ISLAND COUNTY'S BULL KELP:

What are we learning?

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Island County Marine Resources Committee

ISLAND COUNTY MARINE RESOURCES COMMITTEE

MRC meeting
7 February 2017

ACKNOWLEDGMENTS!

VOLUNTEERS

2015

Vernon Brisley
Lenny Corin
Leal Dickson
Linda Kast
Don Meehan
Debra Paros

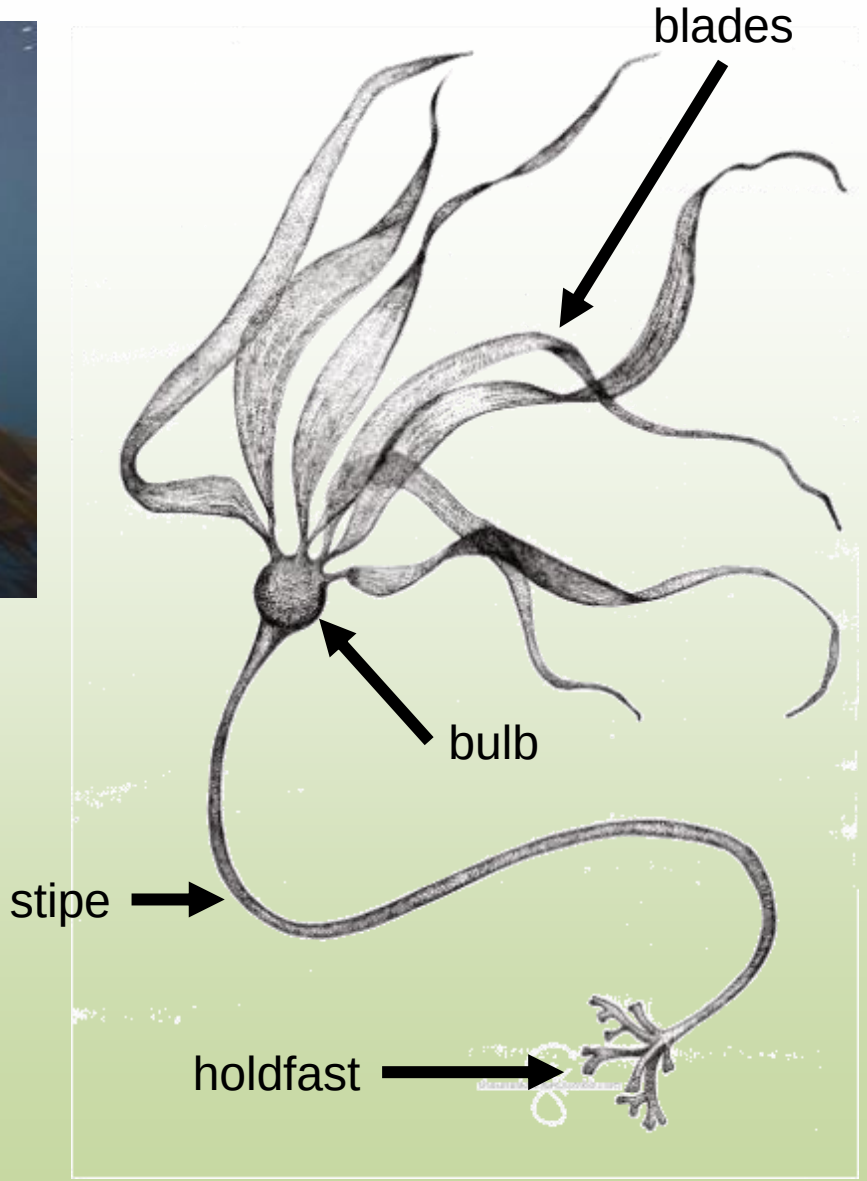
2016

Barbara Bennett
Vernon Brisley
Barbara Brock
Paulette Brunner
Debra Paros
Gregg Ridder

PROFESSIONAL ADVICE & FUNDING

Tom Mumford (Marine Agronomics)
NW Straits Commission
NW Straits Foundation

http://www.montereybayaquarium.org/-/m/images/animal-guide/plants/bull-kelp.jpg?bc=white&h=565&mh=738&mw=1312&w=1000&usecustomfunctions=1&cropx=0&cropy=56



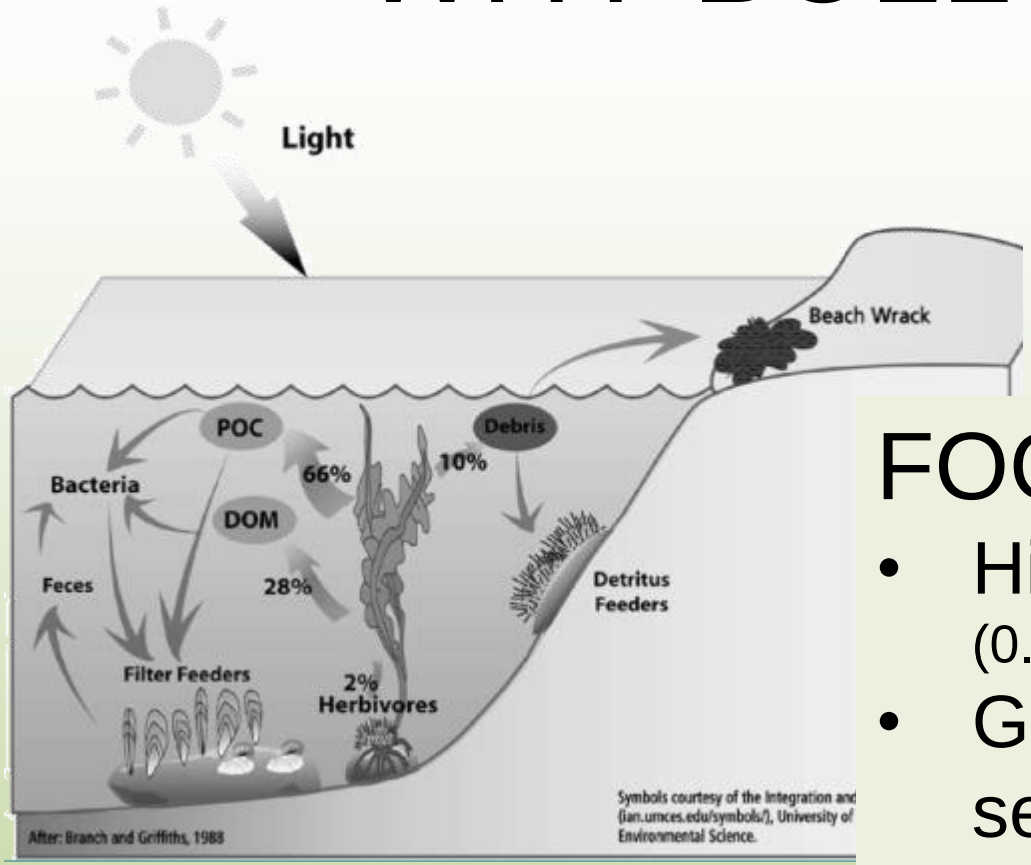
WHY BULL KELP?

STRUCTURAL HABITAT:

- Plant diversity: >50 species of epiphytic algae
  e.g., *Porphyra*, *Ulva*
- Shelter for invertebrates
  bryozoans, hydroids, isopods, caprellid amphipods, starfish, crab
- Nursery habitat for juvenile fishes
  rockfish, surfperch
- Shelter & spawning for adult fish
  sculpin, snailfish, blenny, kelp greenling, herring

CRITICAL HABITAT under the GMA & Shoreline Master Programs

WHY BULL KELP?



FOOD WEB:

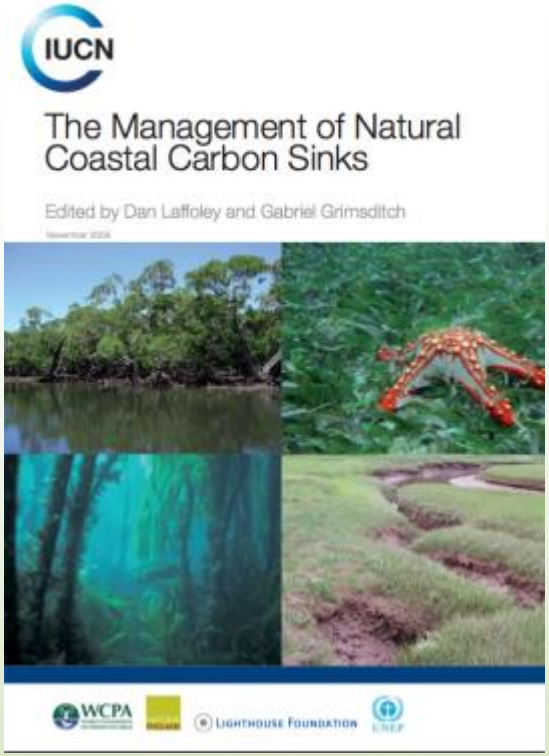
- High primary productivity
  (0.4 – 2.8 kg carbon / m^3)
- Grazing by red & purple sea urchins, red abalone, limpets, snails, amphipod
- Biomass export to other habitats
  beaches, rocky intertidal, canyons

WHY BULL KELP?

WATER QUALITY:

- uptake of inorganic nutrients
  nitrogen, phosphate
- uptake of CO_2
- production of O_2

EASY IDENTIFICATION



LIFE CYCLE

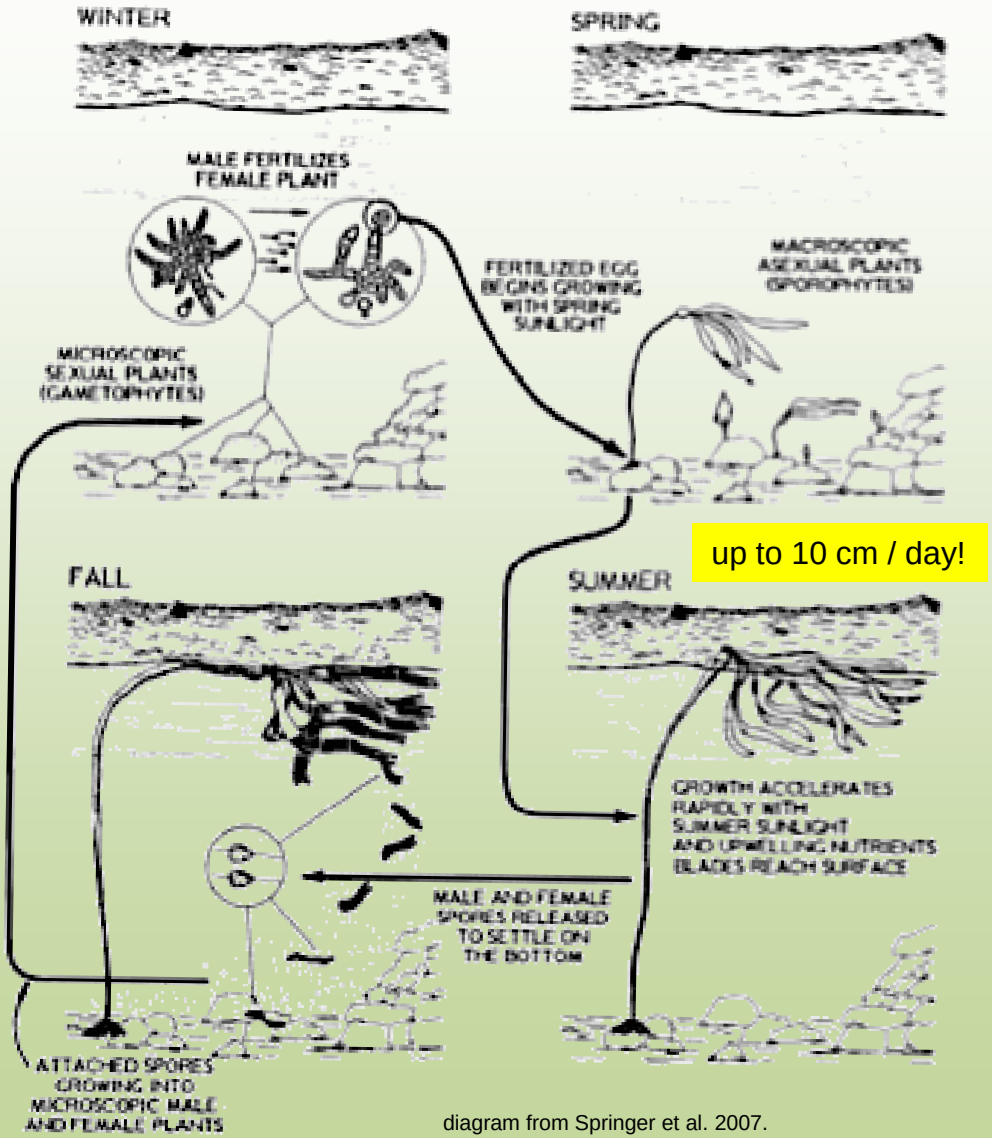


diagram from Springer et al. 2007.
http://www.lenfestocean.org/~/media/legacy/lenfest/pdfs/springer_underlying_report_0.pdf?la=en

- Annual plant
- Can overwinter for a 2nd year
- Microscopic sexual phase
- Macroscopic asexual phase

up to 10 cm / day!

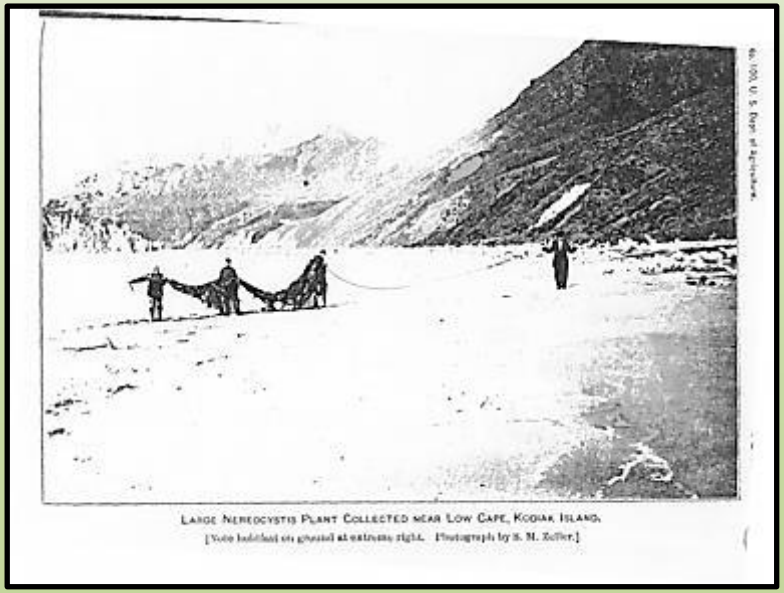
photo from
http://blogs.evergreen.edu/bullkelp/files/2012/12/Sorus-Day.jpg

Distribution:
Umnak Island (Alaska) to Point Conception (California)

Depth: 3 – 30 meters

Can co-occur with giant kelp (*Macrocystis* sp.)

maximum reported length = 123 ft


LARGE NEREOCYSTIS PLANT COLLECTED NEAR LOW CAPE, KODIAK ISLAND.

FACTORS AFFECTING DISTRIBUTION

Light
photoperiod x intensity

Disease
Streblonema, parasitic alga

Temperature
3 – 17°C

Competition
algae, epiphytes

Nutrients
NO_3, NH_4, PO_4

Herbivores
urchins, mollusks, crustaceans

Wave action
dissolved gases, disruption

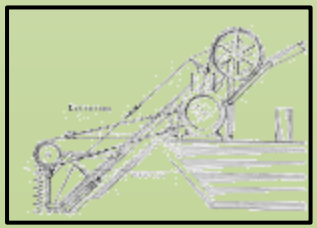
HISTORICAL INTEREST

1870's: Application of "bitter" or potash salts (Mg + K) as fertilizer
German mining monopolies (Kali Syndikat)

1906: Patent for extracting KCl from seaweed (US Patent 823,593)

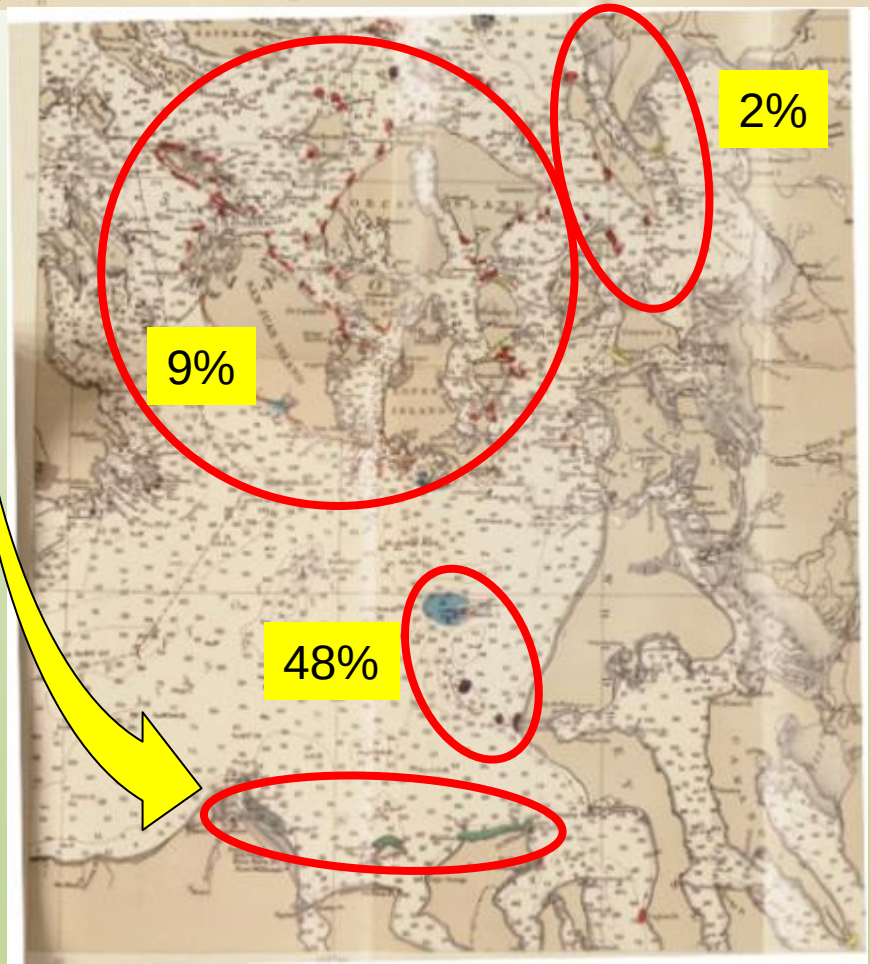
1915: Cameron, F.K.; "Potash from Kelp"; USDA report #100.
Elk kelp (*Pelagophycus porra)* – highest content but too scattered
Long bladder kelp (*Macrocystis pyrifera)* – potash (3 – 28%); N (0.5 – 3%)
Bull kelp (*Nereocystis leutkeana)* – potash (7 – 32%); N (0.8 - 3%)
Puget Sound: 5 sq mi; 520,000 tons kelp; 20,000 tons KCl

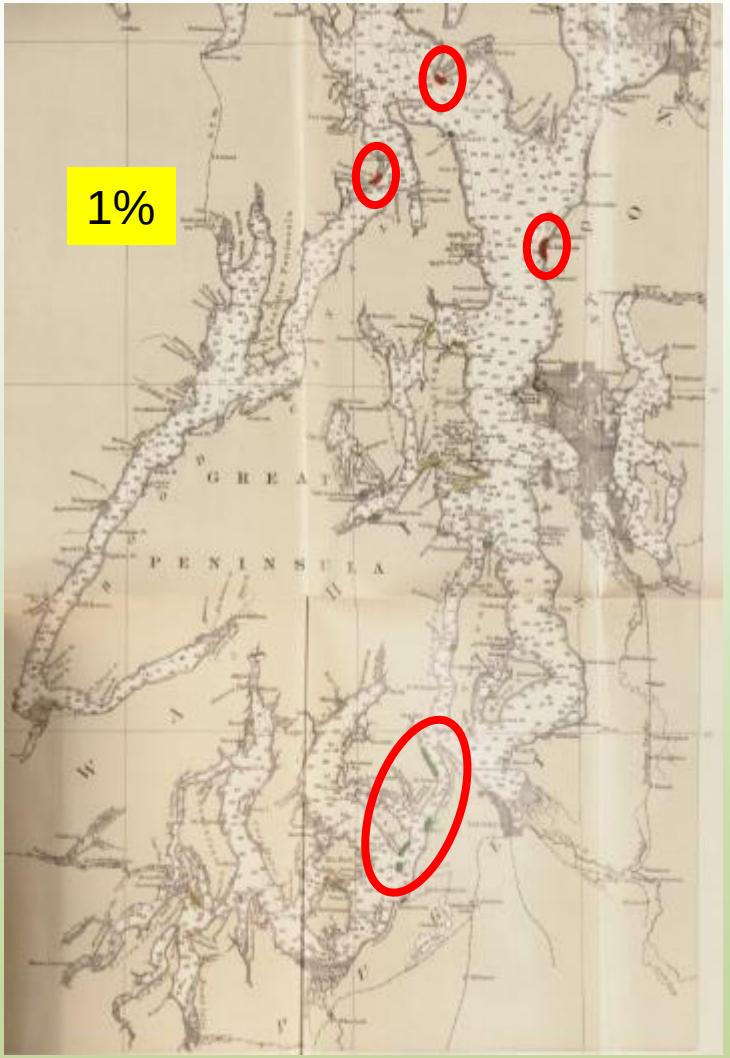
1911-12: George Rigg survey (US Senate Document 190, Dec. 1911)



	Tons.
1. Smiths Island	100,000
2. American shore of the Strait of Juan de Fuca	85,000
3. San Juan Island and small islands near its shore	10,000
4. Other islands of the San Juan group	9,000
5. Admiralty Head to Point Roberts	5,000
6. Puget Sound from Port Townsend to Olympia	1,000
	210,000

Riggs Tonnage Estimates (1911-12)



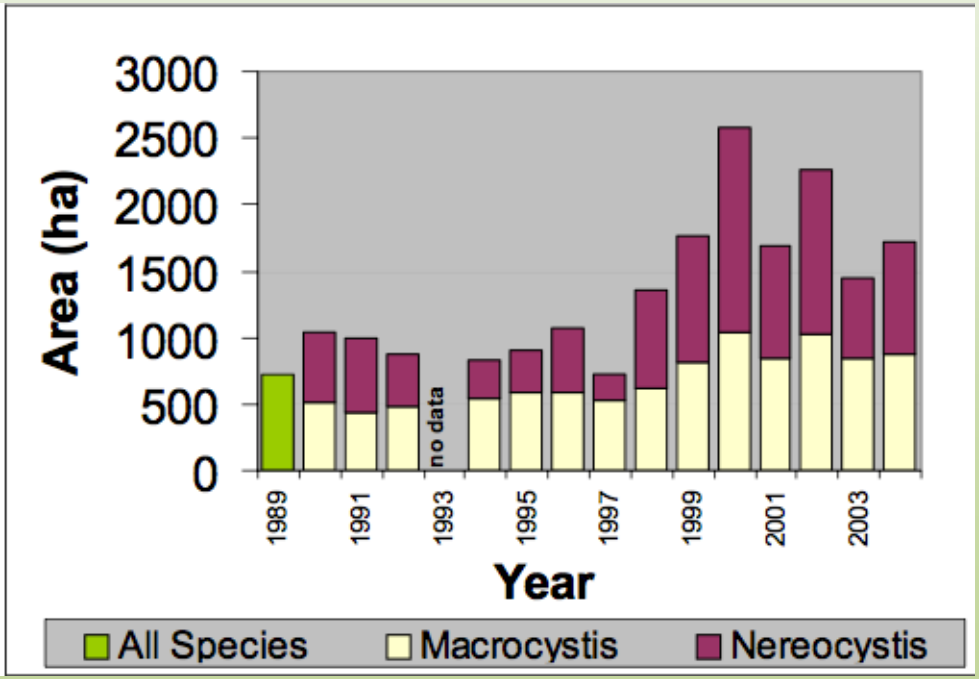


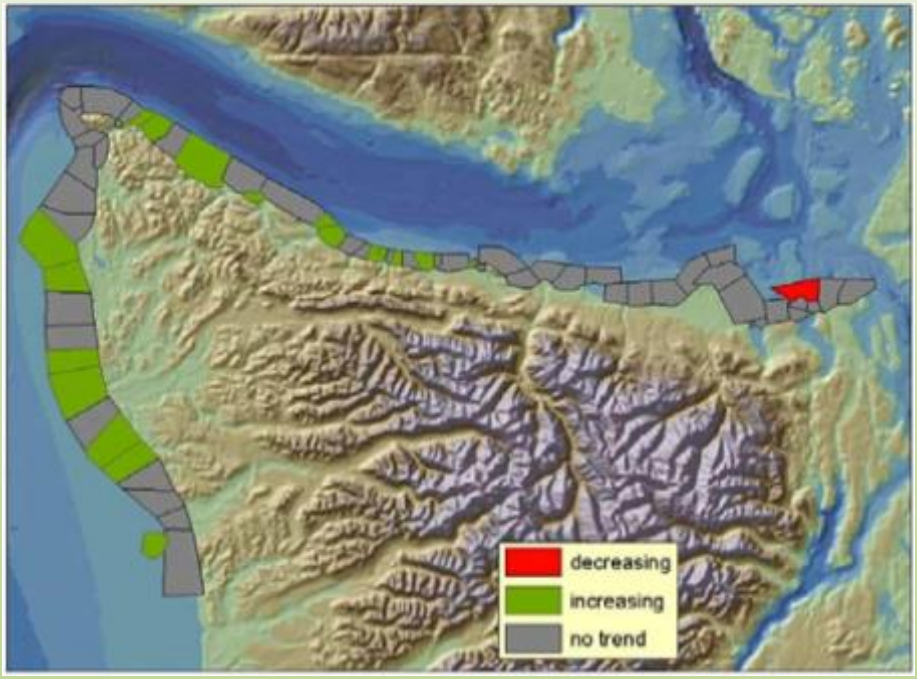
MODERN SURVEYS: WA Dept of Natural Resources

Long Term Survey (1989 to present)

Port Townsend to Copalis River (Juan de Fuca & Outer Coast)

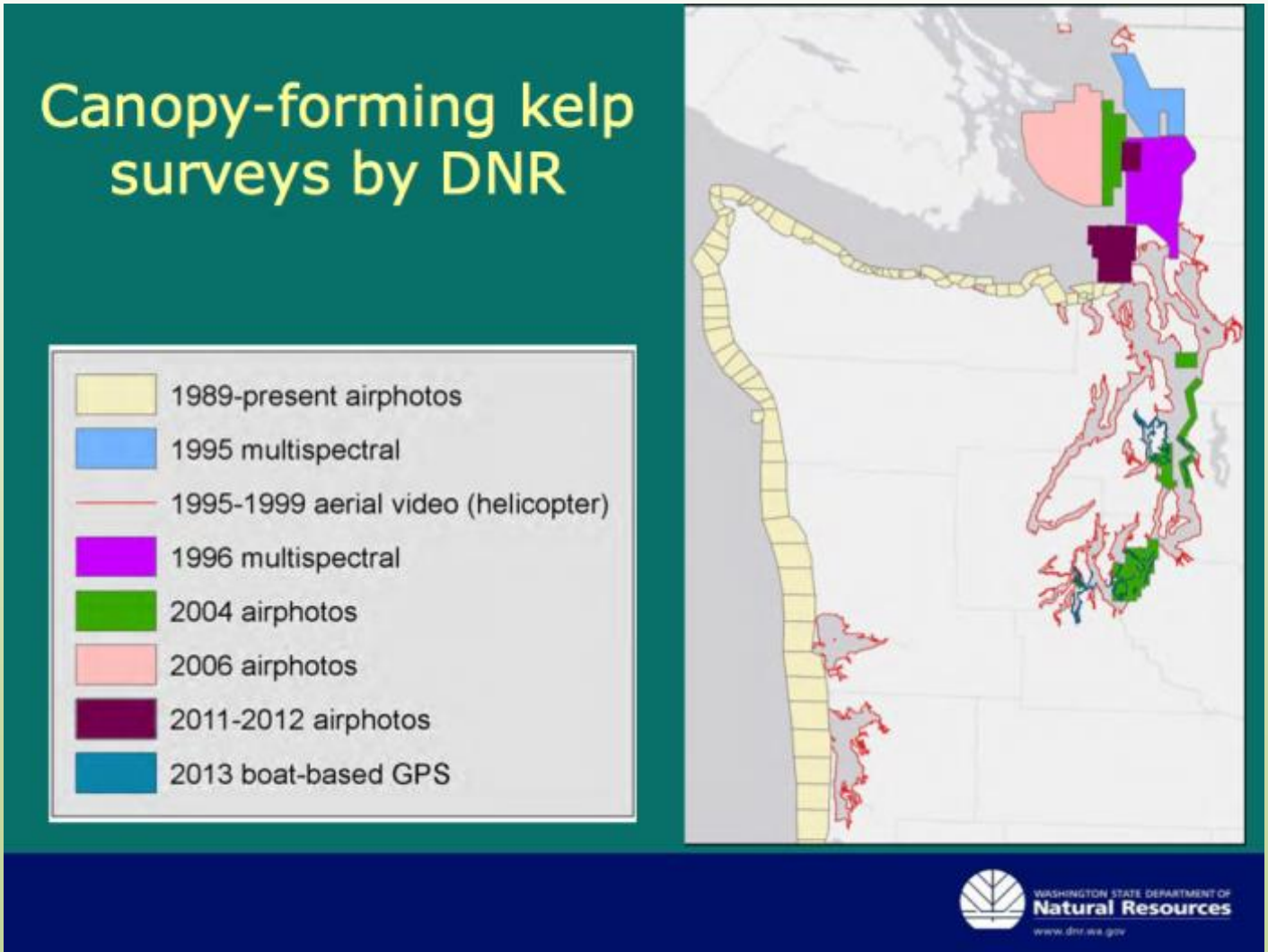
Aerial photography with consistent protocols





from Berry et al. 2005. ***Using Historical Data to Estimate Changes in Floating Kelp (Nereocystis luetkeana and Macrocystis integrifolia) in Puget Sound, Washington***

MODERN SURVEYS: WA Dept of Natural Resources



courtesy Helen Berry, WA DNR

Northwest Straits COMMISSION

partners in marine conservation

- Test boat-based protocol for citizen science
- Use kayaks & hand-held GPS units
- Report results at a workshop

2015 MRC Boat-based Bull Kelp Survey

SAFETY was top concern among all MRC teams

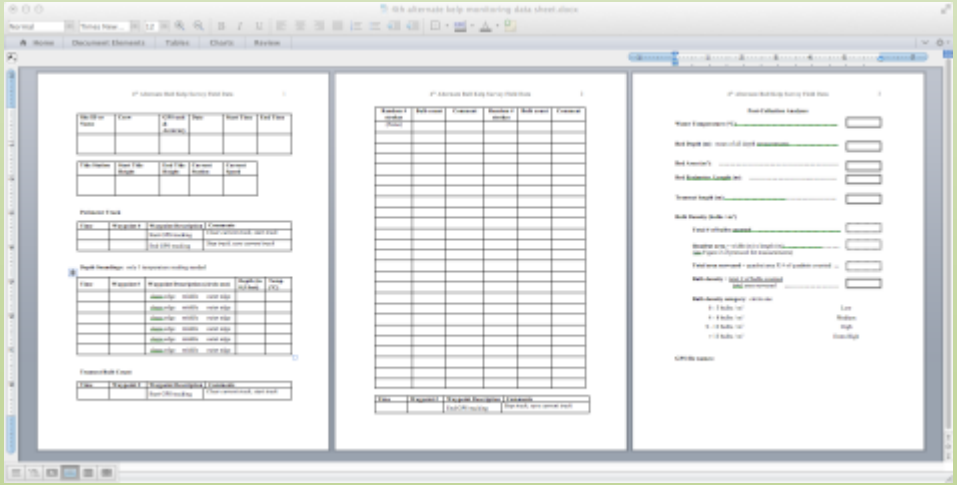
- Exposure to ocean conditions (Strait of Juan de Fuca)
- Bed located in surf zone or adjacent rock cliffs
- Travel distance to beds (~ 9 miles in Whatcom County)
- Fast current or rip tides (San Juan County)

2015 ISLAND MRC BULL KELP SURVEYS

Biodegradable depth measurement device

Observed kelp use by wildlife

Designed a field & data report sheet



LIBBEY BEACH

Tide Perimeters

June: 3,000 m^2 (0')

July: 2,437 m^2 (5')

HASTIE LAKE LAUNCH

Tide Perimeters

June: 53,716 m^2 (0')

July: 49,601 m^2 (5')

August: 58,746 m^2 (5')

September: 40,181 m^2 (5')

EBEY'S LANDING

0' tide height

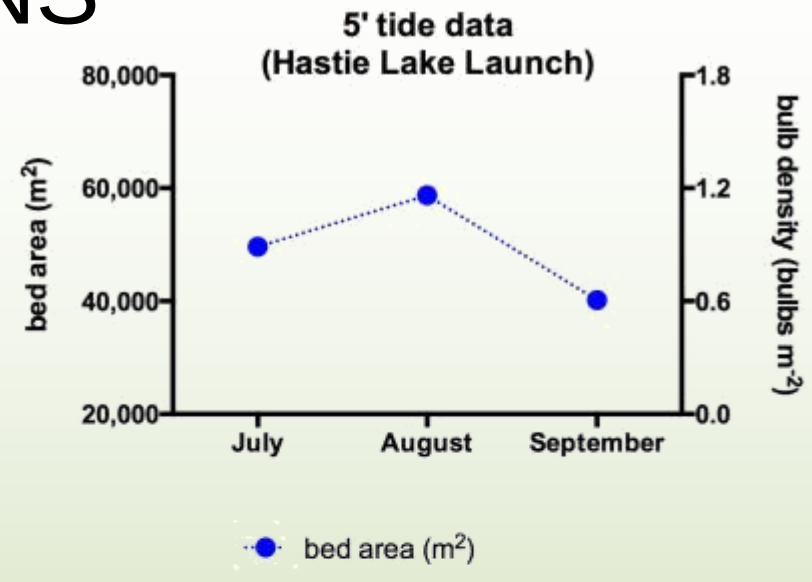
Tide Perimeters
June: 38,384 m^2
July: 59,151 m^2
August: 74,302 m^2
September: 72,336 m^2

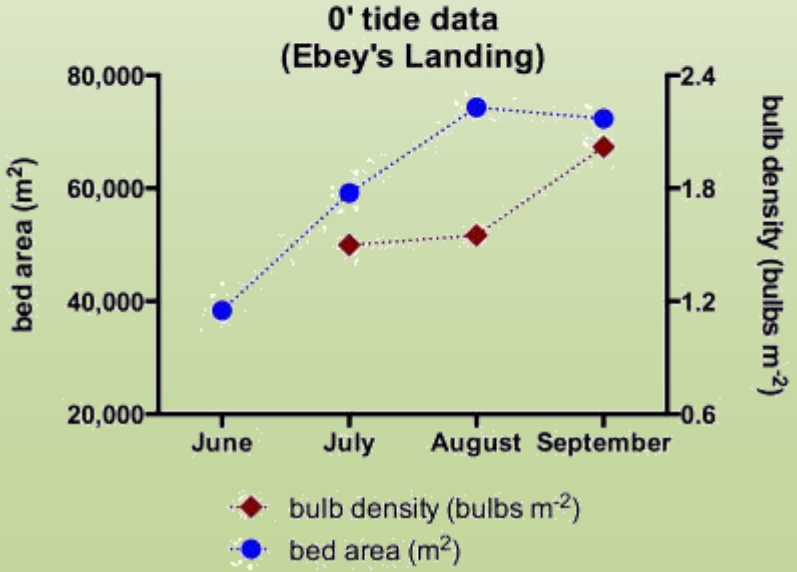
5' tide height

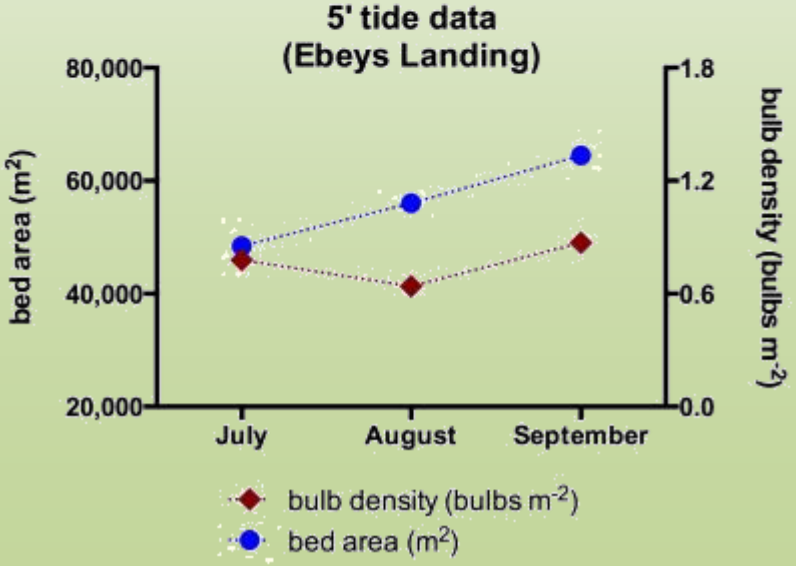
Tide Perimeters
July: 48,419 m^2
August: 56,004 m^2
September: 64,460 m^2

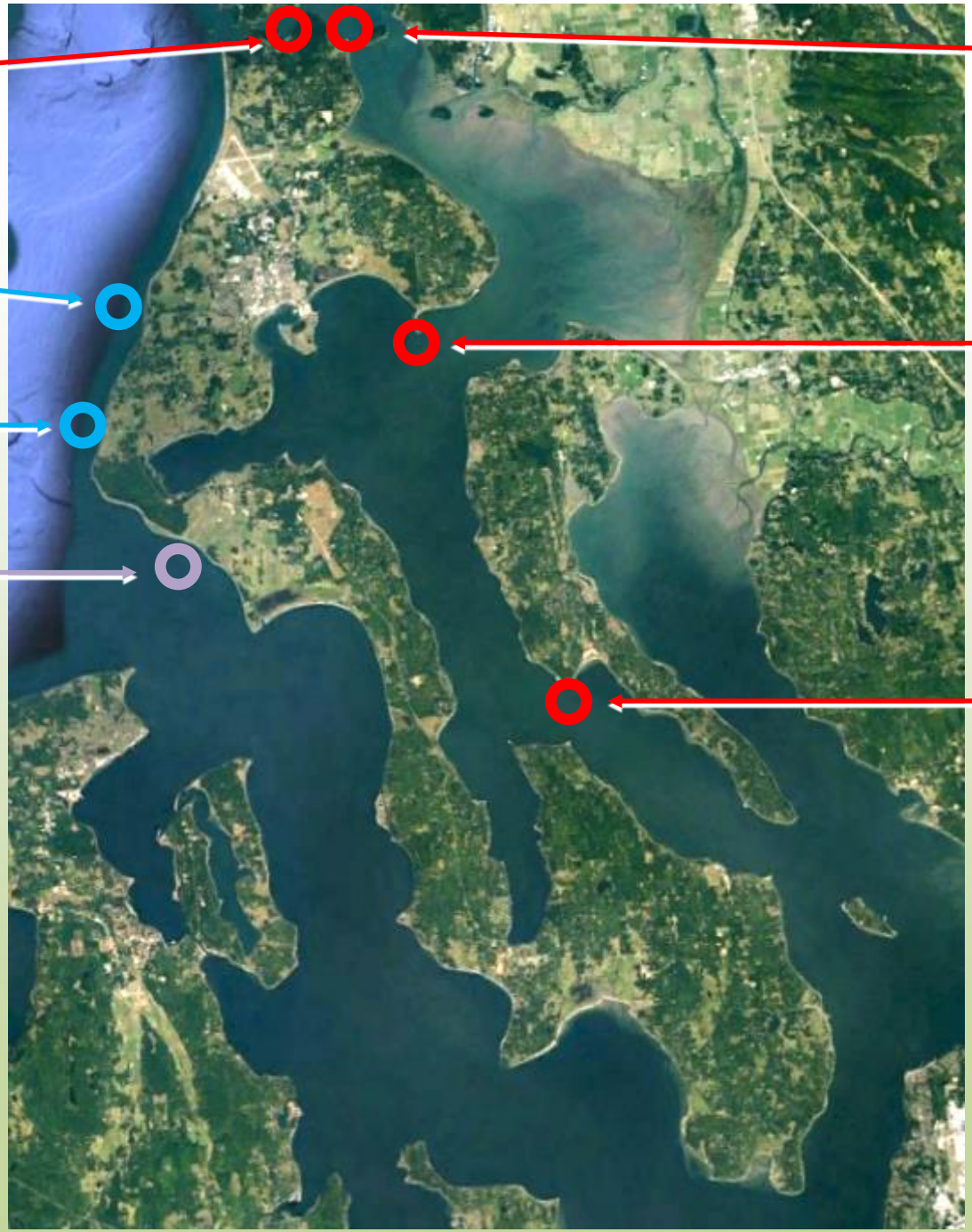
MONTHLY PATTERNS

- Bed areas peak in August or September
- Bulb density peaks in September
- Bulb density at 5’ tide is 40-50% density at 0’ tide

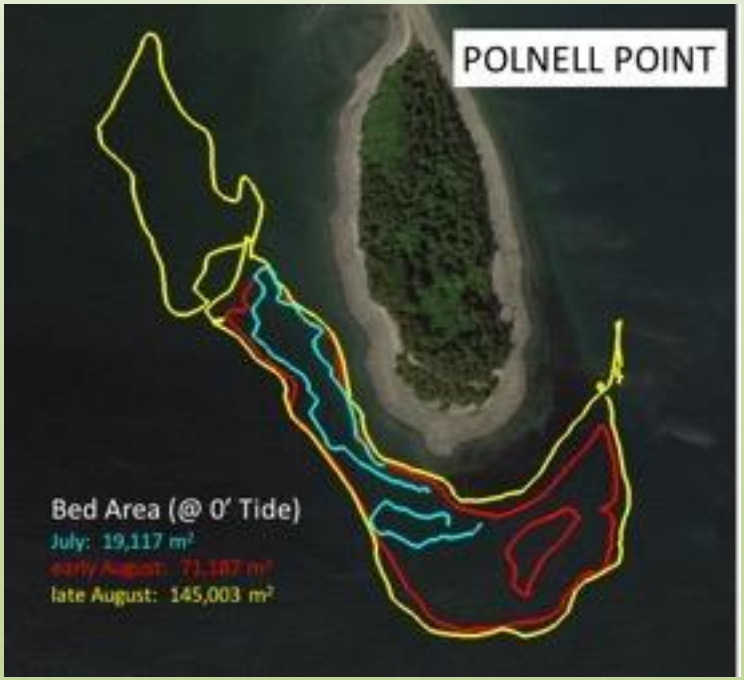




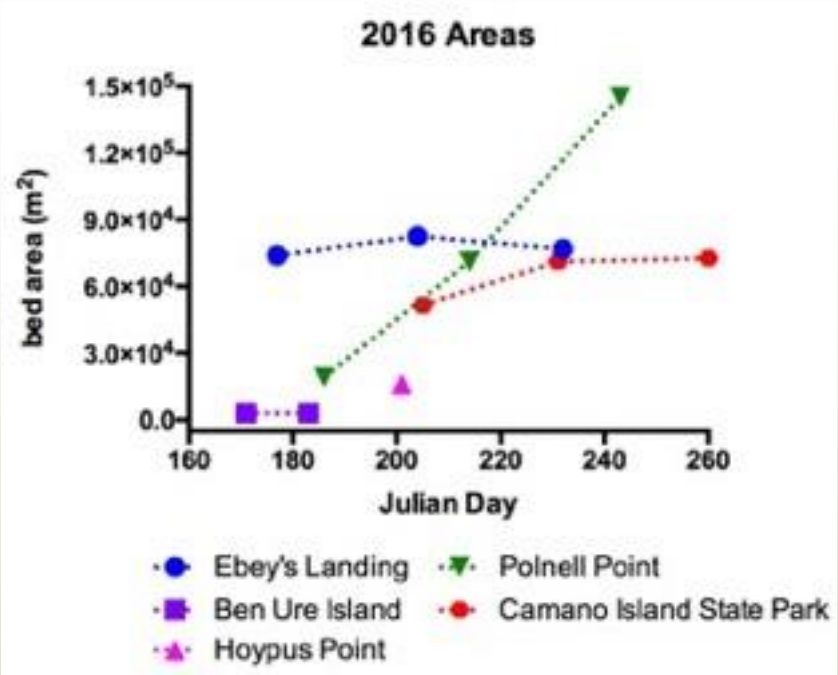


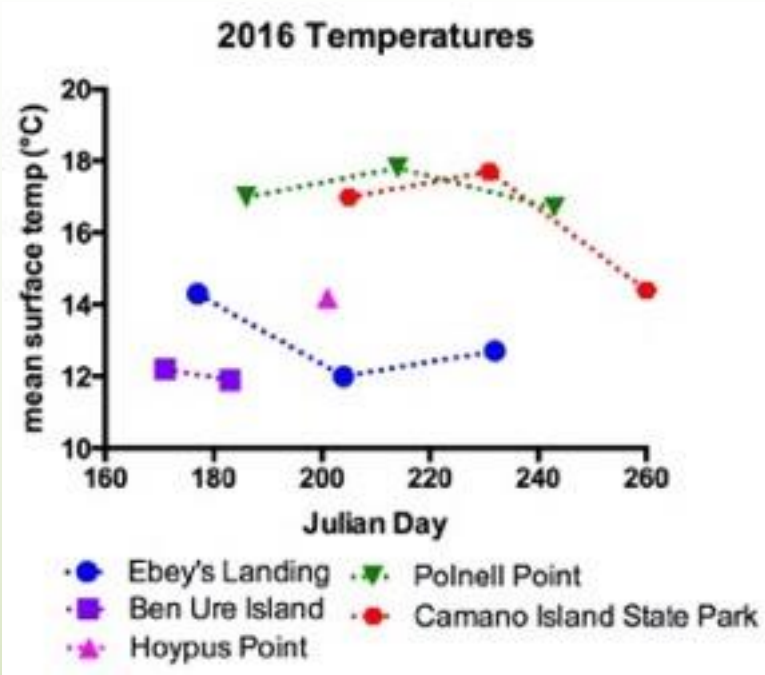

Ben Ure Island (Cornet Bay)
Hoypus Point
Hastie Lake Launch
Polnell Point
Libbey Beach Park
Ebey's Landing
Lowell Point (Camano Is. State Park)
2015
2015 – 2016
2016

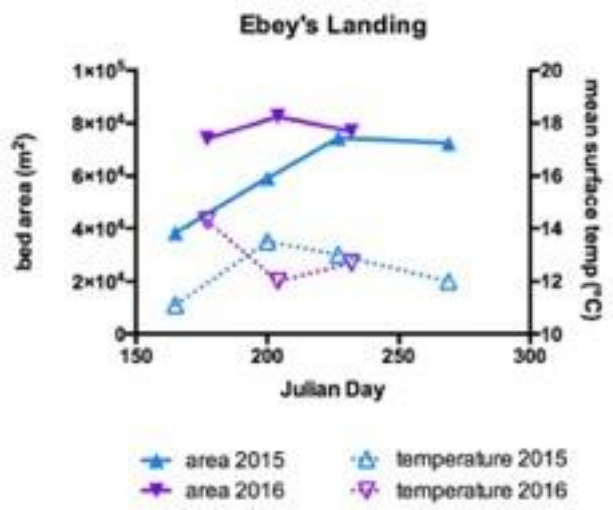
New 2016 Survey Sites



2016 Results







2015 vs 2015

Anecdotal Biological Observations

Forage fish (mostly herring) and shiner perch

Shiner perch and a tube snout (at 20-23 seconds)

Submerged aquatic vegetation beneath bull kelp with shiner perch, forage fish, and kelp perch (at 26 and 40 seconds)

Kelp crab hiding among kelp blades

CONCLUSIONS & KEY OBSERVATIONS

- Site selection criteria should include ocean hazards & launch conditions
- Boat-based surveys can provide seasonal & year-to-year estimates of beds
- Seasonal patterns of bed growth are different among beds
- Observations of plants & animals in beds can contribute to understanding the ecosystem functions of kelp
- Seawater temperature may be a limiting factor for bull kelp as climate change progresses

WHAT'S UP FOR 2017?

AERIAL PHOTOGRAPHY

(Vern Brisley & Gregg Ridder)


THANK YOU!