Use Analysis Process Update

Washington Coastal Marine Advisory Council Meeting

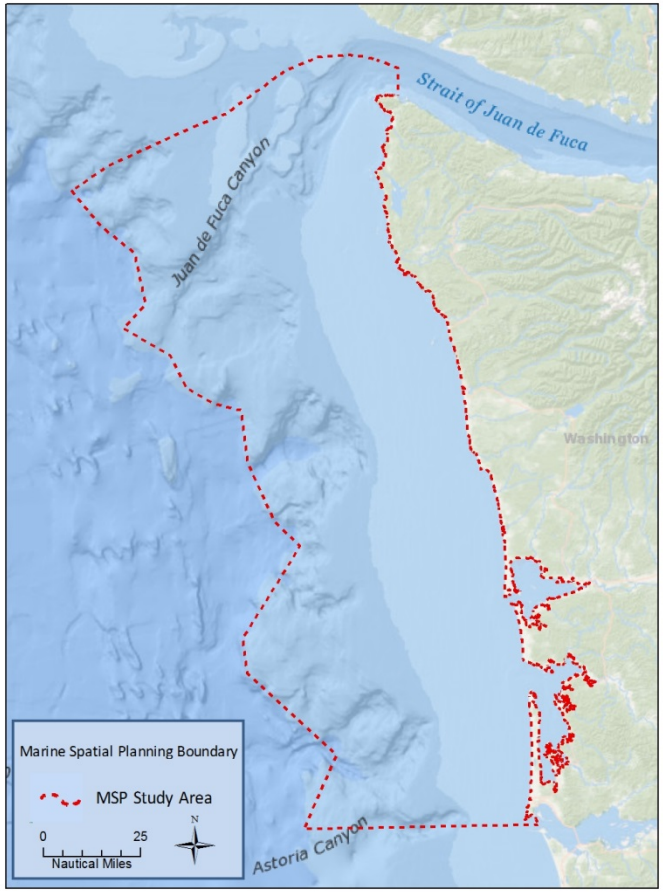
December 9, 2015

Port of Grays Harbor

Outline

1. Outline of MSP & Use Analysis project
2. Methods/Approach
3. Existing Use Maps
4. Next steps
5. Discussion

Scope of MSP



The study area is 700 fathoms offshore and includes federal waters and estuaries.

INTENT:
Address location of potential new marine uses.

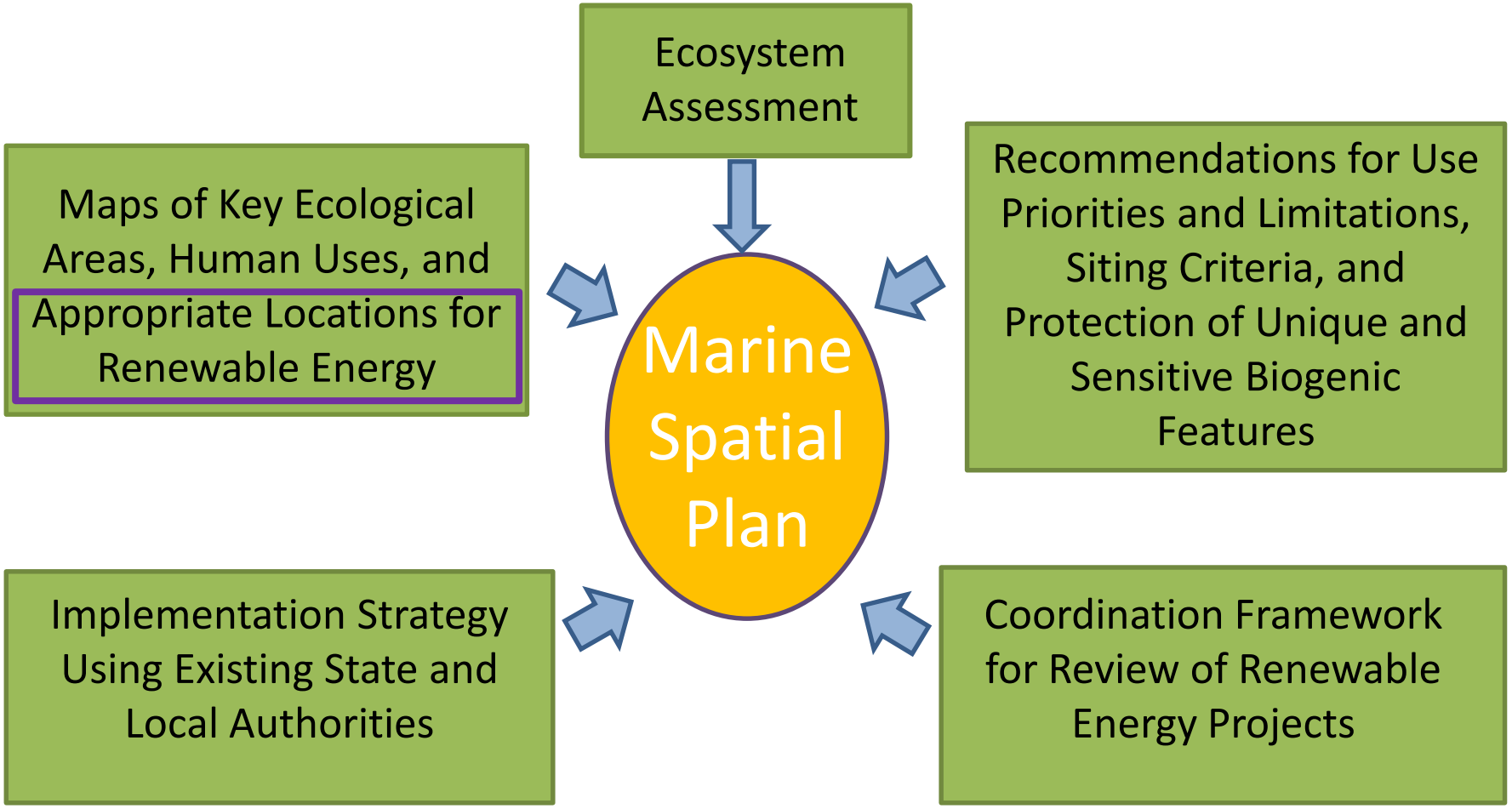
PLAN GOALS/OBJECTIVES:

- Protect existing uses
- Protect cultural uses/resources
- Preserve environment
- Integrate decision-making
- Provide new economic opportunities

NON-REGULATORY PLAN

MSP Context

The marine management plan must include but not be limited to…



RCW 43.372.040(6)

(6) The marine management plan must include but not be limited to:

. . .

(c) A series of maps that, at a minimum, summarize available data on: The key ecological aspects of the marine ecosystem, including physical and biological characteristics, as well as areas that are environmentally sensitive or contain unique or sensitive species or biological communities that must be conserved and warrant protective measures; human uses of marine waters, particularly areas with high value for fishing, shellfish aquaculture, recreation, and maritime commerce; and appropriate locations with high potential for renewable energy production with minimal potential for conflicts with other existing uses or sensitive environments;

-RCW 43.372.040

Use Analysis Process

Final Products:

1. Maps that provides general sense of where higher levels of conflict *may* occur with new uses

2. Recommendations for planning regarding new uses (space use)

Use Analysis Approach

1. Produce maps for existing uses by sector:
   - Intensity of uses
   - Number of uses present
2. Overlay all sector maps to produce map of all existing uses
   - Intensity of uses
   - Number of sectors
3. Overlay renewable energy maps for comparison
4. Develop recommendations

Process To Date

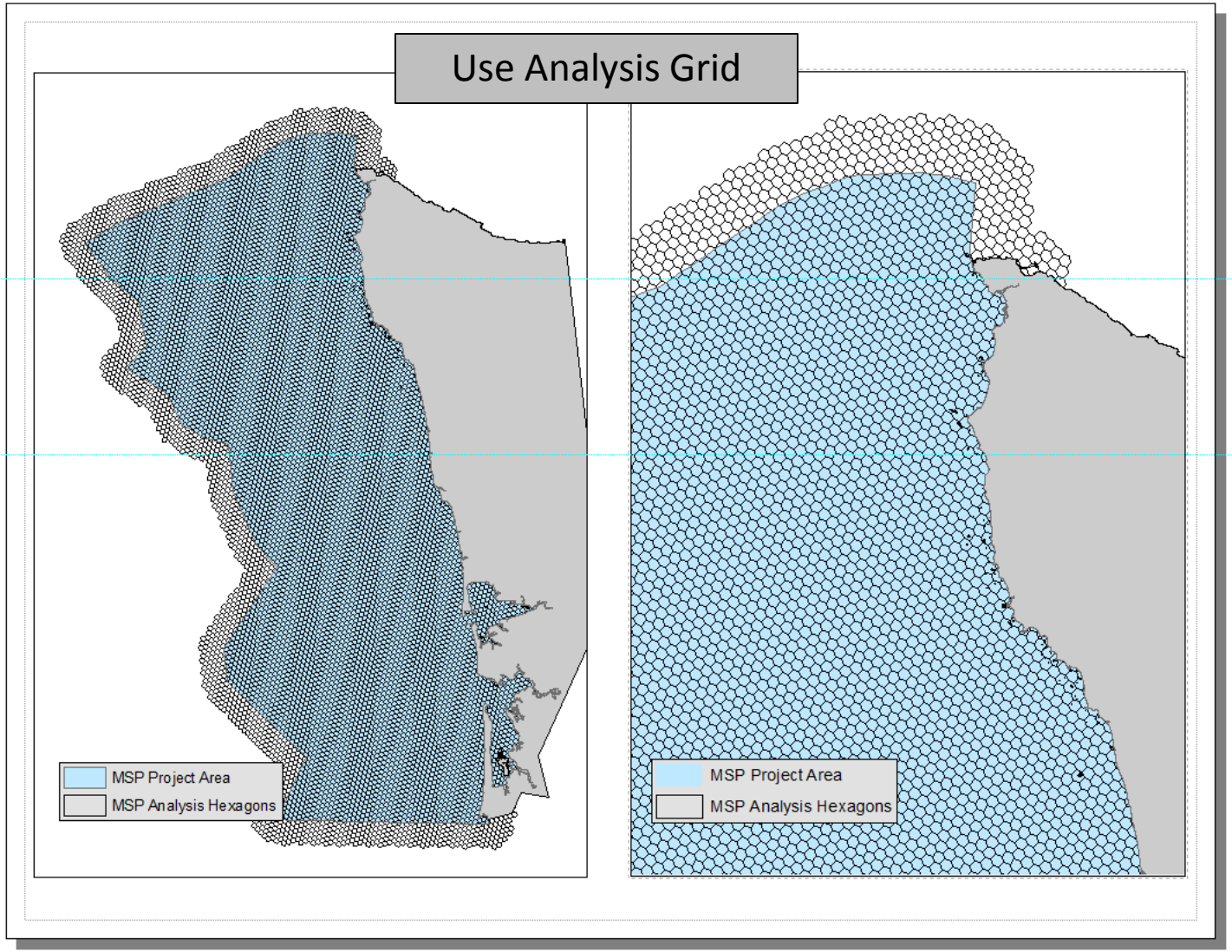
- Briefings to WCMAC on concept and process
- Meetings with marine use sectors regarding data sources and potential conflicts with new uses.
- GIS work (*ongoing*)
- Tribal briefing and input (*ongoing*)

Existing Use Scoring Criteria

- Use intensity data, where available.
- Convert data to footprints of where the use occurs (or not) for “number of uses” maps.

- Retain conflict coding for existing use data layers within attributes of data, where available:
  - High, Medium, Low, None

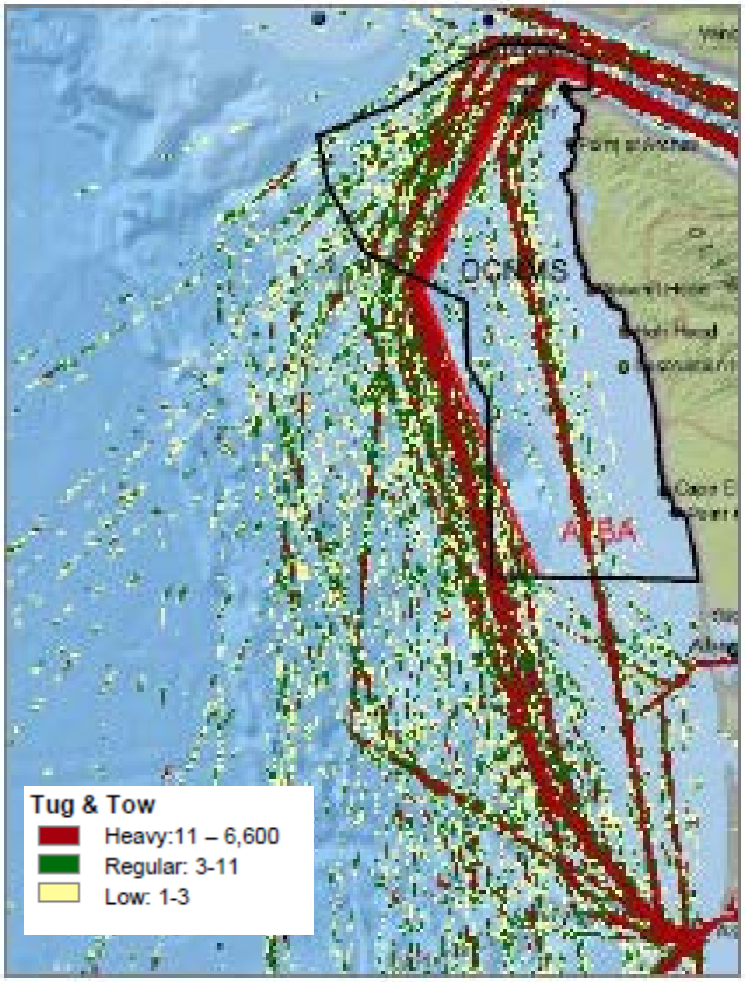
Analysis Unit = 1 Sq Mile Hexagons



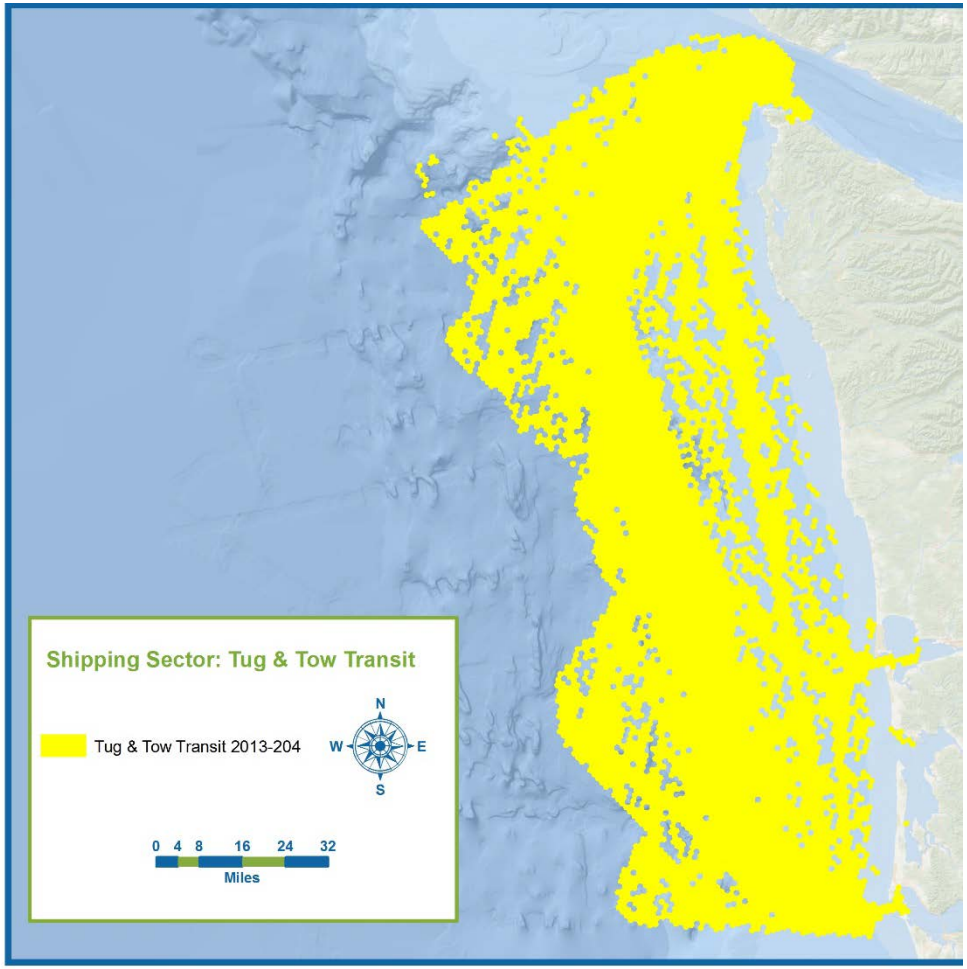
There are 8,272 hexagon cells in the grid within the boundaries of the planning area.

Existing Use Mapping – Shipping: draft use maps

Intensity data: Tug and Tow

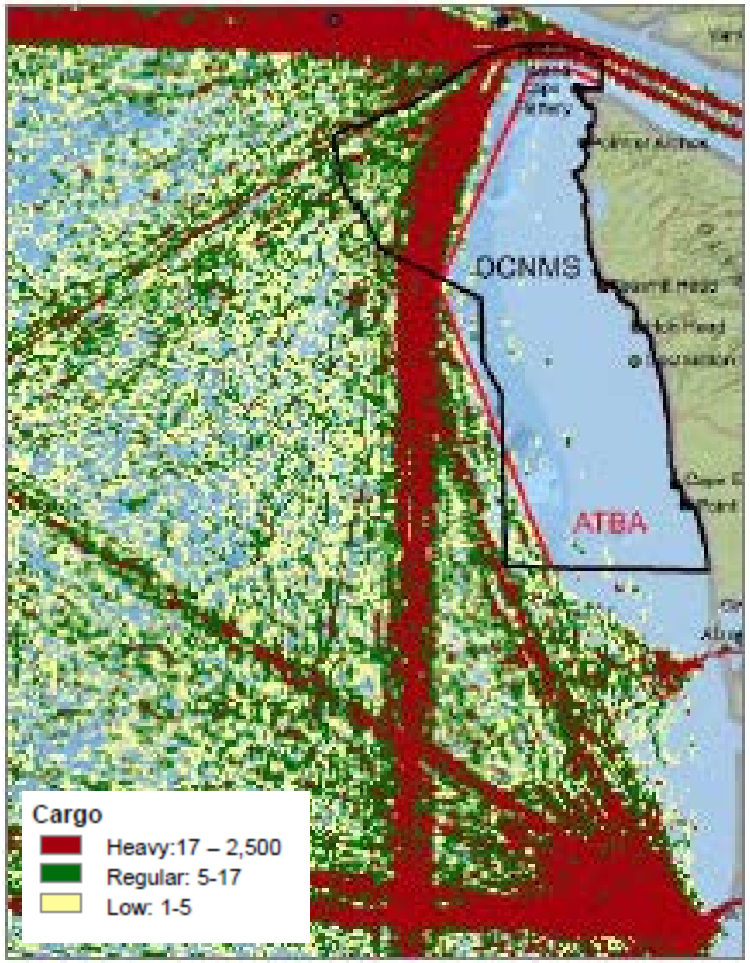


Sum of Use: Tug and Tow

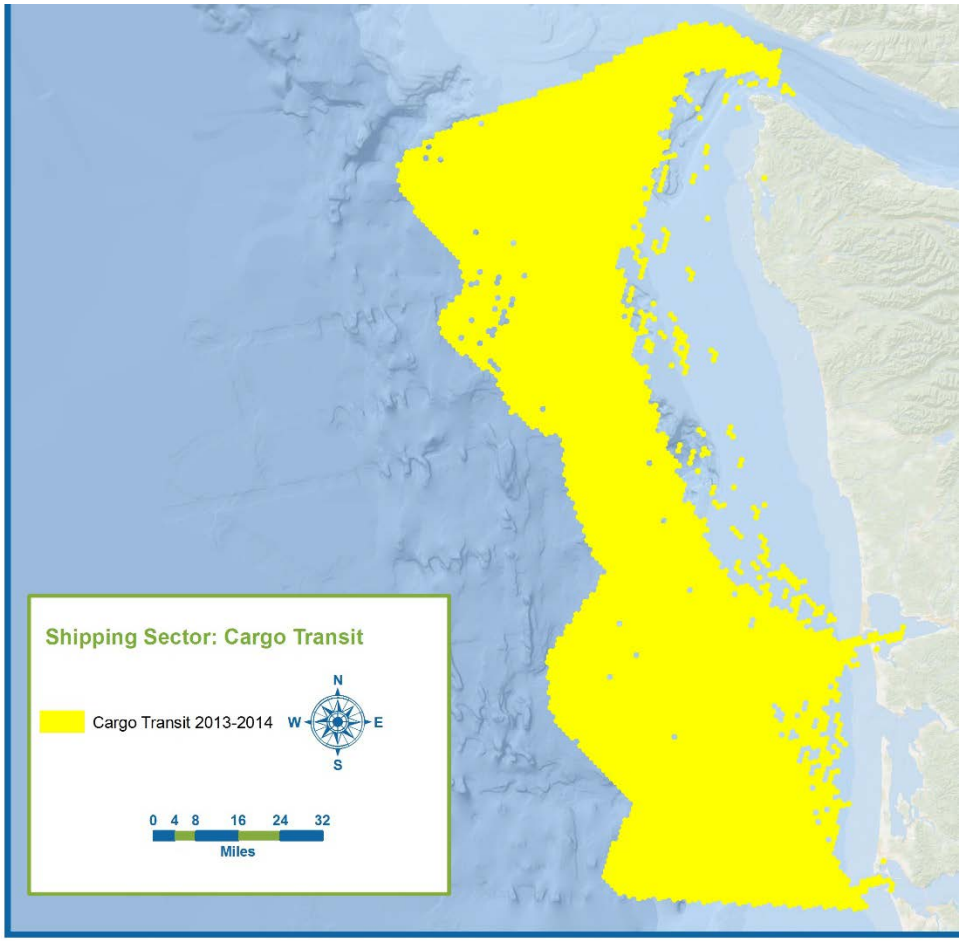


Existing Use Mapping – Shipping: draft use maps

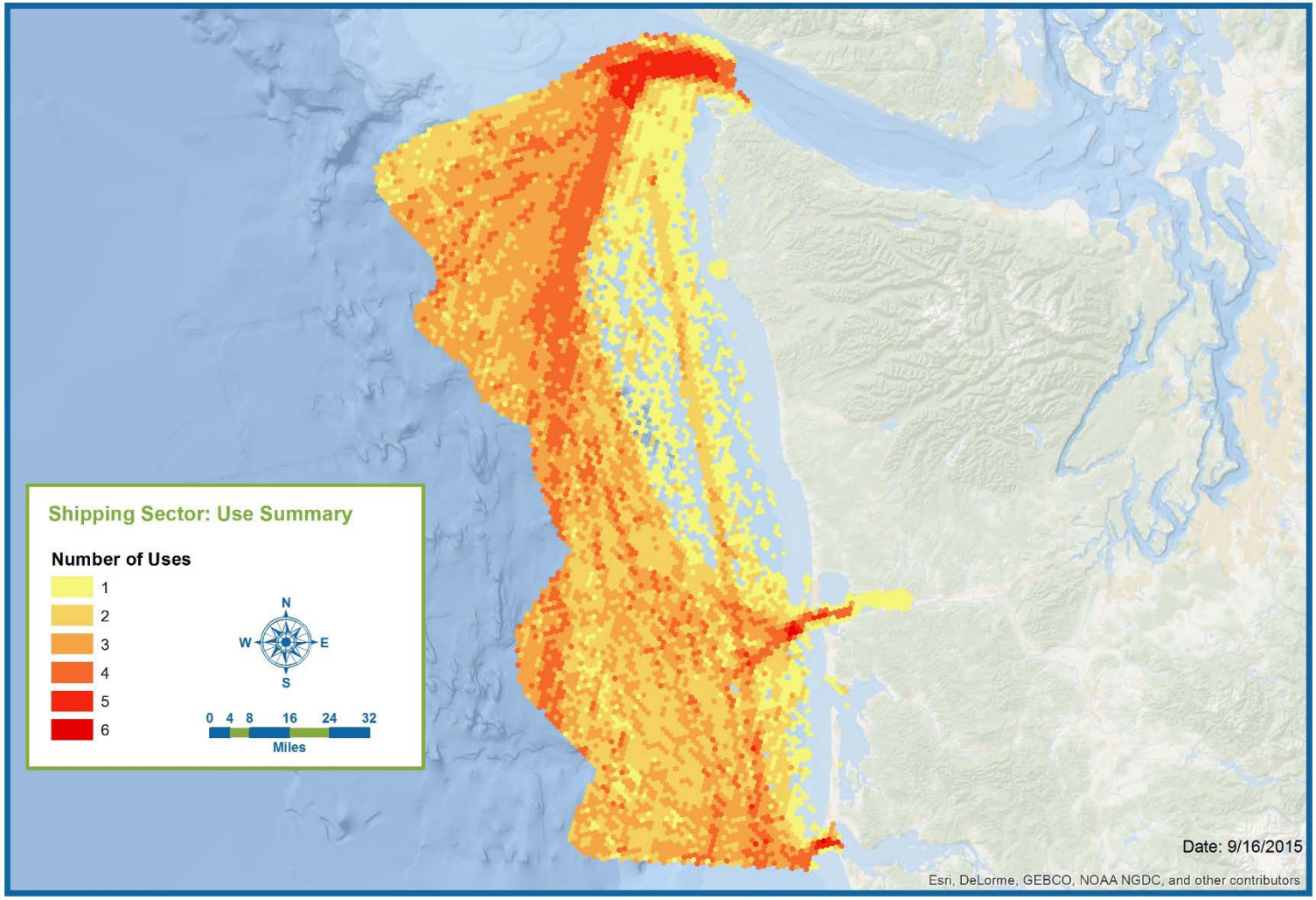
Intensity data: Cargo



Sum of use: Cargo



Shipping: Draft Number of Uses



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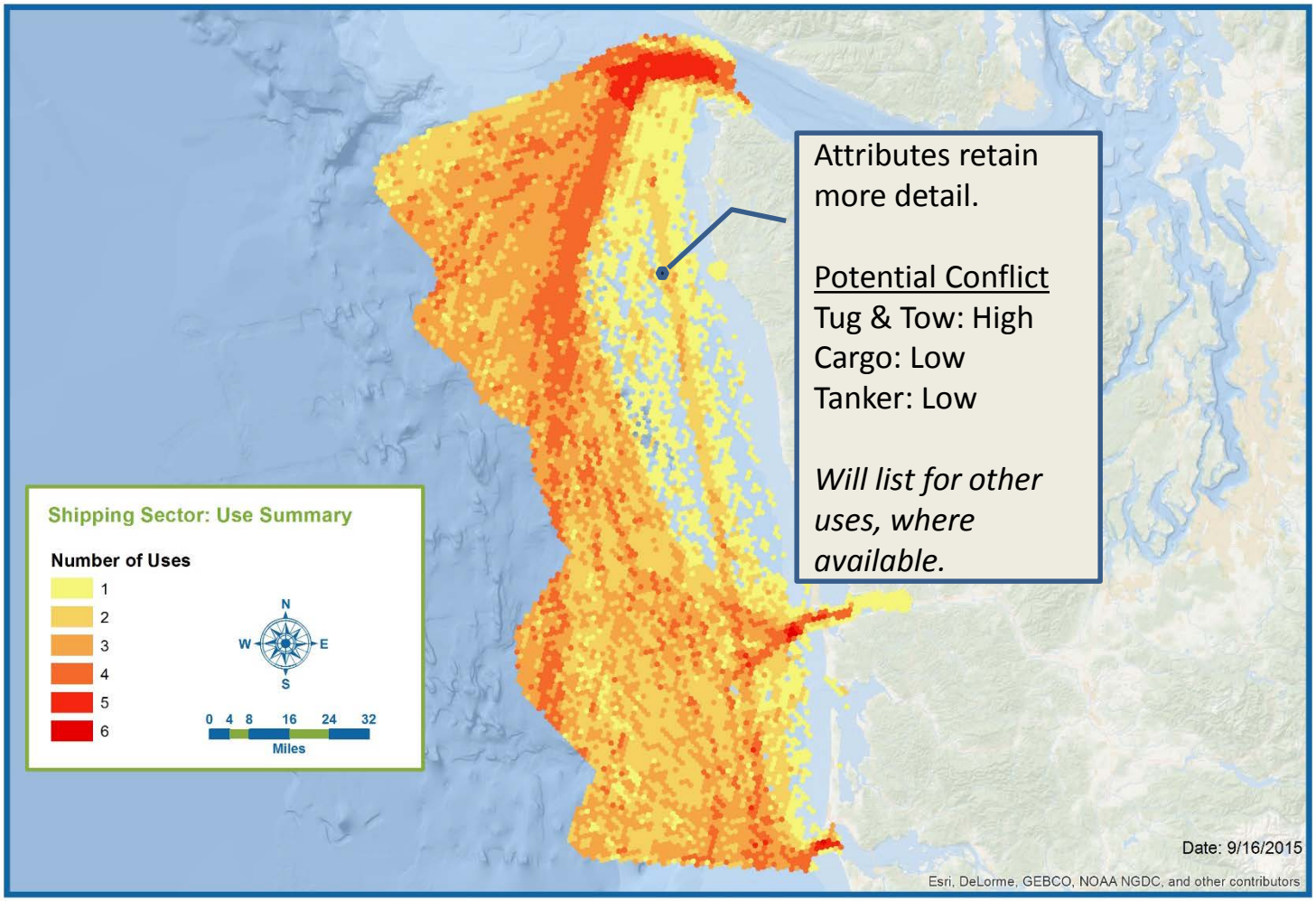
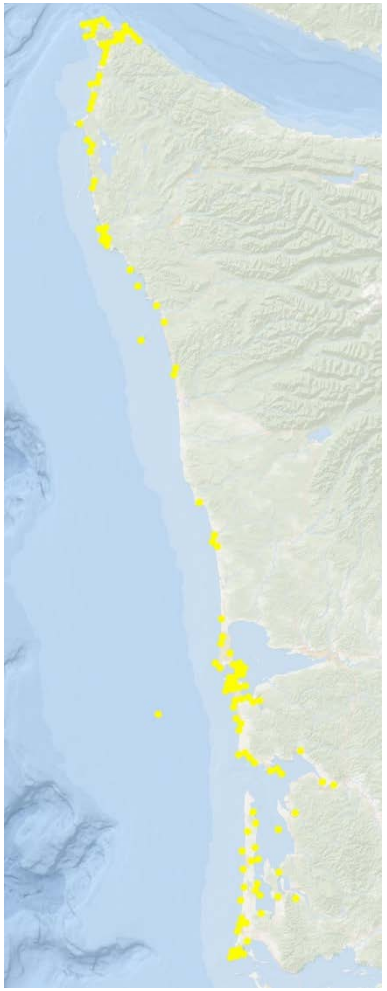
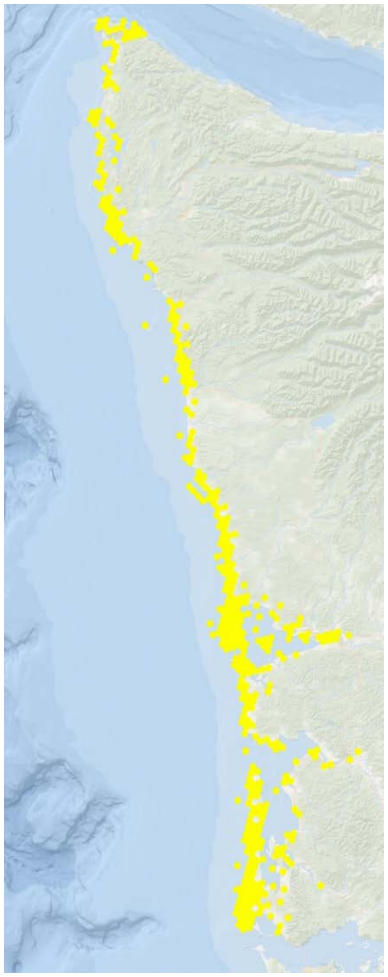


Recreation: Draft Use Footprint Maps

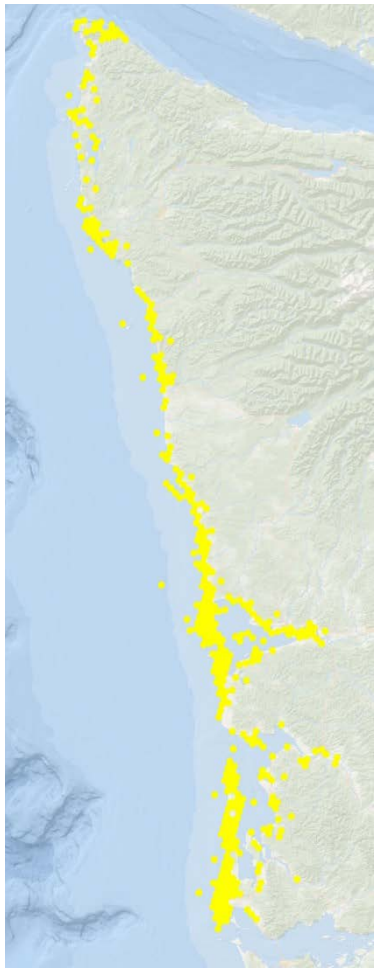
Footprint of use:
Surface-water



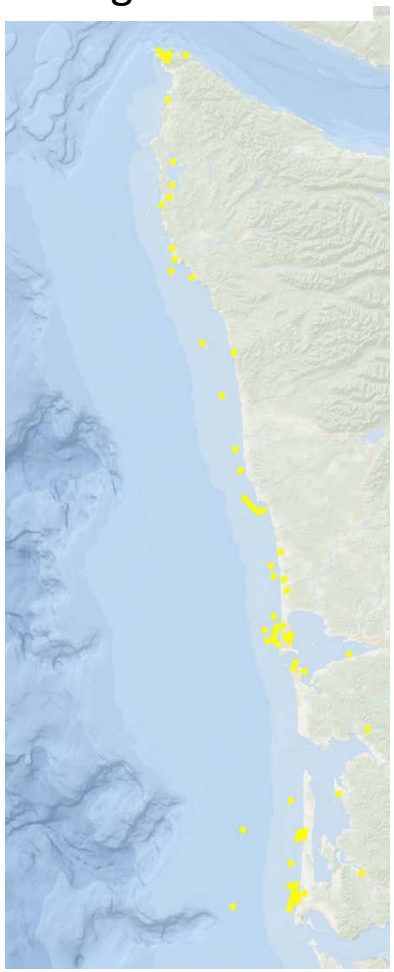
Footprint of use:
Shore-based



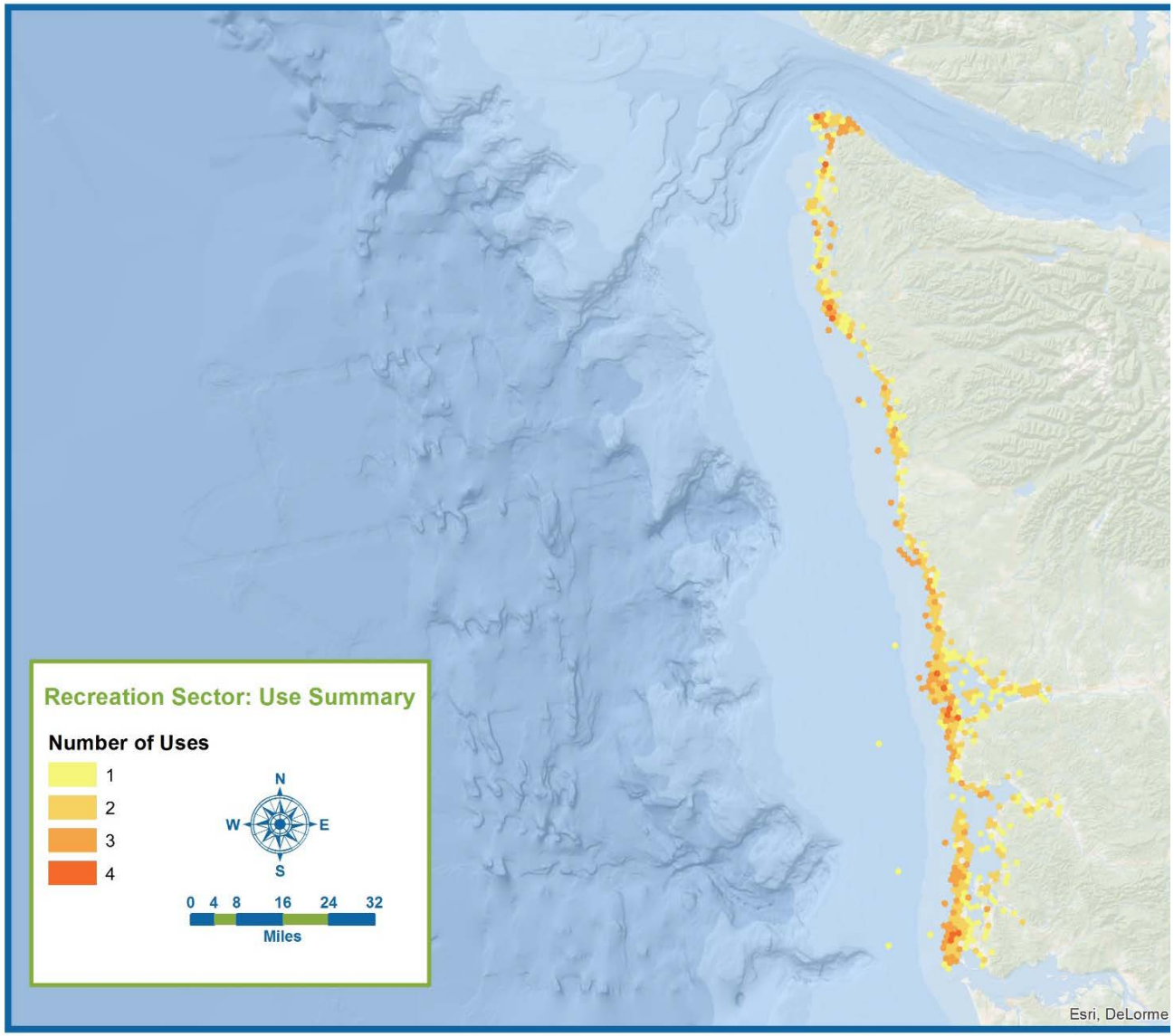
Footprint of use:
Wildlife Viewing



Footprint of use:
Diving



All Recreation: draft number of uses

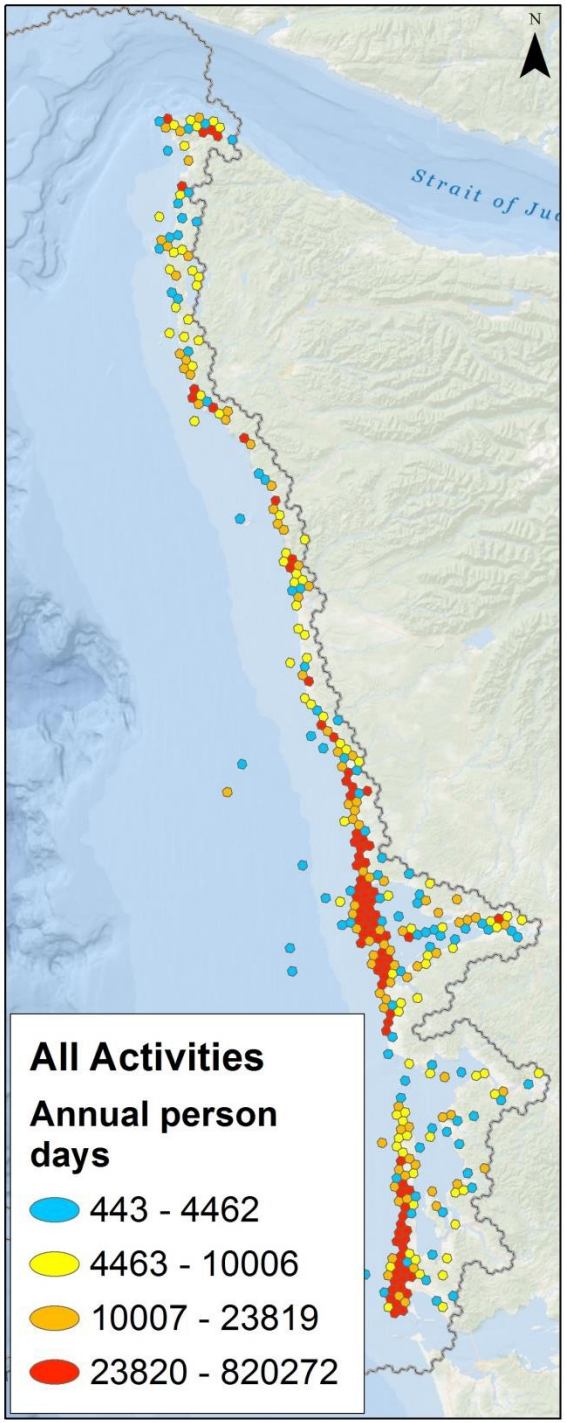


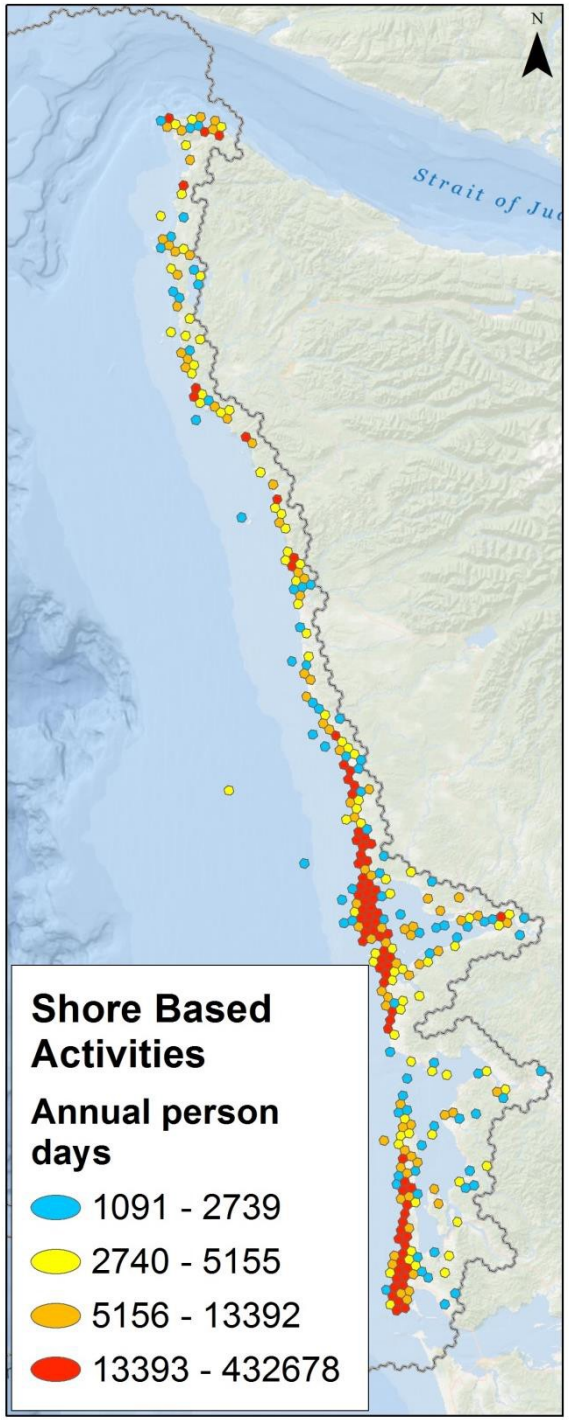
Recreation: Intensity data

Converted person trips to person days (OCNMS).

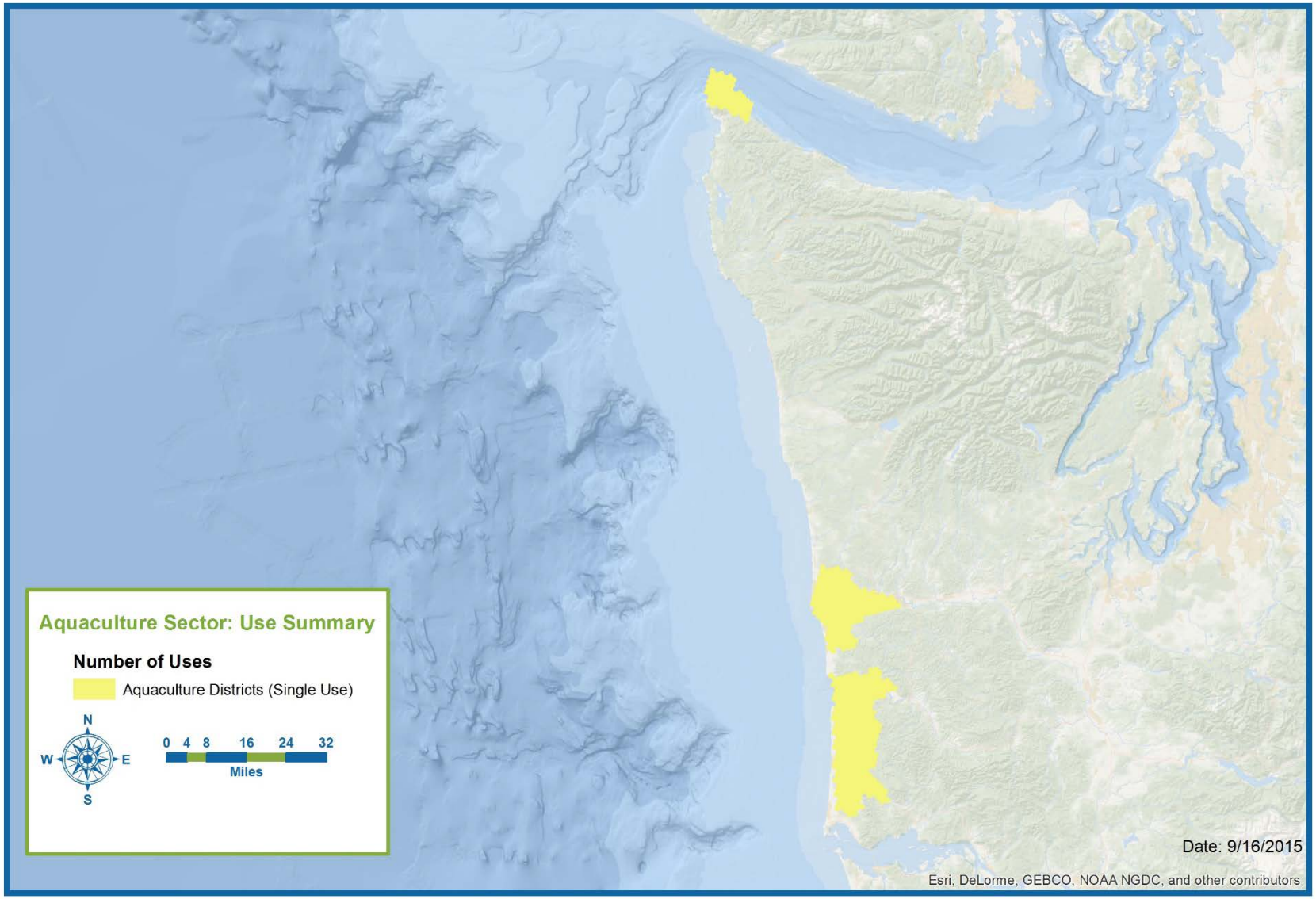
Person-trip = # of visits a household takes to a given destination * the number of people per trip

Person-day = person trips * the length of the stay.

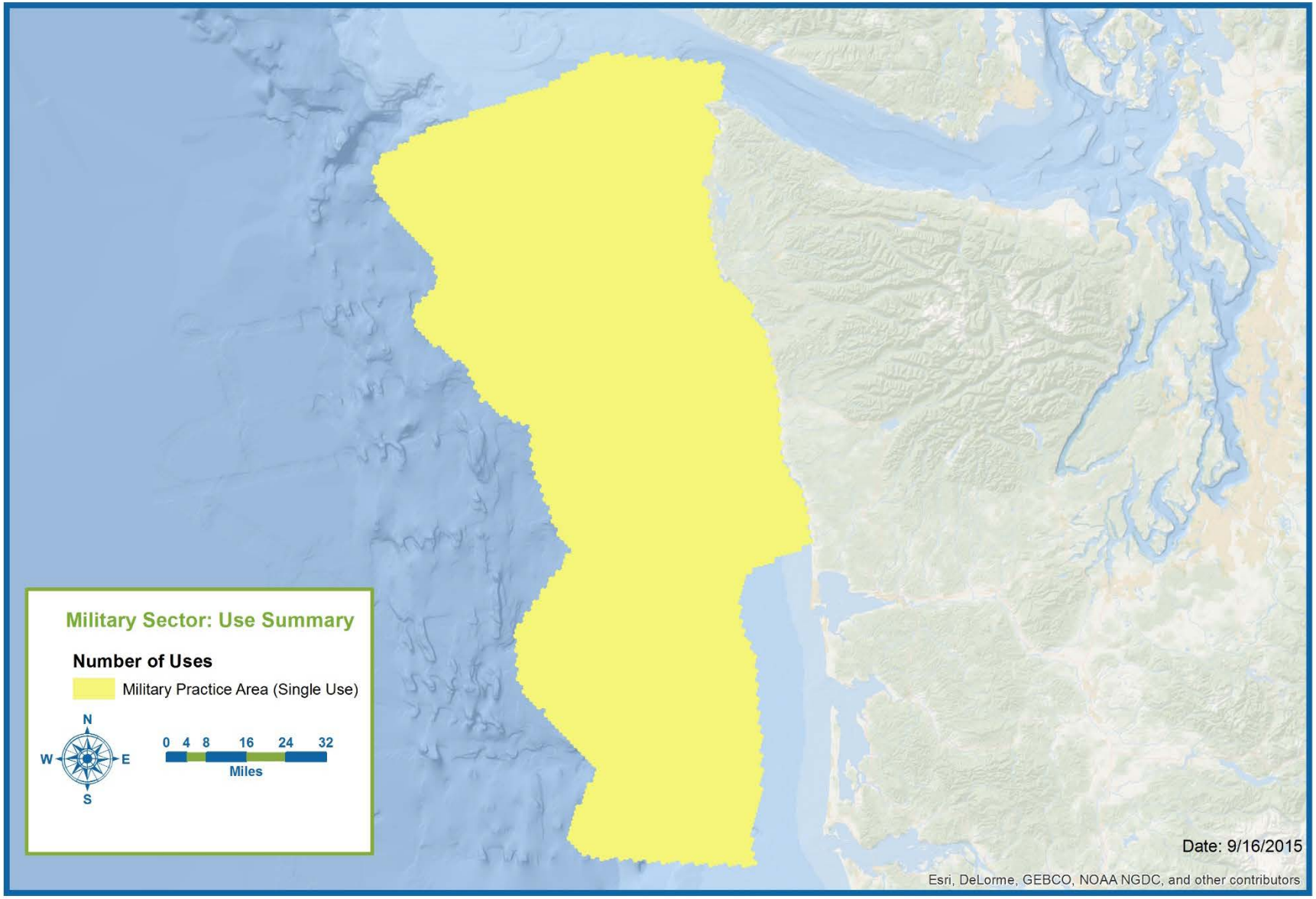




Aquaculture: draft footprint



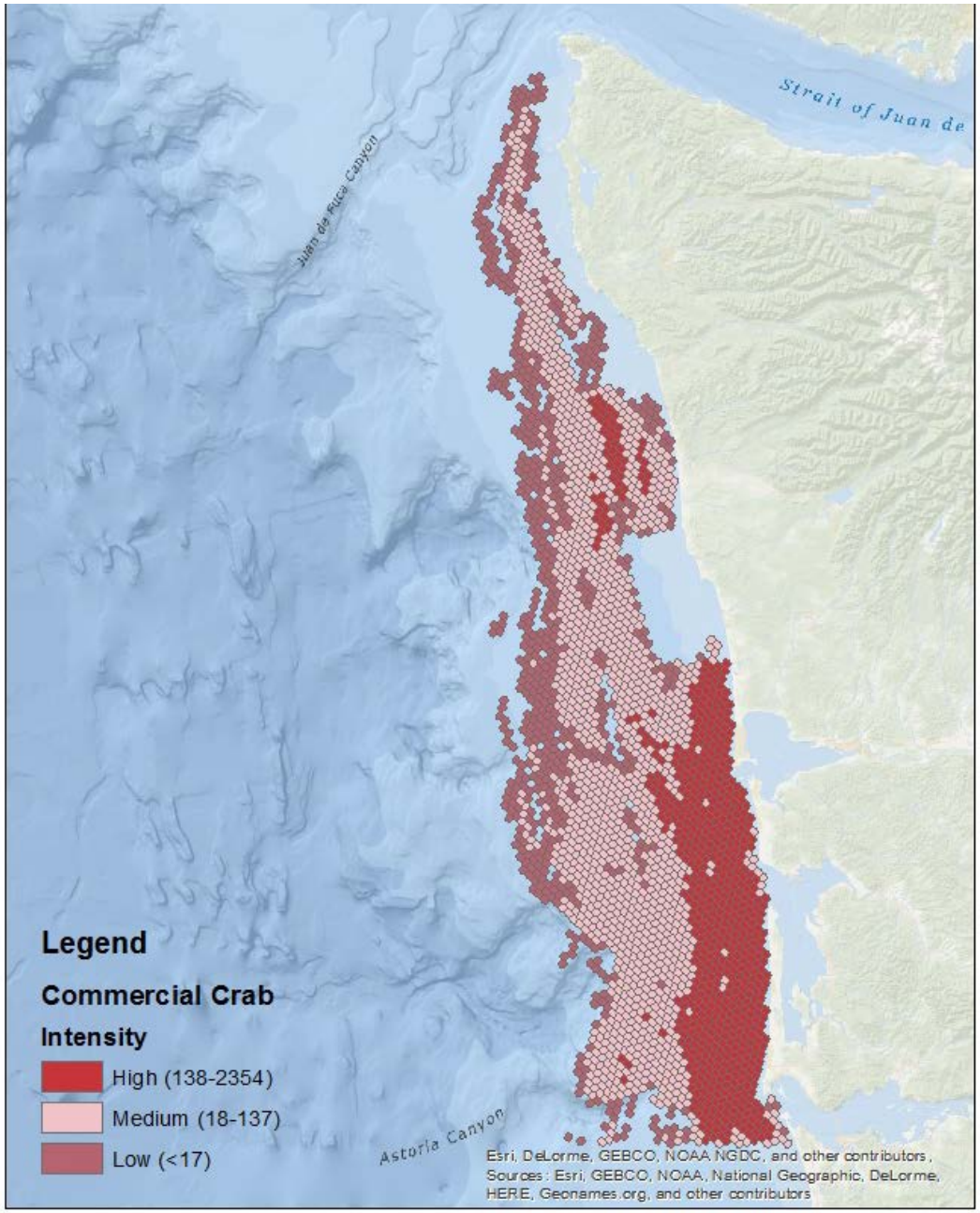
Military: draft footprint



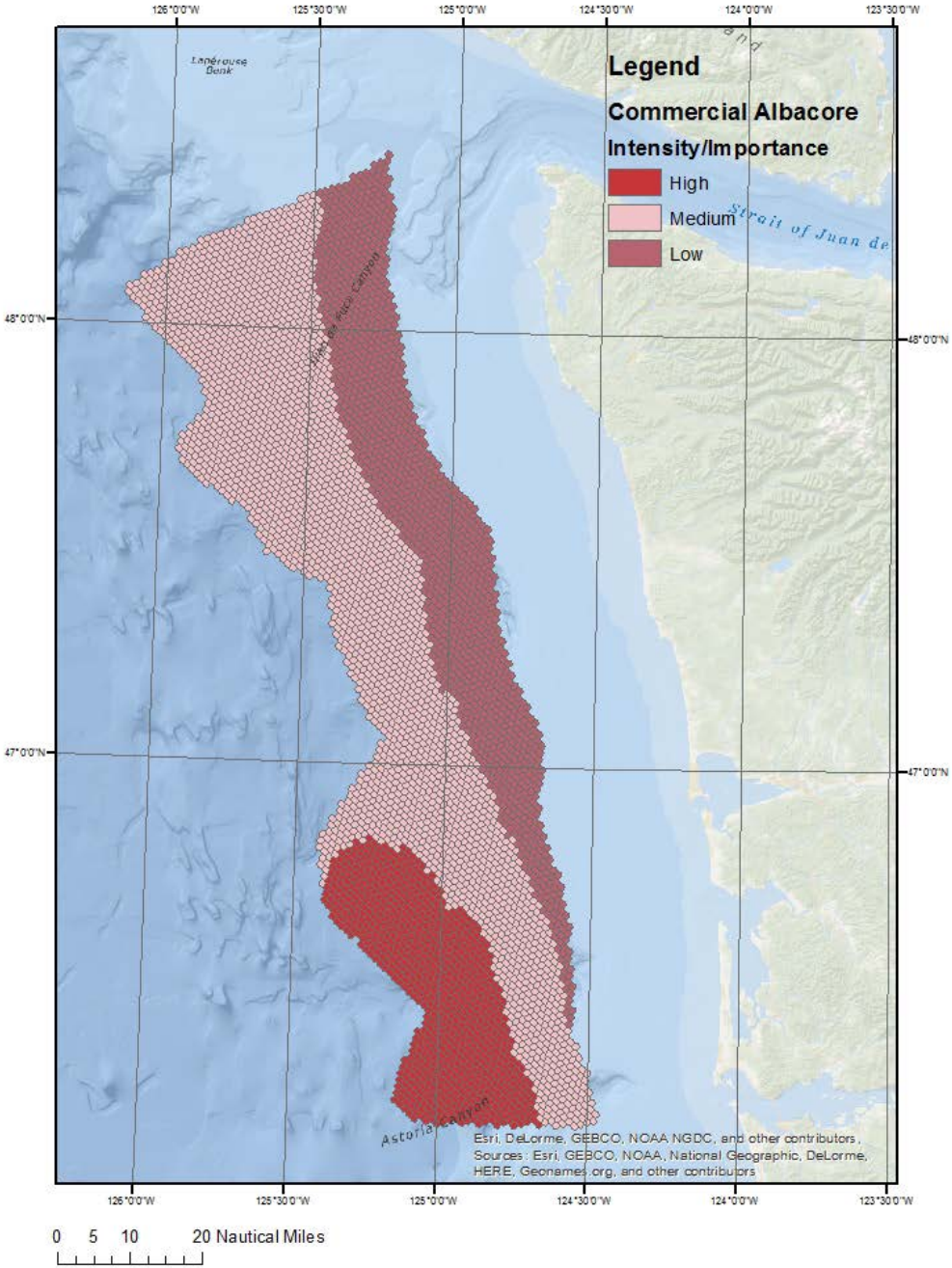
The Fisheries Use Maps

	Commercial
1	Albacore
2	Dungeness Crab
	Groundfish
3	Fixed Gear
4	Bottom Trawl
5	Pacific Whiting
6	Pink Shrimp
7	Salmon
8	Sardine
	Recreational
9	Albacore
10	Bottomfish and Lingcod
11	Pacific Halibut
12	Salmon

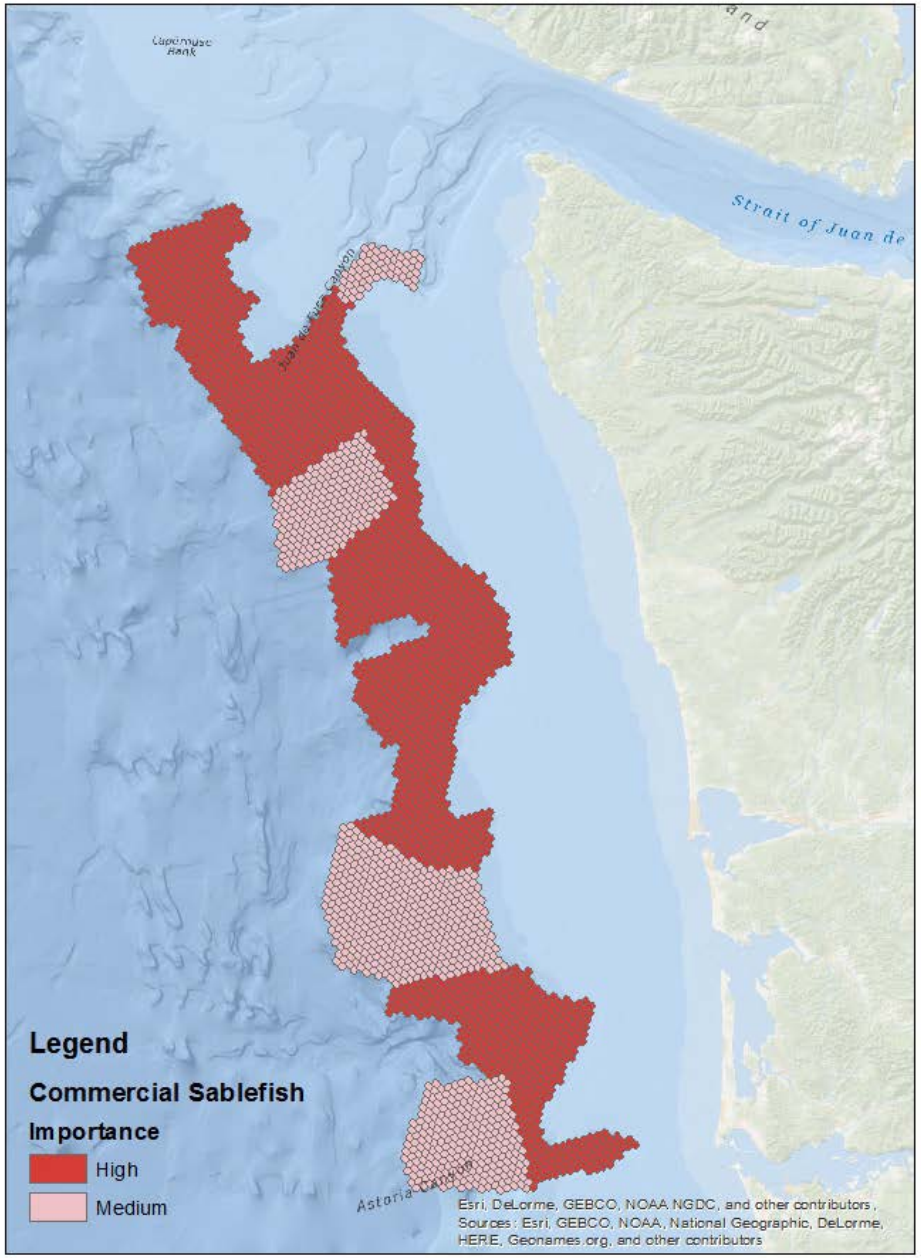
Commercial Crab Fishing: updated



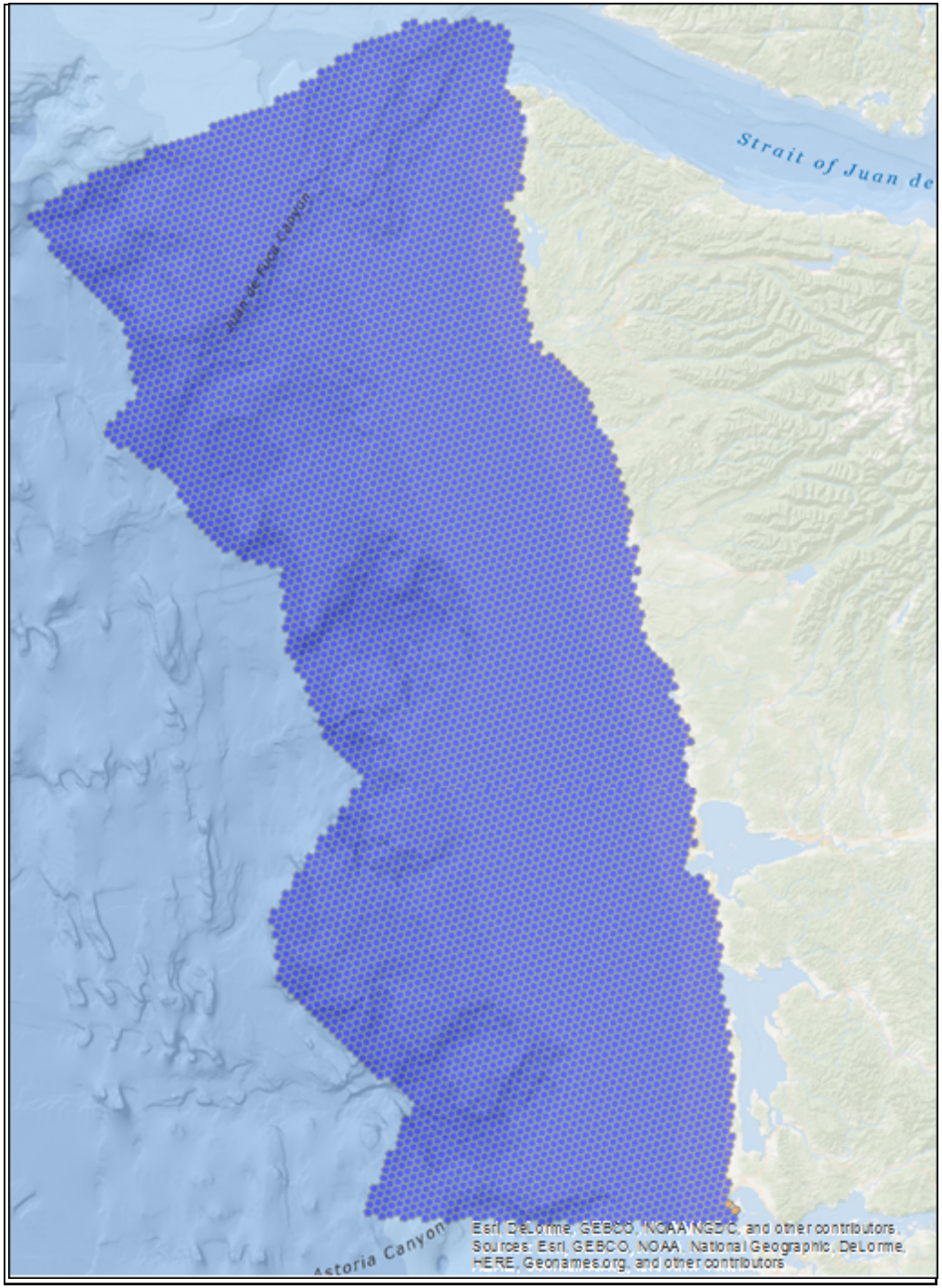
Commercial Albacore: updated map



Commercial Sablefish: updated map



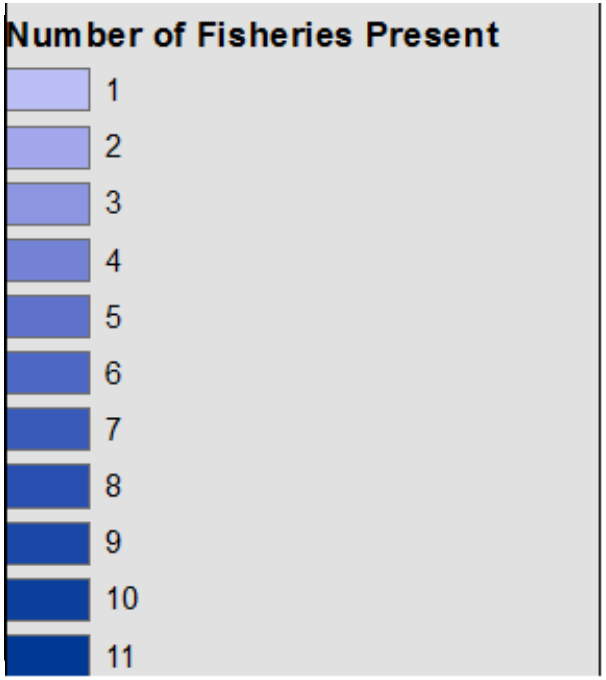
Footprint Map – The "Fisheries" Sector

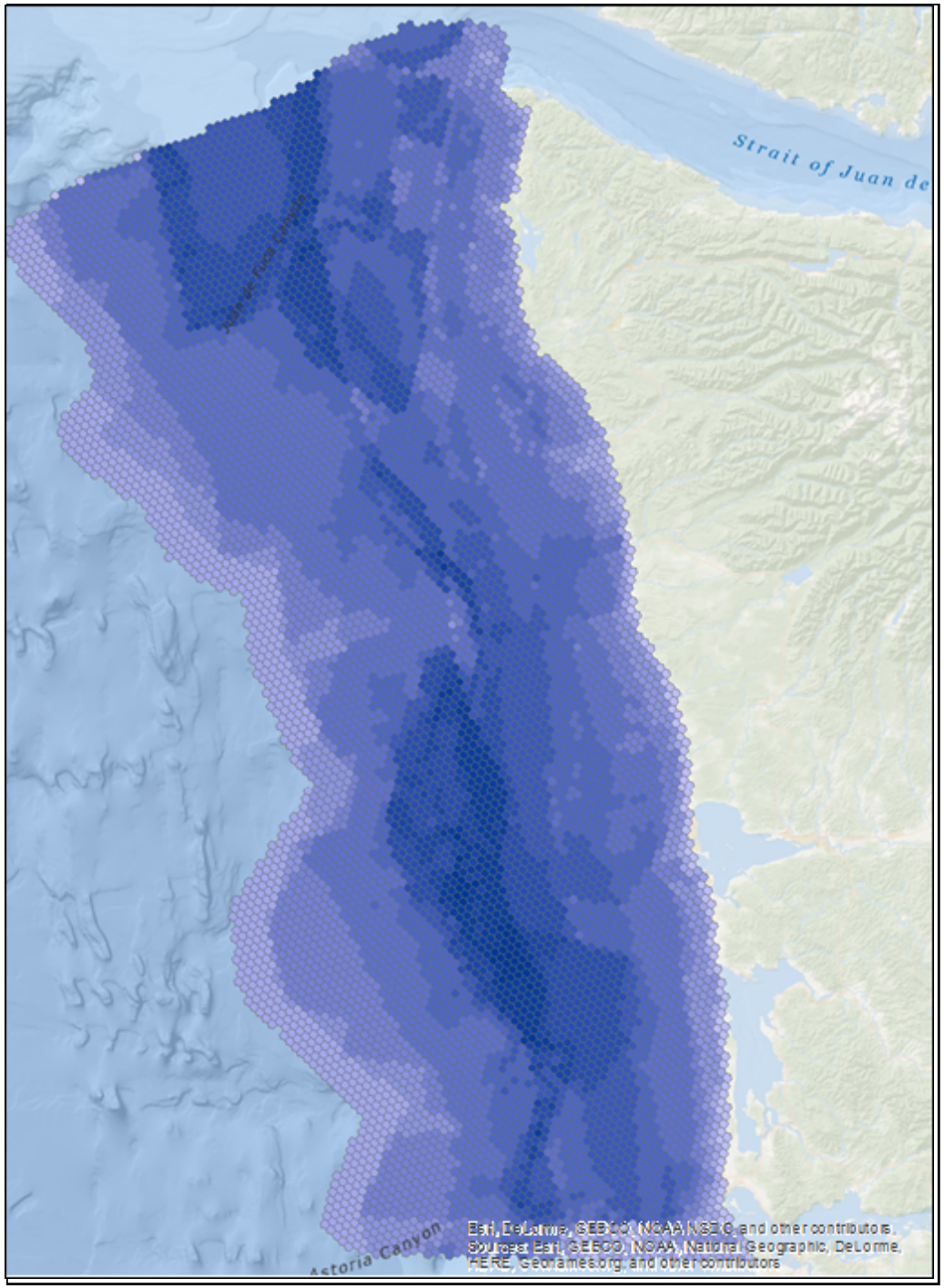


Fisheries Use Present?

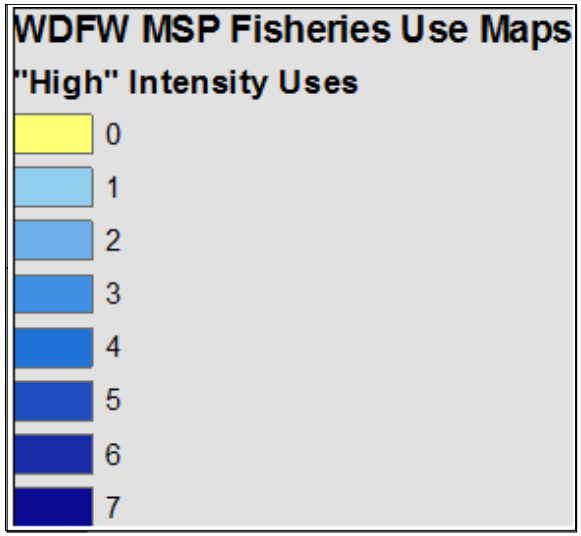
- No
- Yes

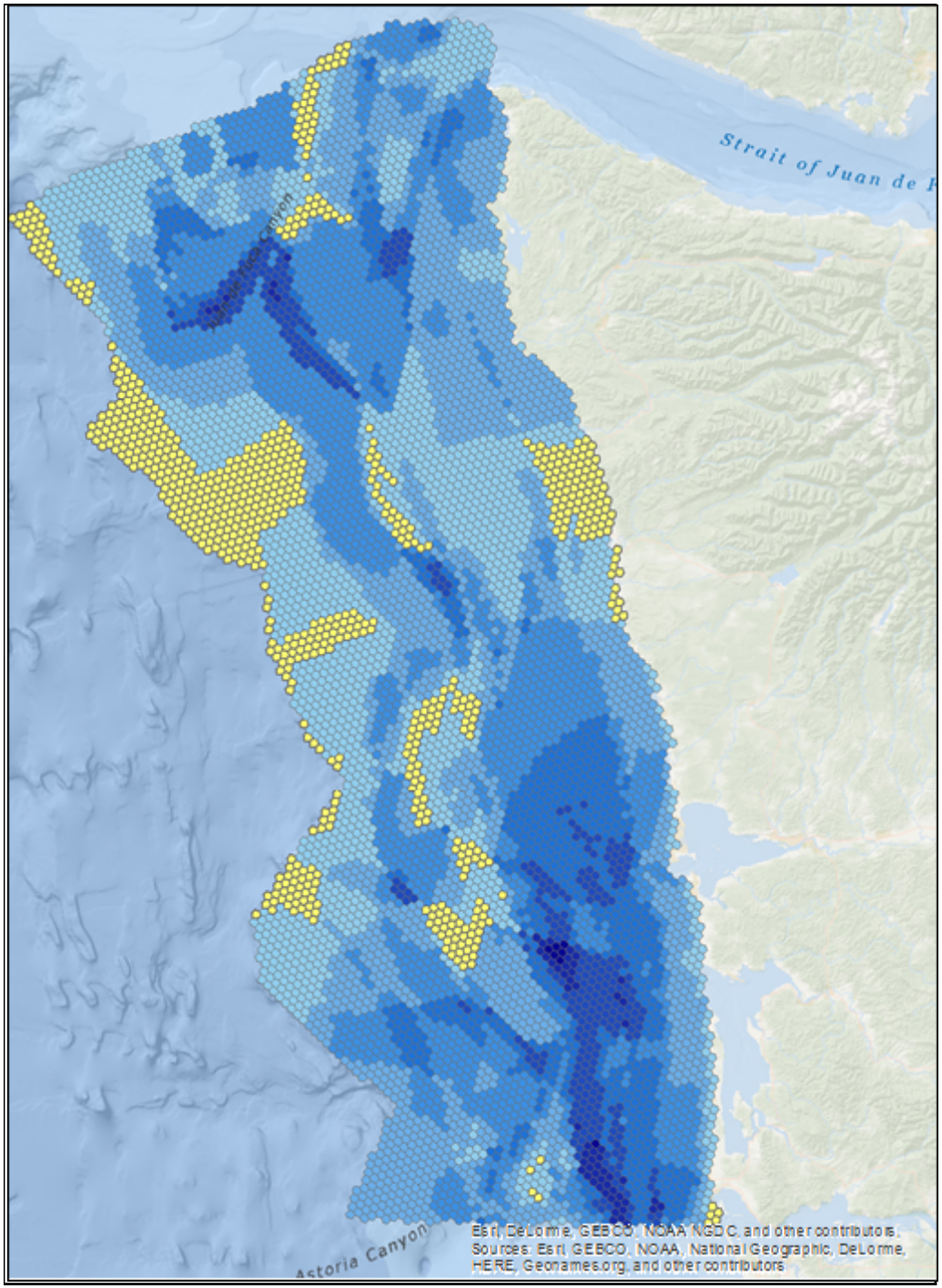
Footprint Map – Individual Fisheries



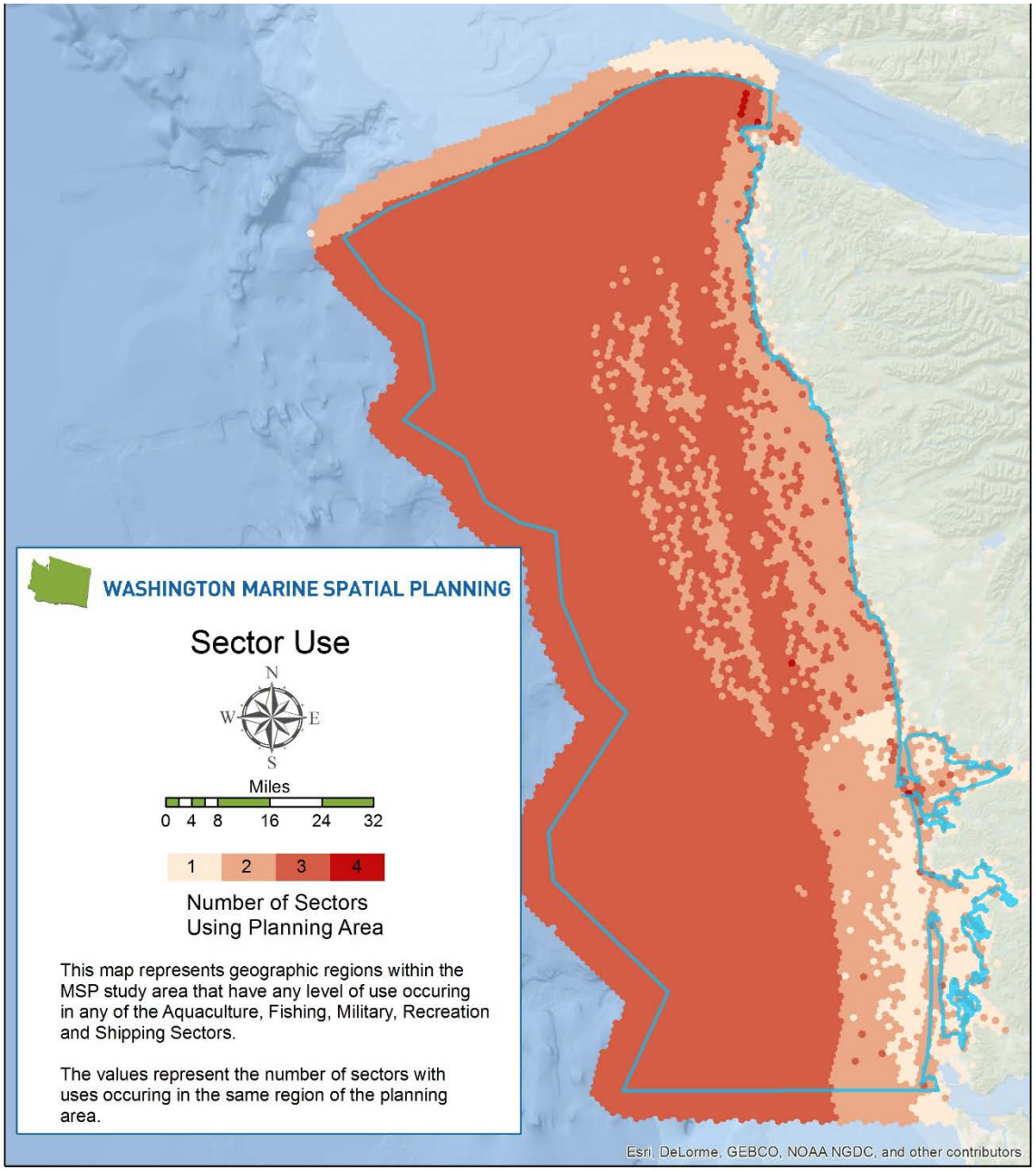


“High” Intensity Fisheries

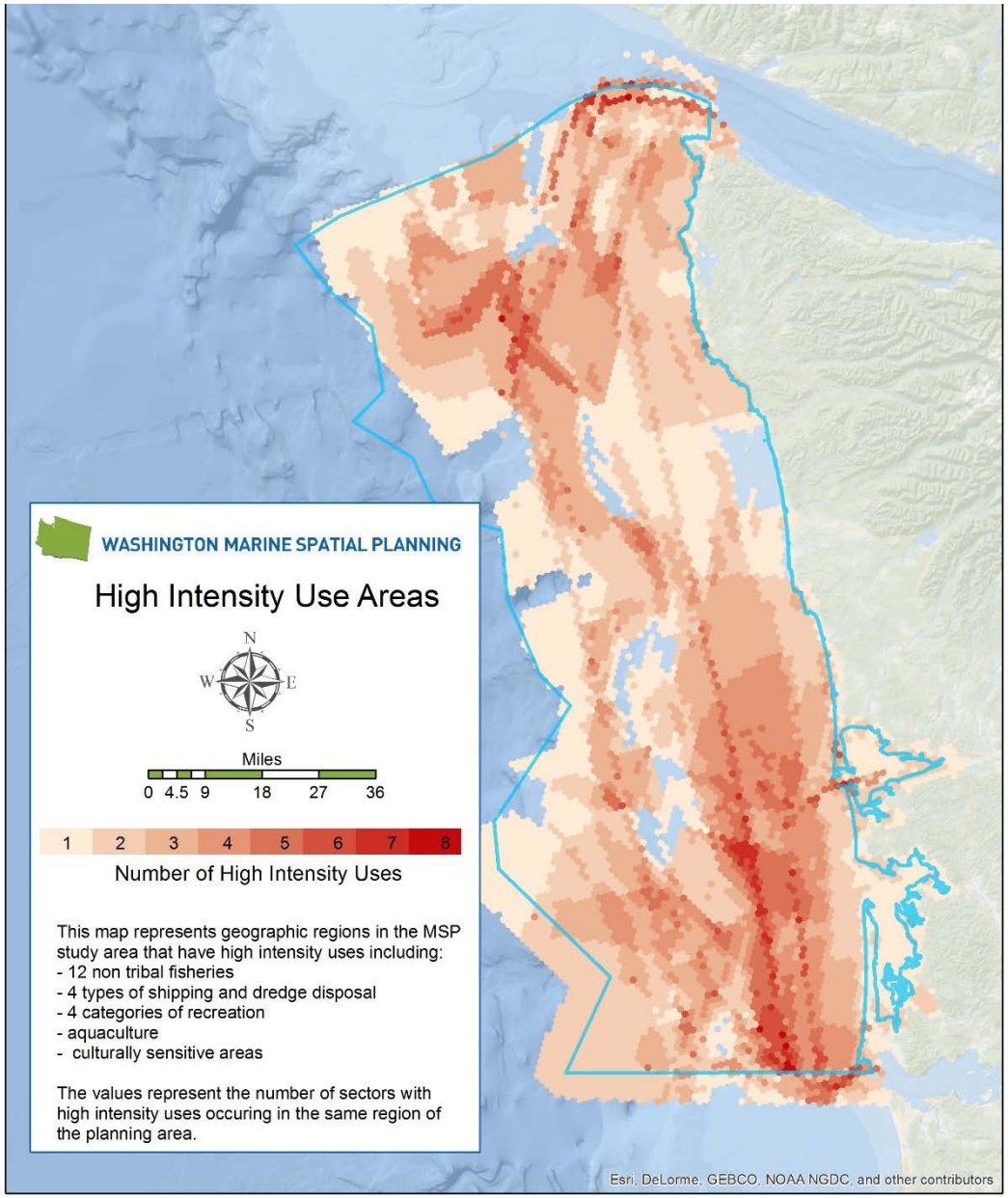




DRAFT: Number of Sectors



DRAFT: High Intensity Use Areas



Use Analysis Approach

1. Produce maps for existing uses by sector:
   - Intensity of uses
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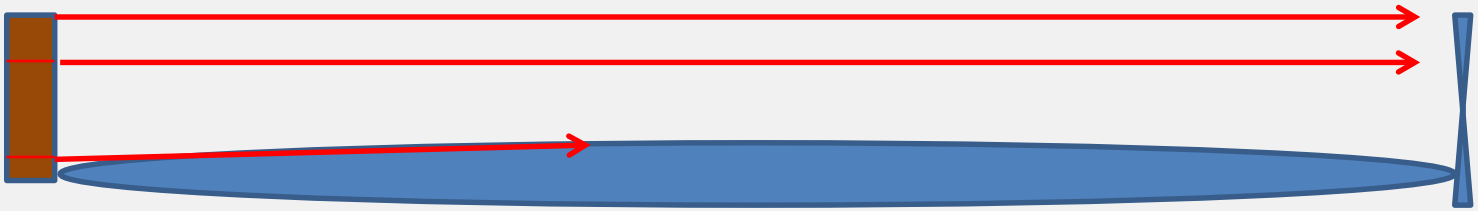
2. Overlay all sector maps to produce map of all existing uses
   - Intensity of uses
   - Number of uses
3. **Overlay renewable energy maps for comparison**
4. **Develop recommendations**

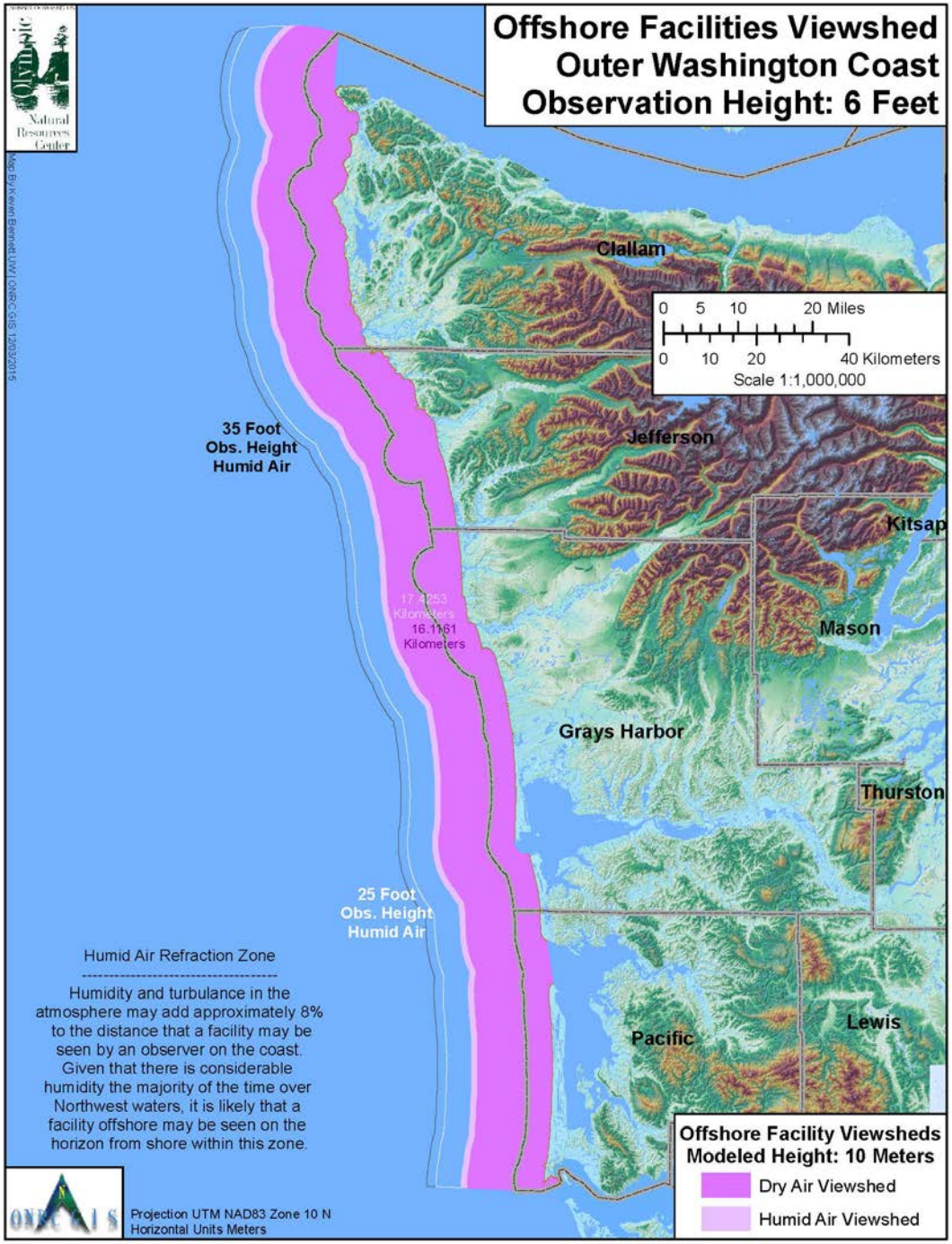
Next Steps & Timeline

Summer	Sector input on data & GIS work
June/Sept	**WCMAC – briefings for Advisory Council**
Nov. 9	WDFW fisheries maps workshop
Fall	GIS work
Dec. 4	**Tribal policy & technical review**
Dec. 9	**WCMAC - review draft use maps, input on next steps (i.e. renewable energy comparison)**
Winter	GIS work: incorporate Ecologically Important Areas, refine use maps, options for renewable energy comparison
Winter	**Tribal input and recommendations**
Feb 10	**WCMAC – discuss renewable energy comparisons & recommendations**
March/April	**Tribal feedback**
April 20	**WCMAC – finalize recommendations**

How far off-shore must energy devices be before we can't see them any more?

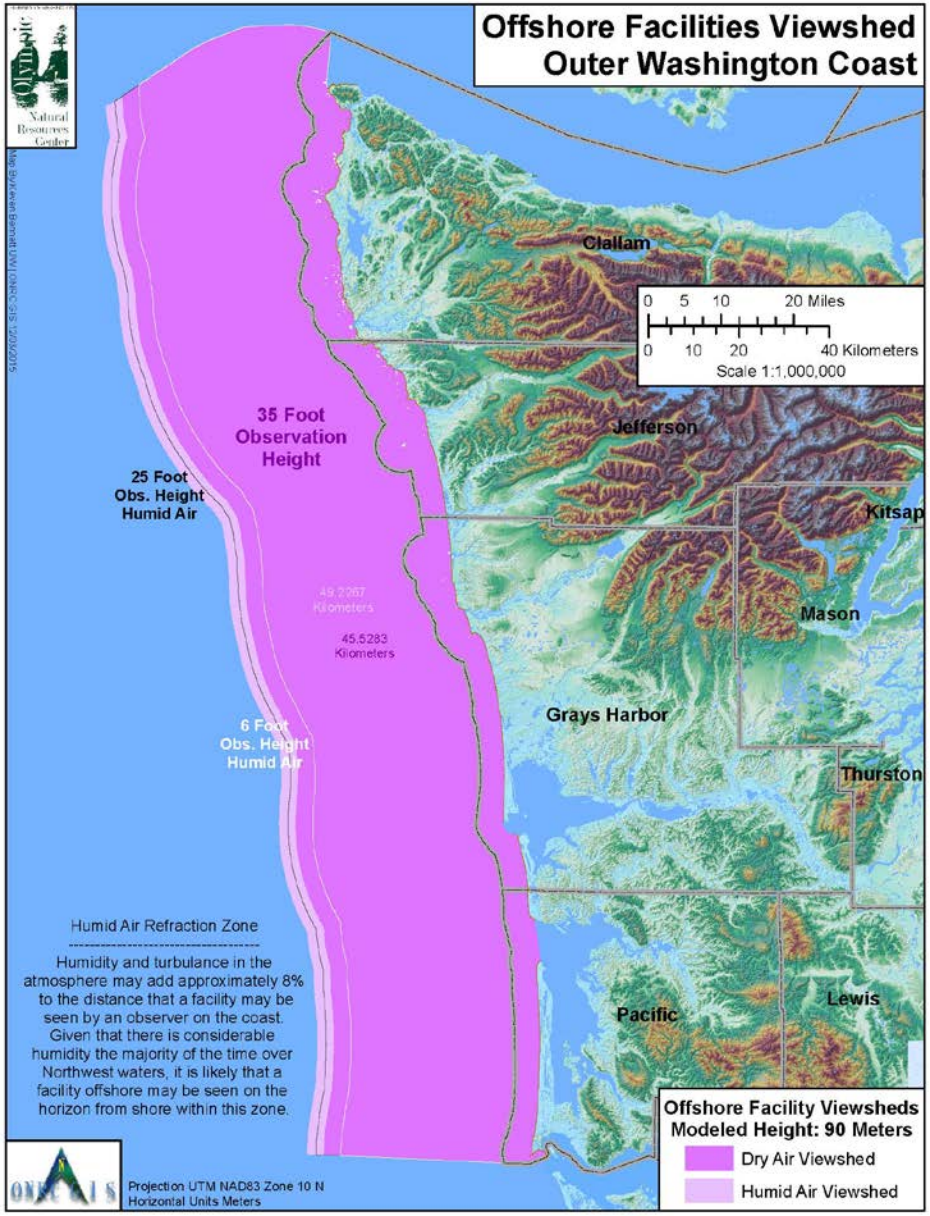
1st level = Standing on shore (6 foot view).
2nd level is from a 2nd story hotel balcony (approx. 25 ft. up).
3rd level is from a 3rd story hotel balcony (approx. 35 ft. up)



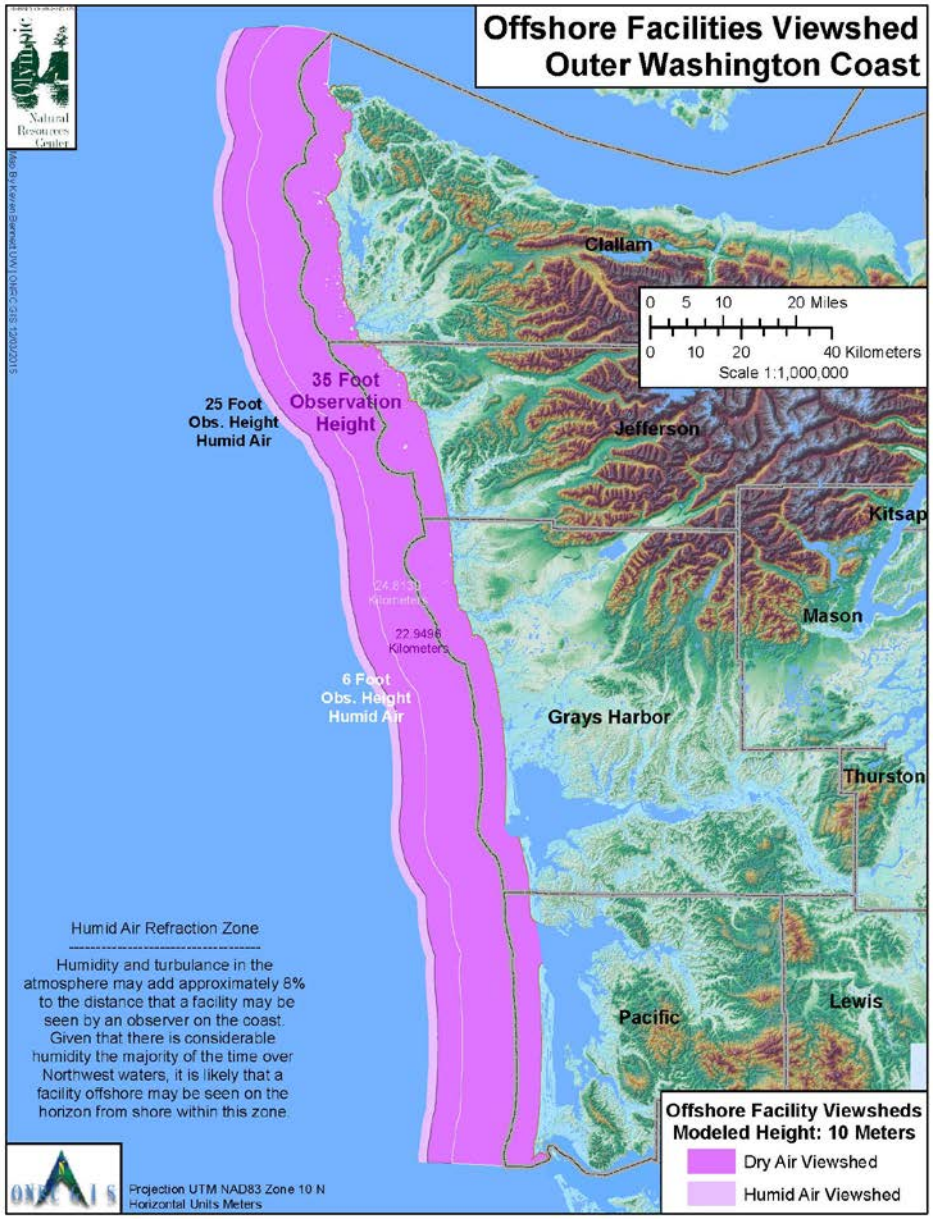

Offshore Facilities Viewshed
Outer Washington Coast
Observation Height: 6 Feet
Olympic Natural Resources Center
Map By Kevin Bennett UW ONRC GIS 12/03/2015
Clallam
0 5 10 20 Miles
0 10 20 40 Kilometers
Scale 1:1,000,000
Jefferson
Kitsap
Mason
Grays Harbor
Thurston
Pacific
Lewis
35 Foot
Obs. Height
Humid Air
17.7253
Kilometers
16.1161
Kilometers
25 Foot
Obs. Height
Humid Air
Humid Air Refraction Zone
Humidity and turbulance in the atmosphere may add approximately 8% to the distance that a facility may be seen by an observer on the coast. Given that there is considerable humidity the majority of the time over Northwest waters, it is likely that a facility offshore may be seen on the horizon from shore within this zone.
Projection UTM NAD83 Zone 10 N
Horizontal Units Meters
Offshore Facility Viewsheds
Modeled Height: 10 Meters
Dry Air Viewshed
Humid Air Viewshed

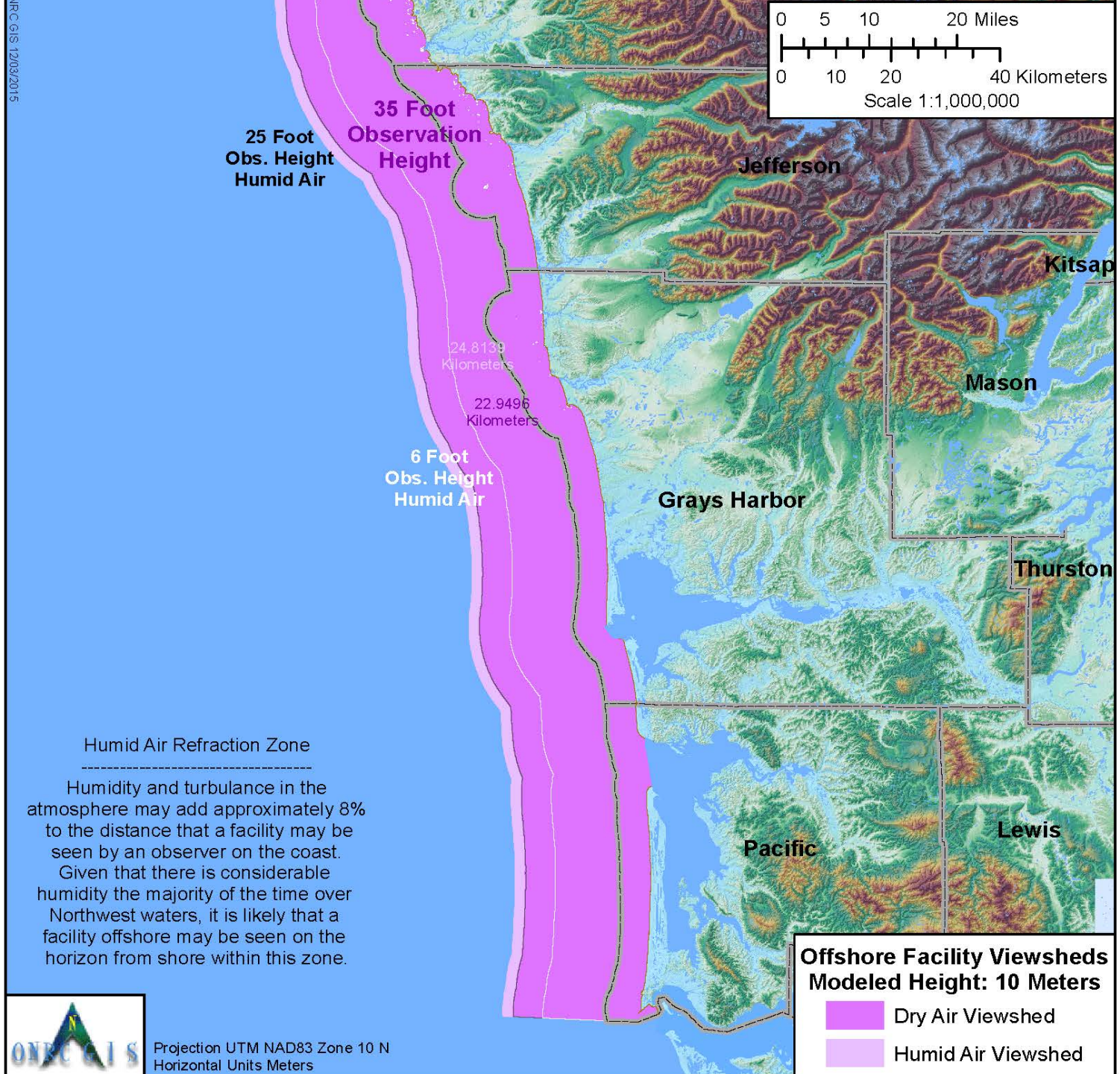
Energy facilities must be sighted offshore beyond these zones to be invisible to the observer on shore at 6ft., 25 ft. (2nd floor hotel Room), or 35 ft. (3rd floor hotel room).

90 Meter Tall Wind Farm



10 Meter Tall Offshore Facility




ONRC GIS 12/03/2015
0 5 10 20 Miles
0 10 20 40 Kilometers
Scale 1:1,000,000
35 Foot Observation Height
25 Foot Obs. Height Humid Air
Jefferson
Kitsap
Mason
24.8139 Kilometers
22.9496 Kilometers
6 Foot Obs. Height Humid Air
Grays Harbor
Thurston
Lewis
Pacific
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Modeled Height: 10 Meters
Dry Air Viewshed
Humid Air Viewshed
ONRC GIS
Projection UTM NAD83 Zone 10 N
Horizontal Units Meters

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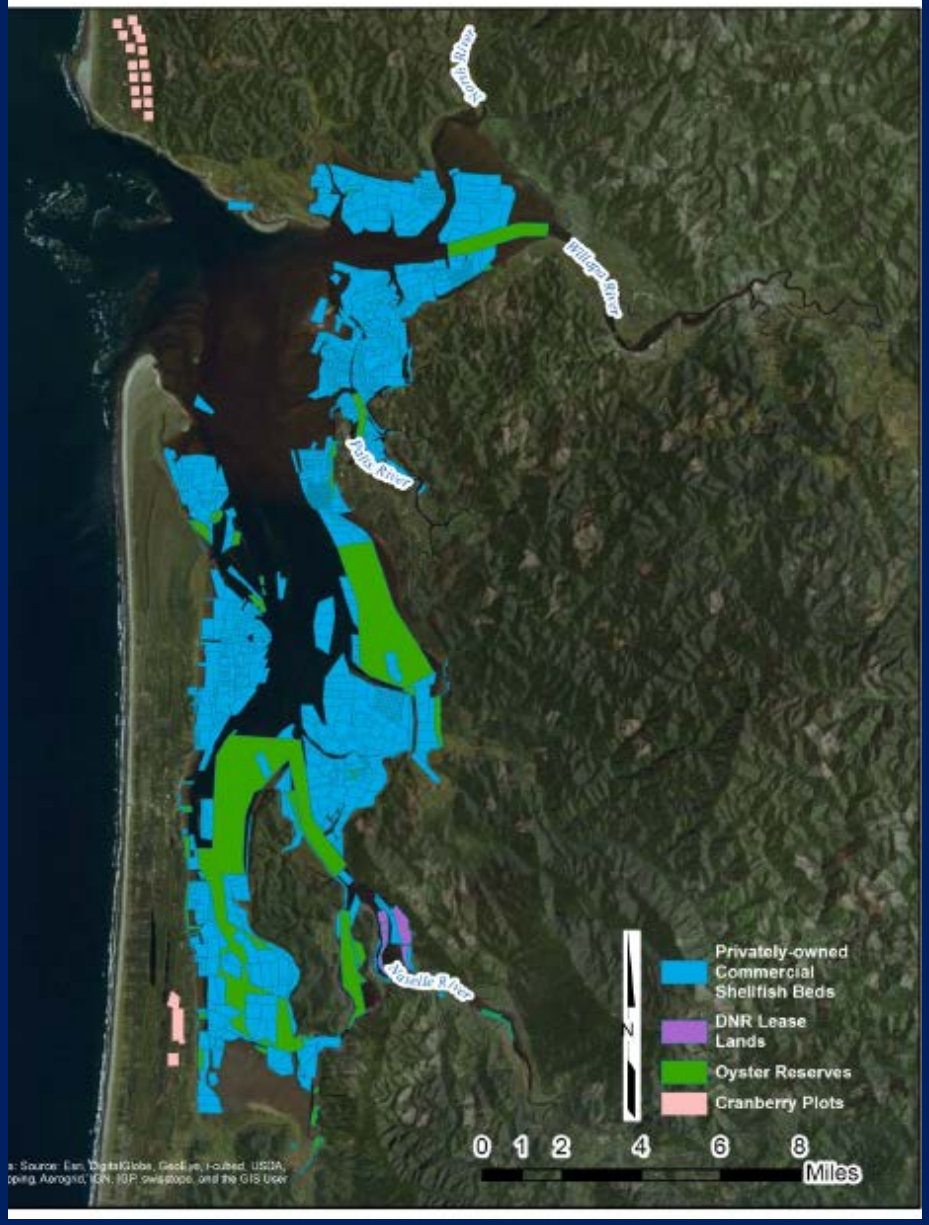
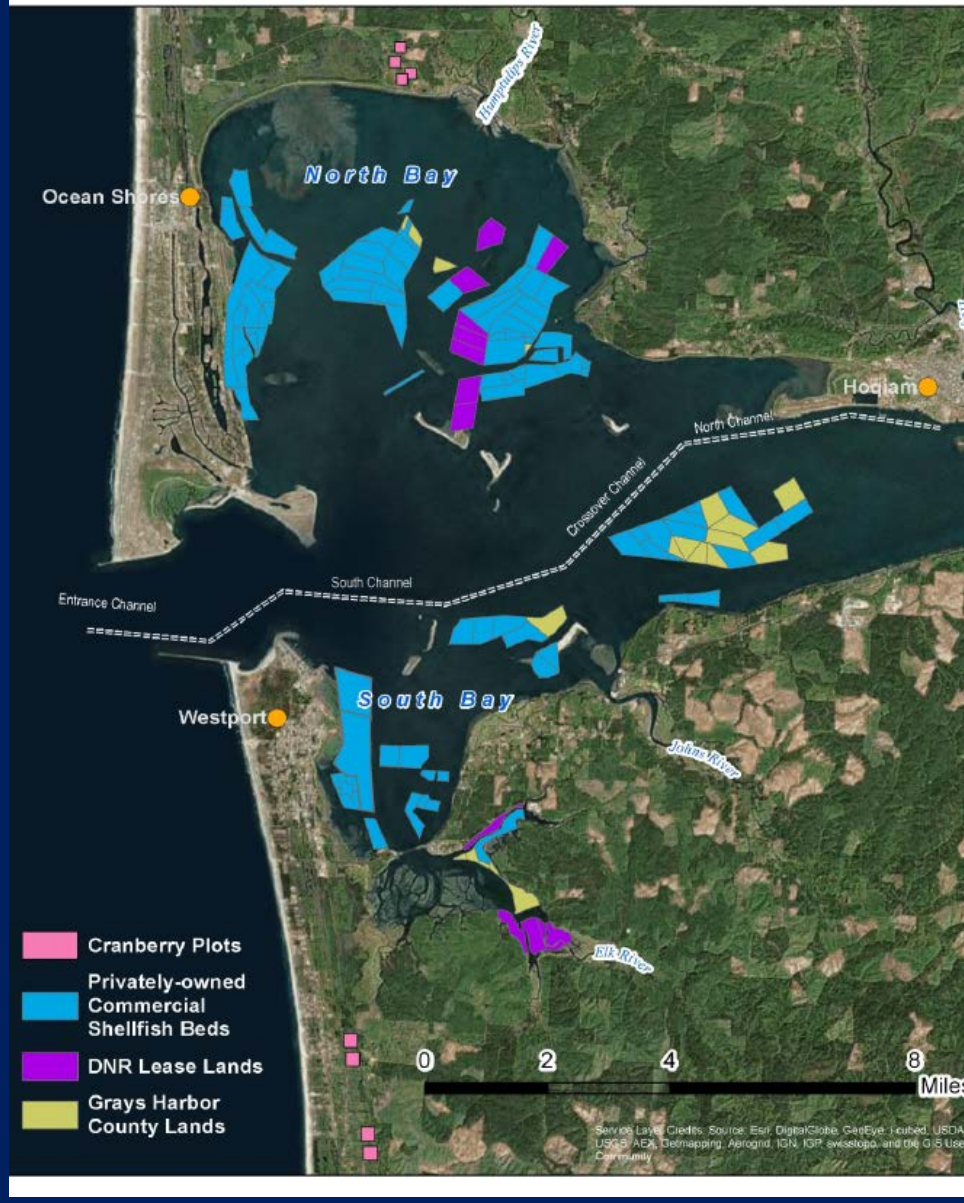
Burrowing Shrimp in Willapa Bay: background, status, and future options for addressing burrowing shrimp in Willapa Bay

Kim Patten, WSU Long Beach Research and Extension Unit

- Background
  - An overview of the industry
  - Burrowing shrimp
    - Biology and impacts
    - History of cultural, mechanical, biological, and chemical control
- Current project and status
- What is at stake?
- Next steps



25,000 acres of shellfish beds in Willapa Bay, 36% farmed (9,000 acres) (11% of bay)



3,000 acres of shellfish beds in Grays Harbor, 30% farmed (900 acres) (1.5% of bay)

Shellfish aquaculture in SW Washington – production statistics

- Area farmed:
  - 3,000 acres of shellfish beds in Grays Harbor, 30% farmed (900 acres)
  - 25,000 acres of shellfish beds in Willapa Bay, 36% farmed (9,000 acres)
- Production methods:
  - Bottom culture ~ 95 %
  - Off-Bottom culture ~ 5 %
    - ~ 95% is Long Line
    - ~ 5% is Flip bags
- Market:
  - 95% of volume is "meat oyster" @ ~$25/gal of sucked meat
  - 5% of volumes is single whole oyster for restaurant trade @ $0.25 to 1.00/oyster
- National importance :
  - WA ~ 26% of US commercial oyster
  - Willapa Bay produces 65 % of WA oyster (17% of total US Oysters)

Shellfish aquaculture in SW Washington – production statistics

- Net $value to the state of Washington?
  - Northern Economic Study
    - Pacific county $90M total $ output & $45M labor income
    - Grays Harbor $12M total $ output & $6M labor income
    - Total ~ $153 M
  - WGHOGA
    - Wholesale retail sales ~ $45M /yr
    - Value of 2.8x multiplier to local economy ~ $126 M
    - Total ~ $170M
- Jobs
    - Pacific County 1600 jobs
    - Grays Harbor County 210 jobs
    - Total ~ 1800 jobs

- Background
  - An overview of the industry
  - Burrowing shrimp
    - Biology and impacts
    - History of cultural, mechanical, biological, and chemical control
- Current project and status
- Next steps
- What is at stake?

The problem

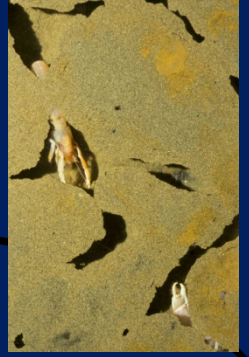
Ghost shrimp

Mud Shrimp

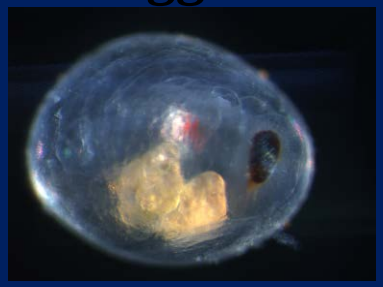
Burrowing Shrimp Life History

Juvenile

Adult



Egg



Zoea

Post larvae

New recruits and juvenile shrimp
Adult shrimp

Burrow cast - Dumbauld 2015

Carbaryl – no shrimp, dense Z. marina , and good crop ready for harvest (1-2 years)

Moderate shrimp, no Z. marina, lines sinking, oysters crop starting to drop and be lost

Thick shrimp, everything is gone in < 6 months.

- Background
  - An overview of the industry
  - Burrowing shrimp
    - Biology and impacts
    - History of cultural, mechanical, biological, and chemical control
- Current project and status
- Next steps
- What is at stake?

- Pre-2000 history of control
  - WDFW - carbaryl in 1960
  - Growers - mechanical and cultural methods 1950 to 2000
  - WDFW & UW –cultural methods 1990's
  - WDFW and PSI – IPM 1990's
  - Battelle NW Labs – IPM and chemical 1990's

- Conclusion Pre-2000 research
  - Carbaryl works and is the best option
  - There have been no net long term negative impacts
  - There had been a net positive impact on the ecosystem service
  - None of the other options were viable

- 2000 to 2002
  - Continued lawsuits on the use of carbaryl force growers into a out-of-court settlement.
  - Ten year phase-out with ramped up research effort to find an alternative to carbaryl.

- Post 2002- a major new research effort with lots of new partners.

Post 2002 funding > $7 M

- State of Washington ~ $ 1.2M
- SARE- $50k
- Murdock Foundation~ $20k
- UW- $100k
- WSU - $500k
- OSU-$40k
- WDFW- $500
- USDA ~ $ 3 M
- WSCPR- $ 200k
- WGHOGA ~$750k

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Washington State University Vancouver
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USDA ars

OSU Oregon State University

Pacific Shellfish Institute

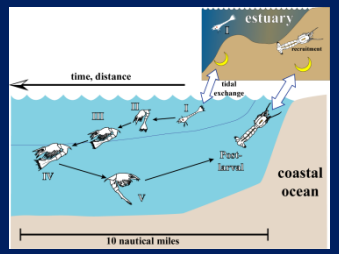
University of Idaho
A LEGACY OF LEADING

The IR-4 Project

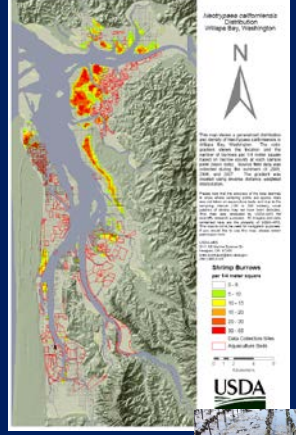
SAN JOSÉ STATE UNIVERSITY

Post 2002 Burrowing Shrimp Research

Biology/Ecology

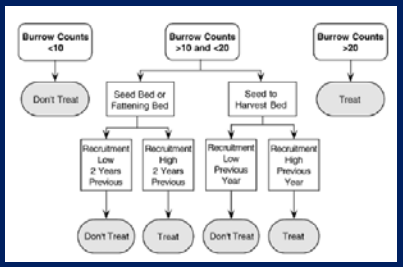


Monitoring/ Mapping



Cultural control

IPM

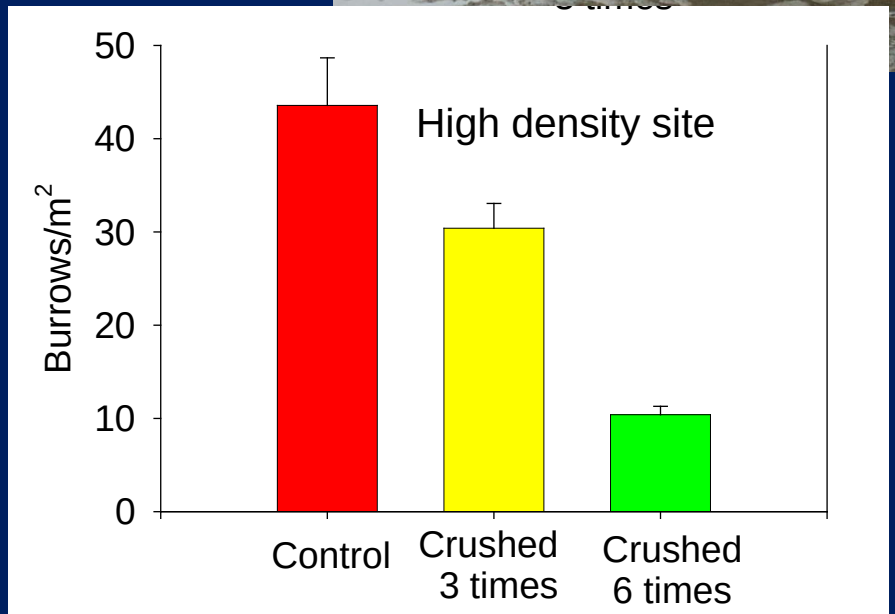


Mechanical / physical management

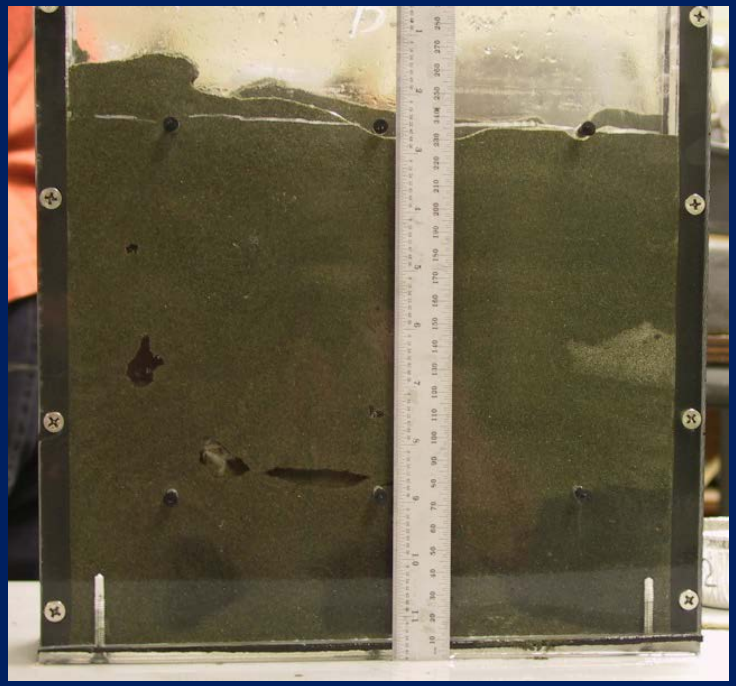
Biological control

Chemical control

Mechanical control


High density site
Burrows/m2
50
40
30
20
10
0
Control
Crushed 3 times
Crushed 6 times

Sediment engineering - compaction



Surface modification: thin cement layer
Univ. of Idaho

Other methods assessed

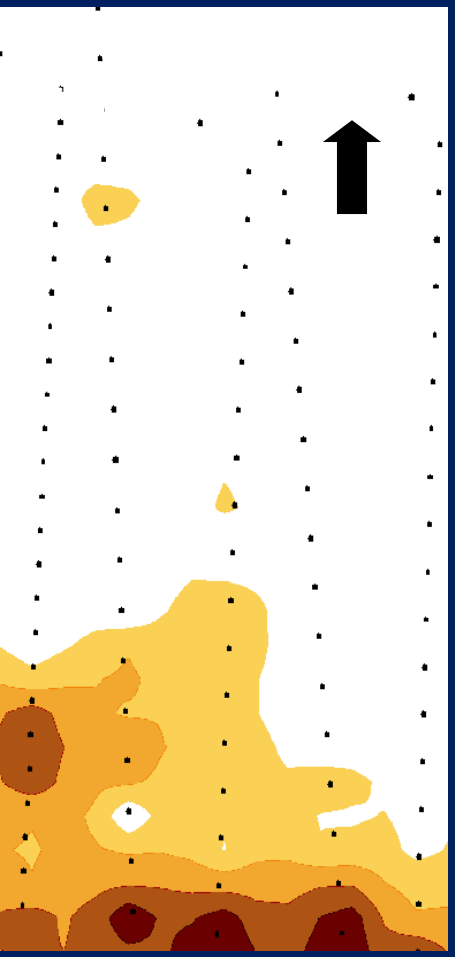
- **Trapping**
- **Tarping**
- **Electro-shocking**
- **High pressure water sled**
- **High pressure water knifes**

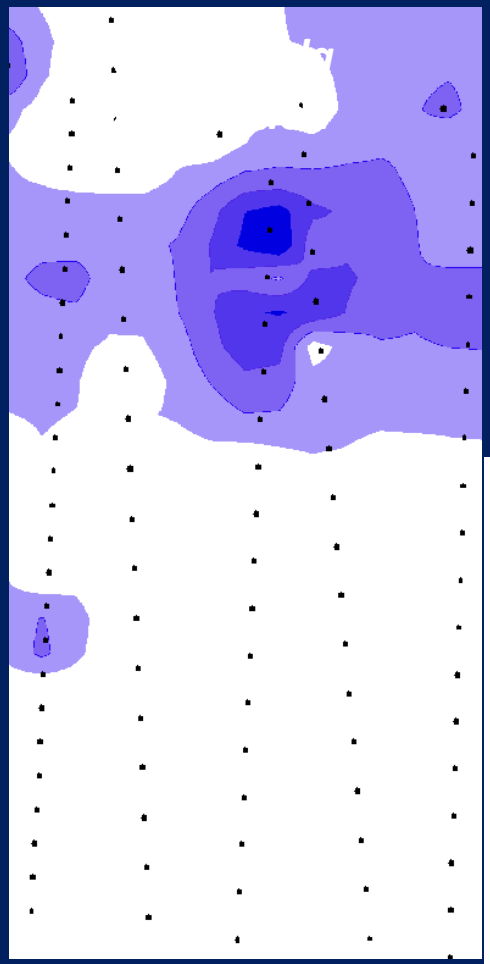
Biological control

Isopods for Biological Control of Burrowing Shrimp

Ione cornuta Bate

Lugworm





1.59 - 3.18 per m²

Adult Lugworm

6.37 – 7.95

.92 – 1.84 per m²

1.85 – 2.76

2.77 – 3.68

3.69 – 4.60

2006 Willapa Bay Predator Sampling Counts

Sampling site (row total)

Cedar River (390)

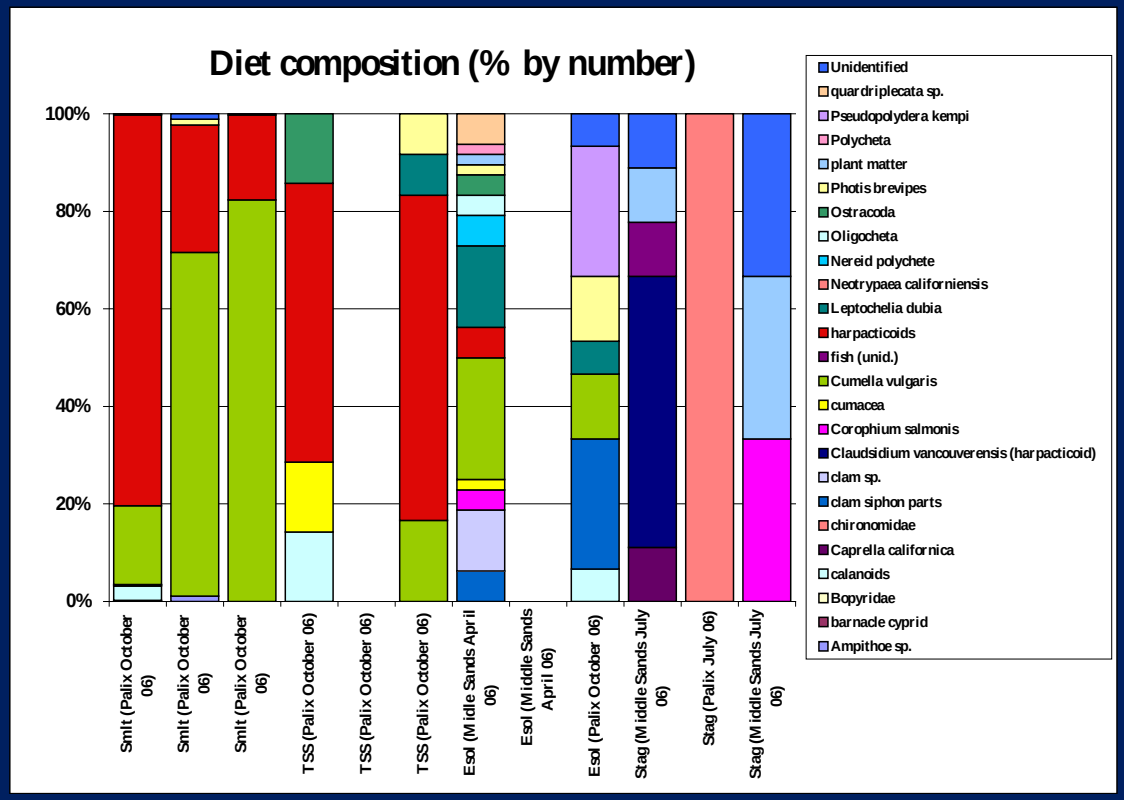
Stickleback	5
Sculpin	29
Chum	3
Flatfish	28
TOTAL	**65**
Crangon	*10*

Palix River (381)

Stickleback	2
Sculpin	38
Chum	48
Chinook	1
Flatfish	38
Smelt	18
TOTAL	**145**
Crangon	*32*

Middle Sands (231)

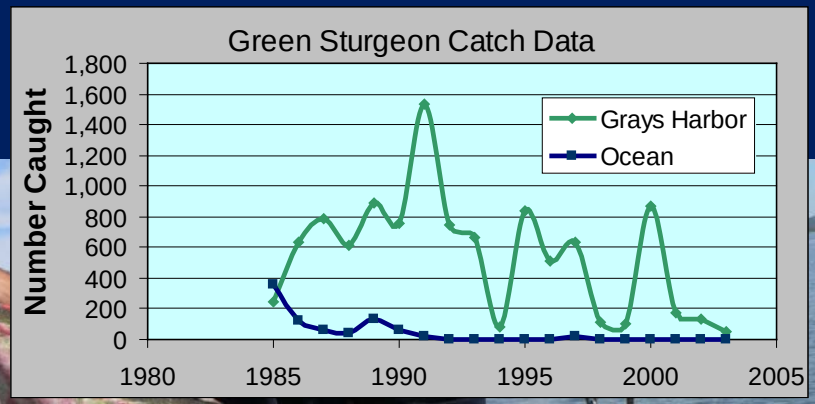
Stickleback	1
Sculpin	21
Flatfish	46
TOTAL	**68**
Crangon	*2*

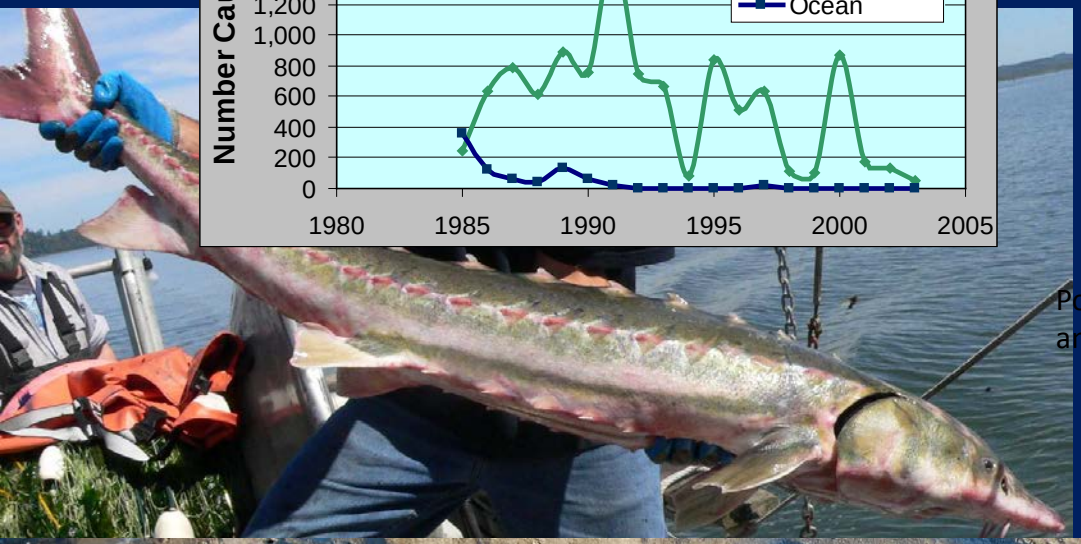


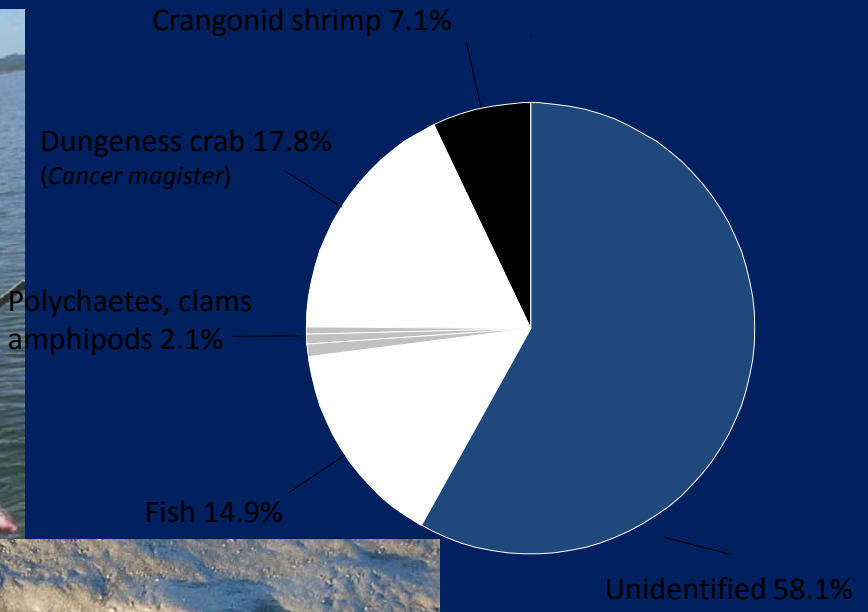
April (278)

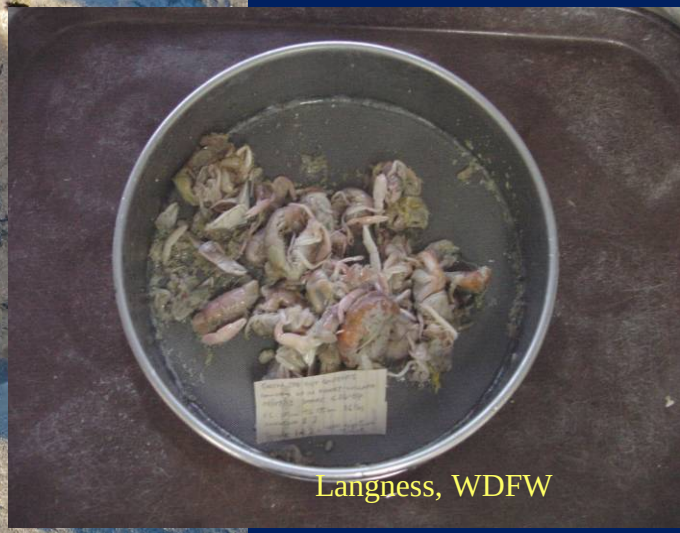
Sampling period (column total)

Green Sturgeon





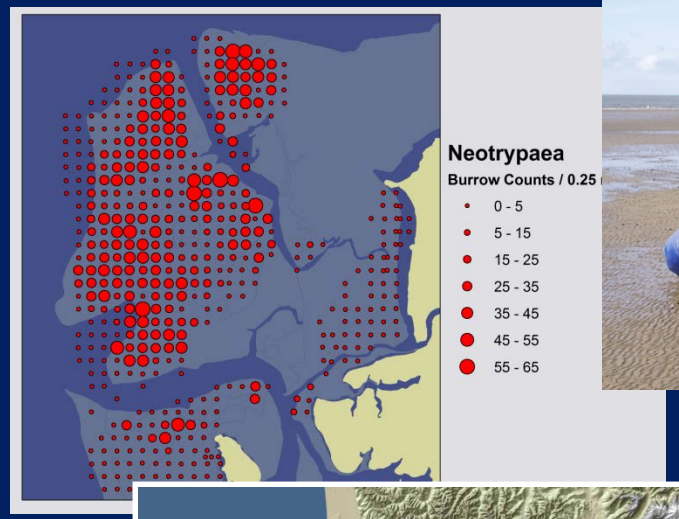


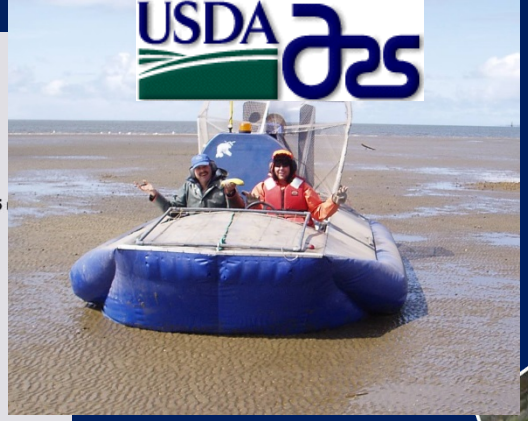


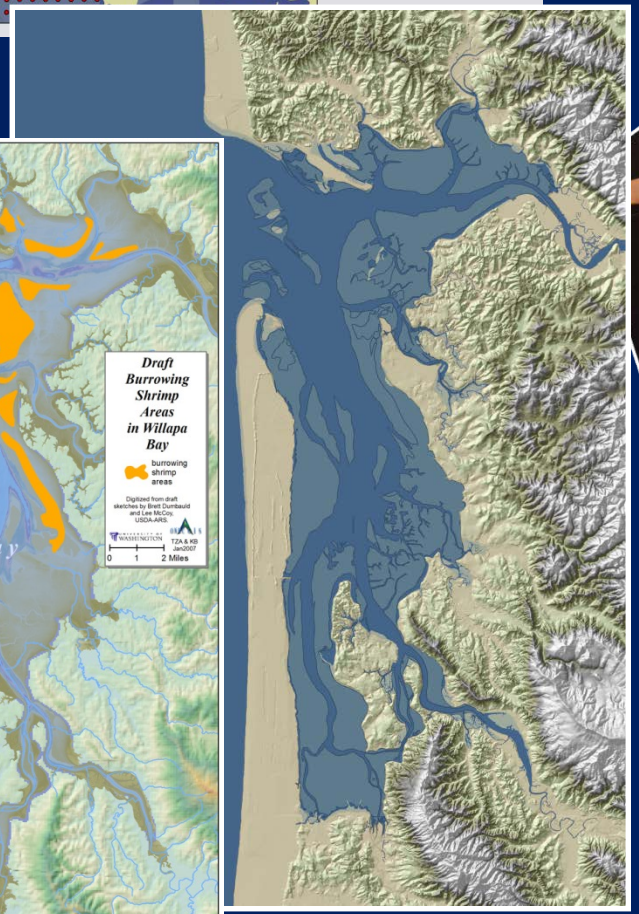
Langness, WDFW

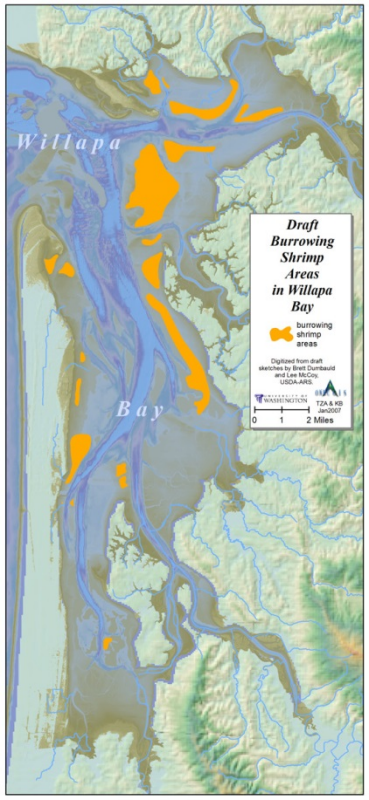
Mapping, monitoring and IPM

Mapping



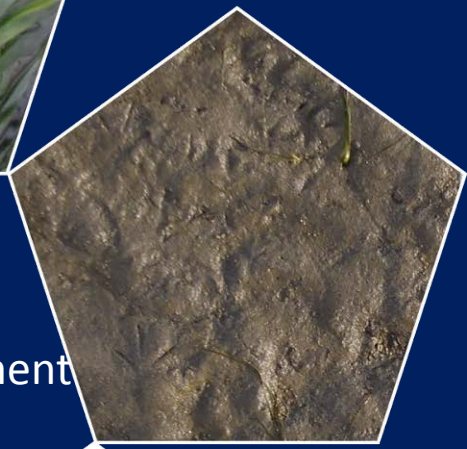




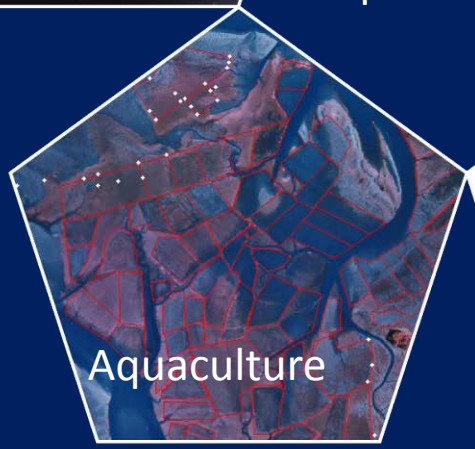


Eelgrass

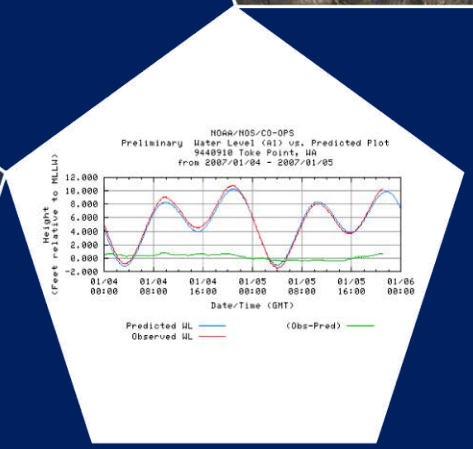
Shrimp



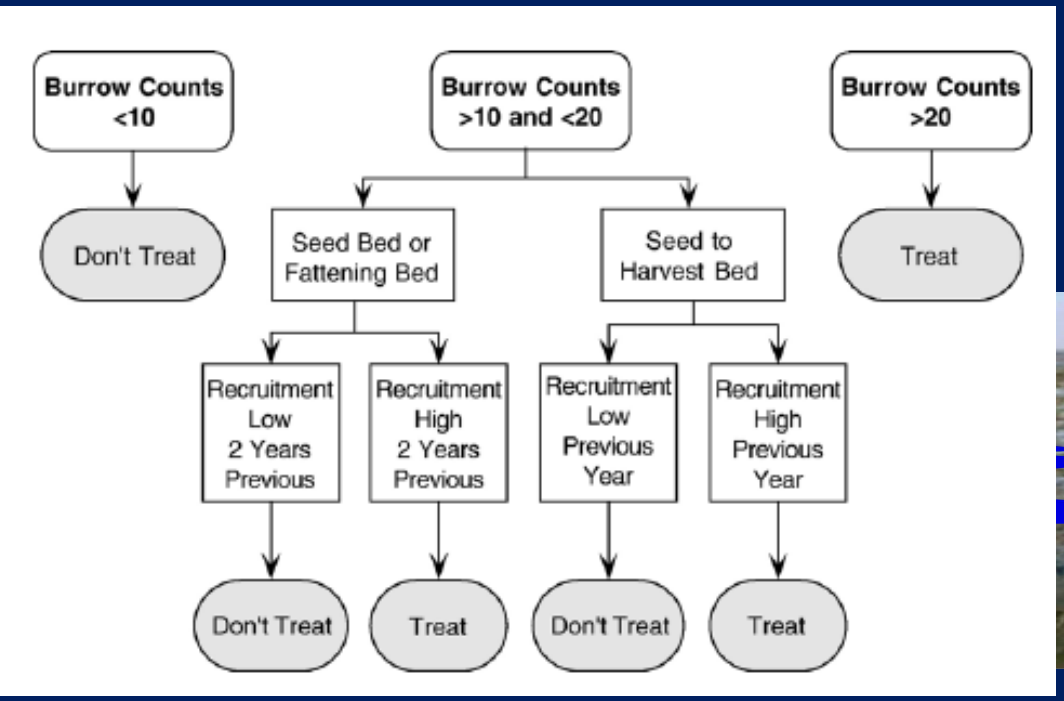
Sediment

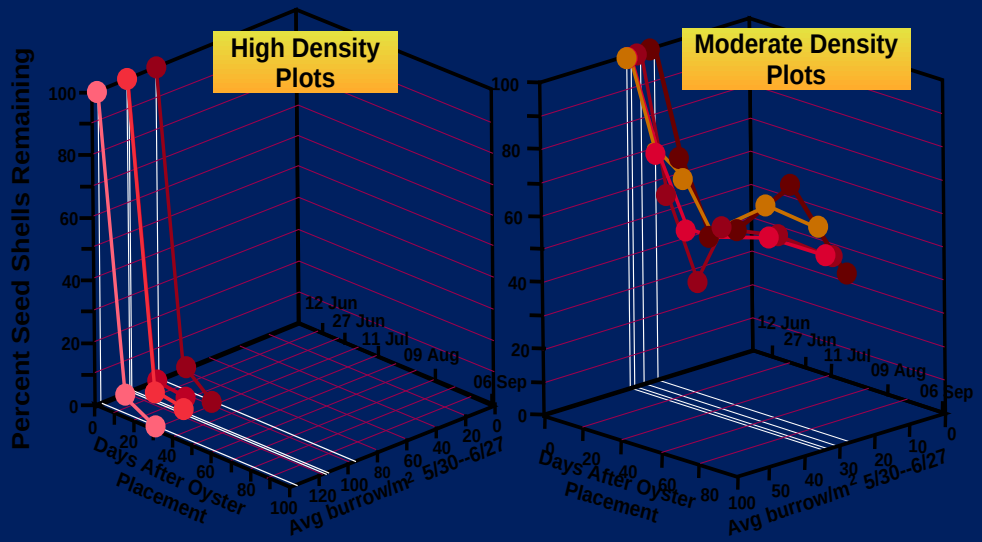


Aquaculture



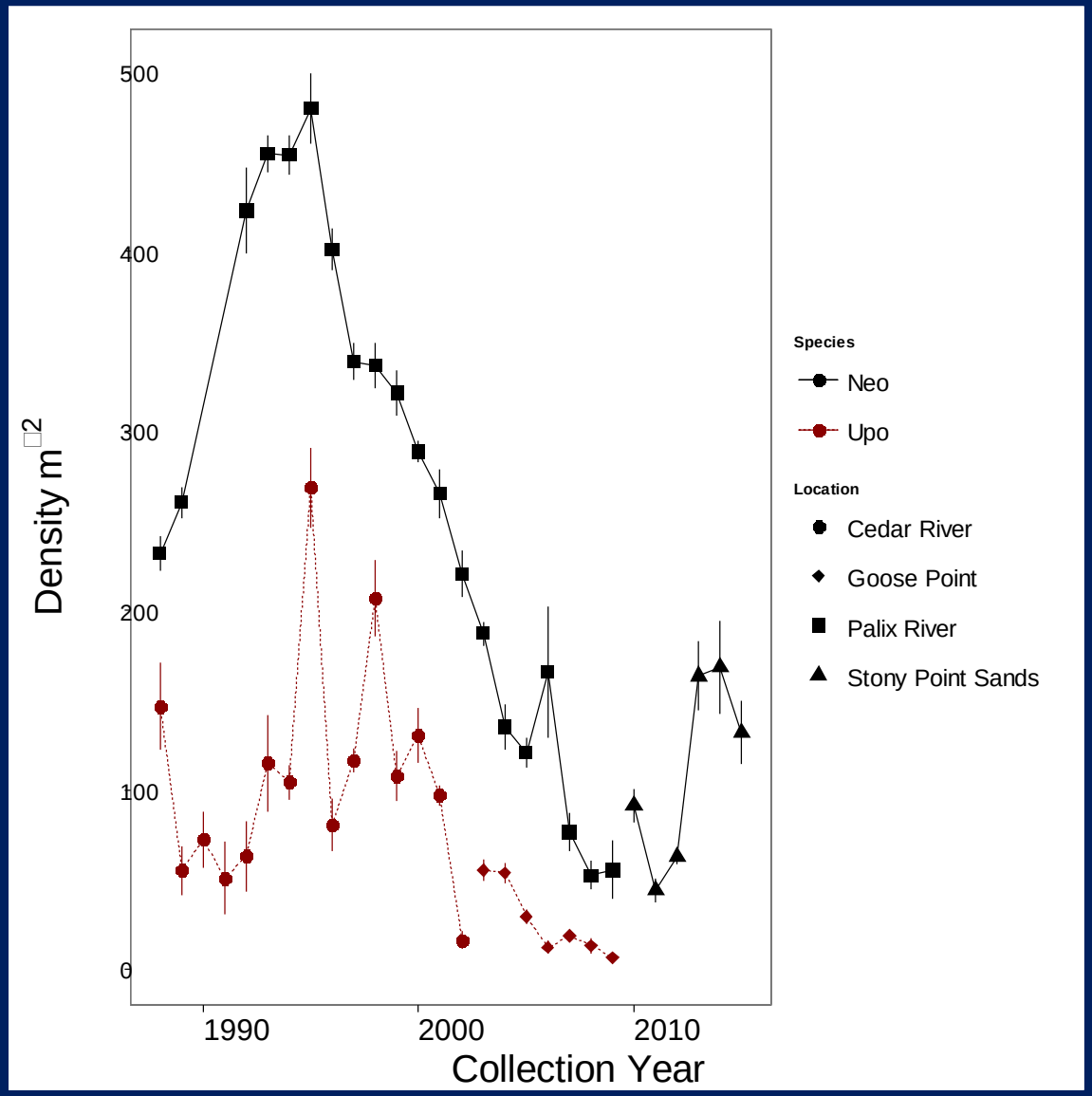
IPM

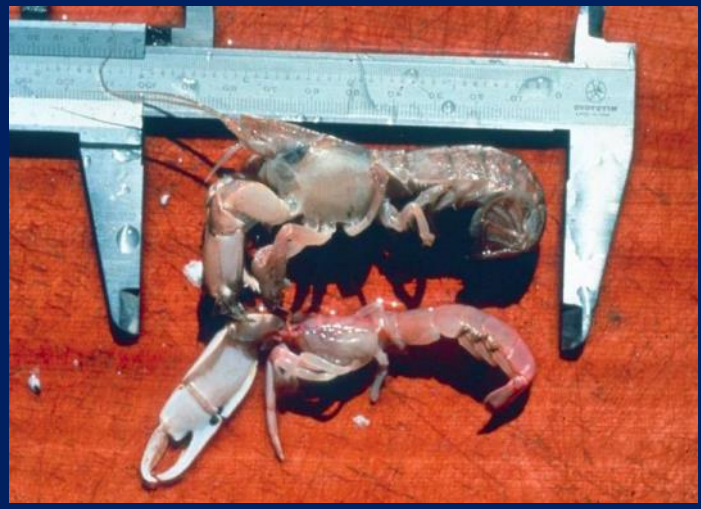

Burrow Counts <10
Burrow Counts >10 and <20
Burrow Counts >20
Don't Treat
Seed Bed or Fattening Bed
Seed to Harvest Bed
Treat
Recruitment Low 2 Years Previous
Recruitment High 2 Years Previous
Recruitment Low Previous Year
Recruitment High Previous Year
Don't Treat
Treat
Don't Treat
Treat


High Density Plots
Moderate Density Plots
Percent Seed Shells Remaining
Days After Oyster Placement
Avg burrow/m2
12 Jun
27 Jun
11 Jul
09 Aug
06 Sep
5/30--6/27

Monitoring

Shrimp Populations in Willapa Bay, Washington

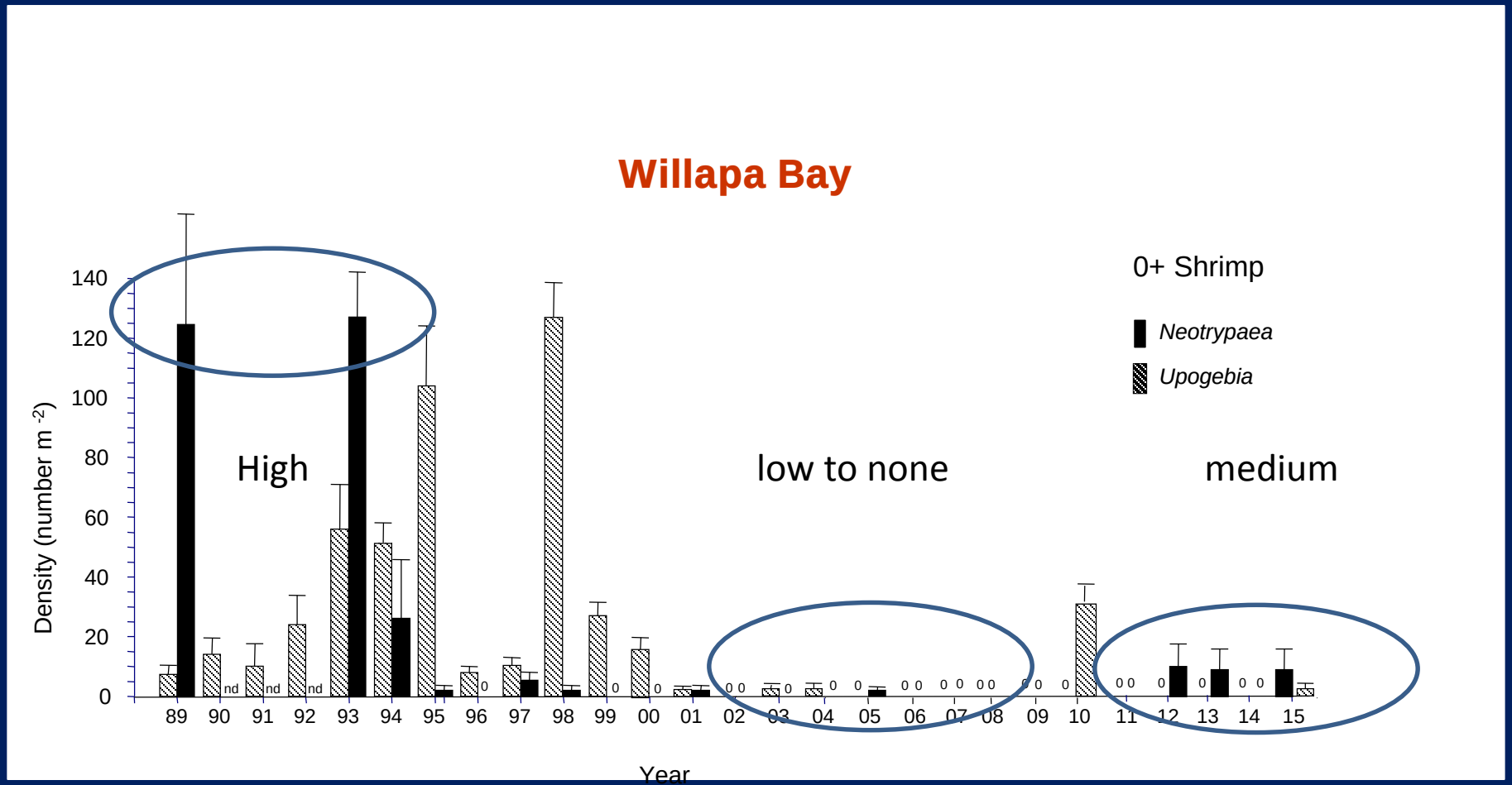




Shrimp are increasing again, but still well below density observed in the 1990's

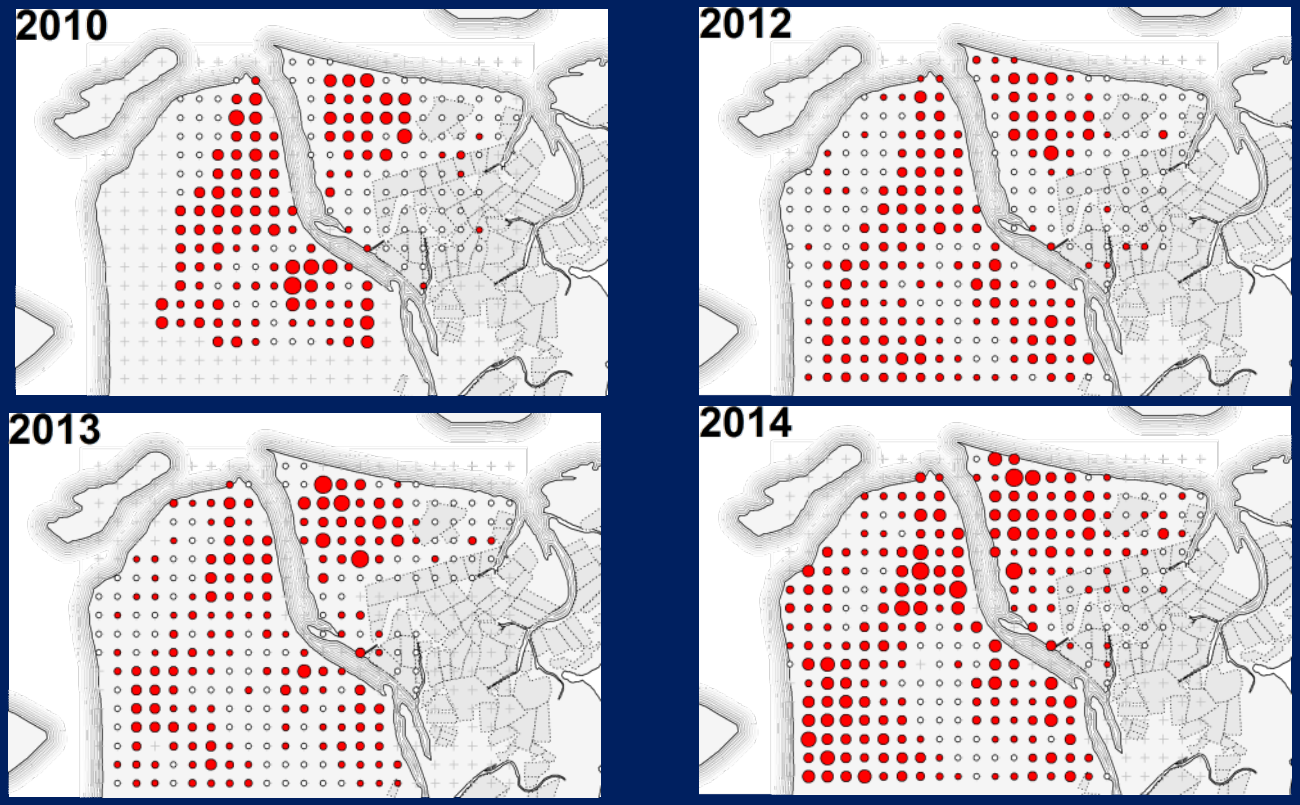
Slide courtesy of Dumbauld 2015

Recruit trends



Slide courtesy of Dumbauld 2015

Stony Point Sands Shrimp Surveys



275 burrows m^{-2}

206 burrows m^{-2}

138 burrows m^{-2}

69 burrows m^{-2}

0 burrows m^{-2}

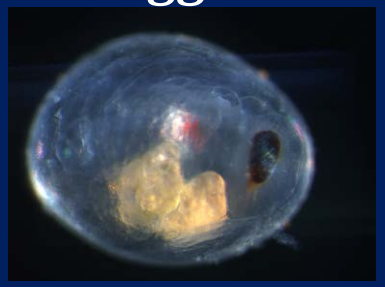
USDA survey shows - Increase in density and area

Slide courtesy of Dumbauld 2015

Biology and Ecology

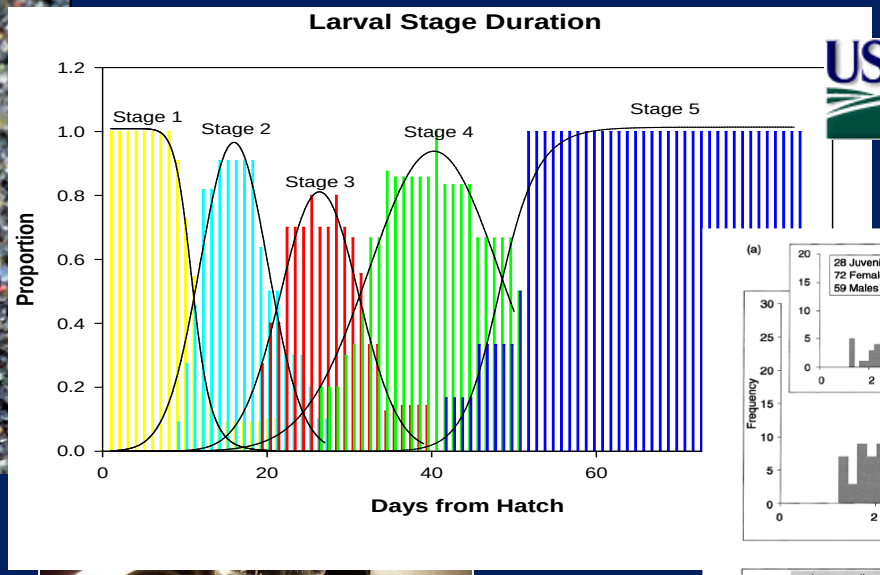
Burrowing Shrimp Life History

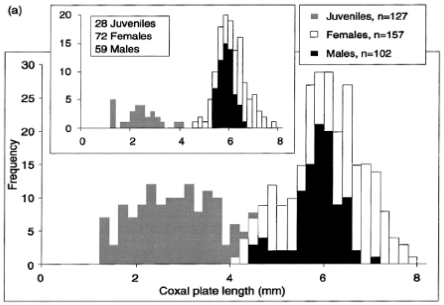
Egg

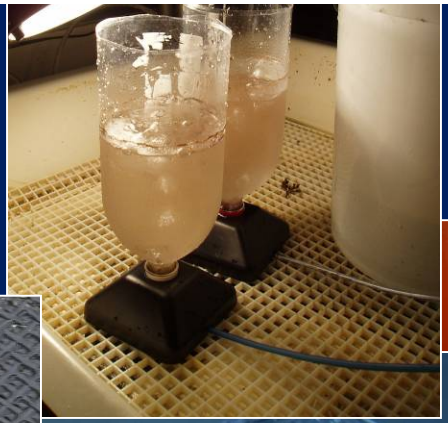


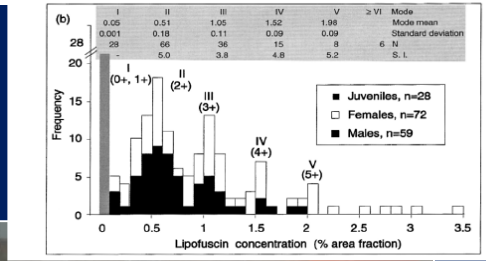
Juvenile

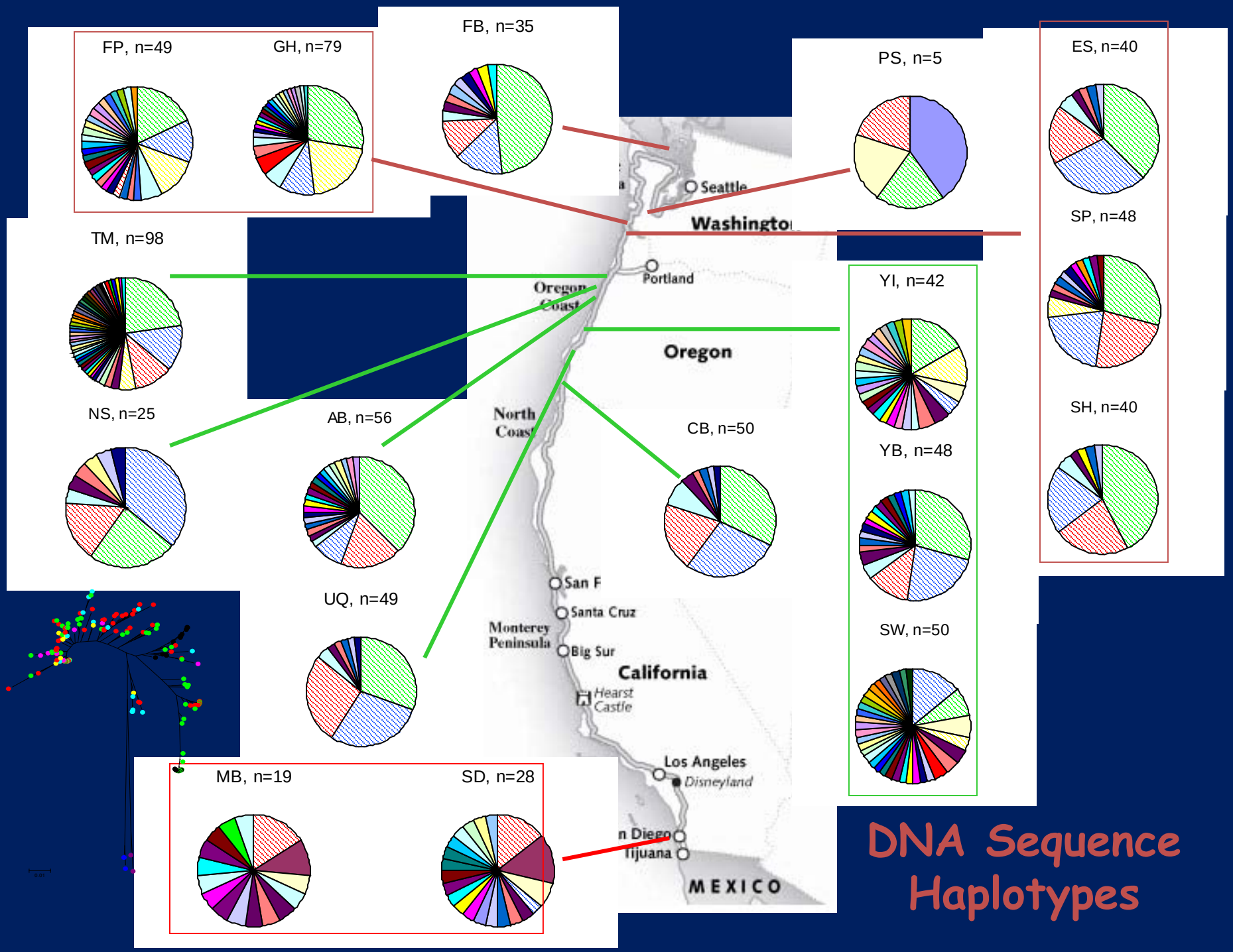
Zoea


Larval Stage Duration
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Proportion
Days from Hatch
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
20
40
60


(a)
28 Juveniles
72 Females
59 Males
Juveniles, n=127
Females, n=157
Males, n=102
Frequency
Coxal plate length (mm)

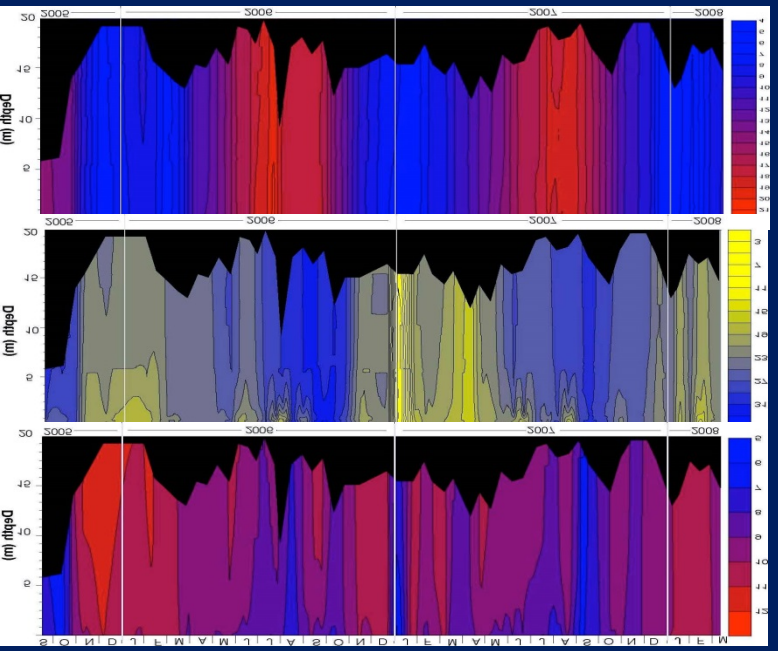


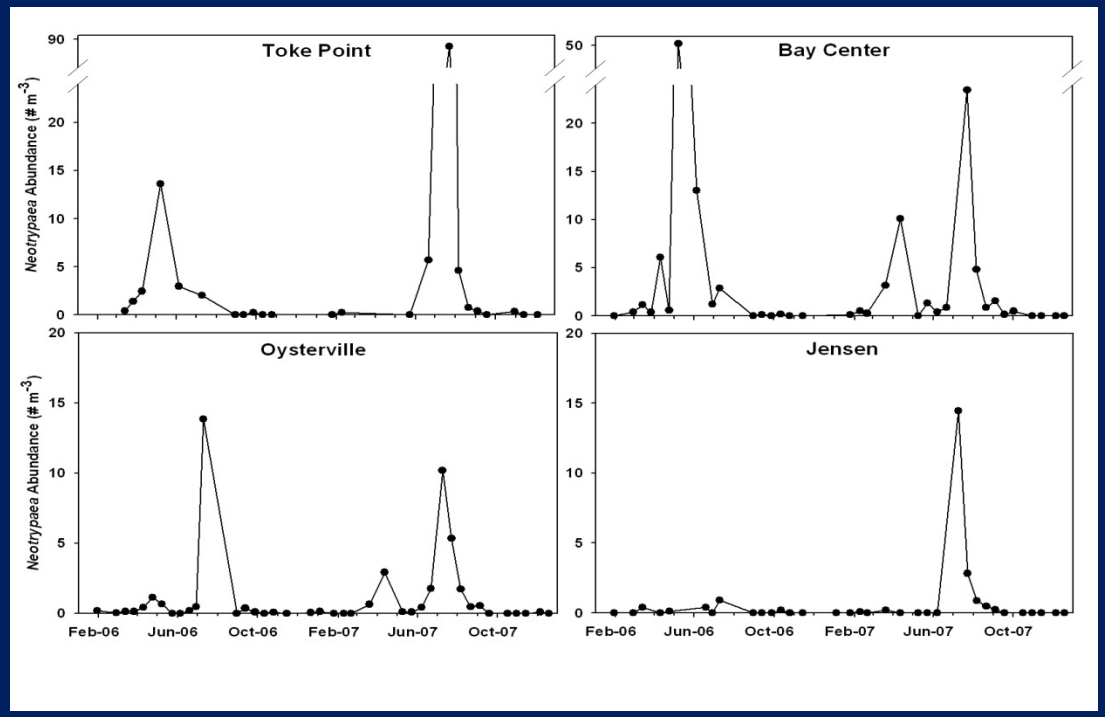

(b)
I (0+, 1+)
II (2+)
III (3+)
IV (4+)
V (5+)
Juveniles, n=28
Females, n=72
Males, n=59
Frequency
Lipofuscin concentration (% area fraction)



DNA Sequence Haplotypes

Ghost Shrimp Abundance 2006 and 2007





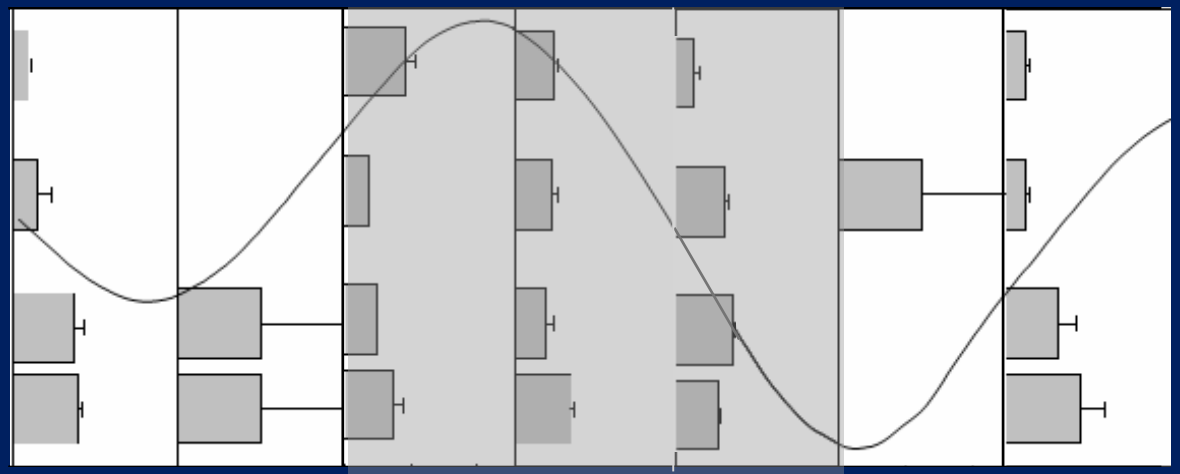
Neotrypaea californiensis

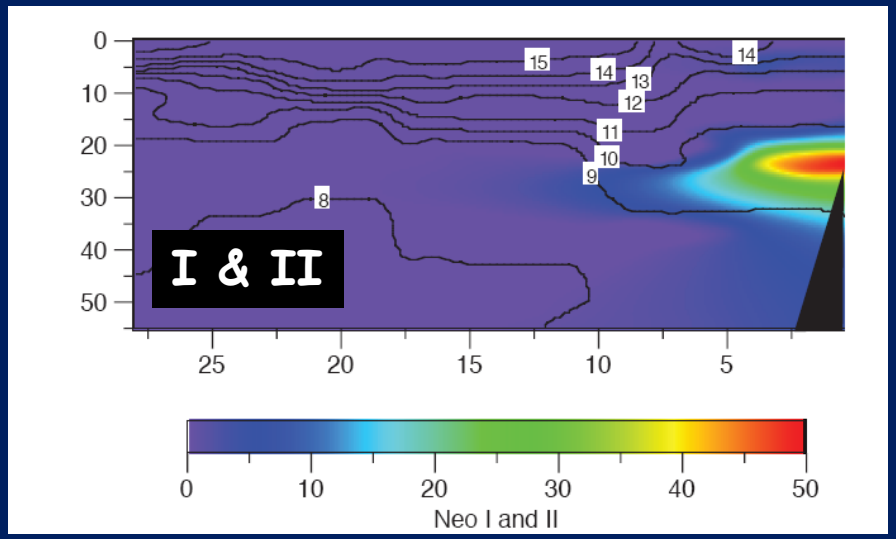
1m below surface

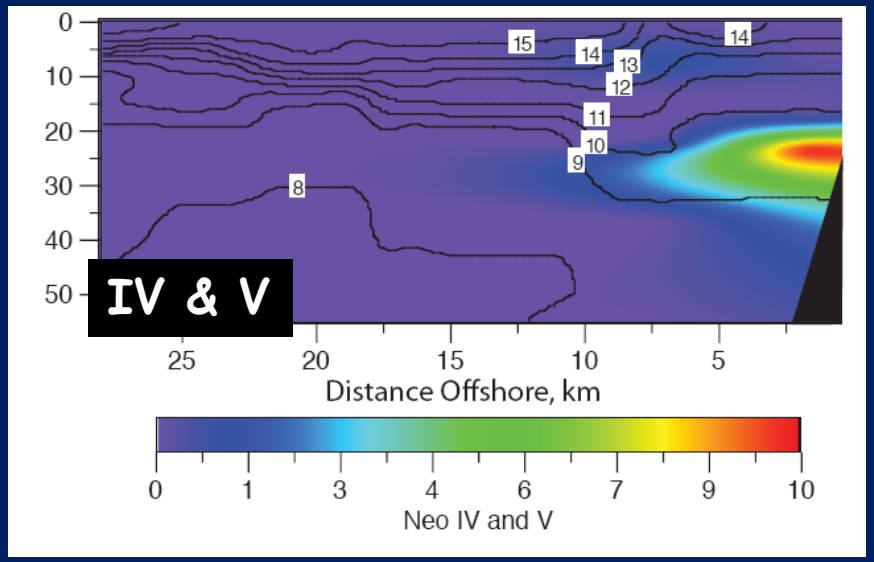
Midwater

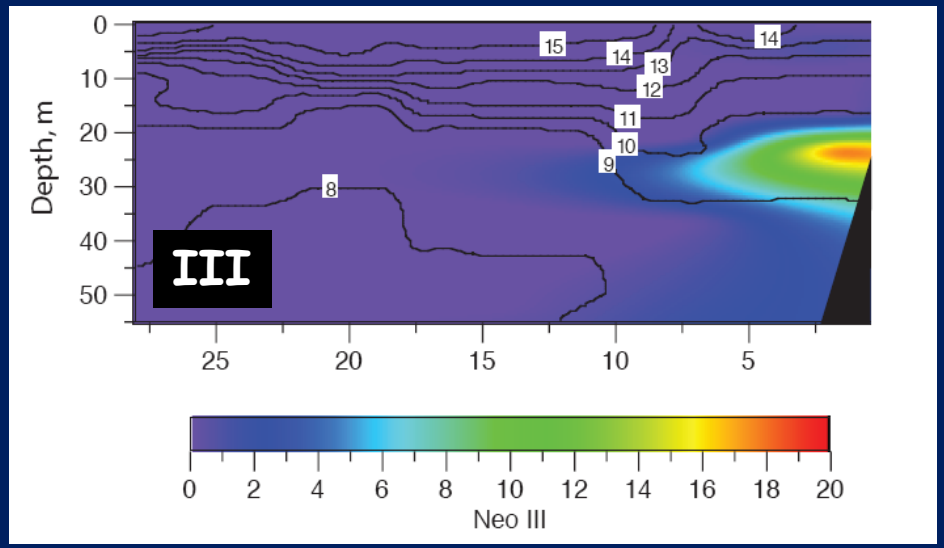
1m above bottom

0.5m above bottom

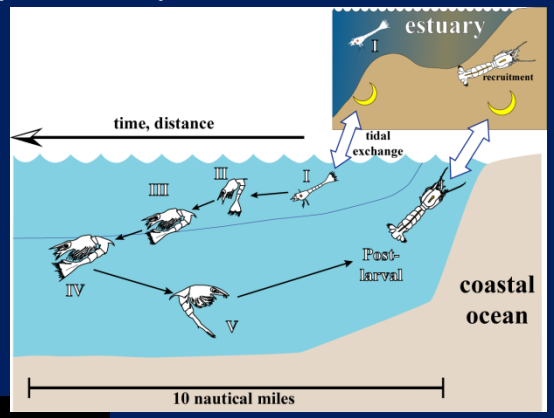




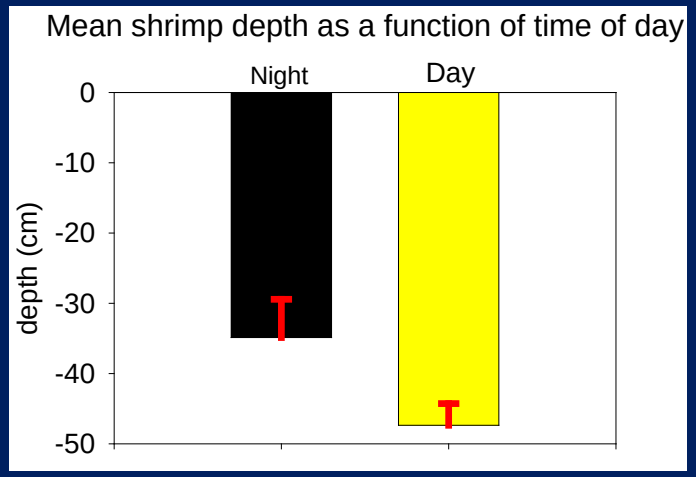




All stages retained near the coast and out of Ekman transport layer



densities in # larvae m^{-3}, lines of uniform temperature


Mean shrimp depth as a function of time of day
Night
Day
depth (cm)
0
-10
-20
-30
-40
-50

Age Structure Analysis

Lipofuscin-based age structure

	Mean	SD	S.I.
	0.64	0.152	-
3	0.79	1.165	1.19
4	0.99	0.500	2.44
5	1.17	1.185	2.07
6	1.63	1.009	4.13
7	2.00	0.050	4.97

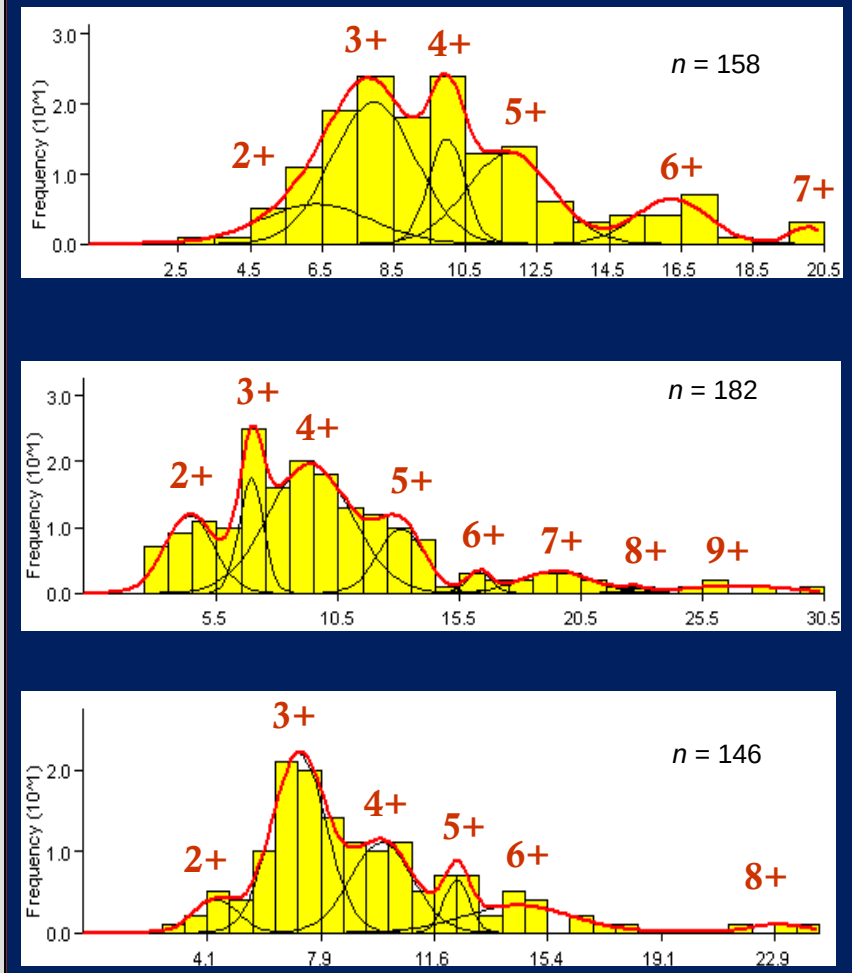
***WB* - Middle Island Sands**

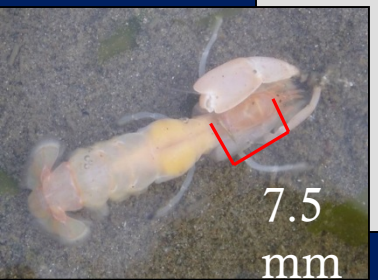
Age	Mean	SD	S.I.
2	0.44	0.101	-
3	0.69	0.050	3.37
4	0.93	0.172	2.18
5	1.31	0.096	2.80
6	1.63	0.050	4.40
7	1.95	0.145	3.27
8	2.27	0.050	3.33
9	2.68	0.200	3.26

***YB* - Idaho Flats**

Age	Mean	SD	S.I.
2	0.44	0.073	-
	0.71	0.088	3.37
	0.98	0.107	2.77
	1.24	0.042	3.42
	1.44	0.178	1.83
	2.30	0.094	6.35

Age pigment data





Chemical control

Chemistries evaluated to date for efficacy: 2003 to 2007 data

Essential plant oils

- clove oil
- cinnamon oil
- citronella oil
- cedar oil
- linseed oil
- garlic oil
- geranium oil
- peppermint oil
- rosemary oil
- thyme oil
- neem oil

Fertilizers or mineral-based compounds

- sulfur → Problematic in applying & obtaining consistent efficacy
- NaCl
- Lime
- copper
- urea ammonium nitrate
- aqua ammonium
- ammonium thiosulfate
- Kyrocide
- ammonium sulfate

Plant extracts or "natural" insecticides

- crushed chrysanthemums
- naturally extracted pyrethrums
  - Pyganic → Problematic in obtaining consistent efficacy
  - Pryrenone
- mustard seed meal
- habanero pepper extract
- yucca extract
- sabadilla
- white pepper
- geranial
- citric acid
- malic acid
- hydrogen peroxide
- potassium salts of fatty acids
- SeaKlean

Insecticide

- carbaryl → Used for comparative efficacy studies
- Spectrus
- Belay (clothianidin)
- Esteem (pyriproxyfen)
- Methoprene
- synthetic pyrethrums
  - Deltaguard (deltamethrin)
  - Bigrade (bifenthrin)
  - zeta-cypermethrin)
- imidacloprid → Selected for registration

Other compounds

- bleach
- $KMnO_4$
- 2-phenethyl propionate
- potassium sorbate

ARCTIC CAT

ARCTIC CAT

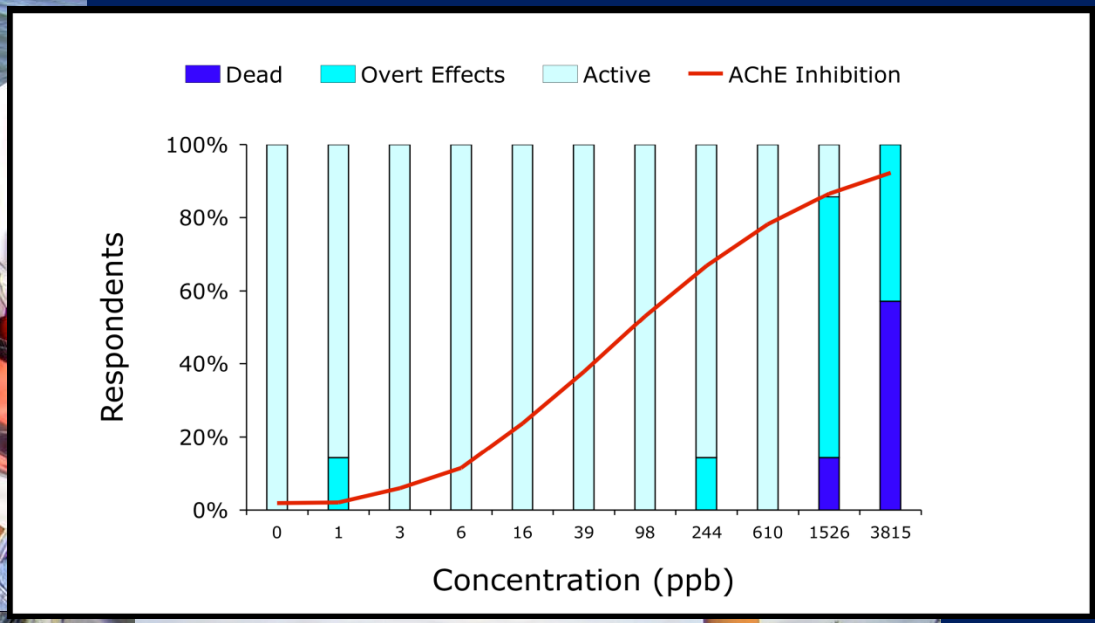
Nontarget species survival following 4, 24, 48 & 96 hours exposure to 0,1, 10, 100 ppm imidacloprid

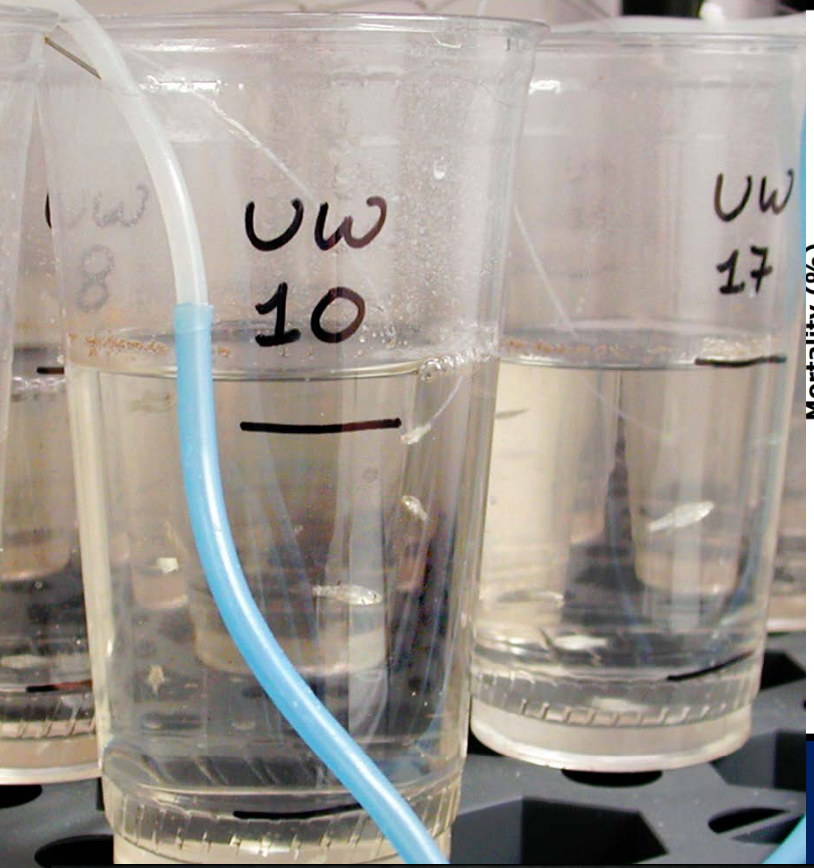
4 hr exposure to 5 ppm
zero mortality

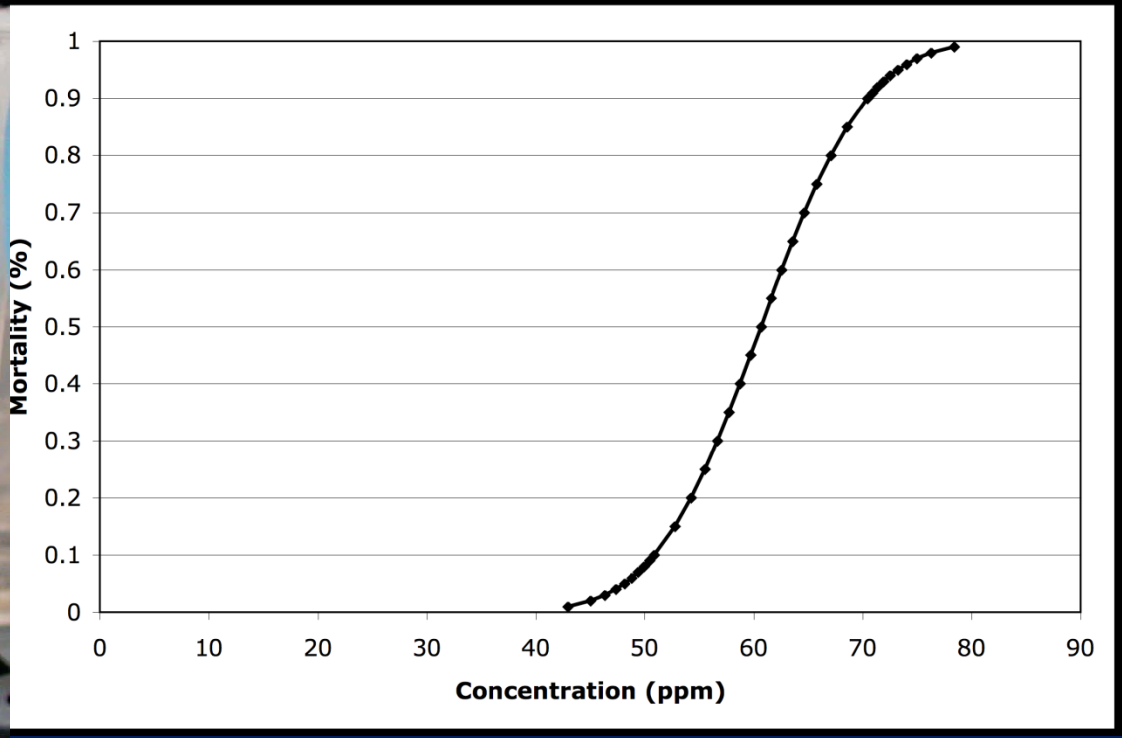
24 hrs exposure in sand/water to 0.5 % G up to 4 lbs ai/ac temporary tetany with zero mortality after 1 week.

4 hr exposure to ≥5 ppm temporary tetany with zero mortality after 1 week.

- Imidacloprid 0.5 to 2 lbs ai/ac: no treatment effect,
- Carbaryl 8 lbs ai/ac: 100% mortality


Dead
Overt Effects
Active
AChE Inhibition
100%
80%
60%
40%
20%
0%
Respondents
0
1
3
6
16
39
98
244
610
1526
3815
Concentration (ppb)

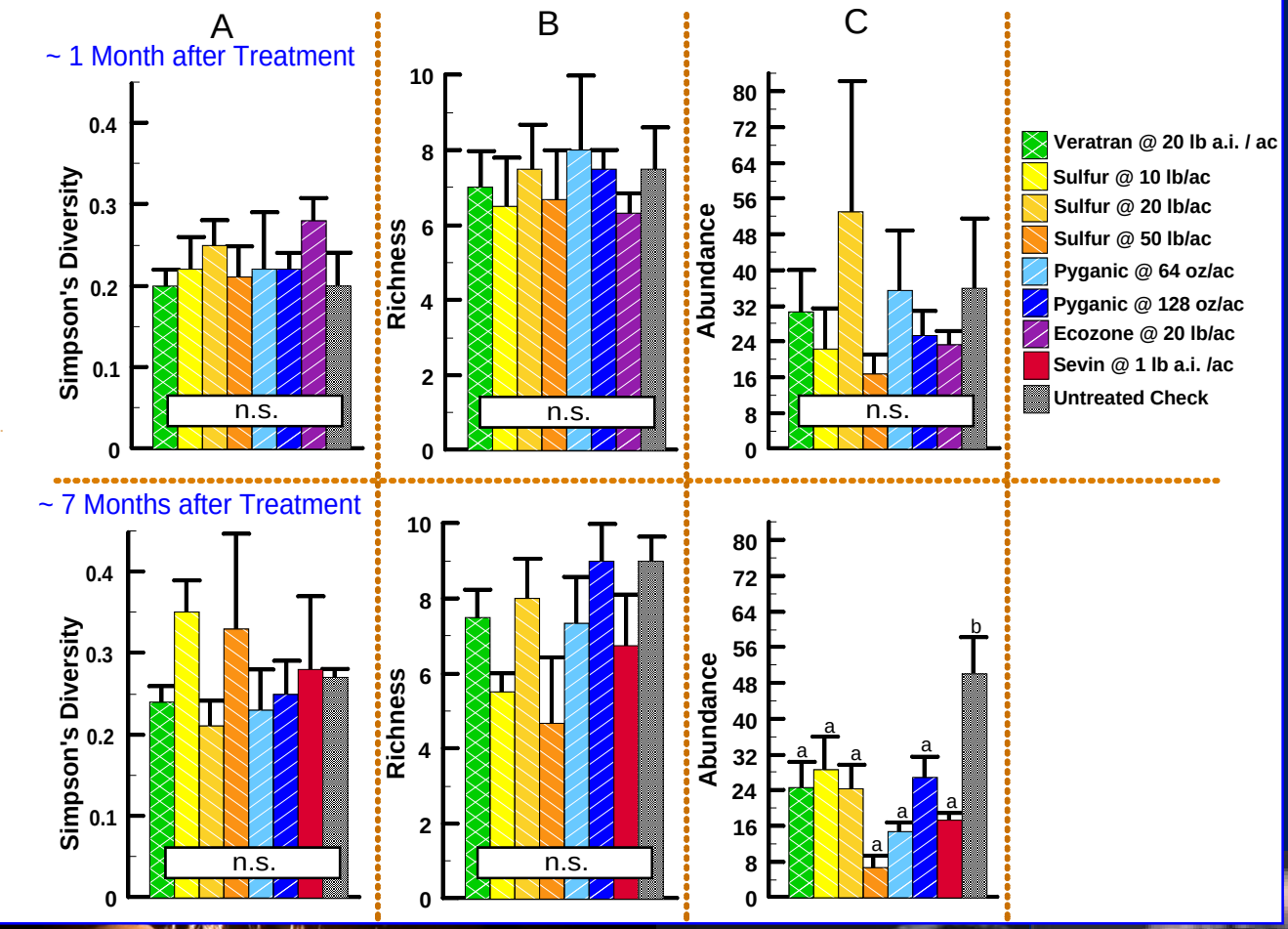

UW
10
UW
17

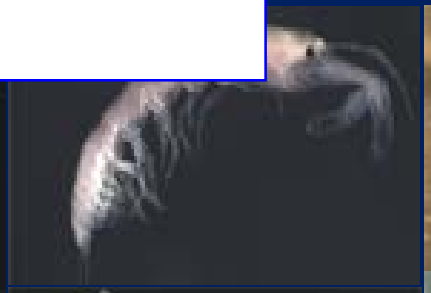

Mortality (%)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
40
50
60
70
80
90
Concentration (ppm)

WACFWRU

2010 to 2014

- **Series of large scale applications to monitor for impacts, movement, persistence**
- **Different sediments, application methods, formulations**


A
B
C
~ 1 Month after Treatment
~ 7 Months after Treatment
Simpson's Diversity
Richness
Abundance
n.s.
a
b
Veratran @ 20 lb a.i. / ac
Sulfur @ 10 lb/ac
Sulfur @ 20 lb/ac
Sulfur @ 50 lb/ac
Pyganic @ 64 oz/ac
Pyganic @ 128 oz/ac
Ecozone @ 20 lb/ac
Sevin @ 1 lb a.i. /ac
Untreated Check



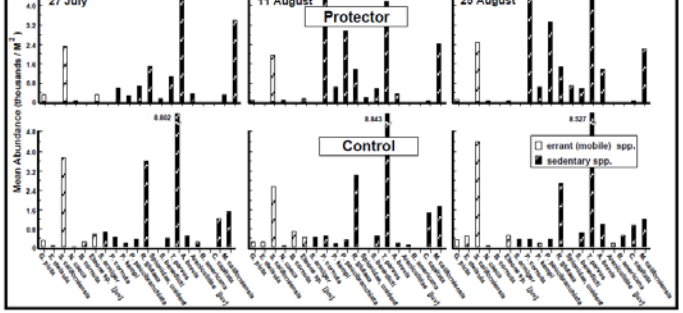


Figure 13 – Mean abundances of 19 most common of 54 polychaetes at the Protector-treated and control plots before treatment (27 July) and at 14 and 28 days after treatment (11 August, 25 August)

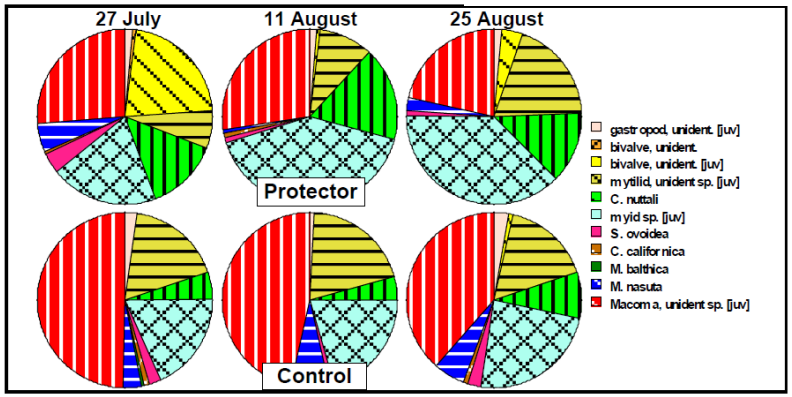


Figure 15 – Proportional abundance of mollusks at Protector-treated and control plots before treatment (27 July) and at 14 and 28 days after treatment (11 August, 25 August)

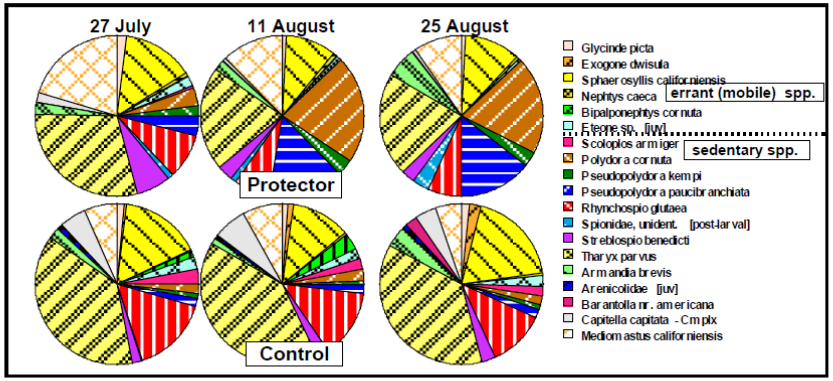


Figure 12 – Proportional abundance of 19 of 54 polychaetes at the Protector-treated and control plots before treatment (July 27) and at 14 and 28 days after treatment (11 August, 25 August)

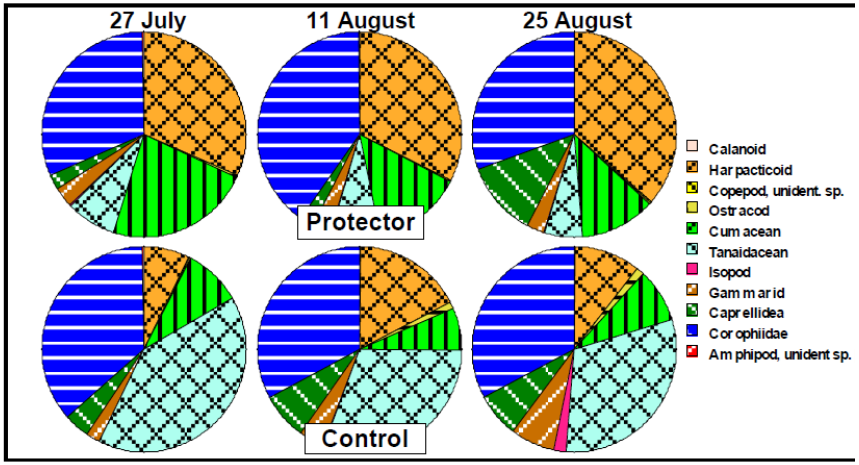


Figure 19 – Mean abundances of 11 of 14 crustaceans at the Protector-treated and control plots bef treatment (27 July) and at 14 and 28 days after treatment (11 August, 25 August)

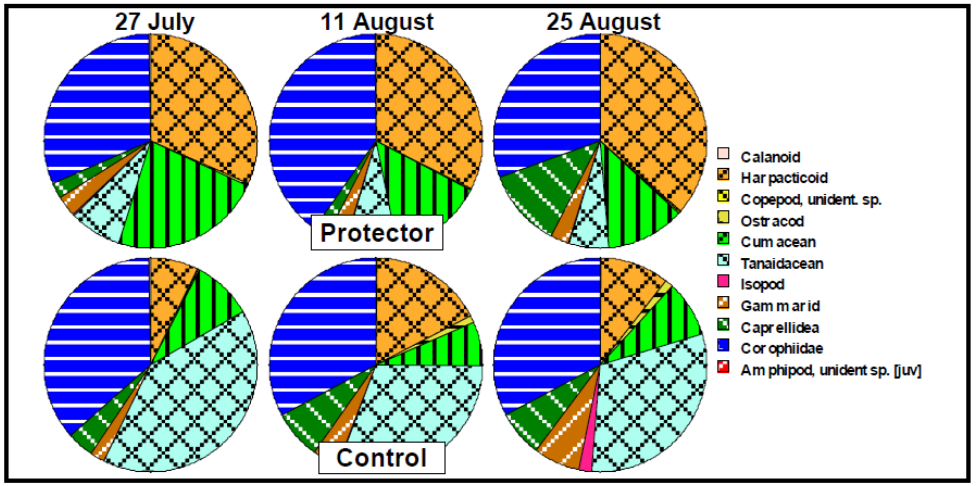
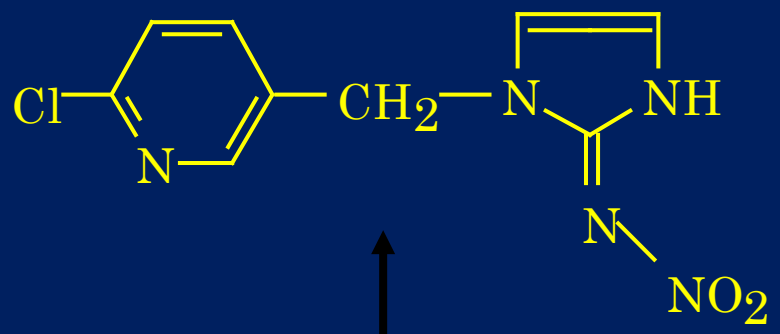
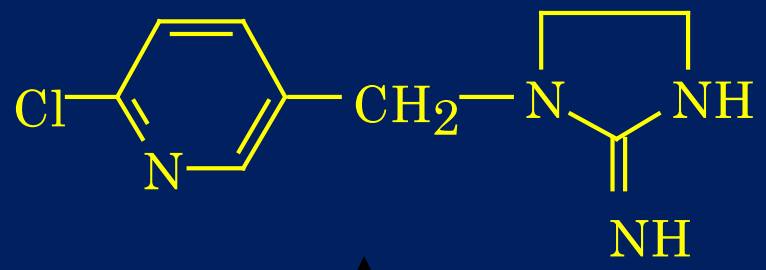


Figure 18 – Proportional abundance of 11 of 14 crustaceans at Protector-treated and control plots before treatment (27 July) and at 14 and 28 days after treatment (11 August, 25 August)

Metabolic Pathways

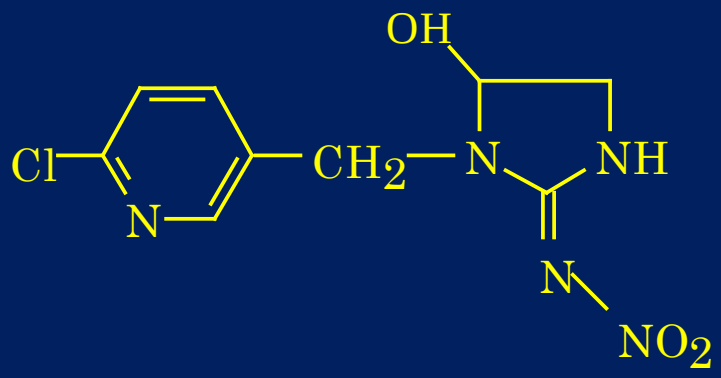


olefin

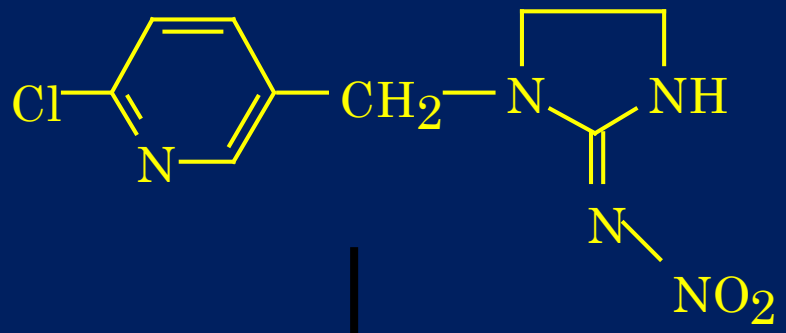


guanidine

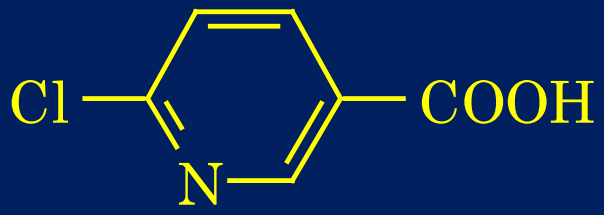
imidacloprid



5-hydroxy



6-chloropicolyl conjugates



6-chloronicotinic acid

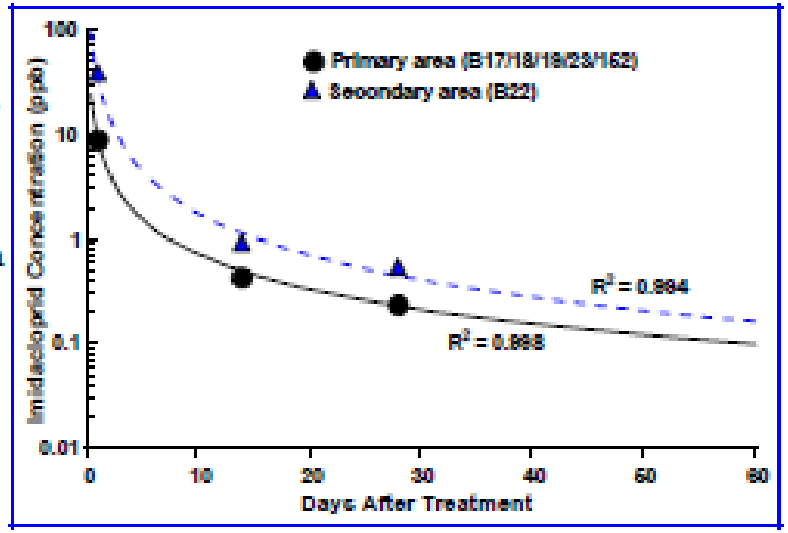
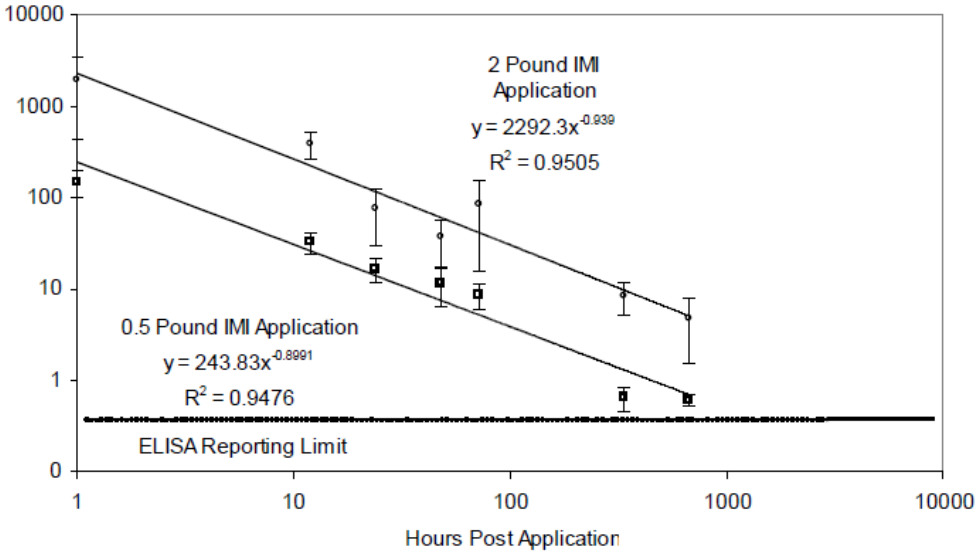


Figure 17. Observed concentrations of imidacloprid at 3 post-treatment invervals in porewater sampled at the primary and secondary treated plots and associated power functions.

Figure 8 – Imidacloprid concentrations in surface water at Stony Point

Figure 11 – Imidacloprid concentrations in surface water at Cedar River – Nisbet



PETITION PROPOSING TOLERANCES FOR IMIDACLOPRID USE IN SHELLFISH

Keith W. Dorschner, Ph.D.

IR-4 Project Headquarters
Rutgers, The State University of NJ
500 College Road East, Suite 201 W
Princeton, NJ 08540

Table C.4 Summary of Residue Data from Oyster Field Trials with Imidacloprid

				Residue Levels (ppm) [1]						
Commodity	Analyte	Total Rate (lb ai/A) [2]	PHI (days)	Sample Size (n)	Min.	Max.	HAFT[3]	Median	Mean	Std. Dev.
Oyster Meat	Imidacloprid	0.525–0.590	28	2	ND	ND	—	—	—	—
			57	2	ND	ND	—	—	—	—
			84–86	6	ND	< 0.05	—	—	—	—
		1.87–2.02	27	2	< 0.05	< 0.05	—	—	—	—
			56	2	< 0.05	< 0.05	—	—	—	—
			84–85	6	ND	< 0.05	—	—	—	—

No residues above the LLMV of 0.05 ppm were observed. Data from this study may be used to support a tolerance proposal for imidacloprid on shellfish.

DEPARTMENT OF
ECOLOGY
State of Washington

Issuance Date: April 16, 2015
Effective Date: May 16, 2015
Expiration Date: May 15, 2020

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WASTE DISCHARGE PERMIT NO. WA0039781

State of Washington
DEPARTMENT OF ECOLOGY
Olympia, Washington 98504-7775

In compliance with the provisions of
Chapter 90.48 Revised Code of Washington
(State of Washington Water Pollution Control Act)
and
Title 33 United States Code, Section 1251 et seq.
The Federal Water Pollution Control Act (The Clean Water Act)

The Willapa Grays Harbor Oyster Growers Association
P.O. Box 3
Ocean Park, Washington 98640

- Background
  - An overview of the industry
  - Burrowing shrimp
    - Biology and impacts
    - History of cultural, mechanical, biological, and chemical control
- Current project and status
- What is at stake?
- Next steps

Washington State Turns to Neurotoxins to Save Its Oysters

A pesticide from the group of chemicals linked to colony collapse disorder will now be sprayed in US waters. What could go wrong?

The Seattle Times — Local News

TRANSPORTATION CRIME POLITICS EDUCATION EASTSIDE HEALTH OBITUARIES

Danny Westneat

Disbelief over state plan to spray neurotoxin into oyster beds

Originally published April 28, 2015 at 8:19 pm | Updated April 29, 2015 at 11:05 am

The state has approved plans to spray in Willapa Bay a neurotoxic pesticide that has a warning right on the bottle: "Do not apply directly to water." What could go wrong?

As a retired nuclear power-plant operator, Ross Barkhurst, 70, is by no means an environmentalist. In fact he spent his career clashing with them.

But even he's shocked by what just got approved in our supposedly green Washington state: They're going to use crop-dusting helicopters to spray into the oyster beds of Willapa Bay a neurotoxic pesticide that has a warning right on the bottle: "Do not apply directly to water."

DON JENKINS/*EO Media Group*

Willapa Bay shellfish farmer Brian Sheldon looks for clams May 11 on tidelands undermined by burrowing shrimp.

Shellfish farmers lick wounds, hire PR help

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

May 4, 2015

CERTIFIED MAIL: 7013 2630 0001 9408 8152

Don Gillies, President
Willapa/ Grays Harbor Oyster Growers Association
PO Box 3
Ocean Park, WA 98640

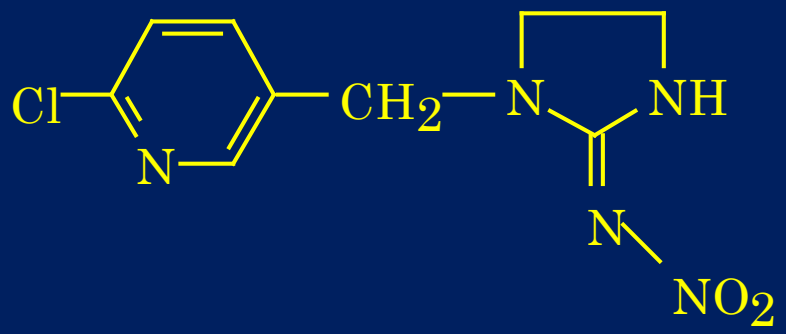
RE: Termination of National Pollutant Discharge Elimination System (NPDES) Permit Number WA0039781

Dear Mr. Gillies:

The Department of Ecology (Ecology) has received information that the above-mentioned permit no longer applies to your facility for the following reason:

- Ecology has received your letter dated May 3, 2015 requesting NPDES Permit WA0039781 be withdrawn.

The permit was issued on April 16, 2015 with an effective date of May 16, 2015. Therefore, while issued, the permit is not yet effective. Accordingly, NPDES Permit Number WA0039781 will be cancelled effective upon the day you receive this letter in accordance with the permittee's request for withdrawal of the permit and Ecology's authority under Revised Code of Washington (RCW) 90.48.160 and 90.48.260.



Permit timing corresponded to a lot of negative press on Neonicotinoids

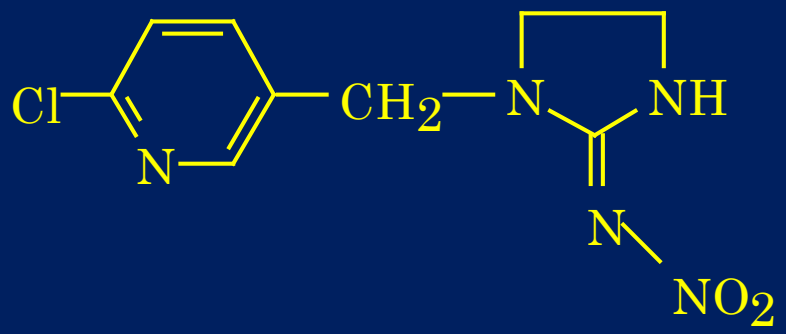
- Concern about birds eating treated seeds
- Netherland study showing declines in populations of insect –eating birds
- Dutch study showing reduced invert species in contaminated water
- Persistent in the terrestrial environment
- Evidence that they are partially responsible for the decline in pollinators.

All valid concerns and all addressed in our studies

The uses prescribed within this NPDES permit – are in fact :

The most benign of all commercial uses

Our studies also indicate Imidacloprid was 3 orders of magnitude safer than carbaryl



- Neonicotinoids are the most widely used insecticides in the US.
- Hundreds of millions of acres treated every year (seed treatments on corn and soybeans)
- Hundreds of crops grown in Washington are treated with neonicotinoids, including : hops, wine grapes, wheat and apples.
- Many of these crops have trace residues of imidacloprid, all of which are well below the safety level (but greater than what we could detect in oysters).

Spraying shellfish with a neural toxin! Risk to the consumers?

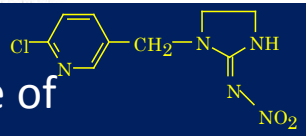
The Seattle Times Local News Log In | Subscribe

TRANSPORTATION CRIME POLITICS EDUCATION EASTSIDE HEALTH OBITUARIES

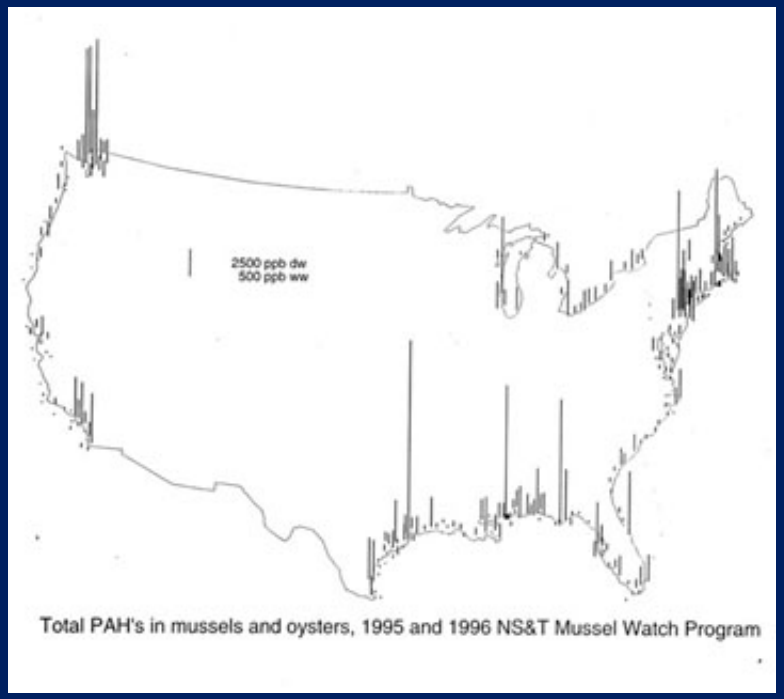
Danny Westneat

Disbelief over state plan to spray neurotoxin into oyster beds

Originally published April 28, 2015 at 8:19 pm | Updated April 29, 2015 at 11:05 am



- Neonicotinoids have extremely low mammalian toxicity.
- Extensive 3rd party research by regulatory agencies found "zero" residue of imidacloprid or its metabolites in shellfish 1 month after direct application with 4 times the commercial rate .
- People concerned about avoiding "neural toxin" in the form of neonicotinoids should refrain from drinking wine or beer.
- The only neural toxin exposure a consumer would have from eating shellfish is from PSP and Polycyclic Aromatic Hydrocarbon.



Total PAH's in mussels and oysters, 1995 and 1996 NS&T Mussel Watch Program

Just for a point of reference – the safest oyster to eat in the US are from Willapa Bay or other small west coast estuaries

- Background
  - An overview of the industry
  - Burrowing shrimp
    - Biology and impacts
    - History of cultural, mechanical, biological, and chemical control
- Current project and status
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What is the economic impact of no burrowing shrimp control?

Assumptions (not worse case)

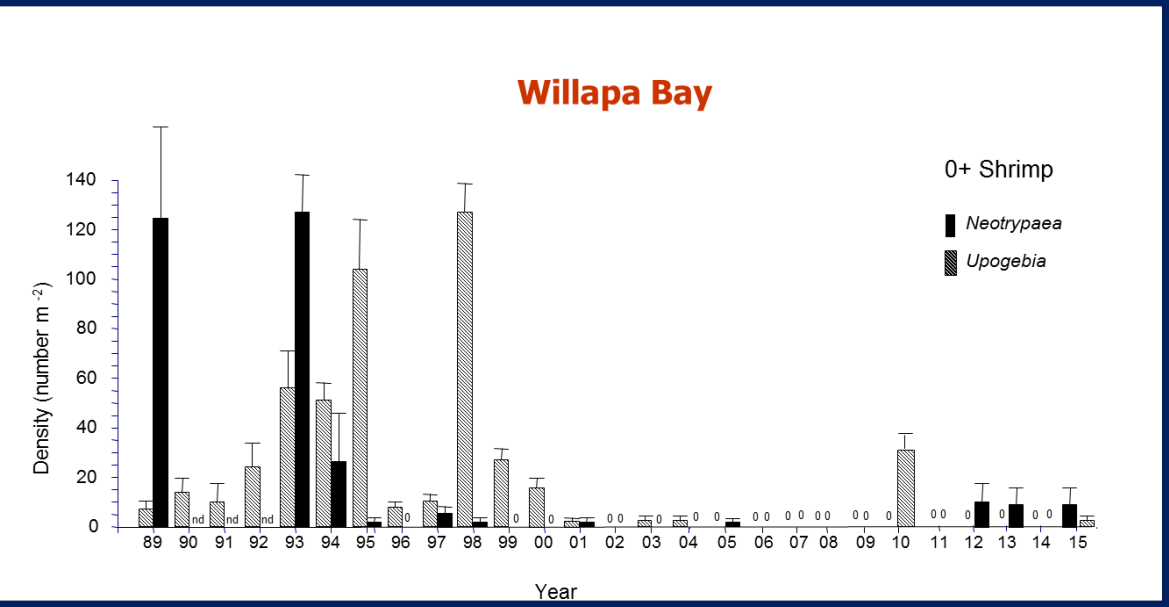
- Average production loss to ground culture for most farmers will be ~ 10 % /yr, stabilizes after ~ 10 years at 70 % of current level
  - Some growers will have 5% loss/yr, others 50% /yr -all depends on bed location
  - For a limited time, growers with ample land can chase shrimp free ground until it runs out.
  - Some moderate level of shift from meat to single oyster on some sites (2 to 5 %)
  - Bulk of the ground culture- meat oyster industry will decline
  - Recruitment level continues at current rate (moderately, but not excessive)
- None of non-chemical control methods will be efficacious (<10 to 20% control) and /or too $ expensive to practical for meat oysters
- Impact will be proportional to overall crop loss
- Start with a net value is $165 M/yr & 1800 jobs

Using this conservative assumptions -what is the economic impact of no burrowing shrimp control?

Direct impacts to SW WA economy @ 10% loss/yr		
year	Net value of industry $ M	# jobs
2015	165	1800
2020	97	1060
2025	50	620

Using worse case scenarios (1994 recruitment levels, 25% loss/yr) -what is the economic impact of no burrowing shrimp control?

Direct impacts to SW WA economy @ 25% loss/yr		
year	Net value of industry $ M	# jobs
2015	165	1800
2020	39	427
2025	9	101



What are the other impact of no burrowing shrimp control?

- Surplus of single oyster (reduced returns of Puget Sound growers)
- Shift to near shore off-bottom culture – navigational, visibility, localized eutrophication issues
- Industry becomes less cooperative and less unified
- Loss of critical mass of industry needed for its own infrastructure
- Shift in diversity of labor force
- Other shellfish declines (Manila clam production)
- Loss industry oversight of water quality and environmental issues.
- Loss of 5th and 6th generation family farms
- Decline in secondary support industries – boat building, schools, etc.
- Bay-wide loss of habitat and ecosystem function (burrowing shrimp monoculture).

- Background
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They've tried smashing, cementing, shocking and shaking them, but now that pesticides are off the table — at least temporarily — what's the option for ridding oyster beds of ghost shrimp?

Scientists at a loss to control this oyster killer

STEVE DIRAMAN / THE SEATTLE TIMES

By SANDI DONGHERTON
Seattle Times science reporter

LONG BEACH, PACIFIC COUNTY — Ever since the shrimp hit the fan this spring, Kim Patten's life has been a whirlwind.

Calls and emails from politicians, business leaders and anxious shellfish growers started flooding the tiny Washington State University research station Patten runs in Willapa Bay. Endless rounds of meetings ensued. The university even a national hit on the Pulitzer campus to huddle with administrators and deans.

Everyone is asking the same question, Patten said. "What are you going to do about it?"

To which he can only shrug.

Over the past 12 years, Patten has tried every method he could think of to control the crawfish-sized crustaceans called ghost shrimp that decimate the famed oyster farms of Washington's coast.

Zapping the creatures with electrified spikes didn't work. Neither did injecting habanero-pepper extract into their burrows, crushing them with heavy machinery or blasting them with high-pressure water jets.

Patten thought he had the problem licked when the state Department of Ecology (DOE) approved a plan to spray tidelands with a neurotoxic pesticide. Called imidacloprid (im-mid-ah-clow-prid), the

SPRAYING FOR CLAMS
Applying herbicides to kill nonnative eel grass still allowed » A8

STEVE DIRAMAN / THE SEATTLE TIMES

WSU researcher Kim Patten counts the number of suspected ghost shrimp in an area that has been taken over by the species, which lives

Ghost shrimp

Scientific name: Neotrypaea californiensis

Habitat: Coastal estuaries

Animal type: Invertebrate

Diet: Plankton and detritus

Size: 4.5 inches

Life span: Up to 20 years

Range: Alaska to Baja California in the intertidal zones or mud flats. It's native to estuaries along the West Coast

Pest to oysters: Ghost shrimp don't directly kill oysters. But their burrows — up to 180 or more per meter — soften the ground and oysters sink into the mud and die.

- freezing for juvenile
- heat for juvenile
- mechanical for juvenile
- tarping + fresh water
- Invasive Polychaeta
- electricity
- ultra sound

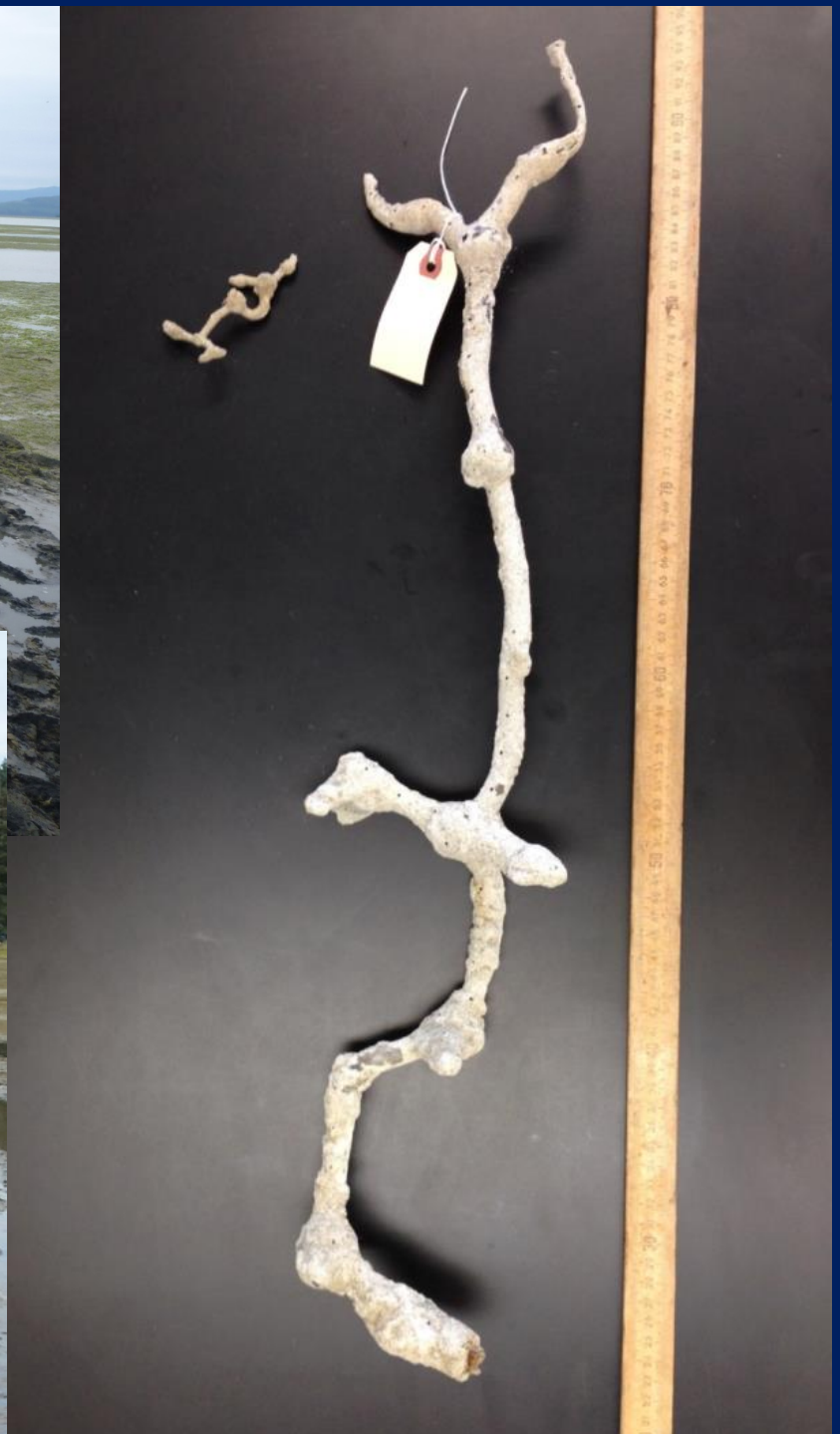
Conclusion

The reality is :

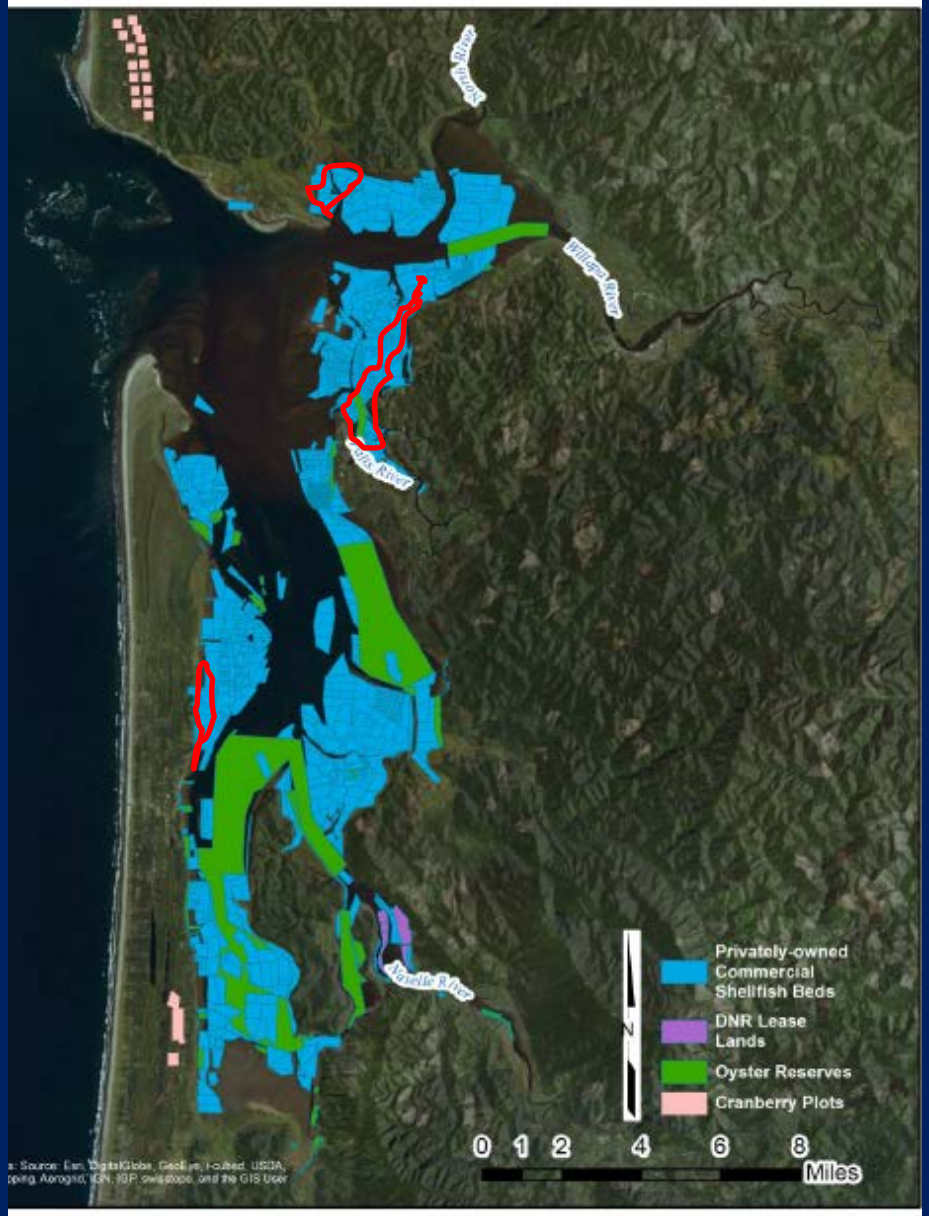
1. We don't and won't have any real control for adults
2. We may or may not be able to suppress moderate levels of juveniles
3. At low recruitment rates we can limp along for a decade and "survive".
4. If recruitments levels are like they were in the early 1990's , however, the industry won't survive the decades it will take to find a viable solution.
5. Any real alternative will cost $millions and take dozens of years to develop. There are very few scientist working on this (lacks critical mass).
6. Permits to conduct research are so restrictive that that I could even get a permit for apply fresh water in 2015

Shrimp are too deep to any surface treatment to work!

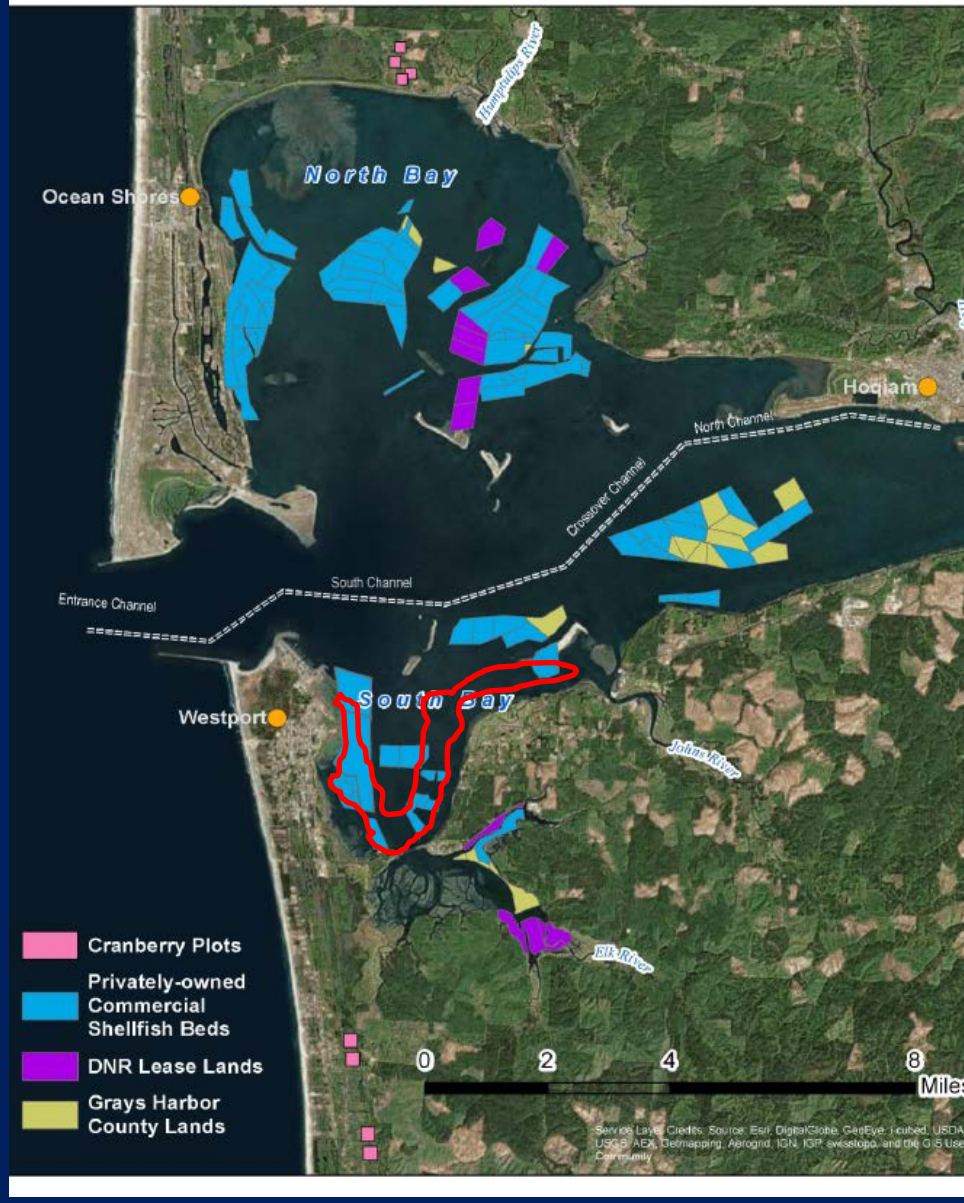
ARCTIC CAT



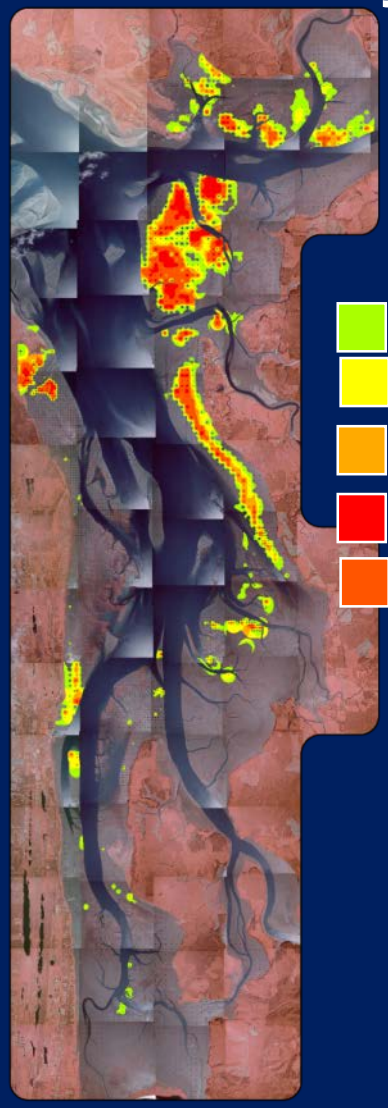
What do we want our bay to look like?



1 – Willapa Bay Tidelands



2006 shrimp density



- 20 – 40 burrows/m^2
- 40 – 60 burrows/m^2
- 60 – 80 burrows/m^2
- 120 – 260 burrows/m^2
- 80 – 120 burrows/m^2