Time to Reevaluate the Ecology of the Columbia River Estuary:

We Need CREDDP II!

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What was CREDDP

Columbia River Estuary Data Development Program

Focus

The Ecology of the Columbia River estuary and the food web linkages and the biological and physical forces that influence those linkages, particularly currents, sediment transport, and salinity. Describe and map the abundance patterns of resources.

Users

Local, state governments, planning commissions, permit applicants and those involved with planning and permitting activities

Research Scientists, educational institutions

Map Courtesy of LCREP

CREDDP DATA - 13 Projects/Work Units

Plant Life

- Emergent Plant Primary Production
- Benthic Primary Production
- Water Column Primary Production

Higer Trophic Levels

- Zooplankton and Larval Fish,
- Benthic Infauna
- Epibenthic Organisms
- Fish
- Avifauna
- Wildlife
- Marine Mammals

Physical Forces

- Sedimentation and Shoaling
- Currents
- Simulation

Map Courtesy of LCREP

RESULTS from CREDDP

Univ. Washington Library
Hits: 35,870
Full online Text: 36
Journal Articles: 23,768

Aquatic Sciences and Fisheries Abstracts
Hits: 1,027
Journal Articles: 981
Books: 25
Reports: 12
Conference Proceedings: 5
other: 4

Google scholar: 731,000

Map Courtesy of LCREP

CREDDP HISTORY

1974 – Governor's of OR and WA requested that the Pacific Northwest River Basins Commission (PNRBC) undertake an interdisciplinary ecological study of the estuary.

1978 – Congress authorized a 6-year $6.2 million plan of study.

1979-1981 – PNRBC administered CREDDP.

1981 (October) PNRBC was abolished.

1981 (December) Water Resource Council (WRC) receives $1.5 million for orderly completion of CREDDP

1982 (September)WRC contracts CREST to complete the program and NOAA assumed the role as Federal Representative.

Map Courtesy of LCREP

Why do we need a new CREDDP?

Provide information and services to make communities more resilient

- Evaluate Change (e.g. climate) in the Columbia River Estuary:
- Identify and quantify linkages/rates of important estuarine functions.
- Establish/improve long-term evaluation/monitoring program
- Understand and manage change in the Columbia River estuary.

Map Courtesy of LCREP

Limits of CREDDP

NO Global Positioning System

No INTERNET!

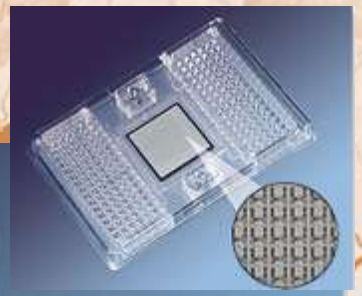
Limited data loggers/electronic water quality measures

Volcanic Eruption: May 12 1980

Genetics

Map Courtesy of LCREP

NEW TECHNOLOGY



What has been Done Since CREDDP?

CRETM-LMER (Columbia River Estuarine Turbidity Maximum-Land Margin Ecosystem Research – Simenstad et al.

NMFS – Bottom et al./Roegner

CREST –Restoration

LCREP Since 1999

CMOP http://www.stccmop.org/about_cmop

OTHER

Map Courtesy of LCREP

Columbia River Estuarine Turbidity Maximum-Land Margin Ecosystem Research

Initiated in 1990: seven major cruises between 1995-1999

Sedimentology: D. Reed
Geochemistry: F. Prahl
Primary Production: L. Small
Microbial: J. Baross
Primary Consumers: C. Simenstad)

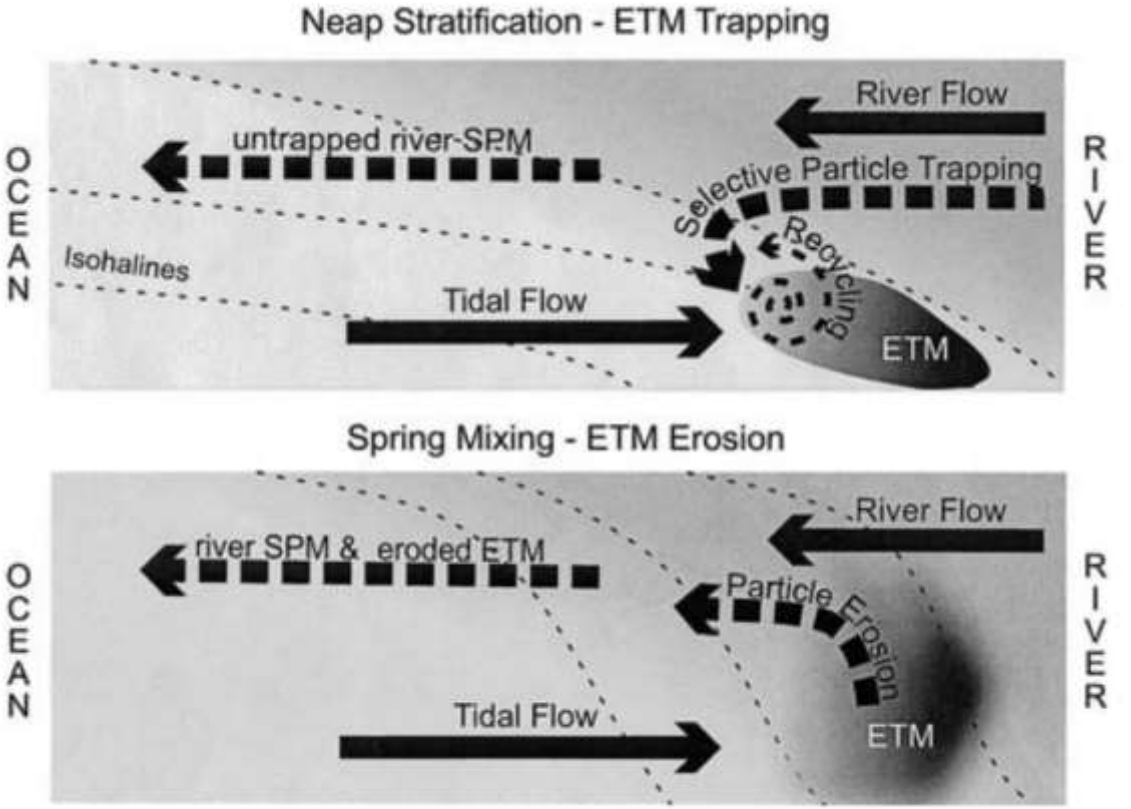
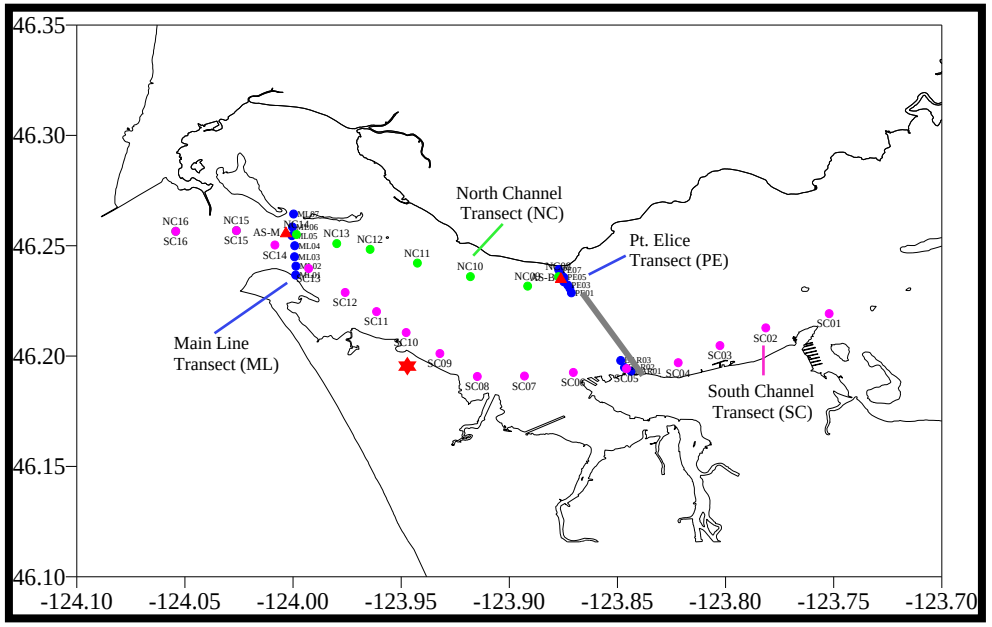


Fig. 2. Schematic of hypothesized particle conveyor belt operation.

Oceanographic studies in the Columbia River Estuary 2004-present

"Red water" blooms

- Herfort et al. 2011. Aquat. Micro. Ecol. 62: 85–97
- Herfort et al. 2011. Est. Coast. Shelf Sci.
- Herfort et al. 2012. Est. Coasts 35:878–891
- Peterson et al. 2013. Aquat. Micro. Ecol. 68



Hydrography and ocean-estuary exchange

- Roegner et al. 2010. Est. Coasts 34: 281-296
- Roegner et al. 2011. PLoS ONE 6:e18672

Ichthyoplankton

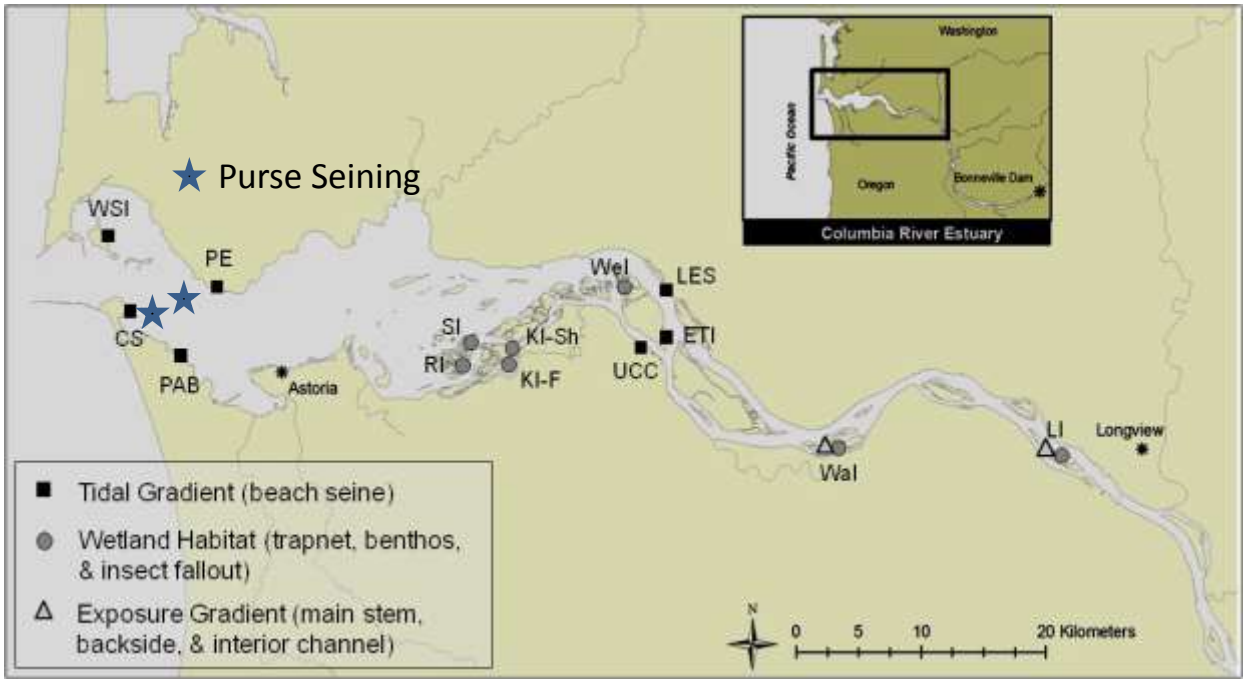
- Marko 2008 MS. Thesis

Phytoplankton

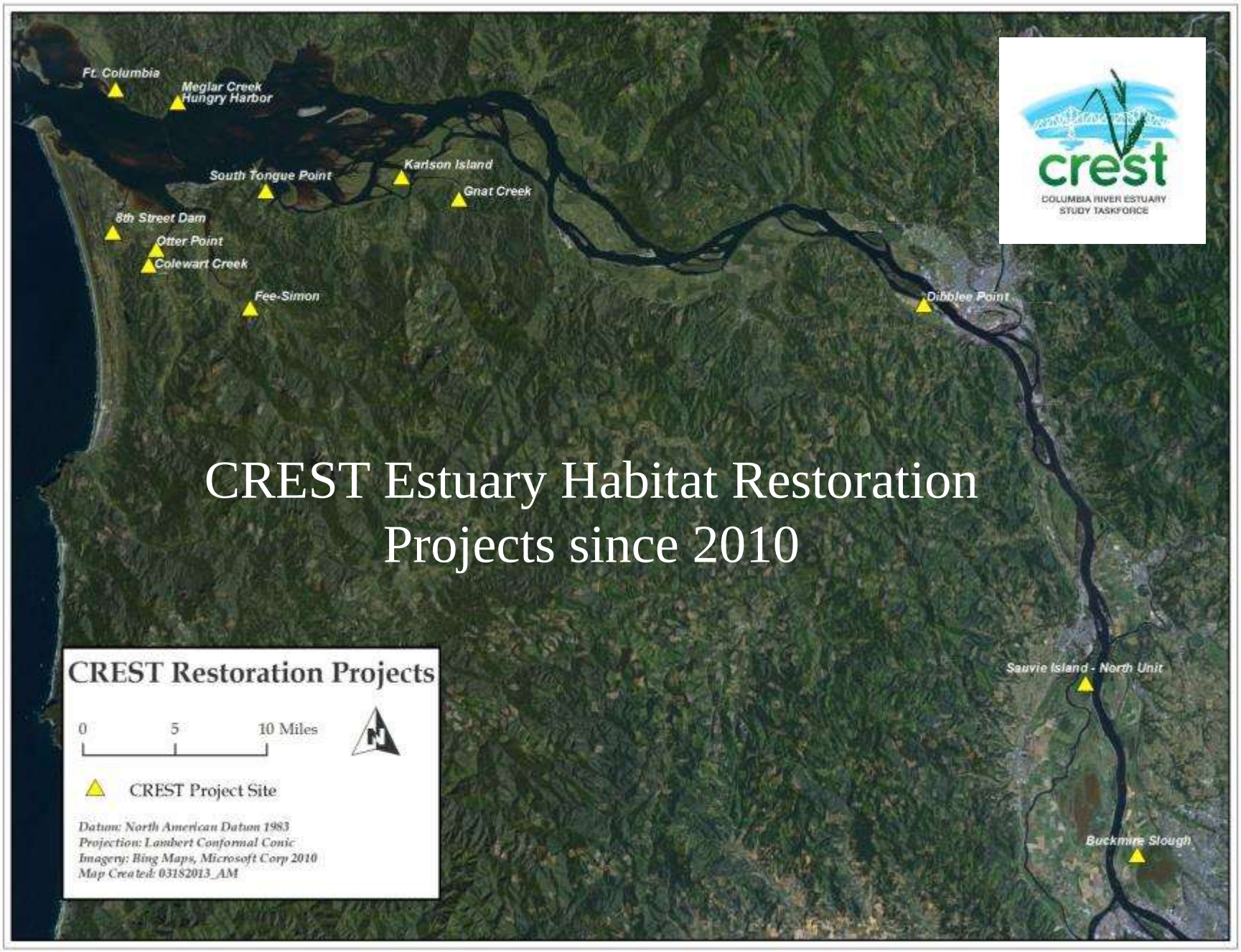
- Breckenridge et al. 2014. Est. Coasts

Crab Acoustics

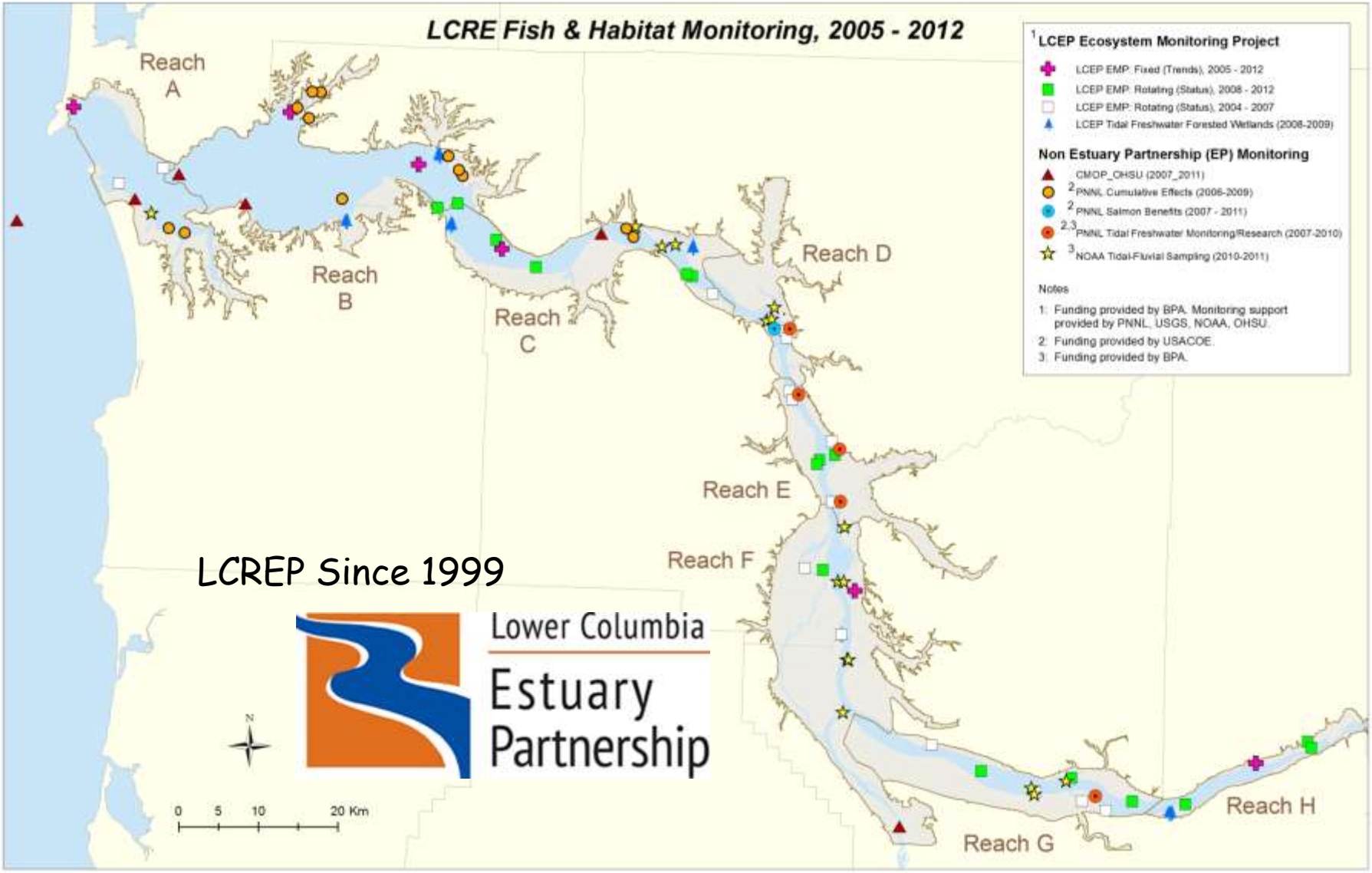
NMFS/UW Salmon sampling sites 2002-2008

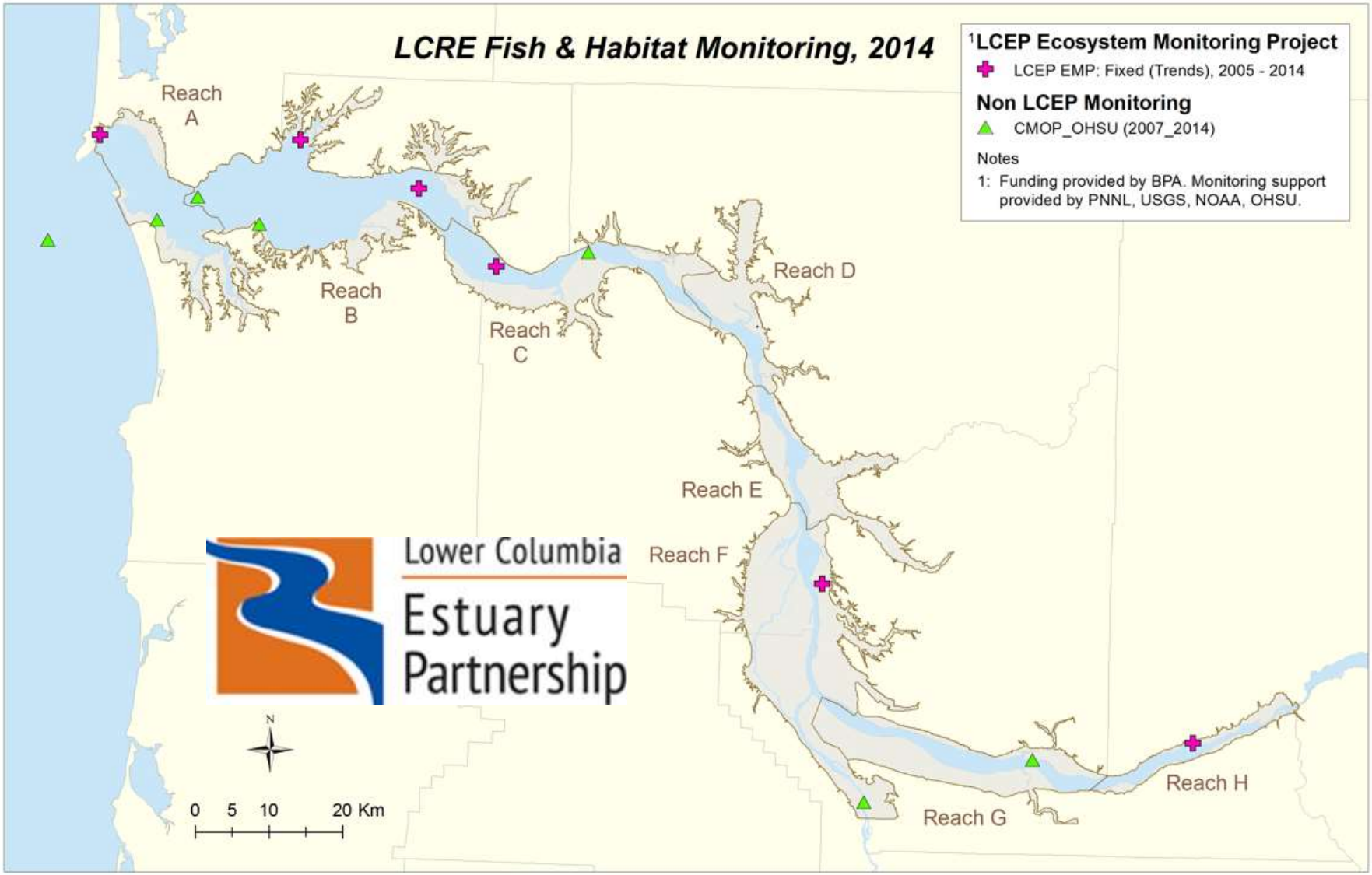


WSI	West Sand Island	SI-N, SI-S	Seal Island (north, south channels)
CS	Clatsop Spit	RI-N, RI-S	Russian Island (north, south channels)
PE	Point Ellice	KI-Sh	Karlson Island-Shrub
PAB	Point Adams Beach	KI-F	Karlson Island-Forested
LES	Lower Elochoman Slough	WeI-N, Wel-S	Welch Island (north, south channels)
ETI	East Tenasillahe Island	Wal-E, Wal-W	Wallace Island (east, west channels)
UCC	Upper Clifton Channel	LI-E, LI-W	Lord Island (east, west channels)



CREST Estuary Habitat Restoration Projects since 2010


LCRE Fish & Habitat Monitoring, 2005 - 2012
Reach A
Reach B
Reach C
Reach D
Reach E
Reach F
Reach G
Reach H
[1] LCEP Ecosystem Monitoring Project
LCEP EMP: Fixed (Trends), 2005 - 2012
LCEP EMP: Rotating (Status), 2008 - 2012
LCEP EMP: Rotating (Status), 2004 - 2007
LCEP Tidal Freshwater Forested Wetlands (2008-2009)
Non Estuary Partnership (EP) Monitoring
CMOP_OHSU (2007_2011)
[2] PNNL Cumulative Effects (2006-2009)
[2] PNNL Salmon Benefits (2007 - 2011)
[2,3] PNNL Tidal Freshwater Monitoring/Research (2007-2010)
[3] NOAA Tidal-Fluvial Sampling (2010-2011)
Notes
1. Funding provided by BPA. Monitoring support provided by PNNL, USGS, NOAA, OHSU.
2. Funding provided by USACOE.
3. Funding provided by BPA.
LCREP Since 1999
Lower Columbia Estuary Partnership
N
0 5 10 20 Km


LCRE Fish & Habitat Monitoring, 2014
[1]LCEP Ecosystem Monitoring Project
LCEP EMP: Fixed (Trends), 2005 - 2014
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Partnership
N
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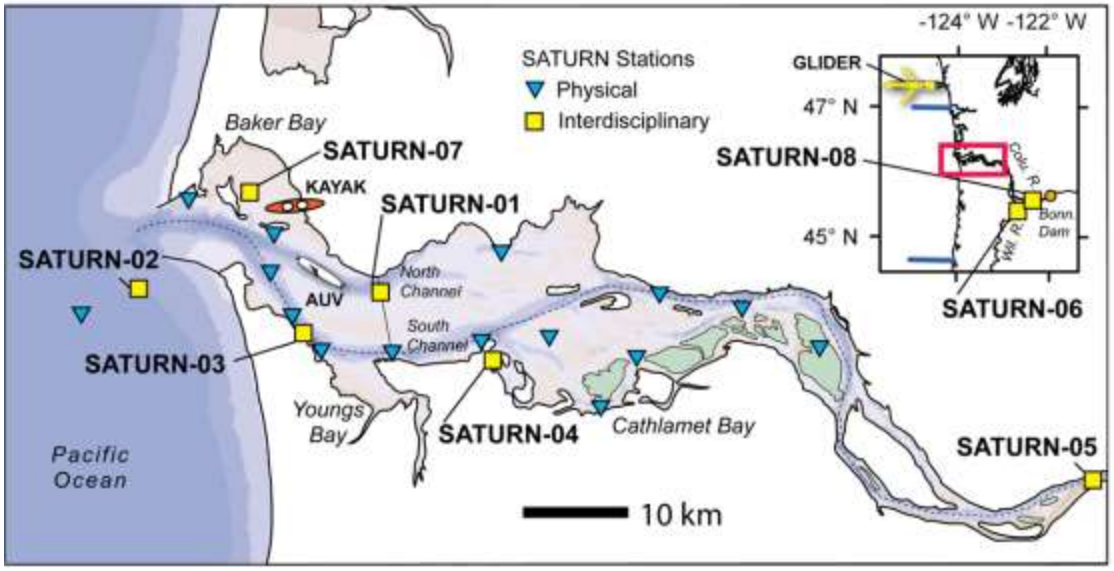
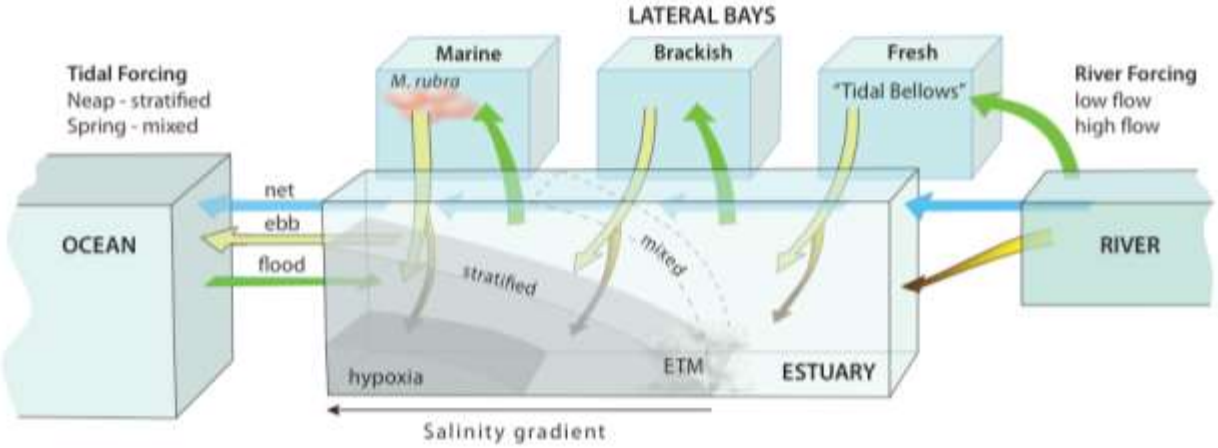
CMOP (Center for Coastal Margin Observation & Prediction) …





A NSF center of excellence (2006-2016). A long-term vision for the continuous **observation**, **modeling** and **analysis** of the Columbia River as an "**estuarine bioreactor**" of regional significance … interdisciplinary team of 16 primary investigators, physical oceanography, biogeochemistry, microbiology, and ecology

CMOP

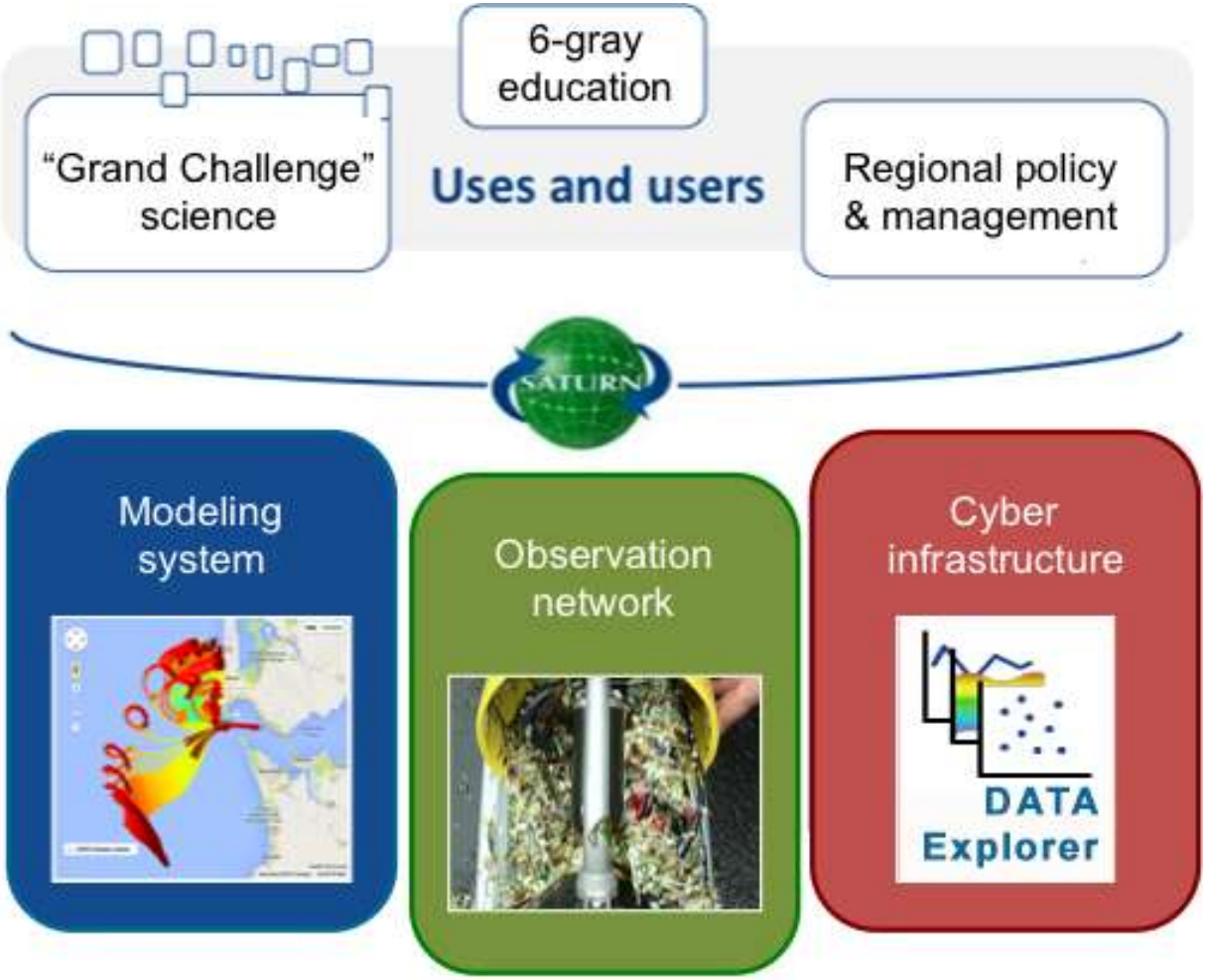
OREGON HEALTH & SCIENCE UNIVERSITY

Oregon State University OSU

UNIVERSITY of WASHINGTON

NSF

... hosts the SATURN "collaboratory," a data and model rich environment with open flow of information and a track record of bridging across *advances in science* and *management and policy needs*



http://www.stccmop.org/saturn

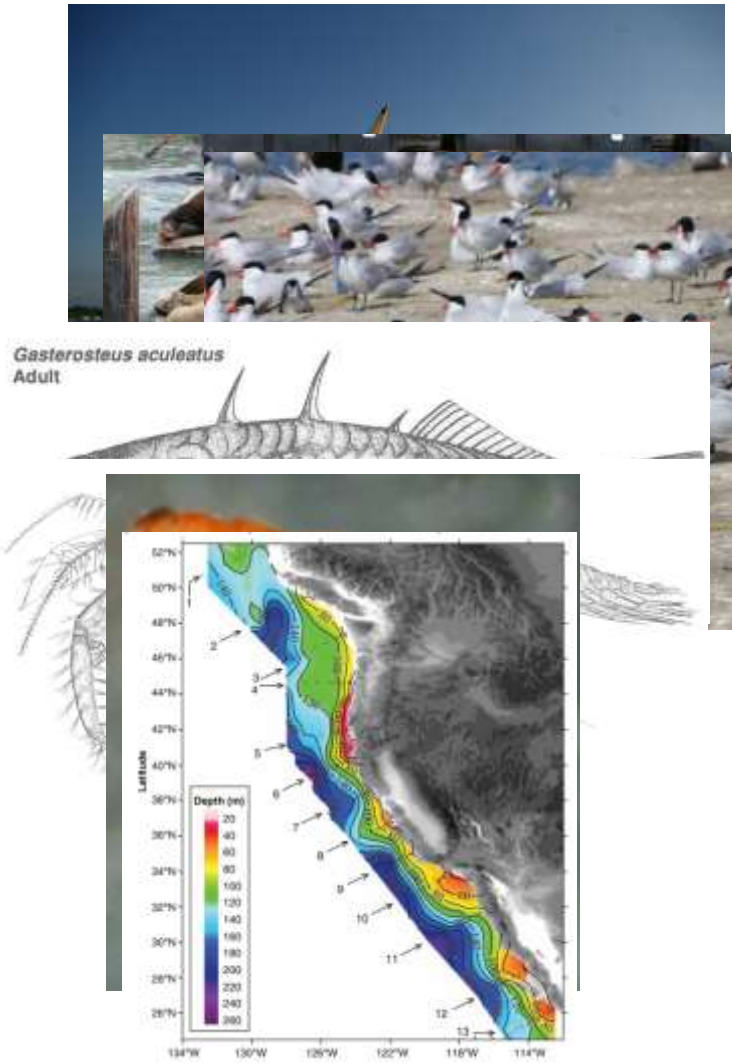
Look for a major synthesis of CMOP research and SATURN infrastructure in an upcoming thematic issue of L&O:F&E (2015)

How do we start?

Phase 1 - Sample

What has changed since CREDDP?

- Circulation
- Primary and Secondary Production
- Water Quality
- Marine Mammals
- Marine Birds
- Fish
- Wetlands
- Food Webs
- Introduced Species
- CLIMATE!



How do we start?

Phase 2

Evaluate relative to CREDDP

- Environment
  - Physical and Biological Resources
- Climate
- Dredging/Modifications
- Pollution
- Restoration

How do we start?

Phase 3

After Comprehensive Comparisons

1) Identify Holes in the Information
    a) Begin detailed specific studies (Testable Hypotheses?)
2) Initiate Appropriate Monitoring
    a) specific resources/rates
    b) locations
3) Model and Model Verification.
4) Annual Meetings
5) After every 5-years – reevaluate!
    Adaptive Research Management

PARTNERS

NOAA
EPA
LCREP
Corps of Engineers
OHSU – CMOP
OSU
UW
WSU
Clatsop Community College
Local Schools
MERTS
National Park Service
CREST
Bonneville Power Administration
Non-Governmental Organizations (e.g., PEW, Foundations)
Volunteers

Oregon Dept Fish Wildlife
Wash. Dept Fish Wildlife
Governor's
Congressional Representatives

OUTCOMES

INTEGRATED information

Accurate **health report** of the Columbia River estuary

Identify locations and metrics that need to be **monitored into the FUTURE**!

Identify **Climate Change effects** and implications for the future.

Estuarine System Models that can **PREDICT and be VERIFIED**

Education/Outreach Opportunities for All Ages!

We A New NAME!

Columbia River Advanced Program (CRAP)

Columbia River Estuary Ecology Program (CREEP)

Monitoring the Ecology of the Columbia River (MECR)

Presentation is available to all
Robert.Emmett@noaa.gov