programs.
- KBNERR leadership stabilized with the appointments of a new Manager, Research Coordinator and Education Coordinator.
- An Assistant Manager was named, followed by administrative reorganization.
- KBNERR staff wrote a number of successful national and regional competitive grant proposals resulting in a significant increase in workload to the administrative team. KBNERR administrative staff consistently met this challenge and provided exceptional grant and budget tracking support to Reserve programs. (Appendix 2)
- The KBNERR Community Council continued to be active in bringing community input to the Reserve. The Council was the driving force behind the Reserve receiving non-federal match dollars through state Capital Improvement Project funds to complete the design, fabrication and installation of new exhibits, and produce a 9-minute video about KBNERR and Kachemak Bay for display at the Alaska Islands and Ocean Visitor Center.
- KBNERR hosted two successful NOAA 312 program evaluations. Findings are outlined on pages 21-23 of this document.
- KBNERR staff contributed significant time to actively participate in system-wide NERR committees: Strategic Committee, CTP Oversight Committee, Climate Change "Cheetah" Team, SWMP Oversight Committee, and numerous sector workgroups.

1.3.2 Research and Monitoring

KBNERR has positioned itself as a significant research and monitoring organization within Kachemak Bay and Cook Inlet. The research team conducted a wide range of applied

research projects that address local and regional resource issues. Likewise, the continuation of system-wide monitoring programs, and the establishment of new monitoring programs over the time period has strengthened KBNERR's role as a science leader in the region, as scientists and decision-makers look for local data on our changing climate.

- KBNERR maintained a fully functional System-wide Monitoring Program (SWMP). An additional meteorological station was deployed near the northwest corner of the Reserve, adjacent to the coast of Cook Inlet, west of Anchor Point.
- KBNERR received funds to conduct SWMP biological monitoring activities, to conduct initial planning and field data collection in two salt marshes within KBNERR boundaries (Fox River Flats, Beluga Slough).
- KBNERR research staff wrote or collaborated on several funded grant proposals to a variety of funding sources, including: Alaska Department of Fish and Game, Alaska Sustainable Salmon Fund, Exxon Valdez Oil Spill Trustee Council, Cook Inlet Regional Citizens Advisory Council, North Pacific Research Board, NOAA, National Marine Mammal Lab, Environmental Protection Agency, Army Corps of Engineers and U.S. Fish and Wildlife Service. Grant collaborators include; University of Alaska Anchorage, University of Alaska Fairbanks, Baylor University, University of South Florida, University of Washington, and Smithsonian Environmental Research Center.
- KBNERR hosted 5 NERR Graduate Research Fellows (2 Ph.D., 3 M.S.) who researched:
    - The effects of flow on local and regional patterns of diversity and species invasions: an experimental approach. J. Palardy
    - The influence of estuarine habitats on the expression of life history characteristics in juvenile coho salmon. T. Hoem-Nehrer
    - Habitat use by macroalgal associated crab populations in Kachemak Bay, Alaska. B. Daley
    - Larval transport of Tanner (*Chionoecetes bairdi*) and Dungeness (*Cancer magister*) crab between inner and outer Kachemak Bay. M. Murphy
    - Effects of lower pH on Tanner crab (*Chionoecetes bairdi*) larval development in Kachemak Bay, Alaska. R. Descoteaux
- Working cooperatively with the City of Homer and the Kenai Peninsula Borough, KBNERR staff documented coastal change (erosion) using historic aerial imagery. By ortho-rectifying these images, KBNERR staff estimated the rate of shoreline change over the past 50+ years within the Homer City limits, and extending along the western shoreline of the Kenai Peninsula to the Forelands (upper Cook Inlet near Kenai, AK).
- KBNERR, along with academic and research partners, conducted an intensive study of the Anchor River watershed and its importance to anadromous fish. Areas of focus included headwater stream wetland settings and ground water influence and their relationship to juvenile salmon, marine derived nutrients, and overwintering habitat use by juvenile salmon in headwater streams.

- KBNERR partnered with the University of Alaska Fairbanks and the University of Washington on a multi-year study of Fox River Flats salt marsh habitats and their importance and use by juvenile salmon.
- KBNERR research staff, in cooperation with Division of Sport Fish staff from the Homer office, examined the spawning, recruitment, and growth of hardshell (littleneck) clams, *Leucoma staminea.*
- KBNERR partnered with local research and education entities to co-sponsor the 2006 and 2009 Kachemak Bay Science Conferences.
- KBNERR research staff, in cooperation with the U.S. Fish and Wildlife Service, conducted research on sea otters as a result of the unusual mortality event (UME) declared for Kachemak Bay and Lower Cook Inlet.

1.3.3 Education and Outreach

KBNERR education programming continued to attract large numbers of K-12 classes, families and individuals to a wide array of education opportunities throughout the period of the 2005-2010 Management Plan. *Discovery Labs* provided the highest level of visibility to the Reserve, both in numbers of participants and volunteers to the education programs. The Reserve remained active in partner activities, and was instrumental in maintaining Homer as an education destination for the region's K-12 school students. Accomplishments over the last 5 years include:

- Staff continue to enhance and improve on the KBNERR signature education program – *Discovery Labs*. Public participation in these labs continued at a high level as evidenced by the long-term average of 120 visitors per lab. The success of these programs has led the Reserve to use this inquiry-based program as the primary delivery mechanism for all K-12 and public education programs.
- KBNERR education staff were active participants and took on leadership roles in the Kachemak Bay Environmental Education Alliance (KBEEA), and the associated sub-group, *Partners in Education,* which is composed of several education partner organizations: KBNERR, Pratt Museum, Center for Alaskan Coastal Studies, Alaska Maritime National Wildlife Refuge, Lake Clark National Park and Preserve, and the Kachemak Bay Campus – Kenai Peninsula College, University of Alaska Anchorage.
- KBNERR staff partnered with the Municipality of Anchorage on their award winning *Salmon in the City* project. Reserve staff designed the project logo, and produced a series of DVD videos for distribution throughout the Anchorage Bowl.
- KBNERR education and research staff designed a community monitoring program using a dedicated group of local volunteers to help monitor for invasive European green crab, invasive tunicates, and harmful algal blooms.

- KBNERR education staff designed a program to encourage youth and their families to get outdoors and participate in unstructured and creative outdoor activities. *Kids in Nature* grew from a local grassroots effort in the Homer community. Participant families are provided with a "tote bag" of supplies – all of which can be used to encourage kids to explore nature. From these beginnings, a "program toolkit" has been developed and is now being used nationally by community organizers to engage local families in a similar program.
- KBNERR education staff organized and conducted two day-long BioBlitz activities in the Homer area. Local families and individuals teamed up with KBNERR staff to collect and document a wide range of plants and animals in Beluga Slough and Cottonwood Creek.
- KBNERR education staff developed and delivered numerous fish and sport fishing related activities, including Discovery Labs and family ice fishing workshops. A fishing rod loaner program was established to encourage youth and families to participate in sport fishing activities.

1.3.4 Coastal Training Program

KBNERR Coastal Training Program (CTP) was challenged over a significant portion of the 2005-2010 Management Plan by the need to fill the coordinator position. That said, the program achieved programmatic excellence during those years when a coordinator was in place. The Reserve hosted or partnered on several trainings and workshops, and built capacity with local and regional coastal decision-makers.

- A series of workshops was developed "linking policy to science." Individual workshop topics included coastal floodplains, wetlands, and roads.
- KBNERR CTP sponsored several NOAA Coastal Services Center classes. These classes, provided at no-cost to participants, have generated interest from throughout Alaska. Topics included: Project Design & Evaluation, Coastal GIS, and Public Issues &Conflict Management.
- KBNERR CTP conducted several needs assessments with target audiences leading to a wide range of user-driven trainings and workshops.
- All KBNERR CTP program strategy and planning documents were revised and approved.
- KBNERR CTP facilitated several local work groups, and assisted in developing two Kenai Peninsula work groups (watershed and marine) representing state and federal government agencies and regional non-governmental organizations.
- KBNERR CTP led several "What's New in the Bay" outreach events highlighting the research and monitoring work of KBNERR staff and others around the region.
- KBNERR CTP, along with federal and NGO partners, hosted a variety of trainings and workshops, which included: Fish Passage, Celebrating the Anchor River through Science

and Stories, Tidal Energy in Kachemak Bay, Local Climate Change Impacts, Physical Oceanography Workshop, and Coastal Erosion.

2.0 NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM

The National Estuarine Research Reserve System is a network of protected areas representing different biogeographic regions of the United States that are protected for long-term research, water-quality monitoring, education and coastal stewardship. Established by the Coastal Zone Management Act of 1972, as amended, the reserve system is a partnership program between the National Oceanic and Atmospheric Administration and the coastal states. NOAA provides partial funding, national guidance and technical assistance. Each reserve is managed on daily basis by a lead state agency or university, with input from local partners. In Alaska, the Kachemak Bay National Estuarine Research Reserve's state partner is the Alaska Department of Fish and Game – Sport Fish Division. The Kachemak Bay NERR was designated in 1999 as the 23rd reserve in the NERR System.

2.1 NOAA - NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM FEDERAL PARTNER

The National Estuarine Research Reserve System was created by the Coastal Zone Management Act (CZMA) of 1972, as amended, 16 USC Section 1461, to augment the Federal Coastal Zone Management (CZM) Program. The CZM Program is dedicated to comprehensive, sustainable management of the nation's coasts.

Protected for long-term research, monitoring, education and coastal stewardship, the Reserve System uses its network of twenty-eight living laboratories to help understand and find solutions to crucial issues facing America's coastal communities. The System is currently represented by 28 reserves in 23 coastal states and territories, protecting over 1.3 million acres of estuarine lands and waters. All reserves within the NERR System are established and managed through a state/federal partnership to ensure long-term management and protection.

With the National Oceanic and Atmospheric Administration (NOAA) as the lead agency for the National Estuarine Research Reserve System (NERRS or Reserve System), it is essential that the individual NERRs nest themselves within the overarching goals identified by NOAA's Next Generation Strategic Plan, 2011-2016:

- Climate Adaptation and Mitigation: An informed society anticipating and responding to climate and its impacts;

- Healthy Oceans: Marine fisheries, habitats, and biodiversity are sustained within healthy and productive ecosystems;
- Resilient Coastal Communities and Economies: Coastal and Great Lakes communities are environmentally and economically sustainable;
- Weather Ready Nation: Society is prepared for and responds to weather related events.

The Reserve System also develops their own goals, strategies, and specific action plans to further support NOAA's mission t*o understand and anticipate changes in climate, weather, oceans, and coasts, share that knowledge and information with others, and to conserve and manage marine resources*.

Process for Reserve Designation and Operation

Under Federal law (16 USC Section 1461), a state can nominate an estuarine ecosystem for Research Reserve status as long as the site meets the following criteria:

- The area is representative of its biogeographic region, is suitable for long-term research, and contributes to the biogeographical and typological balance of the System.
- The law of the coastal state provides long-term protection for the proposed Reserve's resources to ensure a stable environment for research.
- Designation of the site as a Reserve will serve to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation.
- The coastal state has complied with the requirements of any regulations issued by the Secretary [of Commerce].

Reserve boundaries must include an adequate portion of the key land and water areas of the natural system to approximate an ecological unit and to ensure effective conservation.

If the proposed site is accepted into the NERR System, it is eligible for NOAA financial assistance on a cost-share basis with the state. The state exercises administrative and management control, consistent with its obligations to NOAA, as outlined in a Memorandum of Understanding. A reserve may apply to NOAA's Estuarine Reserves Division (ERD) for annual funds to help support operations, research, monitoring, education/interpretation, stewardship, development projects, facility construction, and land acquisition.

2.1.1 Mission

As stated in the NERRS regulations, 15 CFR Part 921(a), the National Estuarine Research Reserve System mission is:

The establishment and management, through Federal-state cooperation, of a national system of Estuarine Research Reserves representative of the various regions and estuarine types in the United States. Estuarine Research Reserves are established to provide opportunities for long-term research, education, and interpretation.

To retain focus on the above referenced mission, NOAA developed goals for the NERRS that serve as the basis for national programmatic development.

2.1.2 Overarching NERR Goals

Federal regulations, 15 CFR Part 921(b), provide five specific goals for the Reserve System:

- Ensure a stable environment for research through long-term protection of National Estuarine Research Reserve resources;
- Address coastal management issues identified as significant through coordinated estuarine research within the System;
- Enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation;
- Promote federal, state, public, and private use of one or more Reserves within the System when such entities conduct estuarine research; and,
- Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

These overarching goals provide a context for linking the NERR's at the national level, while allowing sites to capitalize on their individuality and site-specific, or placed-based, issues. The mission and goals of the individual reserves dovetail with the mission and goals of the NERR System developed collectively by NOAA's Estuarine Reserves Division (ERD) and the reserves.

2.1.3 National Estuarine Research Reserve System Strategic Goals 2011-2016

The Reserve System began a strategic planning process in 1994 in an effort to help NOAA achieve its environmental stewardship mission to 'sustain healthy coasts.' In conjunction with the strategic planning process, ERD and reserve staff has conducted a multi-year action planning process on an annual basis since 1996. The recent 2011-2016 five-year action plan provides an overall vision and direction for the Reserve System during this time period. The goals and objectives of Kachemak Bay NERR articulated within this plan align with the goals and objectives of the 2011-2016 NERR Strategic Plan.

The objectives for the NERRS Strategic Plan goals (revised 2010) are listed in Table 1.

Table 1. NERRS Strategic Plan Goals and Objectives, 2011 - 2016
Goal 1: Protected Places: Estuaries and coastal watersheds are better protected and managed by implementing place-based approaches at Reserves.
Objective 1: Increase permanent protection and restoration of key areas in reserve watersheds to improve coastal habitat quantity, quality, and resiliency to climate change impacts.
Objective 2: Develop, demonstrate, and evaluate tools and practices at reserves that advance progress on habitat protection, water quality, and climate change impacts.
Objective 3: Expand biogeographic representation of the Nation's estuaries in the reserve system by designating new reserves.
Goal 2: Science: NERRS scientific investigations improve understanding and inform decisions affecting estuaries and coastal watersheds.
Objective 1: Expand capacity to monitor changes in habitat and water quality and quantity in response to land use and climate change drivers.
Objective 2: Improve understanding of the effects of climate change and coastal pollution on estuarine and coastal ecology, habitats, and ecosystem processes.
Objective 3: Characterize coastal watersheds and estuary ecosystems and quantify ecosystem services to support ecosystem-based management of natural and built communities.
Objective 4: Increase social science research and use of social information to foster coastal stewards that value and protect estuaries.
Goal 3: People: NERRS education and training increases participants' environmental literacy and ability to make science-based decisions related to estuaries and coastal watersheds.
Objective 1: Enhance the capacity and skills of teachers and students to understand and use NERRS data and information for inquiry-based learning.
Objective 2: Increase estuary literacy and promote active stewardship among public audiences through the development and delivery of tools and programs addressing climate change, habitat protection, and water quality.
Objective 3: Improve the capacity and skills of the coastal decision makers to use and apply science-based information in decisions that affect estuaries and coastal watersheds.

2.2 BIOGEOGRAPHIC REGIONS

NOAA has identified eleven distinct biogeographic regions and twenty-nine sub-regions in the United States, each of which contains several types of estuarine ecosystems (15 CFR Part 921, NERRS Typological Classification Scheme – Figure 2., Appendix 3).

The Kachemak Bay NERR is representative of the Aleutian Island sub-region of the Fjord biogeographic region. It is the only reserve that currently exists in the Fjord region, which, in the United States, is situated entirely within the state of Alaska.

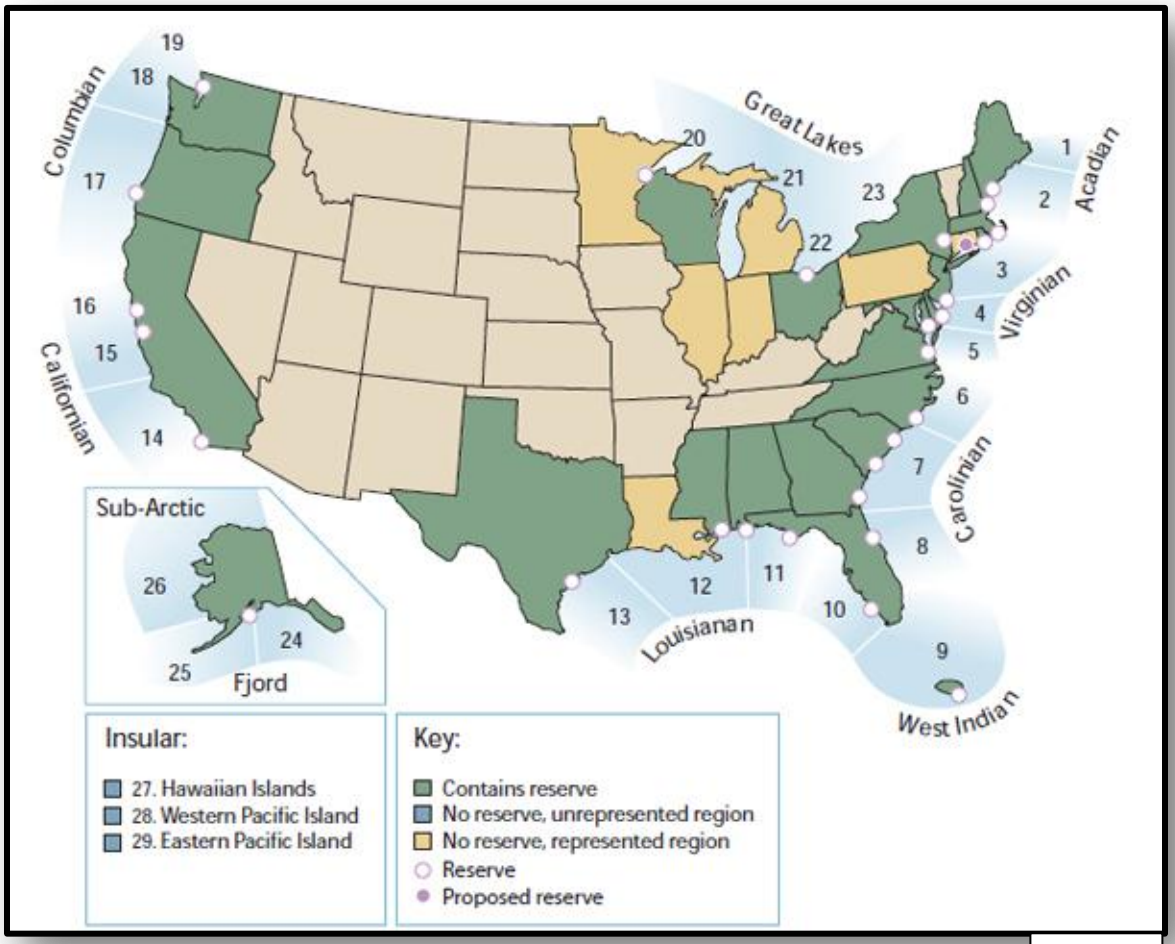


Figure 2.

When complete, the NERR System will contain examples of estuarine hydrologic and biological types characteristic of each biogeographic region. Each reserve is responsible for conducting research, and providing educational and interpretive services that are applicable to its region. As of 2010, the NERR System includes twenty-eight reserves. (Figure 3.).

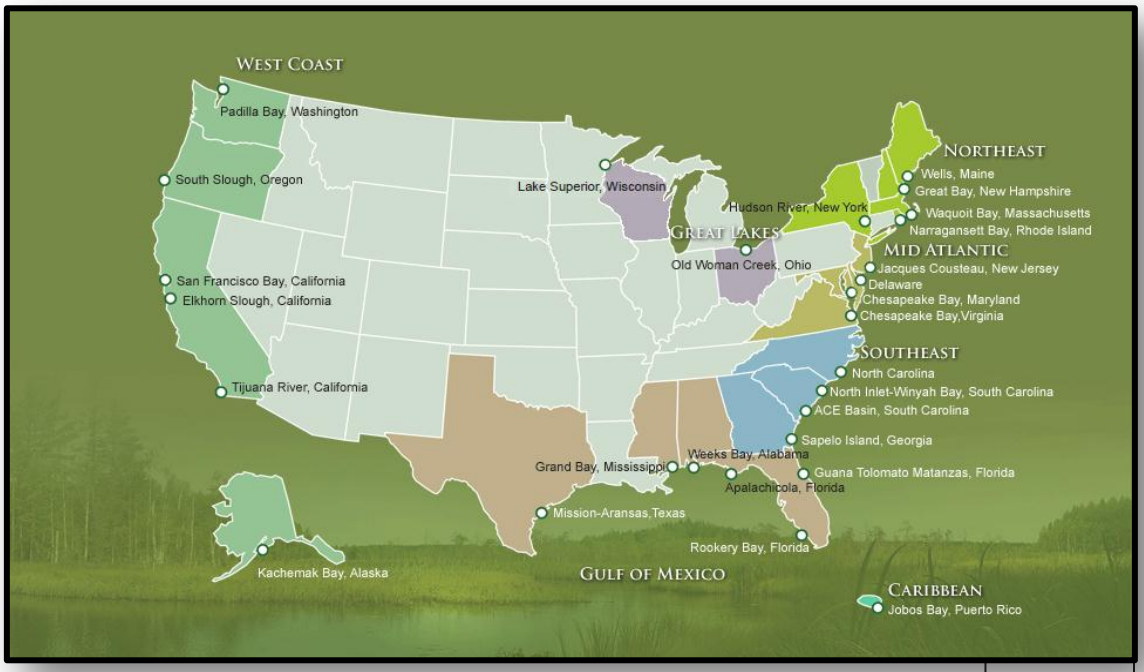


Figure 3.

Individual Reserves are listed in alphabetical order with designation dates in Table 2.

Table 2. NERRS with Designation Dates

NERR	Designation	NERR	Designation
Ace Basin, SC	1992	Narragansett Bay, RI	1980
Apalachicola, FL	1979	North Carolina, NC	1985, 1991
Chesapeake Bay, MD	1985, 1990	North Inlet-Winyah Bay, SC	1992
Chesapeake Bay, VA	1991	Old Woman Creek, OH	1980
Delaware, DE	1993	Padilla Bay, WA	1980
Elkhorn Slough, CA	1979	Rookery Bay, FL	1978
Grand Bay, MS	1999	San Francisco Bay, CA	2003
Great Bay, NH	1989	Sapelo Island, GA	1976
Guana Tolomato Matanzas, FL	1999	South Slough, OR	1974
Hudson River, NY	1982	Texas, TX	2006
Jacques Cousteau, NJ	1998	Tijuana River, CA	1982
Jobos Bay, PR	1981	Waquoit Bay, MA	1988
Kachemak Bay, AK	1999	Weeks Bay, AL	1986
Lake Superior, WI	2010	Wells, ME	1984

2.3 NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM ADMINISTRATIVE FRAMEWORK

The Estuarine Reserves Division (ERD) within the Office of Ocean and Coastal Resource Management (OCRM) administers the Reserve System. The Division establishes standards for designating and operating reserves, provides support for reserve operations and system-wide programming, undertakes projects that benefit the Reserve System, and integrates information from individual reserves to support decision-making at the national level.

NOAA also coordinates with each Reserve's state partner. Kachemak Bay NERR's state partner is the Alaska Department of Fish and Game (ADF&G). Reserve operations are administered under ADF&G's Division of Sport Fish, as outlined, in part, in a Memorandum of Understanding (MOU) between ADF&G and NOAA (Appendix 4). This MOU establishes the state/federal framework for coordination, cooperation, and communication regarding the Reserve.

The management structure for NOAA and ADF&G is as follows:

U. S Department of Commerce
|
National Oceanic and
Atmospheric Administration
(NOAA)
|
National Ocean Service (NOS)
|
Office of Coastal and
Ocean Resource Management
(OCRM)
|
Estuarine Reserves Division (ERD)

Kachemak Bay National Estuarine Research Reserve (KBNERR)

Alaska Department
of Fish and Game
(ADF&G)
|
Sport Fish
Division
(SFD)

2.4 State of Alaska – Alaska Department of Fish and Game: National Estuarine Research Reserve State Partner

The Alaska Department of Fish and Game's mission is to *protect, maintain, and improve the fish, game, and aquatic plant resources of the State, and manage their use and development for the maximum benefit of the people of the State, consistent with the sustained yield principle.* To that end, the Department supports seven Divisions: Sport Fish, Commercial Fisheries, Wildlife Conservation, Habitat, Subsistence, and Boards and Administrative Services. The Reserve is housed within the Division of Sport Fish.

2.4.1 DIVISION OF SPORT FISH

The Division of Sport Fish was established in 1951 as part of Alaska's territorial government to oversee Alaska's developing sport fisheries. Its creation coincided with the passage of the Dingle-Johnson Act that gave states and territories dedicated federal funds to conduct scientific research related to recreational fisheries. Today, the Division is a discrete entity within state government responsible for oversight and management of Alaska's sport and personal use fisheries which has an estimated annual state-wide economic impact of $1.4 billion. The recently completed 2010 – 2014 Strategic Plan details the mission, vision, goals, objectives, and strategies of the Division of Sport Fish.

In Fiscal Year 2011, the Division had an annual budget of approximately $30 million. The Division's primary funding sources are the State's Fish and Game Fund and the Federal Sport Fish Restoration Program. Nearly all of these funds are derived from user-pay sources, including the sale of fishing licenses, stamps, and a federal excise tax on sport fishing-related equipment and fuel.

The Division of Sport Fish's mission is to:

Protect and improve the state's recreational fisheries resources.

2.4.2 Division of Sport Fish Strategic Plan 2010 – 2014

The Division of Sport Fish Strategic Plan supports the recognition that sport fishing opportunities are a driving force of Alaska's economy and essential to the culture and well-being of all Alaskans. The Division's Plan provides a road map for current and future actions and activities, as well as helping to frame budget decisions. As with any dynamic planning process, this 5-year plan continues to be refined over time, with active public involvement in making necessary modifications. The goals and objectives of the Division's Strategic Plan are outlined in Table 3. below. The goals and objectives of Kachemak Bay NERR complement the goals and objectives of the Division's strategic vision.

The Kachemak Bay NERR's research and education programs compliment the Sport Fish Division in multiple ways. Research projects provide Area Management Biologists with relevant habitat data that can be used to assist with local and regional management decisions. Data from monitoring programs, such as the KBNERR System-wide Monitoring Program, coupled with the KBNERR Community Monitoring program, have been used to inform local fishery managers about harmful algal blooms and their impact on stocked salmon smolts. KBNERR education programs emphasize resource stewardship principals, and provide information about sustainable fisheries to students, local residents, and thousands of visitors from all over the world each year. The Reserve is also involved in "growing" anglers by promoting sport fishing to youth and families through skills based trainings, free use of fishing poles and equipment, and organizing and conducting fishing events on the water or ice, depending on the season.

Table 3. ADF&G, Division of Sport Fish Strategic Plan Goals and Objectives
Goal 1: Fisheries Management: Ensure the sustained use of Alaska's recreational fisheries while optimizing economic and social benefits.
Objective 1: **Use area- and fishery-based management to develop and achieve management objectives consistent with the sustained yield principle**
Objective 2: **Inform the public about management practices and policies so they are knowledgeable about and can participate meaningfully in the regulatory process**
Objective 3: **Consider recreational angler preferences and impacts in decision-making processes, including both social and economic effects of management actions**
Objective 4: **Achieve recreational angler compliance with laws and regulations**
Objective 5: **Develop and cultivate associations with recreational anglers, the public, and relevant agencies**
Objective 6: **Minimize impacts of invasive species on fish stocks, recreational fisheries, and fish habitat**
Goal 2: Fisheries Research: Promote excellence in fisheries research
Objective 1: **Plan research projects that are scientifically and statistically sound, cost-effective, and address management information needs**
Objective 2: **Conduct research to improve our understanding of population dynamics, life histories, and habitat requirements of recreationally-fished species**

Objective 3: **Conduct research to improve our understanding of use patterns, satisfaction, and preferences of recreational anglers**
Objective 4: **Publish research results that are peer-reviewed, well-written and timely**
Goal 3: Fisheries Enhancement: Diversify recreational fishing opportunities via supplemental production of hatchery-reared fish
Objective 1: **Conduct enhancement activities in a manner that protects wild fish and habitats**
Objective 2: **Meet regional enhancement needs for prioritized anadromous and freshwater fisheries**
Objective 3: **Produce fish in a manner that is biologically sound, cost-effective, and that utilizes innovative practices**
Objective 4: **Inform the public and division staff about fishery enhancement**
Goal 4: Angler Access: Protect and improve public access to recreational fisheries resources
Objective 1: **Secure and protect recreational angler access to public lands**
Objective 2: **Maintain or improve current access sites and facilities**
Objective 3: **Identify, prioritize, and develop new access sites and facilities projects**
Objective 4: **Inform division staff and the public about access opportunities and the decision-making process**
Goal 5. Information and Education Services: Inform and educate the public about recreational fishing with an emphasis on exceptional customer service
Objective 1: **Inform recreational anglers and division staff about Alaska's recreational fishing opportunities, angler access, regulations, and fisheries management**
Objective 2: **Promote participation in recreational fishing activities**
Objective 3: **Provide the public and division staff with information and products that are consistent, accurate, and easily found and understood**
Objective 4: **Increase public understanding of and participation in the stewardship of Alaska's recreational fisheries resources**
Goal 6. Fish Habitat: Conserve habitat to sustain recreational fisheries resources
Objective 1: **Protect fish habitat to sustain recreational fisheries**
Objective 2: **Improve or restore degraded fish habitat**
Objective 3: **Develop and cultivate partnerships to conserve fish habitat**
Objective 4: **Inform the public about the division's habitat conservation efforts**
Goal 7. Workforce Support: Provide exceptional support to our workforce to attain the Division's vision and goals
Objective 1: **Recruit, develop, and retain highly qualified and motivated staff**
Objective 2: **Provide staff with sufficient resources to perform assigned work**
Objective 3: **Promote a strong team approach between division staff, the regions, and the department's divisions**
Objective 4: **Provide timely and effective administrative support**
Objective 5: **Ensure that funding is sustainable and aligned with the division's priorities and programs**

2.5 Section 312 Program Evaluations

As required by federal regulation, 15 CFR Part 921.40, OCRM periodically evaluates reserves for compliance with Federal requirements and with the individual reserve's federally-approved management plan. As such, NOAA conducts periodic performance evaluations of reserves as a requirement of Sections 312 and 315 of the CZMA. Evaluations are conducted at least once every four years to determine whether the state's management is consistent with NERRS programmatic goals and objectives. Financial assistance from NOAA for reserve operations and programs is dependent upon satisfactory performance evaluations.

Over the last five years, KBNERR has had two 312 evaluations held in Homer: Spring 2006 and Spring 2009. The findings of these reviews identified the following necessary actions and program suggestions:

2006 Evaluation findings:

Necessary Action: By the end of the exhibit construction award period, the Reserve must identify non-federal match funds for the exhibits planned at the Visitor Center or return the funds unexpended to NOAA.

KBNERR Action: **$133,000 match secured from the State of Alaska. The Kachemak Bay Community Council was instrumental in securing the match.**

Program Suggestion: The Reserve and Division are encouraged to continue their efforts to gain more state financial support for core positions, particularly the education and research coordinators.

KBNERR Action: **Between 2006-2009 the leadership of the ADF&G – Sport Fish Division brought additional funding to KBNERR from a variety of sources. Administrative staff are now funded from General Fund monies, and the KBNERR Manager is partially funded from this fund as well. And, ADF&G – SF also committed over $275,000 of State Wildlife Grant funds to conduct research and monitoring projects.**

Program Suggestion: The Reserve should explore stronger state support for the Visitor Center maintenance costs.

KBNERR Action: **KBNERR leadership explored the availability of additional state support for Visitor Center operations with ADF&G – Sport Fish leadership. Due to limited state budgets no new or additional state support was identified to support facility operations.**

Program Suggestion: The Reserve should explore whether additional opportunities exist for partnership and collaboration with the Alaska Coastal Management Program.

KBNERR Action: **KBNERR leadership explored opportunities to partner and collaborate with the Alaska Coastal Management Program (ACMP). As a result of these discussions two areas were identified where the two programs could enhance their partnership – those being the Coastal and Estuarine Land Conservation Program (CELCP) and through coastal training and workshops. The KBNERR Manager joined the Alaska CELCP proposal review committee, and the KBNERR Coastal Training Program Coordinator worked closely with the ACMP to develop and/or facilitate trainings and workshops for Coastal Program Coordinators from throughout Alaska.**

Program Suggestion: The Reserve should install permanent signage at the Visitor Center identifying the Reserve and NOAA and should consider other strategies to increase visibility of the Reserve at the Center.

KBNERR Action: **KBNERR, working closely with our facility partner the Alaska Maritime National Wildlife Refuge, installed a variety of permanent signage throughout the Alaska Islands and Ocean Visitor Center – both externally on the Visitor Center facility and internally within KBNERR spaces.**

Program Suggestion: The Reserve should explore strategies for obtaining a position or person to coordinate activities involving volunteers.

KBNERR Action: **KBNERR leadership explored the potential of establishing a volunteer coordinator position within the Reserve. Due to limited budgets, no funds were identified which could be used to support a volunteer coordinator.**

Program Suggestion: The Reserve should explore the creation or development of a non-profit support organization.

KBNERR Action: **KBNERR, ADF&G-SF leadership, and the Kachemak Bay Research Reserve Community Council have all discussed the creation of a non-profit for many years. While looked at as a positive for Reserve operations there is considerable community concern over the creation of another non-profit in Homer.**

Program Suggestion: The Reserve could explore the Cooperative Ecosystem Studies Unit Program as another option for research coordination and partnership opportunities, particularly with the National Park Service, and U.S. Fish and Wildlife Service in the Kachemak Bay and Kenai Peninsula areas.

KBNERR Action: **KBNERR has used the Cooperative Ecosystem Studies Unit Program in the past when working on a grant funded by the National Park Service. The Reserve will continue to look for opportunities to use this mechanism in future funding scenarios.**

2009 Evaluation findings:

Necessary Action: **None found.**

Program Suggestion: The Reserve and Sport Fish Division have worked hard to secure cash match for Reserve programs. In the face of continuing funding challenges, the Reserve should develop a written strategy for future funding that can be endorsed by the Division of Sport Fish and OCRM.

KBNERR Action: **KBNERR leadership has worked for several years to develop a written strategy for future funding. Due to uncertain economic times the Reserve is faced with a reduced number of funding sources and opportunities which makes developing a long-term strategy extremely difficult. The Reserve will continue to look for long-term funding opportunities in an effort to stabilize our funding structure.**

Program Suggestion: The Reserve's website should be updated, and projects, news and activities that have occurred in the last several years should be added.

KBNERR Action: **KBNERR staff worked in 2010 to update all of the Reserve's webpages on the ADF&G website. In February 2011 the updated web pages were brought on-line when the new ADF&G website went online.**

The results of the 2006 and 2009 evaluations, as well as ADF&G's responses to the evaluations are provided in Appendix 5.

Future 312 Evaluations – Performance Metrics

Beginning in 2012, KBNERR will include reserve-specific performance measures in its annual NOAA operations grant which will be used to review progress in future CZMA Section 312

evaluations. There are several reasons for doing this. Reserves are frequently called out as nationally significant and locally relevant. Section 312 evaluations are meant to review progress of reserve-specific program implementation and to better understand and evaluate its unique context, local relevance, and performance as a partner in the national system. Specific targets and measures provide an additional source of data to help inform the overall evaluation of a reserve for a specific timeframe. These targets and measures also provide a quantitative reference for each reserve about how well it is meeting the goals and objectives it has identified as important to the program. The metrics can facilitate programmatic discussion about the appropriateness of goals and objectives and can be useful in demonstrating program progress to partners, state agencies, a Governor's office, and the public. A complete description of this process is outlined in Appendix 6.

3.0 KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE

3.1 RESERVE BOUNDARIES

Reserve boundaries generally encompass two classifications of areas: (1) core land and waters, and (2) buffer land and waters. Core designated areas are considered vital to the functioning of the estuarine ecosystem, such that they must be under a level of control sufficient to ensure the long-term viability of the reserve for research on natural processes.

The boundary for Kachemak Bay NERR encompasses two State CHAs (Kachemak Bay and Fox River Flats), and two State Parks, (Kachemak Bay State Park and Kachemak Bay State Wilderness Park) (Figure 4.). The State CHAs comprise 923 km^2 (233,650 ac.) within the Reserve boundary [Kachemak Bay = 926 km^2 (226,400 ac.); Fox River Flats = 27 km^2 (7,200 ac.)], while those areas of Kachemak Bay State Park, Alaska's first state park, and Kachemak Bay State Wilderness Park, that fall within the Kachemak Bay watershed make up the remaining 554 km^2 (138,350 ac.). This is an increase in acreage from the previous 2005-2010 Management Plan of approximately 1,095 acres which can be accounted for by increases in GIS capabilities and higher resolution mapping within and along the watershed boundaries. No land acquisitions were made during the time period of the last management plan.

Buffer land and waters protect the core area and provide additional protection for estuarine-dependent species, including those that are rare or endangered. When determined to be appropriate by the state and approved by NOAA, the buffer areas may also include an area necessary for research and interpretation facilities.

Kachemak Bay NERR buffer lands and waters include those portions of Kachemak Bay State Park and Kachemak Bay State Wilderness Park draining into Kachemak Bay, as well as other publicly-owned lands in Beluga Slough and on the Homer Spit.

3.2 LAND OWNERSHIP AND MANAGEMENT

Kachemak Bay NERR, consistent with its designation as a non-regulatory program, does not implement land use regulations or controls, but instead relies upon the existing local, state, and federal regulatory and management authorities (EIS 1998).

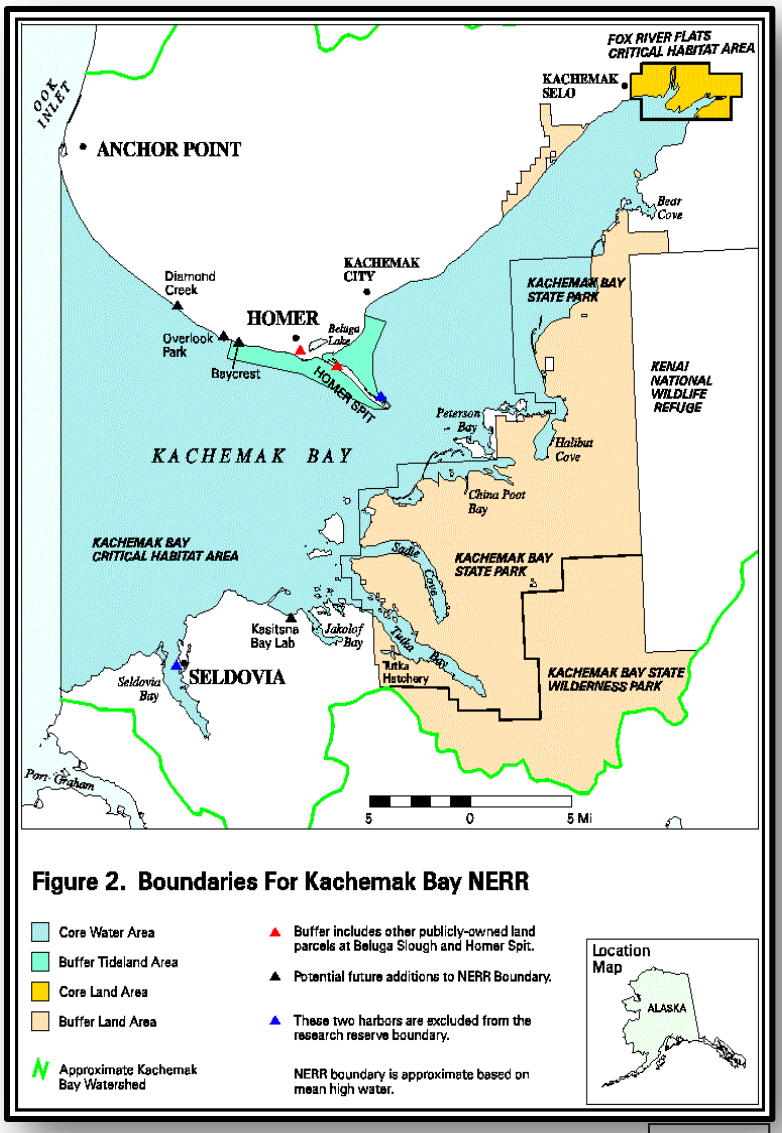


Figure 4.

Only those lands and waters within the Kachemak Bay NERR boundaries that are in public ownership are included in the core and buffer boundaries of the reserve. All public lands within these areas are managed by two State agencies, the Alaska Department of Fish and Game, and the Alaska Department of Natural Resources. These agencies manage the three state legislatively designated areas (Figure 4.) which make up the lands and waters of the Reserve:

1. Kachemak Bay Critical Habitat Area (CHA), managed by the Alaska Department of Fish and Game (ADF&G);

2. Fox River Flats CHA, managed by ADF&G; and,

3. Those portions of Kachemak Bay State Park and State Wilderness Park within the Kachemak Bay watershed, managed by the Alaska Department of Natural Resources.

These Critical Habitat Areas and State Park designations provide the strongest resource conservation protection afforded by legislative action from the State of Alaska.

Alaska's coastal areas differ from the continental United States coasts in that large, contiguous tracts of relatively pristine State lands and waters remain intact. The area within the Kachemak Bay NERR boundary represents approximately 372,000 acres of publicly-owned and, almost

exclusively, State-managed lands and waters, making it the largest reserve in the national system (EIS 1998).

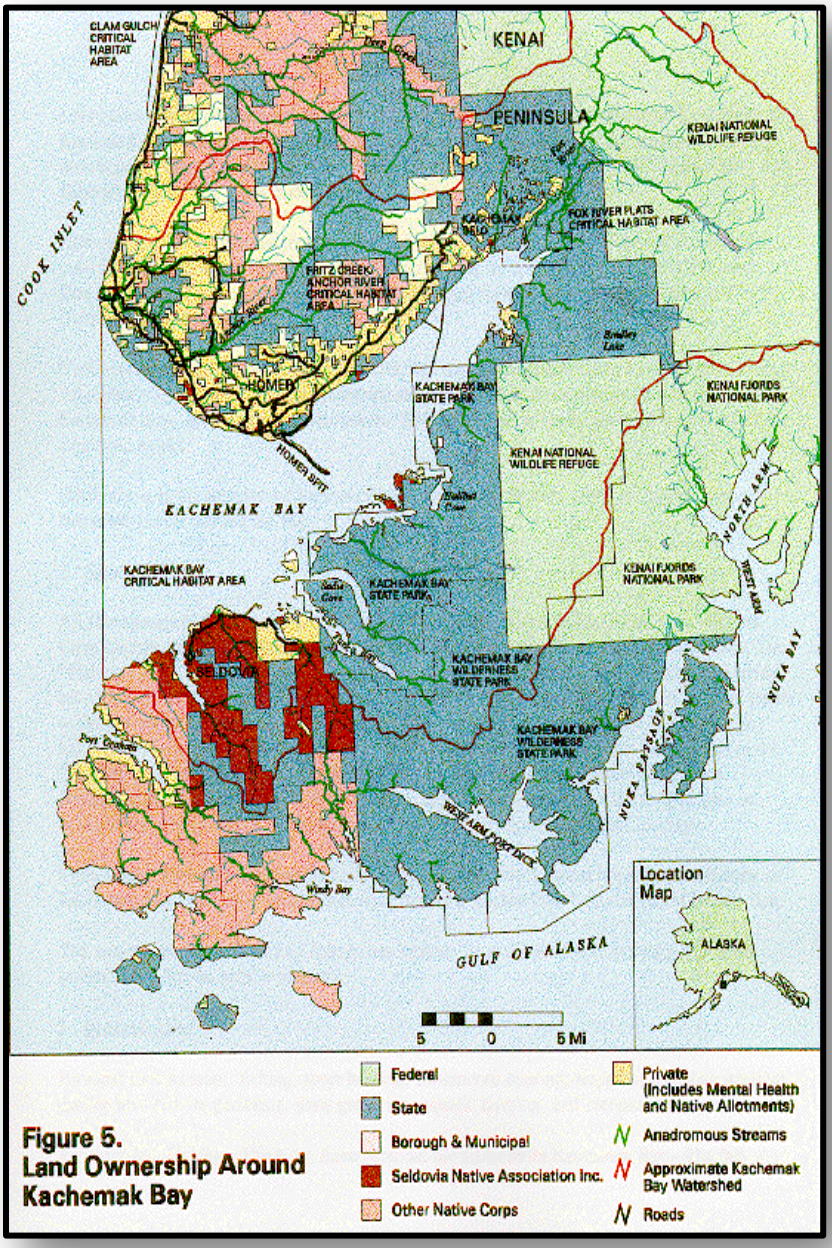


Figure 5. Land Ownership Around Kachemak Bay

Figure 5.

The Alaska Department of Fish & Game (ADF&G) is the lead management agency for KBNERR. As part of establishing the Reserve, ADF&G signed Memoranda of Understanding (MOU) (Appendix 3) with the other primary landholders within the Reserve boundary:

- Alaska Department of Natural Resources (ADNR) [Alaska Division of Parks and Outdoor Recreation (ADPOR) and Division of Mining, Land and Water] (including uplands, wetlands, tidelands, and waters) (Appendix 5);

- U.S. Fish and Wildlife Service (USFWS), Alaska Maritime National Wildlife Refuge (NWR) in Homer (for tidelands and uplands adjoining Beluga Slough) (Appendix 6); and

- City of Homer (for certain city-owned lands and tidelands) (Appendix 7) (EIS 1998).

Land and water management responsibilities within the Reserve are relatively simple, with two principal land managers: ADF&G Division of Wildlife Conservation oversees the two Critical Habitat Areas (CHAs); ADNR, Division of Parks and Outdoor Recreation manages the State Park and State Wilderness Park. These two State agencies signed a Cooperative Agreement in 1989 to coordinate management of State lands and waters within the Fox River Flats and Kachemak Bay CHAs, and the Kachemak Bay State Park (KBSP) (Appendix 5). Land ownership patterns within, and adjacent to, the Reserve are depicted in Figure 5.

3.3 GENERAL LOCATION

Kachemak Bay NERR's administrative headquarters is located in Southcentral Alaska on the Kenai Peninsula in the city of Homer. In 2001, the Reserve began a partnership with the Alaska Maritime National Wildlife Refuge to construct a joint headquarters facility with a visitor center.

This building, known as the Alaska Islands and Ocean Visitor Center (AIOVC), was completed in the fall of 2003, and Reserve staff began operating out of the office in December of that year. Kachemak Bay is an elongated embayment contiguous with the southeastern entrance to Cook Inlet (Figure 4). The Bay is 63 km (39 mi.) long and 39 km (24 mi.) wide at its entrance between Anchor Point and Point Pogibshi, with more than 515 km (320 mi.) of shoreline. The Homer Spit projects 7.2 km (4.5 mi.) out into the Bay, dividing it into an 'inner' and 'outer' Bay. The inner Bay is east of Homer Spit to the head of Kachemak Bay, and the outer Bay is west of Homer Spit to the mouth of Kachemak Bay. The Bay is bordered on the north by the rolling hills and bluffs of the Kenai lowlands, and on the south by the Kenai Mountains, with the watershed encompassing more than 2,658 km^2 (1,026 $mi.^2$).

The Bay has a maritime climate influenced by the Northern Gulf of Alaska waters. Cool summers, mild winters, moderate precipitation and frequent storms characterize the area. Average winter air temperatures in Homer on the north side of the Bay range from -12ºC (10ºF) to 5.5ºC (42ºF), and summer temperatures average 5.5ºC (42ºF) to 15ºC (59ºF). In Seldovia, on

the south side of the Reserve, winter air temperatures reach lows of -12ºC (10ºF), and summer temperatures range from 4ºC (40ºF) to 18ºC (65ºF) (www.seldovia.com 2002).

Annually, Homer receives an average of 0.7 m (25 in.) of annual precipitation. Comparatively, Seldovia averages 0.9 m (35 in.) of annual precipitation (www.seldovia.com 2002).

3.3.1 Climate

The climate in the Kachemak Bay watershed is maritime and characterized by a relatively moderate seasonal range of temperatures, high humidity, and ample rain and snow. The Bay and the Pacific Ocean minimize large extremes in the air temperature, resulting in mild winters and cool summers. Annually, the mean Homer temperatures vary from the high of 15ºC (60ºF) in summer to the low of 5ºC (30ºF) in winter (National Oceanic and Atmospheric Administration, Climate Diagnostic Center 1998). Daily weather, however, can range from sunny and clear to hailing and rainy within the same afternoon (KBNERR 2001).

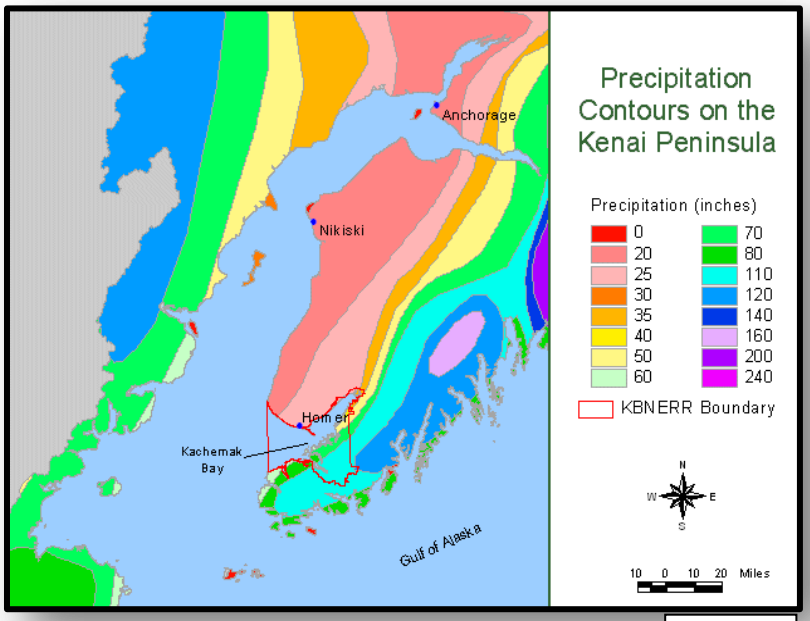


Figure 6.

Most of the 0.7 m (25 in.) of annual precipitation occurs in late summer and fall. The majority of snow falls from November to March, and it frequently rains on warm winter days (Savard and Scully 1984). Despite its maritime climate, the Kachemak Bay watershed does not receive as much precipitation as nearby Seward because the high peaks of the Kenai Mountains and the Outer Coast's steep fjords trap moisture-laden clouds from the Gulf of Alaska, preventing much rain and snow from reaching Kachemak Bay (Figure 6.) (KBNERR 2001).

3.3.2 Geology

Both glacial and tectonic forces have been active in shaping the present features of Kachemak Bay. Active volcanoes (Mt. Douglas, Forepeaked, Mt. Augustine, Mt. Iliamna, and Mt. Redoubt)

lie just outside of the western boundary of the Reserve. Remnants of huge Pleistocene glaciers are still present, with 15 glaciers contributing melt waters into the Bay, the largest of these being Grewingk, Dixon, Portlock, Wosnesenski, Doroshin, Kachemak and Dinglestadt glaciers, as well as the Harding Icefield (EIS 1998). Though glacial valleys and outwash plains dominate the morphology of the Bay, three significant fault zones have contributed to the geologic character of Kachemak Bay. Two of these zones, identified as the 'Tutka Fault Zone' and the 'Doroshin Fault Zone,' are roughly perpendicular to the axis of the Kenai Mountains. The third zone, identified as the 'Halibut Cove Lagoon Zone,' is nearly parallel to the axis of the Kenai Mountains (ADNR 1995, EIS 1998).

The most notable seismic event in recent history was the 1964 Good Friday earthquake on March 27, 1964—the second strongest earthquake ever recorded in the world (U.S. Geological Service, 2010). The 1964 earthquake, centered between Anchorage and Valdez, released stress that had accumulated in the subduction zone where the North American and Pacific plates converge. This earthquake measured 9.2 on the Richter Scale and was felt around the globe. Regional vertical displacement in the form of uplift and subsidence occurred throughout the Cook Inlet, the Kenai Peninsula, and the Copper River Delta. In the Kachemak Bay area, severe effects included land subsidence, landslides, earth fissures, submarine landslides, compaction, and erosion. Water quantity and quality problems were also found in the well water (Waller and Stanley 1966). The end of the Homer Spit sank, stranding people (KBNERR 2001). The primary impacts were:

- 0.6 m to 1.8 m (2 ft. to 6 ft.) subsidence of the entire area
- Earth flows
- Landslides
- Minor fissuring

The Homer Spit forms a distinguishing natural feature in Kachemak Bay. The Spit itself extends 7.2 km (4.5 mi.) into the Bay and is second in length in the United States only to Dungeness Spit in Washington State, an 8-km (5 mi.) long sand spit (KBNERR 2001). Composed of unconsolidated sands and gravels, the geologic origin of the Spit is believed to be both glacial and littoral. The Spit was created between 14,000 to 15,000 years ago as the submarine end moraine of a glacier that filled the Bay during the Naptowne glaciation (Reger and Pinney 1997).

Over time, the process of erosion and the movement of longshore currents worked together to deposit sand and gravel from the adjacent bluffs, building the Spit. Human forces began shaping and influencing the Spit in the 1940s. Though erosional and depositional processes continue to shape the Spit, more dramatic changes have been brought about by human modification (KBNERR 2001).

The Fox River delta at the head of Kachemak Bay is a typical deltaic plain created by sedimentary deposition from Sheep Creek, and the Fox and Bradley Rivers (EIS 1998). The largest salt marsh in Kachemak Bay, Fox River Flats is an extensive, shallow, depositional delta of mudflats and marsh, which receives the waters and sediments of the Fox River, Sheep Creek, Bradley River, Battle Creek, and Martin River. Alternately, they are flooded by the high tides of Kachemak Bay, making the area a large coastal wetland community that is uncommon in Southcentral Alaska (KBNERR 2001).

3.3.3 Physiography and Hydrology

The entire Reserve boundary, including both land and water, encompasses approximately 1,501 km^2 (580 $mi.^2$ or 372,000 ac) – the water alone encompasses more than 60% of the area or approximately 917 km^2 (354 $mi.^2$). Comparatively, the watershed that drains into this area is an estimated 2,658 km^2 (1,026 $mi.^2$) in size. At roughly three times the size of the Bay, the Reserve's watershed, because of its fjord structure, is small compared to many areas where the watershed is more than ten times the size of estuary.

North and South Sides of the Bay

The north and south sides of the Kachemak Bay watershed have dramatically different geomorphology, geology, climate, vegetation, soil, and hydrology characteristics. The gently sloping north side, and the relatively flat topography at the head of the Bay allow for much more extensive river systems than the south side of the Bay, where steep topography and glaciation limit river length. Melting snow and rain drive the hydrologic system of the northern watershed, including the Anchor River, and determines the timing of peak flows. On the south side, snow melt in the early summer, and glacial melt in the late summer, are the predominant influences. The rolling hills and gentle slopes of the north side of the watershed are underlain by sedimentary rock, while the jagged glaciated peaks of the south side are underlain by ancient bedrock (KBNERR 2001).

The climates of either side of the watershed are also rather different, with the south side (Seldovia) showing significantly more annual precipitation and snowfall, and supporting the northern-most reaches of the temperate

rain forest. By comparison, the drier, flatter north side (Homer) supports a mixed deciduous and coniferous community that transitions to tundra comprising much of the western Kenai Peninsula.

The head of Kachemak Bay is characterized by extensive tidal flats, braided drainages, and marshlands. The northern shore consists of cliffs composed mostly of sand and clay leading down to shallow mud flats. The southern shoreline consists of hard rock cliffs and deep embayments. Many islands are also found along the southern shore (EIS 1998).
Several major glacial streams discharge into inner Kachemak Bay: Fox, Martin, Wosnesenski, and Bradley rivers; and Sheep, Battle, Halibut, Portlock and Grewingk Creeks. In addition, several minor nonglacial streams discharge into Kachemak Bay along the southern shore. The northern coast is drier, and only eight small nonglacial streams of limited drainage enter the inner Bay from that side (Trasky et al. 1977, EIS 1998).

The rolling terrain behind the northwest shore suggests that river flow is controlled by precipitation. About 90% of the area immediately north of the Bay is drained by the Anchor River, discharging directly into Lower Cook Inlet (Knull 1975, EIS 1998).

Inner and Outer Kachemak Bay
The Homer Spit is a striking geologic feature of Kachemak Bay, and it also has a dramatic impact on the Bay's circulation. The Spit bisects the Bay into inner and outer zones. These zones differ in freshwater influence and in wave action. The outer Bay is a mixing basin for the cold, saline, nutrient-rich Alaska Coastal Current (ACC) which enters from the southeast via Cook Inlet, and the fresh glacial water that drains from the Bay's tributaries. It is an environment typified by high wave energy that receives the full force of swells from across the Inlet.

The inner Bay has a lower salinity because the influence of freshwater tributaries is stronger in the semi-contained water found behind the Homer Spit. The inner Bay also remains calmer because the Homer Spit blocks the swells from the Inlet. Water masses from the inner and outer zones of the Bay meet at the end of the Spit during the daily tidal cycle.

3.3.4 Oceanography

Kachemak Bay averages 46 m (150 ft.) in depth, the bottom being relatively flat with the exception of a 100-160 m (330-540 ft.) trench that runs along the southern edge. The deepest part of the Bay is a 176-m (576 ft.) depression located north of Cohen Island at the entrance to the inner Bay, known as the Jakolof Trench (EIS 1998).

The dominant water movement in Kachemak Bay is the oscillatory flood and ebb of the tide. The net circulation (independent of, but largely driven by, the tidal currents) in the outer Bay is

characterized by an influx of clear ocean water from the Gulf of Alaska on the south side of the Bay, and a corresponding outflow of glacial runoff derived fresh water on the north side of the Bay. The central region of the outer Bay is believed to contain two semipermanent gyres (Trasky et al. 1977, EIS 1998).

Studies of inner Kachemak Bay (Bright et al. 1960) found an average freshwater layer depth during summer of 3.6 m (12 ft.) and a salinity ranging from nearly zero at stream mouths to 32.5 ppt at the entrance to the inner Bay (EIS 1998). Although fed in part by glacial streams, water in the outer Bay is generally quite clear with a very low suspended sediment load. Suspended sediment concentrations in the inner Bay are normally higher than in the outer Bay, particularly in spring and summer, due to glacial and river runoff near the head of the Bay. Eroding bluffs along the north side of the inner and outer Bay contribute additional sediments (EIS 1998).

Kachemak Bay and the adjacent Cook Inlet are known for their amazing tidal ranges. Kachemak Bay has an 8.7 m (28.5 ft.) tidal range that results from the complex geomorphology of the Gulf of Alaska and adjacent Cook Inlet. Tides in Kachemak Bay and Lower Cook Inlet are semi-diurnal with a significant inequality between successive low waters. This means there are two high tides within a lunar (24 hour 50 minute) day, one of which will generally exceed the other by several feet. The mean diurnal range in Kachemak Bay is 4.7 m (15.4 ft.) at Seldovia. Highest tides exceed 6.9 m (22.5 ft.) and the lowest tides are about -1.8 m (-6.0 ft.) (Trasky et al. 1977, EIS 1998).

Surface water temperatures in the Bay range between a high of 12.8ºC (55°F) in the summer, and a low of -2ºC (28°F) in the winter (EIS 1998).

3.3.5 Circulation

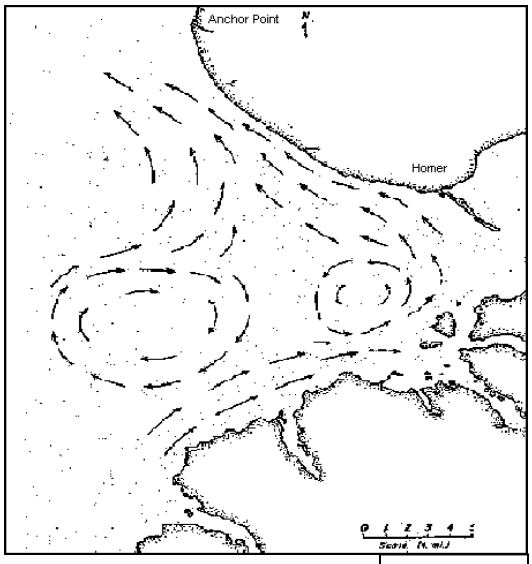


Figure 7.

Circulation in outer Kachemak Bay is believed to be dominated by two large gyres, a counterclockwise rotating gyre in the eastern half and a clockwise rotating gyre in the western half. Net transport in the outer Bay is generally northward, whether or not the gyres are present (Figure 7) (EIS 1998). Surface waters in the outer Bay are apparently derived largely from coastal upwelling (divergence) northwest of the Chugach Islands. This may significantly increase available nutrient concentrations and greatly enhance biological productivity in outer Kachemak Bay (EIS 1998). In general, vertical circulation within inner Kachemak Bay appears typical for a positive, partially

mixed estuary, consisting of a strong outflow of relatively fresh surface water and influx of more saline waters at depth. Circulation is strongly influenced, if not controlled, by freshwater runoff during the spring and summer. However, tides provide an integral and very significant driving force in the circulation of the inner Bay, and fall and winter circulation can be largely tidally driven (EIS 1998).

Fresh water, introduced primarily by the Fox, Bradley, and Martin Rivers and Sheep Creek at the head of the Bay flows out of the Bay along the northwest shore. The gyre movements and horizontal mixing processes tend to distribute the freshwater layer throughout the inner Bay (EIS 1998).

3.4 BIOLOGICAL COMPONENTS

From 1500-m (5,000 ft.) high alpine peaks to 176-m (576 ft.) deep sea trenches, Kachemak Bay is home to a diversity of flora and fauna. In Kachemak Bay and its watershed, the following species have been documented: 11 species of marine mammals, 36 species of terrestrial mammals, 244 species of birds, 1 species of amphibian, 120 species of fish, 404 species of marine invertebrates, 125 species of marine algae, and 663 species of vascular plants (Appendix 9). There are undoubtedly additional species that have yet to be documented, especially fish, invertebrates, marine algae and plants. Kachemak Bay's varied coastline, numerous freshwater sources, and diverse geomorphology create a microcosm of Southcentral Alaskan habitat types (KBNERR 2001). A brief overview of major floral and faunal components within the Reserve is presented below. A more detailed summary of existing plant communities and their composition is provided in Appendix 8.

3.4.1 Flora

Aquatic – Subtidal

The Homer Spit bisects Kachemak Bay into inner and outer Bays, with the inner having more freshwater influence, turbidity, and protection from Lower Cook Inlet waves than the outer Bay. The Spit also creates a constriction that channels the tide to the southern side of the inner Bay. The photic zone supports photosynthesis and large populations of surface-dwelling species and plankton. The aphotic zone below is colder, darker, and has more marine influence because fresh water floats in a lens on the surface. No photosynthesis occurs in the aphotic zone; it receives most of its nutrients from decomposing plankton and other marine life (KBNERR 2001). Kelp forests are the primary subtidal plant community in Kachemak Bay, and are dominated by bull kelp (*Nereocystis luetkeana)*. These subtidal communities provide essential habitat for fish, crab, and other small invertebrates which comprise a rich underwater ecosystem. Bull kelp is harvested for traditional use by local Native villagers, and is an integral part of the life cycle of Northern sea otters (*Enhydra lutris kenyoni*). The largest kelp beds in the Bay lie off Bluff Point on the northwestern shore, with smaller beds in Jakolof Bay and other embayments on the south side.

Aquatic - Intertidal

The Bay's 8.7 m (28.5 ft.) tidal range creates a wide band of intertidal habitats. On the southern shore, rocky substrates are intermixed with beaches and tidal flats. Protected beaches are contrasted with those having high wave energy (KBNERR 2001). In addition to forming the base of the marine food chain, aquatic plants provide habitat structure for a wide variety of organisms. The rocky substrates of Kachemak Bay support the highest diversity of marine plant communities. Marine algae are well-developed from the high-intertidal zone to a depth of about 20 m (66 ft.), with the brown algae, rockweed (*Fucus spp.)* most abundant in the high intertidal zone. Red algae (*Palmaria*, *Mastocarpus, Porphyra,* etc.) prefer disturbed or stressed areas, usually from medium to low intertidal zones. Green algae also inhabit the mid- to lower intertidal, with a variety of kelps inhabiting low intertidal and subtidal zones. Eelgrass beds occur in Seldovia, Jakolof, Kasitsna, and Mud Bays (Lees 1977). Large expanses of eelgrass are found along the inner northern shoreline in the low intertidal zone (EIS 1998).

Terrestrial – Head of the Bay

An extensive tidal marsh surrounds the head of the Bay at Fox River Flats, and numerous smaller marshes lie at the heads of protected bays and fjords (Figure 8.). The northern shore's eroding sandstone bluffs transition into unconsolidated substrates of mixed sand, gravel, and cobble beaches, as well as extensive mudflats (KBNERR 2001). Fox River Flats represents the largest coastal wetland in Kachemak Bay, encompassing approximately 29 km^2 (7,100 ac.) of wetlands and tide flats. The Flats are composed primarily of saltwater herbaceous sedges and unvegetated mud flats. Two sedges dominate the upper intertidal zone: Ramenski sedge (*Carex ramenskii*) and Lyngbye sedge (*Carex lyngbyei*). Large and small ponds are numerous near the upper edge of the intertidal zone. Pond water is silty and fresh, although salinities up to 5% have been recorded (Batten et al. 1978). Aquatic vegetation in the ponds is dominated by pondweeds and mare's tail. The coastal marsh

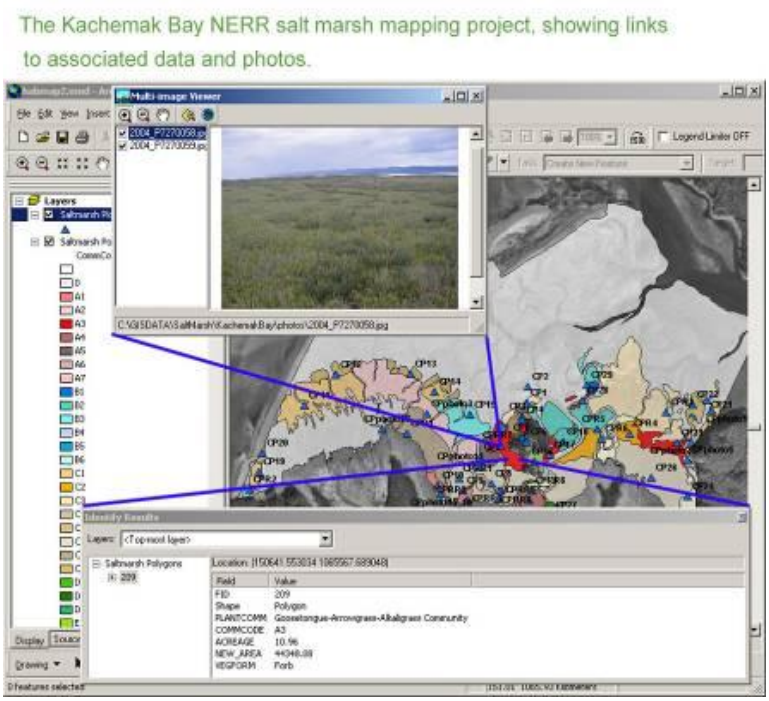


Figure 8.

environment grades into grasslands dominated by reedgrass, or transitioning into an inner marsh in which sedges, grasses, and forbs are common (Batten et al. 1978). Cottonwood groves and alder thickets transition into coniferous forests at higher elevations (EIS 1998).

Terrestrial – Southern Shore

The second largest salt marsh within the Reserve is found in China Poot Bay on the southern shoreline. Twenty-one species of flowering plants have been identified in the 2.4-km^2 (600 ac.) China Poot marsh, a relatively low diversity compared to other salt marshes in Alaska (Crow 1978). An alkali grass, along with several succulent species and arrowgrass, dominate plant communities. These communities depend upon frequent, if not daily, tidal inundation. Much of the litter and detritus from these marsh communities is flushed into the Bay, contributing to the productivity of the marine environment (ADF&G 1993, EIS 1998).

The Kenai Mountains along the southern boundary of the Reserve are segmented by deep ravines, rock walls, glaciers, and icefields. Lower slope vegetation is dominated by mature stands of Sitka spruce, and smaller stands of mixed spruce-deciduous forest. Cottonwoods and willows cover the floodplains and lower river valleys of the region. At the upper extent of the forest and on the steeper or wetter slopes below the tree line (500 m), tall shrubs (primarily alder, mixed with raspberry, elderberry, and devil's club) are the main vegetation type. The higher elevations are composed of grassy meadows, alpine tundra, bare rock, and snowfields (USACE 1982, EIS 1998).

Terrestrial – Northern Shore

The northern side of Kachemak Bay is part of an extensive lowland, where the maritime climate from the southeast and the continental climate from the northwest mix across a gradual topographic gradient. Interior and maritime species overlap and hybridize in this area, including several of the dominant tree species (KBNERR 2001).

The region northeast of Kachemak Bay is primarily rolling terrain and broad, flat valleys. Deep ravines cut by tributaries intersect the bluffs bordering the Bay and the Fox River Valley. Lutz spruce and birch are found in the forested areas. On the steeper hillsides, tall shrub stands containing alder, elderberry, and devil's club are found. On the more exposed slopes above the tall shrubs, subalpine and alpine tundra is characterized by low bearberry, blueberry, and a variety of other low-growing vegetation (EIS 1998).

3.4.2 Fauna

Aquatic

Rocky Substrates - Rocky habitats support the most diverse aquatic communities. Invertebrates are most abundant and diverse where currents are high, and least abundant and diverse in slow currents. Jakolof Bay supports the most robust subtidal macroinvertebrate communities known in Southcentral Alaska (Lees et al. 1980). Most of the macroinvertebrates are sedentary filter

feeders, such as clams. Grazers, such as chitons and sea urchins, are abundant. Abundant predatory macroinvertebrates are primarily sea stars, snails, and hermit crabs.

Sand and Mud Substrates - Since seaweeds are largely absent, detritus forms the base of the food web in the sand and mud regions of outer Kachemak Bay. Much of the detritus is comprised of plant material carried by currents from rocky habitats in Kennedy Entrance and southern Kachemak Bay (Lees et al. 1980).

Invertebrate abundance in sand and mud substrates is strongly influenced by seasonal conditions, and dominance patterns are influenced by tidal exposure. Most invertebrates in sand and mud substrates are deposit or suspension feeders. Many species are more abundant at lower tidal levels; however, species composition does not appear to be affected by tide stage (Dames & Moore 1978).

Mud flats have greater species richness, biomass, and diversity of perennial species than sand beaches and, consequently, attract the highest numbers of shorebirds and ducks (Dames & Moore 1978).

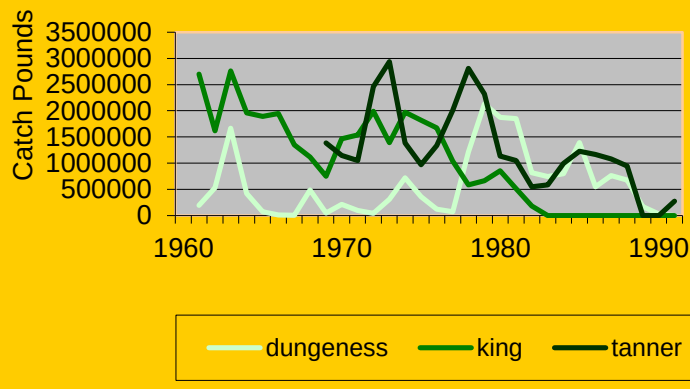
Fish and Shellfish - The historical abundance and diversity of fish and shellfish in Kachemak Bay are the product of a nutrient rich environment, providing critical habitat for approximately 150 species of finfish during various life phases. While the Bay historically supported king, tanner and Dungeness crab and shrimp fisheries, those fisheries are no longer commercially or recreationally viable due to low abundance, with the exception of tanner crab for recreational/personal use harvest in recent years. While these fisheries were closed in the late 1980's and early 1990's, it is unknown as to why after 20+ years of closure, the populations have not rebounded. Currently, the only invertebrates harvested are octopus (as by-catch of the Pacific cod fishery) with an annual guideline harvest level of 35,000 pounds.

Salmon - There are twenty-six documented anadromous fish streams flowing into Kachemak Bay. Five species of Pacific salmon are found in this marine environment: Chinook, sockeye, coho, pink, and chum. Adult salmon are found in marine water throughout the year and in fresh water from late May through October. Streams on the south side of the Bay, primarily support runs of pink and chum salmon. The largest wild run of coho salmon is in the Fox River at the head of the Bay. Two salmon stocking programs are conducted in Kachemak Bay. The first program is conducted by the Division of Sport Fish for the purpose of providing additional sport fishing opportunities by stocking smolt into terminal saltwater locations. Through this program, Chinook and coho salmon smolts are stocked in the Nick Dudiak Fishing Lagoon on Homer Spit, and Chinook smolts in Halibut Cove Lagoon and Seldovia Harbor. The second Kachemak Bay stocking program is conducted by Cook Inlet Aquaculture Association (CIAA) which stocks

sockeye salmon fry into Leisure Lake and Tutka Bay Lagoon. This program enhances common property commercial salmon fishing in Kachemak Bay.

Other Marine Fish - Adult Pacific herring are known to overwinter in offshore feeding grounds, and move into sheltered bays to spawn in the spring. Historically, Kachemak Bay supported major herring spawning areas in Mud Bay, Bear Cove, Mallard Bay, and Tutka Bay. In 2001, the Board of Fish closed, by regulation, the Southern District—which includes Kachemak Bay—to commercial harvest of Pacific herring due to low abundance. Pacific halibut are found throughout the Bay. Flatfish, walleye pollock, and Pacific cod are also found in the Bay. Distributions of flatfish, pollock, and cod have been documented through ADF&G trawl surveys since the 1970's. Kelp beds along the outer southern shores of Kachemak Bay, near Seldovia, are home to significant numbers of rockfish. Other abundant species include spiny dogfish and skates.

Figure 9. Commercial Crab Catch, Southern District of the Cook Inlet Management Area



Source: ADF&G Kachemak Bay and Fox River Flats CHAs Management Plan. 1993.

Crab – Historically, there were three species of commercially harvested crab found in the Bay: king, Dungeness, and tanner (Figure 9.). Dungeness crab inhabit the Bay from the intertidal zone to depths of more than 76 m (250 ft.). Adults are found in the shallow, nearshore waters along the north shore. Younger, smaller crabs are found in the shallow intertidal areas along the southern shore. Although population numbers are currently depressed, king crabs have historically been common south of Anchor Point. Tanner crabs are usually found in deeper water in the fall and winter, and in shallow water for mating and spawning in spring and summer.

Clams - Kachemak Bay has several populations of clams, including Pacific littlenecks, butter clams, surf clams, various cockles, razor clams, and several *Macoma* (Baltic, stained, chalky, oblique, and bent-nosed). Hard-shelled clams can be found in the lower intertidal region on protected gravel-sand-mud beaches. Soft-shelled clams are usually found in areas of mixed sand and mud, or mud and gravel.

Freshwater Fish – The Kachemak Bay watershed includes several freshwater habitats: glacial rivers, streams, ponds, and lakes; clear water rivers, streams, ponds, and lakes; and, riparian

areas. An abundant food source of freshwater aquatic insects (stoneflies, mayflies, caddisflies, dragonflies, and damselflies) support anadromous and freshwater fish species, such as euchalon, salmon, lamprey, stickleback, and rainbow trout.

Birds - Two hundred forty-four species of birds have been identified on and around Kachemak Bay (Erikson and West 1992). Kachemak Bay is the most important marine bird habitat in Lower Cook Inlet (Erikson 1977), with no comparable areas in Upper Cook Inlet. During winter months over 90% of the marine birds in Lower Cook Inlet are found in Kachemak Bay (Erikson 1977). Kachemak Bay is also important for avian feeding, nesting, rearing, and migratory staging throughout the year. The inner Bay coastline has an estimated total year-round density of 1,758 birds/km^2 (679 birds/mi.$^{2)}$ (Arneson 1980).

In 1996, Kachemak Bay was dedicated as an international site of the Western Hemisphere Shorebird Reserve Network. An international site designation indicates that the site hosts greater than 100,000 shorebirds or 10% of a flyway population.

Marine Mammals - While the Reserve is not directly responsible for monitoring these species, coordination with key partners ensures that these species will retain their presence and function in the Kachemak Bay system. Fifteen species of marine mammals have been documented in Kachemak Bay, including whales, porpoises, Steller sea lions, seals, and sea otters.

Reptiles – Only one species of reptile has been documented in the Reserve, a deceased green sea turtle. This species was documented in 1996, during an El Nino year. While this may have been an anomaly, it is important to track these occurrences in conjunction with climate change.

Terrestrial

Mammals - At least 30 species of terrestrial mammals inhabit Fox River Flats and the region around Kachemak Bay. Large mammal species that occur around the area include moose, mountain goat, Dall sheep, black bear, and brown bear. Coyote, lynx, fox and wolf are also found in the region.

Amphibians – Only one species of amphibian has been recorded in the Kachemak Bay area. The wood frog, *Rana sylvatica*, has not been thoroughly studied; its life history and range have not been well documented.

3.4.3 Listed Species

An estimated 15 species within the Reserve are listed for protection under State and/or Federal regulations (Table 4). The State of Alaska identifies any species or subspecies of fish or wildlife or population of mammal or bird native to Alaska that has entered a long-term decline in abundance or is vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance as a Species of Special Concern (SOC).

Under this listing, the State will:

- Review existing information on the species;
- Publish a notification of listing, including a summary of the information that led to listing;
- Identify critical seasonal habitat (if known);
  If appropriate, initiate or increase survey and monitoring efforts, population or habitat studies, enhancement efforts, and/or regulatory review; and,
- Recommend management action.

By establishing a State Species of Concern (SOC) List, the State can:

- Protect species or subspecies and forestall or mitigate serious threats to fish or wildlife populations before they become critical;
- Identify conservation concerns at an earlier stage while avoiding the necessity for listing on the State Endangered Species List or through the Federal Endangered Species Act; and,
- Provide for recovery efforts to be initiated under a more flexible management system. A byproduct of this new list will be to help the State focus conservation efforts on ecosystems and problems that may affect a variety of species and habitats.

The following species occurring within the Reserve have protected status at the identified State and/or Federal level(s):

The Federal species designations include endangered, threatened, or candidate listings:

- Endangered Species – an animal or plant species in danger of extinction throughout all or a significant portion of its range
- Threatened Species – an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
- Candidate Species – an animal or plant for which the U.S. Fish and Wildlife Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act, but for which development of a listing regulations precluded by other higher priority listing activities.
- Proposed Threatened Species – an animal or plant that is being proposed for threatened status.

Table 4. State and Federal Listed Species in Kachemak Bay NERR

	Common Name	Scientific Name	State Status	Federal Status
Birds	spectacled eider	Somateria fischeri	SOC	T
	Steller eider	Polysticta stelleri	SOC	T
	Kittlitz's Murrelet	Brachyramphus brevirostiris		C
	Marbled Murrelet	Brachyramphus marmoratus		C
	American peregrine falcon	Falco peregrinus anatum	SOC	
	Arctic peregrine falcon	Falco peregrines tundrius	SOC	
	Yellow-billed Loon	Gavia adamsii		C
	gray-cheeked thrush	Catharus minimus	SOC	
	blackpoll warbler	Dendroica striata	SOC	
	Townsend's warbler	Dendroica townsendi	SOC	
Mammals	brown bear	Ursus arctos	SOC, Kenai Peninsula Population	
	harbor seal	Phoca vitulina	SOC	
	Steller sea lion	Eumetopias jubatus	SOC	E
	beluga or white whale	Delphinapterus leucas	SOC	E
	humpback whale	Megaptera novaeangliae	E	E
T = threatened; E = endangered; C = candidate, SOC = species of concern				

4.0 Management Plan Overview

4.1 Introduction

The mission of the Kachemak Bay NERR is to:

> Enhance understanding and appreciation of the Kachemak Bay estuary and adjacent waters to ensure that these ecosystems remain healthy and productive.

Our mission has driven, and will continue to drive, the focus of work at KBNERR, and will be implemented by: (1) working as an integrated team to increase knowledge about the Kachemak Bay estuary; (2) developing a comprehensive research and monitoring program that builds a database of baseline information for long-term monitoring and future change analyses; (3) establishing an educational leadership presence in the community and region through innovative, hands-on, inquiry-based programs that expand beyond traditional learning experiences; and, (4) translating and communicating science-based findings to our agency and staff, coastal decision-makers, local communities and the general public to promote informed decisions about, and stewardship of the coastal environment.

In addition to upholding its mission, the Reserve conducts all activities under a unifying vision that emphasizes programmatic focus and commitment:

- We are committed to working as an integrated team to achieve a common vision of excellence in coastal science.
- We are committed to providing leadership and building partnerships in order to conduct and promote excellence in regional research, education and training.
- We are committed to translating and communicating the results of our science, and that of others, to promote informed coastal decision-making.
- We believe that gaining an understanding and appreciation of how high latitude coastal ecosystems function will lead to responsible actions and sustainable use of Alaskan coastal resources.
- We believe that the Kachemak Bay estuary and adjacent waters provide an outstanding living laboratory in which to conduct high latitude coastal research, education and training.

4.2 Management Plan Framework

The Kachemak Bay NERR Management Plan has been developed to address specific goals, objectives and strategies within the Research, Education and Administration programs for the next five years. This Plan has been revised and updated from the previous 2005-2010 Management Plan that was approved by NOAA in 2005.

A staff retreat was held in the winter of 2010 to develop long-term goals, objectives and strategies. Programmatic meetings with research, education and training staff were held in the winter/spring of 2010 to update and further refine the respective strategies. Drafts of the Plan have been reviewed by NOAA - Estuarine Reserve's Division staff, and the KBNERR's Community Council and partners for review. This Plan spans a five-year period from 2012 through 2017.

This Management Plan will be used to develop five-year Action Plans for each programmatic section: Research and Monitoring, Education and Outreach, Training, and Program Administration. The Action Plans will further define the Reserve's programs by defining Tasks under the identified Goals, Objectives, and Strategies. Additionally, each program will develop an Annual Work Plan that targets specific components to be completed during the state fiscal year.

As noted earlier, over the next five years KBNERR will focus our research and education programs and projects on these emphasis areas of climate change and harvested species. Since the Reserve is managed under a partnership between NOAA and ADF&G, Division of Sport Fish, it is necessary for the goals and objectives of the Reserve to align with those of the administering agencies. Consequently, as each Reserve goal and objective is discussed within the text of the Management Plan Framework, Research and Monitoring, Education and Outreach, and Program Administration sections of this Management Plan, the over-arching goals and objectives from the NERRS Strategic Plan and the ADF&G, Division of Sport Fish Strategic Plan are identified. The Reserve also works very closely with the community through the Reserve's Community Council, which is comprised of nine community members and a corresponding number of partner agency representatives. Additionally, Reserve progress and accomplishments relative to the previous Management Plan's goals and objectives are briefly discussed in Appendix 10.

The mission of the Kachemak Bay NERR is to: Enhance understanding and appreciation of the Kachemak Bay estuary and adjacent waters to ensure that these ecosystems remain healthy and productive. The goals to support this mission are identified in Table 5. Objectives for these goals are addressed in the respective programmatic sections.

Table 5. Kachemak Bay NERR Goals and Objectives
Goal 1: Research, Education and Administration staff function as integrated teams to foster informed coastal decision making.
Objective A: **Reserve staff will collaborate on Reserve programming.**
Goal 2: Conduct, collaborate on, and encourage research and monitoring of ecosystems in the Kachemak Bay region that informs decision-making on climate change and harvested species.
Objective A: **Conduct research to improve our understanding of coastal ecosystems.**
Objective B: **Improve upon existing data and long-term monitoring necessary to support research needs within the Reserve.**
Objective C: **Contribute to increasing regional, statewide and national collaborations among agencies, communities, universities, non-governmental organizations and tribal governments.**
Objective D: **Identify and develop strategies to address rapid change.**
Goal 3: Foster coastal stewardship actions and inform coastal management through research, training and public education
Objective A: **Communicates and promotes understanding of how coastal ecosystems function and their relevance to society.**
Objective B: **Promotes informed decision-making on coastal resource issues through informed exchange and outreach.**
Objective C: **Collaborations with the community, statewide and national partners for research and education are expanded.**
Objective D: **Future stewardship is fostered by creating opportunities for children and families to connect with the coastal environment.**
Goal 4: Increase Kachemak Bay NERR's recognition as a leader in coastal research and education, locally, regionally, and nationally.
Objective A: **Stakeholders and public are aware of, and involved in the Reserve's mission and goals.**
Objective B: **Technology is used effectively to outreach research and education programs.**
Goal 5: Provide support and resources to the KBNERR workforce to attain the Reserve's vision and mission of an engaged community which makes informed coastal decisions about Kachemak Bay and adjacent waters.
Objective A: **Qualified and motivated staff are recruited, developed, and retained.**
Objective B: **The work environment is safe, positive, and supportive.**
Objective C: **The Reserve's organizational structure is effective.**
Objective D: **Funding is stable and is aligned with the Reserve's priorities and programs.**

Throughout the process of writing our management plan KBNERR staff strove to ensure that all goals/objectives/strategies were integrated between programmatic sectors. For this plan to be successful in achieving each of our goals, it is incumbent upon the entire KBNERR team to work together. We cannot work in a programmatic vacuum and expect integration to naturally follow. Integration is both a guiding principle and a goal that we are committed to achieve and sustain.

As stated in our previous 5-year plan, it is the combination of a robust Research program, a dynamic Education program, an engaged training program, and a strong Administrative backbone that fosters and positions the Reserve for long-term organizational success.

5.0 RESEARCH AND MONITORING [§921.50]

5.1 INTRODUCTION

The mission of the Kachemak Bay National Estuarine Research Reserve (KBNERR) is to: *Enhance understanding and appreciation of the Kachemak Bay estuary and adjacent waters to ensure that these ecosystems remain healthy and productive.* The KBNERR is well positioned to conduct studies that elucidate broad-scale ecological patterns, and to monitor long-term trends in the Bay that have relevance to the broader region of Cook Inlet and the Gulf of Alaska. As an emerging sentinel site for the region, the Kachemak Bay NERR can serve a vital function by providing the scientific and management communities with baseline and long-term datasets that range from the headwaters to open ocean. During the past 10 years, KBNERR has completed the production of baseline maps and datasets for future use by coastal decision-makers and researchers. Much of the baseline work has been accomplished through KBNERR and key collaborations with local, regional, and national partners. Examples of long-term monitoring and baseline data for the Reserve include an ongoing System-wide Monitoring Program (SWMP), featuring water quality, meteorology, and emergent salt marsh vegetation mapping. Other baseline information for KBNERR has been obtained through grants managed by NERR staff and collaborators: sea grass and kelp bed mapping, detailed shoreline mapping, modeling of juvenile salmon rearing habitats, multi-beam sonar data (with back scatter) of the KBNERR bathymetry (NOAA, Kasitsna Bay Lab), data histories on Lower Cook Inlet circulation, and a partial coverage of the coastal zone with LiDAR data. Collectively, the data history for KBNERR provides a rich background for future studies and for supplying information to help make informed decisions regarding the coastal habitat in our region.

Areas of emphasis driving the Reserve's direction and focus over the next five-years include climate change and harvested species. These two areas dovetail closely with KBNERR's state and federal partners' areas of emphasis, with the Division of Sport Fish focusing on sport harvested fish and shellfish species, and NOAA emphasizing an understanding of climate change, and addressing questions of adaptation and mitigation.

Kachemak Bay NERR, the only subarctic reserve in the NERR system, is at the front lines of climate change. Locally, environmental change is evidenced by glacial retreat and the resultant land level changes due to isostatic rebound, continued bluff erosion within Reserve boundaries, and documented ocean acidification in Alaska waters that pulse seasonally into the Bay. These and other changes are a daily reminder that the coastal environment is changing.

Locally, fisheries are a driving force of both natural systems and the economy. People are dependent on these resources for food, jobs, and the role they play in binding diverse cultures. It is imperative that changes to landscapes and habitats that are critical to all life stages of fisheries

be studied and analyzed, and the results communicated to resource managers, coastal decision-makers, and local communities.

This chapter has been developed in conjunction with national and state priorities, with input and guidance from the current Research staff and other Kachemak Bay NERR staff. Community input is received through the Kachemak Bay Research Reserve Community Council and their Research Committee, composed of Council members, as well as agency and academic research partners.

The Kachemak Bay NERR has a growing science program, with a vision to become a leading research entity for Lower Cook Inlet and the surrounding Gulf of Alaska waters. The region of scientific emphasis (Figure 10.) extends beyond the Reserve boundaries to encompass areas that affect, or are affected by, waters within it, and which connect to outside research and monitoring efforts. This expanded area includes waters to the east as far as the Pye Islands in Kenai Fjords National Park, to the south as far as Shuyak Island in the Kodiak Archipelago, to the west across Cook Inlet, and to the north as far as Kasilof. Collaborative research is expected to develop as various groups conduct studies within and beyond the region of scientific emphasis. Kachemak Bay is fundamentally driven by large-scale processes, and coastal

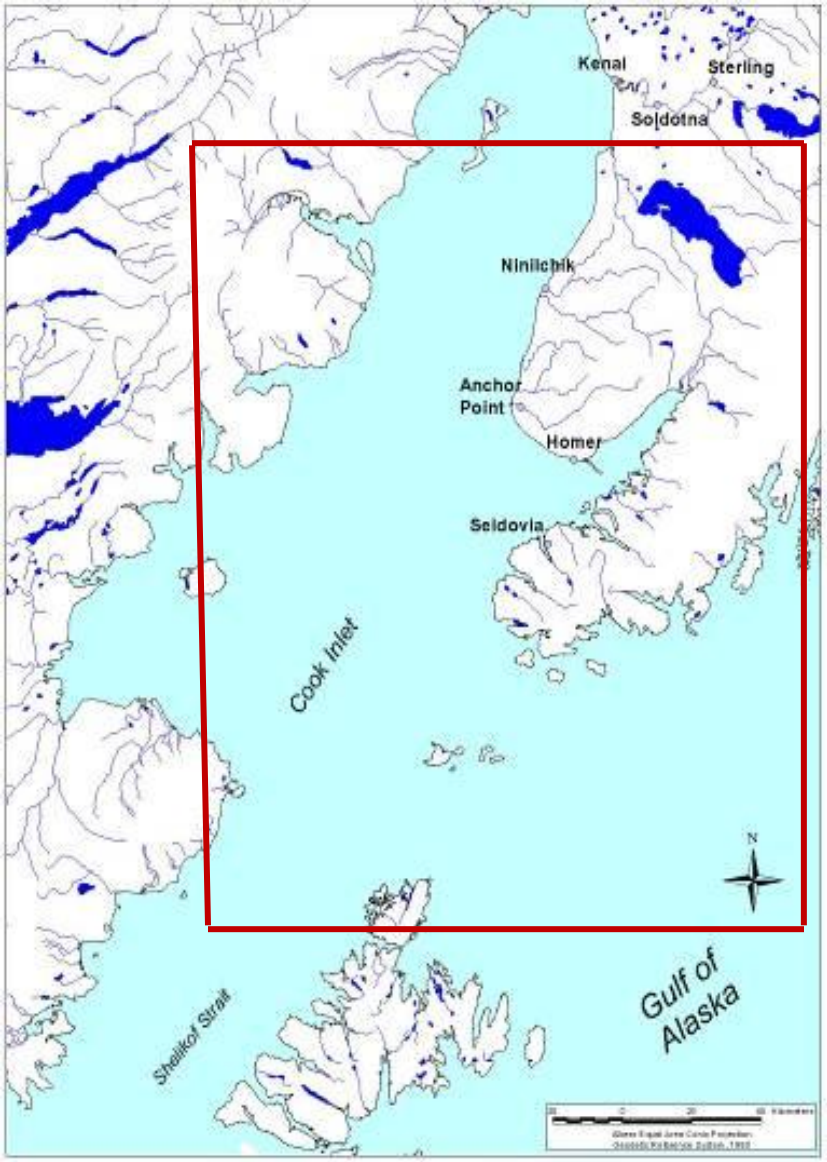


Figure 10. Region of Emphasis

habitats in the region are connected by the ocean circulation patterns of the Gulf of Alaska. The Kachemak Bay NERR is well positioned to study these broad-scale ecological patterns and to monitor long-term trends in Kachemak Bay that have relevance to Cook Inlet and the Gulf of Alaska. As an emerging sentinel site for the region, the Kachemak Bay NERR can provide scientific and management communities with vital baseline and long-term datasets that will facilitate understanding of regional ecological shifts over time.

5.2 NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM PRIORITIES AND OPPORTUNITIES

Research at Kachemak Bay NERR is designed to fulfill the Reserve System goals as defined in the following program regulations:

- Address coastal management issues identified as significant through coordinated estuarine research within the System;
- Promote Federal, state, public, and private use of one or more reserves within the System when such entities conduct estuarine research; and
- Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

5.2.1 National Estuarine Research Reserve System Research Funding Priorities

Federal regulations, 15 CFR Part 921.50(a), specify the purposes for which research funds are to be used:

- Support management-related research that will enhance scientific understanding of the Reserve ecosystem;
- Provide information needed by reserve managers and coastal ecosystem policy-makers; and
- Improve public awareness and understanding of estuarine ecosystems and estuarine management issues.

The Reserve System's research goals to support the above referenced priorities:

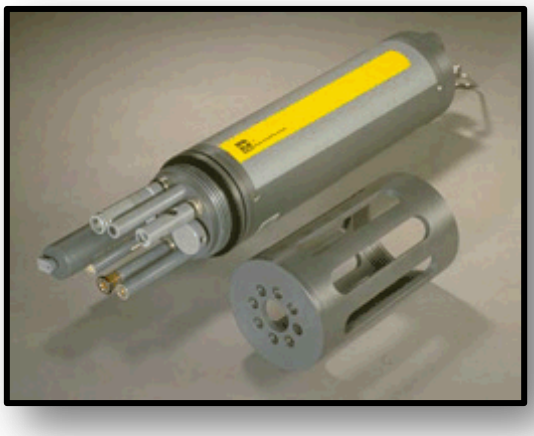
- Ensure a stable environment for research through long-term protection of Reserve resources;
- Address coastal management issues through coordinated estuarine research within the System;
- Collect information necessary for improved understanding and management of estuarine areas, and making the information available to stakeholders.

5.2.2 System-wide Monitoring Program

It is the policy of KBNERR to implement each phase of the System-wide Monitoring Plan initiated by Estuarine Reserves Division in 1993, as outlined in the Reserve Systems Strategic Plan. The general funding and implementation of SWMP has occurred incrementally in the following way:

Phase I: Environmental Characterization, including studies necessary for inventory and comprehensive site descriptions
Phase II: Site Profile, including a synthesis of data and information; and
Phase III: Implementation of the System-wide Monitoring Program

As of the writing of this Plan, the KBNERR has completed Phase I and Phase II of SWMP and is focused on completing elements in the System wide Monitoring Plan (as revised in 2010). SWMP provides standardized data collection and reporting protocols for national estuarine environmental trends, while allowing the flexibility to assess coastal management issues of regional or local concern. The principal mission of the monitoring program is to develop quantitative measurements of short-term variability and long-term changes in the integrity and biodiversity of representative estuarine ecosystems and coastal watersheds, for the purposes of contributing to effective coastal zone management. The SWMP program is designed to enhance the value and vision of the reserves as a system of national reference sites, and is structured to facilitate answering locally relevant questions.



Water Quality and Metrological Data
The KBNERR operates two permanent meteorological stations: one atop the Land's End Resort on the Homer Spit, and one in Anchor Point. The Reserve maintains two permanent water quality stations in Kachemak Bay: one at the tip of the Homer Spit, and one in Seldovia Bay, with a sonde 1 m (3 ft.) below the surface and a second 1 m (3 ft.) above the bottom at each location. (Figure 11.) This arrangement will be used to answer questions related to the surface and subsurface flow within the Bay. Monthly nutrient grab samples are collected at the same locations as the water quality sites, with 11 additional nutrient samples being collected inside the Homer Harbor over an entire tidal cycle. The KBNERR has also been monitoring temperature information in 4 sub-bays on the south side of Kachemak Bay (Bear Cove, Halibut Cove,

Peterson Bay, and Jakolof Bay) using TidBit temperature loggers. For the last two years, the Reserve has seasonally deployed a data sonde in the Nick Dudiak Fishing Lagoon on the Homer Spit to monitor water quality parameters for salmon stocking efforts. The Reserve historically (for a short period of time) deployed data sondes in 5 other locations within Kachemak Bay: Aurora Rock, Halibut Cove, Port Graham, Cohen Island, and Munson Point.

As defined in the SWMP guidance, the monitoring program currently measures water quality (pH, conductivity, salinity, temperature, dissolved oxygen, turbidity, water level) and atmospheric conditions (temperature, relative humidity, barometric pressure, wind speed and direction, down-welling irradiance, precipitation). In addition, the program collects monthly nutrient (nitrate, nitrite, ammonium, phosphate, silicate) and chlorophyll a samples, and monthly diel samples [Isco sampling is conducted inside the Homer Harbor, away from the ferry dock sonde station]. Each reserve uses a set of automated instruments and weather stations to collect these data for submission to a centralized data management office.

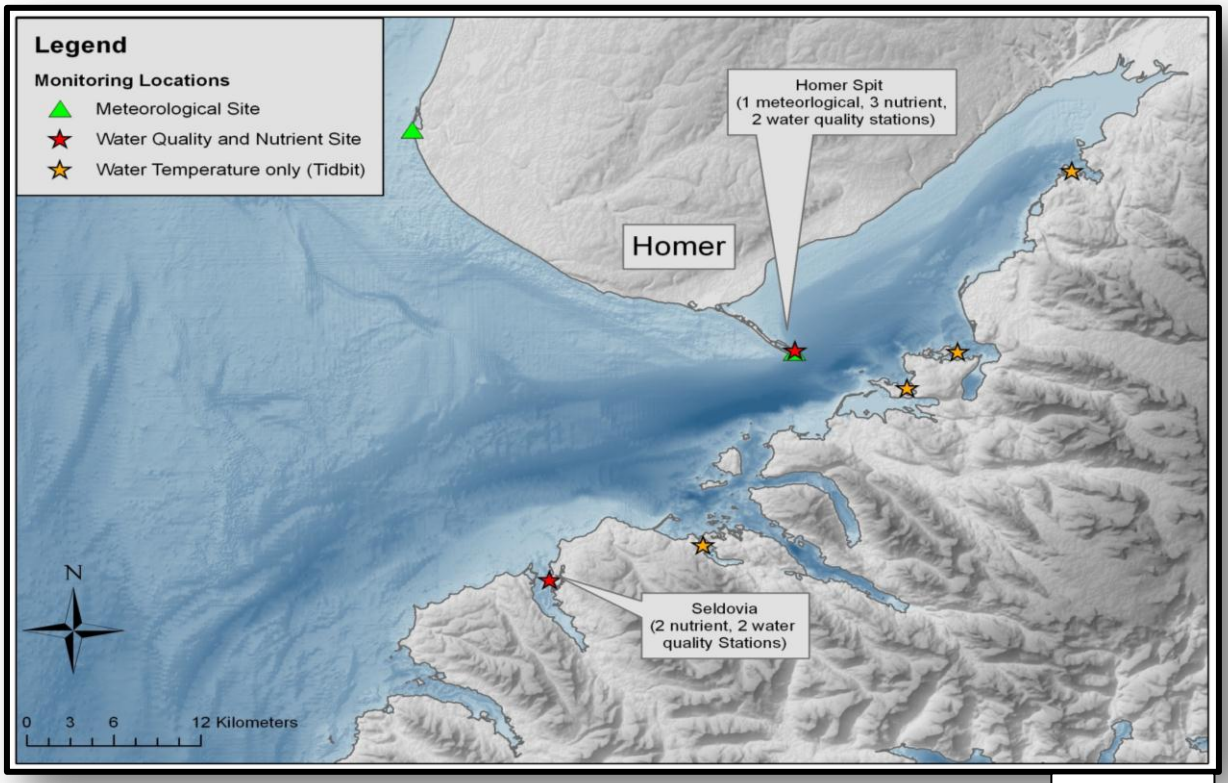


Figure 11.

These data are compiled electronically at a central data management "hub," the Centralized Data Management Office (CDMO) at the Belle W. Baruch Institute for Marine Biology and Coastal Research at the University of South Carolina. The metadata meets the standards of the Federal Geographical Data Committee.

Real-time data from telemetered stations can be found at:

AOOS http://data.aoos.org/maps/sensors.php.
NANOOS: http://www.nanoos-shellfish.org/Alaska/14.aspx; and,
NDBC: http://www.ndbc.noaa.gov/station_page.php?station=kcha2 ;

Archived data on water quality can be found at CDMO: http://cdmo.baruch.sc.edu/. In addition to our monitoring program, KBNERR continues to provide maintenance as needed to the ARGUS camera array, which looks at sediment transport along Bishop's Beach and can be found at: http://www.planetargus.com/homer/.

5.2.3 Graduate Research Fellows

The Graduate Research Fellowship Program supports students to produce high-quality research in the reserves. The fellowship provides graduate students with funding for 1-3 years to conduct their research, as well as an opportunity to assist with the research and monitoring program at a reserve. Projects must address coastal management issues identified as having regional or national significance; relate them to the Reserve System research focus areas; and be conducted at least partially within one or more designated reserve sites.

During this management planning period, focus areas for new students are: circulation modeling and plankton transport, community ecology and climate change stressors (including ocean acidification), life history strategies and habitat characteristics of harvested species, and social science related to climate change adaptation. Students work with the Research Coordinator or Manager at the host reserve to develop a plan to participate in the reserve's research and/or monitoring program. Students are asked to provide up to 15 hours per week of research and/or monitoring assistance to the reserve. This training may take place throughout the school year or may be concentrated during a specific season.

Students will be recruited through NOAA's Graduate Research Fellowship Program to address questions of interest as defined by the NERRS and Kachemak Bay NERR Research priorities. The students are expected to be capable of designing and conducting an appropriate research project within the Reserve. The Research Coordinator and other Kachemak Bay NERR staff will assist, as much as possible, in improving the students' research plans and in conducting the research.

5.2.4 Science Collaborative

The Reserve System Science Collaborative is a program that focuses on integrating science into the management of coastal natural resources. Currently administered through the University of

New Hampshire, the program integrates and applies the principles of collaborative research, information and technology transfer, graduate education, and adaptive management, with the goal of developing and applying science-based tools to detect, prevent, and reverse the impacts of coastal pollution and habitat degradation in a time of climate change. The program is designed to enhance the Reserve System's ability to support decisions related to coastal resources through collaborative approaches that engage the people who produce science and technology with those who need it. In so doing, the Science Collaborative seeks to make the process of linking science to coastal management decisions, practices, and policies more efficient, timely, and effective.

In 2010, KBNERR, in collaboration with the University of Alaska Fairbanks, was awarded a Science Collaborative Grant to provide timely information on coastal uplift and biological changes associated with uplift and sea level rise for land use planning, harbor maintenance and safety, and subsistence food resources. Currently in Kachemak Bay, the landscape is lifting as the sea level rises on a global scale. This coastal uplift is due to changes still occurring from the 1964 earthquake and rapid melting of heavy glaciers in the surrounding icefields. The loss of glacial ice mass, isostatic uplift, and relative sea level rise have not yet been documented in our region. Coastal communities rely on the nearshore habitat for transportation, safe harbor infrastructure, and food resources, so it is important to understand the physical processes that affect these uses. The Science Collaborative grant involves coastal decision-makers in the scientific process to ensure that results of the study are useful to local communities. To help the Reserve provide the best product, the intended users of the information participate in the study through quarterly meetings, providing input on the design and progress. The core intended user group assembled for this project include: City of Homer; Seldovia Village Tribe; Kachemak Bay Research Reserve Community Council; Kenai Peninsula Borough; NOAA, Kasitsna Bay Laboratory; and the Department of Natural Resources, Division of Mining, Land, and Water.

5.2.5 Research Partners

Since its early years, KBNERR has expressed the goal of having a Research program that conducts, collaborates, and encourages others to conduct research in the Kachemak Bay estuary. This goal was borne out of the simple fact that KBNERR is a small research entity in a very large landscape. To be effective and efficient, KBNERR researchers have partnered with a wide range of organizations. Evaluating the success of restoration efforts, as well as assessing the recovery of impacted communities requires detailed, statistically rigorous, protocols that can be equally applied to both reference areas and impacted sites. Periodic, consistent, long-term monitoring of un-impacted or reference sites can also provide measures of natural variability that are very useful in evaluating restoration efforts or recovery from perturbation. These partnerships exist and relate directly to project funding, tasks, and focus. Examples of research partnerships include:

1. University of Alaska Fairbanks (UAF) – As an academic partner, the University also serves on the Research Committee, providing significant and diverse resources for cooperative projects. (www.uaf.alaska.edu)

2. NOAA, Kasitsna Bay Laboratory – The Reserve's local NOAA partner, the Kasitsna Bay Lab partners on both research and education projects, and the Lab Director sits on the KBNERR Community Council. (http://www.ccfhr.noaa.gov/about/kasitsna.aspx)

3. Baylor University – An active research partner, both professors and graduate students have collaborated on several Reserve research projects over the past five years. (http://www.baylor.edu/CRASR/splash.php)

Other research partners and collaborators include, but are not limited to:

Alaska Ocean Observing Program (www.aoos.org)
Cook Inlet Regional Citizens Advisory Council (CIRCAC) (www.circac.org)
Exxon Valdez Oil Spill Trustee Council (www.evostc.state.ak.us)
Kenai Peninsula Fish Habitat Partnership (http://office.kenaiwatershed.org/KPFHP/)
Kenai Watershed Forum (www.kenaiwatershed.org)
NOAA, Central Data Management Organization (www.cdmo.baruch.sc.edu)
Port Graham Tribe
Nanwalek Tribe
Seldovia Village Tribe (www.svt.org)
Smithsonian Environmental Research Center (http://www.serc.si.edu/)
University of Alaska, Anchorage (www.uaa.alaska.edu)
University of South Florida (http://geology.usf.edu/)
University of Washington (http://fish.washington.edu/)
US Environmental Protection Agency (www.epa.gov)
U.S. Fish and Wildlife Service, Alaska Maritime NWR (www.fws.gov)
Rochester Institute of Technology (www.rit.edu)

5.3 KBNERR Research Emphasis

The objective of the KBNERR Research program is to provide information to coastal decision-makers and local communities on the physical science, health, and productivity of the Kachemak Bay estuarine ecosystem and surrounding waters. As stated earlier, the Reserve's two primary areas of focus are climate change and harvested species. In terms of climate change, new challenges face coastal habitats within the Reserve, such as sea level rise, changes in fresh and

marine water temperatures, frequency of storm events, long-term drying trends in the watershed, rapid loss of coastal glaciers, ocean acidification, and coastal uplift. The KBNERR is uniquely positioned to study these effects of climate change in the estuary and the local community ecology over the long term, as the two major icefields which supply the Bay with meltwater during the summer months--the Grewingk/Yalik complex and the Harding Icefield–undergo rapid melting in coming decades. This meltwater is expected to influence the biological diversity of the Bay by driving circulation patterns, nutrient loading, composition of salt marsh vegetation, and the pH, salinity, turbidity, and water stratification of the estuary.

Of particular interest is how the accelerated rate of glacial melt will affect surface circulation patterns related to larval recruitment and transport of harvested crab and clam species. The size of KBNERR and proximity to the Gulf of Alaska make the Reserve an ideal sentinel site for understanding and interpreting these large-scale ecological shifts related to climate change in Southcentral Alaska over time.

KBNERR is currently engaged in many areas of research and long-term monitoring within, and adjacent to, the Reserve boundaries. Studies of juvenile salmon and their habitats, sea bird and sea otter diets, invasive species, harmful algal blooms, water quality, meteorology, emergent salt marsh vegetation and sediment accretion, land and sea-level changes, water circulation, and plankton transport, are all part of the current program. Research and monitoring efforts take time to 'mature' before the results can be incorporated into decision-making processes. For this reason, not all work will be ready for distribution to a wider audience during the tenure of this management plan. During the next five years, the KBNERR Research program will strive to accomplish, by leading and through collaboration, the following major goals:

1. Obtain a method and venue for sharing all KBNERR datasets (with appropriate documentation) with staff, other researchers, coastal decision-makers, and the public
2. Provide coastal decision-makers and the public with a model of current and projected land-level changes resulting from post seismic activity and isostatic rebound for bedrock and unconsolidated soils in the region
3. Provide coastal decision-makers and the public with a model of relative sea level rise projections for the region
4. Provide coastal decision-makers and habitat managers with a model of juvenile salmon use of headwater stream habitat within the region
5. Identify landscape connections (i.e., hydrology, topography, vegetation, and nutrient flow) driving variability in headwater stream juvenile salmon habitats
6. Update the circulation model for Kachemak Bay and Lower Cook Inlet in the Gulf of Alaska
7. Compare surface and subsurface circulation patterns in Kachemak Bay during periods of heavy glacier meltwater input and periods where there is very little meltwater input

8. Identify variability in baseline pH levels in Kachemak Bay
9. Set a structure for long-term monitoring of land and sea-level changes, and for biological diversity in salt marsh habitats in Kachemak Bay
10. Collectively develop biological diversity indices (based on solid inventory and monitoring) in Kachemak Bay prior to perturbations of the nearshore system, such as marine invasive species, changes in ocean pH, circulation patterns, or oil spills

5.4 KBNERR RESEARCH GOALS AND OBJECTIVES

Overview

There are a few approaches that should be considered common to achieving the research goals and objectives:

- Encourage research by outside groups, especially toward Reserve priorities;
- Collaborate with groups conducting research in the Kachemak Bay area;
- Pursue funding to conduct research by Kachemak Bay NERR staff;
- Synthesize and disseminate existing information;
- Coordinate and engage with the Kachemak Bay NERR's Coastal Training Program to provide research products for use in CTP training and outreach events; and
- Coordinate with Kachemak Bay NERR's Education program to provide information for informal, formal, and outreach activities.

This approach supports the NERRS and ADF&G research specific goals already mentioned. It also supports the research of partnering agencies that monitor or manage specific areas or species.

Developing the best understanding of processes within the Kachemak Bay NERR region requires a wide range of expertise. To obtain that level of expertise, the Reserve must encourage other groups to conduct research within the Reserve. In many cases, this encouragement only requires identifying potential researchers and providing the background information necessary to develop strong proposals. The next level of encouragement involves offering facility and personnel support.

Collaborations are expected to develop through several tracks. Collaborations with ADF&G staff will develop through research that supports the existing ADF&G research. Collaborations with other groups, such as NOAA Kasitsna Bay Laboratory, University of Alaska Fairbanks, University of Alaska Anchorage, and others, will occur given common research interests, Kachemak Bay's capacity for technology testing, and complimentary research opportunities. Collaborations will also provide support for some outside research projects, most of which will

be conducted by researchers located far from the Reserve. Many of those projects will require the expertise of Kachemak Bay NERR staff to assist with and/or maintain those programs. Partnerships will be developed to support projects closely align with Kachemak Bay NERR research goals.

Given the funding structure of Kachemak Bay NERR, the goals of the Research program, and the identified areas of emphasis, Research staff will need to pursue outside funding. Research staff will also examine how NOAA and ADF&G funds can be used to achieve the research needs of Kachemak Bay NERR. One mechanism for the use of NOAA funds is to encourage the Graduate Research Fellowship students to study issues listed within this Management Plan.

Some of the Research objectives may be achieved through the collection and synthesis of existing information and data. Reserve Research staff will examine the means to collect the relevant information and, when necessary, convert it into forms that meet the needs of Kachemak Bay NERR research goals (e.g. Fish and Game reports, research at Kasitsna Bay Laboratory).

5.5 KBNERR MONITORING PROGRAM

Reserve scientists aspire to predict how coastal systems respond to changes in climate and human-induced disturbances by understanding how the Kachemak Bay estuary functions and changes over time. The factors that influence estuarine systems often occur over long periods of time and across broad geographic areas. The Reserve System relies on sustained long-term monitoring to identify patterns of change which provide information about factors that contribute to the observed changes. The National Estuarine Research Reserve System (NERRS) has the following programmatic areas of emphasis: a System-wide Monitoring Program (SWMP), Science Collaborative, and a Graduate Research Fellowship (GRF) program which ensure there is a mechanism to support long- and short-term data acquisition. The KBNERR also has a place-based research program which is primarily grant-driven and centers around aspects of the ecosystem unique to the region. Both the national program and the place-based program provide the foundation for developing solutions to coastal management problems and concerns.

Achievement of the research objectives requires a mixture of specific research programs and long-term monitoring strategies. Several monitoring programs exist within Kachemak Bay, from water quality monitoring, to coastal change, to wildlife monitoring programs--all of which are led by a variety of organizations and agencies. Listed below are monitoring programs supported by the NERRS and by the Alaska Department of Fish and Game, Division of Sport Fish.

The objectives for the next five years of the water quality and meteorological monitoring program are as follows:

1) **Continue to collect information that improves our understanding of circulation patterns in Kachemak Bay and Lower Cook Inlet**

   Analyses and interpretation of water quality and temperature data

   a. Identification of seasonal and annual patterns of freshwater surface layers at both monitoring stations
   b. Identification of wind influences on circulation patterns in Kachemak Bay
   c. Form a research focus group that includes oceanographic expertise, which will assist in the design, identification of funding via collaborations, analyses, and interpretation (see Goal 2, Objective 1,Stategy 5)
   d. Continue to seek funding for data analysis

2) **Provide resource managers and the public with accurate real-time water quality and meteorological information to make better informed decisions**

   a. Identify which resource managers need these data and provide data or data summaries/syntheses based on their needs
   b. Make Anchor Point meteorological data more available to the general public by real-time web reporting

3) **Continue to monitor atmospheric, water quality, and nutrient parameters, and track how these variables may be changing with a shifting climate**

   a. Provide a synthesis of all water quality and meteorological monitoring data collected at KBNERR every five years to partners and collaborators
   b. Identify funding for staff time for data analysis
   c. Evaluate the placement of data sondes and the expansion of the water quality monitoring program, based on this synthesis and our ability to answer questions relevant to coastal decision-makers

5.5.1 Biological Monitoring Program

Restoration of emergent and submersed aquatic vegetation (SAV) communities is a major management goal in most developed estuarine areas and is an important initiative of NOAA and NERRS (NOAA/NOS 1999). Evaluating the success of restoration efforts, as well as assessing the recovery of impacted communities requires detailed, statistically rigorous, protocols that can be equally applied to both reference areas and impacted sites. Periodic, consistent, long-term monitoring of un-impacted or reference sites can also provide measures of natural variability that are very useful in evaluating restoration efforts or recovery from perturbation (Moore, 2009.). Initial funding of the NERR Biological Monitoring Program began in 2010, with KBNERR receiving funding to design and conduct initial surveys of Fox River Flats and Beluga Slough.

The salt marshes in Kachemak Bay are in relatively pristine condition and mostly free of invasive species. However, natural forces within the Reserve have significantly altered some of these marshes. The 1964 earthquake lowered the elevation of several marshes by more than a meter. The landscape has been experiencing geostatic rebound since then, and in some locations uplift has been as much as 60 cm. Land and sea-level changes have profound effects on plant community composition, and emergent salt marsh vegetation is sensitive to slight variations in elevation (and associated frequency and duration of saltwater immersion). In KBNERR, the balance between rebound and rising sea levels will determine the extent and community composition of salt marshes, and serve as an indicator of future changes in relative sea level.

KBNERR salt marsh habitats have multiple sources of freshwater input which include glacial meltwater, springs and ground water, and precipitation. Not all salt marshes are influenced by glacial meltwater; however, it is a primary source for Fox River Flats, the largest marsh in the Reserve. Marshes occurring where glacial streams enter the Bay are affected by cold, sediment-laden waters in the summer. However, all 15 glaciers which provide meltwater into Kachemak Bay (from the Grewingk/Yalik and Harding Icefields) have retreated in the past 60 years. The glaciers have also thinned significantly, and in time, will begin to contribute less fresh water to salt marshes in KBNERR.

Over the next five years, the objectives of the KBNERR's Biological Monitoring Program, in conjunction with the Science Collaborative Project are:

1. Contribute data on emergent salt marsh vegetation patterns to the National Estuarine Research Reserve Biological Monitoring Program, partners, and collaborators
2. Establish a long-term monitoring system for marshes with a range of glacial meltwater input and document changes in the physical and biological structure over time
    a. Establish vertically stable benchmarks in sentinel site marshes within KBNERR
    b. Establish abiotic monitoring (temperature, salinity, sediment accretion) in sentinel sites
    c. Establish permanent transects and characterize all emergent vegetation plots annually for the first three years, and thereafter on a five-year rotation in the sentinel sites
3. Monitor long-term trends in salt marsh vegetation as an indicator of sea and land-level changes
    a. Establish funding for the continued monitoring beyond the life of the Science Collaborative grant
    b. Form a research focus group to collaborate on items such as technical aspects of monitoring sediment accretion of salt marsh habitats with local, regional and national researchers

c. Evaluate changes in marsh migration and biological diversity over time due to climate change stressors (relative sea level rise, isostatic and geostatic rebound, and fresh water sources)
d. Provide a 5-year synthesis of all biotic and abiotic data collected and identify information trends and data gaps

5.5.2 Land Use, Habitat Mapping and Change

As the Reserve evolves, it is vital to inventory and map the habitats within and surrounding it. These habitat maps will provide the basis for process studies and the evaluation of temporal change. The expansive area and diversity of habitats – subtidal to alpine – require the Reserve to work with other groups to incorporate existing information to represent the region.

This component will be developed to identify, track, and evaluate long-term changes in coastal habitats. The main objective for this element in the next five years will be to examine the quality and availability of existing habitat data, to identify data gaps, and provide recommendations to KBNERR leadership on additional needs.

5.5.3 KBNERR Citizen Science Monitoring

KBNERR has an active citizen science monitoring program within the Reserve's Education Program for Harmful Algal Blooms (HABs), European green crab, and tunicates. This program is funded by a State Wildlife Grant, administered by the Alaska Department of Fish and Game, Division of Sport Fish. Commercial shipping, sport and commercial fishing, mariculture, and other activities provide mechanisms for introducing invasive species to the Reserve. The primary goal of this program has been early detection and reporting. In this Plan, our goal is to broaden the scope of the Reserve's citizen science monitoring and develop 5-year plans for future research that will enable an informed response to harmful species.

5.5.4 Other Monitoring Programs

1. Fish and Game
The Sport Fish and Commercial Fisheries Divisions of ADF&G monitor a number of fish and invertebrate populations within Kachemak Bay and the surrounding waters. Trawl surveys and the offshore test fishery in Cook Inlet have been conducted since the 1970s, making them among the longest State fisheries monitoring programs. Other monitoring programs, such as littleneck clam abundance and groundfish and finfish (e.g., salmon and herring) stock and harvest assessments, provide valuable biological data. As applicable, Kachemak Bay NERR will work with these programs to supplement the measurements.

2. Alaska Ocean Observing System

The Alaska Ocean Observing System's mission is to improve Alaska's ability to rapidly detect changes in marine ecosystems and living resources, and predict future changes and their consequences for the public good (www.aoos.org).

The Kachemak Bay Research Reserve will continue to support the Alaska Ocean Observing System (AOOS) by providing long-term data, assistance with outreach and education, and to coordinate on shared research projects. The KBNERR and AOOS have a shared mission and can support efforts such as oceanographic modeling of Lower Cook Inlet through collaboration and data sharing. An objective for the next two years will be to provide KBNERR long-term and short-term datasets to AOOS for inclusion in their Lower Cook Inlet database. This will facilitate making KBNERR data broadly available for a wide range of user groups, including the general public.

5.6 KACHEMAK BAY NERR GOAL 2

KACHEMAK BAY NERR GOAL 2:

CONDUCT, COLLABORATE ON, AND ENCOURAGE RESEARCH AND MONITORING OF ECOSYSTEMS IN THE KACHEMAK BAY REGION THAT INFORMS DECISION-MAKING ON CLIMATE CHANGE AND HARVESTED SPECIES.

(NERRS Strategic Plan Goal 2 - Science; ADF&G, Sport Fish Strategic Plan Goal 2 – Fisheries Research)

As the Reserve evolves, it is vital to maintain a viable research program that invites collaboration from researchers on a broad variety of topics. It is also vital that KBNERR maintains and makes available existing inventory and monitoring databases, and periodically updates mapped habitats within and surrounding the Reserve. These databases provide the basis for process studies and the evaluation of temporal change. In Objective A, detailed work plan elements accompany each strategy and are intended to follow the State of Alaska's fiscal year cycle.

Objective A. Conduct research to improve our understanding of coastal ecosystems.

(NERRS Strategic Plan Goal 2, Objectives 1, 2 and 3; ADF&G, Sport Fish Strategic Plan Goal 2, Objectives 1, 2 and 4)

Strategies:

- Identify and conduct research on impacts to the ecosystem due to climate change
- Collect life history and habitat data on harvested, threatened, or endangered species within the Reserve
- Continue monitoring of, and develop research initiatives for, marine invasive species and harmful algal blooms

- Actively seek funding initiatives for new projects that meet the intent of Objective A.

Objective B. Improve upon existing data and long-term monitoring necessary to support research needs within the Reserve.

(NERRS Strategic Plan Goal 2, Objective 1; ADF&G - Sport Fish Strategic Plan Goal 2, Objectives 2 and 4)

Strategies:

- Provide and facilitate data exchange with partners
- Build capacity through participation in partner-led, ecosystem-related research and monitoring projects
- Continue and expand environmental monitoring programs within the Kachemak Bay region
- Continue offering support to local, state, and national programs for citizen science participation in long-term monitoring of invasive species and harmful algal blooms

Objective C. Contribute to increasing regional, statewide and national collaborations among agencies, communities, universities, non-governmental organizations and tribal governments.

(NERRS Strategic Plan Goal 2, Objectives 1; ADF&G, Sport Fish Strategic Plan Goal 1, Objective 5, Goal 2, Objective 2)

Strategies:

- Participate in the annual Alaska Marine Science Symposium
- Provide direction and collaboration in the development of the Kachemak Bay Science Conference
- Revitalize regular meetings and collaborations with the Research Committee, and support active engagement of the KBNERR Community Council
- Maintain and increase collaborations with university partners and graduate students, non-governmental organizations, and tribal governments
- Identify a mechanism to support KBNERR staff participation in existing regional, statewide and national collaborations

Objective D. Identify and develop strategies to address rapid change.

(NERRS Strategic Plan Goal 1, Objective 2, Goal 2, Objective 2, Goal 3, Objective 3; ADF&G, Sport Fish Strategic Plan Goal 1, Objective 6)

Strategies:

- Develop response plans for anthropogenic and biological threats to the local ecology of Kachemak Bay
- Establish KBNERR's role in oil spill response in the Kachemak Bay region

6.0 EDUCATION AND OUTREACH [§921.13(a)(4)]

6.1 INTRODUCTION

The Reserve System provides a vehicle to increase understanding and awareness of coastal and estuarine systems, and improve decision-making among key audiences to promote stewardship of the nation's coastal resources. Education and outreach at reserves nationally and in particular at the Kachemak Bay National Estuarine Research Reserve (KBNERR), incorporate a range of science-based programs and methodologies tailored to specific audiences around priority coastal resource issues. Kachemak Bay NERR staff work with local communities and regional groups to address many different topics, including climate change, salmon and their habitats, and aquatic invasive species. Through integrated research and education programs, the Reserve helps communities develop strategies to deal successfully with these and other coastal resource issues. The goal of the Kachemak Bay National Estuarine Research Reserve Education program is to engage students and the public in hands-on learning opportunities that promote appreciation of the coastal environment; support understanding of coastal ecosystems and their dynamics; and foster active stewardship.

The Reserve's Education program supports the Reserve's priorities by incorporating climate change and harvested fish species education in public and classroom Discovery Lab programming in collaboration with Research and the Coastal Training Program. As part of an overarching Reserve goal, ongoing research projects are outreached by the education team. The integration of all KBNERR programmatic areas is addressed in Chapter 4 under Kachemak Bay NERR Goal 1 and will not be discussed in this Chapter.

The target audiences and strategies implemented by the KBNERR align with priorities of the NERRS and ADF&G. Target audiences include K-16 students and teachers, and the local and visiting public.

K-16 and professional teacher development programs include the use of KBNERR developed coastal and estuarine science curricular activities aligned with Alaska and Kenai Peninsula Borough School District education standards, that involve inquiry-based lab classroom activities and field experiences. The NERRS Estuaries101 curriculum is incorporated and modified into KBNERR activities for reinforce local relevance. Funding to deliver a K-12 Estuarine Education Program (KEEP) workshop locally has been identified as a priority by KBNERR staff. KBNERR leadership will continue to advocate to bring B-WET (Bay-Watershed Education and Training) funding to KBNERR to help fund education and training programs such as KEEP and Teachers on the Estuary (TOTE). With the current state and national financial challenges, it appears that B-WET funding might not be a viable funding opportunity during the time-frame of this management plan. However, efforts at KBNERR will continue to look for alternative funding

sources to fulfill this programmatic need. Reserve education activities are guided by NERR education plans that identify goals, priorities, and implementation strategies for these important programs. Education and training programs, interpretive exhibits, and community outreach programs integrate elements of NERRS/KBNERR research and monitoring activities, and relevant outside research, to ensure a systematic, multi-faceted, and (community-based) locally-focused approach to fostering coastal stewardship.

6.2 NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM AND ALASKA DEPARTMENT OF FISH AND GAME EDUCATION MISSION, GOALS, AND OBJECTIVES

The National Estuarine Research Reserve System's mission includes an emphasis on education, interpretation, and outreach. The Education program at Kachemak Bay NERR is designed to fulfill the reserve system goals as defined in the regulations (15 CFR Part 921(b)):

- Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation; and
- Conduct and coordinate estuarine research within the system, gathering and making available information necessary for improved understanding and management of estuarine areas.

Education-related objectives in the National Estuarine Research Reserve System Strategic Plan (2011 - 2017) include:

- Enhance the capacity and skills of teachers and students to understand and use NERRS data and information for inquiry-based learning;
- Increase estuary literacy and promote active stewardship among public audiences through the development and delivery of tools and programs addressing climate change, habitat protection, and water quality;
- Improve the capacity and skills of the coastal decision-makers to use and apply science-based information in decisions that affect estuaries and coastal watersheds.

This plan has been developed in conjunction with national and state priorities with input and guidance by Kachemak Bay NERR staff and it's Community

Council through its Education Committee which is composed of Council members, and local public K-12 educators and home school parents.

Kachemak Bay NERR is a component of the ADF&G, Division of Sport Fish. As such, education programming supports the mission of the Division to protect and improve the state's recreational fisheries resources. KBNERR education programming, which focuses on the coastal environment, complements the traditional Sport Fish aquatic education program, which emphasizes sport fishing opportunities and resources found primarily in freshwater environments. While the Kachemak Bay NERR and Sport Fish Education programs have a different primary focus, staff has developed a close working relationship that ensures programmatic continuity and mutually beneficial outcomes.

6.3 KACHEMAK BAY NERR EDUCATION

Over the next five years, KBNERR's Education program will concentrate its efforts on delivering formal and informal education programs and activities.

Formal Education
Beginning in fall 2010, KBNERR streamlined its educational outreach by utilizing the Reserve's well-established Discovery Lab program to meet the needs of visiting K-12 school groups. Each month during the school year, a topic-driven lab based out of the Alaska Islands and Ocean Visitor Center (AIOVC) offers education opportunities for public, private, and home school students, ranging from kindergarten to university level. KBNERR education staff draws upon the expertise of area scientists (KBNERR and others) to incorporate current research findings when developing these student labs. Classes and workshops for professional teacher development continue to be offered to both pre-service and classroom teachers.

Informal Education
During the summer, public Discovery Labs, Estuary Hikes, and Beach Walks offered at the AIOVC draw participants of all ages, and include both residents and visitors to the area. Partnering agencies and organizations often provide staff to assist with design and presentation of these programs. The public Discovery Labs are similar to the student labs provided to formal education classes, only with a broader, less in-depth coverage of the topic, and a less structured learning environment.

General Approach

KBNERR Education staff will work to achieve the goals and objectives outlined in this plan using these strategies:

- collaborate on grant proposals, ensuring tightly linked research, training, and education projects;
- ensure effective science translation and communication of research findings;
- provide trainings, support and outreach for community monitoring programs;
- collaborate with ADF&G Sport Fish educators, local communities, the KBNERR Community Council, the Community Council Education Committee, Tribal, and regional groups on education programs, activities, and training opportunities;
- provide regular web updates to the ADF&G and KBNERR Community Council websites;
- conduct periodic market analyses of local and regional education providers, and conduct needs assessments of regional K-12 teachers;
- conduct thorough and ongoing programmatic evaluations of students and their teachers;
- pursue grant-funded projects and activities that meet specific program needs.

Along with these strategies, many of the Reserve's formal and informal education programs will incorporate multiple forms of outreach products and methods, including printed materials, inquiry-based lab classroom and field experiences, scientific illustrations, and video components. This approach will allow visitors to choose the learning mechanism most suitable to their learning style. For example, a single topic can be presented in various formats to appeal to readers, hands-on learners, visual and auditory learners.

Programmatic evaluations are an ongoing tool used by KBNERR staff to measure the effectiveness of formal K-16 education programs. Written evaluations are completed by visiting teachers whose students participate in K-12 Discovery Lab programs, and the KBNERR Coastal Training Program has begun using an electronic tool which has utility in program evaluations of professional teacher development trainings.

6.3.1 Education Partners

Partnerships play a critical role in most, if not all KBNERR education activities. Over the past several years the education team has developed and fostered a growing number of partnerships which have proven to be extremely beneficial to the Reserve, and we hope, equally as fulfilling to our partners. As with our research and training partners, education partnerships exist and relate directly to program coordination, projects, leveraging of resources, and funding. Examples of Homer education partnerships include:

1. Pratt Museum – A local partner with the Reserve, the Pratt Museum and Reserve coordinate in full partnership on long-term visioning, programmatic development, and grant specific projects. (www.prattmuseum.org)

2. Center for Alaskan Coastal Studies - A local partner with the Reserve, the Center of Alaskan Coastal Studies and Reserve coordinate in full partnership on long-term visioning, programmatic development, and grant specific projects. (www.akcoastalstudies.org)

3. Alaska Maritime National Wildlife Refuge – Co-located within the Alaska Islands and Ocean Visitor Center, Refuge education staff are a full partner with KBNERR education programming. (http://alaskamaritime.fws.gov/)

Other education partners include, but are not limited to:

- Alaska Dept. of Fish and Game – Sport Fish Division (www.adfg.alaska.gov)
- Alaska Sea Grant (www.uaf.edu/seagrant)
- Kachemak Bay Environmental Education Alliance (www.homerfieldtrips.com)
- Kenai Peninsula Borough School District (www.kpbsd.k12.ak.us)
- Lake Clark National Park and Preserve (www.nps.gov/lacl/index.htm)
- Prince William Sound Regional Citizens Advisory Council (http://pwsrcac.org/)
- Seldovia Village Tribe (www.svt.org)
- Port Graham Tribe
- Nanwalek Tribe
- University of Alaska Anchorage, Kenai Peninsula College, Kachemak Bay Campus (www.kpc.alaska.edu/Kachemak)

6.4 FORMAL EDUCATION PROGRAM

The Kachemak Bay NERR formal education program is focused primarily on K-12 students throughout Southcentral Alaska. Almost 13,000 students have participated in formal education with the Reserve in the last five years totaling approximately 19,000 contact hours.

Kachemak Bay NERR education staff, as with staff of any marine science facility, is faced with numerous challenges to achieve

their mission of teaching school-aged students about the marine world, due to declining school budgets, changing State and district science standards, and districts' focus on classroom performance standards. These factors combine to place increasing challenges not only on the school, but also marine science education providers.

KBNERR utilizes the expertise of the KBNERR Community Council Education Committee, which is comprised of classroom teachers, retired teachers, and other committed community members, to find ways to address these challenges. For example, the Education Committee assisted with proofing the 2010 Market Analysis and Needs Assessment and gave constructive advice on how to engage teachers in filling out the Needs Assessment.

The FY2010 Education Market Analysis and Needs Assessment, funded by the NERR KEEP initiative uncovered gaps in environmental education topics currently offered in the Homer area.

- 69% of teachers surveyed have a desire to learn more about climate change through educational information on local scientific research, especially as it pertains to sea level rise. (Needs Assessment)
- Coastal environmental educators are interested in an increased focus on climate change and lab or field work techniques, and expressed a desire for training on climate change issues. (Market Analysis)

To address this gap and enhance climate literacy KBNERR Education will;

- Translate our understanding of the processes and impacts of climate change through the interpretation of KBNERR research, and research done by others in the region using data such as:
    - System-wide Monitoring Program data
    - glacial retreat, sea level rise, and coastal uplift
    - impacts of warming streams on fish populations
    - long-term drying trends on the Kenai
    - accelerated coastal erosion
    - warmer seas and enhanced survival rate of invasive and harmful species
    - ocean acidification and impacts to planktonic populations and overall productivity
- Engage elementary and middle school students in ways that excite them about the environment and help them to gain an understanding of what's naturally found here through hands-on and investigative activities.
- Reach high school students with compelling, locally relevant learning opportunities that promote an appreciation of the coastal environment, support an understanding of coastal ecosystems and their dynamics, and foster active stewardship actions.
- Opportunistically provide subject matter speakers (Reserve staff) to present to high school and college science classes.

- For all audiences, demonstrate and communicate that environments are dynamic, and change is always ongoing.

The Reserve is working with local school districts, school administrators, and classroom teachers to ensure that all programming meets the needs of the students and is aligned with State and school district science standards. In years past we have offered an array of 21 inquiry-based marine science programs developed by Reserve staff – each designed to target a specific grade and its associated science standards. To better reach a broad audience with limited funding in 2010 KBNERR expanded our topic-driven Discovery Labs from a once-a-month activity, to include all K-12 classroom fieldtrips. These research-based labs are open to the public on the first Wednesday of each month, and remain up for three weeks thereafter to allow for scheduled classroom visits. On the fourth week of each month a new research topic is developed for the next month's lab. Labs are modified as needed throughout the month to accommodate different grade levels. Response from area teachers about this change in format has been overwhelmingly positive. (See below for full description of our Discovery Lab program)

Annual program attendance by K-12 students in KBNERR formal education offerings during the years 2007 – 2010 were:

- 2010: 1,791 students and 286 adults
- 2009: 2,434 students and 322 adults
- 2008: 1,980 students and 377 adults
- 2007: 1,992 students and 379 adults

Student numbers have declined due to a decrease in the number of education programs offered.

6.5 INFORMAL EDUCATION PROGRAM

Kachemak Bay NERR is housed in the Alaska Islands and Ocean Visitor Center (AIOVC) with the Alaska Maritime National Wildlife Refuge. Since opening in 2003 the Visitor Center continues to exceed most visitation expectations, with nearly 75,000 visitors coming through the doors each year to learn about Alaska's marine environment. The Visitor Center setting allows KNBERR staff to interact with people of all ages from around the world and introduce them to the NERRS and, in particular, the work being done by Reserve staff. In an effort to give guests to

this facility additional information, Kachemak Bay NERR offers interpretive exhibits within the Visitor Center that highlight the research done by Reserve scientists and others working in the Kachemak Bay region.

When KBNERR staff moved into the AIOVC in late 2003 the Reserve had a small, but adequate exhibit space in which to outreach Reserve science. However, with ever increasing information becoming available each year from Reserve research, it quickly became evident that the Reserve exhibit space was in need of a redesign. Using NERR PAC (Procurement, Acquisition, Construction) funds, coupled with State matching funds, the Reserve was able to design, fabricate and install a suite of new exhibits in the AIOVC. The new exhibits include a real-time and to scale tide gauge of Kachemak Bay tides, five representative exhibits of habitat types found in KBNERR, a 9-minute Reserve video that plays in the Visitor Center auditorium, and a series of video vignettes that highlight biodiversity, tides, and research conducted by Reserve scientists. These exhibits provide the Reserve with the opportunity to provide timely project updates and keep our messages current and relevant to coastal issues in and around KBNERR.

While visitation at the AIOVC has been an incredible boon to the visibility of the Reserve it has also brought challenges the Education staff to keep up with an ever-increasing demand for information. To provide high quality educational opportunities in the Visitor Center KBNERR education staff developed our highly effective Discovery Labs. These labs take place in our fully-equipped lab classroom and present a topic of local interest about the coastal environment. Topics are subdivided into eight different tables, each containing interesting information and relevant scientific investigations presented in multiple ways to appeal to a variety of ages and learning styles. Most tables include hands-on activities, and may incorporate the use of dissecting and compound scopes allowing for close-up examination of live marine invertebrates or plankters; experiments that learners can conduct; and some type of craft activities. Examples of lab topics include: Invasive Species – Here and On Their Way; Alaska's Marine Mammals; and Our Changing Climate. The visitors experience is self-directed, allowing each person to devote as much time as they choose at each of the many learning stations. Kachemak Bay NERR staff and volunteers are available at all learning stations for questions and further discussion. During the summer months, Reserve staff guide *Discovery Walks* along the edge of Beluga Slough adjacent to the AIOVC. These walks are offered to all ages and include time to observe and experience a local salt marsh.

Annual program attendance by the public in KBNERR Discovery Lab offerings during the years 2007 – 2010 were:

- 2010: 2,846 (reduction in 1 week of summer labs from previous years)
- 2009: 3,576
- 2008: 3,430
- 2007: 4,061

6.6 EDUCATION GOALS, OBJECTIVES AND STATEGIES

KACHEMAK BAY NERR GOAL 3: FOSTER STEWARDSHIP INFORM COASTAL MANAGEMENT THROUGH RESEARCH AND PUBLIC EDUCATION

(NERRS Strategic Plan Goal 3 People, ADF&G, Sport Fish Strategic Plan Goal 5)

Objective A. Communicate and promote understanding of how coastal ecosystems function and their connection to society.

(NERRS Strategic Plan Goal 1, Objective 2 and Goal 3, Objectives 1, 2 and 3; ADF&G, Sport Fish Strategic Plan Goal 5, Objective 4)

FORMAL EDUCATION

Strategies:

- Develop and implement topic-driven K-16 Discovery Labs and associated learning opportunities focusing on coastal ecology and specific KBNERR research projects, especially those relating to climate change and harvestable species.
- Provide professional teacher development opportunities based upon feedback from the education community and the Education Committee.
- Assist teachers and students to meet science, technology, engineering and math (STEM) learning objectives by adhering to State and Federal K-12 performance standards when developing and delivering Discovery Lab and associated learning opportunities focusing on coastal ecology and KBNERR research projects.
- Measure effectiveness of KBNERR formal education in meeting K-12 STEM learning objectives through written teacher program assessments.

INFORMAL EDUCATION

Strategies:

- Collaborate with local partners to communicate information about the Bay's dynamic coastal processes and habitats
- Utilize public Discovery Labs and associated learning opportunities to engage the public in learning about coastal ecology and specific KBNERR research projects
- Provide training and support for citizen science and monitoring programs
- Outreach Research and Education programs on the Reserve's and AIOVC website
- Provide "What's New in the Bay" presentations to interested groups
- Provide timely news releases of Reserve activities and encourage feature articles and radio/TV spot
- Develop and provide information programs to outreach Reserve activities

Objective B. Promotes informed decision-making on coastal resource issues through informed exchange and outreach.

(NERRS Strategic Plan Goal 2, Objective 2 and Goal 3, Objectives 1, 2 and 3; ADF&G, Sport Fish Strategic Plan Goal 5, Objective 3 and 4)

INFORMAL EDUCATION

Strategies:

- Incorporate hands-on, inquiry-based laboratory and field learning opportunities in all education and interpretive activities
- Provide educational opportunities at the Alaska Islands and Ocean Visitor Center
- Provide educational opportunities in Tribal and rural communities in the Kachemak Bay/Lower Cook Inlet
- Host, assist in planning, and/or provide expertise for marine/coastal science-related events for the general public
- Promote and encourage public attendance at KBNERR 'Brown Bag' seminars

Objective C. Collaborations with the community, statewide and national partners for research and education are expanded.

(NERRS Strategic Plan Goal 2, Objective 1 and 4; ADF&G, Sport Fish Strategic Plan Goal 2, Objectives 2, Goal 5, Objective 4)

FORMAL EDUCATION

Strategies:

- Provide mentorship opportunities for community members and junior high school, senior high school, and university students
- Work with University of Alaska – Anchorage, Kenai Peninsula College, Kachemak Bay Campus to offer for-credit teacher workshops led by KBNERR staff and presentations by community experts, other agencies, and non-governmental organizations
- Work with Kachemak Bay Environmental Education Alliance to complete a new market analysis and needs assessment that will benefit regional K-16 environmental education organizations.

INFORMAL EDUCATION

Strategies:

- Develop and provide public information programs to disseminate Reserve research through appropriate venues
- Strengthen collaborations with local Tribal partners in Port Graham and Nanwalek
- Participate in local, regional, state, and national conferences in order to build partnerships, gain educational knowledge and skills, and outreach our research and education programs

- Recruit, train and support community volunteers for KBNERR led community monitoring programs
- Encourage participation by research, education and community stakeholders in Reserve activities and education outreach initiatives

Objective D. Future stewardship is fostered by creating opportunities for children and families to connect with the coastal environment.

(NERRS Strategic Plan Goal 3, Objective 1 and 2; ADF&G, Sport Fish Strategic Plan Goal 5, Objectives 2 and 4)

FORMAL EDUCATION

Strategies:

- Educate students about coastal processes, responsible stewardship actions, and decision-making activities

INFORMAL EDUCATION

Strategies:

- Host or contribute staff time to family-friendly events in an outdoor location which provide opportunities for children and parents to engage in safe, enjoyable nature-based activities
- Provide outreach to Boys and Girls Club and Head Start in order to reach children who might not otherwise attend KBNERR activities
- Encourage and increase participation in citizen monitoring and other volunteer programs.
- Provide mentorship opportunities for community members and junior high school, senior high school, and university students

7.0 COASTAL TRAINING PROGRAM [§921.13(a)(4)]

7.1 INTRODUCTION

The Reserve System provides a vehicle to increase understanding and awareness of coastal and estuarine systems, and improve decision-making among key audiences to promote stewardship of the nation's coastal resources. Training and outreach at reserves nationally and in particular at KBNERR, incorporate a range of science-based programs and methodologies tailored to specific audiences around priority coastal resource issues. Kachemak Bay NERR staff work with local communities and regional groups to address many different topics, including climate change, salmon and their habitats, and aquatic invasive species. Through integrated research, training, and education programs, the reserve helps communities develop strategies to deal successfully with these and other coastal resource issues. A needs assessment was conducted in 2010 of Kenai Peninsula decision-makers to determine the priority topics for the Reserve's Coastal Training Program. Results indicated climate change, conservation biology, ecosystem-based management, oceanography, and cumulative impacts as priority topics – all of which incorporate KBNERR's primary focus issues of climate change and harvested species.

The mission of the KBNERR Coastal Training Program is to enhance understanding, appreciation, stewardship, and ecosystem management of Kachemak Bay by providing science-based training, technical assistance, and collaborative learning opportunities to Kenai Peninsula coastal scientists, elected officials, and city and borough employees. From this mission, the goal of our program is to inform and enhance collaborative decision-making for the sustainability of Kenai Peninsula ecosystems, particularly Kachemak Bay.

7.2 NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM COASTAL TRAINING PROGRAM MISSION AND GOALS

The Kachemak Bay NERR Coastal Training Program (CTP) is part of a national CTP initiative sponsored by the Estuarine Reserves Division within NOAA. The goal of the Reserve System Coastal Training Program is to improve decision-making related to coastal resources management at local and regional levels.

The Coastal Training Program provides current scientific information and skill-building opportunities to those responsible for making decisions affecting coastal resources. Through this program, the Reserve System can ensure that coastal decision-makers have the knowledge and tools they need to address critical resource management issues of concern to local communities.

The goal of the Coastal Training Program is better informed decision-making by local and regional coastal decision-makers to improve coastal stewardship.

The objectives of the Coastal Training Program are that:

- Local and regional coastal decision-makers increasingly apply science-based knowledge and skills in their work related to NERRS priority issues; and
- Local and regional coastal decision-makers increasingly apply diverse perspectives related to NERRS priority issues

Nationally, the Coastal Training Program offers programs related to climate change, coastal habitat conservation and restoration, biodiversity, water quality, and sustainable resource management. Programs target a range of audiences, such as land-use planners, elected officials, regulators, land developers, community groups, environmental non-profits, businesses, and applied scientific groups. These training programs provide opportunities for professionals to network across disciplines, and develop new collaborative relationships to solve complex environmental problems. Additionally, the CTP provides a critical feedback loop to ensure that professional audiences are informed on local and regional science and research priorities. Programs are developed in a variety of formats ranging from seminars, hands-on skill training, participatory workshops, lectures, and technology demonstrations. Participants benefit from opportunities to share experiences and network in a multidisciplinary setting. Partnerships are important to the success of the program.

7.3 KACHEMAK BAY NERR COASTAL TRAINING PROGRAM

With increasing human development and activities along the coasts and within state waters, it is important that coastal decision-makers have the opportunity to improve their knowledge and decision-making skills to help create a more sustainable future in Alaska. Community and Borough elected and appointed officials, resource user groups, planners, regulators, and resource managers are challenged to make decisions each day that affect land use and the use of coastal resources.

To answer this need, the Kachemak Bay National Estuarine Research Reserve initiated its Coastal Training Program to provide up-to-date scientific information and skill-building opportunities to individuals who are responsible for making critical decisions that affect coastal resources along the Kenai Peninsula and coastal Southcentral Alaska.

KBNERR works closely with local partners, Alaska Sea Grant staff, and a host of other state and federal partners in determining key coastal resource issues and identifying target audiences. Partnerships with local agencies and organizations are critical in the exchange and sharing of expertise and resources to deliver relevant and accessible training programs that meet the needs of specific groups.

The Coastal Training Program requires a systematic program development process, involving periodic review of the Reserve's niche in the training market, conducting audience assessments, developing a five-year program strategy and marketing plan, and establishing an advisory group for guidance, program review, and perspective in program development. Membership of the advisory group consists of one representative from each of the following entities:

- Alaska COSEE (Centers for Ocean Sciences Education Excellence)
- Alaska Department of Fish and Game – Division of Sport Fish
- Alaska Sea Grant
- Kachemak Bay NERR – Research Program
- Kenai Peninsula Borough
- Kenai Watershed Forum
- NOAA – Alaska Regional Team

The NERR Coastal Training Program implements a system-wide performance monitoring system, wherein staff report data into an online data management system according to a suite of performance indicators related to increases in participant understanding, applications of learning, and enhanced networking with peers and experts to inform the development and delivery of current and future programs.

Each year, the Kachemak Bay NERR provides workshops targeted at three identified audiences: coastal policy decision-makers (e.g. elected officials, planners and regulatory agencies at the local, borough, state, and federal levels); coastal resource managers and scientists (e.g. fishery, wildlife, marine mammal) at the state, federal, and tribal levels; and, coastal resource user groups (e.g. ecotourism guides, sport fishing guides, and water taxi services). Depending on current issues--including coastal erosion, climate change, renewable energies, and ocean acidification– and needs of the area, one or more of these audiences may be targeted annually. Needs assessments for each target audience will occur over the next five years to determine issues and topics of interest from which to develop CTP workshops.

Additionally, the Reserve is situated within the small community of Homer (population 5,400), with several Alaska Native villages (Seldovia, Port Graham, and Nanwalek) and Russian villages (Razdolna, Kachemak Selo, Voznesenka, and Nikolaevsk) located within and along its boundaries. Given the community's relatively small size, issues addressed and research conducted by the Reserve are relevant to all residents.

7.4 KBNERR COASTAL TRAINING PROGRAM PARTNERS

Since its inception in 2002, the KBNERR Coastal Training Program has partnered with many other training entities, from the local Kenai River Center, to the NOAA Coastal Services Center. As with all KBNERR programmatic sectors, the CTP is extremely effective in leveraging resources, making it and associated training opportunities considerably more efficient for a variety of training audiences. Over the past several years, the Reserve has been fortunate to partner with a few key agency and non-governmental organizations, which include:

Alaska Coastal Management Program (prior to 2011)
Alaska Department of Fish and Game (http://www.adfg.alaska.gov/)
Alaska Sea Grant (http://seagrant.uaf.edu/)
Center for Alaskan Coastal Studies (www.akcoastalstudies.org)
City of Homer (http://www.cityofhomer-ak.gov/)
Cook Inletkeeper (http://inletkeeper.org)
Kachemak Heritage Land Trust (http://kachemaklandtrust.org)
Kenai River Center (www.borough.kenai.ak.us/KenaiRiverCenter)
Kenai Watershed Forum (http://www.kenaiwatershed.org/)
NOAA – Alaska Regional Team
(http://www.regions.noaa.gov/alaska/alaska_region_team.html)
NOAA – Coastal Services Center (http://www.csc.noaa.gov/)
University of Alaska – Anchorage (http://www.uaa.alaska.edu/)
University of Alaska – Fairbanks (http://www.uaf.edu/)

7.5 KBNERR COASTAL TRAINING PROGRAM GOALS AND OBJECTIVES

KACHEMAK BAY NERR GOAL 1: INTEGRATE RESEARCH, EDUCATION, AND ADMINISTRATIVE EFFORTS OF THE KBNERR

(NERRS Strategic Plan Goal 1, Objective 2; ADF&G, Sport Fish Strategic Plan Goal 7, Objectives 1,2,3,4 and 5)

Objective A. Reserve staff will collaborate on Reserve programming.

(NERRS Strategic Plan Goal 1, Objective 2; ADF&G, Sport Fish Strategic Plan Goal 7, Objectives 1, 2, 3, 4, and 5)

Strategies:

- The CTP coordinator meets regularly with KBNERR management, research, and education teams to collaboratively develop program efforts
- The CTP coordinator contributes to the development of methodologies to standardize cross-discipline collaboration
- The CTP coordinator is included in KBNERR planning processes
- The CTP efforts, projects, and ideas are presented at regularly scheduled staff meetings

KACHEMAK BAY NERR GOAL 2: CONDUCT, COLLABORATE ON, AND ENCOURAGE RESEARCH AND MONITORING OF ECOSYSTEMS IN THE KACHEMAK BAY REGION THAT INFORMS DECISION-MAKING ON CLIMATE CHANGE AND HARVESTED SPECIES

Objective A. Regional, statewide and national collaborations among agencies, communities, universities, NGO's and tribal governments are increased.

(NERRS Strategic Plan Goal 2, Objective 1; ADF&G, Sport Fish Strategic Plan Goal 1, Objective 5, Goal 2, Objective 2)

Strategies:

- The CTP helps coordinate, plan, and sponsor the Kachemak Bay Science Conference
- By working with partners, coordinating informal networking opportunities, and facilitating data/information exchange, the CTP helps to develop and maintain a matrix of Kachemak Bay research activities
- By participating in statewide, regional, and local workshops and meetings, the CTP supports the KBNERR's presence and partners' awareness of KBNERR research and education goals

Objective B. Improve upon existing data and long-term monitoring necessary to support research needs within the Reserve.

(NERRS Strategic Plan Goal 2, Objective 1; ADF&G - Sport Fish Strategic Plan Goal 2, Objectives 2 and 4)

Strategies:

- By coordinating workgroup meetings and 'What's New in the Bay' Discovery Labs, compiling research abstracts, and maintaining products available on the KBNERR website, the CTP facilitates KBNERR data exchange with partners
- Through climate change meetings, workshops, and needs assessments, the CTP helps identify research needs on coastal climate change impacts

Objective D. Identify and develop strategies to address rapid environmental changes.

(NERRS Strategic Plan Goal 1, Objective 2, Goal 2, Goal 3, Objective 3; ADF&G, Sport Fish Strategic Plan Goal 1, Objective 6)

Strategies:

- By delivering workshops such as climate change adaptation, the CTP supports the development of rapid response plans for ecological threats to Kachemak Bay

KACHEMAK BAY NERR GOAL 3: FOSTER STEWARDSHIP, AND INFORM COASTAL MANAGEMENT THROUGH RESEARCH AND PUBLIC EDUCATION

Objective A. Communicate and promote understanding of how coastal ecosystems function and their connection to society.

(NERRS Strategic Plan Goal 1, Objective 2 and Goal 3, Objectives 1, 2 and 3; ADF&G, Sport Fish Strategic Plan Goal 5, Objective 4)

Strategies:

- Train coastal decision-makers and user groups on coastal processes
- Provide "What's New in the Bay" presentations to coastal decision-makers
- Outreach Reserve's programs and resources on listservs and the Reserve's website
- Foster partnerships and collaborations that enhance information exchange

Objective B. Promotes informed decision-making on coastal resource issues through informed exchange and outreach.

(NERRS Strategic Plan Goal 2, Objective 2 and Goal 3, Objectives 1, 2 and 3; ADF&G, Sport Fish Strategic Plan Goal 5, Objective 3 and 4)

Strategies:

- Provide CTP workshop and meeting opportunities for area decision-makers, researchers, and resource managers on research topics that are relevant to the lower Cook Inlet ecosystem
- Develop and facilitate opportunities for information exchange between researchers, decision-makers and the public
- Synthesize and outreach existing data to better inform decision-makers about coastal issues

Objective C. Collaborations with the community, statewide and national partners for research and education are expanded.

(NERRS Strategic Plan Goal 2, Objective 1 and 4; ADF&G, Sport Fish Strategic Plan Goal 2, Objectives 2, Goal 5, Objective 4)

Strategies:

- Outreach our research program findings to coastal resource managers and user groups
- Work with local, regional, state, and national task force groups to identify common issues and to work synergistically toward data collection and problem resolution
- Participate in workshops and meetings to foster local, regional, and national partnerships and exchange
- Maintain and utilize website to outreach Reserve efforts and programs

KACHEMAK BAY NERR GOAL 4: INCREASE THE RESERVE'S RECOGNITION AS A LEADER IN COASTAL RESEARCH AND EDUCATION LOCALLY, REGIONALLY, AND NATIONALLY

Objective A. Stakeholders are aware of, and involved in, the Reserve's mission and goals.

(NERRS Strategic Plan Goal 1, Objective 2 and Goal 3, Objective 2; ADF&G, Sport Fish Strategic Plan Goal 5, Objectives 3 and 4)

Strategies:

- The CTP contributes to the development and implementation of a KBNERR communication plan that describes key messages, informational materials, and distribution mechanisms

- The CTP contributes to quarterly reports provided to the Community Council, and will contribute to other quarterly reports provided to stakeholders

Objective B. Technology is incorporated effectively and used to outreach research and education programs.

(NERRS Strategic Plan Goal 1, Objective 2; ADF&G, Sport Fish Strategic Plan Goal 5, Objective 3)

Strategies:

- The CTP coordinator makes regular updates to the website to outreach research and educational events
- The CTP supports and communicates webinar opportunities to stakeholders

8.0 PROGRAM ADMINISTRATION [§921.13(a)(2)]

8.1 ADMINISTRATIVE FRAMEWORK

The Alaska Department of Fish and Game (ADF&G) is the state agency partner responsible for administering the Kachemak Bay National Estuarine Research Reserve in conformance with Education, Research and Coastal Training Program goals of Kachemak Bay NERR and the NERR System. Kachemak Bay NERR is positioned within, and receives administrative support from, the Sport Fish Division of ADF&G. The Reserve and ADF&G work cooperatively to execute partnerships, cooperative agreements, Reimbursable Services Agreements (RSAs), and other collaborative arrangements with federal and state agencies, research and education institutions and organizations, non-profits, and local governments to achieve its missions and goals.

The overall administrative organization for Kachemak Bay NERR is composed of NOAA (federal partner), ADF&G (state partner), the Reserve's Community Council (community partner), and other key landholders and management agencies that work within the Kachemak Bay and Lower Cook Inlet region. The 18-member KBNERR Community Council was established to provide community, local government, state and federal agency, and other key stakeholder input into the continued development and direction of the Reserve. The nine community members are selected for 2-year terms using an application process, with final selection and appointment to the Council made by the Sport Fish Division Director. The nine agency representatives are employees of key KBNERR state and federal partner agencies, as outlined in the Community Council charter.

The KBNERR Community Council Charter was developed to provide direction for community involvement with the Reserve (Appendix 11). Committees have been formed to assist in programmatic development and implementation. Specifically, the Community Council has established standing committees for research, education and legislative affairs. The Coastal Training Program has an advisory committee representing key training partners which is outside the Community Council framework (see Chapter 7 for CTP Advisory Committee membership). Other subcommittees may be formed to assist in implementation of Reserve programs on an 'as needed' basis.

The goals and objectives of the Administrative Plan provide support, guidance and structure for the general operations of the Reserve, while forecasting future spending, budgets, staffing and facility needs.

8.2 FUNDING APPROACH

KBNERR leadership continually strives to establish and sustain stable, long-term funding for all staff positions. Over the previous 5-year period, the Division of Sport Fish has contributed substantial funding to stabilize the long-term financial needs of the Reserve. These increases in State funding has stabilized the funding for administrative salaries and has grown to meet the requirement for non-federal match monies. For example, three of the administrative staff (Manager, Assistant Manager, and Administrative Assistant) receives all or some portion of their salaries from the State general fund. In the case of the Assistant Manager and Administrative Assistant, these funds account for 100% of their annual personnel costs.

Since designation, KBNERR staff has been funded through a variety of sources, with several positions receiving support through a mix of funding from ADF&G, NOAA operations, and competitive grants. Each year, many staff submit competitive grants to support portions of theirs and others salaries. Over the last five-years KBNERR staff has written several successful multi-year grants which have helped to stabilize funding in the near term. These grants have been funded by a variety of sources, such as the NERR Science Collaborative, Alaska Sustainable Salmon Fund, and the Exxon-Valdez Oil Spill Trustee Council. Over the next five years, it is anticipated that KBNERR funding will continue to be a mix of consistent operational and project funding from the Division of Sport Fish and NOAA, coupled with competitive grant funding from within our partner organizations and outside sources.

Continuing to build on the strong relationship with the Division of Sport Fish, and developing strong working relationships all Fish and Game divisions, will potentially bring new funding opportunities to the Reserve over the next five years. The Reserve will continue to pursue grant support from the State Wildlife Grant program, and if funds continue to be available, from the Alaska Sustainable Salmon Fund. At the federal level, it is hoped that funding sources such as, or similar to, the Science Collaborative, will continue to be made available in the coming years as well.

8.3 ANNUAL BUDGET

Kachemak Bay NERR's general operations and programmatic functions are covered through three primary funding sources: (1) the annual NOAA Operations award; (2) ADF&G, Division of Sport Fish general funds and Fish and Game license dollars; and (3) a variety of competitive grant sources. As stated previously, the Reserve is based on a state/federal partnership. This partnership brings to the Reserve operational funding through the annual NOAA Operations award. This award provides funds for Reserve operations and maintenance, partial salary for a number of personnel, and programmatic activities that support the NERR mission, such as the System-wide Monitoring Program and the Coastal Training Program. The NOAA operations

award requires a 30% non-federal match. Consequently, the funds currently received by the Reserve from ADF&G are used to achieve this match requirement, which typically requires approximately $277,000 per year. Historically, securing non-federal match has been challenging for Reserve leadership to achieve. As noted earlier, increasing support by the Division of Sport Fish has significantly reduced the annual uncertainty of obtaining sufficient non-federal match monies. It is anticipated that over the next five years the level of funding, at both the state and federal levels, will see some level of reduction. If these reductions do in fact occur, the Reserve may once again be placed in a match shortfall position, placing the responsibility of obtaining a stable match source for the NOAA Operations award as a primary task for the Administrative and Management teams. Future funding plans will continue to advocate for stable or increased State support to reduce the need to look elsewhere for non-federal funds.

Planning for future budgets is becoming increasingly difficult. Each year, increased personnel costs (wages and benefits) continue to challenge the Reserve. Overall expenditures are projected to grow by at least 5% annually across the board (e.g. personnel, operations and maintenance, equipment). With level, functionally decreasing, or declining budgets over the next five years, KBNERR administration will be faced with difficult decisions on reducing levels of programmatic outputs.

To continue to flourish, KBNERR, like the national system, must make bold new moves that will keep programs growing and supported by leadership, at both the elected official and agency levels. Resting on past success and maintaining status quo cannot be the vision for the future. KBNERR must be ready to pursue opportunities that arise within its mission. To accomplish this forward movement, KBNERR will:

- Aggressively pursue long-term funding opportunities for both efficient use of staff time and programmatic continuity
- Pursue large, multi-year grants, rather than multiple small grants
- Identify and build relationships with corporate donors with similar goals
- Build relationships with private foundations with common issues and strategies
- Work and collaborate with private, non-profit groups
- Continue to show value of KBNERR to state and federal partners

8.4 RESERVE STAFF

To date, all KBNERR staff has been hired from within the State of Alaska, ADF&G personnel hiring process, and who can be characterized by a number of personnel classifications, including:

Permanent Full-time: Work a minimum of 37.5 hours/week. For health insurance and retirement benefit purposes only, 30 hours is considered full-time.

Permanent Part-time: Work less than 37.5 hours/week. Must work a minimum of 15 hours/week to be eligible for health insurance with retirement benefits, holiday pay and accrued leave prorated based on the number of hours worked per week.
Permanent Seasonal: Full-time or part-time, but less than 12 months/year.
Nonpermanent: There are two types: long-term and short-term. Short-term employment is less than 120 calendar days and the employee is not eligible for benefits. If this position goes beyond 120 calendar days, the position is filled as a long-term employee who can work up to two fiscal years, and is entitled to holiday pay, accrued leave and health insurance. Neither type is eligible for retirement benefits.

Table 6 outlines current (FY11) staff at Kachemak Bay NERR, hiring status and funding status.

Table 6. Kachemak Bay NERR Current Staff Positions

Program	Position	Hiring Status	Approx. Funding Status
Administration	Manager / Program Coordinator II	Permanent, Full-time	80% ADF&G, 20% NOAA
Administration	Assistant Manager / Program Coordinator I	Permanent, Full-time	100% ADF&G
Administration	Administrative Support / Administrative Assistant I	Permanent, Full-time	100% ADF&G
Administration	Coastal Training Coordinator / Project Assistant	Permanent, Seasonal	65% NOAA 35% Competitive grants
Research	Research Coordinator / Fishery Biologist III	Permanent, Full-time	55% NOAA 15% ADF&G 30% Competitive grants
Research	Fisheries Biologist / Fishery Biologist II	Permanent, Seasonal	TBD
Research	Research Analyst & GIS / Research Analyst II	Permanent, Full-time	45% NOAA 55% Competitive grants
Research	Watershed Specialist / Habitat Biologist II	Permanent, Part-time	1% NOAA 70% Competitive grants 29% ADF&G
Research	Fisheries Biologist / Fishery Biologist I	Permanent, Seasonal	40% NOAA 60% Competitive grants
Education	Education Coordinator / Education Specialist I	Permanent, Full-time	50% NOAA 15% ADF&G 35% Competitive grants
Education	Marine Educator / Education Associate III	Permanent, Seasonal	40% NOAA 15% ADF&G 45% Competitive grants
Education	Marine Educator & Community Monitoring Lead / Education Associate II	Permanent, Seasonal	1% NOAA 35% ADF&G 64% Competitive grants

8.4.1 Current Administrative Staff

The Manager's responsibility is to guide, support and direct the Kachemak Bay National Estuarine Research Reserves' administration, research, education, and training programs. The position supervises the Assistant Manager, Research Coordinator, and Education Coordinator, and also serves as liaison and representative of the Reserve with various state and federal agencies and non-governmental organizations. The Assistant Manager position is new to KBNERR (first filled in Spring 2011), and is responsible for assisting the KBNERR Manager in guiding, supporting and directing Reserve programs by coordinating financial, Community Council, and coastal training functions. The position directly supervises the Coastal Training Program Coordinator and Administrative Assistant I. The Coastal Training Program Coordinator works with all Reserve programs, and is responsible for the design and facilitation of training programs that have been identified by coastal decision-makers and stakeholders through a series of systematic needs assessments. The Administrative Support position provides guidance on personnel, purchasing, and travel issues, and is responsible for scheduling, recordkeeping, inventory, and budget balancing. This position also serves as the Reserve's receptionist and liaison for visitors to the KBNERR bunkhouse.

8.4.2 Current Research Staff

The Research Coordinator (Fishery Biologist III) responsibilities include: coordination of all research and monitoring programs; supervision and support of the Research staff; supervision of, and ensuring proper execution of, the System-wide Monitoring Program (SWMP); supervision of Graduate Research Fellow (GRF) students; and development and coordination with others of outside funding for research and monitoring activities. The Research Coordinator is responsible for supervision of the following staff: Watershed Specialist (Habitat Biologist II), which establishes and implements research projects based on a watershed approach, including applied science, functional assessments and community involvement; Fisheries Biologist II, which establishes and implements applied research projects based on fishery management needs; GIS Specialist (Research Analyst II), which oversees GIS/ data management activities at the Reserve, including data collection and capture, metadata integration, and compilation of GIS data layers to ensure compatibility; Fisheries Biologist I (SWMP Technician), which leads the day-to-day activities for the long-term water quality monitoring program, and assists with all elements of the research program.

8.4.3 Current Education Staff

The Education Coordinator (Education Specialist I) responsibilities include: coordination of all Kachemak Bay NERR Education programs; supervision and support of Education staff; and development and coordination of outside funding for education program design and delivery. The Education Coordinator is responsible for supervision of the following staff: Marine Science Educator (Education Associate III), which oversees K-12 and teacher-training programs, coordinates with agencies and organizations on education efforts, and coordinates and delivers Discovery Labs and other informal programs for the general public. In turn, the Education Associate III is responsible for the supervision of the Marine Science Educator/Community Monitoring Coordinator (Education Associate II), which supervises community volunteers in various community monitoring programs (e.g. European green crabs, tunicates, and harmful algal blooms) and assists with the delivery of education programming. The Education Associate II also works closely with the Research team to coordinate community monitoring data collection and analysis to ensure data compatibility with ongoing database design and development.

Figure 12 shows a chart of how these positions are organized within the Kachemak Bay NERR programs.

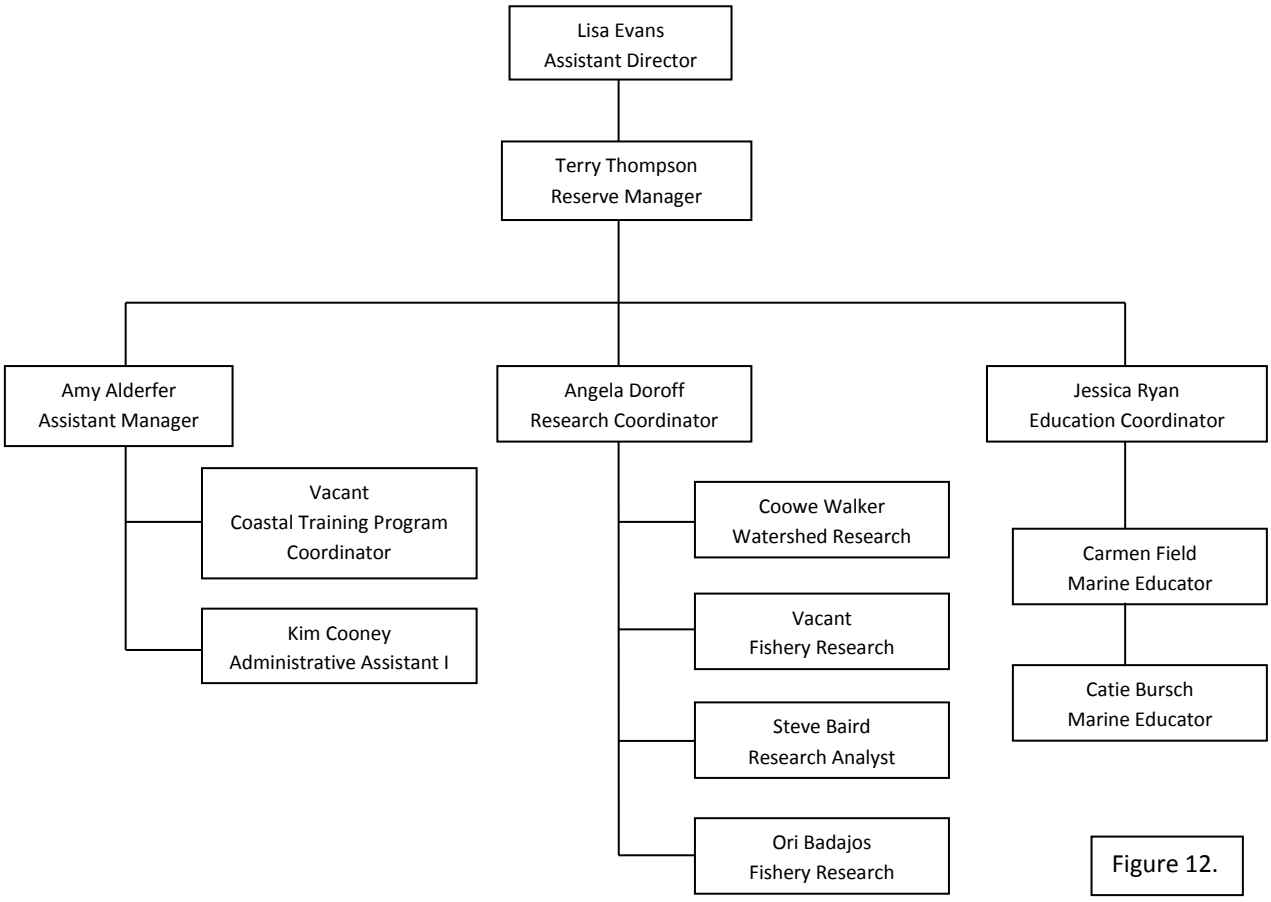


Figure 12.

8.4.4 Future Staff Needs

The Reserve does not envision growth in permanent staffing levels over the next five years, but will continue to rely on both long-term and short-term non-permanent hires to fill unmet personnel needs on a project-by-project basis. Interns will continue to be encouraged and hired as needed, as will project volunteers.

Existing positions will continue to be evaluated as a function of the annual performance evaluation process to determine if the current job class adequately represents the duties and level of responsibility asked of the position. When appropriate, changes in job class will be pursued.

8.5 FACILITIES PLAN

Kachemak Bay NERR Facilities

The Reserve maintains offices, educational lab classrooms, a research lab, seminar and conference room, and a small exhibit area in the Alaska Islands and Ocean Visitor Center (AIOVC). The 3,421-m^2 (36,825-$ft.^2$), state-of-the-art Visitor Center was built, and is maintained, through a partnership with the US Fish and Wildlife Service, Alaska Maritime National Wildlife Refuge (AMNWR). Approximately 37% (1,266-m^2 or 13,625-$ft.^2$) of the Visitor Center is space dedicated to the Reserve or shared with the Refuge.

In 2009, the Memorandum of Agreement (MOA) between the Kachemak Bay NERR and AMNWR was re-negotiated and signed by NOAA, U.S. Fish and Wildlife Service, and the State of Alaska, Department of Fish and Game. Year one of this MOA negotiated the annual operational costs for KBNERR at $118,050 with a 3% annual increase over the 5-year life of the MOA. Operational costs for the AIOVC will begin at $125,240 at the start of this 5-year plan. The current MOA will expire in 2013, with negotiations for a revised MOA scheduled to begin in 2012.

The Reserve also maintains two off-site facilities: a laboratory/staging area, and a modular building with partner offices and a bunkhouse. The Bay Avenue laboratory is used for equipment staging, construction, maintenance, and storage, as well as for sample processing. The modular facility, which served as the Reserve's Headquarters prior to the construction and completion of the AIOVC, currently houses office space for Reserve partners who are collaborating on projects of common interest. The bunkhouse is heavily used by the Reserve, especially during the summer field season. These facilities, as well as the AIOVC, are detailed in the Facilities Plan in Appendix 12.

Current Facility and Equipment Capabilities

Kachemak Bay NERR has two major research facilities under its purview: (1) the main AIOVC lab and (2) the Bay Avenue laboratory. The main lab and office space within the AIOVC accommodates the majority of Research staff needs. The laboratory in the AIOVC is used for processing biological samples and SWMP data sonde calibrations. The lab has an instrumentation calibration station, fume hood, and space for multiple microscope and sample preparation stations. Additionally, there is space for several pieces of laboratory equipment. An office within AIOVC is dedicated to telemetry equipment for downloading data collected at KBNERR SWMP stations and other monitoring sensors. Unoccupied cubicles and offices are used to support visiting scientists and seasonal employees.

Most KBNERR education programming is conducted in a lab classroom located in the Visitor Center. The lab classroom has the capacity to host 32 students at learning stations, with a wide range of scientific equipment to enhance hands-on learning experiences. Students have access to compound and dissecting microscopes, three salt water aquaria housing marine invertebrates, digital imaging technology, and basic dissecting equipment.

The Bay Avenue laboratory is used for equipment and boat storage, sample processing, equipment repair, and as a staging area for both KBNERR and partner projects. It also houses a well-equipped workshop with a suite of power and hand tools.

The Reserve acquired a 25 ft. Boston Whaler boat in 2010 from the U.S. Fish and Wildlife Service through a transfer of federal surplus equipment. Projects that require a boat larger than the Boston Whaler will be supported by contracting with local vessel operators. The Reserve boat is a shared asset between all KBNERR programs.

8.5.1 Partner Facilities

Kasitsna Bay Laboratory

Kasitsna Bay Laboratory (KBL) is the Alaska field laboratory of the Center for Coastal Fisheries and Habitat Research (CCFHR), one of five Centers within the National Centers for Coastal Ocean Science (NCCOS) in the National Ocean Service (NOS) line office of NOAA.

KBL is the only NCCOS field laboratory on the U.S. Pacific Ocean coast. Originally constructed in 1959, the KBL underwent a $12.5 million redevelopment project that was completed in summer 2007. New facilities constructed at the KBL include a pier, wet and dry laboratories, SCUBA station, maintenance shop, two dormitories, a warehouse, and water/sewer

infrastructure. The new construction greatly expanded KBL facilities for year-round field and laboratory-based research.

Situated in a sentinel subarctic location at a biogeographic boundary along the Gulf of Alaska coast, KBL facilitates coastal climate change research in close proximity to the diverse marine and terrestrial habitats of Kachemak Bay and Cook Inlet. Coastal field ecology studies are enhanced by ready access to eel grass, kelp, and salt marsh communities, rocky fjords, mudflats, and glacial rivers and watersheds. Research is complemented by the capacity to conduct experiments under controlled conditions in flowing sea water and dry laboratory facilities. With year-round operations, KBL enables expanded coastal research and monitoring in the winter months, during which time there is limited sampling in Alaskan waters. The laboratory also provides an ideal test bed for developing and refining applications of emerging technology to improve characterization of challenging subarctic coastal ecosystems. Such technology includes multibeam sonar, airborne LiDAR, harmful algal bloom detection kits, satellite remote sensing, and autonomous underwater vehicles.

Core KBL research areas:

- *Climate change and ocean acidification* – Evaluate and forecast the impacts of global climate change and ocean acidification on the structure and ecological function of subarctic coastal and estuarine habitats.
- *Harmful algal blooms (HABs) and marine diseases* – Understand and predict the distribution and impacts of HABs and marine diseases in subarctic ecosystems, as well as their response to changing environmental conditions.

KBL research will also emphasize two research strategies within these core topic areas:

- *Marine spatial planning* – Holistically combine coastal ecology studies, mapping and observations to produce ecosystem assessments, models and forecasts that guide coastal planning and resource management efforts.
- *Emerging technology applications* – Develop new technology tools and applications to characterize challenging subarctic marine environments and improve public and ecosystem health.

With the capacity to host up to 48 visiting researchers on-site for field and laboratory studies, anywhere from days to months in duration, the facility offers a unique opportunity for cost-effective collaborations.

NCCOS and the University of Alaska Fairbanks (UAF) School of Fisheries and Ocean Sciences conduct collaborative research and education programs at KBL which is located within the boundaries of the Kachemak Bay National Estuarine Research Reserve. According to the Kasitsna Bay Laboratory Science Plan of 2010, KBL staff will closely collaborate with

KBNERR and other ADF&G offices in Homer on coastal science issues affecting Kachemak Bay (Kasitsna Bay Laboratory Science Plan, 2010.). Collaborative efforts to date between KBNERR and KBL include projects funded by the Exxon-Valdez Oil Spill Trustee Council, and cooperative (unfunded) opportunities such as the Cook Inlet/Kachemak Bay circulation studies, shellfish monitoring for paralytic shellfish toxins, Hollings Scholar student support, and the Hydropalooza benthic mapping project.

8.5.2 Future Facility Needs

No new KBNERR facilities are planned over the next five years. However, some minor upgrades to existing facilities and equipment may be needed.

General Description of Proposed Facility Needs

Facility needs for the Reserve have significantly decreased from those identified in the previous Management Plan. Currently, KBNERR envisions only a small number of potential facility proposals over the next five years. These are primarily aimed at assisting local KBNERR partners, but all have direct benefit to KBNERR. (See Table 7.)

Table 7. Proposed Future Facility Enhancements

Facility Enhancement	Anticipated Schedule	Cost Estimates
USFWS Beluga Slough Trail	FY14 (State FY)	$400,000
City of Homer: Reserve Signage – Homer	FY14	$50,000
KBSP Trail Signage	FY15	$70,000
Pratt Museum (marine room exhibits)	FY15	$150,000

The Reserve does not anticipate being the primary lead or funder on partnership facility projects, but recognizes the importance of these projects to our partners, and the ability to outreach KBNERR science and stewardship messages through our partner's facilities and the land/trails that they manage. Additional details on these projects are provided in the Facilities Plan in Appendix 12.

8.6 COMMUNITY PARTNERS

The community was very involved in the establishment of the Reserve, and the partners list reflects continued involvement with many of those founding organizations, as well as with a growing number of important local and regional partners:

- Alaska Department of Fish and Game – Homer office (http://www.adfg.alaska.gov/)
- Alaska Department of Natural Resources (www.dnr.alaska.gov)
- Alaska Maritime National Wildlife Refuge (http://alaskamaritime.fws.gov/)
- Alaska Ocean Observing System (http://www.aoos.org)
- Alaska Sea Grant (http://seagrant.uaf.edu/)
- Alaska SeaLife Center (www.alaskasealife.org)
- Center for Alaskan Coastal Studies (http://www.akcoastalstudies.org/)
- City of Homer (http://www.cityofhomer-ak.gov/)
- Kachemak City
- City of Seldovia (www.seldovia.com)
- Cook Inletkeeper (www.inletkeeper.org)
- English Bay Corporation
- Environmental Protection Agency (www.epa.gov)
- Kachemak Bay Campus, Kenai Peninsula College, University of Alaska Anchorage (http://www.kpc.alaska.edu/KBC/)
- Kachemak Bay Conservation Society (http://www.kbayconservation.org/)
- Kachemak Heritage Land Trust (www.kachemaklandtrust.org)
- Kenai Peninsula Borough (www.borough.kenai.ak.us)
- Kenai Watershed Forum (http://www.kenaiwatershed.org/)
- Nanwalek IRA Council (www.chugachmiut.org/tribes/nanwalek.html)
- National Park Service – Lake Clark (www.nps.gov/lacl) and Katmai (www.nps.gov/katm)
- NOAA/University of Alaska Fairbanks – Kasitsna Bay Laboratory (http://www.westnurc.uaf.edu/kbay.html)
- Port Graham Village Corporation
- Port Graham Village Traditional Council
- Pratt Museum (http://www.prattmuseum.org/)
- Seldovia Native Association (http://www.snai.com/)
- Seldovia Village Tribe (www.svt.org)
- U.S. Department of the Interior, Bureau of Indian Affairs (http://www.bia.gov/)

8.7 KBNERR ADMINISTRATIVE MISSION, GOALS AND OBJECTIVES

The mission of the administrative team is to actively partner with the research and education staff to provide administrative and managerial infrastructure to support the Reserve's mission. To that end, the goals and objectives related to administration and leadership clearly point out the need for an engaged and supported workforce to fulfill the Reserve's mission. The Reserve's Management Team (Manager, Assistant Manager, Research Coordinator, and Education Coordinator) provides clear direction and support to staff based on the Reserve's mission. The

Management Team places a strong emphasis on staff retention, and recognizing the value that all staff have in helping to achieve the mission and goals of both the Reserve and the Division of Sport Fish. This priority is coupled with providing opportunities for increasing staff professional development, which is viewed as one element to maintain and build morale and job satisfaction. To help achieve these actions, the Management Team strives to maintain a long-term stable funding plan in a challenging fiscal environment.

KBNERR staff work to increase the visibility of Kachemak Bay NERR within their respective professional communities, as well as within the local community, region, state and nation. The resulting identity recognition strengthens the Reserve's role as a leader in research, education, training and stewardship, while fostering key partnerships that help further its mission and goals beyond mere physical boundaries.

The Program Administration objectives are divided into two categories: leadership and management.

- The leadership component is external, emphasizing how the Reserve is looking ahead to where it will be positioned in five years, and providing Reserve direction and outreaching that vision to its partners.
- The management component is internal, identifying the steps necessary for the Reserve to progress from where the Reserve is today to where it wants to be in five years and beyond.

The Administrative goals are primarily aligned with:

- NERRS Strategic Plan Goal 1 – Protected Places: Estuaries and coastal watersheds are better protected and managed by implementing place-based approaches at Reserves; and
- ADF&G, Division of Sport Fish Strategic Plan Goal 7 – Workforce Support: Provide exceptional support to our workforce to attain the Division's vision and goals.

KACHEMAK BAY NERR GOAL 4: INCREASE KACHEMAK BAY NERR'S RECOGNITION AS A LEADER IN COASTAL RESEARCH AND EDUCATION, LOCALLY, REGIONALLY, AND NATIONALLY

(NERRS Strategic Plan Goal 1; ADF&G, Sport Fish Strategic Plan Goal 5)

Objective 1. Stakeholders and the public are aware of, and involved in the Reserve's mission and goals.

(NERRS Strategic Plan Goal 1, Objective 2 and Goal 3, Objective 2; ADF&G, Sport Fish Strategic Plan Goal 5, Objectives 3 and 4)

LEADERSHIP

Strategies:

- Develop and implement an overarching KBNERR communication plan that describes key messages, informational materials, and distribution mechanics
- Standardize and disseminate a quarterly newsletter to stakeholders and the general public
- Continue article submissions to local and regional newspapers
- Foster and participate in community, statewide, and national collaborations that support Kachemak Bay NERR research, education, and training

MANAGEMENT

Strategies:

- Work with the KBNERR Community Council to identify how it actively participates in Reserve activities and research initiatives
- Use National Estuaries Day and other events to highlight the integration of research, education, and administration
- Ensure that project/program one-pagers and communication plans are produced
- Work with KBNERR Community Council to establish a Friends of KBNERR or other donor mechanism
- Recruit, maintain and support an active volunteer program

Objective 2. Technology is incorporated effectively and used to outreach research and education programs.

(NERRS Strategic Plan Goal 1, Objective 2; ADF&G, Sport Fish Strategic Plan Goal 5, Objective 3)

LEADERSHIP

Strategies:

- With other partners, use technology to synthesize research and education activities (e.g. GIS mapping, webinars, and video conferencing)

MANAGEMENT

Strategies:

- Web site: Within the guidelines of Departmental policies, establish a mechanism for maintenance and regularly scheduled updates of the KBNERR website
- Identify current and new media opportunities and outlets to communicate the Reserve's education, training, and research programs
- Incorporate emerging communication technologies in Reserve outreach elements

KACHEMAK BAY NERR GOAL 5: PROVIDE SUPPORT AND RESOURCES TO THE KBRR WORKFORCE TO ATTAIN THE RESERVE'S MISSION

(NERRS Strategic Plan Goal 1; ADF&G, Sport Fish Strategic Plan Goal 7)

Objective 1. Qualified and motivated staff are recruited, developed and retained.

(NERRS Strategic Plan Goal 1, Objective 2; ADF&G, Sport Fish Strategic Plan Goal 7, Objective 1)

MANAGEMENT

Strategies:

- Reserve staff has opportunities for professional development, training and job advancement
- Conduct annual performance evaluations
- Staff salaries are from stable funding sources
- Regularly evaluate staffing levels and ensure adequate staffing and workload
- Support graduate level education, internship and volunteer opportunities
- Conduct exit interviews with all departing staff
- Standardize and continue new employee orientation program
- Review and update as needed KBNERR position descriptions
- Cross-train staff

Objective 2. The work environment is safe, positive and supportive.

(NERRS Strategic Plan Goal 1, Objective 2; ADF&G, Sport Fish Strategic Plan Goal 7, Objective 2)

MANAGEMENT

Strategies:

- Host regular opportunities to share information internally
- Create a volunteer recognition program
- All staff receives safety training
- Safety equipment is provided, maintained and used
- Develop a mechanism to address internal complaints
- Improve staff communication
- Ensure staff has appropriate tools, technology, and equipment
- Staff has the time to accomplish assigned work

Objective 3. The Reserve's organizational structure is effective.

(NERRS Strategic Plan Goal 1, Objective 2, ADF&G, Sport Fish Strategic Plan Goal 7, Objective 3)

LEADERSHIP

Strategies:

- Develop mechanisms for staff to interact with other NERR's on a national level

MANAGEMENT

Strategies:

- Staff provides weekly updates to KBNERR management
- Management Team meeting notes are distributed to all staff
- Staff meetings are held twice per month and notes distributed to all staff
- Continue to ensure that staff is familiar with administrative processes
- Continue to provide effective budgeting, financial, and administrative support
- Ensure consistency in application of administrative procedures
- Conduct periodic staff needs assessments, e.g. training and professional skills
- Continue to provide timely information to staff on new procedural changes

Objective 4. Funding is stable and is aligned with the Reserve's priorities and programs.

(NERRS Strategic Plan Goal 1, Objective 2; ADF&G, Sport Fish Strategic Plan, Goal 7, Objective 2)

LEADERSHIP

Strategies:

- Identify funding opportunities with partner organizations

MANAGEMENT

Strategies:

- Prepare annual evaluation on progress toward achieving strategic plan goals, objectives, and strategies
- Ensure projects are based on, and prioritized by, the Reserve's Research and Education plans
- Develop a strategy for supporting non-grant funded activities

Objective 5. Staff has sufficient resources to perform their work.

(NERRS Strategic Plan Goal 1, Objective 2; ADF&G, Sport Fish Strategic Plan Goal 7, Objective 2)

MANAGEMENT

Strategies:

- Develop technology replacement schedule
- Develop maintenance schedule for facilities and equipment

9.0 PUBLIC ACCESS AND VISITOR USE

Management activities for public lands and waters within the Reserve boundaries are the responsibility of the Alaska Department of Fish and Game (ADF&G) and the Alaska Department of Natural Resources (ADNR). Specifically, ADF&G, Division of Wildlife Conservation manages the Kachemak Bay and Fox River Flats Critical Habitat Areas; ADNR, Division of Parks and Outdoor Recreation manages Kachemak Bay State Park and Kachemak Bay State Wilderness State Park; and ADNR, Division of Mining, Land and Water manages the submerged lands of the Bay. The Reserve does not own or directly manage any of the lands and waters within its designated boundaries, so a formal Public Access Plan has not been developed by the Reserve.

9.1 NERRS PRIORITIES FOR PUBLIC ACCESS

Section 921.13(a) (5) of the NERRS regulations requires a Plan for Public Access as part of the overall Reserve Management Plan. Public access can be defined as the ability of all members of the community to pass physically and visually to, from and along the ocean shore, other waterfronts and over public lands. The ability to enjoy the ocean, bays, and rivers is directly related to the ability to reach them from the uplands. A Public Access Plan must try to allow for long-term public use and enjoyment of the water and shoreline, while minimizing damage to the resources themselves (EIS 1998).

9.2 ADF&G, DIVISION OF SPORT FISH PRIORITIES FOR PUBLIC ACCESS

By law, the mission of the Division of Sport Fish is to protect and improve the State's recreational fisheries resources. The Division of Sport Fish has addressed public access in its 2010- 2014 Strategic Plan through Goal 4: Angler Access, which identifies the need to protect and improve public access to recreational fisheries resources. The Division has a vested interest in securing and protecting recreational angler access to public lands and waters, maintaining or improving current access sites and facilities, and identifying, prioritizing, and developing new access sites.

9.3 MANAGEMENT AGENCIES PUBLIC ACCESS POLICIES

Both the Alaska Department of Fish and Game, and the Department of Natural Resources have public access policies in their respective area management plans. The Kachemak Bay and Fox River Flats Critical Habitat Areas Management Plan contains the following statement: "Maintain existing public access into Kachemak Bay and Fox River Flats critical habitat areas. Improve public access within Kachemak Bay Critical Habitat Area consistent with the goals of the

management plan. Fox River Flats Trail should continue to be used as an all-weather trail with appropriate terms and conditions, including weight restrictions, placed on use of motorized vehicles."

9.4 KACHEMAK BAY NERR PUBLIC ACCESS

The Kachemak Bay NERR respects the continuation of traditional uses in the Bay, while at the same time working to ensure the intent of designation is preserved that provides a stable and intact biological system for KBNERR research, monitoring, education, and training to occur. ADNR has addressed public access and the preservation of existing uses in their respective Management Plans for the CHAs and State Park. Objectives in the Kachemak Bay and Fox River Flats CHA Management Plan mandate maintained or increased opportunity to hunt, fish, and recreate within those areas consistent with CHA goals (ADF&G 1993). The Kachemak Bay State Park Management Plan lists objectives for assessing public needs and providing recreational opportunities, and also discusses various access issues in the region (ADNR 1995).

9.4.1 Current Public Access

Most visitors to the Kachemak Bay area arrive in Homer by motor vehicle or by plane. Fewer visitors arrive via the Alaska Marine Highway System (state ferry) or cruise ship, but the number of cruise ships has been on the rise in recent years. The opening of the Alaska Islands and Ocean Visitor Center in 2003 substantially increased the visibility of the Reserve and the diversity and number of activities offered to local residents and visitors.

Access to Kachemak Bay and Fox River Flats CHAs is primarily via Kachemak Bay proper and a system of public trails. There are approximately ten public boat ramps and docks located around Kachemak Bay, with the City-operated Homer Spit boat launch serving as the primary access point. Bay access can also be gained through Seldovia Harbor, Bradley River, Halibut Cove, and Jakolof Bay on the south side, and Mud Bay, Mariner Park, Bishop's Beach, and Diamond Creek Trail on the north side, Fox River Flats can be accessed from the Bay, or by road, via the State-maintained Swift Creek Switchback Trail.

Several public access points can also be found along the Homer Spit, Homer Airport beach, Sterling Highway, and East End Road.

North Side Access

On the north side of the Bay beach access is available by road from the Sterling Highway at the Anchor River State Recreation Area in Anchor Point, and at Bishop's Beach near Beluga Slough in Homer, a short trail walk from the Alaska Islands and Ocean Visitor Center. Access to Mud Bay can be made from Kachemak Drive in Homer, and several pull-outs along the Homer Spit allow for motorized and pedestrian beach access.

Further out, at the terminal point of East End Road, the Swift Creek Switchback Trail authorized by the State for pedestrian, horse, and ATV access only, leads down to the beach. The trail connects to the Fox River Flats Trail, which runs from the head of the Bay up the valley on the west side of Fox River Flats, providing the main access to the Flats, as well as the Russian Old Believer village of Kachemak - Selo.

South Side Access

Since the south side of the Bay is not accessible by road, it has experienced less human impact over the years. The glaciers, relatively intact forest, pristine inlets and diverse salt marshes and intertidal life that typify the south side are of great interest to researchers, educators, and recreationists alike. Travel to these areas from Homer requires a boat or small plane, and each summer, hundreds of private boats, water taxis, and public and private ferries cross the Bay in pursuit of recreational, educational and research activities.

Kachemak Bay State Park (KBSP), Alaska's first State

Park, and Kachemak Bay State Wilderness Park, contains roughly 1,619 km^2 (400,000 ac.) of mountains, glaciers, forests and ocean. The estimated 554 km^2 (137,000 ac.) of Park uplands included in the Reserve's boundary drains into Kachemak Bay from the surrounding watershed.

Fifteen State Park trailheads are found on the south side of the Bay, with KBSP cabins and campsites available to the public in Halibut Cove, China Poot Bay, and Tutka Bay Lagoon (ADNR 2004). Owners of private land in-holdings on the south side of the Bay access the park via their property and along the shore to hike, fish, hunt, and beach comb.

Existing Uses

Kachemak Bay supports several maritime focused activities. At the present time, the primary and permitted uses of Bay resources include:

- Sport fishing and hunting
- Commercial fishing
- Personal use and subsistence fishing and hunting
- Shellfish mariculture
- Plant gathering
- Livestock grazing
- Education uses
- Trapping
- Transportation and moorage
- Recreation and tourism
- Shoreline lodges and residences
- Pipelines and utility lines
- Logging/timber
- Shoreline stabilization (armor rock)
- Annual maintenance dredging in, and adjacent to, port and harbor facilities

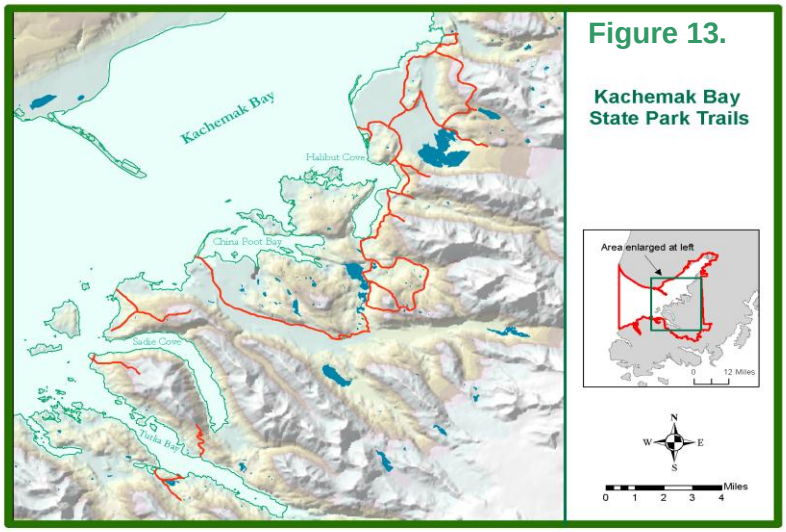


Figure 13.

Kachemak Bay State Park Trails

Sport and personal use fishing and shellfish harvesting, recreational and subsistence hunting, commercial fishing, hiking, camping, and boating are all traditional uses within the boundaries of Kachemak Bay NERR. Several of these activities are subject to state regulation

and require personal licenses and permits, such as fishing and hunting licenses and personal use permits. Some activities require licensing/permits based on location in either the Critical Habitat Areas or State Park. Access for the majority of these activities generally takes the form of a boat or small plane.

There are excellent hiking and camping opportunities along the shoreline and in the surrounding forests and mountains (Figure 13.). Glaciers and snowfields stretch for miles above the timberline and provide opportunities for skiers and hikers. Park attractions include Grewingk Glacier, Poot Peak, China Poot Bay, Halibut Cove Lagoon, Humpy Creek, and China Poot (Leisure) Lake.

9.4.2 Future Public Access

The Reserve does not foresee major expansions in public access from the land management agencies over the next five years. However, some minor plans for expansion of public access in Kachemak Bay have been discussed over the years, and will continue to be considered in future discussions. Existing access sites will be improved when necessary, consistent with the goals and objectives of CHAs, KBSP, and the NERR program. Public access plans or needs include:

- Upgrade of interpretative trails at the AIOVC, allowing improved access to estuarine areas for educational purposes, specifically Beluga Slough (USFWS 1994, EIS 1998)
- Additional small boat mooring buoys within the Kachemak Bay State Park for camping at public beaches to limit impacts by anchors on the diverse and productive intertidal zone
- Potential development of foot trail access at Cottonwood Creek and/or Eastland Creek on Kachemak Bay State Park lands near the head of the Bay.
- Development of the Kachemak Bay Water Trail

Proposals to increase public access will be reviewed by the Alaska Department of Fish and Game, Habitat Division and Kachemak Bay State Park staff to ensure that compatibility and management needs are met. (EIS 1998) Both of these State entities are represented on the Reserve's Community Council, where relevant issues or topics, such as public access, can be presented and discussed during quarterly meetings. Any action taken by the Kachemak Bay Community Council related to land management or policies with KBNERR boundaries would be advisory in nature if presented to either ADF&G or ADNR.

10.0 LAND ACQUISITION

When Kachemak Bay NERR was designated, boundaries were selected to reflect lands and waters under state ownership and have adequate controls in place to ensure future health and productivity of the Reserve. While Kachemak Bay NERR is not actively involved in land acquisition, the Kachemak Heritage Land Trust (KHLT), and at times, the ADF&G, Division of Sport Fish, works to protect land and resources through fee simple acquisition, as well as conservation easements.

10.1 ALASKA DEPARTMENT OF FISH & GAME

The ADF&G is involved in several aspects of land acquisition. ADF&G assisted in the development of the Habitat Protection component of the *Exxon Valdez* Oil Spill (EVOS) restoration program, and evaluated over 1 million acres of private land for possible protection or restoration as part of that process. The program's first large parcel acquisition of 96.3 km^2 (23,800 ac.) occurred on the south shore of Kachemak Bay in 1993.

By serving on the board for the Bradley Lake Moose Mitigation fund, the ADF&G directs moose habitat preservation, maintenance, and enhancement on the southern Kenai Peninsula, including areas around Beluga Slough, a highly visible component of the Reserve.

The Department also partners on grants, such as the North American Wetlands Conservation Act grant program, with non-governmental organizations, including The Nature Conservancy and Kachemak Heritage Land Trust. These grants have secured land at Stone Step Lake, Beluga Slough, and Fox River Flats for long-term conservation.

10.2 KACHEMAK HERITAGE LAND TRUST

A non-profit organization, Kachemak Heritage Land Trust (KHLT) preserves land with significant natural, recreational, or cultural values for public benefit by working with willing landowners on the Kenai Peninsula. Since 1989, the Land Trust has secured more than 25 properties with conservation easements on 1,943 acres, and owns 1,038 acres for conservation. Many of the parcels KHLT targets complement resource conservation within the Reserve, including land adjacent to the CHA's and State Park. The Land Trust also focuses on land within the City of Homer, including the Beluga Slough area which the Reserve and Alaska Maritime NWR use for education and outreach programs, and riparian land on the Anchor River significant to fish and water quality. In addition, KHLT owns land at the Head of Kachemak Bay for perpetual conservation.

10.3 NERRS BOUNDARY EXPANSION GUIDELINES

The procedures for expanding the Reserve boundary are found in 15 CFR §921.33 (Appendix 15). Basically, NERR boundary changes:

- Require written approval from NOAA
- May require public notice and an opportunity for public comment (this step is not mandatory if the property in question was listed in the Reserve Management Plan or Final EIS)
- In certain cases, may require an environmental assessment or EIS

10.4 KACHEMAK BAY NERR FUTURE BOUNDARY EXPANSION OPTIONS

Within the Reserve boundaries the majority of the southern shore is owned by the State although there are numerous privately owned inholdings which are excluded from the Reserve's boundaries. The northern shore is generally privately owned, with small publicly owned parcels managed by Kachemak Bay State Park and the City of Homer. The water column of Kachemak Bay is entirely state-owned, managed by the Alaska Department of Fish and Game, and is included in the designated Kachemak Bay CHA. The majority of the tidal and submerged lands are also owned by the State, managed by the Department of Natural Resources with a few exceptions:

- Submerged lands in the Homer Boat Harbor (owned by US Coast Guard)
- Tidelands along the City limits (owned by the City of Homer)
- Submerged lands in the Seldovia Boat Harbor (owned by the City of Seldovia)
- Relatively small, privately owned tideland parcels at scattered sites around the Bay, within the Kachemak Bay CHA (privately owned)
- Four private inholdings within the Fox River Flats CHA (privately owned)

Discussions during the initial designation of the Reserve led to the consideration of several expansions of the Kachemak Bay NERR boundary. The most realistic boundary expansion opportunities include the following areas:

10.4.1 Critical Habitat Areas and Kachemak Bay State Parks

Since the Fox River Flats and Kachemak Bay CHAs are major Reserve components, any inholdings identified in the Management Plan for these areas are relevant to the Reserve. Fee simple acquisition, conservation easements, and donations would be considered appropriate for these inholdings. If acquired, these lands should be considered additions to the Reserve's boundary.

Additional inholdings and leases for the CHA's, and inholdings for KBSP are identified in Appendix 13 and Appendix 14, respectively.

10.4.2 New State Park Parcels

In 1989, the Cottonwood/Eastland parcels on the north shore of Kachemak Bay were added to Kachemak Bay State Park. A small purchase of 0.16 km^2 (40 ac.) in 1995 brought the total unit to approximately 10 km^2 (2,500 ac.) in size, with an estimated 7.2 km (4.5 mi.) of shoreline.

In 1998, the *Exxon Valdez* Trustee Council funded the acquisition of three parcels on the north side of Kachemak Bay with significant natural habitat values. These parcels included: (1) Baycrest State Recreation Area – 0.36 km^2 (90 ac.); (2) Overlook Park State Recreation Area – 0.39 km^2 (97 ac.); and (3) Diamond Creek State Recreation Area – 0.89 km^2 (220 ac.) (Figure 14.). These parcels are under the authority of Alaska DNR as State Park units, but not as part of the legislatively designated Kachemak Bay State Park. The Overlook Park State Recreation Area is managed by Kachemak Bay Conservation Society through an MOU with the ADPOR. These parcels fall within the watershed of the Reserve and could easily be incorporated within the Reserve boundary. These three parcels front over 3.2 km^2 (2 mi.) of Kachemak Bay's northern shoreline and reach inland to encompass coastal bluffs and a mixture of upland habitats. Baycrest and Overlook Park State Recreation Areas lie nearly adjacent to each other and contain extensive tidal pool systems, exhibiting a high diversity of invertebrates and marine algae within the rocky intertidal zone. The areas are popular with local community groups, including public schools and natural history study groups, for field trips, and bird watching. Overlook Park includes a series of ponds below the bluff, which form a small estuarine system. Diamond Creek State Recreation Area rises from the beach to a large wooded bluff with nesting bald eagles, and is also an important beach access site.

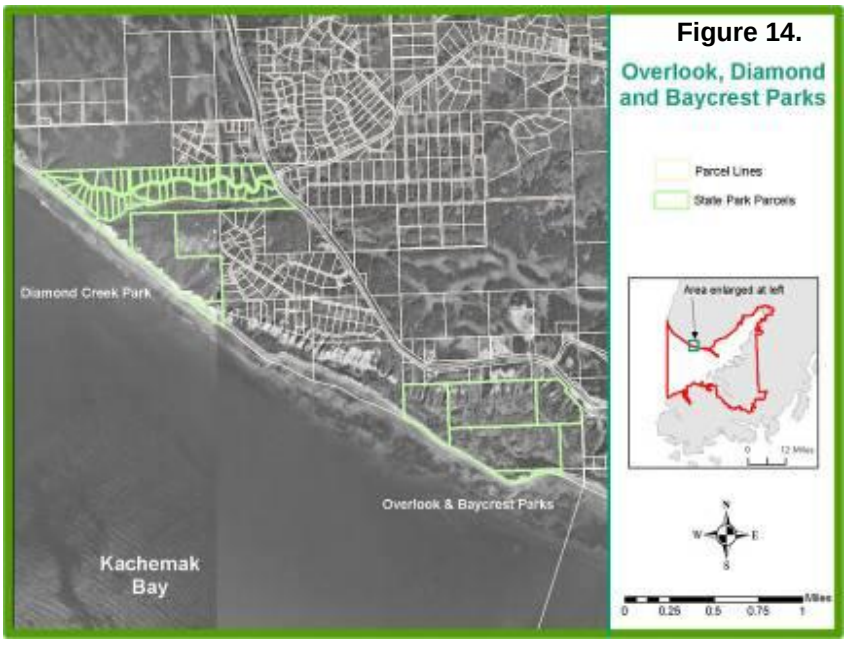


Figure 14.

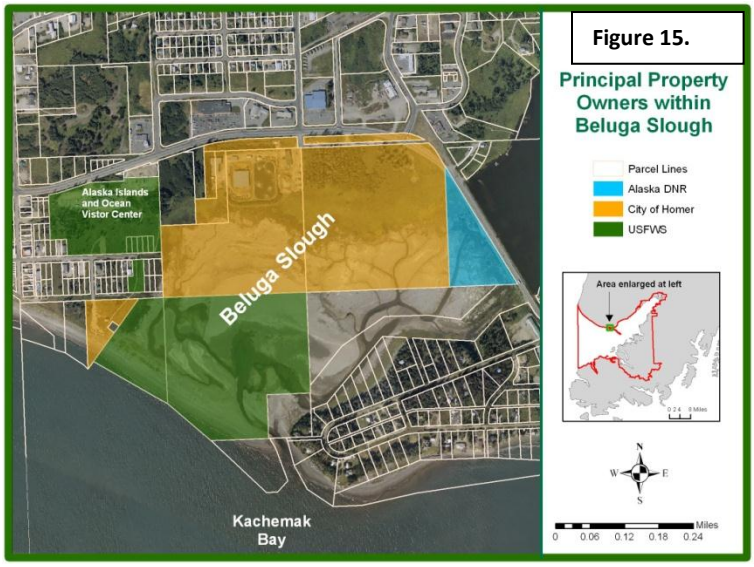
Additionally, the State received a donation of 0.32 km^2 (80-ac.) above McNeil Canyon in 2002 in what has become known as Eveline State Recreation Site.

These parcels have individual Management Plans and a different level of protection than KBSP lands, and could be added to the Kachemak Bay NERR boundary in the future. The estuarine research and educational opportunities found on these properties are unique for the northern side of the Bay and would certainly complement Kachemak Bay NERR Research and Education objectives if incorporated. During the five-year period of this management plan there are no plans to pursue including these lands to the Reserve boundaries.

10.4.3 Beluga Slough

For the benefit of the general public, Kachemak Bay NERR, the Alaska Maritime NWR, public ownership of parcels in the Beluga Slough area is a priority (Figure 15.). Parcels acquired from the City of Homer, ADF&G or the U.S. Fish and Wildlife Service could be assimilated into the Reserve boundaries following modification of the existing MOU's with the acquiring entity.

The Reserve currently shares a short trail to Beluga Slough with the Alaska Maritime NWR which is used for interpretive walks. The education programs of both agencies could benefit by having more land, and during the planning phase of the AIOVC, additional trails were anticipated. In 2009 the City of Homer received a Coastal Impact Assistance Program grant that funded trail reconstruction for part of the Beluga Slough trail. The Maritime Refuge, with involvement from KBNERR, worked closely with the City throughout the granting and installation process.



In late 2011 or early 2012, after several years of negotiations, the Alaska Maritime National Wildlife Refuge is expected to take possession of five additional inholdings to the Alaska Islands and Ocean Visitor Center parcel adjacent to Beluga Slough. This land was purchased by a consortium of conservation organizations and will be transferred into federal ownership to the USFWS.

Over time, new opportunities may lead the Reserve to consider expanding its boundary. Such options would be pursued only if the new areas would aid the Reserve in meeting stated goals, and were under public ownership or some other arrangement that assures long-term control over the property. Options to extend the boundary may include: a simple boundary expansion to include publicly owned lands (pending agreement with the appropriate owner agency); purchase

at the estimated fair market value from willing landowners; a less-than-fee-simple purchase (conservation easement); or a donation.

While the Reserve does not actively manage the lands listed below, it does envision continuing to work and strengthen partnerships with the following major landholders:

- Critical Habitat Areas – ADF&G
- Kachemak Bay State Park and State Wilderness Park -ADNR
- City of Homer
- USFWS, Alaska Maritime NWR

Consistent communication and coordination between these partner organizations and KBNERR will result in cooperative efforts on land acquisition, management actions and potential restoration projects, as well collaboration on critical resource issues, research needs, and outreach efforts on affected lands.

11.0 RESOURCE CONSERVATION

11.1 EXISTING RESOURCES

Kachemak Bay NERR is comprised primarily of two State Critical Habitat Areas (CHA), Fox River Flats and Kachemak Bay, and one State Park, Kachemak Bay State Park. State CHAs were created 'to protect and preserve habitat areas especially crucial to the perpetuation of fish and wildlife, and to restrict all other uses not compatible with that primary purpose.' CHAs support essential life functions (e.g., nesting, staging, spawning) or large concentrations of one or more fish and wildlife populations, and are managed by the Alaska Department of Fish and Game (ADF&G 1990). Kachemak Bay State Park was designated 'to protect and preserve these lands and waters for their unique and exceptional scenic nature,' and is managed by Alaska Department of Natural Resources (ADNR).

The primary goal of ADF&G management is habitat protection. Land and water uses not compatible with that goal are restricted. Fishing, hunting, trapping, and recreational activities are encouraged when compatible with the primary reason for establishment (ADF&G 1990). The focus of ADNR management is on incorporating compatible recreation opportunities into the natural environment, while preserving natural and scenic features (ADNR 1995).

11.1.1 Fox River Flats CHA

Established in 1972, Fox River Flats CHA encompasses expansive intertidal mud flats and a complex of low-lying marshlands in the lower Fox River Valley at the head of Kachemak Bay (ADF&G 1990).

Birds – As a major staging area for thousands of waterfowl and upwards of a million or more shorebirds, the Flats serve as a stopover to rest, loaf, and feed during migration. The most numerous shorebird is the western sandpiper, with dunlin and dowitcher also present. Canada geese compete with grazing cattle in the spring for goose tongue and other newly emerged vegetation. In spring, summer, and fall brackish ponds serve as forage areas for mallard, pintail, American wigeon, and green-winged teal. Scaup, scoter, goldeneye, and merganser feed in the nearshore waters of the Bay. During migration, trumpeter swans are known to concentrate on the Flats. Gulls, and, in the appropriate season, sparrows, warblers, and swallows, can usually be glimpsed. Cottonwood trees along the edge of the Flats host several bald eagle nests (ADF&G 1990).

Mammals – During the winter months, moose move down into the valley from the hills, concentrating along the edges of the Flats to feed on willow. In their search for food, black and brown bear, coyote, red fox, and wolves occasionally cross the Flats. Mink, ermine, muskrat, and

river otter are also found on the Flats' low-lying marshes, with more infrequent visits by lynx and wolverine. Large predators seek prey, such as snowshoe hares, voles, and shrews, in the low-lying marshes. Harbor seals regularly haul out on the tidal flats. Small pods of beluga whale, feeding on herring and hooligan in the spring and salmon in the summer, may be seen near the head of Kachemak Bay (ADF&G 1990).

Fish – Fox River, Sheep Creek, Bradley River, and Fox Creek are all anadromous fish streams, supporting coho, chum, and pink salmon as well as Dolly Varden. Fox River and Fox Creek also support sockeye salmon, and eulachon. Some sockeye and Chinook salmon can be found in Bradley River. (ADF&G 1990).

11.1.2 Kachemak Bay CHA

The Kachemak Bay CHA was established in 1974, providing easy access, offering outstanding recreational opportunities, and protecting a diverse and productive environment. Several significant fisheries (finfish and shellfish) are supported by the Bay. Kachemak Bay hosts tens of thousands of feeding waterfowl, shorebirds, and seabirds in the spring, summer, and fall. Marine mammals and waterbirds remain in the Bay's protected waters through the winter months (ADF&G 1991).

Partially the result of a large gyre-like circulation pattern, the high level of biological productivity in Kachemak Bay serves to hold shellfish larvae in the Bay. Productivity is further enhanced by a two-layered 'nutrient trap' estuarine system where organic nutrients are flushed out of the Bay by surface waters and settle to the bottom, then are moved back into the Bay by deep, onshore currents (ADF&G 1991).

Birds – Large flocks of geese, ducks and shorebirds move through the Bay and its associated wetlands during the spring and fall migration. Most of these spring and fall migrants use the Fox River Flats staging areas at the head of the Bay (ADF&G 1991).

Kachemak Bay and nearby waters support the highest seabird densities in Cook Inlet during the spring and summer months. Tufted puffins, horned puffins, pigeon guillemots, black-legged kittiwakes, glaucous-winged gulls, and common murres nest on Gull Island, Grass Island, 60 ft. Rock, Hesketh Island, and Point Pogibshi. Kachemak Bay also accommodates 90% of the overwintering seabird and waterfowl populations of Lower Cook Inlet (ADF&G 1991).

Mammals – Feeding on marine invertebrates and nearshore fish, mink and river otters forage along the beaches. Coyote, wolves, and an occasional black or brown bear search the beaches for carrion or prey. The shallow and productive nearshore waters provide habitat for sea otters, especially along the rocky southern shore and, along the northern shore in Mud Bay in the winter

(ADF&G 1991). In May 2008 aerial surveys were flown in Kachemak Bay over the course of one week. Estimates of the overall sea otter population of Kachemak Bay were 3,596 ± 802 animals. The estimated annual rate of increase in Kachemak Bay between a 2002 population survey and 2008 was 26% per year which exceeds the maximum productivity rate for this species. It is therefore likely that immigration from other areas has contributed to the observed population increase of sea otters in Kachemak Bay (Gill, et al. 2009).

Harbor porpoise are common foragers in the Bay. Harbor seals haul out on the Bradley River Flats and various rocks on the southern boundary of the Bay. The National Marine Mammal Laboratory conducted aerial survey counts of harbor seals in Lower Cook Inlet from 2003-2005. The sandbars of Upper Kachemak Bay were found to have the highest concentration of hauled out harbor seals in all areas surveyed; the adjusted October count was 2,177 seals (Boveng et al. 2008). Humpback, killer, and minke whales are commonly found in Kachemak Bay, with rare Steller sea lions, beluga whale, gray whale, Stejneger's or Bearing Sea beaked whale, northern fur seal, and walrus sightings.

Fish and Marine Invertebrates — Some of the richest marine invertebrate communities in all of Cook Inlet are found in Kachemak Bay. The clams, mussels, snails, worms, and other marine invertebrates found on the mudflats and rocky/gravel beaches of Kachemak Bay serve as forage for sea ducks, dabbling ducks, shorebirds, marine fish and coastal mammals. The south side of Kachemak Bay is fringed with rocky shores and kelp beds interspersed with pocket beaches of sand and gravel, supporting productive intertidal and subtidal marine life. The north side of Kachemak Bay, including Homer Spit, is composed primarily of gravel and sand, with an abundance of razor clams, cockles, and surf clams (ADF&G 1991). Southcentral Alaska's largest hardshell clam fishery occurs in Kachemak Bay for littleneck clams *Protothaca staminea* and butter clams *Saxidomus giganteus*. A fishery for Tanner crabs C*hionoecetes bairdi* reopened in Cook Inlet in 2008 after a 6 year closure. Once thriving fisheries for king crabs *Lithodes* spp, Dungeness crabs, and shrimp in Kachemak Bay are now closed because of low abundance. Other mollusks such as cockles *Clinocardium* spp, *Serripes* spp, softshell clams Family Myidae, tritons *Fusitriton oregonensis*, sea urchins Class

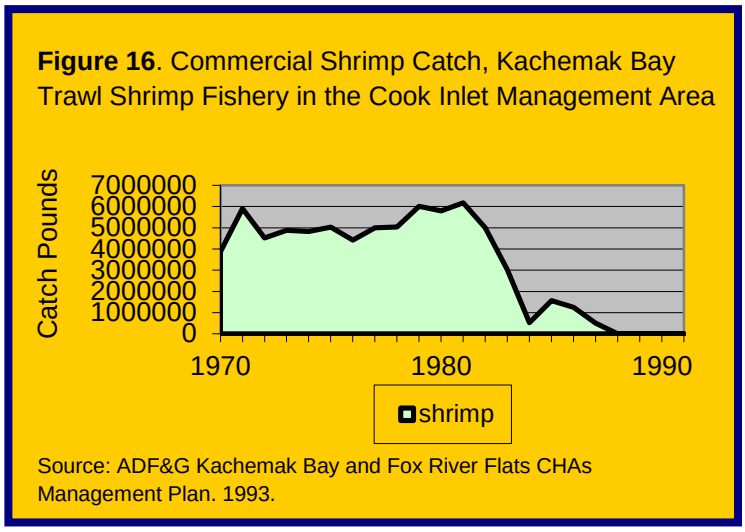


Figure 16. Commercial Shrimp Catch, Kachemak Bay Trawl Shrimp Fishery in the Cook Inlet Management Area

Source: ADF&G Kachemak Bay and Fox River Flats CHAs Management Plan. 1993.

Echinoidea, and sea cucumbers *Parasthichopus californicus* are harvested in small amounts. (Szarzi et al. 2010)

Kachemak Bay is an important finfish and shellfish nursery area, with historical abundances of: herring; salmon; halibut; king, tanner and Dungeness crab; and, pink, spot, humpy, side-stripe, and coonstripe shrimp (Figure 16) (ADF&G 1991). The noncommercial king crab fishery has been closed since 1985. Incidental catches of king crabs in department Tanner crab trawl surveys conducted since 1991 number in the single digits for most years since 1994, except 1997. The trawl survey does not target king crab habitat specifically, but it is likely the survey catches reflect gross population trends of king crab. The noncommercial shrimp fishery closed in 1997. A department small mesh trawl survey that has been conducted periodically since 1975 has found shrimp stocks remain mostly at extremely low levels since 1993 (Goldman et al. *In prep*; Gustafson 1994-1996; Gustafson and Bechtol 1998; 2000; 2001; 2005). Both king crab and shrimp fisheries are anticipated to remain closed for an indeterminate time because there is little evidence of a recovery in their population sizes. (Szarzi et al. 2010)

11.1.3 Kachemak Bay State Park

Birds – The bays, inlets, and shores of the State Park support many populations of gulls, terns, seabirds, waterfowl, and shorebirds. Many of these birds are migratory, using the Bay for specific seasons, while others spend their entire life on the Bay. The most abundant group of birds are waterfowl, which include diving ducks, sea ducks, dabblers, geese, and swans (ADNR 1995). Numerous species, including common eiders, harlequin ducks, mallards, goldeneye ducks, mergansers, Scaup, scoters, pintail, and teal, frequent Kachemak Bay (ADNR 1995). Given their extremely diverse diets, feeding habits change by species and season (ADNR 1995).

Populations of bald eagles are found along the lakes, rivers, and bays of the Park. Specifically, Nuka Island hosts the highest concentration of nesting bald eagles on the southern Kenai Peninsula coast (ADNR 1995).

Mammals – Visitors to the Park frequently observe marine mammals, such as sea otters, seals, porpoise and whales. Harbor seals use beaches and rocky shores as ‘haul out’ to rest and give birth (ADNR 1995). Sea otters, pushed to extinction by the Russian fur trade, have made a considerable recovery, and can be observed foraging on fish, crab, sea urchins, mussels, and octopus (ADNR 1995).

Land mammals include moose, black bear, mountain goats, coyotes and wolves. While black bear can be found throughout Kachemak Bay State Park, red fox and wolves are rare (ADNR 1995). Coyote populations have not been well defined and their abundance is likely dependent

upon available food sources (ADNR 1995). Other small mammals found in the Park include ermine, mink, marten, river otter, wolverine, lynx, hoary marmot, red squirrel, and mice.

Fish and Invertebrates – Sockeye, pink, chum, and coho salmon spawn in several of the streams in the Park (ADNR 1995). The release of hatchery-reared Chinook salmon smolt in Halibut Cove Lagoon has sustained a terminal sport fishery (ADNR 1995). Since 1979, the lagoon has served only as a Chinook salmon imprinting, rearing and release site. Access to the fishery is via boat. It provides fishing opportunity in a beautiful and remote setting. Anglers fish from the Alaska State Park (ASP) dock or from anchored vessels near the dock. A limited amount of trolling occurs in greater Halibut Cove at the mouth of the lagoon channel. (Szarzi et al. 2010) Dolly Varden, a species of char, are another popular sport fish found in streams in the Park. Rainbow trout, a popular sport fish stocked in China Poot Lake in the 1950's, have a self-sustaining population (ADNR 1995).

Human Use

Currently there are numerous existing human uses in the Reserve, which includes private inholdings which include residential housing units (these parcels are excluded from Reserve boundaries); private and non-profit businesses; public and private education facilities; recreation and tourism; sport and commercial fishing; hunting; personal use and subsistence harvesting of fish, shellfish, wildlife and plants; mariculture; logging reforestation; livestock grazing; marine transportation and moorage; pipeline and utility lines; and shoreline stabilization activities (EIS 1998).

11.2 USE RESTRICTIONS, PERMIT NEEDS AND REGULATORY AUTHORITY

11.2.1 Regulations and Permit Requirements for Critical Habitat Areas

The designation of a CHA creates a restrictive threshold for activities on both State and private land and waters that may affect the fish and wildlife resources of the area. 5 AAC 95.610 provides the regulatory authority for the CHAs:

> *The [Kachemak Bay and Fox River Flats Critical Habitat Areas Management] Plan presents management goals and policies for the critical habitat areas and their resources which the department will use in determining whether proposed activities in the critical habitat areas are compatible with the protection of fish and wildlife, their habitats, and public use of the critical habitat areas…. The department will review each special area permit application for consistency with the goals and policies of the management plan…. A special area permit…*

will be approved, conditioned, or denied based on the criteria set out in the goals and policies in the management plan and on the standards contained elsewhere in 5 AAC 95.

Under state statute, any person or governmental agency who desires to conduct an activity within the boundaries of the CHA is required to submit plans and specifications to the ADF&G and receive authorization before proceeding. As authorized by 5 AAC 95, ADF&G requires a Special Area Permit for the following activities:

- Construction, placement, and continuing use of any improvement, structure, or real property within the special area
- Destruction of vegetation
- Detonation of an explosive other than a firearm
- Excavation, surface or shoreline altering activity, dredging, filling, draining, or flooding
- Natural resource or energy exploration, development, production, or associated activities
- Water diversion or withdrawal
- Off-road use of wheeled or tracked equipment
- Waste disposal
- Placement or use of a toxic substance
- Grazing or animal husbandry
- Any other activity that is likely to have a significant effect on vegetation, drainage, water quality, soil stability, fish, wildlife, or their habitat, or which disturbs fish or wildlife other than lawful hunting, trapping, fishing, viewing, and photography

The standards for conditioning, approving, or denying Special Area Permits state that ADF&G will permit the uses listed above only if it meets, or can be conditioned to meet, the following standards (5 AAC 95.430):

- The use or activity is consistent with the protection of fish and wildlife and their use, protection of fish and wildlife habitat, and the purpose for which the special area was established
- The use or activity does not unduly restrict or interfere with the public use and enjoyment of the resource values for which the special area was established
- Any adverse impact on fish and wildlife, and their habitats and any restriction or interference with public use, is mitigated in accordance with 5AAC 95.900

The types of projects permitted within, or adjacent to, the Reserve boundary over the past few years include a wide range of activities, some of which include: the construction of a boat moorage raft, mariculture farm activities, buried utility lines, deployment of hydrophones for

detection of tagged octopus, grazing permits in the Fox River Flats, individual docks, and lodging facilities.

Permits issued are contingent upon compliance with other sections of the regulations and the approved CHA Management Plan. Permits or approvals from other regulatory agencies are also required for many of the listed activities (ADF&G 1993).

The CHA designation is one of the highest levels of protection that the State may afford to lands and waters. Examples of prohibited activities include: in-water storing or transporting of logs, mining, exploring for oil and gas, storing or depositing hazardous materials, operation of personal watercraft, and on-bottom mariculture. A violation of the CHA policies and permits is a criminal offense, Class A misdemeanor. These regulations ensure that any activities allowed within the CHAs will be compatible with the establishment of the Research Reserve (ADF&G 1993).

11.2.2 Regulations and Permit Requirements for Kachemak Bay State Park

Appendix 16 summarizes the policies for the legislatively designated areas within the Reserve boundary that are most likely to apply to Kachemak Bay NERR activities. These policies address research, monitoring, and management studies, fire management, insect infestation, education and outreach programs, visitor use management, trails, and facility development. The Kachemak Bay State Park policies were developed with the input from the public, the KBSP Citizen's Advisory Board, and state and federal agencies. The policies were adopted after public review and comment.

ADNR was authorized to create special park use permit regulations under 11 AAC 18. Under this authority, ADNR requires a permit for the following activities:

- Assembly of more than 20 persons
- Any promotional or entertainment event
- Camping in a developed campground for longer than 15 consecutive days
- Construction or placement of an improvement, structure, or property within the Park and its tidelands
- Discharging explosives
- Conducting exploration, scientific research, or information collection activities requiring authorization under 11 AAC 12
- Commercial activities described in 11 AAC 12
- Recurring or permanent motorized access to land not controlled or owned by the State
- Occupying a campsite with more than allowed number of vehicles
- Uses limited to or prohibited by the director under 11 AAC 12 or 11 AAC 20

- Any other incompatible use as defined by statute and regulation, or which does not otherwise have lawful recreation as its primary purpose

ADNR, Division of Parks and Outdoor Recreation reviews the applications for park use permits and may issue a permit for the activities listed above if it is determined that (11 AAC 18.025):

- Park facilities and natural and cultural resources will not be adversely affected
- The State Park is protected from pollution
- Public use values of the State Park will be maintained and protected
- The public safety, health, and welfare will not be adversely affected
- The activity is consistent with the Alaska Coastal Management Program (AS 46.40), if applicable

Permits issued are contingent upon compliance with other sections of the regulations and the approved Management Plan. The permit may contain conditions which are reasonably consistent with protection and use of the Park for the purposes for which it was established. It may also contain reasonable limitations on the equipment used, and the time and area within which the activity is allowed. A permit may be revoked by the director or a local park officer for failure to abide by any permit condition or limitation (11 AAC 18.025).

Activities prohibited within KBSP include: construction or placement of structures other than those developed and maintained by the Division of Parks and Outdoor Recreation, tideland leases, mariculture, livestock grazing, use of bicycles and motorized vehicles, and removal of any natural resource, including plants and minerals. These regulations ensure that any activities allowed within the CHAs will be compatible with the Research Reserve.

The Division also has many regulations prohibiting or restricting specific public use and behavior. These include, but are not limited to: campfires, firearms, aircraft use, disturbance of natural objects, underwater diving safety, anchoring and mooring, vandalism, and refuse and waste.

In addition, the Division has specific authority to further close or restrict use of State Park lands and waters under 11 AAC 12.335. Such closure or use restriction determinations must be necessary for the maintenance of public health and safety, protection of the environment or scenic values, protection of natural or cultural resources, aid to scientific research, implementation of management responsibilities, equitable allocation and use of facilities, or the avoidance of conflict among visitor use activities.

The Division also regulates commercial use of the Park under 11 AAC 12. Anyone conducting a commercial activity on State Park land or water is required to apply for and be issued a

Commercial Use Permit on an annual basis. The only exception is commercial fishing conducted aboard vessels.

Alaska Department of Natural Resources, Division of Mining, Land & Water

In addition to the authorities described in the previous section for the State Park, ADNR also has responsibilities for authorizing activities elsewhere in the NERR. ADNR's Division of Mining, Land & Water issues permits, leases, easements and rights-of-way for activities as diverse as mariculture operations, large docks, and utility lines. The Division also administers material sales, and is responsible for issuing permits and certificates to allocate water. The ADNR Division of Agriculture is responsible for administering grazing leases and permits.

Alaska Department of Fish and Game

ADF&G manages statewide fishing and hunting according to harvest limits and terms established by the Alaska Board of Fish and the Board of Game. The ADF&G Habitat Division coordinates departmental review of proposals for projects and activities within legislatively designated special areas (e.g., State game refuges, sanctuaries, and Critical Habitat Areas), such as those found within KBNERR. If a use is found to be compatible with the purpose(s) for which the special area was created, the Habitat Division issues an authorization in the form of a Special Area Permit. If the use is found to be incompatible, Habitat issues a denial to the proposal. The ADF&G, Division of Commercial Fisheries issues operating permits for aquatic farms statewide. Since Kachemak Bay has been designated a State Critical Habitat Area, the Habitat Division also issues Special Area Permits for aquatic farm operations found within the Critical Habitat Area.

As the custodian of the fish resources of the State, ADF&G requires Fish Resource permits for the collection of fish, shellfish, other invertebrates, and aquatic plants not covered by existing regulations. This requirement includes methods and means (gear), numbers, locations, seasons, or the possession and/or transportation of live fish in any life-stage outside of existing regulations. Fish resource permits are a privilege and will be issued only to those organizations and individuals who meet the departmental requirements specified in this policy, and who are engaged in scientific, educational, propagative, or exhibition activities. The Reserve complies with these regulations by obtaining all necessary permits for collection of organisms to be used in research, education and outreach programs.

Alaska Department of Environmental Conservation

The Alaska Department of Environmental Conservation (ADEC) has the delegated responsibility from the U.S. Environmental Protection Agency (USEPA) for Air and Water Quality Standards and non-point source pollution control activities. The water quality standards are for physical and

chemical properties, and are enforced through permitting, field evaluations and voluntary monitoring activities by public organizations. ADEC comments on permits administered by the Army Corp of Engineers for fill in wetlands and navigable waters under Section 401 of the Clean Water Act (CWA) (33 USC § 1342 or 1344) certification process.

Regulatory oversight for oil and gas exploration, municipal wastewater, and seafood processing discharge is administered through the National Pollutant Discharge Elimination System (NPDES) by both ADEC and USEPA. Air emissions are regulated by ADEC under delegated permitting responsibility from USEPA.

Oil Pollution Prevention regulation planning for facilities and vessels is conducted by ADEC under regulation 18 AAC 75, which requires a plan review every three years. Cook Inlet Spill Prevention and Response, Inc. (CISPRI) and Alaska Chadux Corporation currently hold member contingency plans for Cook Inlet and Kachemak Bay.

ADEC also certifies water quality statewide for aquatic farming sites and commercially harvested shellfish beaches.

11.2.3 Other Regulatory Entities

The U.S. Army Corps of Engineers evaluates applications for discharging dredge and fill material into waters of the United States, including wetlands. Federal and state agencies (including the USFWS, National Marine Fisheries Service, and USEPA), along with local governments (e.g., Kenai Peninsula Borough and City of Homer), review applications for USACE permits pursuant to the Fish and Wildlife Coordination Act (16 USC 661-666 et. seq.).

Activities associated with the Clean Water Act are regulated by the U.S. Environmental Protection Agency (USEPA). The Clean Water Act (CWA; 33 USC § 1251, et seq.) prohibits discharge of sediments, fill material and other pollutants into waters of the United States, except as authorized by a permit issued pursuant to Section 402 or 404 of the CWA (33 USC § 1342 or 1344). Section 308(a) of the CWA (33 USC § 1318(a)) authorizes USEPA to require the submittal of information regarding such discharges.

An approval from the U.S. Coast Guard is required for certain kinds of work in navigable waters. The Kenai Peninsula Borough may review and comment on all state and federal permit applications within the coastal zone, including the CHAs and State Park.

11.2.4 Other Planning Entities

A number of other state and municipal plans that apply to the area and with which the Reserve is consistent include:

Alaska Coastal Management Act

Winter of 2011 saw the sunset of the Alaska Coastal Management Act, and as of July 1, 2011 the Alaska Department of Natural Resources, Alaska Coastal Management Program ceased to exist.

The Kenai Peninsula Borough has a valid Coastal Management Plan adopted by the Borough Assembly in June 2008. The Plan has both enforceable and recommendation policies. With this Plan, the Borough can comment on projects within the coastal zone boundaries defined as follows:

- Landward Limit: The landward limit of the interim coastal zone boundary is the 1,000-foot elevation contour in the Kenai Peninsula Borough.
- Seaward Limit: The seaward boundary of this zone includes the offshore waters to the three-mile limit of state jurisdiction.

The Kenai Peninsula Borough Comprehensive Plan provides general planning guidance. The most recent Plan was approved in 2005. (http://www2.borough.kenai.ak.us/planningdept/plan/2005/plan.htm)

Kenai Peninsula Borough All Hazards Mitigation Plan

The Kenai Peninsula Borough worked with Peninsula cities to develop the final draft of a multi-jurisdictional mitigation plan. This document provides guidance for planning and development relative to hazards, such as earthquakes, floods, wildfires, tsunamis, seiches, and severe weather events. (http://www2.borough.kenai.ak.us/emergency/hazmit/plan.htm)

11.2.5 Surveillance and Enforcement Strategy

In addition to statewide regulations, the most stringent regulations on activities in the Kachemak Bay region (including the Reserve) come from the CHA and State Park Management Plans. Many activities are prohibited or restricted in these areas. State Park and CHA designations are the highest levels of legislative protection that the State affords to lands and waters. In some cases, State Park lands and waters have more restrictive policies and regulations than CHAs.

Within the Reserve, the primary mechanism for enforcing State laws and regulations is through permit review. The managing entities (ADF&G and ADNR) also conduct surveillance and enforcement within these areas with assistance from the Alaska Department of Public Safety (State Troopers and Fish and Wildlife Protection) officers. These officers are currently based in Anchor Point, approximately 15 miles north of Homer. Collectively, these state officials have considerable field presence in the Kachemak Bay area. Some ADF&G and ADNR employees are deputized officials with the authority to enforce their respective departmental regulations, and issue notices of violation and citations. Officials with the Alaska Department of Public Safety are commissioned to enforce all laws of the State of Alaska. Therefore, they have the authority to make arrests or take other appropriate action for violation of State laws and regulations.

Many uses and activities within Kachemak Bay NERR must be authorized by permits issued by ADF&G (e.g., Special Area Permits for CHAs) or ADNR (e.g., State tideland leases or State Park permits). Project inspections are performed to ensure that permitted activities are carried out appropriately. Enforcement actions, including issuance of notices of violation, citations or civil litigation, may be taken for unauthorized activities or for failure to comply with permit conditions. Violations of Special Area regulations are Class A misdemeanors, and are punishable by fines and up to one year in jail. A violation of State Park policies and regulations is a criminal offense punishable by fine or court action.

12.0 STEWARDSHIP AND MANIPULATION

12.1 NERRS AND ENVIRONMENTAL RESTORATION WORK

The NERR System, under 15 CFR Section 921.1 (e), recognizes the need and desirability to allow restoration 'to improve the representative character and integrity of a reserve.' Manipulative techniques may be required to restore degraded areas or systems that have undergone a physical or ecological alteration. Restoration goals and objectives should focus on the restoration of environmentally degraded areas to their historical environmental status, in terms of original ecological structure or functional equivalent (EIS 1998).

While the Reserve does not own land, or serve as the lead management agency for areas potentially in need of restoration, it finds restoration important, especially as it relates to improved scientific understanding of restorative processes. Over the next five years, KBNERR will support—and when appropriate, collaborate with—local and regional partners on identifying, planning, implementing , and monitoring restoration projects to promote the health and productivity of Kachemak Bay and its watershed, and provide reference data to support restoration projects.

12.2 POTENTIAL STEWARDSHIP INITIATIVES

Most of the area included within the Kachemak Bay NERR boundary is relatively pristine and has not been significantly impacted by human activity. However, a few locations within, or adjacent to, the Reserve have been impacted and could be candidates for some level of restoration or enhancement.

The following is a list of potential sites and projects to be considered as restoration needs for the Reserve.

12.2.1 Harbor Baseline Studies, Monitoring and Restoration

Formal studies conducted in 2008-2010 examined contaminants in the Homer Harbor and throughout the Bay, extending to Port Graham, just outside the Reserve boundary. The studies were due in part to concerns over the potential impact of historic and existing activities on water and sediment quality. Homer and Seldovia harbors are regularly visited by commercial and recreational fishing boats, state ferries, marine industrial vessels and tour boats. Additionally, cruise ships have become more common in Homer in recent years. The high volume of marine traffic broadens the potential for petroleum and nutrient impacts, as well as the introduction of marine invasive species through hull fouling.

Results from these studies showed that the Homer Harbor contained elevated concentrations of metallic and organic contaminants, and that organic compounds were detected throughout the Bay but at relatively low concentrations. (Hartwell, 2011). Results from these initial assessments can be used to direct future investigations.

Initial sampling for marine invasive species identified 13 non-indigenous species in Kachemak Bay and Cook Inlet (Hines and Ruiz, 2000). Another four non-indigenous species were reported, but not verified (Hines and Ruiz, 2000). Over the past several years, KBNERR staff has been involved in monitoring for aquatic non-indigenous species, in particular tunicates, by deploying settling plates throughout Kachemak Bay. To date, no additional non-indigenous species have been identified.

Both the Homer and Seldovia harbors are excluded from the Reserve, but their adjacent waters have the potential to negatively affect Reserve resources.

12.2.2 Mud Bay

Located on the northeast side of the base of the Homer Spit, Mud Bay is susceptible to human impact from four-wheel drive traffic, shellfish harvesting, and industrial use. To ensure the long-term sustainability of Mud Bay, an assessment could be conducted to determine the extent of current impacts, project future impacts, and identify areas for potential restoration and/or moderation of existing activities.

To discourage vehicle traffic on the beach, the City of Homer's Beach Task Force has installed directional signage and large rocks in several locations.

Restoration options:

- Reducing human impacts (through education)
- Studying the rates and causes of sedimentation in these areas
- Identifying other potential habitat adjustments (EIS 1998)

12.2.3 Beluga Slough

Alaska Maritime NWR is working with the City of Homer to protect private lands near the drifting mouth of Beluga Slough where it enters Kachemak Bay. Historically, the mouth of the slough has shifted, at times threatening to encroach on private property at Munson Point on the southeast portion of Beluga Slough. Heavy equipment has been used in the past to rework the outfall location, and landowners have used a variety of methods to stabilize the shoreline, including dumping concrete forms along the beach. To discourage further dumping and provide a

level of protection to the already impacted slough, the Alaska Maritime NWR, in partnership with the ADF&G – Habitat Division, City of Homer, and the Army Corps of Engineers to manage the outlet to keep it away from private structures.

Additionally, the City of Homer and Alaska Maritime NWR are working on small restoration projects in the Beluga Slough area:

- Maintaining the natural beach storm berm which protects Beluga Slough from continual saltwater intrusion. This berm once supported nesting eider ducks, but has been damaged by vehicle use
- Preventing driftwood collection
- Enhancing forest edge vegetation disturbed by facilities construction
- Restoring the depleted winter moose browse in the willow scrub (EIS 1998)

12.2.4 Fox River Flats

The Fox River Flats area (Figure 17.) has historically been used by several groups, including ranchers, hunters, and ATV enthusiasts. This highly productive saltmarsh forms the headwaters of Kachemak Bay, channeling surface water runoff from adjacent creeks which serves as critical habitat for juvenile salmon and shorebirds, and contributes to nutrient cycling in the Bay. To ensure the long-term sustainability of the Fox River Flats, an assessment outlining user needs and resource impacts should be completed to determine the extent of current impacts, project future impacts, and identify areas for potential restoration and/or moderation of existing activities.

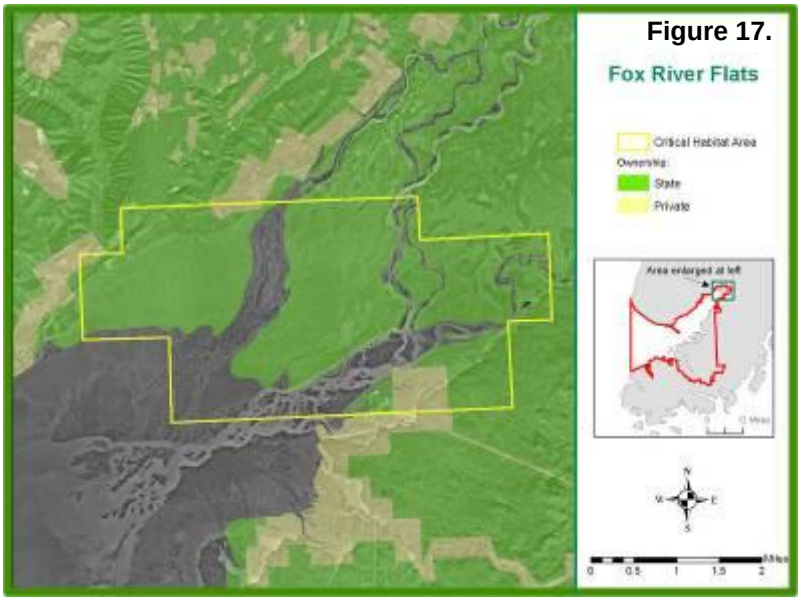


Figure 17.

Several studies have been conducted to investigate the effects of grazing on plant communities in the Flats, in particular, those pertaining to waterfowl and shorebird habitat and range evaluation. The studies included exclusion experiments, assessment of cattle utilization, evaluation of plant annual production, ecological site mapping (basic plant communities and soils), and visual reconnaissance assessments by several biologists. The results of these studies indicate that cattle

prefer to graze the intertidal sedge communities and to use upland areas for loafing. The reports also indicate that grazing in the upper Fox River Valley is light to nonexistent.

While these studies suggest that grazing pressure in general is light, even in the preferred intertidal areas, notable changes in plant species composition between grazed and un-grazed areas were identified (Swanson and Barker 1992). The exclusion areas were revisited in 1999. Although no statistical tests were reported, the results suggest that vegetation density, height, and seed-head density were reduced in grazed areas compared with un-grazed areas (Swanson 1999). In 2004, the Cattlemen's Association installed fences in specified areas on the Flats and will be completing an assessment of grazing impacts.

Future restoration efforts may include:

- Conducting a resource assessment targeted toward the various users of Fox River Flats
- Planning an access trail, in conjunction with Critical Habitat Area staff to minimize user impacts
- Studying the efficacy of the rotational grazing strategy developed during the last lease renewal
- Replanting of preferred intertidal forage species
- Developing a long-term ecological monitoring strategy with baseline data to assess future change
- Determining the strength of salmon runs for long-term management

12.2.5 KBSP – Cottonwood/Eastland Unit Reforestation

These units were logged prior to acquisition for Kachemak Bay State Park. It is anticipated that the historic habitats of this site will be restored through a reforestation project. Trails for these units have already been scouted and development of these trails for public use is part of the vision for these components.

12.3 RESEARCH MANIPULATIONS

Habitat manipulations for research purposes are allowed within the Reserve in accordance with the following guidelines (§921.1 (d)): 1) the activity must be consistent with the mission and goals of the NERRS; 2) be limited in nature and extent to the minimum manipulative activity necessary to accomplish the stated research objective; and 3) be specified in, or be compatible with, research objectives specified in the Reserve's Management Plan (EIS 1998).

For research purposes, activities may be allowed which alter or impact conditions in the Reserve. Such experimental manipulations are usually small-scale or have only temporary effects. Examples of potential habitat manipulations for research include, but are not limited to (EIS 1998):

- Taking soil cores, boring soil holes, excavating observation wells or profile pits, etc.
- Placement of sampling apparatus (and supporting structures) for aquatic biotic surveys, such as drop nets or fyke nets
- Construction and operation of hydrological monitoring stations, involving devices such as tide gauges and stillwells, current meters, pumps, or electrical probes and sensors
- Marking study plots, boundaries, sampling stations, transects, etc. with stakes, flags, tape, signs, twine, etc.
- Clipping and harvesting of above ground vegetation plots
- In fixed plots, removal of fauna or algae down to bare substrate for studies, such as invertebrate or algae recruitment
- Placement of animal exclusion or enclosure cages
- Reseeding native species on an experimental level
- Construction and use of wildlife observation blinds
- Placement of small footbridges or boardwalks to allow access to research areas
- Installation of small water control structures for hydrological studies, such as weirs, flumes, canal-checks, riserboards, etc.
- Release of tracking dyes, etc.

For the parts of the Reserve covered by the CHA or State Park Management Plans, any manipulative activities must be consistent with the policies contained in those plans. These policies were written to ensure that activities are conducted in an environmentally sensitive manner (EIS 1998).

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Appendix 1. Index of NERR Program Regulations

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Title 15: Commerce and Foreign Trade

PART 921—NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM REGULATIONS

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2. Southern Gulf of Maine (Sheepscot River to Cape Cod)

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4. Middle Atlantic (Sandy Hook to Cape Hatteras)
5. Chesapeake Bay

Carolinian
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7. South Atlantic (Santee River to St. John's River)
8. East Florida (St. John's River to Cape Canaveral)

West Indian
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10. West Florida (Ft. Jefferson to Cedar Key)

Louisianian
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12. Mississippi Delta (Mobile Bay to Galveston)
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Californian
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15. Central California (Point Conception to Cape Mendocino)
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19. Puget Sound

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21. Lakes Michigan and Huron (including Straits of Mackinac, St. Clair River, and Lake St. Clair)
22. Lake Erie (including Detroit River and Niagara Falls)
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Insular
27. Hawaiian Islands
28. Western Pacific Island
29. Eastern Pacific Island

Appendix 3. MOU ADF&G and NOAA

MEMORANDUM OF UNDERSTANDING
between the

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
and the

ALASKA DEPARTMENT OF FISH AND GAME

Detailing the State-Federal Roles in the
KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE

This Memorandum of Understanding (MOU) serves to establish the framework for coordination, cooperation, and communication regarding the Kachemak Bay National Estuarine Research Reserve (KBNERR). This agreement concerns the Office of Ocean and Coastal Resource Management (OCRM), National Ocean Service, National Oceanic and Atmospheric Administration (NOAA), whose address is 1305 East-West Highway N/ORM, Silver Spring, Maryland 20910, and the Alaska Department of Fish and Game (ADF&G), Division of Sport Fish, West 8th Street, P.O. Box 25526, Juneau, Alaska 99802-5526.

WHEREAS, the State of Alaska has determined that the waters and coastal habitats of the Kachemak Bay system provide representative opportunities to study coastal , estuarine, and human processes occurring within an estuarine ecosystem; and

WHEREAS, the State of Alaska finds that the resources of Kachemak Bay and its value to the citizens of Alaska and the United States will benefit from the management of this site as a part of the National Estuarine Research Reserve System; and

WHEREAS, NOAA has concurred with that finding and designated Kachemak Bay as a National Estuarine Research Reserve in Alaska in 1999 pursuant to its authority under Section 315 of the Coastal Zone Management Act of 1972, as amended, (CZMA, P.L. 92-583, 16 USC 1461) and in accordance with implementing regulations at 15 CFR 921.30; and

WHEREAS, ADF&G is designated by the State of Alaska and in the Kachemak Bay National Estuarine Research Reserve Management Plan ("Plan") as the agency responsible for managing the Reserve, as defined in the Plan; and

WHEREAS, the Plan describes the goals, objectives, plans, administrative structure, and institutional arrangements for the Reserve, including this MOU and others; and

WHERAS, ADF&G acknowledges the need and requirement for continuing State-Federal cooperation for the long-term management of the Reserve in a manner consistent with the purposes sought through its designation.

NOW THEREFORE, in consideration of the mutual agreements contained herein, it is agreed by and between ADF&G and NOAA as follows:

ARTICLE 1: STATE-FEDERAL ROLES IN RESERVE MANAGEMENT

The following section describes the roles and responsibilities of the Reserve partners. The obligations described for each Reserve partner are subject to available funding.

A. State Role in Reserve Management

ADF&G, as the principal contact for the State of Alaska in all matters concerning the Reserve, will be responsible for ensuring that the Reserve complies with management objectives of the Plan, the Alaska Coastal Management Program, other applicable provisions of Alaska law, Section 315 of the Federal Coastal Zone Management Act (CZMA), and the federal regulations of the National Estuarine Research Reserve System (NERRS). ADF&G will be the grant receiving office for KBNERR under Section 315 of the CZMA. Subject to available and authorized appropriations, ADF&G's responsibilities for Plan implementation include the following:

1. Annually apply for, budget, and allocate funds received for KBNERR operations (e.g. education, research, and monitoring programs), as well as for acquisition and facilities;
2. Conduct active research and monitoring programs that draw scientists from various institutions to work together on understanding coastal issues;
3. Conduct and maintain programs that provide materials, activities, workshops, and conferences that translate the research results to the resource users, regulators, and the public;
4. Provide staff and volunteers to monitor, protect, educate, and translate research results;
5. Maintain facilities including a research laboratory, classroom, library, office, meeting space, field equipment storage, and interpretive display space;
6. Maintain equipment to facilitate research and outreach activities that, among other things, will include boats, laboratory and field equipment, audiovisual, curriculum, reference materials, and databases;
7. Maintain effective partnerships with local, regional, and state policy makers, regulators, and the general public;
8. Serve as principal representative on issues involving proposed boundary changes and/or updates to the Plan;
9. Respond to NOAA's requests for information and evaluation findings pursuant to Section 312 of the CZMA;
10. Expend funds in accordance with federal and state laws, KBNERR Management Plan, and annual appropriations; and,
11. Ensure enforcement of the applicable provisions of Alaska law, including the rules and regulations of the Alaska Coastal Management Program, to protect the Research Reserve.

B. Federal Role in Reserve Operation

The Office of Ocean and Coastal Resource Management will serve to administer the provisions of Section 315 of the CZMA to ensure that the Reserve operates in accordance with the goals of the NERRS and the Plan. These responsibilities are subject to the availability of appropriated funds. In carrying out its responsibilities, OCRM will:

1. Review and process applications for financial assistance from ADF&G, consistent with 15 CFR Part 921 for acquisition, development, management, and operation of the Reserve;
2. Review and process applications for financial assistance from ADF&G and other eligible entities consistent with 15 CFR Part 921 for education, research, and monitoring programs for the benefit of the Reserve;
3. This agreement does not create any obligation on the part of OCRM to award financial assistance;
4. Make periodic evaluations in accordance with Section 312 of the CZMA to measure ADF&G's performance in the Plan implementation;
5. Advise ADF&G of existing and emerging national and regional issues; and,
6. Establish an information exchange network cataloging all available research data and educational material developed ateach Reserve included within the NERRS.

C. General Provisions

1. Nothing in this agreement or subsequent financial assistance awards shall obligate any party in the expenditure of funds, or for future payments of money, in excess of appropriations authorized by law.
2. Both parties agree to comply with all applicable federal or state laws regulating ethical conduct of public officers and employees.
3. Each party will comply with all applicable laws, regulations, and executive orders relative to Equal Opportunity Employment.
4. Upon termination of this agreement or any subsequent financial assistance awards, any equipment purchased for studies initiated in furtherance of this agreement will be returned to the agency of initial purchase.
5. A free exchange of research and assessment data among agencies is encouraged and is necessary to insure the success of these cooperative studies.

D. Other Provisions

Nothing in this MOU diminishes the independent authority or coordination responsibility of each agency in administering its statutory obligations. Nothing herein is intended to conflict with current agency directives. If the terms of this MOU are inconsistent with existing directives of any agency entering into this agreement, then those portions which are determined to be inconsistent shall be invalid; but the remaining terms not affected by the inconsistency shall remain in full force and effect. At the first opportunity for review of this agreement, all necessary changes will be made by either an amendment to this MOU or by entering into a new MOU, which ever is deemed expedient to the interest of all parties. Should disagreement arise on the interpretation of the provisions of this MOU, or amendments and/or revisions thereto, that cannot be resolved at the operating level, the area(s) of disagreement shall be stated in writing by each party and presented to the other parties for consideration.

ARTICLE II: REAL PROPERTY ACQUIRED FOR THE PURPOSE OF THE RESERVE

As well as agreeing to adhere to the rest of the provisions set forth at 15 CFR Part 921, the State of Alaska agrees to the conditions set forth at 15 CFR 921.21(e), which specify the legal documentation requirements concerning the use and disposition of real property acquired for Reserve purposes with Federal funds under Section 315 of the CZMA.

ARTICLE III: PROGRAM EVALUATION

OCRM will schedule periodic evaluations of the State's performance in meeting the terms of financial assistance awards, in implementing the Management Plan and in meeting the provisions of this MOU. Where findings of deficiency occur, NOAA may initiate action in accordance with the designation withdrawal procedures established by the CZMA and applicable regulations.

ARTICLE IV: EFFECTIVE DATE, REVIEW, AMENDMENT, AND TERMINATION

This MOU is effective on the date of the designation of the Reserve. The MOU will be reviewed periodically. This MOU may be amended by the mutual consent of the parties. This MOU may be terminated by mutual consent of the parties, or by NOAA if it withdraws designation of the area as a National Estuarine Research Reserve, pursuant to applicable provisions of the CZMA and its implementing regulations as described under 15 CFR Part 923 Subpart L. Should this MOU be terminated, reimbursement of unexpended funds shall be determined on a pro rata basis according to the amount of work done by the parties at the time of termination.

IN WITNESS THEREOF, the parties hereto have caused this MOU to be executed.

Eldon Hout
Director
Office of Ocean and Coastal
Resource Management
National Ocean Service
National Oceanic and
Atmospheric Administration
US Department of Commerce

2/8/06
Date

for McKie Campbell
Commissioner
Department of Fish and Game
State of Alaska

11/22/05
Date

Tom Lawson
Director
Division of Administration
Fish and Game
State of Alaska

11/21/05
Date

Kelly Hepler
Director
Division of Sport Fish Department of
Department of Fish and Game
State of Alaska

11/18/05
Date

Appendix 4. Coastal Zone Management 312 Evaluation and ADF&G Response for 2006 and 2009 evaluations.

FINAL EVALUATION FINDINGS

KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE

July 2003 through April 2006

Office of Ocean and Coastal Resource Management
National Ocean Service

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

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I. EXECUTIVE SUMMARY

The Coastal Zone Management Act (CZMA) of 1972, as amended, established the National Estuarine Research Reserve System (NERRS). Sections 312 and 315 of the CZMA require the National Oceanic and Atmospheric Administration (NOAA) to conduct periodic performance reviews or evaluations of all federally approved National Estuarine Research Reserves (NERRs). The review described in this document examined the operation and management of the Kachemak Bay National Estuarine Research Reserve (KBNERR or the Reserve) during the period from July 2003 through April 2006. The Reserve is administered by the Alaska Department of Fish and Game (ADF&G) Sport Fish Division (SFD).

This document describes the evaluation findings of the Director of NOAA's Office of Ocean and Coastal Resource Management (OCRM) with respect to the Kachemak Bay NERR during the review period. These evaluations include discussions of major accomplishments as well as recommendations for program improvement. The fundamental conclusion of the findings is that the State of Alaska is successfully implementing its federally approved NERR.

The evaluation team documented a number of Kachemak Bay Reserve accomplishments during this review period. Leadership and management at the Reserve have improved and strengthened since the last evaluation. State and departmental support for the Reserve and its programs has also increased, and staff communication and morale have improved noticeably. The Reserve has completed revisions to its management plan. Strong partnerships and collaborations have been initiated or maintained, and the wide range of research and educational activities and programs are evidence of that. The Reserve's system-wide monitoring program has become solidly established, as has the coastal training program.

The evaluation team also identified areas where the Reserve and its programming could be strengthened. One of these recommendations is necessary and required. The Reserve must identify non-federal match funds by the date specified for the planned exhibits at the Visitor Center, for which federal funds have already been awarded, or return the federal funds unexpended. The Reserve and Sport Fish Division are encouraged to continue their efforts to gain more state financial support for core positions, particularly the education and research coordinators. The Reserve also should explore stronger state support for the Visitor Center maintenance costs. Permanent signage identifying the Reserve and NOAA should be installed at the Visitor Center as well. Several program suggestions are provided to encourage the Reserve to look at additional partnership opportunities or to more clearly identify the Reserve's role in existing partnerships. Finally, because of the growth of the Reserve's programs and activities, staff may want to explore the creation of a non-profit support organization and the services of a person as a coordinator of volunteer activities.

II. PROGRAM REVIEW PROCEDURES

A. OVERVIEW

The National Oceanic and Atmospheric Administration (NOAA) began its review of the Kachemak Bay Reserve in January 2006. The §312 evaluation process involves four distinct components:

- An initial document review and identification of specific issues of particular concern;
- A site visit to Alaska, including interviews and public meetings;
- Development of draft evaluation findings; and
- Preparation of the final evaluation findings, partly based on comments from the state regarding the content and timetables of recommendations specified in the draft document.

The recommendations made by this evaluation appear in boxes and bold type and follow the findings section where facts relevant to the recommendation are discussed. The recommendations may be of two types:

> **Necessary Actions** address programmatic requirements of the CZMA's implementing regulations and of the Kachemak Bay Reserve approved by NOAA. These must be carried out by the date(s) specified;
>
> **Program Suggestions** denote actions that NOAA's Office of Ocean and Coastal Resource Management (OCRM) believes would improve the program, but which are not mandatory at this time. If no dates are indicated, the state is expected to have considered these Program Suggestions by the time of the next CZMA §312 evaluations.

A complete summary of accomplishments and recommendations is outlined in Appendix A.

Failure to address Necessary Actions may result in a future finding of non-adherence and the invoking of interim sanctions, as specified in CZMA §312(c). Program Suggestions that are reiterated in consecutive evaluations to address continuing problems may be elevated to Necessary Actions. The findings in this evaluation document will be considered by NOAA in making future financial award decisions relative to the Kachemak Bay Reserve.

B. DOCUMENT REVIEW AND ISSUES DEVELOPMENT

The evaluation team reviewed a wide variety of documents prior to the site visit, including: (1) 2004 Kachemak Bay Reserve §312 evaluation findings; (2) federally approved Environmental Impact Statement and program documents;(3) financial assistance awards and work products; (4) semi-annual performance reports; (5) official correspondence; and (6) relevant publications on natural resource management issues in Alaska.

Based on this review and on discussions with OCRM, the evaluation team identified the following priority issues:

- major accomplishments during the review period;

- status of Reserve staffing and needs;
- facilities development and/or land acquisition efforts;
- status of general administration of the Reserve and management plan revisions;
- status of implementation of the Reserve's research, monitoring, and education programs;
- the manner in which the Reserve coordinates with other governmental and non-governmental organizations and programs in the state and region; and
- the manner in which the Reserve has addressed the recommendations contained in the §312 evaluation findings released in 2004. The Kachemak Bay Reserve's assessment of how it has responded to each of the recommendations in the 2004 evaluation findings is located in Appendix B.

C. SITE VISIT TO KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE

Notification of the scheduled evaluation was sent to the Alaska Department of Fish and Game, relevant environmental agencies, members of Alaska's congressional delegation, and regional newspapers. In addition, a notice of NOAA's "Intent to Evaluate" was published in the Federal Register on February 21, 2006.

The site visit to the Kachemak Bay Reserve was conducted from April 3, 2006, through April 6, 2006. The evaluation team consisted of Ms. Chris McCay, Evaluation Team Leader, National Policy and Evaluation Division, OCRM; Ms. Nina Garfield, Program Specialist, Estuarine Reserves Division, OCRM; and Dr. William Reay, Manager, Chesapeake Bay-Virginia National Estuarine Research Reserve.

During the site visit, the evaluation team met with Kachemak Bay Reserve staff, senior staff from the ADF&G Sport Fish Division, other state agency staff, coastal researchers and academicians, U.S. Fish and Wildlife Service, National Park Service, local government staff and officials, KBNERR Community Council members, and non-profit organizations. Appendix C lists people and institutions contacted during this review.

As required by the CZMA, NOAA held an advertised public meeting on Wednesday, April 5, 2006, at 7:00 p.m. at the Kachemak Bay Reserve, Alaska Islands and Ocean Visitor Center, 95 Sterling Highway, Homer, Alaska. The public meeting gave members of the general public the opportunity to express their opinions about the overall operation and management of the Kachemak Bay Reserve. Appendix D lists individuals who registered at the meeting. NOAA's responses to written comments submitted during this evaluation are summarized in Appendix E.

The Kachemak Bay Reserve and Sport Fish Division staff members were crucial in setting up meetings and arranging logistics for the evaluation site visit. Their support is most gratefully acknowledged.

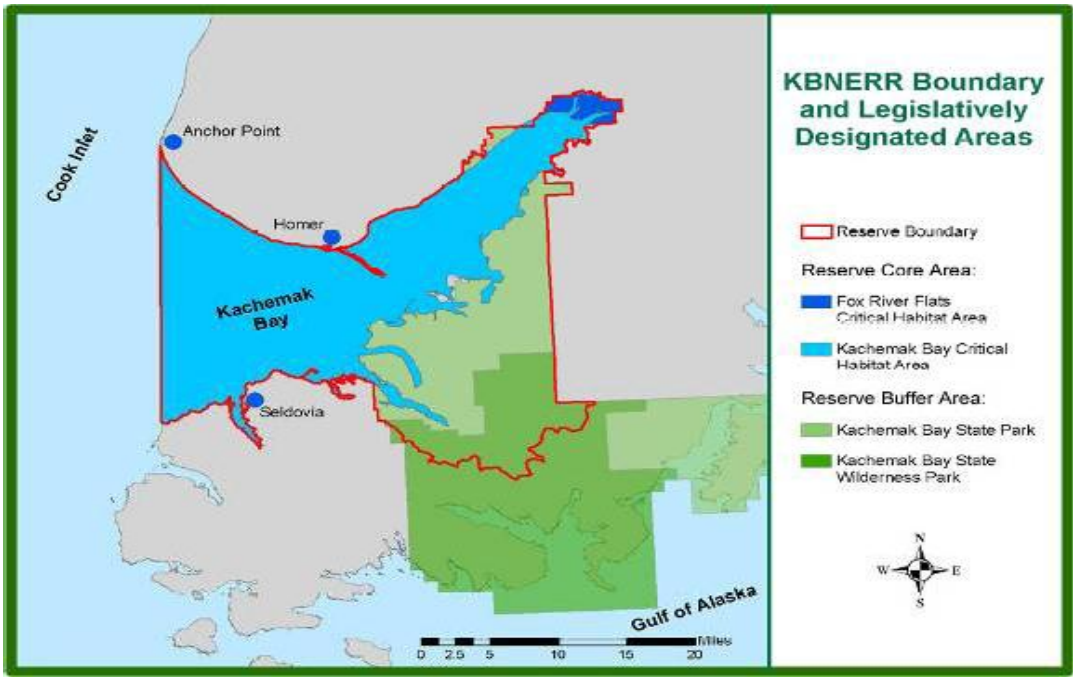
III. RESERVE PROGRAM DESCRIPTION

NOAA's Office of Ocean and Coastal Resource Management designated the Kachemak Bay National Estuarine Research Reserve (KBNERR or the Reserve) in 1999. The lead agency is the Alaska Department of Fish and Game (ADF&G), Sport Fish Division (SFD).

Kachemak Bay is located in south-central Alaska and is one of the most productive and diverse estuaries in Alaska and features tidal mudflats, marshlands, and upland forests. The southern shore includes the Kenai Mountains, which contain several glaciers that drain directly into the Bay. Kachemak Bay is 24 miles wide at its mouth and approximately 36 miles long. The Bay is a temperate region fjord with hydrographic conditions unique among National Estuarine Research Reserve System (NERRS) estuaries. An 8.7-meter tidal range primarily drives the Bay's circulation, and ocean currents within the Gulf of Alaska result in upwelling of nutrient rich waters. This nutrient-rich environment provides critical habitat for many species during various life phases.

KBNERR is located south of Anchorage on the western coast of the Kenai Peninsula and is the largest in the NERRS, encompassing approximately 365,000 acres. The lands within the Reserve are entirely in public ownership and are managed by various local, state, and federal entities. Three legislatively designated areas are included within the Reserve: (1) Kachemak Bay Critical Habitat Area, (2) Fox River Flats Critical Habitat Area, and (3) the portion of Kachemak Bay State Park that drains into Kachemak Bay. The two critical habitat areas are managed by the ADF&G Sport Fish Division, and the Alaska Department of Natural Resources manages the state park. These designations provide the strongest resource protection afforded by Alaska. Current uses include boating, fishing, hunting, shellfish harvesting, mariculture, and a variety of recreational activities such as sightseeing and hiking. Traditional uses permitted by state and federal agencies include commercial and recreational fishing and limited livestock grazing.

The Reserve's headquarters are located on the Kenai Peninsula in the City of Homer, overlooking Bishop's Beach and Beluga Slough. The Reserve is co-located with the Alaska Maritime National Wildlife Refuge in the Alaska Islands and Ocean Visitor Center, completed in late fall, 2003. In addition to housing a bookstore and exhibits for both the Reserve and the Refuge, the Center is equipped with a dry lab, classrooms, public meeting rooms, and offices for the Reserve. A separate modular facility in Homer provides leased offices for some partner agencies through cooperative agreements. A bunkhouse is available for up to eight visiting researchers, graduate students, and volunteers, including kitchen-dining, bath, and meeting room facilities. A third building owned by the Reserve provides limited lab, storage, and workshop space.



IV. REVIEW FINDINGS, ACCOMPLISHMENTS, AND RECOMMENDATIONS

A. OPERATIONS AND MANAGEMENT

1. Administration and Staffing

There has been a strong positive change in the administration and management of the Reserve since the last evaluation, which included several recommendations to address the lack of leadership, planning, and the financial and administrative shortfalls noted by the evaluation team at that time. A few months prior to the July 2003 evaluation site visit, the Reserve was transferred to the Alaska Department of Fish and Game (ADF&G) Sport Fish Division from the recently dissolved Habitat and Restoration Division. Shortly after the 2003 evaluation, the Reserve manager retired and the research coordinator resigned. A new manager was hired, and staff members were involved in that hiring. A researcher on staff was hired as the research coordinator. A management team was designated from the staff and is still in operation. The manager was strongly supportive of the staff and in turn was well-respected by staff and the Sport Fish Division. However, this manager resigned for personal reasons several months before the 2006 site visit, and the research coordinator was designated as the acting manager. At the time of the 2006 site visit, staff members were again involved in the hiring of a new manager, and at the time of the issuance of these findings, a new manager has begun work. Staff members said they were pleased with their involvement in the hiring of both managers, and the improvement in staff morale and communication since the last evaluation was positively noted by staff members, partner organizations, and even members of the public attending the public meeting. A member of the evaluation team for this evaluation was also a member during the 2003 evaluation and similarly commented on the positive changes.

During this evaluation period, the Reserve completed a strategic planning effort to redefine the Reserve's vision, mission, goals, and objectives. This was followed by an internal prioritization of these goals and objectives and the establishment of a tactical plan to attain the high priority objectives. This effort involved all staff on an equal basis.

The Reserve currently has a staff of 13: six permanent, full-time positions (manager, education and research coordinators, two administrative staff, and a GIS specialist); four permanent, seasonal positions (guaranteed one month of work and no more than eleven months per year, and includes the CTP coordinator, watershed researcher, marine ecologist and lead classroom instructor), and three non-permanent, long-term positions (covers two fiscal years, and currently includes a videographer, illustrator, and research assistant). Non-permanent, short-term (up to three months) staff are hired to assist with programs as needed.

The Reserve staffing has remained remarkably stable during several periods of management transition and uncertainty. The staff members are well liked and highly respected by their peers and community members with whom the evaluation team met. Staff members provide leadership in the local community and in the national NERRS community. Both the education coordinator and research coordinator have stepped in to serve as acting reserve manager when needed.

The financial shortfalls and state support issues noted in the previous findings have improved

during this evaluation period. Since 2003 the state has provided approximately $80,000 annually to support two administrative staff positions, which has also improved the non-federal match situation. Just months before the site visit, the Reserve was given permission to create two new permanent seasonal positions. Although there is no guaranteed outcome, the Department of Fish and Game is now seeking, for the first time, general revenue funds from the Legislature to support staff and the Reserve. Grant monies from the Exxon Valdez Oil Spill (EVOS) Trustee Council support the research programs and education programs, and, when granted, are used to provide non-federal matching funds for NOAA operational funds. State wildlife grant funds also provide program and staff support. These funds are appropriated by Congress, and one-third of the monies to Alaska are administered by the Sport Fish Division.

The Reserve and the Division are now exploring the development of a three-year financial plan, a Reserve 'friends' non-profit organization or other mechanism for citizens to provide funding and support, a Fish and Game foundation with some funding targeted to the Reserve, and possible corporate support or sponsorship for the Discovery Labs educational programs. Within this more positive situation, the Reserve is encouraged to look for ways to bring the education coordinator and the research coordinator (two of the Reserve's core positions) onto state funding, particularly because the EVOS Trustees Council is going to re-evaluate the direction and process for awarding EVOS funds and because the state wildlife funds are dependent upon a congressional allocation. The non-federal match situation would also improve when more core staff members are state-funded.

The Sport Fish Division appears to be an excellent, mutually beneficial fit for the Reserve. The Division Director and Assistant Director (who has direct oversight responsibility for the Reserve) provided strong support throughout the period covered by this evaluation. Without that leadership, the changes seen in management and increased financial support would not have been possible. A new assistant director assumed the position shortly before the 2006 site visit, and she spent the entire week of the visit with the evaluation team and Reserve staff. Reserve staff provide GIS and technical training and support to the ADF&G, and the Reserve's videographer supports some of the ADF&G outreach efforts. The education coordinator's help is sought to vision and plan for aquatic education activities throughout all ADF&G regions. The education activities of the Reserve are designed to crosswalk with state and school district science standards throughout Southcentral Alaska. Research priorities at the Reserve complement traditional ADF&G projects.

ACCOMPLISHMENT: Leadership and management at the Reserve have improved and strengthened significantly since the last evaluation. State and departmental support for the Reserve and its programs has also increased, and staff communication and morale have improved noticeably.

PROGRAM SUGGESTION: The Reserve and Division are encouraged to continue their efforts to gain more state financial support for core positions, particularly the education and research coordinators.

2. Management Plan

At the time of the last evaluation, the Findings included a recommendation for the Reserve to revise its management plan. During the period covered by this evaluation and during significant management changes and programmatic development, the management plan has been successfully revised.

ACCOMPLISHMENT: The Reserve has successfully completed revisions to its management plan.

3. Facilities and Infrastructure

In late 2003 the Reserve moved into the Alaska Islands and Ocean Visitor Center. The Center was constructed with funding from both NOAA and the U.S. Fish and Wildlife Service and houses the Alaska Maritime National Wildlife Refuge as well as the Reserve. Since the Center's opening, more than 75,000 visitors, on average, have toured the facility annually. Participation in various outreach and education programs has increased tenfold, from 300-500 individuals per year on average to over 4,600. The Visitor Center and the Reserve are beginning to serve as an unofficial center of the community. In addition to housing a bookstore and including exhibit space for both the Reserve and the Refuge, the Center is equipped with a dry lab, classrooms, public meeting rooms, and offices for the Reserve. A separate modular facility in Homer provides office and meeting room space for partner agencies through cooperative agreements. Up to eight Reserve volunteers, graduate students, and collaborating scientists have access to the reserve's bunkhouse, which provides sleeping, kitchen-dining, and bath facilities. A third building owned by the Reserve provides limited lab, storage, and workshop space.

The Reserve faces two challenges now that it occupies the new Visitor Center. It has received approximately $200,000 in federal construction funds from NOAA for planned exhibits at the Center but has been unsuccessful so far in obtaining non-federal match. This is a serious and immediate concern to NOAA, because by not securing State matching funds, the Reserve is not in compliance with procedures governing the award of federal funds under the statutory authority of the CZMA and competitive selection process. The Reserve also is responsible for its share of the maintenance of the Visitor Center, which is a significant amount and which currently is paid for with federal operational funds.

NECESSARY ACTION: By the end of the exhibit construction award period, the Reserve must identify non-federal match funds for the exhibits planned at the Visitor Center or return the funds unexpended to NOAA.

PROGRAM SUGGESTION: The Reserve should explore stronger state support for the Visitor Center maintenance costs.

4. Coordination and Partnerships

The Reserve's programs and staff members are extremely well coordinated and integrated in a

seamless fashion. Education programs involve thematic topics of high priority to the research program, and research staff members frequently participate in educational programs. The GIS specialist supports every major program at the Reserve; an administrative assistant is involved in the SWMP; and the office manager serves as the liaison between the Reserve and the Reserve's Community Council. The Reserve's programs are very relevant to management needs at the departmental, state, regional, and local levels, and the Coastal Training Program has done a very good job at getting scientific information out to coastal managers at all levels.

The Reserve also does an excellent job coordinating its programs and working in partnership with other agencies and non-profit organizations. This is no small feat, because the greater Homer community area has over 50 non-profit groups. While that speaks well of the community and its citizens, it presents a challenge to all to manage competition for visibility, a limited number of volunteers, and funding from grant sources as well.

Because staffing has remained remarkably stable and constant, staff members are sensitive to these issues and have developed personal and professional relationships over time that play a large role in the successful collaborations and partnerships. There are a number of collaborative forums and activities in which the Reserve plays an active part, including, but not limited to, the Kachemak Bay Environmental Education Alliance, the Kachemak Bay Research Reserve Community Council (KBRR Community Council or Council), the Reserve's research and education committees (subcommittees of the Community Council), and the Kachemak Bay Science Conference. Many of these collaborations and partnerships through research, education, and the Coastal Training Program are discussed elsewhere in this document.

One of the most obvious and successful efforts of coordination is that with the Alaska Maritime National Wildlife Refuge involving the Visitor Center. Reserve staff members have increased their efforts to work more closely with the National Park Service and the nearby national parks, and there has been increased coordination with the NOAA NCCOS Katsitsna Bay Lab since a NOAA staff member has been stationed full-time in Homer as the lab director. The Reserve also coordinates closely with the Alaska Department of Natural Resources' (DNR) Division of Parks and Outdoor Recreation because of DNR management of state parks and ADF&G management of critical habitat areas within the Reserve boundaries.

The KBRR Community Council provides a connection between Kachemak Bay communities, statewide and national research and education organizations, and the Reserve. Its primary purpose is to provide an organized structure for dialogue and recommendations between agencies, local governments, researchers, environmental educators, conservation groups, and others interested in natural science research and education and the Reserve staff. The Council charter provides for nine community members and 11 ex officio (non-voting) agency members. A Reserve staff member serves as the liaison between the Reserve and the Council.

The evaluation team met with many of the Council members and was impressed with their dedication to and support of the Reserve staff and activities. The members all spoke highly of Reserve staff members. Most, if not all, of the Council members are frequent volunteers for Reserve programs and activities. The Council has a strong sense of 'ownership' in terms of its purpose and roles. Its members assist with outreach and education for state legislators and appear willing to assume more than an advisory role. Those members with whom the evaluation team met provided a discussion of both the strengths of the Reserve and new areas or gaps to address, such as the need to reach beyond schools with educational programs and into the general

community (e.g., senior citizens); the continuous need to translate research into educational vehicles to reach the community; and the Reserve's need for a volunteer coordinator.

ACCOMPLISHMENT: The Reserve has demonstrated strong partnerships by collaborating and coordinating with numerous federal and state agencies, researchers, educators, and non-profit organizations. Reserve staff members are sensitive to the roles and interactions with numerous partners and generally are able to avoid competition for volunteers, visibility, and funding. The KBRR Community Council is a strong advocate of Reserve programs and activities.

The Alaska Coastal Management Program has recently been restructured programmatically through the completion and federal approval of a program amendment and final environmental impact statement. The Program is located in the Department of Natural Resources, with offices in Juneau, Anchorage, and a district office presence in Soldotna. The Reserve should explore whether any additional opportunities exist with the newly structured coastal management program for coordination or mutual program support within the Reserve and Kenai Peninsula.

PROGRAM SUGGESTION: The Reserve should explore whether additional opportunities exist for partnership and collaboration with the Alaska Coastal Management Program.

5. Program Visibility

At one level, because the community within which the Reserve resides is relatively small, citizens, non-profit groups, and other agencies are generally aware of the Reserve and know about its programs and activities. However, the Homer area is a well-known tourist destination for fishing, bird-watching, and other activities during the summer months, and the population increases dramatically. Now that the Reserve and the National Wildlife Refuge share a facility, it is less easy to physically see the separate agency identities, especially for first time visitors and summer tourists. The Visitor Center lacks permanent signage identifying the Reserve, NOAA, or even the Alaska Department of Fish and Game as cohabitants. Even the 'front desk' one encounters upon entering the Visitor Center is always staffed by a NWR staff member or NWR volunteer. As noted in an earlier section, the Reserve has not yet installed planned permanent exhibits that would also strengthen the identity of the Reserve in the Center. The Reserve needs to install permanent signage at the Visitor Center and consider other strategies to strengthen the visibility of the Reserve in the Center; e.g., having a staff member or Reserve volunteer sit at the front desk for periods of time. *[Since the site visit, the State has indicated that new signage identifying the Reserve, NOAA, and ADF&G has been installed in the Visitor Center lab classroom, on the exterior of the Visitor Center, and on the entrance sign to the Visitor Center public parking area.]*

PROGRAM SUGGESTION: The Reserve should install permanent signage at the Visitor Center identifying the Reserve and NOAA and should consider other strategies to increase the visibility of the Reserve at the Center.

6. Volunteer Support and Non-profit "Friends" Group Support

There are two elements the evaluation team discussed with the Reserve during the site visit that would likely enhance the capabilities of all the integrated activities and programs. The Reserve considers that it officially established its volunteer program in 2004 with approximately 20 local volunteers assisting with various education programs. As activities and programs expand to meet the capabilities offered by the Visitor Center, the increased use of more volunteers will be vital to that success. Reserve staff are well aware that they themselves will always be too few in number to operate without volunteers. However, an increased number of volunteers requires more volunteer training and coordination. Cross training volunteers from other partner organizations would also be beneficial. The Reserve should consider whether and how to identify a volunteer coordinator to take on many of these tasks.

PROGRAM SUGGESTION: The Reserve should explore strategies for obtaining a position or person to coordinate activities involving volunteers.

The other element of stewardship discussed during the evaluation site visit is the opportunity to develop a non-profit support organization – a "Friends of the Reserve or Kachemak Bay" group. Many reserves within the reserve system have such support groups. These groups are able to accomplish many activities and tasks that the Reserve staff cannot accomplish. Many state-agency affiliated reserves cannot produce items such as tee-shirts or coffee mugs with a state agency or reserve logo and profit from their sale. A friends group can do that. Members of a friends group could also help to man the visitor reception desk just inside the Visitor Center that is now totally handled by NWR staff or NWR friends group volunteers. A member of the friends group could also serve as a volunteer coordinator and liaison with Reserve staff members for program and activity support.

PROGRAM SUGGESTION: The Reserve should explore the creation or development of a non-profit support organization.

B. RESEARCH AND MONITORING

1. Research Activities

The Reserve has research programs of great breadth and depth. The research staff members encourage collaborations among a variety of partners, integrate research with the Reserve's education programs, and in turn are strong partners and collaborators themselves. A research staff member maintains the Reserve's geographic information system (GIS) and its data, supports all the other Reserve programs using the GIS, and is involved in field projects and instrument and skiff maintenance. The research program looks at three environments: the ocean/offshore, nearshore, and the watershed. Staff is working to build the socio-economic environment into the research program as well. There have been 19 funded projects completed or currently ongoing since the last evaluation, and staff members are providing assistance (e.g., letting researchers use a location within the Reserve as a 'staging area' and changing filters on another researcher's monitoring equipment) to approximately 12 other research projects per year.

Some of the research projects completed or ongoing during this evaluation period include:

● Intertidal and Salt Marsh Mapping: These projects mapped the vegetation in the intertidal areas and salt marshes of Kachemak Bay and combined the results in a single GIS project.

● Remote Sensing: The Reserve determined the projects and format of visible remote sensing most likely to be required by Gulf of Alaska scientists and resource managers, developed a set of quality control measures to add to each data set identified, and developed a time series of the appropriate variables selected.

● Wetland Function Tool: The Reserve developed a CD-ROM based tool that allows planners and researchers to examine surface water flow in the Anchor Point area. The model has been incorporated into a GIS project with hyperlinks to several pages of materials that explain the material covered by the tool.

● Autonomous Underwater Vehicle (AUV) Demonstration: The Reserve and Oregon State University tested an AUV in Kachemak Bay during 2003. The vehicle swam pre-programmed routes to determine the feasibility of using an AUV to measure currents of Kachemak Bay.

● Wetlands Conference: Reserve staff coordinated a workshop for a group of experts in the field of wetland ecology and nutrient cycles who developed a research plan to address community needs in understanding the relationship of peat wetlands to the watershed continuum on the Lower Kenai Peninsula.

● GLOBEC: This program examined the mesoscale variability in physical, biological, and chemical properties along the southern Kenai Peninsula. Two two-week cruises (May, July-August) were conducted during the summer of 2003. A SeaSoar platform with a variety of physical and bio-optical sensors mounted on it was towed along a number of grids in the Gulf of Alaska. The measurements were analyzed to determine the important scales of spatial variability and to hypothesize what are the important mechanisms for creating the observed variability. This project was led by the University of Alaska-Fairbanks (UAF).

● Invasive Species Monitoring: Kachemak Bay NERR was one of the reserves selected to participate in a National Fish and Wildlife Foundation-funded invasive species monitoring project that was conducted by the Smithsonian Environmental Research Center. Settling plates were deployed for two years in Kachemak Bay to look for invasive species. A time series study was also conducted by deploying fresh plates every three months to examine seasonal variability.

● Homer Coastal Changes: The Reserve provided the City of Homer with maps of the historical bluff edge within Homer city limits. Historical aerial surveys of the Homer coastline from 1951, 1961, 1968, 1974, 1996, and 2003 were digitized. This relatively small project has been extremely well received by the community and incorporated into the Reserve's education and CTP programming.

● Coastal Currents: This project aims to associate oceanographic conditions with changes in the timing of sockeye salmon runs. Physical oceanographic and fisheries data are collected along a transect across Lower Cook Inlet from Anchor Point to the Red River delta each day during July. This project is led by the ADF&G Commercial Fisheries Division in Soldotna.

● Marine Derived Nutrients: This project is studying marine derived nutrients (MDN) and

carbon delivered by salmon and other anadromous fishes. MDN are considered important drivers in riverine ecosystems, providing nutrients and food to these land-based food webs. This study aims to develop a water chemistry proxy for monitoring salmon returns and to track and measure MDN effects in stream, riparian and nearshore environments on the southern Kenai Peninsula. This project being conducted in collaboration with Cook Inletkeeper, USGS, University of Alaska-Anchorage (UAA), and UAF.

● Biophysical Observations Aboard Alaska Marine Highway System Ferries: Oceanographic conditions in the Gulf of Alaska are being monitored using equipment mounted on the ferry M/V Tustumena to observe the path of the Alaska Coastal Current and how it varies in strength and direction throughout the year. The project is led by the NOAA Pacific Marine Environmental Laboratory.

● Coastwalk: The project merges high-resolution mapping of the physical structure of the nearshore environment in Kachemak Bay and citizen-generated biological and human impact data into a GIS. The data has been collected over 18 years through an annual Kachemak Bay Coastwalk shoreline survey conducted by the Alaska Center for Coastal Studies, which is the partner in the project.

● Monitoring Oceanographic Conditions: This project examines oceanographic conditions of water flowing into and out of lower Cook Inlet. Variables measured include temperature, salinity, chlorophyll, and nutrient concentrations. These measurements will be used to improve the understanding of water flow within lower Cook Inlet in order to improve physical, biological, and contaminant transport models of this region. This project is being conducted in collaboration with the Cook Inlet Regional Citizen Advisory Council and UAF.

● Small Mesh Fish Trawl: This is a joint project with the ADF&G Commercial Fisheries Division in Homer. The Reserve is adding water quality measurements to the small-mesh trawl surveys of ADF&G. The goal is to better understand the role of the environment on changes in fish populations within Kachemak Bay.

● Harbor Seal Surveys: This is a joint project with NOAA to maintain and analyze data from NOAA's automated monitoring cameras and aerial surveys in Kachemak Bay and Lower Cook Inlet. The project looks at the accuracy of aerial surveys, the movement of seals in Cook Inlet, and strives to provide the best estimate of harbor seal population.

● Headwater Stream Project: The goal of this project is to populate the Kenai Lowlands Wetland Management Tool with data on salmonid fish and aquatic invertebrate habitat support functions provided by low-order stream riparian wetlands. Providing attributes on wetland function information will substantially increase the usefulness of the Wetland Management Tool for regulatory and conservation planning needs by providing managers, regulators, and property owners with specific information on how wetlands function in the landscape.

The National Estuarine Research Reserve System Graduate Research Fellowship program has been a strong component of the Reserve's research program. The Reserve consistently receives from two to five applications from throughout the U.S. for every GRF opening. During the period covered by this evaluation, three Graduate Research Fellows (GRF) completed or initiated research at the Reserve. One GRF completed research associated with sediment dynamics, another is finishing the third year of research on the spatial and temporal variability in primary

productivity within Kachemak Bay, and a third GRF is studying the use of different habitats in the Bay by crabs. A new GRF will begin examining the role of flow rate on species diversity in the intertidal and shallow subtidal environments starting later in 2006. All of these research projects are directly relevant to management needs in the Reserve and Bay.

The research program has been able to play a strong role in a collaborative forum that brings together a diverse group of researchers. The 4th Kachemak Bay Science Conference was held just days before the evaluation site visit and continued a tradition of gathering together the people who study various components and relationships in the environments encompassed by Kachemak Bay and its watershed to present their findings to each other and the community. The conference has evolved into an interchange of questions, information, and ideas to increase understanding and how best to sustain the health and productivity of the Bay's resources. It has also become a tradition for all of the organizations and agencies involved with scientific research, environmental education, and natural resource management in Homer to work together to plan the conference. Several Reserve staff members continue to serve on the planning committee, and the Reserve continues to sponsor the conference.

ACCOMPLISHMENT: The Kachemak Bay Reserve has a robust and diversified research program, encompassing a wide range of research partners. It also has a well-developed and fully maintained geographic information system. The Reserve continues to provide significant opportunities for student research and plays an active role in maintaining and expanding collaborative research opportunities and communication. Research staff members often serve as the principal investigator or lead researcher in many of the collaborative projects.

During the site visit, the evaluation team and the Reserve staff briefly discussed the Cooperative Ecosystem Studies Unit (CESU) program. This is a network of cooperative research units that has been established to provide research, technical assistance, and education to resource and environmental managers. These units are named CESUs to signify their broad role as providers of research, technical assistance, and education to Federal land management, environmental and research agencies, and their potential partners. Federal agencies contribute research scientists and/or other professionals located and working at CESUs under formal agreements between their respective bureaus and universities. Federal personnel are supervised and supported by their respective agencies, through existing administrative systems. CESUs can create additional opportunities for interdisciplinary and multi-agency research, technical assistance, and education. There is an existing CESU for north and west Alaska, which is hosted by the University of Alaska, with the University of New Hampshire and the Alaska SeaLife Center as partners. The Reserve may want to explore both this existing CESU as well as the CESU program in general as an option for additional resource coordination and opportunities.

PROGRAM SUGGESTION: The Reserve could explore the Cooperative Ecosystem Studies Unit Program as another option for research coordination and partnership opportunities, particularly with the National Park Service and U.S. Fish and Wildlife Service in the Kachemak Bay and Kenai Peninsula areas.

2. Monitoring

As can be seen from the list of research activities above, there is a monitoring component to much of the research being done at the Reserve. The systemwide monitoring program (SWMP) has dealt with personnel and lab changes during this evaluation review period but is now on solid ground. A permanent staff researcher leads the SWMP and an administrative assistant is trained to help with the data loggers. With NOAA/NERRS SWMP Oversight Committee approval, the Reserve moved two monitoring sites that were not accessible much of the year and placed them in a vertical configuration at two existing monitoring sites in Homer (an inner Bay location at the harbor pier) and Seldovia (an outer Bay location at the Seldovia Harbor pier). The Reserve has found the vertical information to be of great value in that Kachemak Bay typically has a two-layered system through the summer. The SWMP is now able to track water in both layers. The Reserve changed chemistry laboratories in 2005 and is now working with a local laboratory that is able to work much more closely with staff to ensure that the Reserve's needs are met. Kachemak Bay Reserve is also one of the pilot sites for the new NERRS telemetry system. The telemetry for the meteorological station (located at the end of Homer Spit) and one water quality station were installed in the fall of 2005.

ACCOMPLISHMENT: The Reserve's systemwide monitoring program (SWMP) has become solidly established, SWMP data is submitted on time, and the data is now generally considered to be the baseline for Kachemak Bay.

C. EDUCATION AND OUTREACH

With the Reserve's move into the Alaska Islands and Ocean Visitor Center, the average number of people participating in Reserve programs annually has increased tenfold. This has presented a tremendous opportunity to reach larger and more varied audiences, but it has put a serious strain on the Reserve's education staff. They have adapted well and handled the workload, and other Reserve staff, Council members, and volunteers have always assisted. The education staff members are adept at collaborating with a large number of environmental and educational non-profit organizations.

The Kachemak Bay Environmental Education Alliance (KBEEA), organized in 2000, represents over 20 member organizations involved in providing or promoting environmental education. The KBEEA and its members coordinate activities to disperse and reduce pressure on resources, avoid duplication of programs, organize citizen-monitoring programs, and evaluate existing science education activities and design new materials and activities based on needs identified by user groups, especially K-12 teachers and coastal managers. Although initial coordination and development of strong partnerships was not seamless, KBEEA now maintains a website, has been able to cross-train volunteers, and is thinking about some strategic group planning, using an overall coordinator/facilitator. The website has become a successful and valuable resource, and a Reserve staff member has been responsible for maintenance, but that work is time-consuming and challenging. Reserve staff members have been heavily involved in overall coordination of the KBEEA. As the KBEEA initiates some strategic planning, the Reserve should also strategize its role in facilitating coordination among educators and non-profit organizations to determine how it can best serve its partners while maintaining its core education and outreach mission and meeting the increased demands in the new Visitor Center.

PROGRAM SUGGESTION: The Reserve is noted for its role in the development and implementation of the Kachemak Bay Environmental Education Alliance, but it should think about its function and capacity to maintain that role so it can determine how it can best serve its partners while maintaining its core education and outreach mission and meeting the increased demands in the new Visitor Center.

The Reserve is also involved in the Kenai Peninsula Science Education Consortium, which was begun in 2004 and is composed of representatives from the Alaska SeaLife Center, Challenger Learning Center (NASA), University of Alaska-Anchorage, Kenai Peninsula College, Kenai Peninsula School District, the Alaska Maritime NWR, and the Reserve. These members provide science education and have united to form a distance education consortium. Perhaps nowhere else within the Reserve system and many of the states is distance learning a more necessary mechanism to promote environmental education. The Reserve has recognized the necessity to provide more distance learning opportunities.

1. Education and Outreach

The Reserve's formal education program is focused primarily on K-12 students throughout south central Alaska. Classroom and field activities are provided for public, private, and home-schooled students. Participation increased from approximately 450 students and one program in 2002, to approximately 1700 students and 9 programs in 2004 in the new Visitor Center, and 1900 students and 17 programs in 2005. Education staff indicated that the approximately 20 programs being offered for 2006 would be about the maximum the Reserve can handle.

The increased numbers of K-12 class and field activities are now organized around three concept units: *High Seas Drifters* (ocean science); *Estuary Ecology and Research* (estuarine/coastal science); and *Careers in Marine Science*. The *High Seas Drifters* programs are classroom lab activities that give students an opportunity to gain hands-on experience with marine organisms, monitoring the marine environment, and using scientific lab equipment. *Estuary Ecology and Research* lab and field programs introduce students to coastal habitats, estuaries, the Reserve, and Reserve research questions and current projects in Kachemak Bay. The Classes and workshops are also provided for professional teacher development. Careers in Marine Science is a one-hour lab class that introduces students to the variety of careers in marine science through group discussion, related hands-on activities, the "Meet a Reserve Marine Scientist" illustrated presentation, and more.

Given the logistics of travel in Alaska, it is a mark of very successful Reserve programs that students from throughout the Kenai Peninsula Borough, Anchorage Borough, and **Matanuska-Susitna Borough school districts and even beyond raise money to travel to Homer for class, lab, and field activities. The Reserve's educational programs are now aligned to state educational standards for science and the curricula of the three above-mention school districts. As noted in the discussion just prior to this section, the logistics of travel is also what has motivated the Reserve and its partners in the** Kenai Peninsula Science Education Consortium to focus on enhanced distance learning capabilities and opportunities.

The Reserve developed entirely new programming with the move into the new Visitor Center. These activities are primarily centered on classroom activities offered to the visiting public –

informal educational programming. Without doubt, the most popular activity, which has also become the Reserve's signature event, is the "Discovery Labs." These are completely open-door, no registration required activities at the Center that are geared to a variety of ages, levels of interest, and knowledge. Just a few of the many topics covered in the Discovery Labs include: Tides & Currents: Going with the Flow; Plankton: Unseen Rulers of the Sea; Seashore Plants: Masters of Adaptation; Tubefeet in Tidepools: Echinoderms of the Bay; and Crabmania in Kachemak Bay.

In the winter, approximately two Discovery Labs are held each month, but in the summer Discovery Labs are held three times a week. That sort of workload involves an incredible amount of planning for staff as well as the time of a significant number of volunteers. Participants are often surprised to learn that there is no charge for these activities but are equally surprised to learn that there is no "dedicated" funding for these programs either. (The Discovery Labs are grant-supported activities, but the citizens thought there was an amount of money specifically earmarked for the Labs.) Several members of the public with whom the evaluation team met told the team that there should be dedicated monies for the programs, believing this would guarantee their permanence and stability in spite of any potential fluctuations in general operational funding for the Reserve. Estuary Walks are also held twice a week in the summer and are a popular one-hour guided interpretive hike from the Visitor Center along the Beluga Slough trail to the Bishop's Beach berm.

Outreach to the public is consistently accomplished through the formal and informal education programs of the Reserve, but staff has also developed other mechanisms to reach the general public. In recent years the Reserve has conducted *What's New in the Bay* workshops as an opportunity for north and south shore community members and special interest groups to learn about and share information and ideas on the nature of Kachemak Bay with Reserve staff. Residents of Homer, Seldovia, and Port Graham have learned about research and education efforts through these public forums, as have water taxi operators, eco-tourism business staff/ owners, and charter fishing operators/owners. Reserve staff members participate in about five festivals a year, often traveling with the ADF&G mobile classroom. One of the festivals is the annual Kachemak Bay Shorebird Festival, now in its 14th year. Each year, staff members are actively involved in planning and leading Shorebird Festival events and in annual Earth Day activities as well.

Technological limitations and time zone differences prevent the Reserve's real-time participation in EstuaryLive, but the Reserve hosts activities and programs every year for National Estuary Day. Homer businesses, non-profit organizations and agencies have organized a series of Coastweeks events each autumn since 2001 to promote the importance of Kachemak Bay ecosystems and their need for protection. The Reserve is actively involved in the planning and activities. Coastweeks 2005 focused on monitoring for coastal change, with events taking place between early September and early October.

The Reserve has initiated a partnership with the Homer News to publish bi-weekly articles, written by Reserve staff, on the natural world of Kachemak Bay and the Reserve's watershed, nearshore and oceanic research efforts. The bi-weekly series, called Bay Science, has covered a wide range of topics and translates research and science for the general population. A local National Public Radio Station is one of the Reserve's strong supporters and has done a number of broadcasts from Coastal Training Program seminars and workshops. The Reserve has produced some news releases, and during the evaluation site visit, staff indicated that they are

considering development of a media plan.

ACCOMPLISHMENT: The Reserve has successfully expanded its range and number of formal and informal educational and outreach activities to take advantage of the new Visitor Center. The Reserve has also recognized and successfully met the need to take the Reserve's message and programs beyond the Visitor Center and out into the community at large. It has begun to increase its distance learning capabilities.

2. Coastal Training Program (CTP)

The Reserve's coastal training program (CTP) became fully operational in late 2003 after the approval of the required needs assessment, market analysis, marketing plan, program strategy, and technical committee outline. The CTP has three target audiences: 1) coastal resource managers and scientists (e.g., fishery, wildlife, marine mammal, shellfish); 2) coastal policy and decision-makers (e.g., elected officials, planners, and regulatory agencies at the local, borough, state, and federal levels); and 3) coastal resource user groups (e.g., ecotourism guides, sport fishing guides, and water taxi services). The staff's goal is to provide at least one training opportunity per month to one of the target audiences, either sponsored solely by the Reserve or in partnership with other training partners in the Kachemak Bay region. Education and CTP staff members from the Reserve were involved in the 4th annual Kachemak Bay Science Conference because of their ongoing commitment and involvement in the integration of research and education.

Highlights of some of the training opportunities conducted during this evaluation period include:

● Coastal Erosion on the Western Kenai Peninsula: Directed toward policy makers, this two-day workshop brought in 10 experts on coastal processes to discuss how these processes are affecting the Kenai Peninsula coastline.

● Coastal Floodplains: Linking Policy to Science: This two-day working conference was designed for policymakers, planners, and managers of the Kenai Peninsula Borough and the cities of Seward, Homer, Kenai, Soldotna, Seldovia, and Port Graham.

● Road Science and Policy on the Kenai Peninsula: The objective of this workshop was to better inform local policy makers and land managers of the ecological and hydrologic effects of roads, and of various planning and construction methods that can mitigate some of the negative effects while still providing for safe and efficient transportation. The goal is for local decision-makers to utilize this information to develop road management policy and projects that take into consideration ecological and hydrologic as well as transportation concerns. Over 70 participants attended.

● Needs assessment: The CTP staff completed a new needs assessment of one of the CTP target audiences – south central regional fishery scientists and managers – assessing their science and technology training interests.

● Geographic Information System (GIS) Training: Two courses for resource managers were held during the same week. The first, a two-day Environmental Systems Research Institute

(ESRI)-certified training course covered the basics of ArcGIS software, specifically ArcGIS 9.2. Participants learned to create, edit, and work with georeferenced spatial data; manipulate tabular data; query a GIS database; and produce maps, reports, and graphs. The second three-day intermediate level course provided an opportunity to address a variety of coastal issues using ArcView 9.2 technology. Problem-solving exercises integrated basic GIS topics with real-world scenarios dealing with population growth, sensitive habitats, and marine protected areas. The NOAA Coastal Services Center co-sponsored and taught the courses.

● Tsunamis: Following the December 2004 Asian tsunami, the Reserve, in conjunction with Sea Grant, the University of Alaska-Fairbanks, and the City of Homer, held a public meeting to discuss the science behind tsunamis, present tsunami inundation maps, and discuss emergency response. Homer has been affected by tsunamis in the past and has the potential for tsunami impacts in the future, so this is a significant local and regional issue.

ACCOMPLISHMENT: The Reserve's Coastal Training Program is fully approved and functional and has become a highly effective venue for providing training in the Kachemak Bay and Kenai Peninsula region.

D. STEWARDSHIP AND RESOURCE MANAGEMENT

Within the NERR system, many reserves conduct or accomplish programs or activities related to land acquisition, enforcement, restoration, restoration science, technical advice and support, and community education under the general rubric of stewardship and resource management. Because the Reserve has so successfully integrated its research and education components, elements of stewardship and resource management are identifiable in almost all of its activities and programs, as can be seen in the discussions above.

The land and waters within the Reserve boundaries are in public ownership and management, although the Reserve does not have direct resource management responsibility for those land and water resources within its boundaries. The Reserve is not now actively involved in land acquisition (2005 Kachemak Bay NERR Management Plan). The management plan does outline options for future boundary expansion.

The majority of the area included within the Reserve boundary is relatively pristine and has not been significantly impacted by human activity. However, the Reserve's management plan recognizes that there are a few locations that have been impacted and that could be considered for restoration. Such restoration would be done in partnership with the agency having management responsibility. Some of the Reserve's research and education activities are preliminary to potential restoration and resource management activities. These include stewardship issues such as the decline of shellfish stocks, grazing impacts in the Fox River Flats, and upland development pressures on salmon streams.

V. CONCLUSION

For the reasons stated herein, I find that the State of Alaska is adhering to the programmatic requirements of the Coastal Zone Management Act and the regulations of the National Estuarine Research Reserve System in the operation of its approved Kachemak Bay National Estuarine Research Reserve.

The Kachemak Bay Reserve has made notable progress in: Administration and Staffing; Management Plan; Coordination and Partnerships; Research Activities; Monitoring; Education and Outreach; and Coastal Training Program.

These evaluation findings also contain nine (9) recommendations: one (1) Necessary Action that is mandatory and eight (8) Program Suggestions. The state must address the Necessary Action by the date indicated. The Program Suggestions should be addressed before the next regularly-scheduled program evaluation, but they are not mandatory at this time. Program Suggestions that must be repeated in subsequent evaluations may be elevated to Necessary Actions. Summary tables of program accomplishments and recommendations are provided in Section VI.

This is a programmatic evaluation of the Kachemak Bay National Estuarine Research Reserve that may have implications regarding the state's financial assistance awards. However, it does not make any judgment about or replace any financial audits.

_____ _____

David M. Kennedy
Director, Office of Ocean and Coastal
Resource Management

Date

VI. APPENDICES

Appendix A. Summary of Accomplishments and Recommendations

The evaluation team documented a number of the ADF&G Sport Fish Division's and Reserve's accomplishments during the review period. These include:

Issue Area	Accomplishment
Administration and Staffing	Leadership and management at the Reserve have improved and strengthened significantly since the last evaluation. State and departmental support for the Reserve and its programs has also increased, and staff communication and morale have improved noticeably.
Management Plan	The Reserve has successfully completed revisions to its management plan.
Coordination and Partnerships	The Reserve has demonstrated strong partnerships by collaborating and coordinating with numerous federal and state agencies, researchers, educators, and non-profit organizations. Reserve staff members are sensitive to the roles and interactions with numerous partners and generally are able to avoid competition for volunteers, visibility, and funding. The KBRR Community Council is a strong advocate of Reserve programs and activities.
Research Activities	The Kachemak Bay Reserve has a robust and diversified research program, encompassing a wide range of research partners. It also has a well-developed and fully maintained geographic information system. The Reserve continues to provide significant opportunities for student research and plays an active role in maintaining and expanding collaborative research opportunities and communication. Research staff members often serve as the principal investigator or lead researcher in many of the collaborative projects.
Monitoring	The Reserve's systemwide monitoring program (SWMP) has become solidly established, SWMP data is submitted on time, and the data is now generally considered to be the baseline for Kachemak Bay.
Education and Outreach	The Reserve has successfully expanded its range and number of formal and informal educational and outreach activities to take advantage of the new Visitor Center. The Reserve has also

	recognized and successfully met the need to take the Reserve's message and programs beyond the Visitor Center and out into the community at large. It has begun to increase its distance learning capabilities.
Coastal Training Program	The Reserve's Coastal Training Program is fully approved and functional and has become a highly effective venue for providing training in the Kachemak Bay and Kenai Peninsula region.

In addition to the accomplishments listed above, the evaluation team identified several areas where the program could be strengthened. Recommendations are in the forms of Program Suggestions and Necessary Actions. Areas for improvement include:

Issue Area	**Recommendation**
Administration and Staffing	PROGRAM SUGGESTION: The Reserve and Division are encouraged to continue their efforts to gain more state financial support for core positions, particularly the education and research coordinators.
Facilities and Infrastructure	NECESSARY ACTION: By the end of the exhibit construction award period, the Reserve must identify non-federal match funds for the exhibits planned at the Visitor Center or return the funds unexpended to NOAA. PROGRAM SUGGESTION: The Reserve should explore stronger state support for the Visitor Center maintenance costs.
Coordination and Partnerships	PROGRAM SUGGESTION: The Reserve should explore whether additional opportunities exist for partnership and collaboration with the Alaska Coastal Management Program.
Program Visibility	PROGRAM SUGGESTION: The Reserve should install permanent signage at the Visitor Center identifying the Reserve and NOAA and should consider other strategies to increase the visibility of the Reserve at the Center.
Volunteer Support and Non-profit "Friends" Group Support	PROGRAM SUGGESTION: The Reserve should explore strategies for obtaining a position or person to coordinate activities involving volunteers. PROGRAM SUGGESTION: The Reserve should explore the creation or development of a non-profit support organization.

Research Activities	PROGRAM SUGGESTION: The Reserve could explore the Cooperative Ecosystem Studies Unit Program as another option for research coordination and partnership opportunities, particularly with the National Park Service and U.S. Fish and Wildlife Service in the Kachemak Bay and Kenai Peninsula areas.
Education and Outreach	PROGRAM SUGGESTION: The Reserve is noted for its role in the development and implementation of the Kachemak Bay Environmental Education Alliance, but it should think about its function and capacity to maintain that role so it can determine how it can best serve its partners while maintaining its core education and outreach mission and meeting the increased demands in the new Visitor Center.

Appendix B. Response to Previous (2002) Evaluation Findings

Necessary Action: ADFG and reserve management must work together to develop alternative methods of addressing current financial shortfalls at KBNERR. Within one month of receipt of final evaluation findings, KBNERR must submit to NOAA a FY04 financial plan detailing all sources of match. Updates to the plan will be described in KBNERR's semi-annual performance reports.

Response: Since 2003, the Department has provided the reserve with $80,000 to fund the administrative positions. The Department has also provided funds totally about $120,000 annually to assist it in meeting its education and outreach goals. In state FY 2007 we will be providing the reserve with $70,000 to conduct a research project on hardshell clams. We are also using in-kind services from the Department's marine research and management operations to match the NOAA operations grant. Upon careful review, these services are aligned with the reserve's core mission and goals and have been approved by NOAA for use as match. Finally, we are providing the reserve biometric assistance to help it be more competitive for other grants, including various state grants. This year, the reserve is also poised to obtain several state research grants that closely align with its mission. In combination, these efforts have resulted in balanced budgets.

Necessary Action: Upon receipt of final evaluation findings, KBNERR must begin submitting complete grant applications and semi-annual reports to NOAA on time.

Response: We have instituted internal timelines that have assured assure documents are submitted to NOAA in a timely fashion, including time for internal review requirements. We have also provided additional administrative support to the unit.

Program Suggestion: NOAA strongly urges ADFG and reserve management to work together to address the current lack of leadership at the reserve. Reserve management should begin proactive, transparent decision-making and planning for KBNERR's future. Thorough and respectful communication between reserve management and staff as well as among staff is absolutely critical. NOAA requests that specific actions that have been taken to address leadership issues at the reserve, particularly related to staff and financial management, be detailed and updated in KBNERR's semiannual performance reports.

Response: As we stated in our formal response, this statement troubles us and we are concerned about the programmatic implications it potentially brings up. While we acknowledge that there have been communication issues between and among staff at the reserve, we do not believe this has resulted in the reserve from not being able to successfully implement and enforce its mission or goals. So long as the reserve is achieving its contractual obligations, we do not believe the federal government should be requiring actions regarding our staffing or personnel. Staffing and personnel issues are more appropriately evaluated by the managing agency.

With respect to the issue we completed a strategic planning effort to redefine the reserve's vision, mission, goals and objectives. This was followed by an internal prioritization of these goals and objectives and the establishment of a tactical plan to attain high priority objectives. This effort involved all staff on an equal basis. We also involved staff in the hiring of a

replacement reserve manager, which became open due to the retirement of the existing manager. We will use this same process for the hiring of the new manager, which recently became open due to the resignation of Judy Haner. In combination, we believe these efforts result in more "proactive, transparent decision-making and planning".

Program Suggestion: NOAA strongly recommends ADFG to work cooperatively with KBNERR to explore all options regarding future ownership and use of the reserve's existing modular facility.

Response: While the new facility for KBNERR represents a great opportunity, it also presents a funding challenge. We currently lease space within the modular to other agencies/entities that are aligned with the reserve's mission and goals. The reserve is being fairly compensated for the use of this space.

Program Suggestion: NOAA strongly encourages KBNERR to develop a detailed process and timeline for revising its management plan by December 2003. Updates on the management plan revision's progress should be described in KBNERR's semi-annual reports.

Response: The ADF&G successfully completed the revision of its management plan.

Program Suggestion: NOAA encourages KBNERR to explore options for closer collaboration with community partners once the outstanding financial issues at the reserve have been addressed.

Response: As we stated in our review comments the Department places a high priority on partner involvement and collaboration. Based on internal review we conducted, we believe the reserve is doing, given the resources it has available, an adequate job of partner involvement and collaboration.

Program Suggestion: NOAA strongly encourages KBNERR to expand its efforts to reach local Native Alaskan communities through both education and research to the greatest extent possible.

Response: The Department places a high priority on partnerships and collaborations with Native Alaskans. Based on internal review, we believe the reserve is doing, given the resources it has available, an adequate job of Native Alaskan partner involvement and collaboration.

Appendix C. Persons and Institutions Contacted

U.S. Senators
Honorable Lisa Murkowski
Honorable Ted Stevens

U.S. Representatives
Honorable Don Young

Alaska Department of Fish and Game
Lisa Evans, Assistant Director, Division of Sport Fish
Nicky Szarzi, Division of Sport Fish
Ted Otis, Division of Commercial Fisheries

Kachemak Bay National Estuarine Research Reserve
Scott Pegau, Research Coordinator and Acting Manager at time of site visit
Terry Thompson, Education Coordinator
Coowe Walker, Stewardship Coordinator
Rick Foster, CTP Coordinator
Amy Alderfer
Ori Badajos
Steve Baird
Catie Bursch
Kevin Co
Kim Donohue
Carmen Field
Judy Hamilton

Kachemak Bay NERR Community Council
Bob Hartley, Chair
Daisy Lee Bitter, Community Member
Nelda Osgood, Community Member
Ralph Broshes, Community Member
Jim Hornaday, Community Member
Roger MacCampbell, Department of Natural Resources, State Parks
Brenda Konar, University of Alaska

Federal and State Agency Representatives
Greg Siekaniec, Refuge Manager, USFWS Alaska Maritime National Wildlife Refuge
Anne Morkill, Deputy Refuge Manager, USFWS Alaska Maritime National Wildlife Refuge
Marianne Aplin, USFWS Alaska Maritime National Wildlife Refuge, Visitor Center Manager
Melonie Shipman, Education Specialist, USFWS Alaska Maritime National Wildlife Refuge
Joel Hard, Superintendent, Lake Clark National Park and Preserve
Elizabeth Wasserman, Lake Clark National Park and Preserve
Mary McBurney, Lake Clark National Park and Preserve
Kris Holderied, NOAA/NCCOS Kasitsna Bay Lab

Other Organizations and Representatives
Dick Wyland, Mayor, City of Seldovia
Kurt Reynertson, City Manager, City of Seldovia

Shirley Schollenberg, Homer Soil and Water Conservation District
Ingrid Harrald, Cook Inletkeeper
John Plaskett, Cook Inletkeeper
Marilyn Sigman, Executive Director, Center for Alaskan Coastal Studies
Heather Beggs, Museum Director, Pratt Museum
Louis Bettini, Director of Education, Pratt Museum
Sue Saupe, Cook Inlet Regional Citizen Advisory Council
Anne Solomon, University of Washington
Judy Haner, former Reserve Manager

Appendix D. Persons Attending the Public Meeting

The public meeting was held on Wednesday, April 5, 2006, at 7:00 p.m. at the Alaska Islands and Ocean Visitor Center, 95 Sterling Highway, Homer Alaska. The following attended the meeting:

Michael Opheim, Seldovia Village Tribe
David Raskin
Tom Manson
D. Hoffman
Julie Little
Andy Bond
Bob Hartley
Pat Hartley

Appendix E. NOAA's Response to Written Comments

NOAA received written comments regarding the Kachemak Bay National Estuarine Research Reserve. Each of the letters is part of the official record of the evaluation and is briefly summarized below, followed by NOAA's response.

Dr. Glenn Shaw
Professor of Atmospheric Science
Geophysical Institute, University of Alaska at Fairbanks
Comment: Dr. Shaw praised the scientific work and collaboration of the Reserve staff. They have been of great assistance to the Geophysical Institute and the International Arctic Research Center in several research projects and have willingly provided logistical assistance as well.

NOAA's Response: No response necessary. The evaluation team thanks Dr. Shaw for his comments.

Dr. Bob Piorkowski
Invasive Species Program Coordinator
Alaska Department of Fish and Game
Comment: Dr. Piorkowski is responsible for developing a statewide program of invasive species-related monitoring, research, and outreach and depends upon partnerships to carry out much of that work. The Reserve has been a strong partner in all aspects of that work, and Dr. Piorkowski looks forward to additional collaboration with the Reserve staff.

NOAA's Response: No response necessary. The evaluation team thanks Dr. Piorkowski for his comments.

Dr. Uri ten Brink
Senior Research Geophysicist, USGS-Woods Hole Science Center and
Adjunct Scientist, the Woods Hole Oceanographic Institution
Comment: Dr. ten Brink noted with appreciation the cooperation and assistance that the Reserve provided to the USGS during the placement and recovery of seismometers in the water around the Augustine volcano during an eruptive period. Reserve staff were extremely helpful in all phases of the work and their knowledge was vital to the Woods Hole staff, who had no knowledge of the area.

NOAA's Response: No response necessary. The evaluation team thanks Dr. ten Brink for his comments.

Bob Shavelson, Executive Director
Cook Inlet Keeper
Comment: Cook Inlet Keeper is a nonprofit organization dedicated to protecting the Cook Inlet watershed and the life it sustains. Mr. Shavelson indicates that the Reserve's and Cook Inlet Keeper's similar research and education goals have made the Reserve a strong partner. He applauds the achievements that the Reserve has made in both its education and research departments over the last three years and outlines a number of those successes. In particular he

acknowledges the highly skilled staff members.

NOAA's Response: No response necessary. The evaluation team thanks Mr. Shavelson for his comments.

Michael Szabados, Director
NOAA Center for Operational Oceanographic Products and Services (CO-OPS)
Comment: Mr. Szabados recognizes the collaborative efforts of the Reserve during the CO-OPS' successful completion of tidal current surveys in Cook Inlet. He notes that the Reserve staff continually assisted CO-OPS field teams while working in Homer by providing local office and storage assistance, maintenance and data retrieval support, and a vital connection to the local user community.

NOAA's Response: No response necessary. The evaluation team thanks Mr. Szabados for his comments.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

Office of the Commissioner

FRANK MURKOWSKI, GOVERNOR

P.O. BOX 115526
JUNEAU, AK 99811-5526
PHONE: (907) 465-4100
FAX: (907) 465-2332

August 15, 2006

Mr. Ralph Cantral, Chief
National Policy and Evaluation Division
Office of Ocean and Coastal Resource Management
NOAA National Ocean Service
U.S. Department of Commerce
Silver Spring, Maryland 20910

Dear Mr. Cantral:

I write in response to the draft evaluation findings provided to the Alaska Department of Fish and Game (ADF&G) by your office prior to finalization of the Kachemak Bay National Estuarine Research Reserve (KBNERR) performance review.

ADF&G is pleased with NOAA's assessment that it is successfully implementing the federally approved KBNERR. ADF&G values this federal-state-local partnership and looks forward to the continuing development of the reserve and its programs.

ADF&G especially appreciates the evaluation team's recognition of specific accomplishments since the last KBNERR review in 2003, including improvement and strengthening of leadership and management, completion of revisions to the management plan, increased state and departmental support, improved staff communication and morale, initiation and maintenance of strong partnerships and collaborations, and solid establishment of the system-wide monitoring and coastal training programs. I firmly believe that KBNERR's operations, management, and staff communications and morale have improved dramatically during the review period. These changes support an increasingly prominent role for KBNERR in local, state, and national arenas.

ADF&G comments on the specific evaluation areas are below. These include one necessary action, six program suggestions, and 15 technical clarifications/corrections.

Necessary Action: By November 1, 2006, the Reserve must identify non-federal match funds for the exhibits planned at the Visitor Center or return the funds unexpended to NOAA.

ADF&G is aware that KBNERR is required to identify non-federal matching funds for the planned exhibits or return $197,302 in federal construction funds to NOAA. We hope, however, that NOAA might permit a no-cost extension on this deadline. KBNERR was without a reserve manager for five months in early 2003 and for five months in early 2006. Staff responsible for

pursuing non-federal matching funds were burdened with additional, and unanticipated, management and administrative responsibilities. Active pursuit of matching funds thus far includes five requests already declined by large private firms/foundations, and additional requests underway to a larger number of firms and foundations. It is possible that matching funds will become available as a number of smaller grants, rather than one lump sum from a single grantor. Organizations expressing interest in the project have notified KBNERR that they are not likely to respond definitively to KBNERR requests before December 2006. Any prospective inclusion of KBNERR match funding in ADF&G's capital projects budget request (as part of its annual budget package, signed by the Governor in fall 2006 and submitted to the State Legislature), could not be signed into law until spring 2007, with funds becoming available after July 1, 2007.

Program Suggestion: The Reserve and Division are encouraged to continue their efforts to gain more state financial support for core positions, particularly the education and research coordinators.

ADF&G has significantly increased its financial support for core positions during the review period and intends to maintain that level of support in the future. The Division of Sport Fish, under which the KBNERR resides, develops its annual budget requests and allocates its financial resources to reflect the goals, objectives, and strategies of an established strategic plan. KBNERR's education and research coordinators have been encouraged to develop projects that will contribute directly to the division's identified priorities during the annual budget development process. Those projects will be given the same consideration for funding as all other division proposals.

Additionally, the KBNERR manager has been tasked with the development of a five-year financial plan which will clearly identify core funding needs and potential sources of funding to meet those needs. Once complete, ADF&G will assess its current level of support for KBNERR and consider any proposed adjustments.

At this time, ADF&G is confident that it has provided sufficient levels of financial support to KBNERR core positions and is meeting the intent and requirements of the National Estuarine Research Reserve (NERR) program.

Program Suggestion: The Reserve should explore stronger state support for the Visitor Center maintenance costs.

ADF&G respectfully disagrees with this suggestion and remains confident that it has appropriately prioritized and allocated available funds to support the KBNERR portion of annual visitor center maintenance costs. ADF&G does not believe it is inappropriate to utilize its annual NERR Operations grant funding for this purpose, and is confident the source of those funds is stable.

ADF&G wishes to express its concern about the planned expansion of the reserve system and its potential impact on operational funds for existing reserves. ADF&G strongly believes that future expansion of the reserve system should not result in decreased operational funding for existing reserves.

Program Suggestion: The Reserve should explore whether opportunities exist for partnership and collaboration with the Alaska Coastal Management Program.
KBNERR has an active relationship with the Alaska Coastal Management Program (ACMP). KBNERR collaborated with ACMP on the development of a draft Coastal and Estuarine Land Conservation Plan. The Kenai Peninsula Coastal Zone Manager is a member of the reserve's Coastal Training Program (CTP) Advisory Committee, and participates in many CTP workshops. All CTP workshops are publicized to ACMP staff. KBNERR recently received funding through the ACMP enhancement grant program to collaborate with the Kenai Peninsula Borough ACMP office in the identification of erosion hotspots along the Kenai Peninsula.

Program Suggestion: The Reserve should install permanent signage at the Visitor Center identifying the Reserve and NOAA and should consider other strategies to increase the visibility of the Reserve at the Center.

Since the review visit, new signage installed in the visitor center lab classroom identifies KBNERR, NOAA, and ADF&G. Permanent signage has also been installed on the exterior of the Islands and Ocean Visitor Center, as well as on the entrance sign to the visitor center public parking area. KBNERR, NOAA, and ADF&G will be more visible after the establishment of exhibits in public areas of the visitors' center. The reserve hopes to begin sharing some responsibility for the front reception desk with the refuge.

Program Suggestion: The Reserve should explore strategies for obtaining a position or person to coordinate activities involving volunteers.

Knowing that any new position would divert scarce resources from other KBNERR programs, and given the reserve's relatively light dependence on volunteers, KBNERR does not desire a full-time volunteer coordinator and does not intend to pursue such a position. The pool of potential volunteers is small and thinly distributed. The greater Homer area houses around 8,000 permanent residents and hosts a surprising number of non-profit organizations and parks, several of which have well established volunteer programs. Active attempts to enlarge KBNERR's local volunteer base could divert volunteers from our local partners who rely on the same small volunteer pool. Reserve education and research staff currently take responsibility for recruitment, training, and coordination of KBNERR volunteers, and perform these functions well. They further assist in the training of volunteers for local partner organizations. The reserve is considering the possibility of recruiting a small number of long-term, peak season volunteers from outside the Homer area. The development of such a program (and/or a friends group, as mentioned below), could assist in expanding and developing volunteer opportunities.

Program Suggestion: The Reserve should explore the creation or development of a non-profit support organization.

Since the review visit, KBNERR has continued to explore possibilities for a "Friends of KBNERR" group. Such a group, however, would have to tap populations outside the immediate Homer area. Local Homer residents are unlikely to take an active interest in such a group, due in part to the area's modest income opportunities, and in part to the significant number of existing local philanthropic activities. New membership would most likely reside in Anchorage, the nearest city of any size, from which residents travel to Homer as a popular vacation destination. *Program Suggestion: The Reserve could explore the Cooperative Ecosystem Studies Unit Program as another option for research coordination and partnership opportunities, particularly within the National Park Service and U.S. Fish and Wildlife Service in the Kachemak Bay and Kenai Peninsula areas.*

The reserve is interested in any mechanism that facilitates active partnerships with other organization or units within NOAA. KBNERR will analyze the benefits of joining the existing Cooperative Ecosystem Studies Unit Program or the formation of a new unit.

Technical Corrections/Clarifications:

It is customary in Alaska to write "Southcentral" as a single (capitalized) word.

Page 4 - 2nd paragraph: The correct tidal range for Kachemak Bay is 8.7 meters.

Page 4 - 4th paragraph: Suggested revision when referring to the modular reserve facility and its use by partner organizations: "A separate modular facility in Homer provides offices for some partner organizations through cooperative agreements. A bunkhouse…"

Page 7 - 1st paragraph: Please replace "permanent full-time" positions with "permanent seasonal" positions.

Page 7 - 1st paragraph: Suggested revision to reference Exxon Valdez Oil Spill funds: "Grant monies from the Exxon Valdez Oil Spill Trustee Council (EVOS) help support the research and education programs, and when granted, are used to achieve the required non-federal matching funds for NOAA operations."

Page 7 - 3rd paragraph: Please revise the sentence concerning the education coordinator reference to: "The education coordinator is sought to help vision and plan for aquatic education activities throughout all F&G regions. The education activities of the reserve are designed to crosswalk with state and school district science standards throughout Southcentral Alaska."

Page 8 (Facilities and Infrastructure) -1st paragraph: Please revise these two sentences: "A separate modular facility in Homer provides office and meeting room space for partner agencies through cooperative agreements. Up to eight KBNERR volunteers, graduate students, and collaborating scientists have access to the reserve's bunkhouse which provides sleeping, kitchen-dining, and bath facilities."

Page 9 (Coordination and Partnerships) - 3rd paragraph: In reference to the various councils and committees, please add that there is also a reserve education committee, structured the same as the reserve research committee – a subcommittee of the community council.

Page 9 - 3rd paragraph: The Kachemak Bay Science Conference is every two to three years, depending on our ability to get one organized.

Page 9 - 4th paragraph: The last sentence implies that critical habitat areas are managed by Alaska Department of Natural Resources, when in fact they are managed by Fish and Game – Sport Fish, through the habitat section.

Page 9 - 5th paragraph: Please revise last sentence to read: "There are nine community members and 12 ex officio (non-voting) agency members."

Page 10 - 3rd paragraph: Correct spelling of Soldotna.

Page 11 - 2nd paragraph: Please revise the sentence concerning the need for a friends group: "These groups are able to accomplish many activities and tasks that the reserve staff cannot accomplish."

Page 13 - 3rd bullet: Cook Inlet Keeper has changed their name to Cook Inletkeeper.

Page 18 - 3rd paragraph: Please delete "article" after Bay Science.

Again, we appreciate NOAA's favorable draft evaluation of KBNERR. Thank you for considering the above corrections, responses, and suggestions. We look forward to receiving your final report.

Sincerely,

McKie Campbell
Commissioner

Kachemak Bay National Estuarine Research Reserve

May 2006 through April 2009

All photos courtesy of the Kachemak Bay NERR

Office of Ocean and Coastal Resource Management
National Ocean Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT
Silver Spring, Maryland 20910

OCT 23 2009

Denby S. Lloyd, Commissioner
Alaska Department of Fish and Game
1255 West 8th Street
P.O. Box 115526
Juneau, Alaska 99811-5526

Dear Commissioner Lloyd:

Enclosed are the final evaluation findings for the Kachemak Bay National Estuarine Research Reserve (Reserve) for the period from May 2006 through April 2009.

The fundamental conclusion of this evaluation is that Alaska is adhering to the programmatic requirements of the NERR system in its operation of the approved Kachemak Bay Reserve. This document contains two recommendations, neither of which is mandatory. In response to the State's comments on the NOAA draft evaluation findings, we have made all factual corrections and deleted the recommendation regarding educational outreach efforts to Anchorage children.

We appreciate your cooperation and assistance and that of the Reserve staff during the accomplishment of this evaluation.

Sincerely,

Donna Wieting

Donna Wieting
Acting Director

Enclosure

cc: Charles O. Swanton, Director Sport Fish Division, Department of Fish and Game
Lisa Evans, Assistant Director, Sport Fish Division, Department of Fish and Game
Terry Thompson, Manager, Kachemak Bay NERR
Nina Garfield, Estuarine Reserves Division, OCRM, NOAA
William Reay, Manager, Chesapeake Bay-Virginia NERR

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TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

The Coastal Zone Management Act (CZMA) of 1972, as amended, established the National Estuarine Research Reserve System (NERRS). Sections 312 and 315 of the CZMA require the National Oceanic and Atmospheric Administration (NOAA) to conduct periodic performance reviews or evaluations of all federally approved National Estuarine Research Reserves (NERRs). The review described in this document examined the operation and management of the Kachemak Bay National Estuarine Research Reserve (the NERR or the Reserve) during the period from May 2006 through April 2009. The Reserve is administered by the Alaska Department of Fish and Game (ADF&G), Sport Fish Division.

This document describes the evaluation findings of the Director of NOAA's Office of Ocean and Coastal Resource Management (OCRM) with respect to the Kachemak Bay NERR during the review period. This evaluation includes discussions of major accomplishments as well as recommendations for program improvement. The fundamental conclusion of the findings is that the State of Alaska is successfully implementing its federally approved NERR.

The evaluation team documented a number of Kachemak Bay Reserve accomplishments during this review period. During the three years since the last evaluation, the Reserve has undergone a period of significant transition, particularly with regard to staffing. In spite of several vacancies in key positions for more than a year and sometimes almost two years, the staff maintained programs and projects with very little delay or reduction in Reserve products and services. The State of Alaska and the ADF&G Sport Fish Division provided increased state financial support, and the Reserve Community Council was successful in obtaining state funds to match the federal funding for Visitor Center Exhibits. Operating through collaboration and partnerships is a hallmark of the Reserve's approach to conducting its programs. Research and monitoring efforts address a number of state and local needs, have direct application and use by other organizations and communities, and can inform management decisions related to climate change. Research and education programs and projects are well integrated, and the Reserve has expanded both its formal and informal education programming.

The evaluation team also identified areas where the Reserve and its programming could be strengthened. The Reserve, the Sport Fish Division, and the Community Council have all worked hard to secure cash match for Reserve programs. In the face of continuing funding challenges, the Reserve should develop a written strategy for future funding that can be endorsed by the Division of Sport Fish and OCRM. Because of the importance of electronic media in providing outreach and information, the Reserve's website should be significantly updated.

II. PROGRAM REVIEW PROCEDURES

A. OVERVIEW

The National Oceanic and Atmospheric Administration (NOAA) began its review of the Kachemak Bay Reserve in January 2009. The §312 evaluation process involves four distinct components:

- Initial document review and identification of specific issues of particular concern;
- A site visit to Alaska, including interviews and public meetings;
- Development of draft evaluation findings; and
- Preparation of the final evaluation findings, partly based on comments from the state regarding the content and timetables of recommendations specified in the draft document.

The recommendations made by this evaluation appear in boxes and bold type and follow the findings section where facts relevant to the recommendation are discussed. The recommendations may be of two types:

Necessary Actions address programmatic requirements of the CZMA's implementing regulations and of the Kachemak Bay Reserve approved by NOAA. These must be carried out by the date(s) specified;

Program Suggestions denote actions that NOAA's Office of Ocean and Coastal Resource Management (OCRM) believes would improve the program, but which are not mandatory at this time. If no dates are indicated, the state is expected to have considered these Program Suggestions by the time of the next CZMA §312 evaluations.

A complete summary of accomplishments and recommendations is outlined in Appendix A.

Failure to address Necessary Actions may result in a future finding of non-adherence and the invoking of interim sanctions, as specified in CZMA §312(c). Program Suggestions that are reiterated in consecutive evaluations to address continuing problems may be elevated to Necessary Actions. The findings in this evaluation document will be considered by NOAA in making future financial award decisions relative to the Kachemak Bay Reserve.

B. DOCUMENT REVIEW AND ISSUES DEVELOPMENT

The evaluation team reviewed a wide variety of documents prior to the site visit, including: (1) Kachemak Bay Reserve §312 evaluation findings dated 2006; (2) federally approved Environmental Impact Statement and program documents; (3) financial assistance awards and work products; (4) semi-annual performance reports; (5) official correspondence; and (6) relevant publications on natural resource management issues in Alaska.

Based on this review and on discussions with OCRM, the evaluation team identified the following priority issues:

- major accomplishments during the review period;
- status of Reserve staffing and needs;
- facilities development and maintenance and/or land acquisition efforts;
- status of general administration of the Reserve;
- status of implementation of the Reserve's research, monitoring, and education programs;
- the manner in which the Reserve coordinates with other governmental and non-governmental organizations and programs in the state and region; and
- the Reserve's progress in addressing the recommendations contained in the most recent Section 312 evaluation findings dated August 2006.

C. SITE VISIT TO KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE

Notification of the scheduled evaluation was sent to the Alaska Department of Fish and Game, members of Alaska's congressional delegation, and regional newspapers. In addition, a notice of NOAA's "Intent to Evaluate" was published in the Federal Register on April 1, 2009.

The site visit to the Kachemak Bay Reserve was conducted from April 27 – May 1, 2009. The evaluation team consisted of Ms. Chris McCay, Evaluation Team Leader, National Policy and Evaluation Division, OCRM; Ms. Nina Garfield, Program Specialist, Estuarine Reserves Division, OCRM; and Dr. William Reay, Manager, Chesapeake Bay-Virginia National Estuarine Research Reserve.

During the site visit, the evaluation team met with the Reserve manager and staff; senior staff from the ADF&G Sport Fish Division and Commercial Fisheries Division; other state agency staff; coastal researchers and academicians; federal agency staff, including NOAA programs; local government staff; Kachemak Bay Research Reserve Community Council members; and non-profit organizations. Appendix C lists people and institutions contacted during this review.

As required by the CZMA, OCRM held an advertised public meeting on Tuesday, April 28, 2009, at 6:00 p.m. at the Kachemak Bay Reserve, Alaska Islands and Ocean Visitor Center, 95 Sterling Highway, Homer, Alaska. The public meeting gave members of the general public the opportunity to express their opinions about the overall operation and management of the Kachemak Bay Reserve. Appendix D lists individuals who registered at the meeting. NOAA's responses to written comments submitted during this evaluation are summarized in Appendix E.

The Kachemak Bay Reserve manager and staff members were crucial in setting up meetings and helping with logistics for the evaluation site visit. Their support is most gratefully acknowledged.

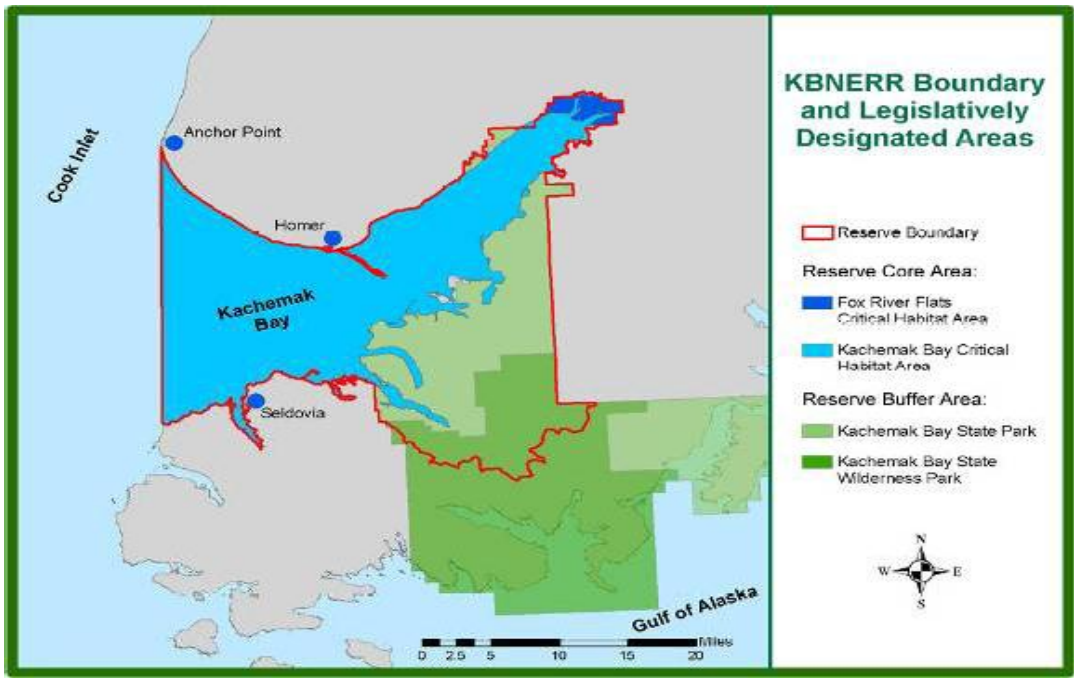
III. RESERVE PROGRAM DESCRIPTION

NOAA's Office of Ocean and Coastal Resource Management designated the Kachemak Bay National Estuarine Research Reserve (KBNERR or the Reserve) in 1999. The lead agency is the Alaska Department of Fish and Game (ADF&G), Sport Fish Division (SFD).

Kachemak Bay is located in south-central Alaska, south of Anchorage on the western coast of the Kenai Peninsula. It is one of the most productive and diverse estuaries in Alaska, and features tidal mudflats, marshlands, and upland forests. The southern shore includes the Kenai Mountains, which contain several glaciers that drain directly into the Bay. Kachemak Bay is 24 miles wide at its mouth and approximately 36 miles long. The Bay is a temperate region fjord with hydrographic conditions unique among National Estuarine Research Reserve System (NERRS) estuaries. An 8.7-meter tidal range primarily drives the Bay's circulation, and ocean currents within the Gulf of Alaska result in upwelling of nutrient rich waters. This nutrient-rich environment provides critical habitat for many species during various life phases.

KBNERR is the largest in the NERRS, encompassing approximately 365,000 acres. The lands within the Reserve are entirely in public ownership and are managed by various local, state, and federal entities. Three legislatively designated areas are included within the Reserve: (1) Kachemak Bay Critical Habitat Area, (2) Fox River Flats Critical Habitat Area, and (3) the portion of Kachemak Bay State Park that drains into Kachemak Bay. The two critical habitat areas are managed by the ADF&G Sport Fish Division, and the Alaska Department of Natural Resources manages the state park. These designations provide the strongest resource protection afforded by Alaska. Current uses include boating, fishing, hunting, shellfish harvesting, mariculture, and a variety of recreational activities such as sightseeing and hiking. Traditional uses permitted by state and federal agencies include commercial and recreational fishing and limited livestock grazing.

The Reserve's headquarters are located on the Kenai Peninsula in the City of Homer, overlooking Bishop's Beach and Beluga Slough. The Reserve is co-located with the Alaska Maritime National Wildlife Refuge in the Alaska Islands and Ocean Visitor Center. In addition to housing a bookstore and exhibits for both the Reserve and the Refuge, the Center is equipped with a dry lab, classrooms, public meeting rooms, and offices for the Reserve. A separate modular facility in Homer provides a bunkhouse for up to 10 visiting researchers, graduate students, and volunteers, including kitchen-dining, bath, and meeting room facilities; and leased offices for some partner agencies through cooperative agreements. A third building owned by the Reserve provides limited lab, storage, and workshop space.


KBNERR Boundary and Legislatively Designated Areas
Cook Inlet
Anchor Point
Homer
Kachemak Bay
Seldovia
Gulf of Alaska
0 2.5 5 10 15 20
Miles
Reserve Boundary
Reserve Core Area:
Fox River Flats Critical Habitat Area
Kachemak Bay Critical Habitat Area
Reserve Buffer Area:
Kachemak Bay State Park
Kachemak Bay State Wilderness Park
N
W
E
S


Eagle River
Anchorage
Tyonek
Cook Inlet
Turnagain Arm
Girdwood
Chickaloon River
Hope
Portage
Portage Glacier
Whittier
Seward Highway
Nikiski
Kenai
Moose River
Sterling
Sterling Highway
Moose Pass
Kalgin Island
Soldotna
Skilak Lake
Cooper Landing
Kenai Lake
Kasilof
Kasilof River
Clam Gulch
Tustumena Lake
Resurrection River
Exit Glacier
Nikolaevsk
Anchor River
Kachemak City
Kachemak Bay
Homer
Halibut Cove
Seldovia
Port Graham

IV. REVIEW FINDINGS, ACCOMPLISHMENTS, AND RECOMMENDATIONS

A. OPERATIONS AND MANAGEMENT

1. Administration and Staffing

During the three years since the last evaluation, the Reserve has undergone a period of significant transition, particularly with regard to staffing. This has included:

Manager – At the time of the last site visit, one of the staff was serving as acting manager, but within two months of the visit, a new manager had been hired. That person resigned eight months later in February 2007. The position as acting manager was then held consecutively by two staff members for nearly two years. In late 2008 the Reserve's education coordinator, who was acting manager at that time, was hired as the new manager.

Education Coordinator – The education coordinator served in that position as well as acting manager for almost one year, until he was hired as the permanent reserve manager. The education coordinator position was advertised, but after less than two months the state of Alaska implemented a hiring freeze. Months later the freeze was lifted, and on the last day of this current evaluation site visit, a person accepted the offer to be the Reserve's education coordinator.

Research Coordinator – Less than a year after the last site visit, the research coordinator accepted a new position and resigned. A new research coordinator was hired, but one year later in May 2008 that person resigned. After approximately five months, a permanent research coordinator was hired. She has been serving in that position for almost five months at the time of this site visit.

Coastal Training Program Coordinator – The CTP coordinator resigned in September 2007. In December 2008 one of the Reserve's Graduate Research Fellows was hired as a temporary CTP coordinator. At the time of the site visit in April 2009, the CTP coordinator position was being advertised. Subsequent to the site visit, a CTP coordinator was hired.

During this evaluation period there were other staffing changes as well. OCRM and the Kachemak Bay Research Reserve Community Council, among others, were concerned about the delay in filling positions, particularly the manager and CTP coordinator. However, when the two positions became vacant in 2006 and 2007, respectively, it was determined that neither job class provided an adequate and qualified candidate pool and that the job class for each was not the most appropriate for the responsibilities of each position. The Reserve and Sport Fish Division leadership decided upon an appropriate job class for each position; both positions were in a single job series. The process was

begun to reclassify both positions. At the same time, however, the state coincidentally and independently undertook a job class study of the chosen job series. When a job class study is underway, the state will not allow recruitments to move forward until the class study is completed.

The study took over two years to complete. Because of that length of time and being forced to rely on existing Reserve staff to fulfill the manager's responsibilities, the ADF&G made a special request to fill the manager position before the job class study was completed. The request was granted, the manager position was finally advertised in June 2008, and the current manager was hired in November 2008.

The CTP coordinator position was in the same situation as the manager position, so staff members assisted with CTP activities in an effort to keep the program ongoing. The job class study was finally completed in February 2009, but because of economic conditions, a state hiring freeze was in place. The CTP coordinator position is federally funded, so the ADF&G requested a waiver on that basis to fill the position while the hiring freeze was in place. The waiver was granted, and the position was posted just after the evaluation site visit in April 2009. Since the site visit, the position has been filled and the new CTP coordinator began in September 2009.

The number of applications for the positions increased after the reclassifications. For example, there were 12 applications for the vacant manager position in early 2006 and 27 applications for the position in late 2008. Both the Reserve and the Sport Fish Division believe that this is a result of the reclassification. The Sport Fish Division Assistant Director has indicated she now hopes to pursue the reclassification of an existing position to serve as an assistant manager position.

The Division was supportive of the Reserve and its administrative location in the Division during reorganization activities in the ADF&G. Some discussion occurred about relocating the Reserve within ADF&G during that time, but with strong divisional support, the Reserve remains within the Sport Fish Division.

During this time of transition, the existing staff were able to continue most of the Reserve's programs and projects with very little reduction or delay in Reserve products and services. During the vacancy of the CTP coordinator position, the Reserve fell behind in reporting on CTP performance measures, but those reports are now complete and are being submitted as required. All other NERRS performance monitoring data submissions were and are submitted on time through the Reserve's semi-annual performance reports.

The Reserve hosted two NERRS sector meetings during this time, and with the staffing situation more stable than it has been in several years, OCRM looks forward to the Reserve becoming more involved in NERR system-wide initiatives. The partners in research and education as well as recipients of assistance and outreach from the Reserve staff with whom the evaluation team met were unanimous in their praise and admiration for the staff's dedication, expertise, and enthusiasm for their work. The ADF&G

Division of Sport Fish also recognized three staff members with Director's Achievement Awards for their outstanding work during this review period.

ACCOMPLISHMENT: The Reserve has come through a period of staff transition and has attained a more stable staffing base. Several staff positions were reclassified, and a new manager, research coordinator, and education coordinator are now in place. Reserve programs and projects continued throughout unstable periods. The staff members are well respected and recognized by their peers, partners, and community members for their expertise, dedication, and enthusiasm.

The previous evaluation findings dated August 2006 included a program suggestion encouraging the Reserve and the Division of Sport Fish to continue efforts to gain more state financial support for core positions. The Division, and particularly the Assistant Director, who has been in the position since the last evaluation and who has direct oversight responsibility for the Reserve, have strongly supported the Reserve and its staff. The State of Alaska has increased its financial support for core positions. At the time of the last evaluation, the manager's position was funded entirely from federal grant monies directed for Reserve operations. General fund monies from the Division of Sport Fish now provide more than 40 percent of the position's salary. State Wildlife Grant funding provides approximately $150,000 per year for research projects, and some funding from these monies provides approximately 40-45 percent of the research coordinator position's salary. The Reserve also receives approximately $127,000 per year from State Wildlife Grant funding to conduct education projects, and the education coordinator position receives some of that funding as well as state funding from the Sport Fish Division, for a total of approximately 60 percent state support for the position's salary.

ACCOMPLISHMENT: The State of Alaska and the ADF&G Division of Sport Fish have provided increased state financial support for the Reserve's activities and core positions.

Through the efforts of the Kachemak Bay Reserve Community Council (Council), the Reserve received $133,000 from the state legislature to use as match for the federal monies awarded to the Reserve for Visitor Center exhibits. Donations from BP (formerly British Petroleum) ($10,000) and the Homer Foundation ($1,000) were given to the Reserve for education programs during this evaluation period. These represent a significant boost to the non-federal funding necessary for the Reserve to administer and operate its programs, but these are non-recurring funds. Without a stable funding source, the Reserve will continually need to seek non-federal funds, an effort that will remain a challenge, especially given the economic recession and state budget concerns. Costs for facilities maintenance, replacement or repair of SWMP equipment, and staff salaries and associated benefit costs will likely only increase, so that less funding is available for programs. Some sources of funding that were previously available to the Reserve (Exxon Valdez Oil Spill funds, for example) are no longer available or are decreasing in amount.

The Reserve may wish to consider developing a funding strategy to complement the Sport Fish Division's efforts to seek state funding. This strategy could, among other items, identify as many state sources and other creative funding mechanisms as can be found as well as ways to gain access to those sources. This is a priority for some of the Council members (see next section) whose support and network of contacts could be helpful.

PROGRAM SUGGESTION: The Reserve and the Sport Fish Division have worked hard to secure cash match for Reserve programs. In the face of continuing funding challenges, the Reserve should develop a written strategy for future funding that can be endorsed by the Division of Sport Fish and OCRM.

2. Kachemak Bay Research Reserve Community Council

The Council was established shortly after Reserve designation. Council members represent and are responsive to a broad base of interests. The director of the ADF&G Sport Fish Division makes appointments to the Council. The Council's primary purpose is broad – to provide an organized structure for substantive and meaningful dialogue and recommendations between numerous groups and entities interested in natural science research and education and the Reserve staff. Members of the Council also serve on the Reserve's research advisory and education advisory committees.

During this evaluation period the Council has been a strong advocate for the Reserve. Through the efforts of several members, the Reserve received $133,000 from the Alaska Legislature to use as match for the federal monies for the Visitor Center exhibits. There had been significant difficulty in obtaining match, and the evaluation findings dated August 2006 contained a necessary action requiring the Reserve to obtain funds by the end of the exhibit award or return the federal funds.

As occurred during the previous evaluation, the evaluation team met with several members of the Council and was impressed by their dedication to and support of the Reserve staff and activities. The members had been concerned about the staffing situation and long vacancy periods for several positions but now are very pleased with the outcome and spoke highly of all the Reserve staff members. In turn, the staff and the Assistant Director noted how extremely helpful the Council has been for the Reserve.

Members of the Council with whom the team met listed a variety of priorities they were anxious to see the Council address or become more involved in, including the identification of more stable non-federal funding; the national budget for the Reserves; identification or establishment of a foundation or other entity that can accept donated funds to be used to pay the Reserve's National Estuarine Research Reserve Foundation dues; revitalization of the Coastal Training Program; education for legislators about the Reserve's accomplishments and needs; and greater clarity in the functions and roles of the Council and the education and research advisory committees. The evaluation team

noted that the upcoming revision to the Reserve's management plan could serve as a vehicle to discuss the role and structure of the Council.

The Reserve and Sport Fish Division have recognized the energy and dedication of the Council and are hoping to reclassify an existing staff position to serve as the Reserve's assistant manager. Among other duties, this position would work directly with the Council. Reserve staff currently assist the Council by preparing meeting minutes and public notice announcements for Council meetings. As envisioned by the Reserve and Sport Fish Division, a new assistant manager position could work with the Council chair to develop agendas, coordinate and assist with training opportunities for Council members, work with the Council's research education, and legislative committees, work with the Council to increase its visibility in the community and region, and assist with some of the Council's priorities (discussed above) that support the Reserve.

ACCOMPLISHMENT: During this evaluation period the Reserve Community Council was successful in obtaining state funds to match the federal funding for the Visitor Center exhibits. Council members are willing to tackle substantive issues and activities to support the Reserve.

3. Management Plan

Reserves are required by Federal regulation to have a current NOAA-approved management plan (15 C.F.R. Part 921.13). The plan should describe the reserve's goals, objectives and management issues, as well as strategies for research, education and interpretation, public access, construction, acquisition and resource preservation, and, if applicable, restoration and habitat manipulation. A management plan has four valuable functions: (1) to provide a vision and framework to guide reserve activities during a five-year period; (2) to enable the reserve and NOAA to track progress and realize opportunities for growth; (3) to present reserve goals, objectives, and strategies for meeting the goals to constituents; and (4) to guide program evaluations. Regulations also require that a reserve's plan be updated every five years.

Kachemak Bay Reserve's management plan will soon be due for revision and update. Throughout the site visit the evaluation team and Reserve staff discussed opportunities to focus on various strategic planning efforts, some of which are linked to the hiring of new staff. This includes development of or revisions to a research plan and an education plan now that new research and education coordinators have been hired. Community Council members also discussed a need to clarify the roles and responsibilities of the Council and the Research and Education Committees. The upcoming time period for revising the Reserve's management plan offers an opportunity to focus on these various planning efforts and how they might relate to the management plan.

4. Facilities and Infrastructure

The Reserve is co-located with the Alaska Maritime National Wildlife Refuge (Refuge) in the Alaska Islands and Ocean Visitor Center. The state owns two other buildings associated with the Reserve, but it is the Center that has increasingly focused attention on Kachemak Bay Reserve and its programs. The Visitor Center is a great asset for the community of Homer, which is allowed to use it for community functions, thereby exposing participants to the Reserve and its activities. It was one of three Alaska locations selected to host the display of posters highlighting the 200th anniversary of NOAA. During the month they were on display, over 14,000 visitors came to the Center.

The Reserve and the Refuge are seeking ways to make the building more energy efficient to address high energy costs. They have worked diligently to make the Center more environmentally "green," and together the two partners now recycle, reuse, or compost an average of 80 percent of waste generated at the Center.

In addition to housing a bookstore and exhibits for both the Reserve and the Refuge, the Center is equipped with a dry lab, classrooms, public meeting rooms, and offices for the Reserve. A separate modular facility in Homer provides a bunkhouse for up to ten visiting researchers, graduate students, and volunteers and includes kitchen-dining, bath, and meeting room facilities. The same modular facility includes leased offices for some partner agencies through cooperative agreements. Another building owned by the Reserve provides limited lab, storage, and workshop space.

5. Coordination and Partnerships

Given its relatively isolated location and Homer's population of about 5,000 people, one could assume somewhat limited opportunities exist for the Reserve to establish many partnerships and coordinate programs and activities with other local groups. In fact, however, Homer is home to a very large number of non-profit and non-governmental groups (the number often cited is 50), many of whom work together rather than separately. This is particularly true in the environmental education field. The Reserve has coordinated on a variety of efforts with a range of agencies and groups, many of which are discussed below.

The Kachemak Bay Environmental Education Alliance (KBEEA) represents over 20 member organizations (including the Reserve) involved in providing or promoting environmental education. KBEEA members coordinate activities to reduce pressure on resources, avoid duplication of programs, organize citizen-monitoring programs and design materials and activities based on needs identified by user groups. Reserve staff played a significant role during development of the KBEEA and was responsible for the group's website. During this evaluation period, leadership for KBEEA has become a rotating position. This has reduced some demands on Reserve staff, and member groups with whom the evaluation team met indicated that the KBEEA has become stronger since the previous evaluation site visit and serves as a role model for other communities. Select examples of cooperation and collaboration between the Reserve and other members of the KBEEA include: The Center for Alaskan Coastal Studies offers

educational boat trips that include plankton tows and then uses the Reserve facilities for follow-up lab analysis. The Reserve continues to share facilities and partner on education events with the Pratt Museum in Homer. The Cook Inlet Regional Citizens Advisory Committee and the Reserve are collaborating on hydrographic survey and salt marsh mapping projects.

The Alaska Coastal Management Program (ACMP) also has been a Reserve collaborative partner during this evaluation period, primarily through the Reserve's Coastal Training Program (CTP). The Reserve conducted a needs assessment for the ACMP's local coastal district coordinators and identified three major needs: 1) review of the ACMP roles, impacts, and how to implement recent changes to statutes and regulations; 2) proper and effective commenting on permit requests; and 3) delivery of effective educational outreach and responses to applications.
Because of the difficulty in providing training in person throughout Alaska, the Reserve suggested to the ACMP that it develop a variety of self-directed presentations for Coastal District Coordinators. Building on that idea, the ACMP is developing four PowerPoint© presentations.

The Reserve could assist the ACMP in addressing other issues identified in the needs assessment, including coastal processes, shoreline and riverbank restoration, and climate change and its implications for coastal Alaska. The ACMP provided funding to the Reserve to conduct a study of erosion rates in the Kenai Peninsula Borough, which was information the borough wanted and needed. The Reserve and ACMP have also collaborated in the review of applications submitted to the state for funding provided to the state under the Coastal Estuarine and Land Conservation Program (CELCP).

The USFWS Maritime National Wildlife Refuge (NWR or Refuge) and the Reserve do more than just share a building, although that itself requires significant cooperation. Both have worked to make the building more energy efficient and now recycle, reuse, or compost an average of 80 percent of waste generated at the Visitor Center as well. The NWR uses the Reserve's lab facilities and 'bunkhouse' space when necessary, and the Reserve uses the NWR's boats after receiving special safety boat training from the Refuge staff. There have been a number of collaborative efforts in education and outreach which are discussed later in this document, and the NWR provided financial support for a Reserve education staff member to represent the State of Alaska at the national "No Child Left Inside" conference in Nebraska.

The two partners have had some discussion about research collaboration, specifically related to climate change issues. They are also in the early stages of discussions about establishing a surface elevation table (SET) network in Kachemak Bay to monitor for elevation changes, particularly in salt marshes. Salt marshes in the Reserve are typically not very accessible and are subject to ice scour, so it is possible SET stations might not prove effective. Thus, the two partners are discussing a SET site in Beluga Slough, which the Visitor Center overlooks and which is more accessible. The Reserve and the Refuge have also begun investigating the possibility of creating a cell-phone tour or pod-cast tour of Reserve and Refuge lands. A person might use a cell phone, for example, to

call a specific number to hear about the natural and cultural history and resources of a particular location. This would be a good outreach mechanism to provide people with information about areas that may be inaccessible.

Lake Clark National Park and Preserve is a wilderness park with no visitor center or road access, so being located in Homer in the building that formerly housed Reserve staff has been valuable – it provides a place for the public to see the face of the Park. The Park is a member of the KBEEA, and Park staff members have assisted the Reserve with its Discovery Labs and other interpretive programs. The National Park Service Pacific West Region (which includes Alaska) is developing a Pacific Ocean Strategy and is now working on possible collaborative and research efforts which could involve the Reserve.

NOAA and the Reserve have collaborated on a number of activities and projects during this evaluation period. In the summer of 2007 the Reserve hosted two NOAA Hollings Scholars and one NOAA Education Partnership Program student who worked with the research and education staff. With the creation and increasing presence and activities of NOAA's Alaska Regional Collaboration Team, additional opportunities are appearing for NOAA and the Reserve to work together.

● The NOAA NCCOS Kasitsna Bay Lab has coordinated with the Reserve to offer K-12 education programs on the Bay's south side at the Lab. The only practical way to reach the Reserve's Visitor Center from the south side of Kachemak Bay is by boat, which is impractical and cost-prohibitive for school classes. Both Reserve staff and Katsitsna Bay Lab staff also collaborate with the Seldovia Village Tribe and others to provide programs during Seldovia Sea Days, which is a learning experience the Seldovia Village Tribe provides to educate its students about Kachemak Bay and its resources. The Lab also depends upon the Reserve's research committee for building research partnerships.

● The NCCOS Center for Coastal Fisheries and Habitat Research, Alaska's Sea Grant Marine Advisory Program, and the Reserve have been collaborating on harmful algal blooms in Kachemak Bay. NCCOS scientists recently developed a relatively cheap, easy, and quick test for domoic acid. Domoic acid is one of the most important biological toxins posing risks to west coast bivalves. The product of a group of naturally occurring diatoms, domoic acid causes amnesiac shellfish poisoning, which can cause serious illness and death in humans and marine mammals when the shellfish are ingested. For unknown reasons, Kachemak Bay is the highest risk site in Alaska for domoic acid.

● NCCOS is involved in leading an effort in Alaska to encourage and involve Native Alaskans in science. In Alaska, NCCOS has worked with the Reserve and others on this effort. The Reserve education staff has worked with the school districts and tribal representatives of Port Graham, Seldovia, and Nanwalek to emphasize science education and has brought programs to the three communities.

● NOAA's National Ocean Service began a new two-year integrated ocean and coastal mapping effort in Kachemak Bay during August 2008 entitled "Hydropalooza." Such

sea-floor data will provide water depth maps and updated nautical charts for Kachemak Bay and the Reserve.

ACCOMPLISHMENT: The Reserve has maintained and strengthened its existing collaborations and partnerships. New elements of partnerships have been developed or are being discussed, which have expanded and will continue to expand the reach of the Reserve's programs.

One area in which the Reserve and the Sport Fish Division may want to strengthen coordination is with other divisions in the ADF&G. The ADF&G is of significant value to the Reserve, but the Reserve can also prove to be of significant value to the Department. There have been some collaborations already, primarily educational efforts. These have included "Leave No Child Inside" program elements such "Discover Wild Alaska" team planning, Kids Fishing Day, and development of a "Kids in Nature" template and toolbox for Department educators. In addressing invasive species threats, projects included the development of a video on threats to Alaska from a variety of invasive species and a traveling educational display on Alaska aquatic invaders.

The Reserve and Sport Fish Division could look for opportunities to support the mission of the Department and its divisions. Some of the Reserve's data and research information is already being used by the Habitat Division, and additional information could prove useful to the Habitat Division. The CTP could solicit training and research needs of the ADF&G divisions and identify whether the Reserve could address any of these needs. Greater support to the ADF&G may also provide more diversified funding opportunities for the Reserve.

B. RESEARCH AND MONITORING

The Reserve has been able to establish its research program from a broader habitat/ecosystem-based perspective rather than a narrower sport fish-based focus. The Reserve has been successful in obtaining funds from the state and from other sources that allow for research projects that may still relate to sport fish but also address the Reserve's other priority research topics. In addition, the Reserve's research and monitoring has direct application and use by other entities. Sea Grant and the small shellfish aquaculture industry in Kachemak Bay use the Reserve's water quality data, temperature monitoring, and harmful algal bloom data and knowledge. Permitting staff in the ADF&G Commercial Fisheries Division use some of the Reserve's research and monitoring data in determinations about permit issuance.

Given the State of Alaska's concern about oil spills and volcanic activity with its associated ash fall, the Reserve's ongoing research in circulation patterning and hydrodynamic studies in Kachemak Bay is quite inter-related and integrated with the Reserve's research involving harbor seals, otters, larval crab transport, hard shell clams, harmful algal blooms, and even glacial retreat. The Reserve's habitat mapping

capabilities are integrated into all of its sector programs and help to inform management decisions about critical habitat areas within the Reserve, serve stewardship opportunities, and will be of increasing importance to climate change adaptation efforts.

1. Research Activities

Goal 2 of the Reserve's management plan is to "Increase understanding of the natural and human processes occurring in the coastal environment." There are five objectives to meet that goal, and each objective has multiple strategies, which pertain to the marine environment, nearshore environment, watershed environment, and/or socio-economic impacts. The research objectives are primarily aligned with the NERRS strategic plan and the ADF&G Sport Fish Division strategic plan. The Reserve staff members have been involved in a variety of research projects and activities that are addressing some of these strategies, and the following highlights are from some of the project work that was conducted during this evaluation period.

Headwater Streams: During this evaluation period the Reserve began conducting Headwater Streams II, whose goal is to model connections between landscape settings and fish communities in headwater streams across the Kenai lowlands. Headwater streams are a high proportion of total stream networks in the Reserve's study area (Anchor River, Stariski Creek, Deep Creek, and Ninilchik River). These systems are poorly understood and generally susceptible to change or alteration because they cross private property or are lands with unprotected status. Thirty sites in four wetland classes have been sampled, measuring almost 60 elements. The research has shown that topography is a key driver of stream health. Researchers have also correlated fish size to other variables, so not every headwater stream is the same; that is, niche partitioning occurs, making it vital to maintain the diversity of habitat configurations for a diversity of fish. Thirteen of the 30 stream systems in the study were identified for protected status. They have been placed in the State Anadromous Stream Catalog. The Catalog is important because it specifies which streams, rivers, and lakes will be given protection as known significant habitat for anadromous fish species, such as salmon. Activities, such as road crossings, or hydroelectric projects that may affect those habitats are reviewed by the Alaska Department of Fish and Game – Habitat Division and will only be permitted if the project plans provide for the proper protection of fish habitat.

Harbor Seal Study: In 2003 the Minerals Management Service began a study to provide information about harbor seal distribution and abundance in Cook Inlet for oil and gas leasing sales and for oil spill response planning. There are approximately 8400 seals in lower Cook Inlet, and approximately 26% of them are found in the Fox River flats in August. The Reserve staff has worked with the NOAA Fisheries Marine Mammal Laboratory to conduct the technical data gathering in Kachemak Bay. Intensive aerial surveys were conducted and satellite tags were deployed on 76 seals. Conclusions reached to date indicate that Kachemak Bay has the largest seal haul-out in all of Cook Inlet, and that Kachemak Bay seals tend to stay in the bay all winter long. The Reserve plans to further analyze data collected (e.g., bathymetry, sea surface temperature, ocean color) to study habitat usage and foraging areas.

Otters as an Indicator Species of Ecosystem Health: Sea otters occupy Kachemak Bay year round. The number of otter carcasses recovered cumulatively throughout the year has increased each year since 2001. Approximately 40% of the known otter mortalities from 2002 through August 2008 were caused by bacteria that cause vulvular endocarditis, which is an inflammation of tissue lining a heart valve. There are several hypotheses about the cause, including increased exposure to the bacteria, increased virulence of bacteria, and predisposing factors allowing the bacteria to infect the otters. Predisposing factors may include immunosuppression due to a virus, contaminants, or genetics; or diet. Radio transmitters have been implanted in 44 otters, and they are monitored weekly, either visually or by radio signal. There is a mortality signal in each VHF transmission. At the time of the site visit, three adult males had been taken in subsistence hunts, and one was killed by a boat strike that caused severe trauma. Two adult females died from disease. The Reserve is also monitoring sea otter forage ecology.

Larval Transport of Tanner and Dungeness Crab between Inner and Outer Kachemak Bay: This project is being conducted by one of the Reserve's Graduate Research Fellows. In order to create effective management strategies, it is imperative to understand larval transport into and out of the bay. Physical forcing, specifically tides and wind, has been shown to control distribution and behavior of larval crabs within estuarine environments; however, no study has documented both larval crab abundance and effects of transport within Kachemak Bay. Several hypotheses are being tested and various sampling methods are being used to identify spatial and temporal distributions. This study will provide critical information for management of sustainable marine resources within this highly productive and diverse estuarine ecosystem and for updating hydrodynamic modeling of the Bay. Further work will focus on genetic analysis, creation of a crab larval identification guide and additional sampling work.

Patterns of Glacial Retreat in Kachemak Bay: Approximately a dozen glaciers are located on the south side of Kachemak Bay. There is no question that they are retreating, but this study looked at the rate of retreat for nine glaciers using photographic analysis. Results of the study to date show that most Kachemak Bay glaciers have receded approximately one mile since 1952. A few have receded half as far, while one has receded over twice as far. Also significant is the finding that the rate of retreat is increasing. Dinglestadt Glacier, for example, has receded almost seven times faster in the past 56 years compared to the 128 years prior. As glaciers continue to recede and thin, glacial discharge into the Bay will decrease, which will lead to a wide range of physical and biological effects.

The Kachemak Bay Reserve has been successful in attracting students in the NERRS Graduate Research Fellowship (GRF) Program. The Reserve hosted three GRFs during this evaluation period. The larval transport of crabs described above is being conducted by a GRF. Another GRF studied physical forcing and its role in sessile communities. He

found that when water flow increased, it lead to an increase in species richness at local sites. This has implications for conservation strategies to address biodiversity and the effects of invasive species. A third GRF project studied the role of habitat complexity with regard to kelp beds in crab ecology. At the time of the site visit another GRF was just beginning her fellowship.

The Reserve staff participated in the 2006 and 2009 Kachemak Bay Science Conferences, and the 2009 event was held at the Visitor Center. It is a tradition for all of the organizations and agencies involved with scientific research, environmental education, and natural resource management in Homer to work together to plan the conferences. These conferences provide the opportunity for researchers and citizen scientists to present their findings to each other and to the community of people who live in the Bay and depend upon its resources. It is a good example of the integration of research and education, both by the Reserve and the larger Homer community. The Monitoring and Education and Outreach sections that follow include additional examples of research and education integration.

ACCOMPLISHMENT: The Reserve's current research and monitoring efforts address a number of state and local needs and have direct application and use by other organizations and communities. Research is well integrated into the educational programs of the Reserve, and the results of many of the research projects can provide reference data that can inform management decisions related to climate change adaptation.

2. Monitoring

In spite of the staff turnover throughout this evaluation period, the Reserve kept its System-wide Monitoring Program (SWMP) functioning. There is an interest in the Bay's bivalve populations and the possible restoration of those populations, so the SWMP water quality data is invaluable. The Reserve has partnered with the Northwest Association of Networked Ocean Observing Systems (NANOOS) to provide real-time water quality data to shellfish growers. Sea Grant uses the Reserve's data for needs related to its aquaculture program. The local oyster farmers in Kachemak Bay benefit from the data because if water temperatures exceed a certain threshold, the growers are not allowed to sell their product. However, when they are aware that surface temperatures are rising, the oysters can be lowered to the Bay bottom until conditions change. The Reserve's meteorological data is used by local mariners and others. The SWMP has also been collaborating with Wet Labs, Inc., on research and development field testing of a phosphate probe.

The Reserve now plans to establish an additional weather station at Anchor Point. The decision to establish this station was in direct response to the needs of a number of users for additional meteorological data in that part of Cook Inlet (the northwest corner of the Reserve) and because of local awareness and appreciation of the Reserve's capabilities.

ACCOMPLISHMENT: Kachemak Bay NERR was able to maintain SWMP in spite of staff turnover and shortages during this evaluation period. The data from SWMP is used by the local aquaculture industry and mariners.

Kachemak Bay Reserve staff members are conducting several monitoring projects in collaboration with community volunteers. These efforts serve as a bridge between research and education and indicate the integrated nature of programs and activities at the Reserve.

Two projects involve monitoring for invasive species: European green crabs, which are voracious predators, preferring bivalves and other infaunal organisms, but are also known to prey on other species of crabs; and tunicates and bryozoans, which are fouling organisms that affect aquaculture. European green crabs have not yet been found in Reserve waters, but tunicates and bryozoans are already in the Bay. The invasive species monitoring originated with the Smithsonian Environmental Research Center (SERC). Initially the tunicate/bryozoan monitoring was a collaboration between the SERC and the NERRS and was conducted in reserves and national marine sanctuaries along the U.S. west coast. Both are now being conducted in Kachemak Bay by Reserve staff and volunteers. These monitoring efforts are a good public education tool, allow for the development of community networks and response planning, and will, in the case of the European green crab, provide the early detection vital for eradication.

Community members are also involved in monitoring for harmful algal blooms (HABs) and phytoplankton. HABs are a particular concern for the aquaculture industry and human health. Five sites around the Bay near oyster farms are monitored biweekly, primarily by oyster farmers.

C. EDUCATION AND OUTREACH

According to the Reserve's management plan, Goal 3 is to "Foster responsible stewardship of the coastal environment." Goal 4 is to "Foster a public that is involved with and supportive of Reserve activities." There are a total of five objectives to meet those goals, and each objective has multiple strategies. The education and outreach objectives are primarily aligned with the NERRS strategic plan and the ADF&G Sport Fish Division strategic plan. In the case of the Sport Fish Division, whose aquatic education program focus is on sport fishing opportunities and resources found primarily in freshwater environments, the Reserve's focus on the marine environment is complementary to the Division's.

The Reserve coordinates its environmental programming with over 20 organizations involved in providing or promoting environmental education through the Kachemak Bay Environmental Education Alliance (KBEEA). KBEEA members coordinate activities to reduce pressure on resources, avoid duplication of programs, organize citizen-monitoring programs and design materials and activities based on needs identified by user groups.

The Reserve's education and outreach programs are well integrated with the research and monitoring programs, as can be seen in the research discussions above and as illustrated by the Reserve's work with the Kachemak Heritage Land Trust. The Trust works on the Kenai Peninsula with willing landowners to preserve land with significant natural, recreational, or cultural values through purchase or conservation easements. The Trust uses the Reserve's research and scientific background information to help identify resources on properties on the Kenai. During this evaluation period the Trust has been conducting outreach to landowners in the Anchor River area. Reserve education staff helped develop a one-page information sheet to describe research and scientific background information in that area in clear, easily understood language. The Trust is now able to provide that information to landowners to help them understand the values of their properties.

1. Education and Outreach Programs

Formal Education Programming: The formal education program (primarily K-12) has grown over the past three years and has even added a pre-K component because of increased interest. Formal education programs are organized around two thematic areas: The Alaska Ocean Science component now has 14 classroom programs (with some outside activities), while the Alaska Estuary Science component has seven outdoor programs. These education programs are offered to classes in April and May and in September and October. The biggest audiences are 3rd and 4th graders. The total numbers of programs offered and students participating have decreased somewhat each year during this evaluation period because the programs have become longer and allow more contact hours per student. The national *Leave No Child Inside* initiative has strongly influenced the development of the outdoor programs, and every grade level program has an outdoor component. Formal programs are extremely popular, but at this point Reserve staff and resource capacity has been met. Reaching out and marketing programs to high schools is part of the K-12 formal education programming that has been limited because of staffing shortages during this evaluation period. The addition of a new education coordinator, who was hired on the last day of the evaluation site visit, will add staff capacity to the education programs.

The Reserve has also created post-Discovery Lab programs. (See discussion of Discovery Labs under the Informal Education Programming below.) The post-Discovery Lab programs are personalized Discovery Labs for pre-school through 12th grade students. The public Discovery Labs are left set up for two or three days afterward, and each school group that formally schedules a session with the Reserve for a post-Discovery Lab is given a short lesson on that Lab's particular topic, followed by time to explore the Discovery Lab. The Reserve tries to have at least four staff (which includes GRFs) and volunteers on hand to help students at the eight lab stations. These programs last from 45 minutes for pre-school and kindergarten classes to 90 minutes for high school students.

ACCOMPLISHMENT: The Reserve has expanded its formal education

programming to the limits of staff and resource capacity in spite of staff shortages and logistical issues. In part it has been able to do this by creating a new K-12 program (post-Discovery Labs) based upon an existing informal program (Discovery Labs). Education programs integrate the research being conducted at the Reserve.

Students and school classes within the general area of Homer are able to come to the Visitor Center for the Reserve's educational programs. Reaching students beyond Homer is more difficult because of costs and time involved with transportation. As noted earlier, the only practical way to reach the Reserve's Visitor Center from the south side of Kachemak Bay is by boat, which is generally impractical and cost-prohibitive for school classes. To reach native Alaskan school classrooms in Seldovia and Port Graham, Reserve staff have crossed the Bay and provided programs at the NCCOS Kasitsna Lab, to which the students are able to travel. Reaching students from Anchorage has been more difficult. Travel from Anchorage to Homer involves an 8-9 hour round-trip drive, which means significant transportation costs and an overnight stay for students. It is now, and will continue to be, a challenge for staff to provide classroom experience to Anchorage students.

The number of K-12 teacher/educator training and workshops offered has also been limited by the number of Reserve education staff and sometimes funding limitations of the target group. The staff did conduct an Anchorage teacher in-service workshop on plankton ecology and art; training for the staff of Kenai Fjords Tours on plankton, seabirds, and marine mammals; two workshops for the volunteers and staff of the Center for Alaskan Coastal Studies on plankton ecology; and provided tide guide training for local residents. These trained tide guides help deliver stewardship messages to large groups visiting Kachemak Bay beaches during low tides in the spring.

Adult education programming has been addressed through several formal mechanisms. Reserve staff members teach college courses at the local college, which benefits the college but also provides a professional development opportunity for Reserve staff. Courses have also been offered to Elderhostel participants, residents of a local senior center, and to a total of 116 newly hired staff of BP.

One K-12 environmental education opportunity in which the Reserve staff expressed interest during the site visit is NOAA's Bay Watershed Education and Training (B-WET) Program. NOAA B-WET is an environmental education program that promotes locally relevant, experiential learning in the K-12 environment. It is locally implemented and administered by the most appropriate NOAA office or program. The primary delivery of B-WET is through competitive funding that promotes meaningful watershed educational experiences. Eligible applicants include K-through-12 public and independent schools and school systems, institutions of higher education, nonprofit organizations, state or local government agencies, and Indian tribal governments. B-WET funds are appropriated each year by Congress and generally are available for up to three successive years for a single project. The funds can be used for a variety of expenses to conduct

programming, including buses, stipends, travel, substitutes, equipment, and professional evaluators. B-WET programs exist in California, Chesapeake Bay, the Gulf of Mexico, Hawaii, New England, and the Pacific Northwest, but not in Alaska.

In order for applicants to be eligible for B-WET funding in Alaska, the Reserve may wish to seek opportunities to gain B-WET grant eligibility for Alaska. Congressional members may be unaware of the state's interest, and the Community Council could be one venue for raising the issue with Alaska's congressional delegation and appropriate others.

Informal Education Programming: Based upon information and comments the evaluation team heard during the site visit, the Reserve's Discovery Labs are highly popular and are the Reserve's 'signature' education activity. These are self-directed open labs designed for people of all ages and include inquiry-based activities at each of the learning stations. From 2006 through 2008, 114 Discovery Lab sessions were attended by approximately 11,150 visitors, both children and adults. Over 90 volunteers assisted the Reserve staff with the Labs. Each Discovery Lab consists of eight learning stations (tables), which are centered on a specific topic. Themes change in each lab, with typically over 20 different topics selected each year. Individual fall and winter labs are provided once, and summer labs are presented three times over a one-week period.

Topics range from sharks and marine invertebrates to estuary edibles and geology, but in 2009, with the eruption activities from the Mt. Redoubt volcano directly affecting the Homer area, the most popular lab offering was entitled "Fire & Ice: Volcanoes & Glaciers." Each topic generally includes one learning station that addresses research being conducted in the Reserve. In an effort to engage all ages into Discovery Lab topics, one learning station involves an art project relevant to the topic. This table is typically staffed by a volunteer and is very popular with the young children who visit the Labs. All of the Reserve staff, including GRFs, and volunteers, many from partner organizations and agencies, man the learning stations at each Discovery Lab. Reserve staff train volunteers every year for these activities.

During this evaluation period, the Reserve provided up to 16 estuary hikes and 20 beach hikes each summer to local residents and visitors to Homer. The beach walks are a cooperative effort among Reserve, Refuge, and National Park staff, who rotate as walk leaders. Community members also volunteer to work with Reserve staff in the monitoring programs for the European green crab, tunicates, and HABs. (After attending classroom training for monitoring European green crab, two local students found a previously undocumented crab species in Halibut Cove on the south shore of Kachemak Bay.)

During this evaluation period, Reserve educators have produced two "Discovery Lab-in-a-Box" scientific kits with input from local science teachers. These are packaged units that can be loaned to teachers who are unable to bring classes to the Reserve. The "clam kit" targets grades 1 through 3, while the "crab kit" targets grades 4 through 6. Several

units of each kit are being created, and the next step is to market them in a more formal fashion.

Outreach Activities: The Reserve has been an active collaborative participant in a number of local community activities, some of which are one-time events and others that are recurring. In all cases informing the public about the resources and character of Kachemak Bay and the importance of stewardship is the Reserve's goal. These outreach activities have included:

- National Estuaries Day – During the 2008 event, the Reserve conducted a Beluga Slough bioblitz.
- Kachemak Bay Shorebird Festival – In collaboration with the Refuge and the National Park, the Reserve hosted a Junior Birders Discovery Lab.
- Earth Day
- Kenai River Festival
- City of Anchorage "Salmon in the City"
- Winter Family Fun Day

The Reserve provides outreach announcements for all of its events via listserves, newspapers, several local radio stations, and posters placed throughout Homer. In addition, the Reserve prepares bi-weekly "Bay Science" articles for the Homer News. These articles are written by staff and visiting researchers about research and topics of scientific interest in Kachemak Bay. With state match for the Visitor Center exhibits obtained, the exhibits, when completed, should be an effective mechanism to provide information about the Reserve and activities. Work on the exhibits has begun.

ACCOMPLISHMENT: The Reserve's informal education programs and outreach activities have been expanded through efforts like the "Discovery Lab-in-a-Box." The community training for monitoring programs has shown significant effectiveness, as evidenced by the discovery of a previously undocumented crab species in Kachemak Bay by two students.

The Reserve also maintains a website, but it is in need of updating. Some of the materials date from five or more years ago. Given the logistical challenges for spreading the word about the Reserve and its activities, this electronic medium is an important way to reach people. With staffing now fairly stable, OCRM urges the Reserve to expend the staff time necessary to update the website.

PROGRAM SUGGESTION: The Reserve's website should be updated, and projects, news and activities that have occurred in the last several years should be added.

2. Coastal Training Program (CTP)

The Reserve's staffing issues during this evaluation period affected the Coastal Training Program. The CTP Coordinator resigned in mid 2007 to take another position elsewhere, and the Reserve did not have a permanent CTP Coordinator from then on. This position was one for which the Reserve waited until the State of Alaska's position classification study and reclassification process was complete. A temporary CTP Coordinator was hired in December 2008. The position was finally reclassified and advertised. At the time of the site visit, applications were being accepted. Since the site visit, the position has been filled.

In the second half of 2006 the CTP provided technical assistance to the City of Homer to coordinate meetings, work sessions, and field trip activities to develop guidelines for coastal bluff erosion on properties bordering the Bay. The CTP also partnered with numerous agencies to provide a one-day workshop on rockfish biology and management for approximately 80 individuals.

The logistical challenges in reaching and leaving Homer and the sparse and dispersed population create difficulties for the CTP to reach a target audience beyond the 25-30 people on the Kenai Peninsula who are among CTP target audiences. Therefore the CTP is reaching out to the statewide Alaska Coastal Management Program. In early 2009 the temporary CTP Coordinator conducted a training needs assessment of the 28 Alaska coastal district coordinators. Three major training needs were identified and presented to the Alaska Coastal Management Program: 1) review of the ACMP roles, impacts, and how to implement recent changes to statutes and regulations; 2) proper and effective commenting on permit requests; and 3) delivery of effective educational outreach and responses to applications. Because of the difficulty in providing training in person throughout Alaska, the Reserve suggested to the ACMP that it develop a variety of self-directed presentations for Coastal District Coordinators. Building on that idea, the ACMP is developing four PowerPoint© presentations.

With a new CTP Coordinator now in place, OCRM anticipates that the Coastal Training Program will move forward. There are opportunities to work with the Alaska Coastal Management Program to collaborate on workshops to address training needs already identified. The CTP may also be able to identify training and research needs of the ADF&G divisions and consider whether the Reserve can address any of these needs.

D. STEWARDSHIP AND RESOURCE MANAGEMENT

Within the NERR system, many reserves conduct or accomplish programs or activities related to land acquisition, enforcement, restoration, restoration science, technical advice and support, and community education under the general rubric of stewardship and resource management. Because the Reserve has so successfully integrated its research and education components, elements of stewardship and resource management are identifiable in almost all of its activities and programs, as can be seen in the discussions above.

All the land and waters within the Reserve boundaries are in public ownership and management, although the Reserve has no direct resource management responsibility for those land and water resources within its boundaries.

The majority of the area included within the Reserve boundary is relatively pristine and has not been significantly impacted by human activity. However, the Reserve's current management plan recognizes that there are a few locations that have been impacted and that could be considered for restoration. Such restoration would be done in partnership with the agency having management responsibility. Some of the Reserve's research and monitoring activities may support potential restoration and resource management activities.

V. CONCLUSION

For the reasons stated herein, I find that the State of Alaska is adhering to the programmatic requirements of the Coastal Zone Management Act and the regulations of the National Estuarine Research Reserve System in the operation of its approved Kachemak Bay National Estuarine Research Reserve.

The Kachemak Bay Reserve has made notable progress in: Administration and Staffing; Kachemak Bay Research Reserve Community Council; Coordination and Partnerships; Research Activities; Monitoring; and Education and Outreach.

These evaluation findings also contain two (2) recommendations. All of the recommendations are in the form of Program Suggestions. There are no Necessary Actions. The Program Suggestions should be addressed before the next regularly-scheduled program evaluation, but they are not mandatory at this time. Program Suggestions that must be repeated in subsequent evaluations may be elevated to Necessary Actions. Summary tables of program accomplishments and recommendations are provided in Section VI.

This is a programmatic evaluation of the Kachemak Bay National Estuarine Research Reserve that may have implications regarding the state's financial assistance awards. However, it does not make any judgment about or replace any financial audits.

Donna Wieting
Acting Director, Office of Ocean and Coastal Resource Management

10/23/09
Date

VI. APPENDICES

Appendix A. Summary of Accomplishments and Recommendations

The evaluation team documented a number of the Reserve Management Authority's and the Reserve's accomplishments during the review period. These include:

Issue Area	Accomplishment
Administration and Staffing	The Reserve has come through a period of staff transition and has attained a more stable staffing base. Several staff positions were reclassified, and a new manager, research coordinator, and education coordinator are now in place. Reserve programs and projects continued throughout unstable periods. The staff members are well respected and recognized by their peers, partners, and community members for their expertise, dedication, and enthusiasm.
Administration and Staffing	The State of Alaska and the ADF&G Division of Sport Fish have provided increased state financial support for the Reserve's activities and core positions.
Kachemak Bay Research Reserve Community Council	During this evaluation period the Reserve Community Council was successful in obtaining state funds to match the federal funding for the Visitor Center exhibits. Council members are willing to tackle substantive issues and activities to support the Reserve.
Coordination and Partnerships	The Reserve has maintained and strengthened its existing collaborations and partnerships. New elements of partnerships have been developed or are being discussed, which have expanded and will continue to expand the reach of the Reserve's programs.
Research Activities	The Reserve's current research and monitoring efforts address a number of state and local needs and have direct application and use by other organizations and communities. Research is well integrated into the educational programs of the Reserve, and the results of many of the research projects can provide reference data that can inform management decisions related to climate change adaptation.
Monitoring	Kachemak Bay NERR was able to maintain SWMP in spite of staff turnover and shortages during this evaluation period. The data from SWMP is used by the local aquaculture industry and mariners.

Education and Outreach	The Reserve has expanded its formal education programming to the limits of staff and resource capacity in spite of staff shortages and logistical issues. In part it has been able to do this by creating a new K-12 program (post-Discovery Labs) based upon an existing informal program (Discovery Labs). Education programs integrate the research being conducted at the Reserve.
Education and Outreach	The Reserve's informal education programs and outreach activities have been expanded through efforts like the "Discovery Lab-in-a-Box." The community training for monitoring programs has shown significant effectiveness, as evidenced by the discovery of a previously undocumented crab species in Kachemak Bay by two students.

In addition to the accomplishments listed above, the evaluation team identified several areas where the program could be strengthened. Recommendations are in the forms of Program Suggestions and Necessary Actions, although there are no Necessary Actions from this evaluation. Areas for improvement include:

Issue Area	**Recommendation**
Administration and Staffing	PROGRAM SUGGESTION: The Reserve and the Sport Fish Division have worked hard to secure cash match for Reserve programs. In the face of continuing funding challenges, the Reserve should develop a written strategy for future funding that can be endorsed by the Division of Sport Fish and OCRM.
Education and Outreach	PROGRAM SUGGESTION: The Reserve's website should be updated, and projects, news and activities that have occurred in the last several years should be added.

Appendix B. Response to Previous (2006) Evaluation Findings

Necessary Action: By the end of the exhibit construction award period, the Reserve must identify non-federal match funds for the exhibits planned at the Visitor Center or return the funds unexpended to NOAA.

Response: The Reserve was able to secure the non-federal match for the NOAA facilities monies in the amount of $133,000 from the State of Alaska in 2007. The Reserve Community Council was instrumental in working with our legislative representatives to secure this state money. KBNERR educator Catie Bursch is leading the efforts to complete the exhibit project. Currently, the Reserve is continuing to work on finishing designs, issuing request for quotes on video products, and working with the U.S. Fish and Wildlife Service to secure an exhibit design and fabrication contractor. Fabrication and installation of the exhibits are scheduled to be completed by summer of 2010.

Program Suggestion: The Reserve and Division are encouraged to continue their efforts to gain more state financial support for core positions, particularly the education and research coordinators.

Response: Over the review period the State of Alaska has strengthened their financial support for core positions, as well as salary support for various KBNERR employees. Currently, multiple KBNERR staff receive state supported salary:

- Manager: 5.25 months of state salary support using general fund monies from the Division of Sport Fish (previously this position was 100% federally funded)
- Research Coordinator: KBNERR receives approximately $150,000 per year from State Wildlife Grant funding to conduct research projects. The RC receives partial funding from these monies to provide programmatic oversight and supervision.
- Education Coordinator: KBNERR receives approximately $127,000 per year from State Wildlife Grant funding to conduct education projects. The EC receives partial funding from these monies to provide programmatic oversight and supervision. The EC also receives approximately 4 months of state funding from the Division to assist with statewide aquatic education oversight and projects.
- Office Manager: 100% state supported salary
- Accounting Clerk: 100% state supported salary

Program Suggestion: The Reserve should explore stronger state support for the Visitor Center maintenance costs.

Response: The Division is keenly aware of the desire to diversify the financial support for Visitor Center operations and maintenance. Due to declining state budgets and

demands on existing monies the State has not been able to provide additional funding. The Community Council has discussed this issue as one they may wish to advocate for with our local elected representatives in coming legislative sessions.

Program Suggestion: The Reserve should explore whether additional opportunities exist for partnership and collaboration with the Alaska Coastal Management Program.

Response: Over the past three years the Reserve has strengthened our ties to the Alaska Coastal Management Program (ACMP) in a couple of key areas: CELCP and training. Over the last two years the KBNERR manager has been actively involved in reviewing and providing comments for CELCP proposals submitted to the ACMP. KBNERR has also been actively involved in participating and presenting at the annual Alaska Coastal Program Manager meeting held in Juneau. Past presentations include: Use of historical aerial images to document coastal erosion, Coastal Training Program (CTP) presentation, and outreaching a recently completed needs assessment of the 28 coastal program coordinators.

Program Suggestion: The Reserve should install permanent signage at the visitor Center identifying the Reserve and NOAA and should consider other strategies to increase the visibility of the Reserve at the Center.

Response: The Reserve, in cooperation with the Alaska Maritime National Wildlife Refuge has worked to install new signage throughout the Alaska Islands and Ocean Visitor Center which clearly identify the facility partners. During high visitor use periods during the summer months KBNERR education interns are providing visitor services at the front reception desk.

Program Suggestion: The Reserve should explore strategies for obtaining a position or person to coordinate activities involving volunteers.

Response: KBNERR was not able to dedicate or support a position to coordinate volunteer activities. While not diminishing the need, KBNERR has not identified a dedicated volunteer coordinator as a high priority. Currently, each KBNERR staff who have volunteer needs or opportunities manages their own volunteers by recruiting, training, and tracking and documenting volunteer hours.

Program Suggestion: The Reserve should explore the creation or development of a non-profit support organization.

Response: Due to community resistance KBNERR has not pursued the establishment of a non-profit support organization. The resistance within the local community is based on fear of competition for already scarce financial resources and the demands that yet another local non-profit would place on the community. The Department of Fish and

Game has established the Alaska Fish and Wildlife Heritage Foundation that may be of use to KBNERR in future years.

Program Suggestion: The Reserve should explore the Cooperative Ecosystem Studies Unit Program as another option for research coordination and partnership opportunities, particularly with the National Park Service and U.S. Fish and Wildlife Service in the Kachemak Bay and Kenai Peninsula areas.

Response: KBNERR has investigated, and when appropriate, looked for opportunities to work within the CESU Pacific Northwest regional system. A number of years ago KBNERR partnered with the National Park Service and the Pacific Northwest CESU on a collaborative project. Since this program suggestion KBNERR has actively looked to use this program, but to date has not found the appropriate project to make this partnership work.

Appendix C. Persons and Institutions Contacted

Alaska Department of Fish and Game
Lisa Evans, Assistant Director, Sport Fish Division
Nicky Szarzi, Sport Fish Division
Ted Otis, Commercial Fisheries Division

Kachemak Bay National Estuarine Research Reserve
Terry Thompson, Manager
Angela Doroff, Research Coordinator
Ori Badajos, Fisheries Biologist
Joel Markis, Fisheries Biologist
Steve Baird, Research Analyst/GIS
Coowe Walker, Watershed Specialist
Carmen Field, Marine Educator
Ingrid Harrald, Marine Educator
Catie Bursch, Marine Educator/Illustrator
Kim Donohue, Administrative Support
Megan Murphy, Graduate Research Fellow
Jim Palardy, Graduate Research Fellow
Tammy Hoem, Graduate Research Fellow

Kachemak Bay Research Reserve Community Council
Bob Hartley, Community Member
Ralph Broshes, Community Member
Will Files, Community Member
Brenda Konar, Agency Member, University of Alaska
Ted Otis, Agency Member, ADF&G
Roger MacCampbell, Agency Member, ADNR, Division of Parks and Recreation

Federal and State Agency and Local Government Representatives
Ray RaLonde, Alaska Sea Grant Marine Advisory Program
Amy Holman, NOAA Alaska Regional Collaboration Team
Kris Holdereid, NOAA National Centers for Coastal Ocean Science
Glenn Seaman, NOAA National Centers for Coastal Ocean Science
Elizabeth Wasserman, Lake Clark National Park and Preserve
Mary McBurney, Lake Clark National Park and Preserve
Glenn Chen, Department of Interior Bureau of Indian Affairs
Lisa Matlock, Maritime National Wildlife Refuge
Steve Brockman, Acting Assistant Manager, Maritime National Wildlife Refuge
Will Meeks, Acting Manager, Maritime National Wildlife Refuge
Marianne Aplin, Visitor Center Manager, Maritime National Wildlife Refuge
Roger MacCampbell, Alaska Department of Natural Resources, Division of State Parks and
Recreation
Gina Shirey-Potts, Alaska Department of Natural Resources, Coastal Management

Program

Other Organizations and Representatives
Michael Opheim, Environmental Specialist, Seldovia Village Tribe
Beth Trowbridge, Center for Alaskan Coastal Studies
Ryjil Christianson, Pratt Museum
Brenda Konar, University of Alaska-Fairbanks
Steve Okkonen, University of Alaska-Fairbanks
Ray RaLonde, Cook Inletkeeper
Marie McCarty, Kachemak Heritage Land Trust

Appendix D. Persons Attending the Public Meeting

The public meeting was held on Tuesday, April 28, 2009, at 6:00 p.m. at the Kachemak Bay Reserve, Alaska Islands and Ocean Visitor Center, 95 Sterling Highway, Homer, Alaska. No members of the public attended the meeting.

Appendix E. NOAA's Response to Written Comments

NOAA received no written comments regarding the management or administration of the Kachemak Bay National Estuarine Research Reserve

STATE OF ALASKA

SEAN PARNELL, GOVERNOR

DEPARTMENT OF FISH AND GAME

DIVISION OF SPORTFISH

P.O. Box 115526
Juneau, Alaska 99811-5526
PHONE: (907) 465-4180
FAX: (907) 465-2772

October 5, 2009

Ms. Kate Barba, Chief
National Policy and Evaluation Division
Office of Ocean and Coastal Resource Management
NOAA National Ocean Service
U.S. Department of Commerce
Silver Spring, MD 20910

Dear Ms. Barba:

On behalf of Commissioner Denby Lloyd, I write in response to the draft evaluation findings provided to the Alaska Department of Fish and Game (ADF&G) by your office prior to finalization of the Kachemak Bay National Estuarine Research Reserve (Reserve) performance review.

ADF&G is pleased with NOAA's assessment that it is adhering to the programmatic requirements of the Coastal Zone Management Act and the regulations of the National Estuarine Research Reserve System in the operation of the Reserve despite significant transition during the review period.

ADF&G appreciates the evaluation team's recognition of specific accomplishments since the last KBNERR review in 2006, including the attainment of a stable and qualified staff base, increased state financial support for core positions and services, well-maintained and improved collaborations and partnerships, integrated programming and solid establishment of the system-wide monitoring program. I firmly believe that the Reserve's successful progress towards its mission despite a significant amount of transition during the review period is a direct result of the dedicated staff and their leaders who comprise the management team. Their progress and accomplishments support a prominent role for the Reserve in local, state and national arenas.

ADF&G comments on the specific evaluation areas are below. These include three program suggestions and 19 technical clarifications/corrections.

Program Suggestion: The Reserve and Sport Fish Division have worked hard to secure cash match for Reserve programs. In the face of continuing funding challenges, the Reserve should develop a written strategy for future funding that can be endorsed by the Division of Sport Fish and OCRM.

ADF&G appreciates acknowledgment of their work to secure stable, cash match for Reserve programs. Since the last review, the Division of Sport Fish has worked hard to bring an increased amount of State General Funds and sport fish license revenue funds to the Reserve which is used to pay a significant portion of salaries for staff and programming.

Within a year, the Reserve will be drafting the next five-year management plan which will include a funding strategy that identifies and addresses issues such as non-federal match, strategic grant writing opportunities, community partnerships and continued state support. ADF&G believes the incorporation of this funding strategy within the Reserve management plan will improve funding stability and fiscal certainty over the next five-years.

Program Suggestion: The Reserve should explore other opportunities to reach groups of school-age children from Anchorage. Boy/Girl Scout troops, Boys/Girls Clubs of America, 4-H groups, or groups sponsored by a PTA/PTO or a religious organization for example, might be able to bring groups to the Reserve even when schools cannot.

ADF&G acknowledges the suggestion to bring more school-aged children to the Reserve which would allow its educational programming to reach a larger audience. However, ADF&G does not intend to implement this suggestion at this time.

As noted in the draft report on page 18, "Reserve staff and resource capacity has been met." Considering current funding levels, ADF&G does not intend to hire additional education staff at the Reserve so increased outreach efforts to reach Anchorage children by bringing them to Homer is not a priority at this time. Furthermore, educational programming within ADF&G Sport Fish Division provides more than adequate coverage for Anchorage-based students.

As also noted in the draft report, the Reserve has recently hired a new Education Coordinator which will bring more capacity to all components of the education program. With this increased capacity, the Reserve has identified additional local audiences that have not yet benefited from existing programming. Over the next few years the Reserve intends to increase the exposure and involvement of local high school students into its programming, as well as outreach to local Native village students across Kachemak Bay in Seldovia, Port Graham, and Nanwalek. ADF&G believes exploring these opportunities are more consistent with the Reserve's mission and its educational programming goals.

Program Suggestion: The Reserve's website should be updated, and projects, news and activities that have occurred in the last several years should be added.

ADF&G agrees with this suggestion. Websites have become an integral part of all successful entities and the Reserve acknowledges that its website is not as comprehensive and up-to-date as could be. The ADF&G website is currently under internal review and will be entirely redesigned over the next year with the comprehensive input from internal and external stakeholders. This redesign will include the Reserve website and staff will be called up to contribute and maintain its content.

Technical Corrections/Clarifications:

Page 4 - 4th paragraph: The Reserve's bunkhouse provides for up to **ten** visitors.

Page 10 – Section 4 - Facilities and Infrastructure - 2nd sentence: The state owns **two** other buildings.

Page 11 - Section 5 - Coordination and Partnerships - The Kachemak Bay Environmental Education Alliance (KBEEA): In reference to collaboration with the Pratt Museum, the Reserve has collaborated on a number of projects during the review period. If the example referenced in the report is the science/art collaborations, then the Pratt Museum hosts at their facility and the Reserve assists with the science messages that are presented along side the themed art pieces. If the reference in the report is a general statement about sharing facilities, then the Reserve does collaborate and share facilities with the Pratt Museum for various education programs, such as Discovery Labs which are conducted at the Alaska Islands and Ocean Visitor Center.

Suggested Edit: The Reserve continues to share facilities and partner on education events with the Pratt Museum.

Page 12 - Section 5 - The Alaska Coastal Management Program: The first two sentences need clarification as written.

Suggested Edit: Because of the difficulty in providing in-person training throughout Alaska, the Reserve suggested to the Alaska Coastal Management Program that they develop a variety of self-directed presentations for Coastal District Coordinators. Building on that idea, the Alaska Coastal Management Program is developing four PowerPoint presentations on the following topics:

- **Intro to the Alaska Coastal Management Program**
- **New Coastal District Coordinator Introduction**
- **Advanced Topics for Alaska Coastal District Coordinators**
- **Coastal Service Resource Area topics**

Page 12 - Section 5 – The Alaska Coastal Management Program - 2nd paragraph: Suggest changing the term global warming to **climate change**.

Page 13 - 2nd bullet: Suggest deleting the final sentence, "Oyster farmers in Kachemak Bay are using the test kits to ensure the health and safety of their product." as that cannot be confirmed as a factual statement.

Page 13 - 3rd bullet: Delete **Ninilchik** and replace with **Nanwalek.**

Page 14 - Section B - Research and Monitoring - 1st paragraph: Delete **Commercial Fisheries** and replace with **Habitat Division.**

Page 15 – 1st paragraph: Suggest replacing "Headwater streams are a high proportion of total stream networks. They are poorly understood and generally susceptible to change because they are in private ownership or an unprotected status" with, **"Headwater streams are a high proportion of total stream networks in our study area (Anchor River, Stariski Creek, Deep Creek, and Ninilchik River). These systems are poorly understood and are generally susceptible to change or alteration because they cross private property or are lands with unprotected status."**

Page 15 – 1st paragraph – 9th line: **Delete two occurrences of "and Atlas".**

Page 15 – 1st paragraph - last sentence: Delete **Alaska Department of Natural Resources** and replace with **Alaska Department of Fish and Game – Habitat Division.**

Page 15 - 2nd paragraph - Harbor Seal Study: Delete **still on-going**. Note: (MMS may still be conducting surveys, but the Reserve is not currently working on this project).

Page 15 - 4th paragraph, Larval Transport of Tanner and Dungeness – **between** Inner and Outer Kachemak Bay

Page 17 - 2nd paragraph: The second weather station will not be a true SWMP station in terms of data submitted to CDMO, but the end of the Spit met station will continue to meet minimum SWMP requirements for weather data. Suggest deleting **SWMP** from the sentence.

Page 19 - Section 1 - Education and Outreach - 2nd paragraph: The restriction on Anchorage travel to Homer may at the time of the 312 review been based on the threat of avalanches, but is not the primary reason for Anchorage schools not traveling to Homer for field trips. The main reason is budgetary due to the high costs associated with bringing students on a 450 mile, multi-day field trip. Suggest deleting the sentence that makes reference to the prohibition of travel to Homer for Anchorage students due to the threat of avalanches.

Page 20 - Informal Education Programming - Discussion of Discovery Labs: There are eight Discovery Lab topics, and each topic is offered three times during a year. **Suggested edit: Each Discovery Lab consists of eight learning stations (tables) which are centered on a specific topic. Themes change in each lab, with typically over 20 different topics selected each year. Individual fall and winter labs are provided once, and summer labs are presented three times over a one-week period.**

Page 20 - 3rd paragraph: Because one of the Reserve staff members is an artist and illustrator, another learning station for each topic involves "scientific illustration." **Suggested edit: In an effort to engage all ages into Discovery Lab topics, one learning station involves an art project relevant to the topic. This table is typically staffed by a volunteer and is very popular with the young kids who visit our labs.**

Page 20 - 4th paragraph: The Reserve conducted 16 estuary hikes and 20 beach hikes during the summers included in this evaluation period. **Suggested Edit: During this evaluation period, the Reserve provided up to 16 estuary hikes and 20 beach hikes each summer to local residents and visitors to Homer.**

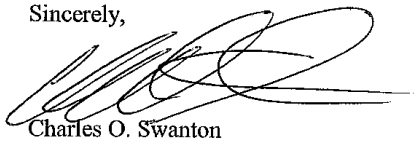
Page 22 - Section 2 - Coastal Training Program - 3rd paragraph – last sentence - **Suggested Edit: Because of the difficulty in providing in-person training throughout Alaska, the Reserve suggested to the Alaska Coastal Management Program that they develop a variety of self-directed presentations for Coastal District Coordinators. Building on that idea, the Alaska Coastal Management Program is developing four PowerPoint presentations on the following topics:**

- **Intro to the Alaska Coastal Management Program**

- **New Coastal District Coordinator Introduction**
- **Advanced Topics for Alaska Coastal District Coordinators**
- **Coastal Service Resource Area topics**

Again, ADF&G thanks you for NOAA's favorable draft evaluation of the Reserve. Thank you for considering the above corrections, responses and suggestions. I look forward to receiving your final report.

Sincerely,



Charles O. Swanton
Director

cc: Lisa Evans, Assistant Director, ADF&G Sport Fish Division
Terry Thompson, Manager, Kachemak Bay NERR
Chris McCay, Evaluation Team Leader, NPED, OCRM, NOAA
Nina Garfield, Estuarine Reserves Division, OCRM, NOAA
William Reay, Manager, Chesapeake Bay-Virginia NERR

Appendix 5. Guidance for Measuring National Estuarine Research Reserve Performance for Section 312 Evaluations.

NOAA's Office of Ocean and Coastal Resource Management (OCRM) and National Estuarine Research Reserves (NERRs) are involved in an effort to establish individual NERR-specific performance metrics to be used in CZMA Section 312 evaluations. There are several reasons for doing this. Reserves are frequently called out as nationally significant and locally relevant. Section 312 evaluations are meant to review progress of reserve-specific program implementation and to better understand and evaluate its unique context, local relevance, and performance as a partner in the national system. Specific targets and measures provide an additional source of data to help inform the overall evaluation of a reserve for a specific timeframe. These targets and measures also provide a quantitative reference for each reserve about how well it is meeting the goals and objectives it has identified as important to the program. The metrics can facilitate programmatic discussion about the appropriateness of goals and objectives and can be useful in demonstrating program progress to partners, state agencies, a Governor's office, and the public.

1. Identification of Goals and Objectives

Each reserve will identify goals and objectives that are appropriate for developing performance measures and numerical targets for Section 312 evaluation periods. The source of the goals and objectives can be either 1) a reserve's management plan or 2) the NERRS national performance measurement system. OCRM is requesting that each reserve identify three (3) objectives from which to derive performance measures. It is acceptable to use one goal with three objectives, two separate goals with a combination of three objectives, or three separate goals with one objective for each, so long as three measures, each with an associated target, can be established. The goals and objectives should reflect important priorities to a reserve or help to highlight its unique identity, because the corresponding measures will be used during Section 312 evaluations to illustrate individual Reserves' progress.

2. Establishment of Measures and Numerical Targets

Each reserve will establish three performance measures, each with an associated target, that relate to the identified goals and objectives. A quantitative target covers a period of five years. That time period generally corresponds to the time period of an evaluation.

3. Approval of Measures and Targets

Each reserve will work with its ERD specialist to select goals and objectives and establish the associated measures and targets. This process will occur from July 2011 through February 2012. An evaluator from the National Policy and Evaluation Division will collaborate with each specialist and reserve and provide input as needed throughout the process. During this first round of establishing measures and targets, all evaluators will meet and consult with one another frequently to ensure that the input we provide is consistent. We anticipate that this collaborative process will result in mutual acceptance and approval of the measures and targets. If there is any

disagreement, the NPED Chief will become involved. The selected goals, objectives, measures, and targets are included in the annual cooperative agreement application, indicating OCRM agreement and approval.

4. Tracking and Reporting Progress

ERD's funding guidance for FY 12 will include a requirement for data collection and reporting on progress toward meeting identified targets. Performance measurement data collection will begin July – October 2012, depending upon the start date of a program's cooperative agreement award. Reporting on progress will be done annually in a reserve's second semi-annual performance report for that cooperative agreement award. Reserve staff will be responsible for reporting on progress in their cooperative agreement performance reports. ERD specialists will be responsible for tracking progress.

NPED evaluators will not be involved in tracking or reviewing progress except at the time of a reserve's evaluation.

5. Use during a Section 312 Evaluation

Targets, and progress toward them, will be one element for review during the Section 312 evaluation. The qualitative and quantitative information OCRM has traditionally gained during pre-site visit review of materials and through meetings, discussions, and phone calls during and after the site visit is extremely valuable and will continue to be used to inform the findings. Establishing performance measures and targets is an effort to include an additional quantitative data point in evaluations, an additional reference to inform program review and discussion, and to provide greater accountability.

All reserves will begin collecting performance measurement data at approximately the same time. However, all reserves will not be scheduled for an evaluation five years from that time. For many reserves, an evaluation will occur at a time that does not correspond with the end of the five-year data collection. Whenever a reserve's evaluation is scheduled, the evaluation team will consider the status of the measures and targets at that time.

If a reserve does not meet a particular target, that does not mean a reserve will be found 'not in compliance' or require that sanctions be imposed. If a target is not met, reasons and context will be discussed during an evaluation, considering whether unforeseen or unavoidable circumstances occurred, whether the target was unrealistic, or whether it should be revised or replaced with one that is better aligned with the reserve goal and objective (see Changes to Metrics, below). The evaluation findings will reflect that, and a recommendation could be included as a result of the situation.

One reserve's progress will not be compared with any other reserve. A reserve's targets and its progress toward meeting those targets are unique to the reserve, making it irrelevant for comparative purposes.

6. Changes to Metrics

The National Policy and Evaluation Division hopes that data can be collected for the full five years, even if at the end of five years it is apparent that the measure wasn't entirely appropriate or that the target was unrealistic. There may, however, be circumstances in which a reserve (in consultation with ERD) proposes to modify a performance measure or target prior to the five year time horizon. For example, if the specific national system goals and objectives on which the measures and targets are based were deleted or significantly changed; if the management plan goals and objectives on which the measures and targets are based were deleted or significantly changed; or if it was no longer possible to collect any data at all, then NPED, ERD, and the reserve would work to identify a new measure and target. During an evaluation we would still look at the original measure and target and also at the status of the new measure and target. No one should propose to change the target during the five year period just because it looks like it cannot be met. As described above, if a target isn't met, then the evaluation would review reasons, context, unforeseen or unavoidable circumstances, whether it was unrealistic, etc.

Appendix 6. MOU KBNERR and USFWS

MEMORANDUM OF AGREEMENT
among

US FISH AND WILDLIFE SERVICE, REGION 7
U.S. DEPARTMENT OF INTERIOR
ANCHORAGE, ALASKA 99503-6199

and

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
OFFICE OF COASTAL OCEAN AND RESOURCE MANAGEMENT
U.S. DEPARTMENT OF COMMERCE
SILVER SPRING, MARYLAND 20910

and

STATE OF ALASKA
ALASKA DEPARTMENT OF FISH AND GAME
KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE
HOMER, ALASKA 99603

regarding
ANNUAL OPERATION AND MAINTENANCE OF THE COMBINED
OFFICE/VISITOR CENTER IN HOMER, ALASKA

FWS Agreement Number: 70181-3-K343
DCN: 70181-3-K343
NOS Agreement Number: MOA-2004-021/1112

I. AUTHORITY

This agreement between the US Department of Interior, Fish and Wildlife Service (hereinafter referred to as the Service), the National Oceanic and Atmospheric Administration's Office of Ocean and Coastal Resource Management (OCRM), and Alaska's Department of Fish and Game (ADF&G) is entered into under the authority of the Fish and Wildlife Coordination Act, 16 USC 661-667. Additionally, ADF&G enters into this agreement under authority of AS 36.30.850.

II. BACKGROUND

The US Fish and Wildlife Service, Alaska Maritime National Wildlife Refuge (AMNWR) manages 3.55 million acres of remote islands and headlands throughout 33,000 miles of coastal Alaska. The AMNWR Comprehensive Conservation Plan and Environmental Impact Statement (1988) listed Homer as the site for a permanent headquarters and visitor's center because its road-accessible location would bring the story of this remote refuge to the public. As the largest seabird refuge in North America, and one of the largest refuges in the nation, it is the responsibility of the refuge to contribute to public understanding and appreciation of seabirds and their role in the ecosystem.

A. The Kachemak Bay National Estuarine Research Reserve (KBRR) is administered by the National Oceanic and Atmospheric Administration (NOAA) through ADF&G under the Coastal Zone Management Act Section 315, 16 USC 1461. ADF&G and NOAA's OCRM will be referred to jointly herein as "the KBRR partners."

B. The Coastal Zone Management Act establishes National Estuarine Research Reserves to provide opportunities for long-term research, education and interpretation. The KBRR, based out of Homer, Alaska, is the largest of the 26 reserves in the National Estuarine Research Reserve System, encompassing 365,000 acres of publicly owned lands and waters (approximately 228,000 acres in Kachemak Bay and Fox River Flats Critical Habitat Areas and 137,000 acres in Kachemak Bay State Park). It is also one of the most productive, diverse and intensively used estuaries in the State of Alaska. The local community pursued the designation of Kachemak Bay as a National Estuarine Research Reserve to preserve the lifestyle and economy of the region.

C. Both the KBRR and AMNWR are federally funded programs with similar goals for conserving, studying, and educating the public about estuarine and marine resources. The benefits of developing a partnership between these agencies for a combined facility in Homer include: sharing costs; obtaining funding from multiple sources; collaborative development and implementation of research and education programs; and offering improved and consolidated services and facilities to the public.

D. The KBRR will be largely funded through NOAA under Section 315 of the Coastal Zone Management Act. AMNWR will be funded through the Department of Interior or other sources as appropriated by Congress. Both agencies will meet the administrative requirements associated with those funding sources.

E. AMNWR and the KBRR partners will share a 36,825 square foot joint facility in Homer with space for administration and support offices, research laboratories and public interpretation and education displays and forums. The KBRR staff will occupy the KBRR partner's portion of the facility. This agreement formalizes this partnership during the occupation of the facility by the KBRR and AMNWR.

III. PURPOSE AND OBJECTIVES

The purpose of this Agreement is to establish a working partnership between KBRR partners and the US Fish and Wildlife Service AMNWR by providing a framework for occupation, operation, and maintenance of the combined office/visitor center in Homer, Alaska.

IV. RESPONSIBILITIES OF THE PARTIES

A. The Service shall:

1. Provide all utilities and support for the operation of the facility including telephone system and associated maintenance, electricity, fuel oil, gas, water and waste, and security system.

2. Provide all services including janitorial, window cleaning, carpet cleaning, waste removal, grounds keeping and snow removal.

3. Provide all service contractors for maintenance and repair of mechanical, electrical, plumbing, cabinetry, and other facility components resulting from the general construction of the project.

4. Provide maintenance staff for the general maintenance of the overall facility.

B. The KBRR partners agree:

1. ADF&G shall:

   a. Ensure compliance with all requirements of the NOAA facility award regarding the use and operation of KBRR dedicated and shared spaces of the facility.

   b. Maintain KBRR property including but not limited to audiovisual (AV) equipment, personal computers, scientific equipment, and KBRR exhibits. The KBRR, through ADF&G, assumes responsibility for payment of all monthly obligations incurred for telephone use (e.g., monthly charges for long distance and local service), Internet charges by providers, and/or other communications used in the performance of daily operations and special events (satellite downlinks, broad band telecasts, video conferencing, conference calling, etc.).

c. Provide funding for the operation and maintenance of the KBRR portion of the facility.

d. Provide funding for repair of any damage to the facility as a result of negligence on the part of the KBRR employees, volunteers, or sponsored agents actions. This does not include normal deterioration or expected maintenance due to longevity of the facility.

2. NOAA shall:

a. Support ADF&G through the reserve system by providing funding for reserve operations and programs. Such funding is congressionally appropriated and subject to change.

b. Coordinate closely with ADF&G regarding any temporary occupation of facility space by NOAA OCRM staff.

3. The Parties agree:

1. Security for events and functions shall be the responsibility of the sponsoring entity.

2. Third party events will be administered according to the Alaska Islands and Ocean Visitor Center Space Use and Rental Policy (Attachment 1).

3. Deferred maintenance needs (e.g., roof, flooring or cabinet replacement, broken water main, etc.) are the responsibility of the partners per the percentage of occupancy as identified in the attached assigned space spreadsheets.

V. PERIOD OF PERFORMANCE

The overall period of performance of this agreement is five years. At the end of the second year, (January 2006) the Service and the KBRR partners will re-evaluate operation and maintenance costs and will make a determination of whether the cost per square feet of occupied space will be adjusted based on the actual operation and maintenance costs of the facility. This review may include a study of the use and expenses associated with the individual and shared spaces. After five years, a similar assessment will occur and the parties will agree to any necessary modifications prior to extending the agreement.

VI. AWARD AMOUNT

The Service and ADF&G will support the operation and maintenance of the facility, which is estimated to be $294,600.00 ($8.00 per square foot) annually for the period of performance identified above. The Service will contribute an estimated amount of $184,128.00 annually for the operation and maintenance based on occupying 23,016 square feet of the facility (62.5%). The ADF&G will contribute $110,472 annually for the operation and maintenance based on occupying 13,809 square feet (37.5%) of the facility. ADF&G will make payment for its share within 30 days of proper billing. They will pay interest of 1.5% per month for bills paid later than 30 days from receipt of bill.

VII. PAYMENT PROVISION

A. The ADF&G shall reimburse the Service twice a year due October 1st and April 1st in the amount of $55, 236. The initial bi-annual payment for occupancy by KBRR after October 1, 2003 will be pro-rated to reflect actual dates of occupancy.

B. The Service shall be responsible for administering payments for the facility and grounds excluding those identified as the responsibility of the KBRR partners in Section IV 2. The Service will provide approximately $184,128.00 annually towards the total estimated annual operations and maintenance costs of $294,600.00 ($8.00 per square foot).

VIII. ADMINISTRATIVE OFFICERS

A. US Fish and Wildlife Service
Sheri' A. Della Silva, Contracting Officer
1011 East Tudor Road (MS-171)
Anchorage, Alaska 99503-6199
(907) 786-3436 FAX(907) 786-3923
Sheri_Dellasilva@fws.gov

B. Alaska Department of Fish and Game
Division of Administration
Tom Taylor
P.O. Box 25526
Juneau, Alaska 99802-5526
(907) 465-6177 FAX(907) 465-6082

IX. PROJECT OFFICERS

A. U.S. Fish and Wildlife Service

Alaska Maritime National Wildlife Refuge
Gregory Siekaniec
95 Sterling Highway, Suite 1
Homer, Alaska 99603
(907) 235-6546 FAX(907) 235-7783
gregory_siekaniec@fws.gov

B. Kachemak Bay National Estuarine Research Reserve
Alaska Department of Fish & Game
Terry Thompson
95 Sterling Highway, Suite 2
Homer, Alaska 99603
(907) 235-6377 FAX(907) 235-4794
terry_thompson@fishgame.ak.us

C. NOAA's Office of Ocean and Coastal Resource Management
Estuarine Reserves Division
Erica Seiden
1305 East-West Highway N/ORM5
Silver Spring, MD 20910
(301) 563-1172 FAX(301) 713-4363
erica.seiden@noaa.gov

X. TERMS AND CONDITIONS

A. All terms and conditions defined in the attached Operations Plan (Attachment 1) and the Space Use and Rental Policy (Attachment 2) are incorporated into this Memorandum of Agreement. The attached plans demonstrate the full extent, spirit, and intent of operating as an effective partnership.

B. The KBRR may share their administered space with other partner government and non-government organizations consistent with the mission of the Reserve. The Reserve may enter into an agreement with reserve partners for use of the facility only if agreed to by both KBRR partners. The Reserve is responsible for partner use, and will not be relieved from any obligation under this Memorandum of Agreement.

C. All parties may upon reasonable prior notice enter each other's designated space and all other areas of the facility. Maintenance staff and contractors will have access to all areas of the facility at all times.

D. The Service and ADF&G will work collaboratively to agree on needed improvements and alterations to the shared portions of the joint facility. The Service will have final authority on all improvements and alterations to designated Service space**.** The KBRR partners will have final authority on all

improvements and alterations to designated KBRR space. All changes and/or alterations must meet state building codes.

E. If KBRR no longer needs to occupy any portion of 13,809 square feet Reserve space in the facility to support their mission, a modification to this agreement will adjust the two annual payments due to the Service based on the reduced square feet occupied by KBRR. The Service and NOAA will decide how the vacated space will be used.

F. Neither party shall have the right to make alterations to the facility, attach fixtures and erect structures or signs in or upon the facility or grounds without the facility partners (KBRR partners and Service) agreeing to the need and funding to support such changes.

XI. MODIFICATION

Amendments or renewals may be proposed at any time during the period of performance by either party and shall become effective only when put in writing and signed by all parties. The Regional Director and the Service Administrative Officer (Contracting Officer) are the only persons authorized to sign modifications on behalf of the Service. The Sport Fish Division Director and the Division of Administration Director are the only persons authorized to sign for ADF&G. The OCRM Director is the only person authorized to sign for NOAA. The operations plan referenced in this Memorandum of Agreement is subject to revision by the KBRR and AMNWR. The operations plan may be updated by mutual agreement between the Managers outside of this Memorandum of Agreement.

XII. SPECIAL PROVISIONS

A. Title to the facility shall be vested with the Service.

B. The KBRR partners shall have use of the KBRR portion of the facility throughout the life of the facility or until such time as both parties agree that the KBRR no longer has a use for the assigned spaces. The KBRR portion is defined in Attachment 3.

C. No member of, or delegate to, Congress or resident commissioner shall be admitted to any share or part of this agreement or to any benefit that may rise therefrom. This provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

D. Nothing in this agreement shall obligate any party in the expenditure of funds, or for future payments of money, in excess of appropriations authorized by law.

E. The parties accept responsibility for any property damage, injury or death, caused by the acts or omissions of their respective employees acting within the scope of their employment, to the fullest extent permitted by law.

F. Both parties agree to comply with all applicable federal or state laws regulating ethical conduct of public officers and employees.

G. Each party will comply with all applicable laws, regulations, and executive orders relative to Equal Employment Opportunity.

H. Nothing herein is intended to conflict with federal, state or local laws or regulations. It there are conflicts, this agreement will be amended at the first opportunity to bring it into conformance with conflicting laws or regulations.

XII. TERMINATION

Any party to this agreement may terminate their participation in this agreement by giving written notice to the other parties; such notice must be given a minimum of sixty days in advance, and such termination shall be effective on the sixtieth day after a signed modification by all parties. After giving such written notice, the party shall bring its activities to a prompt and orderly close and vacate the facility within the sixty (60) calendar days of termination notice.

IN WITNESS WHEREOF, the parties hereto have caused this Memorandum of Agreement to be executed as of the date of last signature below.

U.S. Fish and Wildlife Service	**Alaska Department of Fish and Game**
_____	_____
(Signature)	(Signature)
_____	_____
Regional Director (Printed Name)	Sport Fish Div. Director (Printed Name)
_____	_____
(Date)	(Date)
_____	_____
(Signature)	(Signature)

_____ _____

Contracting Office (Warrant #) Div. of Administration (Printed Name)

_____ _____

(Date) (Date)

National Oceanic and Atmospheric Administration

_____

(Signature)

_____

Director, Office of Ocean and Coastal Resource Management (Printed Name)

_____

(Date)

Appendix 7. MOU ADF&G and the City of Homer

MEMORANDUM OF UNDERSTANDING
between the

ALASKA DEPARTMENT OF FISH AND GAME,
Habitat Restoration Division, and the

CITY OF HOMER,
Division of Land and Division of Parks and Outdoor Recreation

concerning portions of the
KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE

This Memorandum of Understanding (MOU) is designed to assist the governmental agencies in cooperatively managing the areas within the boundaries of the Kachemak Bay National Estuarine Research Reserve (KBNERR). The agreement pertains to the responsibilities of: 1) the Alaska Department of Fish and Game (ADF&G), Habitat Restoration Division, whose address is 1255 West 8th Street, P.O. Box 25526, Juneau, Alaska 99802-5526, and 2) the City of Homer ("City"), whose address is 491 East Pioneer Avenue, Homer, Alaska 99603. In no way does this MOU alter existing authorities and responsibilities either between or within the agencies.

WHEREAS, the State of Alaska has determined that the designation of the KBNERR under the National Estuarine Research Reserve System (NERRS) would provide for beneficial long-term research and improve public understanding of our coastal resources; and

WHEREAS, the National Oceanic and Atmospheric Administration (NOAA), Office of Ocean and Coastal Resource Management, is in the process of designating the KBNERR, which includes areas along the Homer Spit and portions of Beluga Slough; and

WHEREAS, ADF&G is designated by the State of Alaska and in the KBNERR Management Plan, to which this MOU is attached, as the agency responsible for managing the Reserve; and

WHEREAS, the City of Homer has passed resolutions (e.g., Res. 98-14, 96-106) supporting the establishment of KBNERR; and

WHEREAS, the City of Homer has title to lands which form important components of the Reserve, including several acres of tidelands and salt marshes alongside the Homer Spit, and marshland and park parcels in the Beluga Slough area (see attached maps); and

WHEREAS, including these areas in the Reserve may better facilitate estuarine research and education programs in the Homer area.

NOW THEREFORE, it is agreed by and between the City of Homer and ADF&G as follows:

1. The purpose of the KBNERR is to provide a natural field laboratory and living classroom which, in addition to current uses, will be used to gather data and educate people of the state and nation on the natural and human processes occurring within coastal watersheds and estuaries. As stated in the NERRS goals, the Reserve will serve to increase public awareness and understanding of the complex nature of estuarine systems, their values and benefits to humans and the natural world, and the problems that confront them.
2. A Management Plan for the KBNERR was finalized by ADF&G after a public review with critical input from the City of Homer. The Management Plan provides a framework for conducting research and educational programs in the Reserve. Activities within the City lands will be conducted in a manner which is consistent with the management plans for the City lands and the KBNERR. Under terms of this agreement, the City of Homer will continue to manage and administer its lands and programs in these areas. This MOU shall not limit the City authority to carry out such activities so long as they do not adversely affect implementation of the KBNERR Management Plan.
3. The City shall be fully and regularly consulted by ADF&G regarding research and education needs, opportunities, and information pertaining to Reserve areas.
4. The Signatories will coordinate and cooperate to ensure that research and educational activities do not adversely affect the lands, waters, fish, wildlife, natural, and scenic values in these areas, or each other's management plans.
5. Nothing in this agreement shall obligate any party in the expenditure of funds, or for future payments of money, in excess of appropriations authorized by law.
6. Each party agrees that it will be responsible for its own acts and omissions including those of its officers, agents, and employees, and each party shall indemnify, defend, and hold harmless the other, to the maximum extent allowed by law, from any claim of, or liability for error, omission, or negligent act of whatever kind, including attorney fees, for damages to property or injury to persons occasioned by each party's own acts or omissions in connection with the terms of this agreement.
7. Nothing herein is intended to conflict with federal, state, or local laws or regulations. If there are conflicts, this agreement will be amended at the first opportunity to bring it into conformance with conflicting laws or regulations.
8. A free exchange of management, research, and assessment data among agencies is encouraged and is necessary to insure the success of these cooperative efforts.

This MOU will become effective upon the date of the designation of the Reserve. The termination date of this agreement shall be indefinite; however, either party may terminate its participation by providing written notice to the other party ninety days before termination. This agreement may be amended by mutual written consent of the parties.

IN WITNESS THEREOF, the parties hereto have caused this MOU to be executed.

_____ _____

Frank Rue Date
Commissioner
Alaska Department of Fish and Game

_____ _____

Janet Kowalski Date
Director, Habitat Restoration Division
Alaska Department of Fish and Game

_____ _____

Kevin Brooks Date
Director, Administration Division
Alaska Department of Fish and Game

_____ _____

Val Koebenein Date
City Manager
City of Homer

Appendix 8. Habitat Descriptions

HABITATS

This Appendix on habitats within Kachemak Bay NERR and its watersheds was taken in its entirety from the Kachemak Bay Ecological Characterization (KBNERR 2001), and is described in the following broad communities:

- Wetland;
- Subtidal;
- Intertidal;
- Forested; and,
- Non-forested.

Much of the knowledge on the forested and non-forested plant communities comes from the EIS report for the Bradley Dam Project, which was prepared in the mid-1980s.

Subtidal Communities

Kachemak Bay represents the fjord ecoregion in the system of National Estuarine Research Reserves (NERR). A deep, subtidal valley oriented northeast to southwest reflects a glaciated history. As the glaciers melted during the last ice age, the sea level rose, flooding the Bay and submerging deep layers of glacial sediments. Glacial rivers continue to deposit fine silts that settle to the Bay's bottom, creating vast, unconsolidated sediment surfaces. Flushing tides, headland erosion, and successional processes continue to shape the underwater physical environment.

Kelp Forests

From a low tide line to a depth of 2.4 m (90 ft), much of Kachemak Bay's rocky habitat supports kelp forests of split kelp (*Laminaria bongardiana*), bull kelp (*Nereocystis luetkeana*), brown algae *(Alaria fistulosa* and *Agarum cribrosum*), and ribbon or wing kelp (*Alaria crispa*). Old surveys indicate the Bay's largest kelp forests grow along the current-swept, southern outer Bay, particularly near Seldovia Point (Dames and Moore, Inc. 1977). Currently, the largest kelp bed lies off Bluff Point. Kelp forests also occur along the northern shelf and at Archimandritof Shoals, and sugar kelp *(Alaria saccharina)* grows from the Homer Spit northeast to the Fox River Flats on unconsolidated substrates (Erikson, pers. comm.)

Mid-water Communities

Plankton Communities: Studies in the early 1970s identified the dominant phytoplankton species found in Lower Cook Inlet from April through August as microflagellates and the diatom species groups *Thalassiosira* spp. and *Chaetoceros* spp. (Larrance et al. 1977). Zooplankton in Lower Cook Inlet and Kachemak Bay included both nearshore and oceanic species, dominated by the small copepods (*Pseudocalanus* spp., *Acartia longiremis*, and *Oithona similes*) (Damkaer 1977). Dominant summer meroplankton included barnacle nauplii and crab zoea (English 1980).

Fish Assemblages: The water column community changes constantly as species follow feeding, spawning, and seasonal migration patterns. Some species, like rockfish, remain

in the same general area, while others migrate on daily and seasonal cycles. Pandalid shrimp (*Pandalus* spp.), for example, come to the surface during the night to feed and descend to the bottom during the day to evade predators (Barr 1970). In general, summer is the peak of fish activity and fish abundance in the Bay. Halibut, for example, enter the Bay during summer to feed, but most migrate to Cook Inlet and beyond during the winter. Even species like rockfish, that remain in the same general location throughout the year, are more active and may be more conspicuously colored during summer mating or nest-guarding periods (Dames and Moore, Inc. 1979).

Groundfish: Each year ADF&G conducts trawl surveys in the Bay, collecting abundance and biomass estimates for fishery target shrimp species, such as pink (*Pandalus borealis*), humpy (*P. goniurus*), spot (*P. platyceros*), and coonstripe shrimp (*P. hypsinotus*), as well as groundfish species. The most common groundfish species (by weight) in 1995 and 1997 were walleye pollock (*Theragra chalcogramma*) and flathead sole (*Pleuronectes* spp.). Although dated, Hood and Zimmerman (1986) and other surveys, intended to document the source, movement, and habitat needs of king crab (*Paralithodes camtschaticus*) and shrimp larvae to provide some background on the water column community (Sundberg and Clausen 1977, Haynes 1977, Haynes and Wing 1977, Haynes 1983).

Shell Debris Communities

Kachemak Bay supports abundant and diverse clam, mussel, and other mollusk populations. After bivalves are killed by sea otters or die of other causes, their shells drift to the bottom and create a habitat type called shell debris. Shell debris covers softer sediments and creates additional hard attachment surfaces for anemones and hydroids. Crab and other invertebrates seek cover in these shell fragments. If currents allow the shells to persist, they accumulate and form extensive areas of shell debris habitat. Occasional red tide outbreaks or freeze events, leading to mass mortality, may help replenish the shell supply to these habitats.

Soft-Bottom Communities

Driskell (1977) categorized subtidal, unconsolidated sediment types in the Bay as rippled sand, muddy sand, and silt. Rippled sand dominates the western central outer Bay. Sand waves containing coarse sand, gravel, and shell debris can reach 1.8 m (6 ft) high, indicating that strong currents sweep this region during part of the year. Eastward, the substrate becomes siltier and grades into muddy sand. The flat, smooth, muddy sand facies dominate from 18 m to 72 m (59 to 236 ft). At depths greater than 54 m (177 ft), fine silts and clays settle in the still, deep trough that slashes from the northeast to the southwest through Kachemak Bay (Driskell 1979). Much of this sediment may come from glacial runoff, but no studies have yet described its chemical and physical properties to determine how much sediment comes from glaciers versus the eroding northern shore. The distribution of flatfish and other bottom dwellers corresponds with specific grain sizes and sediment types.

Intertidal Communities

Kachemak Bay's varied coastline, numerous freshwater sources, and diverse geomorphology generate many combinations of physical factors, creating a microcosm of Southcentral Alaskan habitat types. The Bay's 8.5 m (28 ft) tidal range generates a wide swath of intertidal habitat. A saline-freshwater interface appears as a distinct color difference that divides the Bay down its north-south axis. On the southern shore, rocky substrates are juxtaposed with beaches and tidal flats, and completely protected beaches are contrasted with those with extreme wave exposure. An expansive tidal marsh blankets the head of the Bay at Fox River Flats, and numerous smaller marshes lie at the heads of protected bays and fjords. The northern shore's eroding sandstone bluffs grade into unconsolidated substrate habitats of mixed sand, gravel, and cobble beaches, as well as mudflats. Eelgrass (*Zostera marina*) beds appear where sandy mudflats occur in low intertidal and shallow subtidal areas with limited wave exposure.

Eelgrass Beds

Eelgrass (*Zostera marina*) grows in beds (clusters) in low intertidal and shallow subtidal sandy mudflats. Like a coral reef or kelp forest, the physical structure of the eelgrass beds provides increased living substrate and cover for myriad invertebrates and fish. The beds also generate food and nutrients for the soft-bottom community through primary productivity and plant decay. Unlike kelp, eelgrass is a flowering, marine vascular plant.

Eelgrass has an associated community of hydroids, bristle worms, isopods, amphipods, shrimp, hermit crabs, gastropods, clams, and other invertebrates that graze the eelgrass blades for epiphytic diatoms, algae, bacteria, and other food sources (Ricketts and Calvin 1968.) Although no one has compiled a list of species associated with the Bay's eelgrass habitats, fauna identified in more extensive eelgrass beds in Koyuktolik (Dogfish) Bay on the southern side of the Kenai Peninsula (Dames and Moore, Inc. 1977) would be similar to that of Kachemak Bay's communities (Erikson, pers. comm.).

Mudflats and Beaches

Kachemak Bay's mudflats, and sand, gravel, and cobble beaches comprise a variety of unconsolidated soft-substrate intertidal habitat types. These intertidal unconsolidated substrate habitats range from sheltered tidal flats to steep cobble beaches exposed to pounding waves, each having distinct biological communities. They support numerous species of clams, polychaete worms, amphipods, and other invertebrates. Sand and gravel beaches host similar taxa adapted to coarser substrate, as well as sand dollars (*Echinarachnius parma*) and sand lance (*Ammodytes hexapterus*). Cobble beaches are subject to greater wave exposure, and fewer species can survive the stress of moving substrate and pounding waves. However, when the cobble provides a protective armor over a heterogeneous mixture of silt, sand, and other unconsolidated sediments, a rich infaunal community may live beneath. Of the unconsolidated habitats, mudflats support the greatest species diversity and biomass, and cobble beaches support the fewest (Lees et al. 1980, Carroll 1994).

People sometimes underestimate the ecological role of mudflats, sand, and gravel beaches because most of fauna found here dwells within the substrate. Yet, they are

critical habitats for their specialized residents. They provide foraging grounds for shorebirds, ducks, fish, and other marine invertebrate predators, as well as spawning and nursery habitats for forage fish and juvenile crustaceans. Harbor seals (*Phoca vitulina*) also use mudflats and protected beaches as haulout areas (Alaska Department of Fish and Game 1993).

Rocky Intertidal

Rocky substrate, moderate to strong wave and surf exposure, and a visible, vertical zonation pattern characterize rocky intertidal habitat. Colorful communities of invertebrates and algae grow in distinct horizontal bands dominated by rockweed, mussels, or barnacles. Physiological tolerance by these species to desiccation and their competitive and predatory interactions with other species largely determine their vertical distribution.

Rocky intertidal habitat supports a diverse and conspicuous assemblage of invertebrates and luxuriant macroalgal growth that produce more organic material than almost any other intertidal habitat (Lees et al. 1980). Common taxa include barnacles, mussels, chitons, sea urchins, grazing snails, sea stars, hermit crabs, and sea anemones, as well as worms and sea cucumbers that hide in crevices and under rocks. Kelps (*Lamaria* spp., *Alaria fistulosa*), fucoids (*Fucus gairdneri*), and other macroalgae (*Ulva* spp., *Porphyra* spp., *Odonthalia* spp.) grow in abundance during the spring and summer when extended daylight hours and upwelling from Lower Cook Inlet create intense productivity. Their biomass supports not only the rocky intertidal habitat, but soft-bottom habitats as well (Lees et al. 1980). Direct consumers in the rocky intertidal habitat include chitons (*Katharina tunicata*, *Mopalia muscosa*, *Tonicella lineata*), sea urchins (*Strongylocentrotus droebachiensis*), and grazing snails (*Littorina* spp. and *Siphonaria thersites*).

After macroalgae die, they decompose and become detritus. Detritus forms the base of the food chain for soft-bottom habitats, and it serves as food for filter feeders, such as barnacles, in other habitats. Deposit- and filter-feeding worms, clams, and other invertebrates are food for birds and fish that forage in the Bay. The transfer of biomass from the rocky intertidal habitat to other habitats ties the health and productivity of kelp and rockweed in the rocky intertidal area to that of soft-bottom dwellers, such as Dungeness crabs (*Cancer magister*), and flatfish, such as halibut (*Hippoglossus stenolepis*) (Lees et al. 1980, Sanger and Jones 1984, Alaska Department of Fish and Game 1993).

The rocky intertidal zone is also an important foraging area for sea otters (*Enhydra lutris*), which must live close to abundant food supplies to maintain their high metabolism. For waterfowl, such as black, surf, and white-winged scoters (*Melanitta nigra*, *M. perspicillata*, and *M. fusca*) and harlequin ducks (*Histrionicus histrionicus*), the rocky intertidal zone is a critical foraging area for mussels (*Mytilus trossulus*), a major food source. While many shorebirds are associated with mudflats, surfbirds (*Aphriza virgata*) and black and ruddy turnstones (*Arenaria interpres* and *A. melanocephala*)

prefer to forage on rocky substrates and gravel beaches (Alaska Department of Fish and Game 1993).

Tidal Marshes

Tidal marshes develop in a variety of places, including at river mouths, behind barrier islands, at spits, and on tidal flats. Tidal marshes in the Kachemak Bay area can be found at Fox River Flats, China Poot Bay, the base of the Homer Spit, Beluga Slough, Halibut Cove Lagoon, Sadie Cove, Tutka Bay, Kasitsna Bay, and Seldovia Bay (Crow and Koppen 1977, Hall 1988). Deposition of sediment from rivers forms a delta consisting of fine silt, clay, and sand upon which lush communities of saltwater, herbaceous sedges and succulent, tidal marsh plants develop. These areas are known by many names, including salt marshes, coastal marshes, estuarine emergent wetlands, estuarine vegetated wetlands, and brackish tidal marshes.

Although Alaska has a high percentage of wetlands, it hosts only 4% of the total vegetated tidal marshes in the United States. Alaska has a large share (28%) of the estuarine wetlands (approximately 8,628 km^2 or 2,131,900 ac) in the entire United States, but only 17% (1,457 km^2 or 360,000 ac) of those are vegetated, and most are mudflats. In contrast, 87% of the estuarine wetlands in the lower 48 United States are vegetated (Hall et al. 1994). Despite the rarity of tidal marshes in Alaska, Kachemak Bay boasts two prominent and distinctly different ones: Fox River Flats and China Poot Bay. Smaller patches of marsh occur at the base of the Homer Spit and elsewhere throughout the Bay.

Forested Plant Communities

Vegetative communities may differ in composition based upon their geographic location. For that reason, some community descriptions are broken down by their location at the Head of the Bay, Southern Shore and Northern Shore.

Sitka/Lutz Spruce

Head of the Bay: Batten et al. (1978) and the authors of the EIS reported closed forests of Sitka spruce (*Picea sitchensis*) occurring on moderately drained slopes below an elevation of 460 m (1,509 ft). However, it is likely that many of the trees originally thought to be Sitka spruce were in fact Lutz spruce (*Picea X lutzii*) (Gracz, pers. comm.). In 1985, the canopy cover in the closed forests was 60% to 75%. The trees reached an average height of 18 m (59 ft) and an average diameter-at-breast height (DBH) of 0.3 m (12 in). In forest openings, tall shrubs of Sitka alder (*Alnus viridis* (Vill.) Lam and D.C. *sinuata* (Regel) A and D. Love) were dominant above a ground cover of ferns and sphagnum moss (*Sphagnum* sp.). Batten et al. (1978) reported low shrubs, including currents (*Ribes* spp.), rusty menziesia (*Menziesia ferruginea*), and elderberry (*Sambucus racemosa*) as common forest opening shrubs. Common understory plants in closed forest areas include shield fern (*Dryopertis expansa*), western oak fern (*Gymnocarpium dryopteris*), trailing raspberry (*Rubus pedatus*), shy maiden (*Moneses uniflora*), twinberry (*Linnaea borealis*), and pleurocarpous mosses, (including *Aulicomnium androgynum*, *Hylocomium splendens*, and *Rhytidiadelphus triquetrus*). The spruce bark beetle outbreak has significantly changed the characteristics of the forest, but there is no specific documentation on the nature of the change.

Open forests of Sitka spruce, or Lutz spruce, occur at elevations above the closed coniferous forests and below subalpine shrub communities. Sitka alder often grow in mixed patches in the open spruce forests. A low shrub layer, typically associated with the open forests may include rusty menziesia, willow (*Salix* sp.), and high-bush cranberry (*Viburnum edule*). The ground cover associated with open forest areas is typically comprised of trailing raspberry, bluejoint (*Calamogrostis canadensis*), horsetail (*Equisetum* sp.), and sphagnum moss. At elevations above 615 m (2,018 ft), spruce occurs only as scattered individuals.

Southern Shore: Sitka spruce (*Picea sitchensis*) forests growing on the southern side of the Kachemak Bay watershed occur at sea levels from 300 m to 600 m (984 to 1,969 ft) in elevation. At tidewater, Sitka spruce can reach heights of over 20 m (67 ft) with diameters of up to 1.5 m (5 ft); however, at timberline they take the form of small bushes. In Prince William Sound (PWS), where the Sitka spruce forests are mixed with western hemlock (*Tsuga heterophylla*), the forests may be found on slopes with grades as steep as 80% (DeVelice et al. 1999). Casual observation suggests that the Sitka spruce forests on the southern side of Kachemak Bay may occur on similarly steep slopes. Understory vegetation of the spruce forest on the southern side is poorly understood. Wintergreens (*Pyrola* spp.), ferns, and mosses are common, with devil's club (*Oplopanax horridus*) dominating the wetter areas. Alder (*Alnus* spp.) is typically present in early succession seres leading to spruce forest. In spruce forests with relatively open canopies, alder and willow (*Salix* sp.) may be prevalent in the understory (Alaska Department of Natural Resources 1995).

Northern Shore: Forests of the northern watershed occur primarily on terraces (relatively level bench or step-like surfaces that break the continuity of a slope). Most of these forest communities contain Lutz spruce (*Picea X lutzii*), which is a hybrid between white spruce (*Picea glauca*) and Sitka spruce (*Picea sitchensis*). The occurrence of this hybrid is another example of the mixing of maritime and continental climates. Sitka spruce is a coastal species, and white spruce is an interior species (Alaback et al. 1994).

Homogeneous stands of Lutz spruce occur from 60 m to 415 m (197 to 1,362 ft) elevation and are usually associated with a shrub layer. Generally, in the Lutz spruce forests at the higher part of the range (230 m to 415 m or 755 to 1362 ft), one will find rusty menziesia (*Menziesia ferruginea*), Barclay's willow (*Salix barclayii*), Alaska spirea (*Spiraea stevenii*), and oval leaf blueberry (*Vaccinium ovalifolium*) in the shrub layer. Common horsetail (*Equisetum arvense*) and shield fern (*Dryopteris expansa*) are common in the herbaceous layer. Other associates include tall fireweed (*Epilobium angustifolium*), Sitka burnett (*Sanguisorba canadensis latifolia*), bluejoint (*Calamagrostis Canadensis*), clasping twisted stalk (*Streptopus amplexifolius*), one-sided wintergreen (*Orthilia secunda*), and trailing raspberry (*Rubus pedatus*).

In the lower elevations (60 m to 360 m or 197 to 1,181 ft), the shrub layer is typically more open and consists of willow and spirea. The herb layer is dominated by oak fern (G*ymnocarpium dryopteris*). Other associates include bluejoint, forest or wood horsetail

(*Equisetum sylvaticum*), Sitka burnett, lingonberry (*Vaccinium vitis-idea*), bunchberry (*Cornus suecica*), twinflower (*Linnea borealis*), and trailing raspberry.

Black Spruce Forests

Black spruce (*Picea mariana*) forests occur between elevations of 28 m to 350 m (92 to 1,148 ft), but they are rare in the watershed. At lower elevations, from 28 m to 260 m (92 to 853 ft), the black spruce stands consist of larger trees, and the canopy is more closed than in those found at higher elevations. This species is characteristic of poorly drained sites (Welsh 1974). Typically, the black spruce forests have a thick shrub layer dominated by northern Labrador tea (*Ledum palustre decumbens*) and dwarf birch (*Betula nana*). Other common associates are crowberry (*Empetrum nigrum*), lingonberry (*Vaccinium vitis-idaea*), and bog blueberry (*V. uliginosum*). The dominant herbs are cloudberry (*Rubus chamaeorus*), and wood or forest horsetail. *Sphagnum* sp. mat, with associated bog cranberry (*V. oxycoccus*), usually covers the ground.

Where drainage is especially poor and/or frost activity is high, black spruce is stunted and the canopy is open. Such stands are found in wet areas where the slope is minimal (about 1%) and the location aspect is north-northwest. Dwarf birch is dominant in the shrub layer. Forest or wood horsetail is the dominant herb. Other associates include cloudberry, willow, bog blueberry, crowberry, and northern Labrador tea.

Birch Forests

Paper birch (*Betula papyrifera*) stands tend to be uncommon in the area at the head of the Bay, just as they are throughout the watershed. Some birch stands were identified during investigations for the EIS and found to be adjacent to river floodplains and coastal marshes. The understory in the birch stands is typically dominated by alder (*Alnus* spp.).

Black Cottonwood Forests

Head of the Bay: Black cottonwood (*Populus balsamifera trichocarpa*) stands are common communities found on sandy or gravel floodplains. At the head of the Bay, the EIS investigators found forest black cottonwood with an average height of 18 m to 22 m (59 to 72 ft) and an average diameter-at-breast-height (DBH) of 0.23 m (9 in). The EIS also identified a shrub layer of mountain alder (*Alnus incana tenuifolia*), and herbaceous layers that included horsetails and grasses. However, the species of grass were not clearly identified.

Southern Shore: Forests of black cottonwood (*Populus balsamifers trichocarpa*) occur along riparian corridors, rivers and creeks, and away from the direct marine influence of the Bay. These forests have canopies ranging from opened to closed. Ferns and grasses dominate the herb layer of the closed canopy forests. In areas where the forest is open, willow (*Salix* spp.) appears as the dominant shrub species. After a catastrophic flood that occurred in 1967 on the Grewingk floodplain, black cottonwoods became the major colonizing tree species (Gracz, pers. comm.).

Mixed Spruce-Birch Forests
The EIS investigators found this uncommon community along moderately, well-drained slopes between sedge-grass communities and coniferous forests. The overstory species were spruce (*Picea* spp.) and paper birch. Associated species included alders (*Alnus viridis sinuata* and *Alnus incana tenuifolia,*), elderberry (*Sambucus racemosa*), and horsetails.

Lutz Spruce-Birch Forests
In some locations, between elevations of 15 m to 122 m (50 to 400 ft), the Lutz spruce is associated with paper birch (*Betula papyrifera*). These spruce-birch forests often lack a shrub layer, but when present, it is rusty menziesia. The dominant herb layers are typically oakfern and common horsetail. Other common subdominants of the herb layer include shield fern, Sitka burnett, bluejoint, and forest or wood horsetail. Trailing raspberry is a common ground cover.

Mixed Spruce-Black Cottonwood Forests
Mixed forests of spruce and black cottonwood commonly dominate the moderately, well-drained, low elevation floodplains. The canopy cover of these forests ranges between 6-25%. Associated species include alder, devil's club, high bush cranberry, and willow. The herb layer at the time of the EIS included ferns, grasses, tall fireweed (*Epilobium angustifolium*), and larkspur (*Delphinum glaucum*). The ground cover included mosses, but no species were identified.

Lutz Spruce-Willow Forests
These forests can be found in the elevation range of 65 m to 565 m (213 to 1,854 ft). Those with a dense common horsetail component in the herb layer are generally found on the north-northwestern foot slopes with wet soils. A second type of spruce-willow forest has an herb layer dominated by bluejoint and occurs from an elevation of 50 m to 175 m (164 to 574 ft) on modified terraces. A third type of spruce-willow forest occurs much higher on modified moraines between elevations of 285 m to 550 m (935 to 1,804 ft). It has a mixed herbaceous layer with bluejoint, tall fireweed, Sitka burnett, and common horsetail as the dominants.

Non-forested Plant Communities
Subalpine
Alder (*Alnus* spp.) dominates the subalpine community and occurs in variable associations with birch (*Betula* spp.) and willow (*Salix* spp.). The herb layer is diverse with a variety of grasses, wild flowers, ferns, and mosses. It is difficult to define where the subalpine ends and the alpine begins (Alaska Department of Natural Resources 1995). The first hints of newly-forming alpine habitat can be seen as fingers of alder developing in the crevices of snow and ice chutes.

Alpine
Above the alpine vegetation is a seemingly endless expanse of snow and ice. Nearly nine glaciers continuously run the length of this section of the Watershed. As they stretch

toward the Gulf of Alaska, the glaciers of Kachemak Bay crest over the Kenai Mountains and blend with the Harding Ice Field further to the northeast.

Tall Alder Shrublands

Alder shrublands are found along river floodplains where tall mountain alder grows with scattered black cottonwood. Alder shrublands, dominated by Sitka alder (*Alnus viridis sinuata*), also occur at higher elevations on slopes between the closed coniferous forests and the lower boundary of the shrub tundra. The herbaceous community in these higher areas includes grasses, ferns, horsetail, tall fireweed, and starflower (*Trientalis europaea*).

Sitka Alder Thickets

Mountain alder (*Alnus viridis sinuate*) is a shrubby alder that occurs between elevations of 65 m to 200 m (213 to 656 ft). It grows in rounded patches in meadows of bluejoint and fireweed, and in thickets on the northern slopes of ridges above 365 m (1,200 ft). Shield fern is commonly the dominant species of the understory. However, near the edges of alder patches, bluejoint grows more densely possibly due to the nitrogen-fixing capacity of the alder. Other common associates are trailing black currant (*Ribes laxiflorum*) and woodland horsetail.

Tall Willow Shrublands

A riparian community dominated by willows is typically found along rivers and streams interspersed with clumps of alder. The EIS identified herbaceous layer in these areas that included bluejoint, ferns, lupine (*Lupinus nootkatensis*), horsetail, tall fireweed, and starflower.

Willow-Diverse Herbaceous

This subalpine community is found between elevations of 595 m to 640 m (1,955 to 2,100 ft) on moderately sloped, northern facing locations. Willow of medium height dominates the shrub layer. The herbaceous layer is diverse with the following common associates: tall fireweed, woodland fern, wild geranium (*Geranium erianthum*), trailing raspberry, Sitka burnette, dwarf nagoonberry, northern starflower, one-sided wintergreen, clasping twisted stalk, and oak fern.

Bluejoint-Willow-False Hellebore

Found on northern facing slopes of relict lateral moraines, this community, dominated by bluejoint and false hellebore (*Veratrum viride*) occurs between elevations of 115 m to 575 m (377 to 1,886 ft). A few scattered Lutz spruce of medium height are commonly present. A low to medium shrub layer dominated by willow is present. Other common associates of the herb layer are Sitka burnette, yarrow, tall fireweed, wild geranium (*Geranium erianthum*), trailing raspberry, one-sided wintergreen, dwarf nagoonberry, monkshood, and Alaska paintbrush (*Castilleja unalaschensis*).

Low Willow Shrublands

The Bradley Lake EIS included observations from subalpine and alpine areas associated with areas around Bradley Lake. Low-growing (0.6 m to 2 m or 24 to 79 in) willows are

the common dominants of these subalpine and alpine zones. Shorter stature plants are found where soils are poor and wind is high. Typically, an associated herbaceous layer includes sedges (*Carex* spp.), grasses, tall fireweed, wild geranium (*Geranium erianthum*), starflower, and wintergreen.

Tall Grasslands

Tall grasslands are found from the lowlands to the subalpine zone on flat, poorly-drained areas and on moderately, well-drained slopes. The dominant species found in 51-75% of the grasslands is bluejoint. Other associates include tall fireweed, horsetails, and sedges.

Bluejoint-Fireweed Communities

On southern slopes of ridges, at lower elevations between 20 m to 150 m (66 to 492 ft), bluejoint and tall fireweed form dense meadows, with northern starflower (*Trientalis europaea arctica*), and woodland fern commonly associated. Also found are the occasional shrub of red elderberry (*Sambucus racemosa*), and red raspberry (*Rubus ideaus*), or open-growing Lutz spruce.

Meadows

Areas comprised of 20-25% bluejoint and fireweed also occur on southern facing slopes of ridges, and on relict glacial lakes at elevations between 137 m to 480 m (449 to 1,575 ft). A diverse assemblage of forbs are associated with this type including, yarrow (*Achillea millefolium*), Sitka burnette, nagoonberry (*Rubus arcticus*), monkshood (*Aconitum delphinifolium*), horsetail, and tall altai fescue (*Festuca altai meadowsca*). Occasionally, tufted hairgrass (*Deschampsia cespitosa beringensis*) and large-awned sedge (*Carex macrochaeta*) are found, replacing bluejoint as the grassy dominant, especially at higher elevations in mesic swales.

Shrub Tundra

Shrub tundra occurs in alpine areas on well-drained, shallow soils. Dominant plant height is less than 0.2 m (8 in) inches. Species that may be present include crowberry (*Empetrum nigrum*), bearberry (*Arctostaphylos* sp.), bog blueberry (*Vaccinium uliginosum*), Alaska spirea (*Spiraea* sp.), alpine azalea (*Andromeda polifolia*), and northern Labrador tea (*Ledum palustre decumbens*). Other associates are lichens and sphagnum moss.

Shrub Fen

Shrub fens occur between elevations of 50 m to 727 m (164 to 2,385 ft) on slight slopes. Several species are co-dominant in the shrub fen, including low-growing crowberry, northern Labrador tea, bog blueberry, and dwarf birch. Cloudberry, lingonberry (*Vaccinium vitis-idaea*), bog rosemary (*Andromeda polifolia*), and common horsetail are often present.

Wetland Plant Communities

Receding glaciers on the northern side of the Kachemak Bay watershed left behind a landscape speckled with depressions. Some of these depressions became lakes that filled in with sediments over the years. Many of the wetland communities observed today

formed in these relict glacial lakes. Other wetland communities are associated with riparian zones (lake fringes).

Mesic Herbaceous Sedge-Grasses
The soils underlying this community are moderately well-drained and deep. They store water or receive water from deep snow patches and are located in the subalpine and alpine zones. The vegetation reaches a height of 0.3 m to 0.5 m (1 to 1.6 ft). Species include bluejoint, altai fescue (*Festuca altaica*), Arctic wormwood (*Artemesia arcticum*), yarrow (*Achillea borealis*), bearberry, crowberry, and marsh violet (*Viola palustris*).

Wet Sedge Fen
This community is found on relict glacial lakes between elevations of 124 m to 130 m (407 to 427 ft) and where the water table remains near the surface most of the year. Beaked sedge (*Carex rostrata*), or water sedge (*C. aquatilis*), are the dominant species found in standing water and on margins of lakes and ponds.

Freshwater Herbaceous Sedge-Grasses
Freshwater herbaceous sedge-grass is found in the lower Fox River area and at higher elevations in the lower Kachemak Creek Valley. It is often interspersed with tall and low shrub communities. The soils are poorly drained (hydric) with 0.05-0.10 m (2-4 in) of standing water during summer. Sedges, predominantly Lyngby's sedge (*Carex lyngbyaei*), and Ramenski's sedge (*Carex ramenski*) comprise up to 50% of the groundcover. Other common associates are horsetail, marsh marigold (*Caltha palustris*), marsh five-finger (*Comarum palustre*), sphagnum moss, willow, and grasses, for which the EIS failed to identify the species.

Willow-Grass
Riparian communities of Barclay's willow (*Salix barclayii*) and bluejoint are found at all elevations on the northern side. Common understory plants include tall Jacob's ladder (*Polemonium acutiflorum*), nagoonberry, woodland fern, and northern starflower.

Shrubby Rush Fen
Although it is found within a wide range of elevations (75 m to 400 m or 246 to 1,312 ft), this community is typically found at lower elevations on relict glacial lakes. Low to medium height shrubs, dominated by tundra rose (*Pentaphylloides floribunda*), and/or sweet gale (*Myrica gale*), are dominant, along with dwarf birch (*Betula nana*), lingonberry, bog rosemary, tufted clubrush (*Tricophorum cespitosum*), and crowberry. Other common associates include tall cotton grass (*Eriophorum angustifolium*), northern Labrador tea, water horsetail (*Equisetum fluviatle*), and cloudberry.

Rush Fen
Rush fen communities are found across a wide range of elevations (54 m to 587 m or 177 to 1,926 ft) and are typically found on relict glacial lake bottoms. They may also occur in depressions on other landforms. Tufted clubrush (*Tricophorum cespitosum*) is typically the dominant species. Associates include dwarf birch, bog rosemary, bog cranberry,

round-leaved sundew (*Drosera rotundifolia*), and tall cotton grass (*Eriophorum angustifolium*). *Sphagnum* moss forms a nearly continuous mat.

Sweet Gale-Sedge Fen

Sweet gale (*Myrica gale*) and creeping sedge (*Carex chordorrhiza*) dominate this community, which usually includes areas of standing water. A diverse forb and sedge assemblage is typically present, including pale sedge (*Carex livida*), bogbean (*Menyanthes trifoliata*), bog rosemary, marsh five-finger, spreading rush (*Juncus supiniformis*), great sundew (*Drosera anglica*), bladderwort (*Utricularia* spp.), and shore sedge (*Carex limosa*).

Coastal Marshes

The Batten et al. (1978) report documented several coastal marsh plant communities. In areas closest to the Bay, where saltwater influence is greatest, Nootka alkali grass (*Puccinellia nutkaensis*) is dominant. Farther from the saltwater influence, Lyngby's sedge and Ramenski's sedge form dense stands, with higher salt marsh areas supporting a more diverse community. These dense communities include Nootka alkali grass, creeping alkali grass (*Puccinellia phryganodes*), seaside arrow grass (*Triglochin maritimum*), marsh arrow grass (*Triglochin palustre*), Alaska orach (*Atriplex alaskensis*), and Canadian sandspurry (*Spergularia canadensis*). The Lyngby's sedge communities tend to occur around marsh fringes and near sloughs and drainages, and the Ramenski sedge communities tend to occur on poorly drained flats. Ponds within the marsh area support aquatic plant communities of Sago pondweed (*Stuckenia pectinatus*), sheathed pondweed (*Stuckenia vaginatus*), four-leaved mare's tail (*Hippuris tetraphylla*), and creeping spike rush (*Eleocharis palustris*). On stream banks in the coastal marsh, Lyngby's sedge is dominant with smaller quantities of bluejoint, Bering’s tufted hairgrass (*Deschampsia beringensis*), red fescue (*Festuca rubra*), meadow barley (*Horduem brachyantherum*), Pacific silverweed (*Argentina egedii*), marsh pea (*Lathyrus palustris*), Pacific hemlock parsley (*Conoselinum pacificum*), and beach lovage (*Ligusticum scoticum*). Where levees have been built up along river banks, beach rye grass (*Leymus mollis*) is dominant.

Appendix 9. Species Lists
Kachemak Bay Marine Flora

Phylum / Division Chlorophyta (Green Algae)

Arctic Sea Moss	*Acrosiphonia arcta*
Green Rope	*Acrosiphonia coalita*
Northern Green Rope	*Acrosiphonia duriuscula*
Dwarf Sea Hair	*Blidingia minima*
Graceful Sea Hair	*Cladophora sericea*
Ritter's Spongy Cushion / Course Spongy Cushion	*Codium ritteri*
Green Sea Grape	*Derbesia marina*
Seagrass Cellophane	*Kornmannia leptoderma*
Sea Cellophane	*Monostroma grevillei*
	Monostroma oxyspermum
Emerald Carpet	*Prasiola meridionalis*
	Rhizoclonium riparium
Twisted Sea Hair	*Rhizoclonium tortuosum*
	Spongomorpha saxatilis
Mermaid's Tresses	*Ulothrix flacca*
	Ulva clathrata
	Ulva expansa
Sea Hair	*Ulva intestinalis*
Sea Lettuce	*Ulva lactuca*
Green String Lettuce	*Ulva linza*
Branched String Lettuce	*Ulva prolifera*
Dark Sea Lettuce	*Ulvaria obscura*

Phylum / Division Heterokontophyta or Ochrophyta (Brown Algae)

Sieve Kelp	*Agarum clathratum*
Ribbon Kelp / Wing Kelp	*Alaria marginata*
Ribbon Kelp / Wing Kelp	*Alaria taeniata*
Bottlebrush Seaweed	*Analipus japonicus*
Spaghetti Kelp	*Chorda filum*
Chocolate Pencils	*Chordaria flagelliformis*
	Chordaria gracilis
Sea Chip / Brown Bag	*Coilodesme bulligera*
Five-ribbed Kelp / Seersucker	*Costaria costata*
Three-ribbed Kelp	*ymathere triplicata*
Northern Bladder Chain / Chain Bladder	*Cytoseira geminata*
Witch's Hair	*Desmarestia aculeata*
Flattened Acid Kelp	*Desmarestia ligulata*
Stringy Acid Kelp	*Desmarestia viridis*
Golden Sea Hair	*Dictyosiphon foeniculaceus*
	Elachista fucicola

Dragon Kelp	*Eualaria fistulosa*
Gooey Golden Seaweed	*Eudesme virescens*
Rockweed / Sea Wrack / Popweed / Bladderwrack	*Fucus distichus* ssp. *evanescens*
	Fucus spiralis
Sea Cauliflower	*Leathesia marina*
Twisted Sea Tubes / Dark Sea Tubes	*Melanosiphon intestinalis*
Bull Kelp	*Nereocystis luetkeana*
False Kelp	*Petalonia fascia*
Sea Felt	*Pylaiella littoralis*
Sea Fungus	*Ralfsia fungiformis*
Split Kelp	*Saccharina groenlandica*
Sugar Kelp	S*accharina latissima*
Sea Cabbage	*Saccharina sessilis*
Soda Straws	*Scytosiphon lomentaria*
Studded Sea Balloons	*Soranthera ulvoidea*
	Spongonema tomentosum

<u>Phylum / Division Rhodophyta (Red Algae)</u>

	Acrochaetium sp.
Bushy Ahnfelt's Seaweed	*Ahnfeltia fastigiata*
Hooked Skein	*Antithamnionella pacifica*
	Bossiella sp.
Beauty Bush	*Callithamnion pikeanum*
	Callophyllis edentata
	Callophyllis rhynchocarpa
	Callophyllis haenophylla
Staghorn Felt	*Ceramium tenuicorne*
	Constantinea simplex
Cracked Saucer	*Constantinea subulifera*
Enigmatic Coral Seaweed	*Corallina frondescens*
Graceful Coral Seaweed	*Corallina vancouveriensis*
	Cryptonemia borealis
	Cryptonemia obovata
Bleached Brunette	*Cryptosiphonia woodii*
Winged Rib	*Delesseria decipiens*
	Devaleraea compressa
	Devaleraea ramentacea
	Devaleraea yendoi
California Red Blade	*Dilsea californica*
	Dilsea integra
Sea Moss	*Endocladia muricata*
Delicate Northern Sea Fan	*Callophyllis cristata*
Sea Sac / Dead Man's Fingers	*Halosaccion glandiforme*
	Halymenia coccinea

	Heterosiphonia crispella
Rusty Rock	*Hildenbrandia rubra*
	Kallymeniopsis oblongifructa
	Kallymeniopsis lacera
Rock Crust	*Lithothamnion* sp.
	Lithothrix aspergillum
Turkish Washcloth / Tar Spot / Grapestone / Sea Tar / Sea Film	*Mastocarpus papillatus*
Iridescent Horn-of-Plenty	*Mazzaella parksii*
Northern Mazza Weed	*Mazzaella oregona*
Bering Membrane Wing	*Membranoptera spinulosa*
	Membranoptera weeksiae
Coralline Crust	*Mesophyllum lamellatum*
Coarse Sea Lace	*Microcladia borealis*
Northern Red Blade	*Neodilsea borealis*
Sea Fern	*Neoptilota asplenioides*
Black Pine	*Neorhodomela larix*
Oregon Pine	*Neorhodomela oregona*
Sea Brush	*Odonthalia floccosa*
	Odonthalia kamtschatica
	Odonthalia washingtoniensis
Red Opuntia	*Opuntiella californica*
Chalky Coral Seaweed	*Pachyarthron cretaceum*
Frilly Red Ribbon	*Palmaria callophylloides*
Stiff Red Ribbon	*Palmaria hecatensis*
Red Ribbon / Red Kale	*Palmaria mollis*
Sea Oak	*Phycodrys* sp.
	Pterothamnion sp.
	Pleonosporium pedicellatum
Polly Hendry	*Polysiphonia hendryi* var. *luxurians*
Polly Pacific	*Polysiphonia pacifica*
	Polysiphonia stricta
	Porphyra amplissima
Red Cellophane	*Porphyra cuneiformis*
	Porphyra fallax
Japanese Laver / Kurogi's Laver	*Porphyra kurogii*
Bull-kelp Laver	*Porphyra nereocystis*
Long Laver / Uppurui-nori	*Porphyra pseudolinearis*
Kjellman's Laver	*Porphyra variegata*
Black Tassel	*Pterosiphonia bipinnata*
Red Wing	*Ptilota filicina*
	Rhodochorton sp.
	Rhodomela lycopodioides
	Rhodymenia liniformis

Scagel's Skein	*Scagelia occidentale*
	Schizymenia epiphytica
Red Eyelet Silk	*Sparlingia pertusa*
	Congregatocarpus kurilensis
Red Sea-cabbage	*Turnerella mertensiana*

Kachemak Bay Terrestrial Plants

Family Lycopodiaceae (Clubmosses)	
Fir clubmoss	*Huperzia selago*
Stiff clubmoss	*Lycopodium annotinum*
Stiff clubmoss	*Lycopodium annotinum* var. *pungens*
Running clubmoss	*Lycopodium clavatum*
Creeping Jenny / Christmas green / Groundcedar	*Lycopodium complanatum*
Alpine clubmoss	*Lycopodium alpinum*
Clubmoss	*Lycopodium* sp.
Family Equisetaceae (Horsetails)	
Variegated scouringrush / Northern scouringrush	*Equisetum variegatum*
Swamp horsetail / Water horsetail	*Equisetum fluviatile*
Marsh horsetail	*Equisetum palustre*
Woodland horsetail / Wood horsetail	*Equisetum sylvaticum*
Meadow horsetail	*Equisetum pratense*
Field horsetail / Common horsetail	*Equisetum arvense*
Horsetail	*Equisetum* sp.
Family Ophioglossaceae (Adder's Tongues)	
Common moonwort	*Botrychium lunaria*
Northwestern moonwort / Northern moonwort	*Botrychium pinnatum*
Lance-leaved moonwort / Lanceleaf grape fern	*Botrychium lanceolatum*
Rattlesnake fern	*Botrychium virginianum*
Family Adiantaceae (Maidenhair Ferns)	
Northern maidenhair fern	*Adiantum pedatum*
Family Cryptogrammaceae (Mountain Parsleys)	
American rockbrake	*Cryptogramma acrostichoides*
Parsley fern / Mountain parsley / Rock brake fern	*Cryptogramma* sp.
Family Thelypteridaceae (Marsh Ferns)	
Narrow beech fern / Long beech fern	*Phegopteris connectilis*
Family Dryopteridaceae (Lady Ferns)	
Lady fern / Common lady fern	*Athyrium filix-femina*

Fragile fern / Brittle bladder fern	*Cystopteris fragilis*
Mountain bladder fern	*Cystopteris montana*
Rocky Mountain woodsi	*Woodsia scopulina*
Rusty woodsia	*Woodsia ilvensis*
Ostrich fern	*Matteuccia struthiopteris*
Shield fern / Trailing wood fern / Spreading wood fern	*Dryopteris expansa*
Western oak fern	*Gymnocarpium dryopteris*

Family Aspidiaceae (Sheild Ferns)

Mt. holly fern / Northern holly fern	*Polystichum lonchitis*
Braun's holly fern	*Polystichum braunii*

Family Pinaceae (Pines / Spruces / Hemlocks)

White spruce	*Picea glauca*
Sitka spruce	*Picea sitchensis*
Lutz spruce	*Picea* X *lutzii*
Black spruce	*Picea mariana*
Spruce	*Picea* spp.
Western hemlock	*Tsuga heterophylla*
Mountain hemlock	*Tsuga mertensiana*

Family Cupressaceae (Cypresses / Junipers)

Common mountain juniper / Common juniper	*Juniperus comunnis*

Family Sparganiaceae (Bur-Reeds)

Narrowleaf bur-reed	*Sparganium angustifolium*
Northern bur-reed	*Sparganium hyperboreum*

Family Potamogetonaceae (Pondweeds)

Eelgrass / Seawrack	*Zostera marina*
Floating pondweed / Floating-weed pondweed	*Potamogeton natans*
Ribbonleaf pondweed	*Potamogeton epihydrus*
Variable pondweed	*Potamogeton gramineus*
Sago pondweed	*Stuckenia pectinatus*
Fineleaf pondweed	*Stuckenia filiformis*
Sheathed pondweed	*Stuckenia vaginatus*

Family Zannichelliaceae (Horned Pondweeds)

Horned pondweed	*Zannichellia palustris*

Family Juncaginaceae (Arrow Grasses)

Sea arrow grass / Seaside arrow grass	*Triglochin maritima*
Marsh arrow grass	*Triglochin palustre*

Family Poaceae - (Grasses)

Reed canary grass / Canary reed grass	*Phalaris arundinacea*
Alpine holy grass / Alpine sweet grass	*Hierochloe alpina*
Vanilla grass	*Hierochloe odorata*
Arctic sweet grass / Arctic holy grass	*Hierochloe pauciflora*
Alpine timothy / Mountain timothy	*Phleum alpinum*
Timothy	*Phleum pratense*
Field foxtail / Meadow foxtail	*Alopecurus pratensis*
Alpine foxtail / Boreal alopecurus	*Alopecurus alpinus*
Shortawn foxtail	*Alopecurus aequalis*
Redtop	*Agrostis gigantea*
Spike bentgrass / Alaska bentgrass	*Agrostis exarata*
Rough bentgrass	*Agrostis scabra*
Merten's bentgrass / Northern bentgrass	*Agrostis mertensii*
Bentgrass / Ticklegrass	*Agrostis* sp.
Bluejoint / Bluejoint reedgrass	*Calamagrostis canadensis*
Slimstem reedgrass	*Calamagrostis stricta*
Circumpolar reedgrass	*Calamagrostis deschampsioides*
Tufted hairgrass	*Deschampsia cespitosa*
Bering's tufted hairgrass	*Deschampsia beringensis*
Hairgrass	*Deschampsia* sp.
Purple mountain hairgrass / Mountain hairgrass	*Vahlodea atropurpurea*
Spiked trisetum / Spike trisetum	*Trisetum spicatum*
Timber oat grass / Downy oat grass	*Danthonia intermedia*
Arctic bluegrass	*Poa arctica*
Arctic bluegrass	*Poa arctica* ssp. *arctica*
Arctic bluegrass	*Poa arctica* ssp. *lanata*
Eminent bluegrass / Large-flower bluegrass / Largeflower speargrass	*Poa eminens*
Largeglume bluegrass	*Poa macrocalyx*
Kentucky bluegrass	*Poa pratensis*

Glaucous bluegrass	*Poa glauca*
Fowl bluegrass	*Poa palustris*
Northern bluegrass	*Poa stenantha*
Annual bluegrass	*Poa annua*
Alaska bluegrass	*Poa paucispicula*
Bluegrass	*Poa* spp.
Weak alkali grass / Pale false manna grass	*Torreyochloa pallida*
Creeping alkali grass	*Puccinellia phryganodes*
Nootka alkali grass	*Puccinellia nutkaensis*
Dwarf alkali grass	*Puccinellia pumila*
Hulten's alkali grass	*Puccinellia hultenii*
Anderson's alkali grass	*Puccinellia andersonii*
Altai fescue	*Festuca altaica*
Alpine fescue	*Festuca brachyphylla*
Red fescue	*Festuca rubra*
Fescue	*Festuca* sp.
Fringed brome	*Bromus ciliatus*
Smooth brome	*Bromus inermis*
Pumpelly's brome / Smooth brome	*Bromus inermis* ssp. *pumpellianus*
Alaska brome / Sitka brome	*Bromus sitchensis*
Italian rye grass	*Lolium perenne*
Meadow barley	*Hordeum brachyantherum*
Squirreltail grass / Foxtail barley	*Hordeum jubatum*
Barley	*Hordeum* sp.
Beach rye grass / Lyme grass/ Seabeach lyme grass / American dune grass	*Leymus mollis* ssp. *mollis*
Quackgrass / Slender wheat grass	*Elymus trachycaulus* ssp. *trachycaulus*
Alaskan wheat grass	*Elymus alaskanus* ssp. *latiglumis*
Siberian wild rye	*Elymus sibiricus*
Wheat grass	*Elymus* sp.

<u>Family Cyperaceae (Sedges)</u>

Narrow-leaved cotton grass / Tall cotton grass	*Eriophorum angustifolium*
Tall cotton grass	*Eriophorum angustifolium* ssp. *subarcticum*
Tall cotton grass	*Eriophorum angustifolium* ssp. *triste*
Slender cotton grass	*Eriophorum gracile*
White cotton grass	*Eriophorum scheuchzeri*
Chamisso's cotton grass / Red cotton grass	*Eriophorum russeolum*
Red cotton grass	*Eriophorum russeolum* var. *albidum*

Arctic cotton grass	*Eriophorum brachyantherum*
Cotton grass	*Eriophorum* sp.
Alpine cotton grass / Alpine bulrush	*Trichophorum alpinum*
Tufted clubrush / Tufted bulrush	*Trichophorum caespitosum*
Creeping spike rush / Common spike rush	*Eleocharis palustris*
Kamchatka spike rush	*Eleocharis kamtschatica*
Needle spike rush	*Eleocharis acicularis*
Spikenard sedge / Spike sedge	*Carex nardina*
Yellow bog sedge / Northern bog sedge	*Carex gynocrates*
Single-spike sedge / Northern singlespike sedge	*Carex scirpoidea*
Bristle-stalked sedge / Bristly-stalked sedge	*Carex leptalea*
Yellow-flowered sedge / Grassy slope arctic sedge	*Carex anthoxanthea*
Coiled sedge	*Carex circinata*
Pyrenean sedge	*Carex pyrenaica* ssp. *micropoda*
Few-seeded bog sedge	*Carex microglochin*
Few-flowered sedge / Fewflower sedge	*Carex pauciflora*
Creeping sedge	*Carex chordorrhiza*
Lesser panicled sedge	*Carex diandra*
Large-headed sedge / Largehead sedge	*Carex macrocephala*
Thick-headed sedge / Chamisso sedge	*Carex pachystachya*
Presl's sedge	*Carex preslii*
Dunhead sedge	*Carex phaeocephala*
Liddon sedge	*Carex petasata*
Meadow sedge	*Carex praticola*
Closedhead sedge	*Carex norvegica* ssp. *inferalpina*
Gray sedge / Silvery sedge	*Carex canescens*
Soft-leaved sedge / Softleaf sedge	*Carex disperma*
Sparseflower sedge	*Carex tenuiflora*
Rye grass sedge	*Carex loliacea*
Smooth sedge / Smoothstem sedge	*Carex laeviculmis*
Bigelow's sedge	*Carex bigelowii*
Kellogg's sedge	*Carex lenticularis* var. *lipocarpa*
Water sedge	*Carex aquatilis*
Sitka sedge	*Carex aquatilis* var. *dives*

Hoppner's sedge	*Carex subspathacea*
Ramenski's sedge / Ramensk's sedge	*Carex ramenskii*
Lyngby's sedge / Lyngbye's sedge	*Carex lyngbyei*
Golden sedge	*Carex aurea*
Long-styled sedge / Variegated sedge	*Carex stylosa*
Gmelin's sedge	*Carex gmelinii*
Mertens' sedge	*Carex mertensii*
Long-awned sedge /	*Carex macrochaeta*
Shortstalk sedge	*Carex podocarpa*
Showy sedge	*Carex spectabilis*
Small-awned sedge	*Carex michrochaeta*
Bering Sea sedge	*Carex michrochaeta* ssp. *nesophila*
Several-flowered sedge / Manyflower sedge	*Carex pluriflora*
Shore sedge / Mud sedge	*Carex limosa*
Poor sedge / Bog sedge / Boreal bog sedge	*Carex magellanica*
Pale sedge / Livid sedge	*Carex livida*
Beaked sedge / Swollen beaked sedge	*Carex rostrata*
Northwest Territory sedge	*Carex utriculata*
Rock sedge	*Carex saxatilis*
Round sedge	*Carex rotundata*
Sedge	*Carex* spp.

Family Araceae (Arums)

Yellow skunk cabbage	*Lysichiton americanum*

Family Juncaceae (Rushes)

Arctic rush	*Juncus arcticus*
Drummond's rush	*Juncus drummondii*
Mertens' rush	*Juncus mertensianus*
Chestnut rush	*Juncus castaneus*
Spreading rush / Hairyleaf rush	*Juncus supiniformis*
Northern green rush	*Juncus alpinoarticulatus* ssp. *nodulosus*
Bog rush / Moor rush	*Juncus stygius*
Toad rush	*Juncus bufonius*
Small-flowered woodrush	*Luzula parviflora*
Many-flowered wood rush / Common wood rush	*Luzula multiflora* ssp. *multiflora*
Many-flowered wood rush / Common wood rush	*Luzula multiflora*
Spiked wood rush	*Luzula spicata*

Wood rush	*Luzula* sp.

Family Liliaceae (Lilies)

Northern asphodel	*Tofieldia coccinea*
Scotch false asphodel	*Tofieldia pusilla*
False asphodel / Sticky false asphodel / Sticky tofieldia	*Tofieldia glutinosa*
Green false Hellebore / Corn Lily	*Veratrum viride*
Wild chives	*Allium schoenoprasum*
Wild chives	*Allium schoenoprasum* var. *sibiricum*
Chocolate lily / Kamchatka fritillary / Indian rice	*Fritillaria biflora*
Common alp lily	*Lloydia serotina*
False lily-of-the-valley	*Maianthemum dilatatum*
Watermelon berry / Clasping twisted stalk / Wild cucumber / Claspleaf twisted stalk	*Streptopus amplexifolius*

Family Iridaceae (Irises)

Wild iris / Wild flag / Beachhead iris	*Iris setosa*
Alaska blue-eyed grass	*Sisyrinchium littorale*
Blue-eyed grass	*Sisyrinchium* sp.

Family Orchidaceae (Orchids)

Lady's slipper orchid / Spotted lady's slipper	*Cypripedium guttatum*
Keyflower	*Dactylorhiza aristata*
Frog orchis / Longbract frog orchid	*Coeloglossum viride*
Bog orchis	*Platanthera convallariiefolia*
Green-flowered bog orchid / Northern rein orchid / Northern green orchid	*Platanthera hyperborea*
White bog orchid / White rein orchid / Bog candle / Scent bottle	*Platanthera dilatata*
Blunt-leaved orchid	*Platanthera obtusata*
Fringed orchid / Bog orchid	*Platanthera* sp.
Ladies' tresses / Hooded ladies' tresses	*Spiranthes romanzoffiana*
Twayblade orchid / Heart-leafed twayblade /	*Listera cordata*

Heartleaf twayblade	
Lesser rattlesnake plantain	*Goodyera repens*
Yellow coralroot	*Corallorrhiza trifida*

Family Salicaceae (Willows)

Balsam poplar / Cottonwood	*Populus balsamifera*
Balsam poploar / Cottonwood	*Populus balsamifera* ssp. *balsamifera*
Black Cottonwood	*Populus balsamifera* ssp. *trichocarpa*
Quaking aspen/American aspen	*Populus tremuloides*
Netleaf willow	*Salix reticulata*
Netleaf willow	*Salix reticulata* ssp. *reticulata*
Least willow	*Salix rotundifolia*
Arctic willow	*Salix arctica*
Alaska bog willow	*Salix fuscescens*
Grayleaf willow	*Salix glauca*
Low blueberry willow / Blueberry willow	*Salix myrtillifolia*
Barclay's willow	*Salix barclayi*
Undergreen willow	*Salix commutata*
Feltleaf willow / Alaska willow	*Salix alaxensis*
Feltleaf willow / Alaska willow	*Salix alaxensis* var. *alaxensis*
Bebb willow	*Salix bebbiana*
Tealeaf willow	*Salix pulchra*
Scouler's willow	*Salix scouleriana*
Sitka willow	*Salix sitchensis*
Littletree willow	*Salix arbusculoides*
Willow	*Salix* spp.

Family Myricaceae (Wax Myrtles)

Sweet gale	*Myrica gale*

Family Betulaceae (Birches)

Dwarf birch	*Betula nana*
Kenai birch	*Betula papyrifera* var. *kenaica*
Paper birch	*Betula papyrifera*
Birch	*Betula* spp.
Mountain alder	*Alnus viridis* ssp. *crispa*
Sitka alder	*Alnus viridus* ssp. *sinuata*
Thin-leaf alder	*Alnus incana* ssp. *tenuifolia*
Alder	*Alnus* sp.

Family Urticaceae (Nettles)

California nettle / Stinging nettle	*Urtica dioica* ssp. *gracilis*

Family Santalaceae (Sandalwoods)

Bastard toad flax / False toad flax	*Geocaulon lividum*

Family Polygonaceae (Buckwheats)

Common sheep sorrel	*Rumex acetosella*
Arctic dock	*Rumex arcticus*
Western dock	*Rumex aquaticus* var. *fenestratus*
Dock	*Rumex* spp.
Alpine mountain sorrel	*Oxyria digyna*
Alpine bistort	*Polygonum viviparum*
Meadow bistort	*Polygonum bistorta*
Prostrate knotweed	*Polygonum aviculare*

Family Chenopodiaceae (Goosefoots)

Blite goosefoot	*Chenopodium capatatum*
Pigweed / Lamb's quarter	*Chenopodium album*
Salt orach / Spearscale / Seashore saltbush	*Atriplex drymarioides*
Gmelin's saltbush	*Atriplex gmelinii*
Alaska orach	*Atriplex alaskensis*
Spear saltbush / Spearscale / Spear orach	*Atriplex patula*
Orach / Saltbush / Seascale / Shadscale / Sea purslane	*Atriplex* spp.
Glasswort / Chicken's claw / Slender grasswort	*Salicornia maritima*
Saltwort / Sea pickle / Pursh seepweed / Sea blite	*Suaeda calceoliformis*

Family Portulacaceae (Purslanes)

Siberian spring beauty / Candy flower	*Claytonia sibirica*
Chamisso's spring beauty / Chamisso's montia / Water miners lettuce	*Montia chamissoi*
Water blinks / Annual water miners lettuce	*Montia fontana*

Family Caryophyllaceae (Pinks)

Common garden chickweed / Common chickweed	*Stellaria media*
Crisp sandwort / Curled starwort	*Stellaria crispa*
Saltmarsh starwort	*Stellaria humifusa*
Northern sandwort /	*Stellaria calycantha*

Northern starwort	
Boreal starwort	*Stellaria borealis*
Sitka starwort	*Stellaria borealis* ssp. *sitchana*
Boreal startwort	*Stellaria borealis* ssp. *borealis*
Long-stalked starwort / Longstalk starwort	*Stellaria longipes*
Chickweed / Starwort	*Stellaria* sp.
Fischer's chickweed	*Cerastium fischerianum*
Field chickweed	*Cerastium arvense*
Mouse-ear chickweed	*Cerastium* spp.
Arctic pearlwort	*Sagina saginoides*
Stickystem pearlwort	*Sagina maxima* ssp. *crassicaulis*
Pearlwort	*Sagina* sp.
Sandwort / Longpod stitchwort	*Minuartia macrocarpa*
Arctic stitchwort	*Minuartia arctica*
Twinflower sandwort	*Minuartia obtusiloba*
Boreal sandwort / Reddish sandwort / Beautiful sandwort	*Minuartia rubella*
Stitchwort	*Minuartia* spp.
Beach greens / Seabeach sandwort / Sea purslane / Seaside sandplant	*Honckenya peploides*
Slender mountain sandwort	*Arenaria capillaris*
Grove sandwort / Blunt-leaved sandwort / Bluntleaf sandwort	*Moehringia lateriflora*
Merckia	*Wilhelmsia physodes*
Canadian sandspurry	*Spergularia canadensis*
Moss campion / Cushion pink	*Silene acaulis*
Apetalous catchfly	*Silene uralensis* ssp. *uralensis*
Arctic catchfly	*Silene involucrata* ssp. *involucrata*
Bladder campion	*Silene* sp.
Wild carnation / Boreal carnation	*Dianthus repens*

Family Nymphaeaceae (Water Lilies)

Yellow pond lily / Yellow water lily / Spatterdock / Rocky Mountain pond lily	*Nuphar lutea* ssp. *polysepala*

Family Ceratophyllaceae (Hornworts)

Hornwort / Coon's tail	*Ceratophyllum demersum*

Family Ranunculaceae (Crowfoots / Buttercups)

Alpine white marsh marigold / White marsh marigold	*Caltha leptosepala*

Yellow marsh marigold	*Caltha palustris*
Yellow marsh marigold	*Caltha palustris* var. *palustris*
Yellow marsh marigold	*Caltha palustris* var. *radicans*
Fern-leaved goldthread / Fernleaf goldthread	*Coptis aspleniifolia*
Three-leaved goldthread / Threeleaf goldthread	*Coptis trifolia*
Red baneberry / Snakeberry	*Actaea rubra*
Red baneberry / Snakeberry	*Actaea rubra* ssp. *arguta*
Western columbine	*Aquilegia formosa*
Tall larkspur / Glaucous larkspur / Sierra larkspur	*Delphinium glaucum*
Mountain monkshood / Larkspurleaf monkshood	*Aconitum delphiniifolium*
Larkspurleaf monkshood	*Anconitum delphiniifolium* ssp. *delphiniifolium*
Yellow anemone / Richardson's anemone / Yellow thimbleweed	*Anemone richardsonii*
Northern anemone / Small-flowered anemone	*Anemone parviflora*
Narcissus anemone / Narcissus-flowered anemone	*Anemone narcissiflora*
Narcissus anemone	*Anemone narcissiflora* var. *monantha*
Cut-leaf anemone / Pacific anemone	*Anemone multifida*
Drummond's anemone	*Anemone drummondii*
High northern buttercup	*Ranunculus hyperboreus*
Lapland buttercup	*Ranunculus lapponicus*
Shore buttercup / Alkali buttercup / Marsh buttercup	*Ranunculus cymbalaria*
Mountain buttercup / Subalpine buttercup / Snowpatch buttercup / Eschscholtz's buttercup	*Ranunculus eschscholtzii*
Snow buttercup	*Ranunculus nivalis*
Littleleaf buttercup	*Ranunculus abortivus*
Little buttercup / Small-flowered buttercup / Idaho buttercup	*Ranunculus uncinatus* var. *parviflorus*
Western buttercup	*Ranunculus occidentalis*
Buttercup	*Ranunculus* spp.
Alpine meadow rue	*Thalictrum alpinum*
Few-flowered meadow rue / Fewflower meadow rue	*Thalictrum sparsiflorum*
Hulten's meadow rue	*Thalictrum hultenii*
Meadow rue	*Thalictrum* sp.

Family Papaveraceae (Poppies)

White poppy / Pale poppy	*Papaver alboroseum*

Family Fumariaceae (Earth Smokes)

Blue corydalis / Fewflower fumewort	*Corydalis pauciflora*

Family Brassicaceae - was Cruciferae (Mustards)

Arctic pennycress	*Thlaspi arcticum*
Danish scurvy grass	*Cochlearia groenlandica*
American sea rocket	*Cakile edentula*
Bird's rape / Field mustard	*Brassica rapa*
Winter cress / American yellow rocket	*Barbarea orthoceras*
Yellow cress	*Rorippa* sp.
Hispid yellow cress	*Rorippa palustris* ssp. *hispida*
Hoary yellow cress	*Rorippa barbareifolia*
Alpine bitter cress	*Cardamine bellidifolia*
Pennsylvania bitter cress	*Cardamine pensylvanica*
Cuckoo flower	*Cardamine pratensis*
Cuckoo flower	*Cardamine pratensis* var. *angustifolia*
Kamchatka rock cress / Few-seeded bitter cress / Little western bitter cress / Wild water cress / Umbel bitter cress	*Cardamine oligosperma*
Shepherd's purse	*Capsella bursa-pastoris*
Yellow arctic draba	*Draba nivalis*
Lance-fruited draba / Lancepod draba	*Draba lonchocarpa*
Rainier draba	*Draba ruaxes*
Palander's draba	*Draba palanderiana*
Yellowstone draba	*Draba incerta*
Alpine draba	*Draba alpina*
Milky draba	*Draba lactea*
Alaska draba	*Draba stenoloba*
White draba / Boreal draba	*Draba borealis*
Golden draba	*Draba aurea*
Woodland draba	*Draba nemorosa*
Arctic draba / North Pacific draba	*Draba hyperborea*
Draba	*Draba* spp.
Kamchatka rockcress	*Arabis kamchatica*
Hairy arabis / Eschscholtz's rockcress	*Arabis eschscholtziana*
Creamflower rockcress	*Arabis hirsuta* var. *pycnocarpa*
Spreadingpod rockcress	*Arabis divaricarpa*

Holboell's rockcress	*Arabis holboellii*
Wormseed mustard / Wormseed wallflower	*Erysimum cheiranthoides*
Shy wallflower	*Erysimum inconspicuum*
Yellow Rocket / Wallflower	*Erysimum* sp.

Family Droseraceae (Sundews)

Great sundew / English sundew	*Drosera anglica*
Round-leaved sundew / Roundleaf sundew	*Drosera rotundifolia*

Family Crassulaceae (Stonecrops)

Roseroot / Ledge stonecrop	*Rhodiola integrifolia* ssp. i*ntegrifolia*

Family Saxifragaceae (Saxifrages)

Leather-leaved saxifrage / Fireleaf leptarrhena	*Leptarrhena pyrolifolia*
Purple mountain saxifrage	*Saxifraga oppositilofia*
Cushion saxifrage / Ciliate saxifrage	*Saxifraga eschscholtzii*
Thymeleaf saxifrage	*Saxifraga serpyllifolia*
Bog saxifrage / Yellow marsh saxifrage	*Saxifraga hirculus*
Spotted saxifrage / Yellowdot saxifrage	*Saxifraga bronchialis*
Funston's saxifrage	*Saxifraga bronchialis* ssp. *funstonii*
Prickly saxifrage / Three-toothed saxifrage	*Saxifraga tricuspidata*
Heart-leaved saxifrage / Cordate-leaved saxifrage / Heartleaf saxifrage	*Saxifraga nelsoniana* ssp. *nelsoniana*
Cordate-leaved saxifrage / Pacific saxifrage	*Saxifraga nelsoniana* ssp. *pacifica*
Brook saxifrage / Weak saxifrage	*Saxifraga rivularis*
Red-stemmed saxifrage / Redstem saxifrage	*Saxifraga lyallii*
Snow saxifrage / Alpine saxifrage	*Saxifraga nivalis*
Coast saxifrage / Coastal saxifrage / Russethair saxifrage	*Saxifraga ferruginea*
Grained saxifrage / Leafystem saxifrage	*Saxifraga foliolosa*
Tufted alpine saxifrage	*Saxifraga caespitosa*
Foam flower / Lace flower /	*Tiarella trifoliata*

Threeleaf foamflower	
Smooth alum root / Alpine heuchera	*Heuchera glabra*
Fringe cups / Bigflower tellima	*Tellima grandiflora*
Five-stamened mitrewort /	*Mitella pentandra*
Northern water carpet / Northern golden saxifrage	*Chrysosplenium tetradrum*
Water carpet	*Chrysosplenium* sp.
Grass-of-Parnassus	*Parnassia palustris*
Northern grass-of-Parnassus/ Bog star / Marsh grass-of-Parnassus	*Parnassia palustris* var. *tenuis*
Kotzebue's grass-of-Parnassus	*Parnassia kotzebuei*

Family Grossulariaceae (Currents)

Stink currant	*Ribes bracteosum*
Northern black currant	*Ribes hudsonianum*
Skunk currant	*Ribes glandulosum*
Trailing black currant / Trailing currant	*Ribes laxiflorum*
Northern red currant / Red currant	*Ribes triste*
Currant	*Ribes* spp.

Family Rosaceae (Roses)

Alaska spiraea / Beauverd's spiraea	*Spiraea stevenii*
Partridgefoot	*Luetkea pectinata*
Goatsbeard / Bride's feathers	*Aruncus dioicus* var. *vulgaris*
Oregon crab apple	*Malus fusca*
Greene's mountain ash	*Sorbus scopulina*
Native mountain ash / Western mountain ash	*Sorbus sitchensis*
Serviceberry / Saskatoon serviceberry	*Amelanchier alnifolia*
Pacific serviceberry	*Amelanchier florida*
Serviceberry	*Amelanchier* sp.
Trailing Raspberry / Strawberryleaf raspberry	*Rubus pedatus*
Cloudberry	*Rubus chamaemorus*
Nagoonberry / Arctic blackberry / Dewberry	*Rubus arcticus*
Arctic blackberry	*Rubus arcticus* ssp. *arcticus*
Dwarf raspberry	*Rubus arcticus* ssp. *acaulis*
Common raspberry / American red raspberry	*Rubus idaeus*
Salmonberry	*Rubus spectabilis*

Coastal strawberry / Pacific beach strawberry	*Fragaria chiloensis* ssp. *pacifica*
Strawberry	*Fragaria* sp.
Marsh five-finger / Purple marshlocks	*Comarum palustre*
Tundra rose / Shrubby cinquefoil	*Dasiphora floribunda*
Villous cinquefoil	*Potentilla villosa*
One-flowered cinquefoil	*Potentilla uniflora*
Arctic cinquefoil	*Potentilla nana*
Norwegian cinquefoil	*Potentilla norvegica*
Hooker's cinquefoil	*Potentilla hookeriana* ssp. *hookeriana*
Staghorn cinquefoil	*Potentilla bimundorum*
Diverse-leaved cinquefoil / Varileaf cinquefoil	*Potentilla diversifolia*
Cinquefoil	*Potentilla* sp.
Silverweed cinquefoil	*Argentina anserina*
Pacific silverweed	*Argentina egedii* ssp. *egedii*
Creeping sibbaldia	*Sibbaldia procumbens*
Yellow geum / Large-leaved avens / Largeleaf avens	*Geum macrophyllum*
Caltha-leaved avens / Calthaleaf avens	*Geum calthifolium*
Ross' geum / Ross' avens	*Geum rossii*
Yellow dryas / Yellow mountain avens / Drummond's mountain avens	*Dryas drummondii*
White dryas / Eightpetal mountain avens	*Dryas octopetala*
Entire-leaved mountain avens / Entireleaf mountain avens	*Dryas integrifolia*
Entireleaf mountain avens	*Dryas integrifolia* ssp. *integrifolia*
Menzies' burnet	*Sanguisorba menziesii*
Sitka burnet / Sitka great burnet / Canadian burnet	*Sanguisorba canadensis*
Burnet	*Sanguisorba* sp.
Prickly rose / Wild rose	*Rosa acicularis*
Nootka rose	*Rosa nutkana*

Family Leguminosae / Fabaceae (Peas)

Arctic lupine	*Lupinus arcticus*
Nootka lupine	*Lupinus nootkatensis*
Alsike clover	*Trifolium hybridum*
White clover	*Trifolium repens*
Red clover	*Trifolium pratense*
Clover	*Trifolum* spp.

Alpine milk vetch	*Astragalus alpinus*
Blackish oxytrope / Purple oxytrope	*Oxytropis nigrescens*
Field locoweed	*Oxytropis campestris*
Field locoweed	*Oxytropis campestris* var. *varians*
Alpine sweet vetch	*Hedysarum alpinum*
Beach peavine / Beach pea	*Lathyrus japonicus*
Vetchling / Marsh pea	*Lathyrus palustris*

Family Geraniaceae (Geraniums)

Wild geranium / Woolly geranium / Sticky geranium	*Geranium erianthum*

Family Balsaminaceae (Touch-Me-Nots)

Western touch-me-not / Common touch-me-not / Jewelweed	*Impatiens noli-tangere*

Family Violaceae (Violets)

Pioneer violet / Stream violet / Yellow wood violet	*Viola glabella*
Aleutian violet / Alaska violet	*Viola langsdorfii*
Hookedspur violet / Western dog violet / Early blue violet	*Viola adunca*
Selkirk's violet	*Viola selkirkii*
Dwarf marsh violet	*Viola epipsila* ssp. *repens*
Violet	*Viola* sp.

Family Elaeagnaceae (Oleasters)

Soapberry / Russet buffalo berry	*Shepherdia canadensis*

Family Onagraceae (Evening Primroses / Fireweeds)

Tall fireweed	*Chamerion angustifolium* ssp. *angustifolium*
Dwarf fireweed / River beauty	*Chamerion latifolium*
Marsh willow herb	*Epilobium palustre*
Pimpernel willow herb	*Epilobium anagallidifolium*
Hornemann's willow herb	*Epilobium hornemannii* ssp. *behringianum*
Small-leaved fireweed / Fringed willow herb	*Epilobium ciliatum* ssp. *ciliatum*
Fringed willow herb / Glandular willow herb	*Epilobium ciliatum* ssp. *glandulosum*
Willow herb	*Epilobium* sp.
Small enchanter's nightshade	*Circaea alpine*

Family Hippuridaceae - was Haloragaceae (Water Milfoils)

Common mare's tail	*Hippuris vulgaris*

Four-leaved mare's tail / Fourleaf mare's tail — *Hippuris tetraphylla*

Family Araliaceae (Ginsengs)

Devil's club — *Oplopanax horridus*

Family Apiaceae - was Umbelliferae (Parsleys)

Purple sweet cicely / Purple sweet root — *Osmorhiza purpurea*

Blunt-fruited sweet cicely / Bluntseed sweet root — *Osmorhiza depauperata*

Thoroughwax / American thorow wax — *Bupleurum americanum*

Western water hemlock / Douglas' water hemlock — *Cicuta douglasii*

Mackenzie's water hemlock — *Cicuta virosa*

Jakutsk snow parsley — *Cnidium cnidiifolium*

Beach lovage / Scotch lovage / Sea lovage / Scotch licorice root / Scottish licorice-root — *Ligusticum scoticum*

Hulten's licorice root — *Ligusticum scoticum* ssp. *hultenii*

Pacific hemlockparsley — *Conioselinum gmelinii*

Angelica / Seawatch angelica / Seacoast angelica — *Angelica lucida*

Kneeling angelica — *Angelica genuflexa*

Common cow parsnip / Pushki or Pootschki — *Heracleum maximum*

Family Cornaceae (Dogwoods)

Swedish dwarf cornel / Lapland cornel — *Cornus suecica*

Bunchberry / Dwarf dogwood / Canadian dwarf cornel / Bunchberry dogwood — *Cornus canadensis*

Hybrid dwarf dogwood — *Cornus canadensis* x *suecica*

Family Pyrolaceae (Wintergreens)

Pipsissewa — *Chimaphila umbellata* ssp. *occidentalis*

Pink wintergreen / Pink pyrola / Liverleaf wintergreen / Woodland wintergreen — *Pyrola asarifolia*

Large-flowered wintergreen / Arctic wintergreen — *Pyrola grandiflora*

Small pyrola / Snowline wintergreen — *Pyrola minor*

Round-leafed pyrola / — *Pyrola chlorantha*

Green-flowered wintergreenn	
Pyrola / Wintergreen	*Pyrola* sp.
One-sided wintergreen / Sidebells wintergreen	*Orthilia secunda*
Shy maiden / Single delight	*Moneses uniflora*

Family Empetraceae (Crowberries)

Black crowberry / Moss berry	*Empetrum nigrum*

Family Ericaceae (Heaths)

Copper flower / Copperbush	*Cladothamnus pyrolaeflorus*
Northern Labrador tea / Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*
Bog Labrador tea / Rusty Labrador-tea	*Ledum groenlandicum*
Kamchatka rhododendron	*Rhododendron camtschaticum*
Kamchatka rhododendron	*Rhododendron camtschaticum* ssp. *camtschaticum*
False azalea / Rusty menzesia	*Menziesia ferruginea*
Alpine azalea	*Loiseleuria procumbens*
Yellow mountain heather / Aleutian mountain heath	*Phyllodoce glanduliflora*
White arctic mountain heather	*Cassiope tetragona*
Alaska moss heather / Alaska mountain heather / Alaska bellheather	*Harrimanella stelleriana*
Clubmoss mountain heather	*Cassiope lycopodioides*
Bog rosemary	*Andromeda polifolia*
Cassandra / Leatherleaf	*Chamaedaphne calyculata*
Kinnikinnick / Chipmunk's apples / mealberry	*Arctostaphylos uva-ursi*
Alpine bearberry / Black bear's grapes / Alpine bear grapes	*Arctostaphylos alpina*
Red fruit bearberry / Red bear's grape	*Arctostaphylos rubra*
Lingonberry / Lowbush cranberry	*Vaccinium vitis-idaea*
Dwarf blueberry / Dwarf bilberry	*Vaccinium cespitosum*
Oval-leaved blueberry / Oval-leaf blueberry / Early blueberry	*Vaccinium ovalifolium*
Bog blueberry	*Vaccinium uliginosum*
Bog cranberry / True cranberry / Small cranberry	*Vaccinium oxycoccos*

Family Diapensiaceae (Diapensias)

Lapland diapensia / Pincushion plant	*Diapensia lapponica*

Family Primulaceae (Primroses)

Pixie eyes / Wedgeleaf primrose	*Primula cuneifolia*
Wedgeleaf primrose	*Primula cuneifolia* ssp. *saxifragifolia*
Pygmy flower rock jasmine	*Androsace septentrionalis*
Alaska androsace / Alaska douglasia	*Douglasia alaskana*
Rock jasmine	*Androsace* spp.
Few-flowered shooting star / Pretty shooting star / Darkthroat shooting star	*Dodecatheon pulchellum*
Shooting star	*Dodecatheon* sp.
Arctic starflower	*Trientalis europaea*
Arctic starflower	*Trientalis europaea* ssp. *arctica*
Sea milkwort	*Glaux maritime*

Family Plumbaginaceae (Leadworts)

Thrift / Thrift sea pink	*Armeria maritime*

Family Gentianaceae (Gentians)

Whitish gentian	*Gentian algida*
Broad-petaled gentian	*Gentiana platypetala*
Inky gentian / Glaucous gentian / Pale gentian	*Gentiana glauca*
Swamp gentian	*Gentiana douglasiana*
Autumn dwarf gentian / Northern gentian	*Gentiana amarella* ssp. *acuta*
Fourpart dwarf gentian	*Gentiana propinqua* ssp. *propinqua*
Star gentian / Marsh felwort	*Lomatogonium rotatum*
Alpine bog swertia / Felwort	*Swertia perennis*

Family Menyanthaceae (Buckbeans)

Buckbean / Bogbean	*Menyanthes trifoliate*

Family Polemoniaceae (Polemoniums)

Tall jacob's ladder	*Polemonium acutiflorum*
Northern jacob's ladder	*Polemonium boreale*
Short jacob's ladder / Beautiful jacob's ladder	*Polemonium pulcherrimum*

Family Hydrophyllaceae (Waterleafs)

Sitka mistmaiden / Sitka romanzoffia	*Romanzoffia sitchensis*

Family Boraginaceae (Borages)

Alpine forget-me-not / Asian forget-me-not	*Myosotis asiatica*
Oysterleaf / Sea Lungwort	*Mertensia maritima*
Tall bluebells / Lungwort	*Mertensia paniculata*

Family Lamiaceae - was Labiatae (Mints)

Common self-heal / Heal-all	*Prunella vulgaris*
Splitlip hemp nettle	*Galeopsis bifida*

Family Scrophulariaceae (Figworts)

Yellow monkeyflower / Seep monkeyflower	*Mimulus guttatus*
American speedwell	*Veronica americana*
American alpine speedwell	*Veronica wormskjoldii*
Yellow paintbrush / Unalaska paintbrush / Alaska Indian paintbrush	*Castilleja unalaschcensis*
Subalpine eyebright	*Euphrasia mollis*
Eyebright	*Euphrasia disjuncta*
Yellow rattle / Arctic rattlebo	*Rhinanthus minor* ssp. *groenlandicus*
Verticulate lousewort / Whorled lousewort	*Pedicularis verticillata*
Common yellow lousewort / Labrador lousewort	*Pedicularis labradorica*
Big-toothed lousewort / Muskeg lousewort	*Pedicularis macrodonta*
Langsdorf's lousewort	*Pedicularis langsdorfii*
Sudetic lousewort	*Pedicularis sudetica* ssp. *interior*
Capitate lousewort	*Pedicularis capitata*
Oeder's lousewort	*Pedicularis oederi*
Woolly lousewort / Kenai lousewort	*Pedicularis kanei*

Family Orobanchaceae (Broomrapes)

Northern groundcone / Broomrape	*Boschniakia rossica*

Family Lentibulariaceae (Bladderworts)

Common butterwort	*Pinguicula vulgaris*
Hairy butterwort	*Pinguicula villosa*

Flat-leaved bladderwort / Flatleaf bladderwort	*Utricularia intermedia*
Bladderwort	*Utricularia* sp.

Family Plantaginaceae (Plantains)

Goose tongue / Seaside plantain	*Plantago maritima*
Goosetongue	*Plantago maritima* var. *juncoides*
Ribgrass / Narrowleaf plantain	*Plantago lanceolata*
Common plantain / Broad-leaved plantain	*Plantago major*
Plantain	*Plantago* sp.

Family Rubiaceae (Madders)

Northern bedstraw	*Galium boreale*
Sweet-scented bedstraw / Fragrant bedstraw	*Galium triflorum*
Small bestraw / Threepetal bedstraw	*Galium trifidum*
Threepetal bedstraw	*Galium trifidum* ssp. *trifidum*
Bedstraw	*Galium* spp.

Family Caprifoliaceae (Honeysuckles)

Red-berried elder / Red elderberry / Red elder	*Sambucus racemosa*
Highbush cranberry / Squashberry	*Viburnum edule*
Twinflower	*Linnaea borealis*

Family Adoxaceae (Moschatels)

Musk root / Moschatel	*Adoxa moschatellina*

Family Valerianaceae (Valerians)

Capitate valerian / Captiate valerian	*Valeriana capitata*
Sitka valerian	*Valeriana sitchensis*

Family Campanulaceae (Bluebells)

Mountain harebell / Common harebell	*Campanula lasiocarpa*
Common harebell / Bluebells of Scotland / Blue bell / Bell flower / Bluebell bellflower	*Campanula rotundifolia*

Family Asteraceae - was Compositae (Composites)

Northern goldenrod / Rocky Mountain goldenrod	*Solidago multiradiata*
Rocky Mountain goldenrod	*Solidago multiradiata* var. *multiradiata*
Canada goldenrod	*Solidago canadensis*
Arctic aster / Siberian aster	*Eurybia sibirica*
Douglas aster	*Symphyotrichum subspicatum* var. *subspicatum*
Arctic alpine fleabane / Arctic daisy	*Erigeron humilus*
Tundra fleabane	*Erigeron hyperboreus*
Bitter fleabane	*Erigeron acris*
Coastal fleabane / Subalpine daisy / Subalpine fleabane	*Erigeron peregrinus*
Subalpine fleabane	*Erigeron peregrinus* ssp. *peregrinus*
Single-headed pussytoes / Pygmy pussytoes	*Antennaria monocephala*
Alpine pussytoes	*Antennaria alpina*
Fries' pussytoes / Alpine pussytoes	*Antennaria friesiana* ssp. *alaskana*
Rosy pussytoes	*Antennaria rosea*
Pulvinate pussytoes	*Antennaria rosea* ssp. *pulvinata*
Pussytoes	*Antennaria* spp.
Common yarrow / Northern yarrow / Boreal yarrow	*Achillea millefolium* var. *borealis*
Yarrow	*Achillea* sp.
Pineapple weed / Disc mayweed	*Matricaria discoidea*
Arctic daisy	*Dendranthema arcticum* ssp. *arcticum*
Common wormwood / Telesii's wormwood / Tilesius' wormwood	*Artemisia tilesii*
Arctic wormwood / Mountain sagwort / Boreal sagebrush	*Artemisia arctica*
Boreal sagebrush	*Artemisia arctica* ssp. *arctica*
Arctic sweet coltsfoot	*Petasites frigidus*
Arctic sweet coltsfoot	*Petasites frigidus* var. *nivalis*
Alpine nodding arnica / Nodding arnica / Lessing arnica	*Arnica lessingii*
Snow arnica	*Arnica frigida*
Mountain arnica / Broadleaf arnica	*Arnica latifolia*
Meadow arnica / Chamisso arnica	*Arnica chamissonis*
Chamisso arnica	*Arnica chamissonis* ssp. *chamissonis*
Alpine arnica	*Arnica* sp.
Rayless alpine butterweed	*Senecio pauciflorus*
Common groundsel /	*Senecio vulgaris*

Old-man-in-the-Spring	
Seabeach groundsel / Beach sunflower / Beach daisy / Seaside ragwort	*Senecio pseudoarnica*
Arrow-leaved groundsel / Arrow leaf ragwort	*Senecio triangularis*
Black-tipped groundsel / Small blacktip ragwort	*Senecio lugens*
Common dandelion	*Taraxacum officinale*
Common dandelion / Horned dandelion	*Taraxacum officinale* ssp. *ceratophorum*
Harp dandelion / Kamchatka dandelion	*Taraxacum lyratum*
Dandelion	*Taraxacum* sp.
Short-beaked agoseris / Pale agoseris	*Agoseris glauca*
Dwarf hawksbeard / Dwarf alpine hawksbeard	*Crepis nana*
Western rattlesnake root	*Prenanthes alata*
Rattlesnake root	*Prenanthes* sp.
Wooly hawkweed	*Hieracium triste*
Slender hawkweed	*Hieracium gracile*
Orange hawkweed	*Hieracium aurantiacum*

Kachemak Bay Fish

Family Petromyzontidae (Lampreys)	
Pacific lamprey	*Lampetra tridentate*
Family Lamnidae (Mackerel Sharks)	
Salmon shark / Mackerel shark	*Lamna ditropis*
Family Squalidae (Dogfish Sharks)	
Pacific sleeper shark	*Somniosus pacificus*
Spiny dogfish	*Squalus acanthias*
Family Rajidae (Skates)	
Alaska skate	*Bathyraja parmifera*
Big skate	*Raja binoculata*
Longnose skate	*Raja rhina*
Bering skate / Sandpaper skate	*Bathyraja interrupta*
Unidentified skate	*Rajidae sp.*
Family Congridae (Conger eels)	
Unidentified conger eel	Congridae sp.
Family Clupeidae (Herrings)	
Pacific herring	*Clupea pallasii*
Family Osmeridae (Smelts)	
Capelin / Grunion / Candlefish	*Mallotus villosus*
Rainbow smelt	*Osmerus mordax*
Longfin smelt	*Spirinchus thaleichthys*
Eulachon / Hooligan / Columbia River smelt / Candlefish	*Thaleichthys pacificus*
Unidentified smelt	*Osmeridae sp.*
Family Salmonidae (Trouts and Salmons)	
Bering cisco	*Coregonus laurettae*
Pink salmon / Pink / Humpy salmon / Humpy / Humpback	*Oncorhynchus gorbuscha*
Chum salmon / Chum / Dog salmon / Dog / Calico	*Oncorhynchus keta*
Silver salmon / Coho salmon	*Oncorhynchus kisutch*
Rainbow trout or Steelhead	*Oncorhynchus mykiss*
Red salmon / Red / Blueback / Sockeye salmon / Sockeye / Kokanee (landlocked fish only)	*Oncorhynchus nerka*
King salmon / King / Blackmouth / Spring / Chinook salmon / Chinook / Quinnat / Tyee / Tule	*Oncorhynchus tshawytscha*

Dolly Varden / Pacific brook char	*Salvelinus malma*

Family Moridae (Codlings)

Unidentified codlings	*Moridae spp.*

Family Gadidae (Cods)

Saffron cod	*Eleginus gracilis*
Pacific cod / Gray cod / True cod	*Gadus macrocephalus*
Cod	*Gadus* sp.
Pacific tomcod / Tomcod	*Microgadus proximus*
Unidentified cod	*Gadidae sp*.
Walleye pollock / Pacific pollock / Bigeye pollock	*Theragra chalcogramma*

Family Trachipteridae (Ribbonfishes)

King-of-the-salmon	*Trachipterus altivelis*

Family Gasterosteidae (Sticklebacks)

Tube-snout	*Aulorhynchus flavidus*
Threespine stickleback	*Gasterosteus aculeatu*
Ninespine stickleback	*Pungitus pungitius*

Family Syngnathidae (Pipefishes)

Bay pipefish	*Syngnathus leptorhynchus*

Family Scorpaenidae (Scorpionfishes and Rockfishes)

Rougheye rockfish / Blacktip rockfish	*Sebastes aleutianus*
Pacific ocean perch / Longjaw rockfish / Pop rockfish	*Sebastes alutus*
Redbanded rockfish / Bandit / Barber pole	*Sebastes babcocki*
Shortraker rockfish / Buoy keg	*Sebastes borealis*
Silvergray rockfish	*Sebastes brevispinus*
Copper rockfish	*Sebastes caurinus*
Dark rockfish /Brown bomber Dark dusky rockfish	*Sebastes ciliatus* (dark morph)
Darkblotched rockfish / Blackblotched rockfish	*Sebastes crameri*
Yellowtail rockfish / Greenie	*Sebastes flavidus*
Quillback rockfish	*Sebastes maliger*
Black rockfish / Black bass	*Sebastes melanops*
China rockfish	*Sebastes nebulosus*
Northern rockfish	*Sebastes polyspinus*

Redstripe rockfish	*Sebastes proriger*
Yelloweye rockfish / Rasphead rockfish /Red snapper	*Sebastes ruberrimus*
Dusky rockfish / Light dusky rockfish	*Sebastes variabilis* (light morph)
Unidentified rockfish	*Sebastes* sp.

Family Anoplopomatidae (Sablefishes)

Sablefish / Black cod	*Anoplopoma fimbria*

Family Hexagrammidae (Greenlings)

Kelp greenling	*Hexagrammos decagrammus*
Whitespotted greenling	*Hexagrammos stelleri*
Rock greenling	*Hexagrammos lagocephalus*
Atka mackerel	*Pleurogrammus monopterygius*
Greenling	*Hexagrammos* spp.
Lingcod	*Ophiodon elongatus*
Unidentified greenling	Hexagrammidae sp.

Family Cottidae (Sculpins)

Bonyhead sculpin / Bonehead sculpin	*Artedius notopilotus*
Sharpnose sculpin	*Clinocottus acuticeps*
Slimy sculpin	*Cottus cognatus*
Bull sculpin	*Enophrys taurina*
Armorhead sculpin	*Gymnocanthus galeatus*
Sculpin	*Gymnocanthus* spp.
Red Irish lord	*Hemilepidotus hemilepidotus*
Yellow Irish lord	*Hemilepidotus jordani*
Brown Irish lord	*Hemilepidotus spinosus*
Irish lord	*Heimilepidotus* sp.
Northern sculpin	*Icelinus borealis*
Sculpin	*Icelus* spp.
Pacific staghorn sculpin	*Leptocottus armatus*
Great sculpin	*Myoxocephalus polyacanthocephalus*
Sculpin	*Myoxocephalus* spp.
Tidepool sculpin	*Oligocottus maculosus*
Slim sculpin	*Radulinus asprellus*
Manacled sculpin	*Synchirus gilli*
Scissortail sculpin	*Triglops forficatus*
Roughspine sculpin	*Triglops macellus*
Ribbed sculpin	*Triglops pingeli*

Family Hemitripteridae (Sailfin Sculpins)

Silverspotted sculpin	*Blepsias cirrhosus*
Bigmouth sculpin	*Hemitripterus bolini*

Sailfin sculpin	*Nautichthys oculofasciatus*
Eyeshade sculpin	*Nautichthys pribilovius*

Family Psychrolutidae (Fathead Sculpins)

Spinyhead sculpin	*Dasycottus setiger*
Darkfin sculpin	*Malacocottus zonurus*
Tadpole sculpin	*Psychrolutes paradoxus*

Family Rhamphocottidae (Grunt Sculpins)

Grunt sculpin	*Rhamphocottus richardsoni*

Family Agonidae (Poachers)

Smooth alligatorfish	*Anoplagonus inermis*
Aleutian alligatorfish	*Aspidophoroides bartoni*
Alligatorfish	*Aspidophoroides monopterygius*
Gray starsnout	*Bathyagonus alascanus*
Spinycheek starsnout / Spinycheek starsnout poacher	*Bathyagonus infraspinatus*
Starsnout poacher	*Bathyagonus* sp.
Tubenose poacher	*Pallasina barbata*
Sturgeon poacher	*Podothecus acipenserinus*
Sawback poacher	*Sarritor frenatus*
Unidentified poacher	Agonidae sp.

Family Cyclopteridae / Liparididae (Snailfishes)

Pacific spiny lumpsucker	*Eumicrotremus orbis*
Tidepool snailfish	*Liparis florae*
Variegated snailfish	*Liparis gibbus*
Snailfish	*Liparis* spp.
Unidentified snailfishes	Liparididae spp.
Unidentified lumpsucker	Cyclopteridae sp.

Family Serranidae (Sea basses)

Unidentified sea bass	Serranidae sp.

Family Bathymasteridae (Ronquils)

Alaskan ronquil	*Bathymaster caeruleofasciatus*
Searcher	*Bathymaster signatus*
Northern ronquil	*Ronquilus jordani*
Unidentified ronquil	Bathymasteridae sp.

Family Zoarcidae (Eelpouts)

Shortfin eelpout	*Lycodes brevipes*
Wattled eelpout	*Lycodes palearis*
Unidentified eelpout	Zoarcidae sp.

Family Stichaeidae (Pricklebacks)

Decorated warbonnet	*Chirolophis decoratus*
Mosshead warbonnet	*Chirolophis nugator*
Matcheek warbonnet	*Chirolophis tarsodes*
Longsnout prickleback	*Lumpenella longirostris*
Slender eelblenny	*Lumpenus fabricii*
Daubed shanny	*Lumpenus maculatus*
Stout eelblenny	*Lumpenus medius*
Snake prickleback	*Lumpenus sagitta*
Slender cockscomb	*Anoplarchus insignis*
Whitebarred prickleback	*Poroclinus rothrocki*
Arctic shanny	*Stichaeus punctatus*
Unidentified prickleback	Stichaeidae sp.

Family Cryptacanthodidae (Wrymouths)

Dwarf wrymouth	*Cryptacanthodes aleutensis*
Giant wrymouth	*Cryptacanthodes giganteus*

Family Pholidae (Gunnels)

Crescent gunnel	*Pholis laeta*
Unidentified gunnels	*Pholis* spp.

Family Anarhichadidae (Wolffishes)

Wolf-eel	*Anarrhichthys ocellatus*

Family Zaproridae (Prowfishes)

Prowfish	*Zaprora silenus*

Family Trichodontidae (Sandfishes)

Pacific sandfish / Tobiefish	*Trichodon trichodon*

Family Ammodytidae (Sand Lances)

Pacific sand lance	*Ammodytes hexapterus*

Family Bothidae (Lefteye Flounders)

Pacific sanddab	*Citharichthys sordidus*

Family Pleuronectidae (Righteye Flounders)

Arrowtooth flounder / Turbot / Arrowtooth halibut / Longjaw flounder / French sole	*Atheresthes stomias*
Rex sole / Longfin sole / Longfinned sole / Longfin flounder / Witch sole	*Errex zachirus*
Flathead sole / Paper sole / Cigarette paper	*Hippoglossoides elassodon*

Pacific halibut / Right halibut / Northern halibut	*Hippoglossus stenolepis*
Dover sole / Slime sole / Slippery flounder or sole / Shortfinned sole	*Microstomus pacificus*
Starry flounder / Grindstone / Emerywheel / Diamond back	*Platichthys stellatus*
Yellowfin sole / Muddab / Alaska dab / Northern sole	*Pleuronectes asper*
Rock sole / Rock flounder / Roughback sole / Broadfin sole / Roughscale sole / Two-lined flounder	*Pleuronectes bilineatus*
Butter sole / Scalyfin flounder or sole / Bellingham sole / Skidegate sole	*Pleuronectes isolepis*
Alaska plaice / Lemon sole/ Yellow-bellied flounder	*Pleuronectes quadrituberculatus*
Sand sole / Fringe sole / Sand flounder / Spotted flounder	*Psettichthys melanostictus*
Greenland halibut / Greenland turbot / Turbot / Lesser halibut / Newfoundland turbot	*Reinhardtius hippoglossoides*
Unidentified flatfish	Pleuronectiformes sp.

Kachemak Bay Marine Mammals

Mustelids

Sea Otter	*Enhydra lutris*

Pinnipeds

Steller's Sea Lion	*Eumetopias jubatus*
California Sea Lion	*Zapholus californianus*
Northern Fur Seal	*Callorhinus ursinus*
Guadelupe Fur Seal	*Arctocephalus townsendi*
Harbor Seal	*Phoca vitulina*

Cetaceans

Minke Whale	*Balaenoptera acutorostrata*
Fin Whale	*Balaenoptera physalus*
Humpback Whale	*Megaptera novaeangliae*
Gray Whale	*Eschrichtius robustus*
Stejneger's or Bering Sea Beaked Whale	*Mesoplodon stejnegeri*
Killer Whale	*Orcinus orca*
Beluga or White Whale	*Delphinapterus leucas*
Harbor Porpoise	*Phocoena phocoena*
Dall's Porpoise	*Phocoenoides dalli*

Kachemak Bay Terrestrial Mammals

Soricids

Common or Masked Shrew	*Sorex cinereus*
Dusky or Montane Shrew	*Sorex monticolus*

Chiropterans

Little Brown Bat	*Myotis lucifugus*

Canids

Coyote	*Canis latrans*
Wolf	*Canis lupus*
Red Fox	*Vulpes vulpes*

Felids

Lynx	*Lynx canadensis*

Mustelids

River or Canadian Otter	*Lontra canadensis*
Wolverine	*Gulo gulo*
Short-tail Weasel or Ermine	*Mustela erminea*
Least Weasel	*Mustela nivalis*
Mink	*Mustela vison*

Ursids

Black Bear	*Ursus americanus*
Brown Bear	*Ursus arctos*

Artiodactyles

Moose	*Alces alces*
Caribou	*Rangifer tarandus*
Mountain Goat	*Oreamnos americanus*
Dall Sheep	*Ovis dalli*

Rodents

Hoary Marmot	*Marmota caligata*
Red Squirrel	*Tamiasciurus hudsonicus*
Beaver	*Castor canadensis*
Northern Red-backed Vole	*Clethrionomys rutilus*
Singing Vole	*Microtus miurus*
Tundra Vole	*Microtus oeconomus*
Muskrat	*Ondatra zibethicus*
Northern Bog Lemming	*Synaptomys borealis*
House Mouse	*Mus musculus*
Norway Rat	*Rattus norvegicus*
Porcupine	*Erethizon dorsatum*

Lagomorphs

Snowshoe Hare	*Lepus americanus*

Kachemak Bay Marine Invertebrates

Protozoans	
Marine ciliate	*Folliculina* sp.
Sponges	
Breadcrumb sponge	*Halichondria panicea*
Purple encrusting sponge	*Haliclona cinerea*
Red encrusting sponge	*Clathria pennata*
Wandering sponge	*Suberites ficus*
Boring sponge	*Cliona celata*
Tube sponge / Urn sponge	*Sycon ciliatum* or *Leucilla nuttingi*
	Myxilla incrustans
Subtidal yellow sponge	*Myxilla lacunosa*
	Neoesperiopsis rigida
	Amphilectus laxus
Smooth scallop sponge	*Mycale adhaerens*
	Mycale lingua
	Lophon sp.
	Geodia cydonium
Cnidarians (Jellyfish, Hydroids, Anemones & Sea Pens)	
Many-ribbed hydromedusa	*Aequorea aequorea*
	Bougainvillia sp.
	Rhizocaulus verticillatus
	Campanularia volubilis
	Opercularella lacerata
	Opercularella rugosa
Creeping bell hydroid	*Calycella syringa*
	Clytia hemisphaerica
	Clytia kincaidi
	Eutonina indicans
	Gonothyraea clarcki
	Lafoea dumosa
	Halecium marsupiale
Sea spruce	*Abietinaria* sp.
	Coryne eximia
	Sarsia tubulosa
	Sertularia robusta
	Sertularella tricuspidata
	Scrippsia sp.
Colonial hydroid	*Obelia longissima*
Ostrichplume hydroid	*Aglaophenia struthionides*
Low tide hydoid	*Plumularia* sp.
Annulate sticky hydroid	*Eudendrium vaginatum*
Rope grass hydroid	*Garveia franciscana*

Sea nettle / Compass jelly	*Chrysaora melanaster*
Lion's mane jelly	*Cyanea capillata*
Moon jelly / Common jelly	*Aurelia aurita*
Moon jelly	*Aurelia labiata*
Stalked jelly	*Haliclystus stejnegeri*
	Urticina crassicornis
Christmas anemone / Painted anemone	*Urticina grebelnyi*
Rose anemone	*Cribrinopsis albopunctata*
Burrowing anemone / Moonglow anemone	*Anthopleura artemisia* or *Anthopleura orientalis*
Giant green anemone	*Anthopleura xanthogrammica*
Aggregating anemone / Clonal anemone	*Anthopleura elegantissima*
Brooding anemone	*Epiactis prolifera*
	Diadumene sp.
Cloned plumose anemone / Frilled anemone	*Metridium senile*
Gigantic anemone / Plumose anemone / Giant frilled anemone	*Metridium farcimen*
Orange colonial anemone / Orange zoanthid	*Epizoanthus scotinus*
Cup coral	*Cariophyllia alaskensis*
Sea pen	*Ptilosarcus gurneyi*
Sea strawberry / Sea raspberry	*Gersemia rubriformis*
Pink branching hydrocoral	*Stylaster* sp.
Sea fans or Gorgonians	Order Gorgonacea
<u>Comb Jellies</u>	
Beroe's comb jelly	*Beroe* sp.
Sea gooseberry	*Pleurobrachia* sp.
Lobed comb jelly	*Bolinopsis* sp.
<u>Worms</u>	
Giant flatworm / Leafy flatworm	*Kaburakia excelsa*
	Notoplana sp.
Planarian	*Planaria* sp.
Red ribbon worm	*Tubulanus polymorphus*
Six-lined ribbon worm	*Tubulanus sexlineatus*
Amphiporus worm	*Amphiporus bimaculatus*
Fierce nemertean	*Amphiporus formidabilis*
	Amphiporus imparispinosus
	Cerebratulus sp.
Green ribbon worm	*Emplectonema gracile*
Wandering ribbon worm	*Paranemertes peregrina*
Agazzi's peanut worm	*Phascolosoma agassizii*
	Golfingia margaritacea

	Thysanocardia nigra
Club worm / Tailed priapalid Catus worm	*Priapulus caudatus*
Lug worm	*Abarenicola pacifica*
	Ampharete acutifrons
Terebellid worm	*Amphitrite groenlandica*
	Oenonidae - unidentified
Bamboo worm	*Axiothella rubrocincta*
	Eteone longa
	Eudistylia polymorpha
	Eudistylia vancouveri
Slime worm, Broom worm	*Flabelligera affinis*
	Gattyana treadwelli
	Harmothoe extenuata
15-scaled worm	*Harmothoe imbricata*
	Laonome kroyeri
	Magelona sp.
	Maldanidae - unidentified
	Myxicola infundibulum
Sand tube worm	*Nicomache personata*
Sand tube worm	*Owenia collaris*
	Paraonella platybranchia
Minute scaleworm	*Pholoe minuta*
	Pholoides aspera
Greenland paddleworm	*Anaitides groenlandica*
	Dipolydora caulleryi
	Boccardia polybranchia
	Polynoidae - unidentified
Parchment tube worm	*Potamilla neglecta*
	Potamilla reniformis
	Prionospio steenstrupi
	Pseudopotamilla ocellata
	Bispira crassicornis
	Sabella sp.
	Sabellidae - unidentified
Sand mat worm	*Schizobranchia insignis*
	Spio filicornis
Scutate stermaspid worm	*Sternaspis scutata*
	Syllidae - unidentified
Terebellid worm	*Terebellides stroemi*
Terebellid worm	*Thelepus cincinnatus*
Intertidal gillworm	*Cirratulus spectabilis*
	Capitella capitata
	S*yllis* sp.
Armored scale worm	*Halosydna brevisetosa*
Yellow scale worm	*Arctonoe vittata*

Giant clam worm	*Nereis brandti*
Clam worm / Pile worm	*Nereis vexillosa*
	Nereis zonata
other Clam worms	Nereididae - unidentified
other Clam worms	*Nephtys* spp.
Pink sandworm	*Glycera* spp.
Cone worm	*Cistenides granulata*
Calcareous tube worm	*Serpula vermicularis*
Red and white tube worm / Coiled tube worm	*Crucigera irregularis*
Spiral tube worm	*Spirorbis spirillum*
Hairy-gilled worm	*Thelepus crispus*
	Scoloplos armiger
	Scolelepis sp.
Sea mouse	*Aphrodita aculeata*
Striped sea-leach	*Notostomum cyclostomum*
Spoonworm	*Bonellia viridis*
	Eubonellia valida
Fat inkeeper	*Echiurus echiurus alascanus*

Gastropods (snails)

Cancellate hairy snail	*Trichotropis cancellata*
Gray hairy snail	*Trichotropis insignis*
Clam sucker	*Odostomia* sp.
Kennicott's whelk	*Beringius kennicotti*
Dire whelk	*Lirabuccinum dirum*
Glacial whelk	*Buccinum glaciale*
Baer's whelk	*Buccinum baeri*
Big-mouthed whelk	*Volutharpa ampullacea*
Hairy triton	*Fusitriton oregonensis*
Ridged neptune	*Neptunea lyrata*
Many-ribbed trophon	*Boreotrophon multicostatus*
Spiny trophon	*Boreotrophon triangulatus*
Clathrate trophon	*Boreotrophon clathratus*
Kachemak tubinid	*Spiromoelleria kachemakensis*
Ringed blind limpet	*Cryptobranchia concentrica*
Blind limpet	*Cryptobranchia* spp.
Sitka periwinkle	*Littorina sitkana*
Checkered periwinkle	*Littorina scutulata*
Duncecap limpet / Whitecap limpet	*Acmaea mitra*
Little northern limpet	*Lottia borealis*
Ribbed limpet	*Lottia digitalis*
Fenestrate limpet	*Lottia fenestrata*
Unstable limpet	*Lottia instabilis*
Mask limpet	*Tectura persona*

Shield limpet	*Lottia pelta*
Plate limpet	*Lottia scutum*
Many-ribbed puncturella	*Puncturella multistriata*
Rough keyhole limpet	*Diodora aspera*
Kachemak tubinid	*Spiromoelleria kachemakensis*
Northern white slipper snail	*Crepidula nummaria*
Western white slipper snail	*Crepidula perforans*
Velvet snail	*Velutina* sp.
Blue top snail / Ribbed top snail	*Calliostoma ligatum*
Puppet margarite	*Margarites pupillus*
Helicine's margarite	*Margarites helicinus*
Columbian obelisk	*Balcis (Eulima?) columbiana*
Frilled dogwinkle	*Nucella lamellosa*
File dogwinkle	*Nucella lima*
Emarginate dogwinkle	*Nucella emarginata*
Channelled dogwinkle	*Nucella canaliculata*
Columbian amphissa	*Amphissa columbiana*
Arctic moon snail	*Cryptonatica affinis*
Aleutian moon snail	*Natica aleutica*
Chink shell	*Lacuna vincta*
Trophon	*Trophonopsis tenuisculptus*
Trophon	*Trophonopsis (Scabrotrophon?) pacificus*
Lora snail	*Oenopota laevigata*
Lung snail	*Siphonaria thersites*
Barrel bubble snail	*Cylichna* sp.
Purple olive snail	*Olivella baetica*

Gastropods (nudibranchs)

Opalescent nudibranch	*Hermissenda crassicornis*
Red nudibranch	*Rostanga pulchra*
	Melanochlamys diomedea
Orange-tipped janolus	*Janolus fuscus*
Balloon aeolis	*Eubranchus olivaceus*
Brown aeolis	*Cuthona* sp.
Maned nudibranch	*Aeolidia papillosa*
Golden dirona	*Dirona aurantia*
White-lined dirona	*Dirona albolineata*
Yellow-edged cadlina	*Cadlina luteomarginata*
Dall's dendronotis	*Dendronotus dalli*
Bushy-backed nudibranch	*Dendronotus frondosus*
Red dendronotis	*Dendronotus rufus*
Spotted nudibranch	*Diaulula sandiegensis*
Orange-tipped nudibranch / Clown nudibranch	*Triopha catalinae*

	Bathydoris dawsoni (?)
	Austrodoris sp.
	Aldisa sp.
	Adalaria proxima
Rough-mantled doris / Many-gilled doris	*Onchidoris bilamellata*
Spiny sand doris	*Acanthodoris* sp.
Nanaimo dorid	*Acanthodoris nanaimoensis*
Odhner's doris / Warty nudibranch	*Archidoris odhneri*
False lemon peel / Monterey doris	*Archidoris montereyensis*
Lemon peel / Pacific sea lemon	*Anisodoris nobili*
Steinberg's dorid / Cryptic nudibranch	*Doridella steinbergae*
Pacific ancula	*Ancula pacifica*
Leather limpet nudibranch	*Onchidella borealis*
California armina	*Armina californica*
Lion nudibranch	*Melibe leonina*
Winged sea slug	*Gastropteron pacificum*
Orange pteropod / Orange sea angel	*Clione limacina*
Purple pteropod / Purple sea butterfly	*Limacina pacifica (helicina?)*
Banded nudibranch	*Polycera zostera*

Cephalopods

Common Pacific octopus	*Octopus dofleini*
Small Pacific squid	*Rossia pacifica*

Bivalves

Weathervane scallop	*Patinopecten caurinus*
Spiny scallop / Spear scallop	*Chlamys hastata*
Pink scallop	*Chlamys hericius*
Pacific rock oyster	*Pododesmus macroschisma*
Greenland cockle	*Serripes groenlandicus*
LaPerouse's cockle / Broad cockle	*Serripes laperousii*
Nuttall's cockle	*Clinocardium nuttallii*
California cockle	*Clinocardium californiense*
Fucan's cockle	*Clinocardium fucanum*
Pacific surf clam / Pink-necked clam	*Mactromeris polynyma*
	Mysella tumida
	Mysella planata

	Pseudopythina sp.
Pacific gaper	*Tresus capax*
Pacific razor clam	*Siliqua patula*
Northern / Arctic razor clam	*Siliqua alta*
Great Alaska tellin	*Tellina lutea*
Salmon tellin	*Tellina nuculoides*
Baltic macoma	*Macoma balthica*
Stained macoma	*Macoma inquinata*
Chalky macoma	*Macoma calcarea*
Bent-nosed macoma	*Macoma nasuta*
Oblique macoma	*Macoma obliqua*
Pacific littleneck clam	*Protothaca staminea*
Butter clam	*Saxidomus giganteus*
Kennerley's venus	*Humilaria kennerleyi*
Gem clam	*Lucina* sp.
Esquimalt astarte / Wavy-line astarte	*Astarte esquimalti*
Northern astarte / Boreal astarte	*Astarte borealis*
Wavy astarte	*Astarte undata*
Pacific bittersweet	*Glycymeris subobsoleta*
Soft-shelled clam / Softshell	*Mya arenaria*
Truncated mya / Truncate softshell	*Mya truncata*
	Mya priapus
Northern soft-shelled clam False softshell	*Mya pseudoarenaria*
Deep soft-shelled clam / Deep softshell	*Mya baxteri*
Ample rough mya	*Panomya ampla*
Arctic rock borer	*Hiatella arctica*
Northwest ugly clam	*Entodesma saxicola*
Blue mussel	*Mytilus trossulus*
California mussel	*Mytilus californianus*
Horse mussel	*Modiolus modiolus*
Nestling mussel / Discordant mussel	*Musculus discors*
Black mussel	*Musculus niger*
Varnished mussel	*Musculus vernicosus*
Feathery shipworm	*Bankia setacea*
Rough piddock	*Zirfaea pilsbryii*
Giant rock scallop	*Crassadoma gigantean*
Thick carditid	*Cyclocardia crassidens*

<u>Chitons</u>

Gumboot chiton	*Cryptochiton stelleri*

Black leather chiton / Katy's chiton	*Katharina tunicata*
Lined chiton	*Tonicella lineata*
Tiger chiton	*Tonicella insignis*
Northern red chiton	*Tonicella rubra*
Mossy chiton	*Mopalia muscosa*
Hairy chiton	*Mopalia ciliata*
Woody chiton	*Mopalia lignosa*
Red veiled chiton	*Placiphorella rufa*
Veiled chiton	*Placiphorella velata*
White chiton	*Ischnochiton (Lepidochitona?) albus*
Dwarf chiton	*Leptochiton rugatus*
Merten's chiton	*Lepidozona mertensii*
Split-plate chiton	*Schizoplax brandtii*
	Schizoplax insignis
	Amicula amiculata
<u>Insects</u>	
Narrow rove beetle	*Diaulota densissima*
<u>Mysids</u>	
	Mysidacea unidentified
	Archaeomysis grebnitzkii
<u>Cumaceans</u>	
	Lamprops sp.
	Lamprops carinata
	Lamprops quadriplicata
<u>Tanaids</u>	
	Leptochelia dubia
<u>Isopods</u>	
Seaweed isopod	*Pentidotea wosnesenskii*
Fewkes' isopod	*Idotea fewkesi*
Pillbug isopod	*Gnorimosphaeroma oregonense*
Pillbug / Sphaeromatid isopod	*Gnorimosphaeroma* sp.
Sea slater	*Ligia pallasii*
	Saduria entomon
<u>Amphipods</u>	
Beach hopper	*Traskorchestia traskiana*
	Anisogammarus pugettensis
Gammarid amphipod	Amphipoda

	(gammaridea - unidentified)
	Paraphoxus milleri
Skeleton shrimp / Caprellid	*Caprella* sp.
	Amphipoda (caprellidae - unidentified)

Shrimps

Pandalid shrimp	*Pandalus* spp.
Pink shrimp	*Bandalus borealis*
Coonstripe shrimp	*Pandalus hypsinotus*
Humpy shrimp	*Pandalus goniurus*
Spot shrimp	*Pandalus platyceros*
Dock shrimp	*Pandalus danae*
other non-pandalid shrimp	*Pandalopsis* spp.
Broken-back shrimp	*Heptacarpus* spp.
Sand or Crangonid shrimp	*Crangon* sp.

Crabs

Hermit crab	*Pagurus* spp.
Hairy hermit crab	*Pagurus hirsutiusculus*
	Pagurus confragosus
Alaskan hermit crab	*Pagurus ochotensis*
Toothshell hermit crab	*Orthopagurus minimus*
Orange hermit crab / Pacific red hermit crab	*Elassochirus gilli*
Striped hermit crab / Widehand hermit crab	*Elassochirus tenuimanus*
Dall's hermit crab	*Elassochirus dalli*
Tube worm hermit crab	*Discorsopagurus schmitti*
Carapace crab / Hairy crab	*Hapalogaster mertensii*
Rhinoceros crab	*Rhinolithodes wosnessenskii*
Heart crab / Rhinoceros crab	*Phyllolithodes papillosus*
Butterfly crab / Umbrella crab / Red shield crab	*Cryptolithodes typicus*
Umbrella crab	*Cryptolithodes stitchensis*
Red king crab	*Paralithodes camtschaticus*
Pygmy rock cancer crab / Black-clawed cancer crab	*Cancer oregonensi*
Dungeness crab	*Cancer magister*
Red rock crab	*Cancer productus*
Horse crab / Helmet crab	*Telmessus cheiragonus*
Decorator crab	*Oregonia gracilis*
Lyre crab	*Hyas lyratus*
Kelp crab	*Pugettia* spp.
Graceful kelp crab	*Pugettia gracilis*

Northern kelp crab	*Pugettia producta*
Bairdi tanner crab	*Chionoecetes bairdi*
Mantle pea crab	*Pinnixa faba*
Commensal worm crab	*Pinnixa occidentalis*
Sharpnose crab	*Scyra acutifrons*

Barnacles

Common acorn barnacle	*Balanus glandula*
Crenate barnacle	*Balanus crenatus*
Giant acorn barnacle	*Balanus nubilus*
	Balanus rostratus alaskanus
Thatched barnacle	*Semibalanus cariosus*
Northern rock barnacle	*Semibalanus balanoides*
Little brown barnacle / Dall's barnacle	*Chthamalus dalli*
Common gooseneck barnacle / Pelagic gooseneck barnacle	*Lepas anatifera*
Graceful hermit-barnacle	*Peltogasterella gracilis*

Mites

Red velvet mite	*Neomolgus littoralis*

Sea Spiders

Clawed sea spider	*Phoxichilidium femoratum*

Bryozoans

Kelp encrusting bryozoan / Kelp lace	*Membranipora membranacea*
Orange encrusting bryozoan	*Schizoporella (?) unicornis*
King crab bryozoan	*Flustrella gigantea*
Frilly bryozoan	*Carbasea carbasea*
Algae-like bryozoan	*Dendrobeania murrayana*
	Alcyonidium pedunculatum
Sea jelly bryozoan	*Alcyonidium* sp.
Staghorn bryozoan	*Heteropora* sp.
	Hippodiplosia sp.
	Microporina borealis
	Myriozoum subgracile
	Rhynchozoon sp.

Brachiopods

Transverse lamp shell / Common lamp shell	*Terebratalia transversa*
Black lamp shell	*Hemithyris psittacea*
	Diestothyris frontalis

	Terebratulina sp.
Smooth lamp shell	*Laqueus californianus*
Sea Stars	
Little six-rayed star	*Leptasterias hexactis*
Polar six-rayed star	*Leptasterias polaris* ssp. *acervata*
Red-banded six-rayed star	*Leptasterias coei*
Black-spined star	*Lethasterias nanimensis*
True star / Mottled star / Troschel's star	*Evasterias troschelli*
Ochre star	*Pisaster ochraceus*
Giant pink star	*Pisaster brevispinus*
Sunflower star	*Pycnopodia helianthoides*
Red-banded star / Rainbow star	*Orthasterias koehleri*
Flat-bottomed star	*Asterias amurensis*
Fish-eating star	*Stylasterias forreri*
Rose star /Spiny sun star	*Crossaster papposus*
Blood star	*Henricia leviuscula*
	Henricia sanguinolenta
	Henricia tumida
Leather star	*Dermasterias imbricata*
Cushion star / Slime star	*Pteraster tesselatus*
Morning sun star	*Solaster dawsoni*
Sun star	*Solaster stimpsoni*
Northern sun star	*Solaster endeca*
Arctic bat star	*Ceramaster arcticus*
Basket star	*Gorgonocephalus caryi*
Basket star	*Gorgonocephalus eucnemis*
Serpent star	*Amphiodia occidentalis*
Daisy brittle star / Ubiquitous brittle star	*Ophiopholis aculeata*
Sea urchins	
Green sea urchin	*Strongylocentrotus droebachiensis*
Red sea urchin	*Strongylocentrotus franciscanus*
Purple sea urchin	*Strongylocentrotus purpuratus*
	Strongylocentrotus pallidus
Northern sand dollar / Green-spined sand dollar	*Echinarachnius parma*
Sea cucumbers	
Alaska tar spot / Black sea cucumber	*Cucumaria vegae*
Tar spot sea cucumber	*Cucumaria pseudocurata*
Red sea cucumber /	*Cucumaria miniata*

Orange sea cucumber	
Football sea cucumber	*Cucumaria fallax (pallida?)*
Peppered sea cucumber	*Cucumaria piperata*
Gray subtidal sea cucumber	*Cucumaria frondosa* ssp. *japonica*
White sea cucumber	*Eupentacta quinquesemita*
Slipper sea cucumber / Red psolus	*Psolus chitonoides*
California sea cucumber	*Parastichopus californicus*
Sweet potato sea cucumber	*Molpadia intermedia*
Rat-tailed sea cucumber / Sand sea cucumber	*Paracaudina chilensis*
Burrowing sea cucumber	*Leptosynapta clarki*
Silky sea cucumber	*Chiridota* sp.

Tunicates

Western distaplia	*Distaplia occidentalis*
Sea peach	*Halocynthia aurantium*
Sea pork	*Aplidium solidum*
Spiny-headed tunicate	*Boltenia villosa*
	Botryllus sp.
Flattop sea squirt	*Chelysoma* sp.
	Cnemidocarpa finmarkiensis
	Corella sp.
Red sea buttons	*Metandrocarpa taylori*
	Ritterella pulchra
Sea bottle	*Styela gibbsi*
Sea bottle	*Styela montereyensis*
	Synoicum parusti
Colonial harbor tunicate	*Distaplia alaskensis*
Chain salp / Beach bubblewrap	*Salpa fusiformis*

Kachemak Bay Birds

(2011 updated checklist with new species and recent name changes added)

Greater White-fronted Goose	*Anser albifrons*
Emperor Goose	*Chen canagica*
Ross's Goose	*Chen rossii*
Snow Goose	*Chen caerulescens*
Cackling Goose	*Branta hutchinsii*
Canada Goose	*Branta canadensis*
Brant	*Branta bernicla*
Trumpeter Swan	*Cygnus buccinator*
Tundra Swan	*Cygnus columbianus*
Gadwall	*Anas strepera*
Eurasian Wigeon	*Anas penelope*
American Wigeon	*Anas americana*
Mallard	*Anas platyrhynchos*
Blue-winged Teal	*Anas discors*
Northern Shoveler	*Anas clypeata*
Northern Pintail	*Anas acuta*
Green-winged Teal	*Anas crecca*
Canvasback	*Aythya valisineria*
Redhead	*Aythya americana*
Common Pochard	*Aythya ferina*
Ring-necked Duck	*Aythya collaris*
Tufted Duck	*Aythya fuligula*
Greater Scaup	*Aythya marila*
Lesser Scaup	*Aythya affinis*
Steller's Eider	*Polysticta stelleri*
Spectacled Eider	*Somateria fischeri*
King Eider	*Somateria spectabilis*
Common Eider	*Somateria mollissima*
Harlequin Duck	*Histrionicus histrionicus*
Surf Scoter	*Melanitta perspicillata*
White-winged Scoter	*Melanitta fusca*
Black Scoter	*Melanitta americana*
Long-tailed Duck / Oldsquaw	*Clangula hyemalis*
Bufflehead	*Bucephala albeola*
Common Goldeneye	*Bucephala clangula*
Barrow's Goldeneye	*Bucephala islandica*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Red-breasted Merganser	*Mergus serrator*
Ruddy Duck	*Oxyura jamaicensis*
Spruce Grouse	*Dendragapus canadensis*
Willow Ptarmigan	*Lagopus lagopus*
Rock Ptarmigan	*Lagopus mutus*

White-tailed Ptarmigan	*Lagopus leucurus*
Red-throated Loon	*Gavia stellata*
Pacific Loon	*Gavia pacifica*
Common Loon	*Gavia immer*
Yellow-billed Loon	*Gavia adamsii*
Horned Grebe	*Podiceps auritus*
Red-necked Grebe	*Podiceps grisegena*
Northern Fulmar	*Fulmarus glacialis*
Sooty Shearwater	*Puffinus griseus*
Short-tailed Shearwater	*Puffinus tenuirostris*
Fork-tailed Storm-Petrel	*Oceanodroma furcata*
Leach's Storm-Petrel	*Oceanodroma leucorhoa*
Brandt's Cormorant	*Phalacrocorax penicillatus*
Double-crested Cormorant	*Phalacrocorax auritus*
Red-faced Cormorant	*Phalacrocorax urile*
Pelagic Cormorant	*Phalacrocorax pelagicus*
Great Blue Heron	*Ardea herodias*
Turkey Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Northern Goshawk	*Accipiter gentilis*
Red-tailed Hawk	*Buteo jamaicensis*
Rough-legged Hawk	*Buteo lagopus*
Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Gyrfalcon	*Falco rusticolus*
Peregrine Falcon	*Falco peregrinus*
American Coot	*Fulica americana*
Sandhill Crane	*Grus canadensis*
Black-bellied Plover	*Pluvialis squatarola*
American Golden-Plover	*Pluvialis dominica*
Pacific Golden-Plover	*Pluvialis fulva*
Semipalmated Plover	*Charadrius semipalmatus*
Killdeer	*Charadrius vociferus*
Black Oystercatcher	*Haematopus bachmani*
Spotted Sandpiper	*Actitis macularia*
Solitary Sandpiper	*Tringa solitaria*
Wandering Tattler	*Heteroscelus incanus*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Whimbrel	*Numenius phaeopus*
Bristle-thighed Curlew	*Numenius tahitiensis*
Hudsonian Godwit	*Limosa haemastica*

Bar-tailed Godwit	*Limosa lapponica*
Marbled Godwit	*Limosa fedoa*
Ruddy Turnstone	*Arenaria interpres*
Black Turnstone	*Arenaria melanocephala*
Surfbird	*Aphriza virgata*
Red Knot	*Calidris canutus*
Sanderling	*Calidris alba*
Semipalmated Sandpiper	*Calidris pusilla*
Western Sandpiper	*Calidris mauri*
Red-necked Stint	*Calidris ruficollis*
Temminck's Stint	*Calidris temminckii*
Least Sandpiper	*Calidris minutilla*
Baird's Sandpiper	*Calidris bairdii*
Pectoral Sandpiper	*Calidris melanotos*
Sharp-tailed Sandpiper	*Calidris acuminata*
Rock Sandpiper	*Calidris ptilocnemis*
Dunlin	*Calidris alpina*
Stilt Sandpiper	*Calidris himantopus*
Ruff	*Philomachus pugnax*
Short-billed Dowitcher	*Limnodromus griseus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Jack Snipe	*Lymnocryptes minimus*
Wilson's Snipe	*Gallinago delicata*
Red-necked Phalarope	*Phalaropus lobatus*
Red Phalarope	*Phalaropus fulicaria*
Black-legged Kittiwake	*Rissa tridactyla*
Red-legged Kittiwake	*Rissa brevirostris*
Ivory Gull	*Pagophila eburnea*
Sabine's Gull	*Xema sabini*
Bonaparte's Gull	*Larus philadelphia*
Black-headed Gull	*Larus ridibundus*
Ross's Gull	*Rhodostethia rosea*
Franklin's Gull	*Larus pipixcan*
Black-tailed Gull	*Larus crassirostris*
Heermann's Gull	*Larus heermanni*
Mew Gull	*Larus canus*
Ring-billed Gull	*Larus delawarensis*
Western Gull	*Larus occidentalis*
California Gull	*Larus californicus*
Herring Gull	*Larus argentatus*
Thayer's Gull	*Larus thayeri*
Lesser Black-backed Gull	
Slaty-backed Gull	*Larus schistisagus*
Glaucous-winged Gull	*Larus glaucescens*
Glaucous Gull	*Larus hyperboreus*
Aleutian Tern	*Sterna aleutica*

Caspian Tern	*Sterna caspia*
White-winged Tern	*Chlidonias leucopterus*
Arctic Tern	*Sterna paradisaea*
Pomarine Jaeger	*Stercorarius pomarinus*
Parasitic Jaeger	*Stercorarius parasiticus*
Long-tailed Jaeger	*Stercorarius longicaudus*
Common Murre	*Uria aalge*
Thick-billed Murre	*Uria lomvia*
Pigeon Guillemot	*Cepphus columba*
Marbled Murrelet	*Brachyramphus marmoratus*
Kittlitz's Murrelet	*Brachyramphus brevirostris*
Ancient Murrelet	*Synthliboramphus antiquus*
Cassin's Auklet	*Ptychoramphus aleuticus*
Parakeet Auklet	*Cyclorrhynchus psittacula*
Crested Auklet	*Aethia cristatella*
Rhinoceros Auklet	*Cerorhinca monocerata*
Horned Puffin	*Fratercula corniculata*
Tufted Puffin	*Fratercula cirrhata*
Eurasian Collared-Dove	*Streptopelia decaocto*
Mourning Dove	*Zenaida macroura*
Western Screech-Owl	*Otus kennicottii*
Great Horned Owl	*Bubo virginianus*
Snowy Owl	*Nyctea scandiaca*
Northern Hawk-Owl	*Surnia ulula*
Great Gray Owl	*Strix nebulosa*
Short-eared Owl	*Asio flammeus*
Boreal Owl	*Aegolius funereus*
Northern Saw-whet Owl	*Aegolius acadicus*
Common Nighthawk	*Chordeiles minor*
Anna's Hummingbird	*Calypte anna*
Rufous Hummingbird	*Selasphorus rufus*
Belted Kingfisher	*Ceryle alcyon*
Red-breasted Sapsucker	*Sphyrapicus ruber*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides vellosus*
Three-toed Woodpecker	*Picoides tridactylus*
Black-backed Woodpecker	*Picoides arcticus*
Northern Flicker	*Colaptes auratus*
Olive-sided Flycatcher	*Contopus borealis*
Western Wood-Pewee	*Contopus sordidulus*
Alder Flycatcher	*Empidonax alnorum*
Say's Phoebe	*Sayornis saya*
Northern Shrike	*Lanius excubitor*
Gray Jay	*Perisoreus canadensis*
Steller's Jay	*Cyanocitta stelleri*
Black-billed Magpie	*Pica pica*

Northwestern Crow	*Corvus caurinus*
Common Raven	*Corvus corax*
Horned Lark	*Eremophila alpestris*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Bank Swallow	*Riparia riparia*
Cliff Swallow	*Hirundo pyrrhonota*
Black-capped Chickadee	*Parus atricapillus*
Chestnut-backed Chickadee	*Parus rufescens*
Boreal Chickadee	*Parus hudsonicus*
Red-breasted Nuthatch	*Sitta canadensis*
Brown Creeper	*Certhia americana*
Pacific Wren	*Troglodytes pacificus*
American Dipper	*Cinclus mexicanus*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Northern Wheatear	*Oenanthe oenanthe*
Mountain Bluebird	*Sialia currucoides*
Townsend's Solitaire	*Myadestes townsendi*
Gray-cheeked Thrush	*Catharus minimus*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
American Robin	*Turdus migratorius*
Varied Thrush	*Ixoreus naevius*
European Starling	*Sturnus vulgaris*
Eastern Yellow Wagtail	*Motacilla tschutschensis*
White Wagtail	*Motacilla alba*
American Pipit	*Anthus rubescens*
Bohemian Waxwing	*Bombycilla garrulus*
Cedar Waxwing	*Bombycilla cedrorum*
Lapland Longspur	*Calcarius lapponicus*
Smith's Longspur	*Calcarius pictus*
Snow Bunting	*Plectrophenax nivalis*
McKay's Bunting	*Plectrophenax hyperboreus*
Orange-crowned Warbler	*Oreothlypis celata*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped (Myrtle) Warbler	*Dendroica coronata*
Townsend's Warbler	*Dendroica townsendi*
Blackpoll Warbler	*Dendroica straita*
American Redstart	*Setophaga ruticilla*
Northern Waterthrush	*Parkesia noveboracensis*
Common Yellowthroat	*Geothlypis trichas*
Wilson's Warbler	*Wilsonia pusilla*
American Tree Sparrow	*Spizella arborea*
Savannah Sparrow	*Passerculus sandwichensis*
Fox Sparrow	*Passerella iliaca*

Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	*Melospiza lincolnii*
White-throated Sparrow	*Zonotrichia albicollis*
Harris's Sparrow	*Zonotrichia querula*
White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Dark-eyed Junco	*Junco hyemalis*
Rustic Bunting	*Emberiza rustica*
Western Tanager	*Piranga ludoviciana*
Red-winged Blackbird	*Agelaius phoeniceus*
Rusty Blackbird	*Euphagus carolinus*
Brown-headed Cowbird	*Molothrus ater*
Brambling	*Fringilla montifringilla*
Gray-crowned Rosy Finch	*Leucosticte tephrocotis*
Pine Grosbeak	*Pinicola enucleator*
Purple Finch	*Carpodacus purpureus*
Cassin's Finch	*Carpodacus cassinii*
Red Crossbill	*Loxia curvirostra*
White-winged Crossbill	*Loxia leucoptera*
Common Redpoll	*Carduelis flammea*
Hoary Redpoll	*Carduelis hornemanni*
Pine Siskin	*Carduelis pinus*
American Goldfinch	*Carduelis tristis*

<u>Introduced or ship-assisted</u>

Ring-necked Pheasant	*Phasianus colchicus*
Rock Dove	*Columba livia*
White-cheeked Starling	*Sturnus cineraceus*

Appendix 10. Kachemak Bay NERR Goals and Objectives Management Plan 2005 - 2010
Goal 1: Recognition of Kachemak Bay Research Reserve as a regional center for uniting research and education.
Objective 1: Facilitate regional coastal education and research programs among agencies, communities, universities, NGOs, and tribal governments
Objective 2: Facilitate the integration of research and education
Goal 2: Increase understanding of the natural and human processes occurring in the coastal environment.
Objective 1: Provide baseline information necessary to support research and resource management community needs within the Reserve
Objective 2: Determine the factors affecting spatial and temporal variability of ecologically important variables
Objective 3: Determine the linkages between the marine, nearshore, and watershed ecosystems and how changes affect those systems
Objective 4: Study the relationships between socio-economic factors and environmental changes
Objective 5: Promote informed decision-making on resource issues
Goal 3: Foster responsible stewardship of the coastal environment.
Objective 1: Increase knowledge and understanding of how coastal ecosystems function
Objective 2: Increase appreciation of the importance of coastal environments
Objective 3: Promote informed decision-making regarding uses of coastal environments
Goal 4: Foster a public that is involved with and supportive of Reserve activities.
Objective 1: Increase awareness of the Reserve's mission and goals
Objective 2: Encourage partnerships and involvement in Kachemak Bay NERR's functions
Objective 3: Increase awareness of the benefits of Kachemak Bay NERR's Research and Education programs
Goal 5: Maintain a workforce that is motivated and effective in attaining the Reserve mission.
Objective 1: Provide each employee with opportunities for professional development to enable them to perform competently and excel in their current position and to prepare qualified employees to be competitive for more advanced jobs
Objective 2: Provide a positive, supportive, safe work environment
Objective 3: Maintain a workforce capable of attaining program goals and objectives
Objective 4: Provide effective leadership structure to accomplish the mission and goals of the Reserve
Objective 5: Develop and implement a stable funding strategy

Appendix 11. 2011 KBNERR Community Council Charter

Community Council Charter

The Kachemak Bay Research Reserve
A Unit of the National Estuarine Research Reserve System

This Charter defines the partnership between the Kachemak Bay National Estuarine Research Reserve and the Community Council (herein referred to as "Council"), which is dedicated to providing recommendations that will aid in the growth and progress of the Research Reserve's programs. The mission of the Reserve is *to enhance understanding and appreciation of the Kachemak Bay estuary and adjacent waters to ensure that these ecosystems remain healthy and productive."* The success of the Council-Reserve partnership is critical for the Reserve to fulfill its mission.

I. Introduction to the Reserve

In 1972, as part of the Coastal Zone Management Act, Congress charged the National Atmospheric and Oceanic Administration (NOAA) with establishing and administering the National Estuarine Research Reserve (NERR) System. As part of this System, estuaries around the country are designated as National Estuarine Research Reserve sites to represent different regions and estuarine types. Each Research Reserve is administered through a memorandum of understanding between a state agency where the Reserve is located and NOAA. The Reserves are responsible for conducting research and providing educational and interpretive services. Collaboration with local communities is one of the main thrusts of the National Estuarine Research Reserve program. NOAA designated the Kachemak Bay National Estuarine Research Reserve, also known locally as the Kachemak Bay Research Reserve and hereafter referred to as the "Research Reserve" or "Reserve", on February 12, 1999. The Alaska Department of Fish and Game, Sport Fish Division, administers the Reserve, in a manner consistent with the National Estuarine Research Reserve System and the approved Management Plan.

The Kachemak Bay NERR encompasses 365,000 acres of diverse waters and lands. Kachemak Bay represents one of the most productive, diverse, and intensively used marine/estuarine environments in Alaska.

II. Council Purpose

The Bay's watershed is home to people with a diversity of interests and perspectives and plays an integral role in their lives. The establishment of Kachemak Bay as a NERR site expands the scope of interested parties to include statewide and national research and education endeavors. Effective communication with all of these entities is critical to the Reserve's successful operation. The primary purpose of the Reserve Community Council

shall be to provide an organized structure for substantive and meaningful dialogue and recommendations between agencies, local governments, researchers, environmental educators, conservation groups, and others interested in natural science research and education and Research Reserve staff.

III. Council Roles

1. The Council's role shall be to provide recommendations to the Reserve regarding the Reserve's Research and Education programs, including:
    - Recommending priority research and monitoring needs, including those that are relevant to local issues of concern;
    - Recommending priority education and interpretive needs, including those that are relevant to local issues of concern;
    - Identifying opportunities for collaborations;
    - Advising on research and education facilities; and
    - Annually reviewing Reserve programs.

2. The Council shall recognize the non-regulatory nature of Reserve programs in all of its activities.

3. Other roles for the Council may be collaboratively developed between Reserve staff and the Council.

4. The Council shall recognize that research conducted through the Reserve must be objective and able to pass scientific peer review.

5. The Council shall recognize that the thrust of the Reserve's education programs is to collaborate with and support existing programs, while developing new initiatives to fill education gaps.

6. The Council shall establish a Research Committee and an Education Committee~~,~~ and shall assign work to those committees consistent with roles reflected in the Management Plan. The Council and the Committees will implement these roles collaboratively. The Committees will report to the Council, which will present recommendations to the Reserve.

IV. Council Membership

1. The Reserve must be responsive to a broad base of interests, including all of those outlined in the Management Plan. The Council will represent these broad interests as much as possible. In addition, Council representation will be balanced to provide equitable representation of interests on the Council.

2. The Council shall consist of not more than nine (9) community members, who strive to embody the following interests and perspectives. ***Members will be sought who encompass more than one perspective and/or interest*:**

- Education
- Research
- South Side of Kachemak Bay
- North side of Kachemak Bay
- Regional Perspective (outside of Kachemak Bay watershed)
- Post-secondary Institutions
- Commercial Fishing
- Recreation and Tourism
- Sport Fishing
- Local Businesses
- Conservation Groups
- Native Alaskans
- Oil Spill Management and Response
- Industry/Business
- Subsistence/ Personal Use Harvesting
- Local Government
- Citizens at large

3. The Reserve also seeks recommendations from the following governments and agencies, which shall be included on the Council as non-voting members.

- Kenai Peninsula Borough, Coastal Zone Management Program
- Alaska Department of Fish and Game, Homer office (Divisions of Sport Fish, Commercial Fisheries and Wildlife Conservation)
- Alaska Department of Fish and Game, Sport Fish Division, Kachemak Bay/Fox River Flats Critical Habitat Areas
- Alaska Department of Natural Resources, Kachemak Bay State Park
- Alaska Department of Natural Resources, other
- Alaska Department of Environmental Conservation
- US Coast Guard
- US Environmental Protection Agency
- US Fish and Wildlife Service, Alaska Maritime National Wildlife Refuge
- US Fish and Wildlife Service, Kenai National Wildlife Refuge
- University of Alaska Anchorage
- NOAA, NCCOS, Kasitsna Bay Laboratory
- National Park Service, Lake Clark National Park and Preserve

❋ V. Council Member Selection

1. The member selection process must be clear, fair, and balanced.

2. Government Agency members shall be appointed by their agency or entity.

3. The extant Council will assess the current Council make-up, seek nominations to maintain a broad-based Council, and nominate future Council members. Whenever possible, and contingent upon the availability of qualified applicants, two nominations for each Council seat will be forwarded to the Director of Sport Fish Division who will make the final appointment.

4. Candidates for Council membership should be able to present and review information impartially, listen to and understand others' points of views. Prospective Council members should be familiar with some of the social and economic aspects of the communities in the Kachemak Bay watershed, have some relevant experience with at least one of the interest areas outlined in Section IV of this charter, and be interested in the Reserve's programs.

5. Notice of available council seats and solicitation of applications shall be published on the KBRR website for four full weeks prior to nominating new council members. Public service announcements regarding vacancies on the Council will be submitted to local print and radio media outlets for a two-week period.

6. Persons interested in being on the Council should submit an application form, an example of which is included as Appendix A of this Charter.

VI. Council Member Terms

1. Governmental agency members will serve at the discretion of their agency or entity and do not have a term limit.

2. Council members will be appointed for a term of two years and may be re-appointed. If necessary, terms of appointment may be changed to provide for balanced (staggered) expiration dates. Members may be re-appointed for additional two year terms with the approval of the Sport Fish Division Director.

3. If a Council member resigns, the Council shall whenever possible, and contingent upon the availability of qualified applicants, nominate two applicants for the position. The Director of Sport Fish Division will select one of the two nominees. Vacancy appointments are for the remainder of the unexpired term of the vacancy.

4. A member who fails to attend three consecutive meetings, without an excused absence or absence for good cause, can be formally removed from the Council and the position opened for nominations for a new representative.

VII. Council Operations and Administration

1. The Council shall elect one member to serve as the Chair and one member to serve as Vice-Chair. Election of these positions is by majority vote of all (voting and non-voting) Council members. Members who will not be present at the time of the election may submit their nominations to the Reserve Council staff in writing prior to the meeting.

2. The operations of the Research Committee and the Education Committee will be determined by the Council, within the bounds of this charter and using the following guidelines:

    a. The topics the Committees address will be determined by the Council in keeping with the roles identified in Section III of this Charter, and further detailed by the Council.
    b. At least two Council members will sit on each Committee.
    c. The Council shall establish criteria for selecting Committee members. Those criteria should include having professional researchers and educators, as well as lay-people, on the Committees in order to foster broad-based dialog.
    d. The procedures for selecting Committee members will be determined by the Council.
    e. Committee chairs or their designee will present an oral report of committee activities conducted since the previous Council meeting.

3. When providing recommendations to the Reserve, the Council shall strive for consensus. To this end the Council has adopted a "Rules of Consensus" model for the conduct of its routine business. For non routine matters Roll Call voting shall be adopted. Such matters include but are not limited to:
    a. Council actions which may reasonable be expected to impact financial matters or legal issues;
    b. Policy statements made by the Council, including amendments to the Council Charter;
    c. Actions requested of the KBRR staff beyond routine liaison and administrative activities on the behalf of the Council;
    d. If consensus cannot be achieved; or
    e. At the request of any member of the Council

    The results of all roll call votes will be recorded in the meeting minutes.

4. A quorum of 5 voting Community Council members is necessary to take action. The Council member can be present at the meeting or teleconferenced in.

5. Meetings will be held at the call of the Council Chair in coordination with Reserve staff.

6. The Council shall meet as frequently as necessary~~,~~ and at least once every three months.

7. All Council and Committee meetings will be open to the public.

8. Members of the public shall be permitted to present oral or written statements on any item on the agenda, or present items for inclusion on the Council agenda.

9. Notice of each Council meeting, including the time, place and agenda, shall be published two weeks prior to the meeting on the KBRR website. Public service announcements regarding upcoming Council meetings will be submitted to local print and radio media outlets. Additional notice may be given by such other means as will result in appropriate publicity to interested groups and individuals.

10. The Reserve will dedicate up to the equivalent of one half-time staff position annually for the purposes of assisting the Council, including taking the attendance at Council meetings, taking and distributing the minutes of Council meetings, recording official votes, preparing public notice announcements for Council and Committee meetings, and providing information that is reasonably necessary for the Council to carry out this charter in a timely way. Minutes and reports shall be available to the general public.

11. Members of the Council and Committees shall serve without pay. Travel funds for Council members may be available at the discretion of the Reserve.

12. Council or Committee members shall identify potential conflicts of interest that might result in financial gain to the member resulting from actions the Council might take. The Council or Committee shall decide if the conflict requires that the member recuse himself or herself from any action on that matter, including discussion.

13. The Council and the Reserve shall collaboratively develop guidelines for communications between the Reserve and the Council and for communications with other agencies, organizations and individuals.

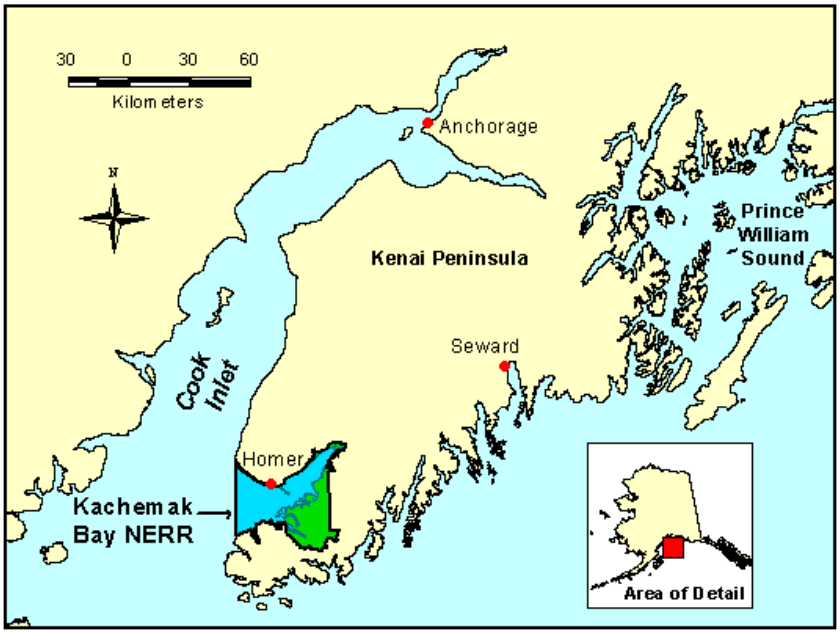
14. The Reserve Manager shall respond to Council recommendations either verbally or in writing.

15. The organization and processes used to structure the Council shall be reviewed initially after the Council has been in operation for one year, and thereafter every three years. The Council and the Reserve shall collaboratively engage in review of the Charter.

16. If the Council and the Reserve determine that changes to the Charter are necessary, then the Council and the Reserve shall work collaboratively to make the necessary changes. Revisions to the Charter must go through the public review process.

Appendix 12. Facilities Plan

KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE
HOMER, ALASKA
FACILITY PLAN 2012-2017



Location:
Approximately 225 miles south of Anchorage, AK

Address:
95 Sterling Highway, Suite 2
Homer, AK 99603

Biogeographic Region Represented:
Fjord biogeographic region
Southern Kenai Peninsula and Lower Cook Inlet, AK

Telephone:
907.226.4799
907.235.4794 fax

State Agency:
AK Dept. of Fish and Game, Sport Fish Division

Date of Designation: 1999
Acreage: 372,000 acres

KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE
ALASKA

OVERVIEW

- The Kachemak Bay National Estuarine Research Reserve (KBNERR) is located on the southern Kenai Peninsula, approximately 225 road miles south of Anchorage. The Reserve is managed by the Alaska Department of Fish and Game (ADF&G), Division of Sport Fish. The Reserve encompasses approximately 372,000 acres of land and water within the Kachemak Bay watershed.
- The Reserve has 12 permanent employees: Manager, Assistant Manager, Research Coordinator, Education Coordinator, Marine Science Educator, Community Monitoring Coordinator, CTP Coordinator, Watershed Specialist, Research Analyst, two Fisheries Biologists, and Administrative Assistant.
- KBNERR operations and maintenance proportional costs of the Alaska Islands and Ocean Visitor Center, partial costs of Modular/Bunkhouse facility, and Bay Avenue Lab are borne by ADF&G through the NOAA operations grant and other competitive grants.
- The Reserve's boundaries includes legislatively designated areas that are managed by the Alaska Department of Fish and Game and Department of Natural Resources for long-term protection of natural resources, providing the Reserve with a stable foundation for long-term research, monitoring and education.

KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE
ALASKA

RESEARCH AND EDUCATION

RESEARCH

- Long-term monitoring of water quality and meteorological conditions (SWMP)
- Hydrographic surveys
- Land level changes
- Saltmarsh and intertidal habitat mapping
- Kelp bed mapping
- Population dynamics of marine species
- Juvenile salmon use of headwater and estuarine habitats

EDUCATION

- Educational programs for K-12 and college students
- Mentor and internship program
- Volunteer program
- Community monitoring program
- Education programs for the general public
- Interpretive exhibits

TRAINING

- Transfer of coastal science to training audiences of coastal decision makers through workshops and trainings

SPECIES	HABITATS
- 45 species of mammals	- tidal salt marshes
15 marine mammals	- intertidal mudflats and beaches
30 terrestrial mammals	- sand, gravel and cobble beaches
- 150 species of fish	- bedrock and boulder shores
- 85 species of marine algae	- intertidal eelgrass beds
- 244 species of birds	- subtidal shell debris
- 407 species of marine invertebrates	- subtidal soft-bottom
- 713 species of vascular plants	- subtidal kelp forests
- 1 species of amphibian	- peat wetland fens
	- anadromous streams

KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE
ALASKA

EXISTING FACILITIES

The Alaska Islands and Ocean Visitor Center

The Reserve maintains offices, research lab, educational lab classroom, seminar and conference rooms and a small exhibit area in the Alaska Islands and Ocean Visitor Center (AIOVC), a 36,825 square foot, state-of-the-art visitor center built and maintained through a partnership with the US Fish and Wildlife Service, Alaska Maritime National Wildlife Refuge. Approximately 37% (13,625 square feet) of the visitor center is a combination of space dedicated to the Reserve as well as space shared with the Refuge. The Reserve also maintains a separate laboratory/workshop and a small bunkhouse off-site of the Visitor Center.

The Alaska Islands and Ocean Visitor Center (AIOVC) trail system to Beluga Slough

RESEARCH

Research Laboratory – 902 sf

- Analytical equipment-based task area - 838sf
- Chemical storage– 64sf

KBNERR research lab

KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE
ALASKA

EDUCATION
Classrooms –1**,713 sf**
- Lab classroom – 1,370sf
- Lab classroom prep area – 178sf
- Outreach/education materials storage – 165sf

Interpretive Exhibits – 500 sf
- Displays – 500sf

Other
- Entry vestibule – 41sf

AIOVC Research Reserve exhibit hall

ADMINISTRATION & SUPPORT

Offices – 2,558sf
- Manager – 239sf
- GIS specialist and watershed specialist (shared) – 193sf
- Assistant Manager – 117sf
- Education Coordinator – 117sf
- Research Coordinator – 117sf
- Special projects cubicles – 734sf
- Education office – 219sf
- CTP Coordinator – 124sf
- Research staff offices – 219sf
- Visiting staff offices (4) – 479sf

Conference/Meeting areas – 955sf
- Entry/waiting – 411sf
- Conference room – 300sf
- Library/Conference – 244sf

Kitchen (shared with USFWS) – 294sf
- 2 refrigerators
- 2 microwave ovens
- dishwasher
- double bowl sink
- storage
- tables and chairs

Storage – 667sf
- General admin storage – 209sf
- Staff lockers (shared with USFWS) – 328sf
- Janitorial supply (shared with USFWS) – 130sf

KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE
ALASKA

Restrooms (shared with USFWS) –1,191sf

- Staff restroom – 144sf
- Public men's restroom – 231sf
- Public women's restroom – 274sf
- Public unisex restroom – 40sf
- Public men's restroom – 208sf
- Public women's restroom – 196sf
- Staff showers (2) – 98sf

Visitor center store (shared with USFWS) – 320sf
Mechanical rooms (shared with USFWS) – 2,176sf

Bay Avenue Laboratory

RESEARCH
Workshop/Storage – 1,500 sf

- Computer-based task area – 200sf
- Indoor tool and gear storage – 1000sf
- Chemical and scientific instrument storage -300sf
- Outdoor small boat storage – 400sf

Modular Office / Bunkhouse

Partner use office space – 3,510sf

- 10 offices
- Administrative entry
- Conference room
- Seminar Room
- Restrooms

Bunkhouse – 1,380sf

- Three bedrooms
- Two baths
- Kitchen
- Laundry / Storage

KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE
ALASKA

Headquarters Site

- Roads
  - .25 miles frontage
  - handicap accessible

- Parking
  - 96 spaces
  - 6 handicap accessible spaces
  - 12 recreational vehicle spaces

- Trails/Boardwalks – approx. 2600 ft.

- Docks – none

- Boat Launch Facilities – none

- Site Lighting - parking lots and walkways

- Potable Water - City of Homer

- Sewer - Municipal

- Power - Homer Electric Association

- Gas - none

- Telephone/Data – digital Voice Over IP

Sustainable design features incorporated into the site:

1. Areas for securing bicycles – public and staff
2. Retained onsite native vegetation during construction
3. Conversion of interior and exterior lighting to LED and compact fluorescent bulbs

KACHEMAK BAY NATIONAL ESTUARINE RESEARCH RESERVE
ALASKA

Facilities Plan 2012-2016

Project 1 Estimated Cost: $400,000 Proposed: Beluga Slough Trail – Fiscal Year 2014

NERR: Kachemak Bay (AK)
Title & Location: Beluga Slough trail replacement
Function: Public access
Space: Alaska Islands and Ocean Visitor Center
Special Consideration:
KBNERR encourages visitors to the Alaska Islands and Ocean Visitor Center to experience an estuary by walking along Beluga Slough, a saltmarsh located directly adjacent to the Visitor Center. During the summer months, KBNERR staff and university interns provide twice weekly estuary hikes on the existing trail. Likewise, during the school year, KBNERR education staff provides opportunities for K-12 students to experience and explore the saltmarsh. The existing trail was designed to be a floating trail, which allows the trail tread to float during extreme tide events. The trail does float as designed, but the tread can become uneven when settling after a high tide, or it becomes slick during rain and snow storms, thereby making the existing trail a safety concern. Our facility partner, the Alaska Maritime National Wildlife Refuge is the landowner for the trail, and any project to upgrade the trail would involve the Refuge as the lead agency for the project.

Project 2 Estimated Cost: $50,000 Proposed Signage – Baycrest Overlook and Homer Spit Trail – Fiscal Year 2014

NERR: Kachemak Bay (AK)
Title & Location: Interpretive signage KBNERR
Function: Education and Administration
Space: Various locations throughout Homer, AK
Special Consideration: At the present time there are no interpretive signs that address that Kachemak Bay is a unit of the National Estuarine Research Reserve system. The City of Homer, through their Public Arts Committee is looking to redesign key public locations where the Bay is a focal point, such as the dramatic overlook that visitors encounter when cresting the hill into Homer/Kachemak Bay. Other locations might include the Homer Spit and the Alaska Marine Highway Ferry Terminal, and the deep water dock where numerous cruise ships disembark thousands of visitors each summer. KBNERR has been identified as a key partner in this redesign. The City of Homer would be the lead organization in these efforts.

Project 3 **Estimated Cost: $70,000** **Proposed Signage – Fiscal Year 2015**

NERR: Kachemak Bay (AK)
Title & Location: Signage for State Parks
Function: Education and Outreach
Space: Kachemak Bay State Parks
Special Consideration:
The proposed project will introduce the Reserve and provide natural history interpretation to the thousands of visitors to the Kachemak Bay State Park, through trailhead kiosks and interpretive signage. This park is the only terrestrial component within the Reserve's designated boundaries. The State Park system has little to no funding for signage. The trails in the state parks receive extensive visitor use in the summer, and signage in the park would be a significant outreach tool for the Reserve. This will also include Grewingk Lake Trail self-guided interpretive signage and brochures. Alaska State Parks would be the lead agency for this project.

Project 4 **Estimated Cost: $150,000** **Proposed Exhibits – Fiscal Year 2015**

NERR: Kachemak Bay (AK)
Title & Location: Kachemak Bay NERR and Pratt Museum marine room exhibits
Function: Education and Outreach
Space: Pratt Museum
Special Consideration:
The proposed marine room exhibits will introduce KBNERR and relevant science to the thousands of Pratt Museum visitors by designing and fabricating new interpretive displays which will be installed in their newly constructed museum in Homer. The Pratt Museum, a nationally recognized natural history museum focuses their efforts on the natural history of the Kachemak Bay region. Currently (2012) the Pratt is engaged in a capital campaign to raise funds to design and build a new museum facility to replace an aging facility. A favorite place for many of their visitors is the marine room. We are proposing to partner with the Pratt Museum to outreach the science being conducted by KBNERR throughout Kachemak Bay. The Pratt Museum would be the lead partner in this collaborative effort.

Appendix 13. Critical Habitat Area In-holdings

Kachemak Bay Critical Habitat Areas Inholdings			
Sec. 31, T. 8 S., R. 14 W. Seward Meridian	City of Seldovia	N/A	8.08
Sec 32, T. 8 S., R. 14 W., Seward Meridian	City of Seldovia	N/A	2.68
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	City of Seldovia	19214001	0.54
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	City of Seldovia	19214002	0.29
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	City of Seldovia	19214003	0.28
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	STOKES, KUSUM M.D. INC. PENSION PLAN	19214004	0.26
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	STOKES, KUSUM M.D. INC. PENSION PLAN	19214005	0.25
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	City of Seldovia	19214019	1.24
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	STOKES, KUSUM M.D. INC. PENSION PLAN	19214006	0.23
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	STOKES, KUSUM M.D. INC. PENSION PLAN	19214007	0.3
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	City of Seldovia	19214008	0.31
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	City of Seldovia	19214010	0.36
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	City of Seldovia	19214011	0.28
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	City of Seldovia	19214012	0.35
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	Seldovia Native Association INC.	19214013	0.34
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	Seldovia Native Association INC.	19214014	0.33
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	Seldovia Native Association INC.	19214015	0.33
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	Seldovia Native Association INC.	19214016	0.32
Sec. 31, T. 8 S., R. 14 W.,	Seldovia Native	19214017	0.42

Seward Meridian	Association INC.		
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	City of Seldovia	19214009	0.21
Sec. 31, T. 8 S., R. 14 W., Seward Meridian	Seldovia Native Association INC.	19214018	1.76
Sec. 32, T. 8 S., R. 14 W., Seward Meridian	NORTHPOINT LIMITED PARTNERSHIP	19212051	0.04
Sec. 32, T. 8 S., R. 14 W., Seward Meridian	WALSH, RAEMERE L. & LINDA L.	19212050	0.05
Sec. 29, T. 8 S., R. 14 W., Seward Meridian	SEDOR, JOHN MARK & JANE C.	19207707	0.04
USS #1771, Sec. 32, T. 8 S., R. 14 W., Seward Meridian	MILTON, GARY F & ALONA L.	19207733	0.04
USS #1771, Sec. 32, T. 8 S., R. 14 W., Seward Meridian	STANDEFER, JAMES D. & MARILYN	19207734	0.07
Sec. 32, T. 8 S., R. 14 W., Seward Meridian	STRANIK, GERALD M. & SUZANNE E.	19207705	0.1
Sec. 29, T. 8 S., R. 14 W., Seward Meridian	STRANIK, GERALD M.	19207818	0.08
Sec. 29, T. 8 S., R. 14 W., Seward Meridian	EDMONDSON, CAMERON A. & RUTH	19207808	0.08
Sec. 29, T. 8 S., R. 14 W., Seward Meridian	MUMMA, SUSAN J.	19207819	0.12
Sec. 32, T. 8 S., R. 14 W., Seward Meridian	SONEN, WALTER S.	19207910	0.09
Sec. 29, T. 8 S., R. 14 W., Seward Meridian	YUKNIS, LEONARD F. & MARTHA	19207905	0.08
Sec. 32, T. 8 S., R. 14 W., Seward Meridian	MORTON, KENNETH V.	19209208	0.02
Sec. 32, T. 8 S., R. 14 W., Seward Meridian	PULIS, CLEO J. & SHIRLEY A. :TRUSTEES	19209207	0.02
Sec. 29, T. 8 S., R. 14 W., Seward Meridian	BOWERS, FRANK & REGINA	19209108	0.03
Sec. 29, T. 8 S., R. 14 W., Seward Meridian	CHARTIER, ALEXANDRA	19209107	0.07
Sec. 20, T. 8 S., R. 13 W., Seward Meridian	State of Alaska	19109121	2.08
Sec. 21, T. 8 S., R. 13 W., Seward Meridian	State of Alaska	19117080	0.29
Sec. 21, T. 8 S., R. 13 W., Seward Meridian	State of Alaska	19117077	0.09

Sec. 22, T. 8 S., R. 13 W., Seward Meridian	OSGOOD, JON L.	unknown	0.09
ATS #133, Lot 1. Sec. 1, T. 7 S., R. 12 W., Seward Meridian	TILLION, CLEM	19328074	0.93
ATS #133, Lot 3. Sec. 1, T. 7 S., R. 12 W., Seward Meridian	TILLION, CLEM	19328077	0.53
ATS #133, Lot 2ASec. 1, T. 7 S., R. 12 W., Seward Meridian	TILLION, CLEM	19334013	0.96
ATS #133, Lot 2B. Sec. 1, T. 7 S., R. 12 W., Seward Meridian	RIDDER, ROBIN LEE. REVOCABLE TRUST	19334012	0.64
ATS #28, Tract-A. Sec. 6, T. 7 S., R. 11 W., Seward Meridian	ZIMMERMAN, MARC & LINDA ZIMMERMAN	19333034	0.54
ATS #28, Tract-A. Sec. 6, T. 7 S., R. 11 W., Seward Meridian	HOBLIT, D.P. & MARILYN	19333033	0.54
ATS #28, Portion of Tract-B. Sec. 6, T. 7 S., R. 11 W., Seward Meridian	BELLAMY, RAYMOND & REBECCA M.	19333076	0.5
ATS #652. Sec. 6, T. 7 S., R. 11 W., Seward Meridian	State of Alaska	19333035	3.39
Sec. 6, T. 7 S., R. 11 W., Seward Meridian	FRITZ, GRANT & SHIRLEY	19333074	0.55
Sec. 6, T. 7 S., R. 11 W., Seward Meridian	RICKETTS, LEE M. FAMILY TRUST	19333036	0.48
Lot 1, ATS #177. Sec. 6, T. 7 S., R. 11 W., Seward Meridian	WICK, SUSAN NOYES	19333080	0.13
Lot 2, ATS #177. Sec. 6, T. 7 S., R. 11 W., Seward Meridian	BELLAMY, MARVIN & ANNETTE	19333079	0.57
ATS #431. Sec. 6, T. 7 S., R. 11 W., Seward Meridian	THURSTON, JAMES & JANET	19338005	0.44
ATS #169. Sec. 6, T. 7 S., R. 11 W., Seward Meridian	TAESCHNER, ALVIN. TRUSTEE OF THE	19328042	0.89
ATS #197. Sec. 5, T. 7 S., R. 11 W., Seward Meridian	MJOS, PETER O. & KAREN E. RUDD	19309021	0.52

ATS # 1019. Sec. 20, T. 5 S., R. 10 W., Seward Meridian	State of Alaska	19325218	0.09
Tract A, ATS#1418. Sec. 3, T. 5 S., R. 10 W., Seward Meridian	State of Alaska	19301137	11.51
Tract B, ATS #1418. Sec. 3, T. 5 S., R. 10 W., Seward Meridian	State of Alaska	19301138	4.25
Lot 1, ATS #1234A. Sec. 11, T. 6 S., R. 13 W., Seward Meridian	State of Alaska	17420113	0.35
Lot 2, ATS #1234A. Sec. 11, T. 6 S., R. 13 W., Seward Meridian	State of Alaska	17420114	0.4
Lot 3, ATS #1234A. Sec. 11, T. 6 S., R. 13 W., Seward Meridian	State of Alaska	17420115	0.3
Lot 4, ATS #1234A. Sec. 11, T. 6 S., R. 13 W., Seward Meridian	State of Alaska	17420116	0.29
Lot 5, ATS #1234A. Sec. 11, T. 6 S., R. 13 W., Seward Meridian	State of Alaska	17420117	0.24
ATS #644. Sec. 11, T. 6 S., R. 13 W., Seward Meridian	State of Alaska	17421021	10.37
ATS #612 & ATS #74. T. 6 S., R. 13 W., T. 6 S., R. 14 W., T. 7 S., R. 13 W., Seward Meridian	City of Homer	17728001	6739.33
Sec. 21, T. 6 S., R. 13 W., Seward Meridian	State of Alaska	18101028	12.87
Sec. 21, T. 6 S., R. 13 W., Seward Meridian	State of Alaska	18101029	58.31
ATS #1373. Sec. 1, T. 7 S., R. 13 W., Seward Meridian	State of Alaska	18103203	11.91
ATS #1603. Sec. 1, T. 7 S., R. 13 W. Seward Meridian	State of Alaska	18107005	1.37
Sec. 31, T. 8 S., R. 14 W. Seward Meridian	City of Seldovia	N/A	8.08
Lot 1, U.S. Survey 4725, Secs. 15, 16, 21 & 22 T. 4 S.,	Nazarian, John - Family Living Trust	18523005	159.53

R. 10 W., Seward Meridian.			
U.S. Survey 3358, Secs. 19, 20, 29 & 30, T. 4 S., R. 10 W., Seward Meridian	Kachemak Selo	18522003	160
Lot 2, U.S. Survey 2937, Sec. 30, T. 4 S., R. 9 W., Seward Meridian	Bureau Of Land Management	18554009	5
Lot 1, U.S. Survey 2937, Secs. 30 & 31, T. 4 S., R. 9 W., Seward Meridian	Alaska Energy Authority	18554014	25.94

*Fish and Game Sport Fish Access "Inventory of Private and Other In-holdings in State Game Refuges, Critical Habitats, and Game Sanctuaries: Cook Inlet, Alaska 2002".

Appendix 14. Kachemak Bay State Park In-holdings

Location	# of Private Parcels	Total Acreage
Cottonwood Creek	7	101.5
Bear Cove	47	173.3
Glacier Spit / Grewingk	1	34.9
Halibut Cove to Peterson Point	222	683.5
Islands	36	234.8
China Poot Bay to Sadie Cove	27	668.9
Sadie Cove	26	190.0
Hazel Lake	3	23.2
Tutka Bay	15	570.0
Total	384	2,680.1

Source: Kenai Peninsula Borough and Alaska Department of Natural Resources

Appendix 15. NERR Boundary Changes

Code of Federal Regulations
Title 15, Volume 3
Current as of September 27, 2011
CITE: 15CFR921.33

Title 15: Commerce and Foreign Trade

PART 921—NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM REGULATIONS
Subpart D—Reserve Designation and Subsequent Operation

§ 921.33 Boundary changes, amendments to the management plan, and addition of multiple-site components.

(a) Changes in the boundary of a Reserve and major changes to the final management plan, including state laws or regulations promulgated specifically for the Reserve, may be made only after written approval by NOAA. NOAA may require public notice, including notice in the Federal Register and an opportunity for public comment before approving a boundary or management plan change. Changes in the boundary of a Reserve involving the acquisition of properties not listed in the management plan or final EIS require public notice and the opportunity for comment; in certain cases, a categorical exclusion, an environmental assessment and possibly an environmental impact statement may be required. NOAA will place a notice in the Federal Register of any proposed changes in Reserve boundaries or proposed major changes to the final management plan. The state shall be responsible for publishing an equivalent notice in the local media. See also requirements of §§921.4(b) and 921.13(a)(11).

(b) As discussed in §921.10(b), a state may choose to develop a multiple-site National Estuarine Research Reserve after the initial acquisition and development award for a single site has been made. NOAA will publish notice of the proposed new site including an invitation for comments from the public in the Federal Register. The state shall be responsible for publishing an equivalent notice in the local newspaper(s). An EIS, if required, shall be prepared in accordance with section §921.13 and shall include an administrative framework for the multiple-site Reserve and a description of the complementary research and educational programs within the Reserve. If NOAA determines, based on the scope of the project and the issues associated with the additional site(s), that an environmental assessment is sufficient to establish a multiple-site Reserve, then the state shall develop a revised management plan which, concerning the additional component, incorporates each of the elements described in §921.13(a). The revised management plan shall address goals and objectives for all components of the multi-site Reserve and the additional component's relationship to the original site(s).

(c) The state shall revise the management plan for a Reserve at least every five years, or more often if necessary. Management plan revisions are subject to (a) above.

(d) NOAA will approve boundary changes, amendments to management plans, or the addition of multiple-site components, by notice in the Federal Register. If necessary NOAA will revise the designation document (findings) for the site.

Appendix 16. Policies for Legislatively Designated Areas in the Reserve Boundary

1. Kachemak Bay and Fox River Flats Critical Habitat Areas

The following are taken from the Kachemak Bay and Fox River Flats Critical Habitat Areas Management Plan (ADF&G 1993). Where CHA lands and waters overlap with Kachemak Bay State Park, the Division of Parks and Outdoor Recreation may have more restrictive policies and regulations. Separate Park permits may be required.

A. Overall policy on activities within CHAs

To protect fish and wildlife populations and their habitats in the Critical Habitat Areas, the Department may allow by permit only those activities compatible with the purposes for which the Critical Habitat Areas were established, terms and standards of 5 AAC 95, and the goals and policies of this Management Plan. Any activity that is not compatible with the purposes for which the Critical Habitat Areas were established, terms and standards of 5 AAC 95, and the goals and policies of this Plan, will not be allowed.

B. Specific policies

Access – Maintain existing public access into Kachemak Bay and Fox River Flats Critical Habitat Areas. Improve public access within Kachemak Bay Critical Habitat Area consistent with the goals of the CHA Management Plan. Fox River Flats Trail should continue to be used as an all-weather trail with appropriate terms and conditions, including weight restrictions, placed on use of motorized vehicles.

Off-Road use of motorized vehicles – To ensure the protection of important habitat, avoid harmful disturbance of fish and wildlife, and accommodate a variety of Critical Habitat Area users, the Department will, as appropriate, establish motorized vehicle use corridors, and seasonal and vehicle use restrictions under a General permit for individual personal and recreational transportation. Organized group events involving 20 or more individuals or the use of industrial or construction type vehicles may, in the commissioner's discretion, be authorized under an individual Special Area Permit under 5 AAC 95.420 (a)(7), if the use is consistent with the goals and policies of this Management Plan. Traversing areas with rooted vegetation in airboats or hovercraft is prohibited.

Information and education – Inform the public about resource values, recreational opportunities (including high value viewing areas) and rules in Kachemak Bay and Fox River Flats Critical Habitat Areas. Encourage compatible education programs, and research and monitoring of fish, wildlife, and habitat resources and their uses.

Fish and wildlife habitat and population enhancement and rehabilitation – As appropriate, allow enhancement and rehabilitation of habitat of indigenous wildlife or fish species and enhancement of fish and wildlife populations, where it furthers the management goals of Kachemak Bay and Fox River Flats CHAs, is not at the expense of existing resource values

(including diversity and abundance), and does not interfere with public use and enjoyment. Priority should be given to encouraging rehabilitation of depleted indigenous fish and wildlife populations.

Water quality – Water quality standards applied to estuarine, marine and freshwater environments in CHAs shall be State water quality standards set out in 18 AAC 70 (as amended as of January 7, 1987). Cumulative effects of waste discharge shall be a primary concern when determining appropriate activities in the CHAs and must meet the above specified standards. Discharge of treated waste products may only be allowed within the CHAs when there is a demonstrable need for which there is no feasible alternative.

Mooring buoys, running lines, and navigational aids – Mooring buoys and running lines will be allowed under the terms of a General permit where adjacent upland landowners require public or private access to their property. Public mooring buoys may also be allowed under the terms of a General permit. Mooring buoys and running lines will be sited and used in a manner that does not interfere with navigation for the purpose of public use and enjoyment of the CHAs, existing fisheries, or other authorized uses. In areas where a proliferation of buoys would have the potential to interfere with navigation for the purpose of public use and enjoyment of the CHAs, or public uses of the CHA, an area or areas may be identified for the location of public and private mooring facilities. Navigational aids will be allowed by General permit.

Harbors, docks, piers, boat ramps, and piling support structures – Harbors, docks, piers, boat ramps, and associated structures may be allowed for the purpose of maintaining or improving public access to Kachemak Bay or where adjacent upland landowners require access to their property in a manner consistent with CHA statutes and regulations, and the goals and policies of this Management Plan. Siting, design, construction and maintenance of these facilities will to the maximum extent possible avoid impacts to habitat, fish, wildlife, navigation for the purpose of public use and enjoyment of the CHAs, and existing fisheries. Community dock development, seasonal docks, mooring buoys, and running lines will be encouraged over individual private permanent docks whenever possible. Solid fill docks will be avoided to the maximum extent possible if the facility will impact productive habitat; interfere with natural coastal processes including tidal action, circulation, erosion, and deposition patterns; or, interfere with public use of one or both of the CHAs. Piling or floating docks will be used whenever possible. The size of a structure will be kept to the minimum necessary to accommodate the proposed activity.

Long-term anchorage, float structures, boat maintenance, and derelict or abandoned boats – Anchorage or placement of a vessel or structure for longer than 14 days in the Fox River Flats or Kachemak Bay CHAs requires authorization under a Special Area Permit and may be allowed if consistent with the purpose for which the CHA was established, and the goals and policies of this Management Plan. A General permit may be issued under the appropriate terms and conditions for the anchoring of vessels in the vicinity of the Homer and Seldovia small boat harbors. Float structures, except when specifically allowed by other policies in this Plan, will not be allowed on public lands and waters in the CHAs. Derelict or abandoned boats may not be left on public lands or waters in the CHAs outside of the Homer or Seldovia small boat harbors. Intertidal boat maintenance outside of established community boat harbors may be authorized on

private tidelands, or on public tidelands when there is no feasible alternative, under terms and conditions consistent with the goals and policies of this Management Plan and the purposes for which the CHAs were established. The sinking of derelict boats in Kachemak Bay may be allowed only for the purpose of artificial reef enhancement undertaken by a local, state, or federal agency, if it will not impact fish and wildlife habitat, fish and wildlife populations, or public use of CHAs.

Shoreline alterations – Except as provided in the Harbors, Docks, Piers, Boat Ramps, and Piling Support Structures policy, no alteration will be allowed of the natural shoreline of Kachemak Bay, except when it will provide an overwhelming public benefit and there is no feasible upland alternative, or in the case where the proposed project is entirely on privately-owned tidelands for the purpose of private property protection. Shoreline alteration of public tidelands to protect private property will not be allowed. Shoreline alteration will, to the maximum extent practicable, follow the natural configuration of the shoreline and avoid impact to fish and wildlife populations, their habitat, and public use and enjoyment of the CHAs. Maintenance and clean-up of shore retention structures will be required of any shoreline alteration project.

Land acquisition – The Department may acquire private or municipal uplands, tidelands, or conservation easements within the CHAs from willing sellers, as time and funding permit through purchase and trade. Donation of lands for addition to the CHAs will also be considered.

Pot and gear storage – The storage of fishing pots and other fishing gear within Kachemak Bay or Fox River Flats CHAs requires a Special Area permit. A Special Area permit may be issued for the storage of fishing pots and other gear where storage will not impact fish and wildlife habitat, fish and wildlife populations, public use of the CHAs, or navigation for the purpose of public use and enjoyment of one or both of the CHAs. Whenever possible, upland storage is preferred.

Shore fishery lease – Use of shore fishery leases may be authorized under the terms of a General permit, if the leases are consistent with the goals and policies of this Management Plan, the purpose for which the CHA was established, salmon harvest regulations, and if the leases are not in conflict with use of the pre-existing shore fishery leases, aquatic farm permits or leases, or other disposals of interest in State property.

Aquatic farming – In a manner compatible with the maintenance of high water quality in Kachemak Bay, aquatic farming activities, including float structures essential to the farm operation, may be permitted in Kachemak Bay on a case by case basis under terms and conditions consistent with the protection of fish and wildlife populations and their habitats, continued use of fish and wildlife, and public use and enjoyment of the CHAs, if compatible with other existing uses. Within the constraints provided by law, Jakolof Bay is recognized as a physically suitable area for aquatic farming activity because of good site conditions and an absence of use conflicts with fisheries. Aquatic farming will not be authorized in China Poot Bay due to its shallow character and conflict with existing navigational channels and fisheries. Additional aquatic farms of any configuration in Peterson Bay or additional floating aquatic farms in Kasitsna Bay will not be authorized due to an absence of suitable sites free from conflict

with existing fisheries and public use. To avoid conflict with existing setnet fisheries, aquatic farms will not be sited within a 305 m (1,000 ft) radius offshore (from mean low water) of commercial set gillnet sites in Seldovia Bay, Kasitsna Bay and McDonald Spit, and Halibut Cove. To provide time for observation of the effect of existing aquatic farms, a moratorium on both the authorization of the expansion of the boundaries of existing farms and the authorization of new aquatic farms (excluding aquatic farms applied for prior to December 31, 1992 and experimental projects conducted in cooperation with the department) in Kachemak Bay will extend through December 31, 1995. Authorization of aquatic farms after that date may occur if authorization is not specifically prohibited by this policy or other State law. The effects of existing aquatic farms will be utilized to determine, in part, decisions to permit, deny, or modify new aquatic farm proposals submitted after the expiration moratorium.

Grazing – A new grazing lease or permit, or renewal of an existing grazing lease may be allowed only for cattle or horses in Fox River Flats CHA under terms and conditions compatible with CHA statutes, and the goals and policies of this Management Plan using guidelines established in consultation with other involved parties during the development of a Range Management Plan. Introduction of species other than cattle and horses will not be allowed. Terms and conditions under which grazing may be allowed will include seasonal restrictions necessary to avoid impact to critical waterfowl and moose habitat, riparian buffers necessary to avoid damage to fish streams, limits on number of animals, requirements for marking animals, responsibility for removing feral animals, application of active management techniques, including moveable fences where appropriate, and requirements to maintain public access on public lands.

Inwater log storage and transfer facilities – To prevent the destruction of benthic marine habitats and interference with public use, including navigation for the purpose of public use and enjoyment of the CHAs and fishing, the inwater storage or transfer of logs is not allowed in Kachemak Bay, except that logs intended for personal use may be transported in Kachemak Bay under the terms of an individual Special Area permit under which inwater time does not exceed 14 days. It is not the intent of this policy to preclude logging on the south side of Kachemak Bay.

Pipelines and utility lines - A new utility or pipeline may be allowed to cross Kachemak Bay CHA if there is no feasible alternative, using an existing corridor whenever possible, consistent with CHA statutes and the goals and policies of this Management Plan, and will avoid impacts to CHA values to the maximum extent possible. Utility lines and pipelines will not be allowed in wetlands in the Fox River Flats CHA. Any easement issued within the CHAs will be non-exclusive use only. Easements for sewer outfalls may only be allowed within Kachemak Bay CHA when there is a demonstrable need for which there is no feasible alternative and must be consistent with the goals and policies of this Management Plan. Except for unauthorized fuel docks, fuel lines and oil pipelines will not be allowed to cross either Kachemak Bay or Fox River Flats CHA.

Mining – Mineral or coal leasing is not allowed in the CHAs. The CHAs should be closed to new locatable mineral entry, and tide and submerged lands closed within the CHAs to issuance

of offshore prospecting permits. Incidental gathering of loose coal for personal use on Kachemak Bay beaches will continue to be allowed.

Material extraction – Material extraction on public lands will not be allowed within the CHAs unless for purposes of maintenance, enhancement or restoration of CHA habitat. All material extraction activities within the CHA, including activities on private lands, must be consistent with CHA statutes and the goals and policies of this Management Plan.

Oil and gas – To avoid damage to fish and wildlife habitats, disturbance to fish and wildlife populations, and displacement of public use, surface entry for oil and gas exploration or development will not be allowed in Kachemak Bay or Fox River Flats CHAs, except that geophysical surveys may be permitted if there is no surface impact and appropriate stipulations, including seasonal restrictions, preclude impact to fish and wildlife habitat, fish and wildlife populations, and public use of CHAs.

Oil drilling rig storage – To avoid damage to fish and wildlife habitats, disturbance to fish and wildlife populations, and displacement of public use of Kachemak Bay CHA, drilling rig storage will not be allowed in the Kachemak Bay CHA.

Hazardous materials – Hazardous materials may not be stored or deposited in the CHAs.

Other uses – To protect fish and wildlife populations and their habitats in the CHAs, the Department may allow by permit only those activities compatible with the purposes for which the CHAs were established, terms and standards of 5 AAC 95, and the goals and policies of this Management Plan. Any activity that is not compatible with the purposes for which the CHAs were established, terms and standards of 5 AAC 95, and the goals and policies of this Management Plan will not be allowed.

2. Relevant Policies of Kachemak Bay State Park

The full set of policies appears in the 1995 Management Plan for Kachemak Bay State Park and Kachemak Bay State Wilderness Area (ADNR 1995). Policies appear in two sections of the State Park Management Plan – the matrix table called 'Guidelines for Appropriate Activities and Facilities within Land-Use Zones', and Chapter 7 'Recommendations/Park-Wide Policies'. After the State Park Management Plan was signed, these sections became enforceable Park policy. These policies cover several categories, such as Resource Management, Visitor Use Management, Private Lands, Commercial Activities, Facility Development, and Trail Development.

The KBSP policies most likely to pertain to possible NERR operations are summarized below. The compatibility of certain uses is sometimes dependent on where the park activity would occur (i.e. Natural, Wilderness, Cultural, or Recreational zone). Note that most of the Park is zoned Wilderness, including everything above 305 m (1,000 ft) elevation, which implies the more restrictive management policies.

Excerpts from 'Guidelines for Appropriate Activities' table:

Research and management studies – Collection of data necessary for Park management decisions or to further science. Priority will be given to studies that contribute to the use and management of native fish and wildlife populations and their habitats. Will be encouraged when consistent with purposes of the Park, under DPOR permit.

Ecological monitoring – Activities or studies that address how fish and wildlife and their habitats are changing due to either human or natural causes are considered compatible.

Fish and wildlife inventories – Using acceptable inventory techniques to obtain information on species distribution, harvests, abundance, habitats, and population dynamics, to meet Park management objectives are considered compatible.

Fisheries enhancement/restoration – Action taken to increase fishery stocks such as artificially incubating fish in streams, fertilizing lakes, and restoring fish access to spawning and rearing habitat. This type of activity is conditionally compatible, under DPOR permit. Structures may or may not be compatible depending on the designated zones (Natural, Wilderness, Cultural, Recreational) of the Park.

Wildlife habitat manipulation – Modification of habitat to increase target wildlife population. Includes both enhancement and restoration activities, such as prescribed burning and mechanical manipulation. This activity is not compatible, except when restoring habitat damaged by human impact.

Wildlife introduction – Introduction of non-indigenous or exotic species is not compatible.

Wildlife stocking – Used to reestablish native species within their original breeding ranges. Compatible after adequate research and public hearings, to ensure there will be no detrimental impact on other species or uses.

Predator control – Relocation or removal of predators to favor other wildlife species or populations, and the protection of reintroduced species is not considered compatible.

Pest and disease control – The use of poisons or chemicals to control or eradicate insect pests and/or diseases to indigenous animals, plants or forests. This is not considered compatible, except to control species not indigenous to the area, or for public safety reasons. This applies to herbicides as well.

Fire suppression – Actions taken to suppress wildfire may or may not be compatible, depending on Park zone.

Resource extraction – Removal of timber, gravel, rock, sand, minerals, plants, or other Park resources for commercial or personal use is not compatible.

Commercial uses – Many are not compatible, such as resource extraction, hydroelectric power, grazing, and commercial lodges (severely restricted). Others, such as aircraft operation, guiding,

and utility crossings, are allowed in specified Park zones, managed through a Park Commercial Use permit system. Commercial fishing is managed by ADF&G.

Excerpts from 'Recommendations/Park-Wide Policies

Resource Management

Research will generally be encouraged within the Park. Proposals for associated facilities or developments, such as research camps, shall be reviewed by Alaska State Parks staff for approval. Issuance of applicable permits will be based on expected levels of impact within the zone in which the activity will occur.

The Park is included in the State Division of Forestry's Fire Management Plan, which recommends minimal wildland fire control efforts within the Park, except where human life or development is at risk.

The introduction of exotic species of plants or animals (those not indigenous to the area) should not be allowed. Proposals of this type will be reviewed by both the Kachemak Bay State Park Citizen's Advisory Board and by the public.

Activities that are incompatible with the Park's enabling legislation, regulations, and this Management Plan, will be prohibited. Examples of compatible and incompatible uses are found in the 'guidelines for activities within land use zones' in this Plan.
Because of fragile soil types, horses and other stock animals (except llamas), should not be allowed on foot trails.

No animals should be tethered within 91 m (300 ft) of freshwater streams or lakes.

The Parks will generally be left to natural environmental processes. Efforts to address insect infestation will focus on public safety and prevention. Campsites and other public use facilities will be periodically inspected for dead or dying trees. If a spruce bark beetle infestation is detected in a dead or dying tree that constitutes a hazard. The tree will be cut for firewood or felled, debarked, and removed for other uses. Standing or fallen trees that have been dead for two or more years that have not already been infested by spruce bark beetle, and are not at risk of infestation will remain. These trees have value to wildlife and will not be cut unless they are hazards. Trees cut for use during trail and facility construction projects, and green blowdown, should be debarked. Slash (waste) will be cut into 0.6 m (2 ft) sections and scattered, to increase exposure to the sun.

Visitor Use Management

Use of motor vehicles within Kachemak Bay State Park and Kachemak Bay State Wilderness Park, other than boats and aircraft, is prohibited. Although current State law allows aircraft use in KBSP, aircraft use within Kachemak Bay State Wilderness Park is allowed only on saltwater and saltwater beaches. Exceptions to these regulations may be allowed by the Director. If exceptions are made, specific landing sites will be designated, and use controlled by either Park Use or Commercial Activities permit. Permits will be routinely reviewed. If Park values are threatened or conflict has developed between user groups, the permit may be revoked. Landing

sites will be established by the Director in consultation with the Kachemak Bay State Park Citizen's Advisory Board.

Hunting, trapping, and fishing are allowed in the Park, subject to ADF&G regulations. Due to concerns for public safety, the discharge of firearms is prohibited within 805 m (½ mi) of developed facilities.

Facility Development

Recreational development and activities which provide access to or enhance enjoyment of the natural environment of State Parks are encouraged, but the development of a State Park must not diminish the value of Park resources. Manipulations of the natural environment shall be limited to the immediate vicinity of development. Facilities must be carefully sited to avoid diminishing scenic values.

All Park facilities shall be sited, designed, and constructed to minimize impact of the natural environment, and on the scenic or wilderness values of the area. Sensitive habitats, such as goat kidding areas, and pristine viewsheds, will be avoided. No facilities will be developed within 91 m (300 ft) of raptor nests, or animal den sites.

Appendix 17. Public Process for Input and Comments on Management Plan Update

Responses to Written and Oral Comments
Received on the 5-Year Management Plan Update

Development of the Kachemak Bay National Estuarine Research Reserve management plan occurred over the past 2 years and included direct input from all Reserve staff members during a two day visioning retreat (January 2010); review and comment by Alaska Department of Fish and Game – Sport Fish Division staff; Kachemak Bay Research Reserve Community Council (June 2011, December 2011, and September 2012); the Research Committee of the Community Council provided review and comment on the Research Plan (Chapter 5) in 2011; the Education Committee provided review and comment on the Education Plan (Chapter 6) in 2011; and the National Oceanic and Atmospheric Administration's Estuarine Reserves Division (ERD) staff provided input and comments throughout the process.

NOAA's Estuarine Reserves Division reviews and approves the plan after ensuring sufficient opportunity for comment by the public, per 15 Code of Federal Regulations 921.33. Once the management plan has been approved by NOAA's ERD, a Federal Register Notice announcing a 30 day public comment period is published. The public comment period for this plan was published in the Federal Register on August 15, 2012 and the comment period ended on September 15, 2012. After the required 30 day public comment period, revisions to the document were made, where appropriate.

Specific comments received on the plan are noted below in bold and are followed by a description of how the Kachemak Bay National Estuarine Research Reserve addressed the comment.

Comment: General comments about grammar, punctuation, suggested edits.

Response: All suggestions were reviewed, and when appropriate, incorporated in the final document.

Comment: Goal 1: Suggests more collaboration and purposefully directed efforts are possible to contribute to the programs of the Kenai Peninsula College, Kachemak Bay Campus. KBRR has much to offer in the way of science education, but seems to skip from secondary school programs to (primary and secondary school) teacher education. College education is not emphasized, yet your work requires college education to accomplish. I know there are lots of college science courses that would benefit from KBRR contributions, as Adjunct instructors,

guest lecturers, and collaborators toward college curriculum development. I expect the Kachemak Bay Campus and the Kenai Peninsula College would be grateful for the offer and I know they should take you up on any help you can provide. Distance education technology makes it possible to share college-level contributions across Alaska to all the campuses of the University of Alaska system.

Response: KBNERR staff has been receptive to invitations to go into either high school or college classes as guest lecturers when appropriate. This point was not articulated into the Plan but has since been addressed.
KBNERR staff are challenged when they receive invitations to opportunistically present to classes, or to fulfill the role of Adjunct instructors by the funding structure of the organization. Most, if not all of our projects are funded by competitive grants. This funding structure limits our ability to add tasks or additional duties that could over-extend the budget of the grant. We will continue to encourage KBNERR staff to fulfill requests as guest lecturers, but we cannot ensure they will have the ability to meet all requests.

Comment: Goals 3 and 5: We have just realized that Alaska, of all coastal states, will not have a Coastal Management Program. Public information about coastal processes and factual knowledge about coastal issues are more valuable than ever in this State, since CZM plans and other benefits of a Coastal Management program are now out the window. KBRR could step up more forcefully to this situation and be leaders of awareness and conscientious coastal stewardship all around the State.

Response: KBNERR, through our Coastal Training Program (CTP) will continue to provide needs based trainings to coastal decision makers throughout Alaska. That said, our CTP will continue to focus their training energies on coastal decision makers in Southcentral Alaska since the Reserve is headquartered in the region, as well as the huge expanse of coastal Alaska beyond Southcentral. As a needs based training provider we will continue to conduct needs assessments of our targeted training audiences to do our best to meet their needs.

Comment: After reviewing your 5 year plan I didn't see any significant changes on the status quo in regards to local knowledge or a plan to incorporate tribal communities in resource development. Even though most tribal members have no post-secondary education they are very informed on their environment.

Response: KBNERR has, and will continue to explore opportunities to work with our neighboring villages across Kachemak Bay. Over the next five years we will continue to meet with personnel from the Tribes in an effort to hear their concerns and questions about coastal issues, and actively look for projects that can be done collaboratively to address their questions.

Comment: First, I want to complement Reserve staff on the preparation of an excellent plan. The KBNERR and its many partners make an incredible contribution to an understanding and wise management of the Kachemak Bay/Lower Cook Inlet ecosystem. The plan does a commendable job in summarizing your accomplishments and laying a strategy for the future.

Please find enclosed a few minor comments on the draft management plan. These comments are intended to reflect discussions with the KBNERR and other researchers and educators and the Port Graham and Nanwalek Tribes over the past to improve communications and collaborations between the Tribes and Western researchers and educators in the Kachemak Bay area. The KBNERR managers, researchers, and educators have all expressed a sincere interest in working with area Tribes in addressing their natural resource research and education needs. This interest is of course qualified with the collective challenge of figuring out ways to fund such collaborations, and fit such collaborations in with other Reserve priorities and needs.

> **Comment:** As identified the following quotes from the plan, the Research Plan, Chapter 5, identifies three Tribes in the Cook Inlet area as research partners (page 54) and in establishing collaborations (page 65, Objective 63). This reflects the Reserve's commitment to work with the Tribes in addressing regional or tribal natural resource needs. We would suggest, however that reference to the Port Graham and Nanwalek Tribes be made consistent with the listing for the Seldovia Village Tribe: i.e., replace "Port Graham-Nanwalek Watershed Council" with "Port Graham Tribe" and "Nanwalek Tribe"
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> Response: Comment accepted incorporated.
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> **Comment:** Unlike the Chapter 5, the Chapter 6 (Education and Outreach), reflects a commitment to work with the Seldovia Tribe, but not the Port Graham and Nanwalek Tribes. I would suggest that Port Graham and Nanwalek Tribes be added the list of education partners. Similarly, the Education and Outreach Plan (unlike the Research) reflect the Reserve's commitment to work the Tribes or outlying communities. What is the Reserves intent in working with the Tribes? I recommend the Reserve reflect their intent in the Education and Outreach goals and objectives.
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> Response: Comment accepted and incorporated.