Alaska ShoreZone
Coastal Habitat Mapping Program

Auke Bay Laboratories
Alaska Fisheries Science Center

Mandy Lindeberg
Coastal Issues in Alaska

- Resource development
- Coastal development
- Climate change
- Loss of sea Ice
- Coastal erosion
- Increased vessel traffic
- Subsistence needs
History of Human Impacts to Alaska’s Coast

- Exxon Valdez oil spill 1989
- Selendang Ayu break up 2004
- Drill Rig Kulluk 2013
- Canadian barge Oct. 2014?

134 ft. barge adrift, Beaufort Sea
What is ShoreZone?

A standardized coastal habitat mapping product:

*ShoreZone images and characterizes biophysical attributes of discrete shore units in both along-shore and across-shore components in a searchable, spatially explicit database.*

- Wave exposure
- Biota
- Geomorphology
- Man-made features
- Sediment texture
- Features
Alaska ShoreZone Program:

A partnership of many agencies and NGOs collaborating on various phases of ShoreZone:

- Phase I – Acquiring Coastal Imagery
- Phase II – Habitat Mapping
- Phase III – Online Products, outreach
Phase I: Acquiring Coastal Imagery

Planning, Logistics, etc.

- Consultations, awareness in coastal communities
- Land ownership and permitting
- Flight plan, fueling locations, lodging, food

I thought you ordered the fuel?
Phase I: Acquiring Coastal Imagery

Mapping is based on video and still imagery:

- low altitude
- oblique
- geo-referenced
- low tide
Phase II: Habitat Mapping - Digital Shoreline

GPS flight trackline recorded at 1-second intervals:

Navigation trackline and imagery are used to segment digital shoreline into along-shore units:
Phase II: ShoreZone Protocol

- Guidelines for users
- Codes and definitions
- Diagrams
- Photographic examples
Table A-2. Classification of shore types employed in ShoreZone mapping (derived from the Howes et al. [1994] "BC Class" system in British Columbia)

<table>
<thead>
<tr>
<th>SUBSTRATE</th>
<th>SEDIMENT</th>
<th>WIDTH</th>
<th>SLOPE</th>
<th>COASTAL CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROCK</td>
<td>N/A</td>
<td>WIDE</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, wide</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>INCLINED (5-20°)</td>
<td>Rock Platform, wide</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FLAT (&lt;5°)</td>
<td>Rock Platform, narrow</td>
</tr>
<tr>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>WIDE</td>
<td>Rock Ramp, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NARROW</td>
<td>STEEP (&gt;20°)</td>
<td>Rock Ramp, narrow</td>
</tr>
<tr>
<td></td>
<td>INCLINED (5-20°)</td>
<td>WIDE</td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT (&lt;5°)</td>
<td></td>
<td>Rock Platform, narrow</td>
<td></td>
</tr>
</tbody>
</table>
Phase II: biophysical mapping

Physical and biological features of across-shore zones are mapped with respect to relative tidal position.
Phase II: habitat mapping - “Biobands”
Phase II: A Rigorous Geospatial Database
<table>
<thead>
<tr>
<th>Substrate Type</th>
<th>Shore Type (BC Class)</th>
<th>Shore Type (BC Class)</th>
<th>% Shoreline (km)</th>
<th>% Shoreline by Shore Type (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock</td>
<td>1</td>
<td>Close to edge</td>
<td>4.3</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>2</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>3</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>4</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>5</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Rock &amp; Sediment</td>
<td>6</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>7</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>8</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>9</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>10</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>11</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>12</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>13</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>14</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>15</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>16</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>17</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>18</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>19</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
<tr>
<td>Sediment</td>
<td>20</td>
<td>Close to edge</td>
<td>4.1</td>
<td>32.7%</td>
</tr>
</tbody>
</table>

Substrate Type Summary:

- Rock (BC Class 1-5)
- Rock + Sediment (BC 6-20)
- Sediment (BC 21-30)
- Organic/Estuarine (BC 31)
- Mammal (BC 32-35)
- Current-dominated channels (BC 34)
- Glacial (BC 35)

Shore Zone Summary Reports

Shore Type

![Shore Zone Map](image-url)
Phase III: ShoreZone online

- ShoreZone.org – partner website
- Main portal - NOAA Fisheries web enabled GIS, “flex site"
- Other portals
Alaska ShoreZone Coastal Mapping and Imagery
https://alaskafisheries.n... National Oceanic and Atmospheric Administration
Alaska ShoreZone Coastal Mapping and Imagery - You can fly the Alaska coastline (via video), view still photos, and access biophysical data using our ...

ShoreZone Flex Site - NOAA Fisheries Alaska
alaskafisheries.noaa.go... National Oceanic and Atmospheric Administration
Disclaimer Privacy Policy ShoreZone Page Metadata Contact Data Dictionary Admin Linl
Alaska ShoreZone Flex Mapping Website. Initial mode: ShoreZone

ShoreZone | Facebook
https://www.facebook.com/ShoreZone
ShoreZone 175 likes · 3 talking about this. ShoreZone is a coastal habitat mapping program using georeferenced imagery taken by helicopter. Geology and...

ShoreZone Habitat Mapping - Coastal and Ocean ...
www.coastalandoceans.com/.../ShoreZo... Coastal and Ocean Resources Inc.
The ShoreZone mapping system assesses coastal habitats with coastal zone aerial video digital still imagery during the lowest daylight tides of the year.

Shorezone - Geographic Information Network of Alaska
www.gina.alaska.edu/projects/shorezone University of Alaska system
The Alaska ShoreZone Project is taking an inventory of the biology and geology of Alaska’s immense coastline by making millions of photographs, video, and ...

Nearshore Habitat Inventory Projects
www.dnr.wa.gov/.../a... Washington State Department of Natural Resources

Integrated Datasets and Web Enabled GIS
ShoreZone on ERMA – Environmental Response Mgmt Application
ShoreZone on ERMA – Imagery on Flicker
Coastal imagery of the North Slope of Alaska from Point Hope in the Chukchi Sea to the Canadian Border in the Beaufort Sea.
ShoreZone on BSEE (Bureau of Safety and Environmental Enforcement)
ShoreZone on AOOS – CIRCAC response tool
ShoreZone on AOOS – Arctic Portal
Recent ShoreZone Online Services

NOAA website:
- YouTube streaming video
- Download video clips
- Download shapefiles, xshore
- Fish Atlas and Shore Station overlay
- Linking video and photo play
- WMS basemap layers

NOAA mobile: internet and stand alone
- Local photos and units
- Internet photos\YouTube & units
- Low resolution imagery
- Medium resolution imagery
- Full resolution imagery
There’s an App for That!

- Smart phones/ tablets
- Carry Map
- Load and go

Seriously?
## Additional Resources online

**ShoreZone demo maps for the CarryMap app**

<table>
<thead>
<tr>
<th>Map</th>
<th>Approx. Size</th>
<th>Apple iOS / Android</th>
<th>Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kachemak Bay - with photos</td>
<td>20 MB</td>
<td>Download</td>
<td>Download</td>
</tr>
<tr>
<td>Cook Inlet - with some photos</td>
<td>400 MB</td>
<td>Download</td>
<td>Download</td>
</tr>
<tr>
<td>Cook Inlet - photos online</td>
<td>115 MB</td>
<td>Download</td>
<td>Download</td>
</tr>
</tbody>
</table>

Download the full ShoreZone geodatabase (620 MB)  

[Download](http://alaskafisheries.noaa.gov/mapping/szflex/szapps.htm)
Applications of ShoreZone

- Originally developed for oil spill planning and response
- First responders – USCG, federal and state agencies
- Resource Managers – sensitive habitats, invasive species
- Scientists – site selection, monitoring, species distribution
- Educators and students – coastal environment
SHOREZONE COASTAL HABITAT MAPPING PROGRAM IN ALASKA

- Imaged and mapped (61,698 km)
- Mapping in progress (5,692 km)
- Imaged; available for mapping funding (855 km)
- Imaging survey funded (1,890 km)
- Needs imagery (~9,300 km)
- State of Alaska

Map Date: September 2014

Map produced by Coastal and Ocean Resources

Are we done yet?
ShoreZone Outreach

- Friend us [facebook]
- Webinars
- Custom training
Alaska ShoreZone Contact:

- Amalie Couvillion
  ShoreZone Partnership Coordinator
  (907) 865-5703
  (907) 351-8346
  acouvillion@tnc.org

Alaska Field Office
715 L Street
Suite 100
Anchorage, AK 99501
FY 2014 ShoreZone Funding Partners

- NMFS AK Region
- NMFS Auke Bay Labs
- NOAA NOS
- NOAA AK Region Collaboration Team
- US DOI FWS Yukon Delta
- US DOI FWS NWR
- US FWS ALCC
- US FWS WALCC
- US DOI NPS
- US DOI BOEM
- US DOI BSEE
- PWS RCAC
- CI RCAC
- TNC
- UAF GINA
Diamond in the Rough – starting to shine...

Future Goals

- 2001: First Survey – Cook Inlet RCAC
- 2003: ShoreZone workgroup formed
- 2005: Web database online; Fish Atlas
- 2007: Record summer surveys
- 2009: Arc Server; 60% AK imaged
- 2011: SEAK complete!
- 2013: Arctic, St. Lawrence
- 2015: Norton Sound; ~80% AK
- 2007: Western AK complete
- 2009: Aleutians
- 2007: Temporal imagery
- 2003: Polished diamond - always needs buffing
A True Measure of Success is:

“We used ShoreZone to …..”
Recent Testimonial – graduate student

Nicole Bitler - Committee on Evolutionary Biology, The University of Chicago

“The ShoreZone habitat mapping resource has been incredibly helpful for my research on the phenotypic consequences of range expansion in two marine intertidal whelks, *Nucella lamellosa* and *Nucella ostrina*. As a graduate student at the University of Chicago, the ShoreZone maps helped me pinpoint ideal sites for collection and have also allowed me to retrospectively assess the biological and environmental characteristics of sites that I visited during my field work in Alaska.

The categorization of wave exposure across coastal sites is one of the features of the maps that has been most useful for my work, since wave exposure has been shown to strongly influence morphology in the whelks I am studying. The photographs and videos associated with the sites are also a fantastic resource, and I have used them in communicating my research to scientific colleagues and non-scientists.”
ShoreZone Referenced in 2014 Publication

- Committee on Responding to Oil Spills in the U.S. Arctic Marine Environment
- Ocean Studies Board
- Division of Life and Earth Studies
- Marine Board
- Transportation Research Board
- National Research Council
Thank You – Questions?
### Web Enabled GIS: desktop orientation

![GIS Interface](image)

**FishAtlas Statewide Queries**

- **Area**
  - Statewide
  - Group By Region
  - Group By Locale
  - Group By Site

- **Fish**
  - All Species
  - Select a Species
  - Group by Habitats
  - Select a Habitat

- **Habitat**
  - All Habitats
  - Group by Habitats
  - Select a Habitat

### FishAtlas Regions

<table>
<thead>
<tr>
<th>Region</th>
<th>Hauls</th>
<th>Species</th>
<th>Total Catch</th>
<th>Fish Catch Locales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaskan Islands</td>
<td>70</td>
<td>27</td>
<td>81.118</td>
<td></td>
</tr>
<tr>
<td>Arctic</td>
<td>81</td>
<td>23</td>
<td>20.603</td>
<td></td>
</tr>
<tr>
<td>Bristol Bay</td>
<td>8</td>
<td>17</td>
<td>8.775</td>
<td></td>
</tr>
<tr>
<td>Prince William Sound</td>
<td>133</td>
<td>55</td>
<td>51.423</td>
<td></td>
</tr>
<tr>
<td>Southeast Alaska</td>
<td>92</td>
<td>402,858</td>
<td>524,368</td>
<td></td>
</tr>
<tr>
<td>Southeastern Alaska</td>
<td>694</td>
<td>92</td>
<td>718,345</td>
<td></td>
</tr>
</tbody>
</table>

**Habitat Key**

- Bedrock
- Elgrass
- Kelp
- Sand-Gravel

**Fish Catch Locales**

- Alaskan Islands: 70 hauls, 27 species, total catch 81.118
- Arctic: 81 hauls, 23 species, total catch 20.603
- Bristol Bay: 8 hauls, 17 species, total catch 8.775
- Prince William Sound: 133 hauls, 55 species, total catch 51.423
- Southeast Alaska: 92 hauls, 402,858 species, total catch 524,368
- Southeastern Alaska: 694 hauls, 92 species, total catch 718,345
Query = all sites with Saffron cod
Entire Database: Saffron cod

Common name: Saffron cod
Scientific name: Melanogrammus aeglefinus
Family: Gadidae

- Adult (365 mm)
- Juvenile (265 mm)

<table>
<thead>
<tr>
<th>Species</th>
<th>N. Catch</th>
<th>Avg Length</th>
<th># Measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saffron cod</td>
<td>17,492</td>
<td>118.3</td>
<td>2,316</td>
</tr>
<tr>
<td>Pacific sandfish</td>
<td>21,770</td>
<td>57.6</td>
<td>1,305</td>
</tr>
<tr>
<td>Capelin</td>
<td>21,770</td>
<td>57.6</td>
<td>2,316</td>
</tr>
<tr>
<td>Crescent gunnel</td>
<td>21,943</td>
<td>56.2</td>
<td>1,305</td>
</tr>
<tr>
<td>Pacific cod</td>
<td>21,770</td>
<td>57.6</td>
<td>2,316</td>
</tr>
<tr>
<td>Pacific sand lance</td>
<td>3,324</td>
<td>3,324</td>
<td>2,316</td>
</tr>
<tr>
<td>Pacific herring</td>
<td>71,045</td>
<td>171.4</td>
<td>41,084</td>
</tr>
</tbody>
</table>

Total N. Catch: 719,345
Total Fish: 710,345
Filter & Download = all sites with Saffron cod

FishAtlas Statewide Queries

Filter & Download = all sites with Saffron cod

FishAtlas Home
FishAtlas Help

Habitat key
- Bedrock
- Eelgrass
- Kelp
- Sand-Gravel

Select a Species
Select a Habitat

FishAtlas Locales
FishAtlas Sites

Temperature Data
Seagrass Data

Locales to Data All

Select a Habitat
Group By Region
Group By Locales
Group By Site

Area
- Statewide
- All Species
- All Habitats

Fish
- Selected Species
- Selected Habitats

Habitat
- Bedrock
- Eelgrass
- Kelp
- Sand-Gravel
Filter: all sites in Chukchi Sea with Saffron cod
All Saffron cod caught at station B16
All Saffron cod caught at station, on 9/14/2009
Fish Atlas: Temperature loggers

Mean monthly water temperature
Data logger depth = 2 m at zero tide
Auke Nu Cove, Auke Bay, southeastern Alaska, THERM12
58.3792 N 134.6898 W

Auke Nu Cove, Auke Bay

Photos: No Image Loaded

Fish Atlas Statewide Queries

Submit | Clear | FishAtlas Home | FishAtlas Help

Area
- Statewide

Fish
- All Species

Habitat
- All Habitats

Group By Region
- All Regions

Group By Locale
- All Locales

Group By Site
- All Sites

Environment
- Temperature

Habitat key
- Bedrock
- Eelgrass
- Kelp
- Sand-Gravel

Sites

<table>
<thead>
<tr>
<th>Site</th>
<th>Region</th>
<th>Locality</th>
<th>Lat</th>
<th>Long</th>
<th>Habitat</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>THERM1</td>
<td>southeast</td>
<td>Tenaspe Springs</td>
<td>57.7364</td>
<td>-135.3765</td>
<td>Eelgrass</td>
<td></td>
</tr>
<tr>
<td>THERM1</td>
<td>Prince Wil</td>
<td>Culross Passage</td>
<td>60.6665</td>
<td>-148.1866</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM2</td>
<td>southeast</td>
<td>Jackpot Bay</td>
<td>65.3443</td>
<td>-148.232</td>
<td>Eelgrass</td>
<td></td>
</tr>
<tr>
<td>THERM2</td>
<td>southeast</td>
<td>Chilk Bay</td>
<td>57.3142</td>
<td>-134.4773</td>
<td>Eelgrass</td>
<td></td>
</tr>
<tr>
<td>THERM3</td>
<td>southeast</td>
<td>Flemming Island</td>
<td>65.1543</td>
<td>-148.042</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM4</td>
<td>southeast</td>
<td>Nakwasina Sound</td>
<td>57.2055</td>
<td>-135.3774</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM4</td>
<td>southeast</td>
<td>Pirate Cove</td>
<td>56.9083</td>
<td>-135.3742</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM6</td>
<td>southeast</td>
<td>Sandy Cove</td>
<td>56.0788</td>
<td>-135.3115</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM6</td>
<td>southeast</td>
<td>Brothers Islands</td>
<td>57.2961</td>
<td>-133.8217</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM7</td>
<td>southeast</td>
<td>Benjamin Island</td>
<td>58.556</td>
<td>-134.0869</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM8</td>
<td>southeast</td>
<td>Funter Bay</td>
<td>58.2517</td>
<td>-134.0866</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM9</td>
<td>southeast</td>
<td>Berners Bay</td>
<td>58.7089</td>
<td>-134.0468</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM10</td>
<td>southeast</td>
<td>Berners Bay</td>
<td>58.6898</td>
<td>-134.92</td>
<td>Eelgrass</td>
<td></td>
</tr>
<tr>
<td>THERM11</td>
<td>southeast</td>
<td>Bridget Cove</td>
<td>58.6465</td>
<td>-134.9053</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM12</td>
<td>southeast</td>
<td>Auke Bay</td>
<td>58.3792</td>
<td>-134.0888</td>
<td>Kelp</td>
<td></td>
</tr>
<tr>
<td>THERM13</td>
<td>southeast</td>
<td>Peterson Creek</td>
<td>58.3035</td>
<td>-134.584</td>
<td>Eelgrass</td>
<td></td>
</tr>
</tbody>
</table>
Fish Atlas: Eelgrass monitoring

Nearshore Fish Atlas of Alaska
Auke Nu Cove, Auke Bay, southeastern Alaska
Eelgrass (Zostera marina) meadow mapped with GPS
Meadow area: 1.87 hectares
Years mapped: 2004-2007

Fish Atlas Statewide Queries
Area: Statewide
Fish: All Species
Habitat: All Habitats

Display Eelgrass Layer
Total: 13

<table>
<thead>
<tr>
<th>Site</th>
<th>Description</th>
<th>Hectares</th>
<th>Acres</th>
<th>Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auke Nu Cove</td>
<td>Auke Nu Cove, Auke Bay</td>
<td>1.05</td>
<td>4.02</td>
<td></td>
</tr>
<tr>
<td>Auke Village</td>
<td>Auke Village, Auke Bay</td>
<td>0.33</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>Bay Creek</td>
<td>Bay Creek, Auke Bay</td>
<td>0.87</td>
<td>2.39</td>
<td></td>
</tr>
<tr>
<td>Bridget Cove Central</td>
<td>Bridget Cove, central</td>
<td>0.69</td>
<td>2.22</td>
<td></td>
</tr>
<tr>
<td>Bridget Cove North</td>
<td>Bridget Cove, north</td>
<td>0.95</td>
<td>2.34</td>
<td></td>
</tr>
<tr>
<td>Bridget Cove South</td>
<td>Bridget Cove, south</td>
<td>5.80</td>
<td>14.34</td>
<td></td>
</tr>
<tr>
<td>Crab Bay</td>
<td>Crab Bay, Tenakee Spur</td>
<td>1.84</td>
<td>4.55</td>
<td></td>
</tr>
<tr>
<td>Echo Cave</td>
<td>Echo Cave, Berners Bay</td>
<td>2.00</td>
<td>7.17</td>
<td></td>
</tr>
<tr>
<td>Funter Bay</td>
<td>Funter Bay</td>
<td>7.73</td>
<td>19.10</td>
<td></td>
</tr>
<tr>
<td>Nakwassina</td>
<td>Nakwassina Sound</td>
<td>0.71</td>
<td>1.77</td>
<td></td>
</tr>
<tr>
<td>Peterson Creek</td>
<td>Peterson Creek</td>
<td>2.79</td>
<td>6.91</td>
<td></td>
</tr>
<tr>
<td>Sandy Cove</td>
<td>Sandy Cove</td>
<td>0.73</td>
<td>1.81</td>
<td></td>
</tr>
<tr>
<td>Waydelich Creek</td>
<td>Waydelich Creek, Auke I</td>
<td>9.26</td>
<td>30.00</td>
<td></td>
</tr>
</tbody>
</table>

About Eelgrass Maps