GULF of ALASKA

Describing Alaskan Groundfish Habitat Using Smooth Sheets

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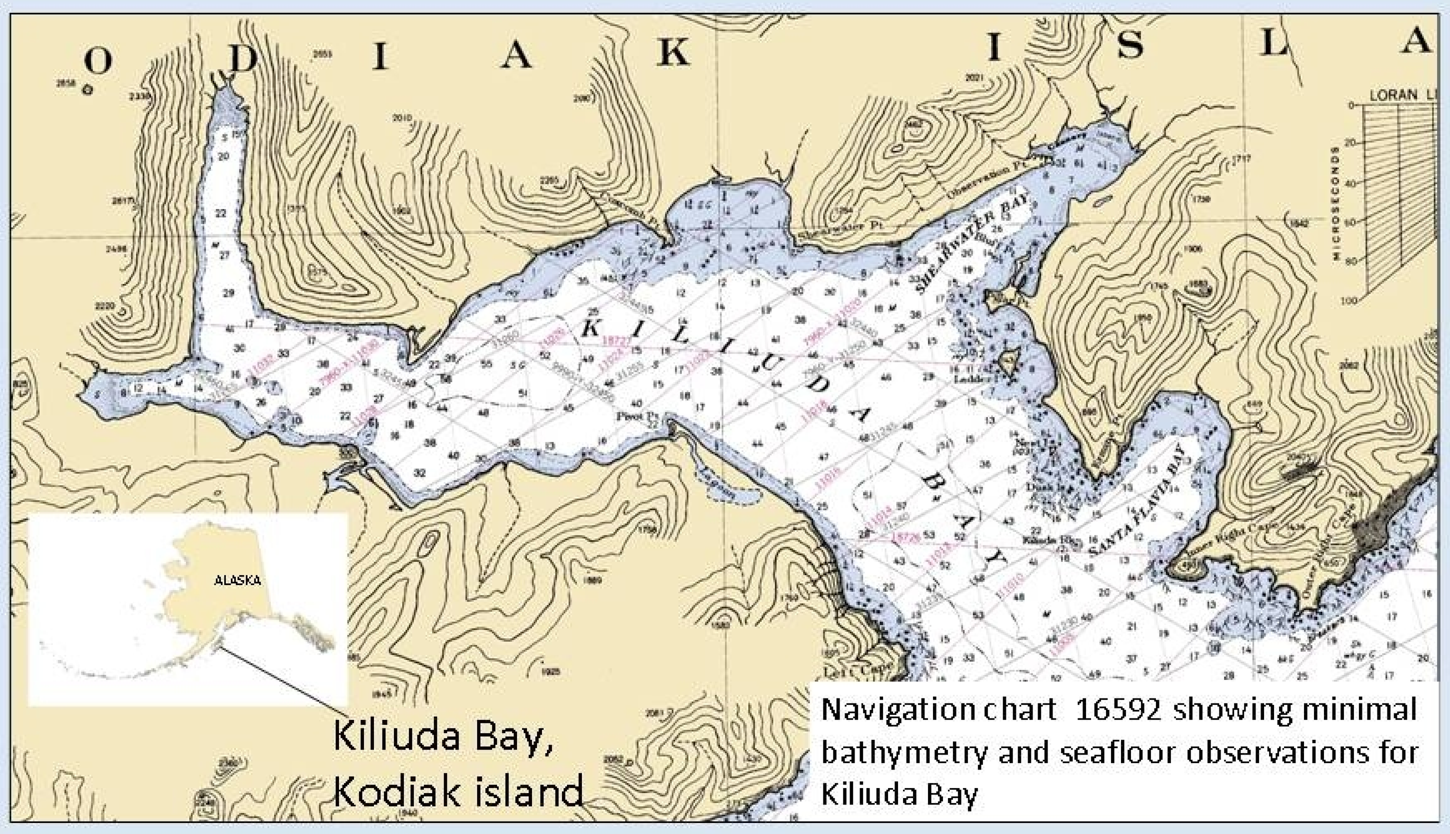
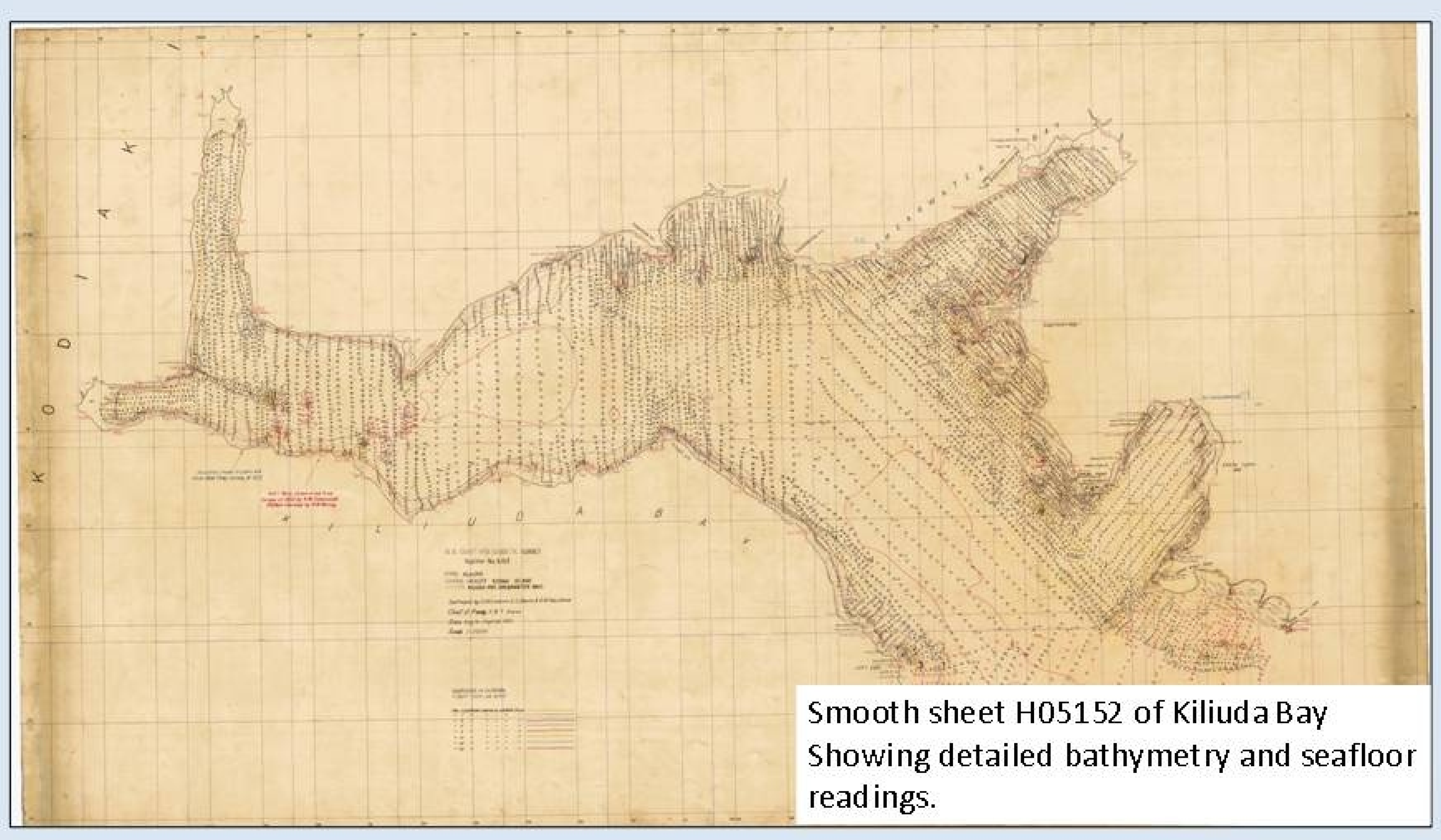
Introduction

Juvenile groundfish habitat can be modeled from smooth sheet information. Smooth sheets represent the original survey work conducted by the National Ocean Service for creating less detailed navigation charts.
For Kiliuda Bay on Kodiak Island, the smooth sheet has about 30x the number of soundings, 17x the number of sediment observations, and many more feature notations than the resulting chart.



Navigation chart 16592 showing minimal bathymetry and seafloor observations for Kiliuda Bay

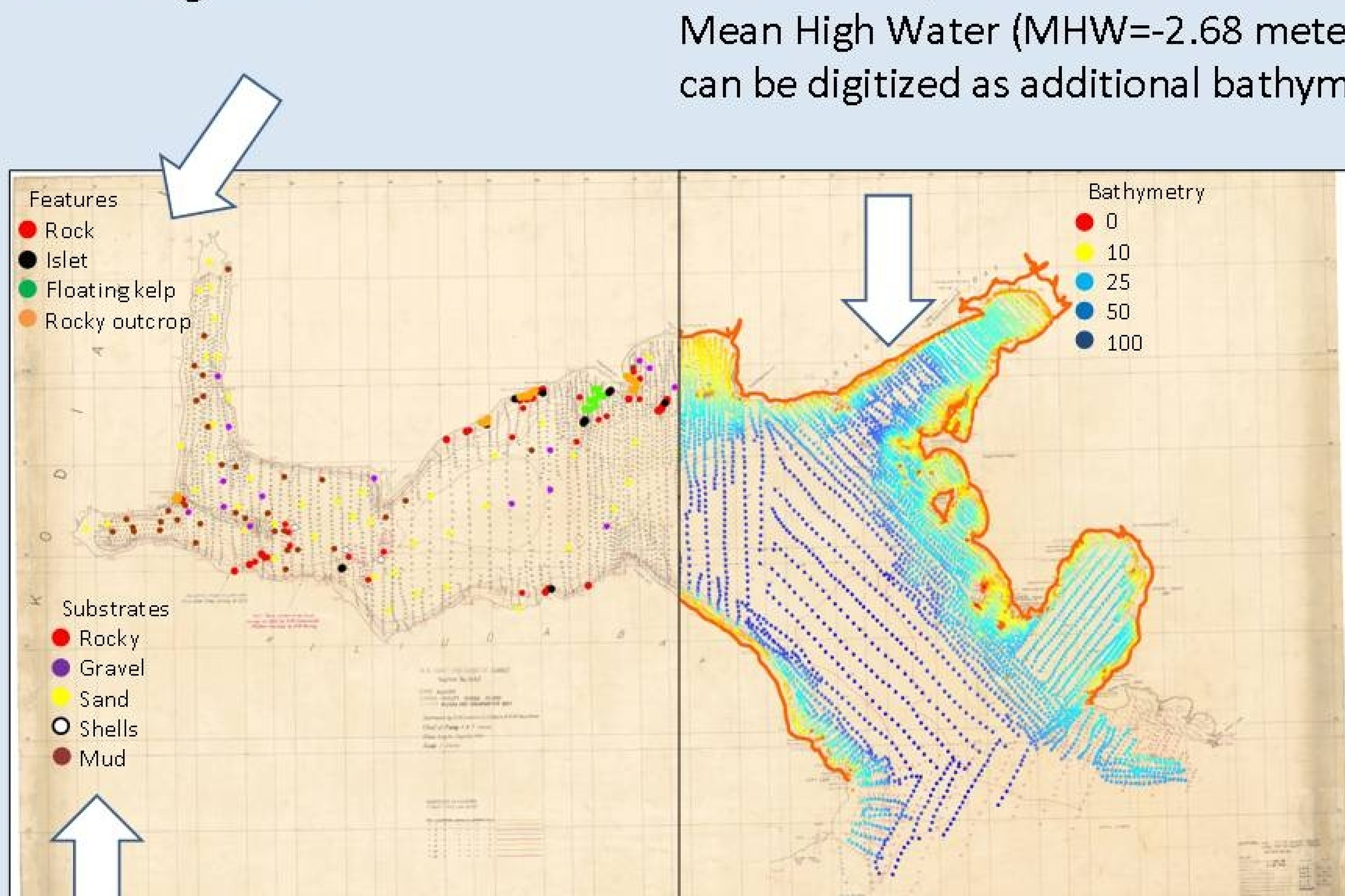

Smooth sheet H05152 of Kiliuda Bay Showing detailed bathymetry and seafloor readings.

Digitizing

Smooth sheets can be downloaded for free at National Geophysical Data Center (NGDC: *http://www.ngdc.noaa.gov*), often along with a file of digitized soundings. The smooth sheet needs to be georegistered in a GIS and datum-shifted.
In this case, H05152 was created in the Valdez datum and needed to be shifted 239 m north (Lat.), 293 m east (Long.) to align with a modern datum - NAD83.

Features such as floating kelp, rocky outcrops, rocks and islets can be digitized.

Soundings also need to be datum-shifted, proofed and edited.
The shoreline, which is defined as Mean High Water (MHW=-2.68 meters), can be digitized as additional bathymetry.



Substrates are digitized as verbal descriptions – "fine gray sand" - and then converted into numerical data using usSEABED (*http://walrus.wr.usgs.gov/usseabed*).

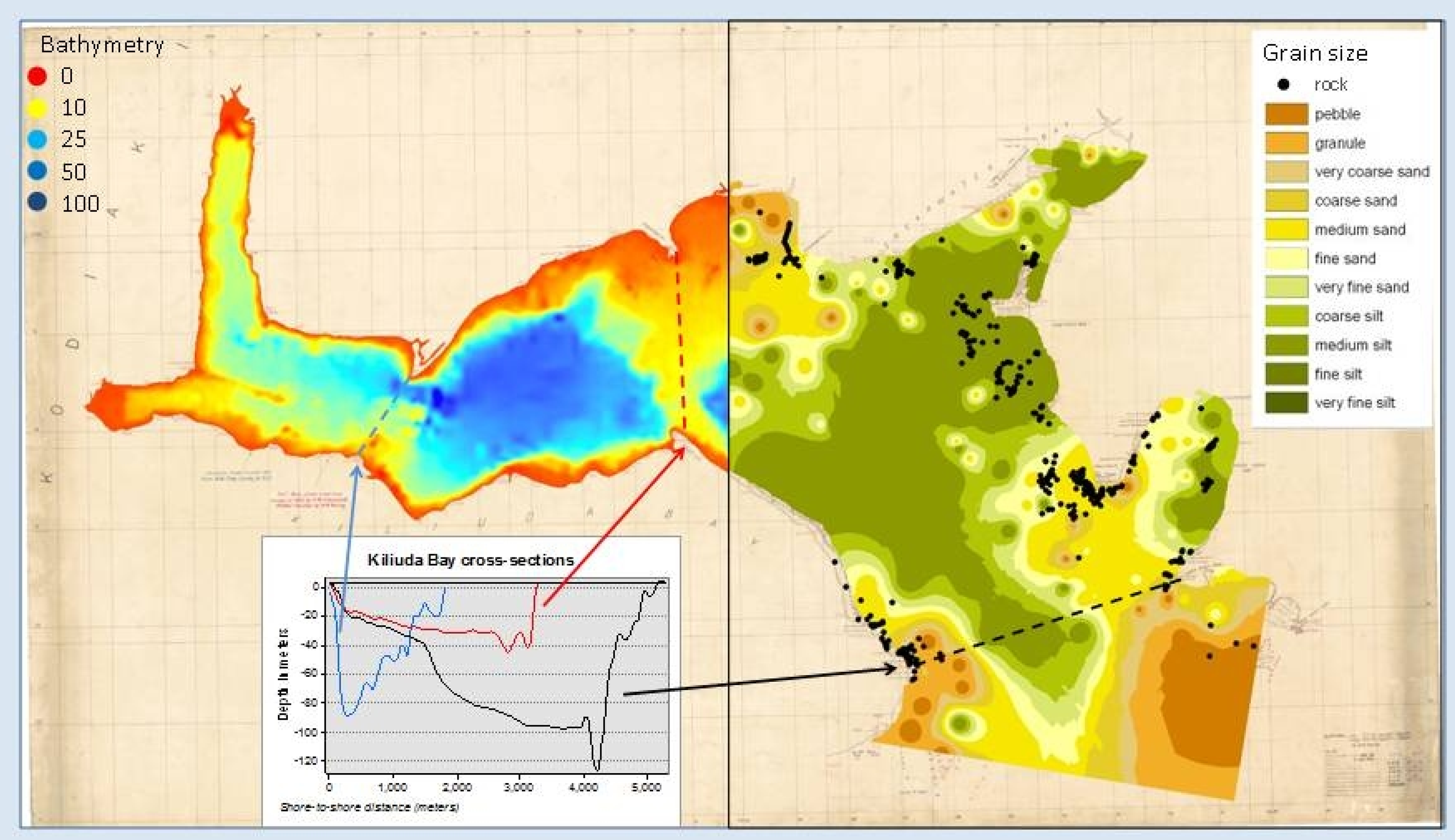
Interpolated surfaces

The soundings can be converted into an interpolated surface, which provides a depth estimate at each place in the bay (below left). Other surfaces such as slope, rugosity, aspect, curvature, and local minima/maxima are simple to produce.

Similarly the numerical sediment values from us SEABED can be converted into an interpolated surface, such as mean grain size (below right) or as individual grain membership (eg. %Gravel, %Sand and %Mud).

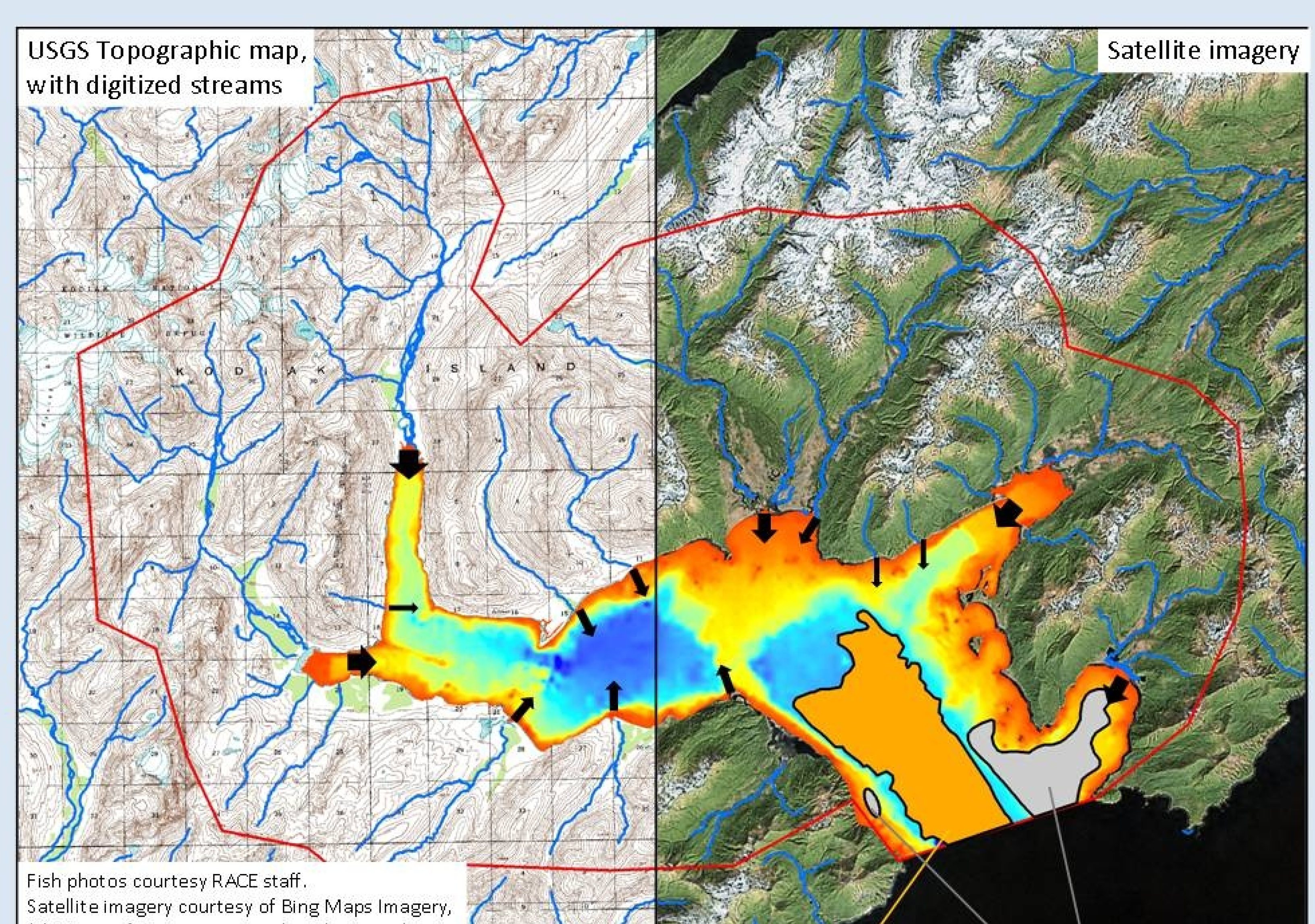
GIS calculations

- shore length of mainland (89.1 km), islands (4.3 km)
- tidal prism (0.2 km^3), seabed exposure at low tide (5 km^2)
- MHW volume (4.7 km^3), area (93 km^2) of the water; or at any depth
- area of kelp patches (0.5 km^2) and reefs (0.2 km^2)
- shore buffers (9.5% of bay within 100m of shore, 71.2% within 1000m)
- cross-sectional areas anywhere across the bay



Other data

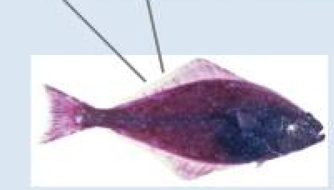
A GIS can integrate other georeferenced data such as USGS Topographic maps and digitized streams (below left, *ftp://ftp.dnr.state.ak.us/asgdc/adnr/hydro_63360.zip*).
Streams and topography are interpolated to draw the watershed boundary, which can be intersected with a precipitation shape file (*http://agdc.usgs.gov/data/usgs/water*) to estimate total watershed or stream-specific freshwater input (below).
All known relevant factors can be combined to estimate groundfish habitat (below right).



Fish photos courtesy RACE staff.
Satellite imagery courtesy of Bing Maps Imagery, (c) Microsoft Corporation and its data suppliers.

Juvenile groundfish habitat is modeled from the literature. Kiliuda bay can be compared to other bays using numerous metrics.


Preferred habitat
Age-0 Flathead sole
(*Hippoglossoides elassodon*)
80-120 meters depth
mud substrate
central areas
(Norcross et al. 1997)


Preferred habitat
Age-0 Pacific halibut
(*Hippoglossus stenolepis*)
10-70 meters depth
sand substrate
<7km from mouth of bay
(Norcross et al. 1997)