County: Whatcom
Grant No: SEANWS-2014-WhCoPW-00008

PROJECT TITLE: Northwest Straits Project: Marine Resources Committee Administration and Operations

TASK NUMBER: 3

DELIVERABLE: No. 3 – Public Speaker Series Summary Report

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County: Whatcom
Grant No: SEANWS-2014-WhCoPW-00008

Public Speaker Series Summary Report for the Whatcom Marine Resources Committee September 23, 2014 through September 30, 2015

Whatcom County Public Works – Natural Resources

For

Whatcom County Marine Resources Committee

September 30, 2015

Preface


Bellingham Bay Symposium. Photo credit: Holly Faulstich

The Public Speaker Series is organized in partnership by the Whatcom Marine Resources Committee and the Whatcom Watershed Information Network (WWIN). Representatives from both organizations participate in the Public Speaker Series subcommittee. A goal of the subcommittee is to identify a co-host for each of the events to reach a broader audience and to utilize partnerships. The purpose of the speaker series is to 1) increase public knowledge on water related issues with scientific literacy; 2) to generate awareness of trends and encourage restoration of water quality and marine habitat and appropriate harvest management through active citizen involvement; and 3) to enhance coordination and partnerships locally and regionally. Events range from 1-1/2 hour single speaker event to multi-speaker all-day symposiums. The subcommittee is continuously aiming to try different event formats (i.e. films, inclusion of counter perspectives, meeting in the Council of Chambers, etc.).

Project Objectives

1. To provide a forum for the exchange of marine resource issues information to both MRC members and the community.

2. To help develop the community's curiosity and concern about marine issues through awareness and participation in community events.

3. To help develop the community's stewardship ethic through continued education and exposure to marine resource issues.

2014-15 Public Speaker Series

Sue Blake, with the WWIN, acted as Chair for the subcommittee. The subcommittee recruited Ed Webber, Graduate Coordinator at Western Washington University, in order to have university representation on the committee as well as potentially collaborate on an event with the Huxley College speaker series. Ed has been key in helping to spread the word about speaker series events with the student population and ensuring the MRC/WWIN speaker series is not duplicating efforts of the Huxley College speaker series. The subcommittee continues to meet on a quarterly basis to discuss new ideas and follow up with previous ideas on events.

The subcommittee aims to draft a calendar each year in order to identify events in advance, however, a calendar is difficult to work from as host schedules change and other important marine topics come to the forefront of community interests.

Jennifer Lanksbury, Washington Department of Fish and Wildlife:

In November 2014, the MRC hosted Jennifer Lanksbury, a biologist with the Washington State Department of Fish and Wildlife, Puget Sound Ecosystem Monitoring Program - Toxics in Biota team. Ms. Lanksbury's research is focused on toxic contaminants in the Sound's biota, including exposure patterns in the nearshore ecosystem. She provided a presentation on how contaminants enter the Puget Sound and are transferred through marine food webs. She also presented results from a recent large-scale mussel monitoring project, which the MRC was involved with during the winter of 2012-13. Approximately twenty-one people attended this event.

State of Bellingham Bay Symposium:

On January 22, 2015 the MRC co-hosted the State of Bellingham Bay Symposium with WWIN and the WSU Extension. Approximately 206 people registered for the event and 150 people participated. This symposium brought together researchers, managers, students, policy makers, and the public in order to understand the physical, chemical, and biological status of Bellingham Bay including new research needs and methods to link research to resource managers. In addition, there was a discussion about on-going coordination/collaboration and ideas and recommendations for staying connected. Students, researchers, and the MRC participated in the poster session portion of the event.

MRC staff attended planning meetings to start developing the symposium starting in May 2014. Planning meetings included members of the speaker series subcommittee and session moderators. The symposium agenda and program were developed through these meetings (Attachment B). The evaluations from the event were overall very positive (Attachment C). The need for more research and collaboration between agencies, jurisdictions, and researchers was clearly noted (Attachment D). A resource directory was developed by the planning committee after the event (Attachment E). It is anticipated that the MRC will co-host a similar event every two years.

Doug Huddle, Historic and Current Fish Abundance in Whatcom County:

At the February MRC meeting the MRC hosted Doug Huddle, retired biologist with the Washington Department of Fish and Wildlife, who provided information about the distribution and abundance of local salmonids, what it was like historically, and some of the common

misunderstandings about the decline of certain salmon species. This event was attended by approximately 30 community members. Attendees expressed interest in learning from the tribal perspective on this topic and to learn more about the tribal and Department of Fish and Wildlife role is in harvest management, and how harvest management shares the sport, commercial, and tribal fisheries.

Robin Kodner, What are all those algae in the Bay?:

The Public Speakers subcommittee (WWIN and MRC) partnered with the Birch Bay Watershed Aquatic Resources Management (BBWARM) District on an event featuring Dr. Robin Kodner from Western Washington University on July 30. Dr. Kodner discussed what algae are common in our waters, typical seasonal algal community cycles, history of harmful blooms in the region and how algal blooms are being effected by anthropogenic activities, including climate change. Approximately 50 people showed up for the event, and positive feedback was received through the event evaluations. This presentation was an ideal follow up to a presentation held at the October MRC meeting, by Ingrid Enschede, Whatcom County Public Works – Stormwater, where she discussed some of the community concerns over ecological changes observed in Birch Bay – specifically increased pink algae growth.

Summary

While MRC members do attend the speaker series events and other general community events, the greatest impact these events have is through the interactions with community members. The speaker series events continue to draw a varied audience size. There is a continued need to find topics that interest a range of community members, so that we can be successful in the three objectives of this task. Events should be planned far enough in advance that adequate publicity is done. More volunteers on the subcommittee could also make a huge difference in the success of speaker events.

Attachments

Attachment A: Event Flyers
Attachment B: Bellingham Bay Symposium Agenda and Program
Attachment C: Bellingham Bay Symposium Evaluation Summary
Attachment D: Bellingham Bay Symposium Research Needs Summary
Attachment E: Bellingham Bay Symposium Resource Directory
Attachment F: Speaker Series Event Evaluation (General)

Public Speaker Series Summary Report

Attachment A: Speaker Series Event Flyers

Mussel Watch
Pilot Expansion Study

An Active Biomonitoring Effort to Assess Contaminants in the Nearshore Ecosystems of the Salish Sea

November 6, 2014 • Thursday • 6:00pm

Civic Center Annex, Garden Level Conf. Rm. • 322 N. Commercial St. Bellingham, WA

Presentation By:

Jennifer Lanksbury

Washington Department of Fish and Wildlife
Puget Sound Ecosystem Monitoring Program (PSEMP)

Join the Whatcom Marine Resources Committee to learn how contaminants enter the Puget Sound and are transferred through marine food webs. Results from a recent, large-scale mussel monitoring project in the Puget Sound will also be presented.

Another Public Speaker Series Event coordinated by:

MRC Whatcom County

WW Whatcom Watersheds Information Network

Northwest Straits Commission

State of the Bay • Research Symposium

You are invited to the Bellingham Bay State of the Bay Research Symposium. The Symposium will bring together researchers, managers, and interested citizens to broaden our understanding of this vital resource and explore opportunities to enhance communication/coordination in order to protect it for future generations.

This all-day event will be held in Bellingham at the Bellingham Cruise Terminal in Fairhaven. Speakers, posters, and videos will cover a wide range of topics including the latest research results, new research needs, and coordination/ communication opportunities.

STATE OF THE BAY
BELLINGHAM BAY

Event is FREE but limited to first 150 people so register early to reserve your space.

Registration Now Open

For more info and to register visit our website at:
http://whatcom.wsu.edu/nr/sotb

Questions? Contact Sue Blake at:
sgblake@wsu.edu or (360) 676-6736, ext. 3

Historic and Current Fish Abundance in Whatcom County

Presentation by: Doug Huddle

Chum Salmon
Photo by: Erika Douglas

Join the Whatcom County Marine Resources Committee meeting to learn more about the distribution and abundance of local salmonids, what it was like historically, and some of the common misunderstandings about the decline of certain salmon species.

Thursday, February 5th

6:00—7:00PM

Garden Level Conference Room, Civic Annex Building

322. N. Commercial St. Bellingham, WA

A Public Speaker Series coordinated by:

MRC Whatcom County | Whatcom Watersheds Information Network | Northwest Straits Initiative — partners in marine conservation | Puget Sound Partnership — our sound, our community, our chance

This project has been funded in part by the United States Environmental Protection Agency

WHAT ARE ALL THOSE ALGAE IN THE BAY?

WHAT MAKES ALGAL BLOOMS HARMFUL AND HOW IT EFFECTS COASTAL COMMUNITIES

A Free Public Speaker Series Event with Dr. Robin Kodner, Western Washington University

Algal blooms are common and natural in coastal marine waters, but can become harmful when blooms are large and persistent. This talk will discuss what algae are common in our waters, typical seasonal algal community cycles, history of harmful blooms in the region and how algal blooms are being effected by anthropogenic activities, including climate change.

Cottonwood Beach in Birch Bay June 18, 2015 courtesy C. Sandvig

THURSDAY JULY 30, 2015
7—8 P.M.

BIRCH BAY BIBLE COMMUNITY CHURCH
4460 BAY ROAD, BLAINE, WA 98230

Questions: Ingrid Enschede, Whatcom County Public Works
(360) 715-7450 x50787

Sponsored by:

BBWARM

MRC Whatcom County

WW Whatcom Watersheds Information Network

Public Speaker Series Summary Report

Attachment B: Bellingham Bay Symposium Agenda and Program

State of the Bay

Research Symposium

January 22, 2015 • Bellingham, WA

Bringing together researchers, managers, and interested citizens to broaden our understanding of this vital resource and explore opportunities to enhance communication and coordination to protect the Bellingham Bay for future generations.

http://whatcom.wsu.edu/nr/sotb

PROGRAM

AGENDA

8:00 - 8:30 Registration

8:30 - 8:50 Welcome and Overview of Day

Lummi Tribal Welcoming
Sue Blake, WSU Extension/Washington Sea Grant
Event Host: Steve Hollenhorst, Dean Huxley College
Kelli Linville, Mayor – City of Bellingham; Jack Louws, County Executive - Whatcom County

8:50- 9:05 Bellingham Bay - Yesterday and Today

Bert Webber, Emeritus Faculty Huxley College - Western Washington University

9:05– 10:00 Key Issues, Challenges, & Research Needs - Local Government Perspective

Facilitator: Carl Weimer, Whatcom County Council

Panelists: Jon Hutchings, City of Bellingham; Mike Hogan, Port of Bellingham; Gary Stoyka, Whatcom County; Randy Kinley, Lummi Nation

Panelist Questions:

- *What value/responsibility does your jurisdiction have associated with Bellingham Bay?*
- *What are the key issues and challenges you face?*
- *What are the information/research needs/gaps that you would like to see addressed?*

10:00 - 10:30 Break

10:30 - 11:45 Physical Processes

Overview of key physical processes that set the foundation for water/sediment chemistry and biological ecosystems including highlights of current research and priority data gaps.

Facilitator: Eric Grossman, U. S. Geological Survey

Speakers:

- Seafloor Mapping and Sediment Transport Studies of Dynamic Historic Change Across the Nooksack River Delta, Eric Grossman, U.S. Geological Survey
- Circulation Model for Bellingham Bay, Tarang Khangaonkar, Pacific Northwest National Laboratory
- Shoreline Change and Nearshore Enhancement Opportunities in Bellingham Bay, Jim Johannessen, Coastal Geologic Services, Inc.
- Nitrogen, Sediment and Other Nutrient Loading into Bellingham Bay from the Nooksack River, Mark von Prause, Washington Department of Ecology - Marine Monitoring Unit

11:45 - 12:30 Lunch

12:30 - 1:45 **Chemistry and Water Quality**

Overview of sediment and water quality conditions and implications for biological systems including highlights of current research and data gaps.

Facilitator: Christopher Krembs, Department of Ecology

Speakers:

- Sediment Quality in Bellingham Bay - Decadal Trends and Current Patterns, Valerie Partridge, Washington Department of Ecology - Marine Monitoring Unit
- Fecal Coliform & Enterococcus in Bellingham Bay, Jean Snyder, State Department of Health
- Stormwater Data Characterization: Results from Phase I Monitoring 2007 - 2012, Brandi Lubliner, Washington Department of Ecology

1:45 - 3:00 **Biological Ecosystems**

Overview of marine food web including relationship to physical & chemical systems & data gaps.

Facilitator: Jude Apple, WWU Shannon Point

Speakers:

- Seagrass in Portage Bay, Marco Hatch, Director - National Indian Center for Marine Environmental Research and Education
- Sea Star Wasting Disease in Bellingham Bay and the Salish Sea, Ben Miner, Marine Ecologist - Western Washington University
- Juvenile Chinook Salmon Assessment of the Nooksack Estuary and Bellingham Bay Nearshore, Eric Beamer, Skagit River Cooperative

3:00 - 3:30 **Break**

3:30 - 4:00 **Regional Research Perspective - Puget Sound Ecosystem Monitoring Gaps**

Ken Dzinbal, Senior Monitoring Program Coordinator - Puget Sound Partnership

4:00 - 4:40 **Combined Perspective - What do We Need to Know & How to Prioritize with Limited Funding?**

Facilitator: Jon Hutchings, City of Bellingham

Panelists: Eric Grossman, USGS; Christopher Krembs, Department of Ecology; Jude Apple, WWU Shannon Point; Carl Weimer, Whatcom County Council; Ken Dzinbal, Puget Sound Partnership; Randy Kinley, Lummi Nation

Panelists Questions:

- *Based on all the perspectives you have heard today, what do you consider the priority information and research needs that are not being met?*
- *Do you have any recommendations for how to more effectively identify information needs, prioritize & coordinate research activities, and develop support and capacity to address needs?*

4:40 - 5:10 **On-going Communication & Collaboration - Overview of Opportunities & Recommendations**

Sue Blake, WSU Extension/Washington Sea Grant; Austin Rose, Whatcom County Marine Resource Committee

5:10 - 5:15 **Closing**

5:15 - 6:30 **Poster Session, Beer Social**

Conference Sponsors

The Planning Committee would like to thank the following sponsors for their support for the conference:

Planning Committee

(listed in alphabetical order)

Jude Apple, WWU Shannon Point
Sue Blake, WSU Extension/Washington Sea Grant, Committee Chair
Alan Chapman, Lummi Natural Resources
Charlotte Clausingjose
Taylor Garrod, RE Sources
Nicole Gilmore, Taylor Shellfish
Pete Granger, Washington Sea Grant
Eric Grossman, United States Geological Survey
Elizabeth Kilanowski, Raincoast GeoResearch
Renee LaCroix, City of Bellingham
Becky Peterson, WSU Extension
Austin Rose, Whatcom County Marine Resources Committee
Bert Webber, Emeritus Huxley College, Western Washington University

Another Public Speaker Series Event coordinated by:

Bellingham Bay Research Symposium
2015 Speaker Information

http://whatcom.wsu.edu/nr/sotb

Bellingham Bay, Yesterday and Today

Presenter: Bert Webber, Emeritus Faculty Huxley College, Western Washington University, bertandsue@earthlink.net

Key Issues, Challenges, and Research Needs - Local Government Perspective

Facilitator: Carl Weimer, Whatcom County Council**,** cweimer@co.whatcom.wa.us, 360-384-5919
Presenters:

- Jon Hutchings, City of Bellingham Assistant Director Natural Resources, jjhutchings@cob.org, 778-7800
- Gary Styoka, Whatcom County Public Works, Natural Resource Manager, GStoyka@co.whatcom.wa.us, 676-6876
- Mike Hogan, Port of Bellingham, Public Affairs Administrator, mikeh@portofbellingham.com, 676-2500
- Randy Kinley, Lummi Nation

Physical Processes

Facilitator: Eric Grossman, U. S. Geological Survey

Presentation Title: Seafloor Mapping , Sediment Transport and Change Nooksack Delta
Researcher: Eric Grossman, PhD, U.S. Geological Survey Pacific Coastal and Marine Science Center and Research Faculty Department of Geology, Western Washington University
Contact Information: egrossman@usgs.gov
Bio Brief: Dr. Eric Grossman is a coastal and marine geologist who conducts research on hydrodynamics, sediment transport and coastal change to inform how land use and climate change influence ecosystems, infrastructure and communities. He has published extensively on sea level rise, coastal geologic framework, coastal dynamics, and more recently on assessments of coastal vulnerability and resilience relative to ecosystem restoration and community health
Abstract: Analyses of geophysical data indicate that the Nooksack River Delta has experienced the greatest amount of historical sedimentation and progradation of western Washington deltas. While the river's load of sand has helped to extend the delta seaward up to 1.5 km since the mid-1800s, the fine fraction of muds have largely been exported to deeper areas of Bellingham Bay and beyond. This is in part due to naturally high sediment loads sourced from the steep, young geology of the North Cascades, but also to land use activities including forestry practices, levees and channelization for flood mitigation that have modified flows and rerouted sediment through time. New measurements of the fluvial sediment load helps to quantify the sediment budget including the amount of sediment being retained within the lower river and delta and that which is exported and affects marine water quality and benthic habitats. Coupled climate change and hydrology models project a 3-6 times increase in fluvial sediment delivery by 2080, which will likely influence channel aggradation, flood risk, ecosystems, habitat restoration, and water quality as more precipitation occurs as rain than snow and sea-level rise traps more sediment in channels.

Website/Links: : http://www.skagitclimatescience.org

Presentation Title: Shoreline Change and Nearshore Enhancement Opportunities in Bellingham Bay
Researcher: Jim Johannessen, MS, Licensed Eng. Geologist, Coastal Geologic Services, Inc.
Contact Information: jim@coastalgeo.com
Bio Brief: Jim Johannessen runs Coastal Geologic Services Inc. in Bellingham, which specializes in beach, bluff and estuarine processes, coastal erosion mitigation, coastal restoration, and applied coastal management consulting. Jim has designed over 70 implemented beach and estuary restoration/enhancement projects throughout the Puget Sound area since starting CGS in 1993, including Marine Park and Boulevard Park in Bellingham and Lummi Shore Road beach nourishment. Jim and CGS have produced restoration designs and guidance documents for the Army Corps, WDFW, and many tribes and local governments.
Abstract: The short talk will provide an overview of finding and research needs for coastal processes and nearshore restoration planning and design in Bellingham Bay. Major shore changes will be outlined, existing data and results of the recent WRIA 1 nearshore habitat prioritization, and research needs will be outlined. Posters will also be displayed.
Website/Links: www.coastalgeo.com,
http://www.cob.org/documents/pw/environment/restoration/master-plan/wria1-nearp-report.pdf,
http://wdfw.wa.gov/publications/01583/

Presentation Title: A Review of Long Term Freshwater Quality Trends in the Nooksack River at Brennan
Researcher: Markus von Prause, Washington State Department of Ecology, Freshwater Monitoring Unit
Contact Information: MVON461@ecy.wa.gov
Bio Brief: Markus Von Prause recently works for the Washington State Department of Ecology's River and Stream Monitoring Program as a Water Quality Scientist. His expertise focuses on freshwater quality monitoring and reporting for the state of Washington.
Abstract: The Washington State Department of Ecology (Ecology) and its predecessor agency have operated an ambient water quality monitoring program since 1959. Since 1971, the program has been monitoring freshwater quality on the Nooksack River (Station 01A050-Nooksack River @ Brennan). The principal goals of the ongoing program are to monitor long term trends in water quality in the Nooksack River, support a probabilistic monitoring program and support Clean Water Act Section 303(d) reporting.
This presentation includes:

- An overview of Ecology's freshwater ambient monitoring program.
- A review of current water quality index trends (1994-2013) for the long term station 01A050 (Nooksack River @ Brennan).
- A summary of annual and seasonal nitrogen /phosphorus concentrations, flux/yield trends (1994-2013) residing in the Nooksack River at Brennan.
- Potential drivers affecting annual and seasonal nitrogen /phosphorus concentrations & flux/yield trends.

A description of Ecology's long-term monitoring program and access to historical data can be found on Ecology's Internet web site.
Website/Links: www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html

Presentation Title: Simulation of Circulation and Water Quality in Bellingham Bay
Researcher: Tarang Khangaonkar, PhD, Pacific Northwest National Laboratory (PNNL)

Contact Information: Tarang.Khangaonkar@pnnl.gov
Bio Brief:
Abstract:
Website/Links:

Chemistry and Water Quality

Facilitator: Christopher Krembs, Department of Ecology

Presentation Title: Overview of Sediment and Water Quality Conditions and Implications for Biological Systems Including Highlights of Current Research and Data Gaps
Researcher: Christopher Krembs, Washington State Department of Ecology
Contact Information: ckre461@ecy.wa.gov
Bio Brief:
Abstract:
Website/Links:

Presentation Title: Sediment Quality in Bellingham Bay - Decadal Trends and Current Patterns
Researcher: Valerie Partridge (presenter), Margaret Dutch, and Sandra Weakland, Washington State Department of Ecology, Marine Monitoring Unit; Lucy McInerney, Washington State Department of Ecology, Toxics Cleanup Program
Contact Information: VPar461@ecy.wa.gov
Bio Brief: Valerie Partridge is a member of the Marine Monitoring Unit of the Washington State Department of Ecology's Environmental Assessment Program. She conducts statistical analyses of data from the Puget Sound Ecosystem Monitoring Program (PSEMP) sediment monitoring programs.
Abstract: As part of its ongoing marine sediment monitoring program, the Washington State Department of Ecology has sampled sediments in northern Bellingham Bay for chemical contaminants, toxicity, and benthic invertebrate communities (benthos). In this talk, results will be presented for benthos and chemistry from the 2010 survey of Bellingham Bay. These results will be placed into context with regional results from 1997 and 2006, as well as pan-Puget Sound results from 1997-2003 and 2004-2014. In addition, benthos results from the annual sampling of one long-term station in central Bellingham Bay will be presented.
Website/Links: www.ecy.wa.gov/programs/eap/sediment

Presentation Title: Fecal Coliform Monitoring in Marine Water to Classify Commercial Shellfish Growing Areas
Researcher: Jean Snyder, Washington State Department of Health, Office of Shellfish and Water Protection
Contact Information: Jean.Snyder@doh.wa.gov
Bio Brief: Jean Snyder is the Restoration Program Lead at Washington State Department of Health in the Office of Shellfish and Water Protection. She works to protect public health by classifying shellfish harvest areas and working with internal and external partners to find and correct nonpoint fecal pollution sources that reduce marine water quality and cause closures of commercial and recreational shellfish beds.
Abstract: WDOH staff continually analyzes marine growing areas to make sure shellfish harvested are safe to eat. This work involves completing an evaluation of the growing area, assigning a classification and monitoring water quality for changes. This talk will briefly provide an overview of this process including marine water quality monitoring for fecal coliform. Then, this talk will discuss the fecal coliform trends in Portage Bay and introduce WDOH's new Commercial Shellfish Map Viewer.
Website/Links: http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/GrowingAreas

Presentation Title: Stormwater Data Characterization: Results from Phase I Monitoring 2007- 2012
Researcher: Brandi Lubliner, Washington State Department of Ecology
Contact Information: brwa461@ecy.wa.gov
Bio Brief: Brandi Lubliner, PE works for the Washington State Department of Ecology in the Water Quality Program as a stormwater engineer and permit monitoring coordinator.
Abstract: Ecology requires monitoring under the NDPES Municipal Stormwater Permits. In the prior permit (2007-2013) monitoring was conducted stormwater outfalls by the Phase I permittees. In the current permit (2013-2018) Ecology gave the option to Phase I and Phase II permittees of continued outfall monitoring or choose a new paradigm of pooling resources for regional scale stormwater impacts monitoring in receiving waters. This talk will briefly explore the results of the outfall monitoring compilation study and the planned monitoring under the current permit.
Website/Links: Results from Phase I Monitoring 2007 - 2012, Brandi Lubliner, Washington Department of Ecology The report, **Western Washington NPDES Phase 1 Stormwater Permit: Final S8.D Data Characterization, 2009-2013,** is available at https://fortress.wa.gov/ecy/publications/SummaryPages/1503001.html.

Biological Ecosystems

Facilitator: Jude Apple, WWU Shannon Point

Presentation Title: Bellingham Bay - Biological Components and Ecological Processes
Researcher: Jude Apple, WWU Shannon Point
Contact Information: Jude.Apple@wwu.edu
Bio Brief: Dr. Jude Apple is a marine scientist at Western Washington University's Shannon Point Marine Center. His research investigates factors contributing to low dissolved oxygen in bottom waters of Bellingham Bay, as well as interactions between ocean carbonate chemistry and the role of planktonic microbes in ocean acidification".
Abstract:
Website/Links:

Presentation Title: The Submerged Landscapes of Portage Bay
Researcher: Marco Hatch, Director National Indian Center for Marine Environmental Research and Education
Contact Information: marcoh@nwic.edu
Bio Brief:
Abstract:
Website/Links:

Presentation Title: Sea Star Wasting Disease
Researcher: Benjamin Miner, PhD, Western Washington University
Contact Information: Benjamin.miner@wwu.edu
Brief Bio: Dr. Benjamin Miner is an associate professor in the Biology Department at Western Washington University. He investigates how the environment influence the ecology and evolution of marine organisms. Recently he has studied the dramatic die-offs of sea stars along the west coast of North America.
Abstract:
Website/Links:

Presentation Title: Juvenile Chinook Salmon Assessment of the Nooksack Estuary and Bellingham Bay Nearshore
Researcher: Eric Beamer Research Director Skagit River System Cooperative
Contact Information: Jude
Bio Brief: Eric Beamer is the Research Director for Skagit River System Cooperative, where he has worked examining salmon freshwater and estuarine ecology since 1984. Mr. Beamer is the principal investigator on projects in the following fields of research: landscape processes influencing habitat conditions, identification of juvenile Chinook salmon life history patterns, and factors influencing wild Chinook salmon production, monitoring Chinook salmon in the tidal delta and nearshore, studies of the use of non-natal estuaries by juvenile Chinook salmon.
Abstract: This project is an assessment of juvenile salmonid use of the Nooksack estuary and Bellingham Bay shoreline habitats with an emphasis on juvenile Chinook salmon. The scope of work examines juvenile Chinook salmon density dependence in the Nooksack estuary, and uses a bioenergetics approach to examine how competition for prey in different habitat types (with variable connectivity and habitat-specific temperature) influences growth and residency, and by extension habitat capacity in the Nooksack estuary. Juvenile salmon outmigrating from the Nooksack River are also potentially using shoreline habitats of the Bellingham Bay and conditions within the Nooksack estuary may influence the timing and size of fish entering Bellingham Bay. Therefore, juvenile salmon are also assessed in selected Bellingham Bay shoreline areas including City of Bellingham sites. The primary outcomes of the assessment are:
1. Assessment of system-wide density dependence in the Nooksack estuary on juvenile Chinook salmon.
2. Bioenergetics modeling of habitat-specific growth potential that factors prey inputs, diet, temperature, and local rearing densities of juvenile Chinook salmon in the Nooksack estuary.
3. Description of temporal, spatial and habitat type patterns of juvenile Chinook salmon that use the Bellingham Bay shoreline.
The State of the Bay presentation reports on all three aspects of the project but focuses on Bellingham Bay results.
Website/Links: http://www.skagitcoop.org/index.php/research/

Regional Research Perspective - Puget Sound Ecosystem Monitoring Program

Presenter: Ken Dzinbal, Senior Monitoring Program Coordinator - Puget Sound Partnership, ken.dzinbal@psp.wa.gov

Combined Perspective - What do we Need to Know and How to Prioritize with Limited Funding

Facilitator: Jon Hutchings, City of Bellingham, jjhutchings@cob.org, 778-7800
Panelists:

- Carl Weimer, Whatcom County Council**,** cweimer@co.whatcom.wa.us, 360-384-5919J
- Christopher Krembs, Washington State Department of Ecology, ckre461@ecy.wa.gov
- Jude Apple, WWU Shannon Point, Jude.Apple@wwu.edu
- Eric Grossman, U. S. Geological Survey, egrossman@usgs.gov
- Jeremy Friemund, Lummi Natural Resources, jeremyf@lummi-nsn.gov
- Ken Dzinbal, Senior Monitoring Program Coordinator - Puget Sound Partnership, ken.dzinbal@psp.wa.gov

On-going Communication and Collaboration - Overview of Opportunities and Recommendations

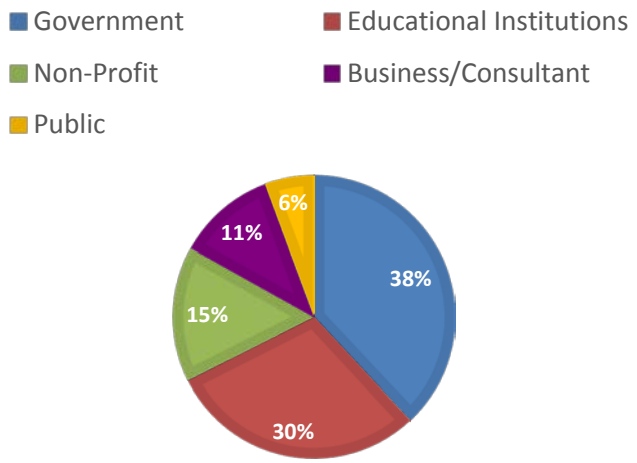
Presenter: Sue Blake, WSU Extension Water Resource Faculty/Washington Sea Grant, sgblake@wsu.edu, 360-676-6736

Public Speaker Series Summary Report

Attachment C: Bellingham Bay Symposium Evaluation Summary

State of the Bay Research Symposium
Summary of Program Evaluation

1. Organization and/or Affiliation



Government - DNR, Port of Bellingham, NW Straits Commission, Ecology, Bellingham, Whatcom County, Whatcom Conservation District, National Marine Fisheries Service, MRC, Bellingham Council, Pacific Northwest National Laboratories, PU Fisheries Caucus,

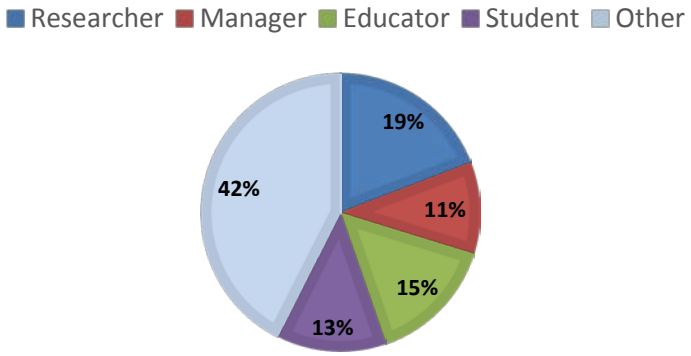
Education: WWU, NWIC, Whatcom Community College, Salish Sea Research Center, BTC Fisheries

Non-Profit: NSEA, Resources, Land Trust, Surfrider, Garden of Salish Sea,

Business/Consultant: Veda Environmental, Lummi Is Wild, Coastal Geologic Services, Anchor QEA, Blue Green Consulting, Evergreen Hemp Company,

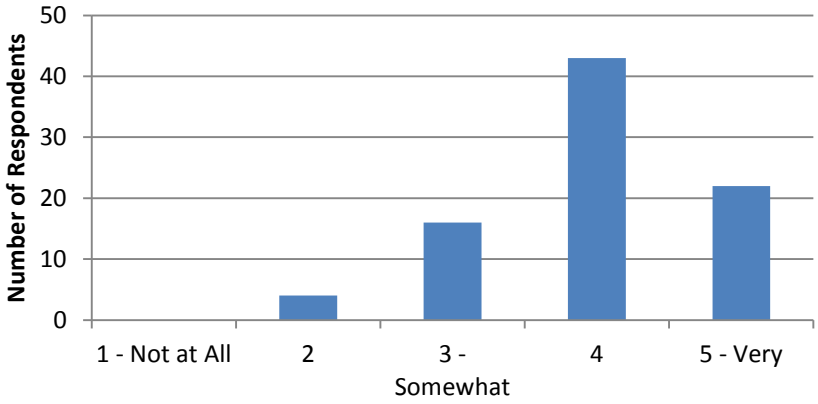
"Other" includes citizens, consultants, government employees, journalists, and Conservation Corp.

2. Please select item which best represents your work/interest;

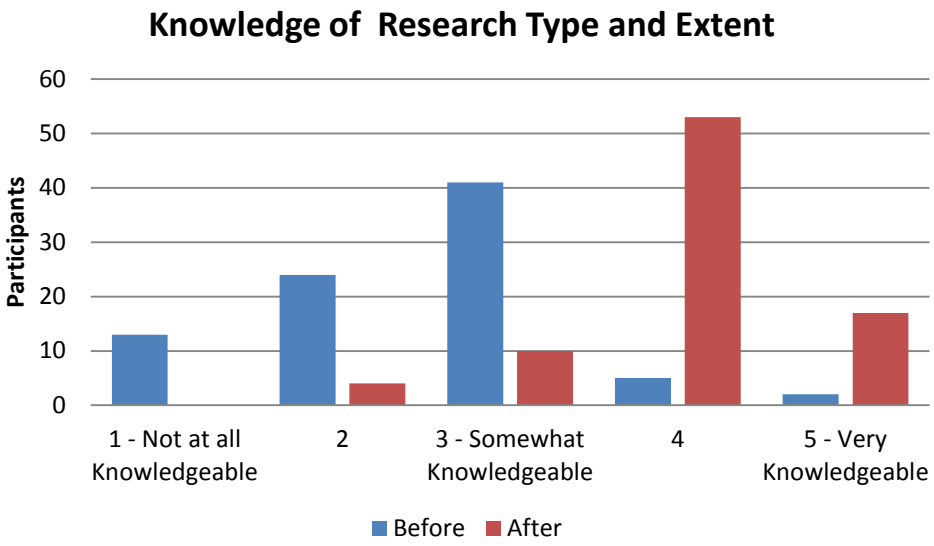


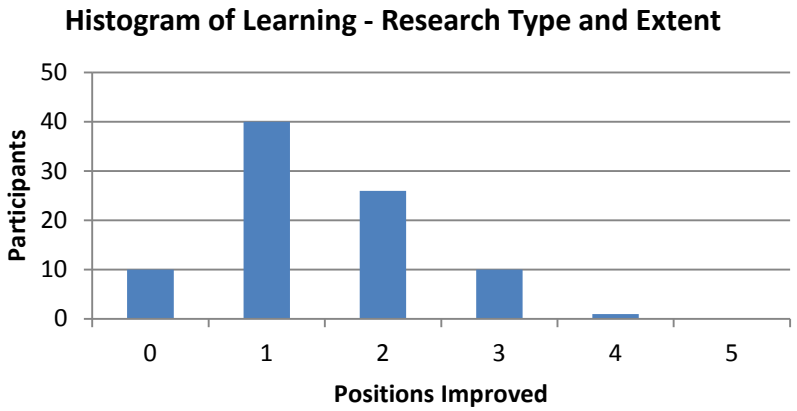
Other: policy, consultants, citizens, government, business, journalist, retiree, regulator, volunteer, activist, habitat restoration and monitoring, supervisor, non-profit, Corp employee

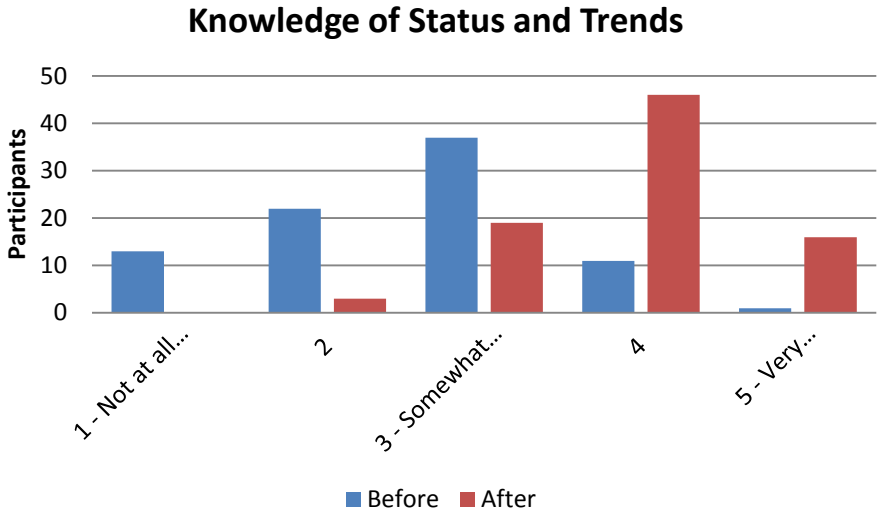
3. Helpfulness of Symposium in understanding local government perspective on key issues. (n = 90, 5 no answer)

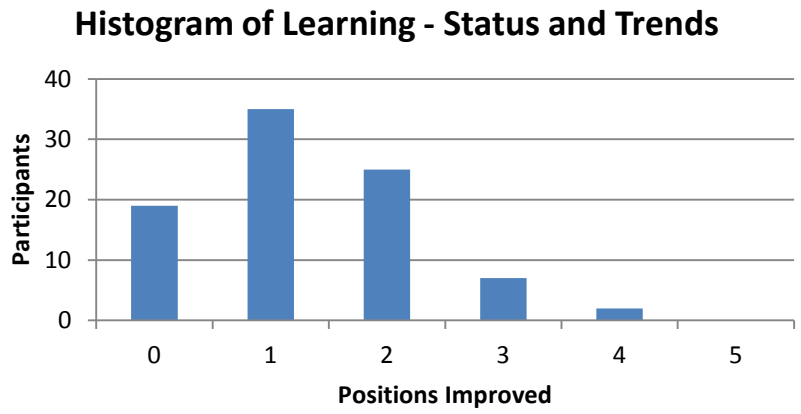


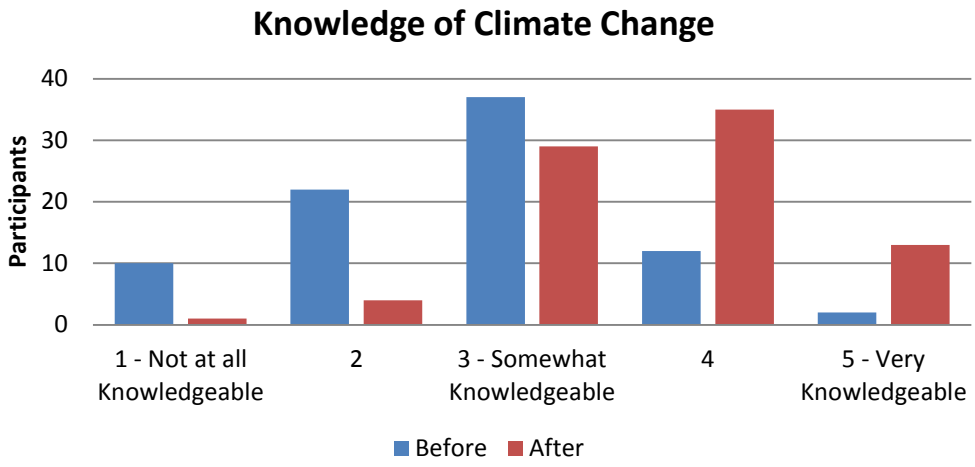
4. Physical, Chemical/Water Quality, Biological Research Programs Knowledge Change Evaluation

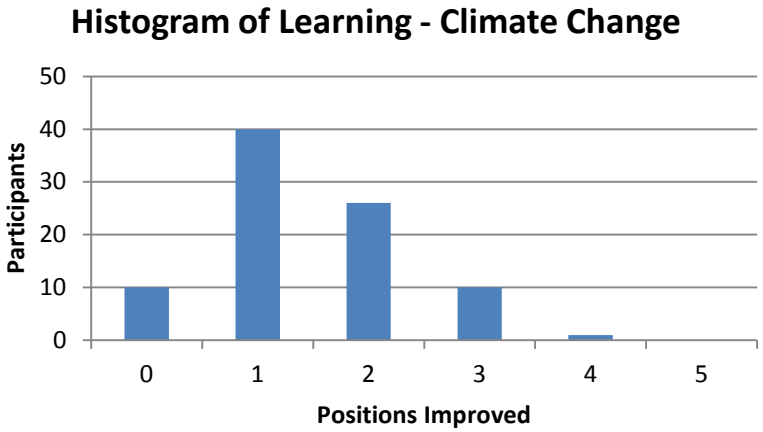




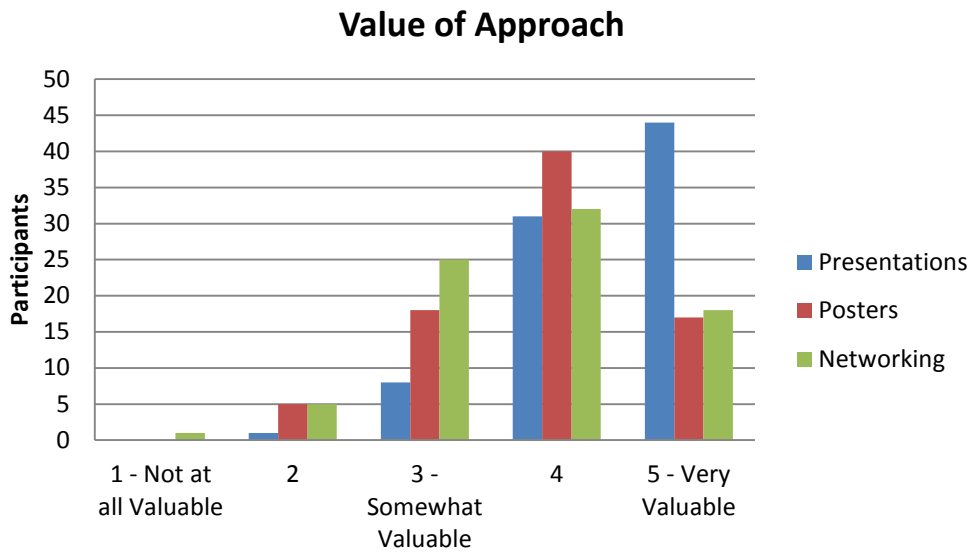



Histogram of Learning - Status and Trends
Participants
40
30
20
10
0
0
1
2
3
4
5
Positions Improved

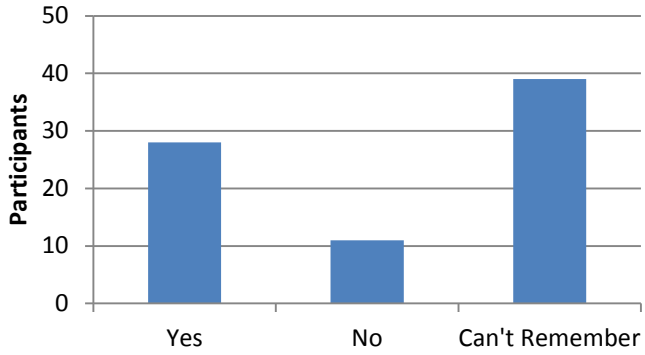

Knowledge of Climate Change
Participants
40
30
20
10
0
1 - Not at all Knowledgeable
2
3 - Somewhat Knowledgeable
4
5 - Very Knowledgeable
Before
After


Histogram of Learning - Climate Change
Participants
50
40
30
20
10
0
0
1
2
3
4
5
Positions Improved

Please rate the value of each of the following approaches in helping understand the status and trends of ecological systems in Bellingham Bay.



5. After attending the symposium, did your perspective on the top three issues change?



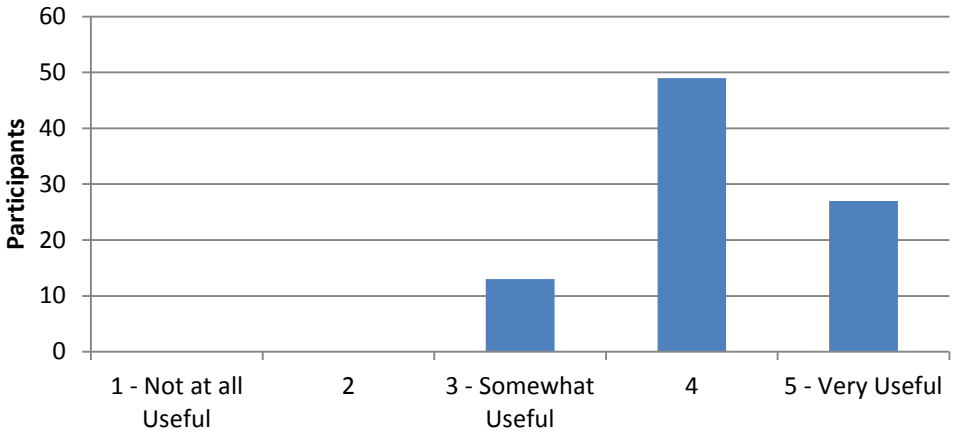
What would you now list as the top 3 issues?

- juvenile salmon, COB Shorelines, FC
- habitat restoration, water quantity (storm events), seasonal fluctuations and adaptation
- climate change - ocean acidification and food web dynamics, accurate risk communication
- funding clean-up, nearshore habitat, water quality
- shoreline and estuary habitat, Nooksack R water quality
- water quality, marine food webs, sediments
- water quality/chemistry, nutrient/sediment changes, vulnerable organisms
- nearshore habitat for juvenile salmon, understanding restoration; clean-up of legacy contaminants; long-term monitoring networks
- stormwater, restoration, data needs
- monitoring ocean chemistry, beach and habitat restoration
- finding what date we collected (N/P) means to bay health, buildup of river debris and silt, danger from runoff
- chemistry/water quality, habitat, human pollution
- local govt needs to make/implement environmental improvements

- water quality, floodplain restoration for sediment input; shoreline armoring
- sediment, nutrients, fc
- Climate change, salmon recovery, pollutants
- various chemicals being leached into Bay, debris, algal blooms
- changes in nutrients, sediment levels, and species composition
- sediment loading in Nooksack Delta; hypoxia and stratification seasonally; stormwater; habitat loss and fragmentation
- fecal coliform, heavy metals, low do
- water quality, stormwater retrofits/projects, lagoon and nearshore restoration
- sedimentation/nutrient loading; stormwater pollution; changes in aquatic benthos
- nutrients, sediments, toxics; which is all ecosystem decline
- sediment toxicity, hypoxia, urban development
- bacteria, sediment and circulation ob water now in Bellingham Bay, climate change
- How can I make a difference, what is our priority
- benthos decline; FC uptick (related?)
- turbidity, Lummis voice/concerns; communities understanding of the meaning of restoration
- fecal coliform, contaminants effects on benthos and sediment characteristics, shoreline armoring and stabilization to reduce erosion ; also shellfish habitat
- restoration technique development; reevaluation of monitoring programs
- climate change resiliency, water quality, restoring ecosystem functions
- contamination, nutrients, pollution; salmon habitat; stakeholder involvement and feeling like all voices have been recognized
- understanding whose involved in phytoplankton blooms; shellfish safety; salmon population restoration
- fecal coliform/Nooksack flows; armored shorelines; funding
- hydrology and sediment transport; climate change; chemical contaminants
- habitat, water quality, tribal rights
- not a good question if you want a good answer, a reminder would be helpful.
- bacteria contamination; sediment contamination; nutrient pollution and DO; fish migration and recovery
- sedimentation, sulfide levels, current flux
- communication with public and elected officials; research
- Nooksack quality; Nooksack sediments; unknowns in Bellingham Bay
- salmon health; water quality (eelgrass, sediments, etc.) starfish wasting
- sediment issues and shift of Nooksack discharge; cement debris on Bellingham shore; 100% adversely affected benthic organisms
- fecal contamination, sediment toxins, sea-level rise
- dredging; pollution police and habitat enforcement police
- moving Lummi Nation into 21st century and hunter gatherer life style not realistic in today's society
- Nooksack sedimentation; water quality; restoring shoreline
- Sedimentation, ?
- land use/input - ag, residential, forestry
- shoreline restoration, freshwater quality, education
- continued work in Nooksack drainage, understanding the benthic changes, flagellates
- contamination coastal access public
- sediment transport issues; phosphates and nitrogen - increasing nutrients
- removing toxins from soil by the bay; cleaning up the bay; preserving salmon streams
- managing inputs to the Nooksack and thus the Bay; restoration as control for pollutants and flooding; stormwater runoff and fecal contaminants
- need more research; management of upland land uses; political leadership/funding
- acidity, nitrogen, mercury
- global warming; pollutant control; logjam shoreline and stormwater issues
- Nooksack River sediment deposition; benthic biodiversity; stormwater quality

- change in nutrient loading to Bay and change in sediment loading
- nearshore, acidification, sediment
- climate change, over population, plankton blooms
- fecal coliform, sediments, stormwater runoff
- My priorities stay the same; I understand them better now and the complexities of the challenges and who is working on them

6. How useful was the symposium in identifying research needs and gaps?



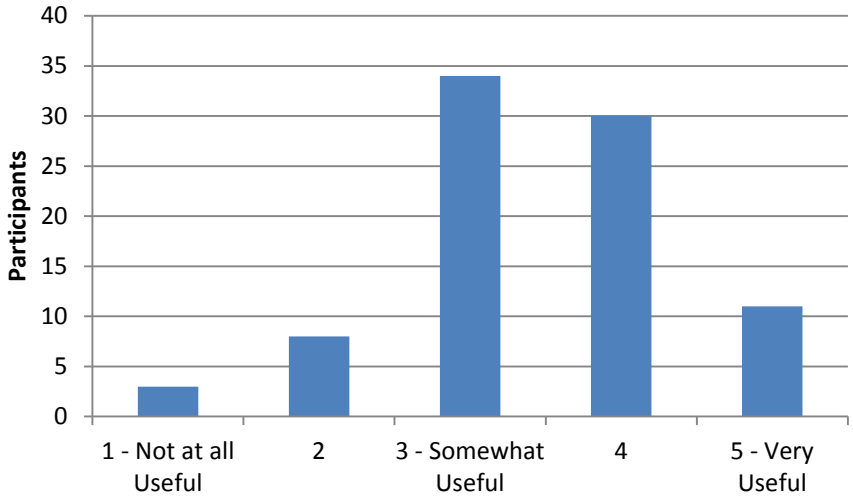
7. Do you have suggestions for additional research needs that were not covered (and if so, please describe)?
    - forage fish
    - data on all such dynamics discussed today - along the ?
    - what is value added of federal and state regulatory oversight
    - Need to monitor long-term at strait of Juan de Fuca to know what is entering water from Pacific and how this is changing over time - has great influence on Puget Sound conditions
    - impact of radiation and migration of debris and invasive species from Japan
    - agriculture impacts
    - how wetland loss plays into WQ, flooding, sediment transport and potential for restoration
    - How quickly do the levels peak and decline (ammonium) - any connection to on-site septic systems?
    - biotoxins
    - baseline marine sediment cores to pre-history depth ~10000 years
    - affects of Bellingham Bay off shore disposal site
    - the idea of using hemp for contaminant remediation deserves looking into
    - PCPs endocrine disruptors and their effects
    - more on phytoplankton
    - economic research, how is the state of the Bay linked to our economy
    - upriver issues - what is causing fecal coliform increase- maybe increased herds of deer
    - local anthropogenic impact vs external effects such as Canadian pollution and climate change
    - endocrine disruptors
    - salt marsh (if ever present in Bay) can it be restored/can it migrate?
    - hatchery and salmon forming impacts on wild salmon
    - connect more directly with land use decisions
    - inland source contribution to state of the bay such as land use, glacier melt and quality and forestry practices
    - impacts of land use on water quality, solutions
    - toxic soil
    - effects of urbanization such as increased driving of gas powered vehicles in terms of runoff into Bay

- taking groups of data/presentations and synthesizing
- sociological/cultural effects - touched on a little bit but never a focus, economics?

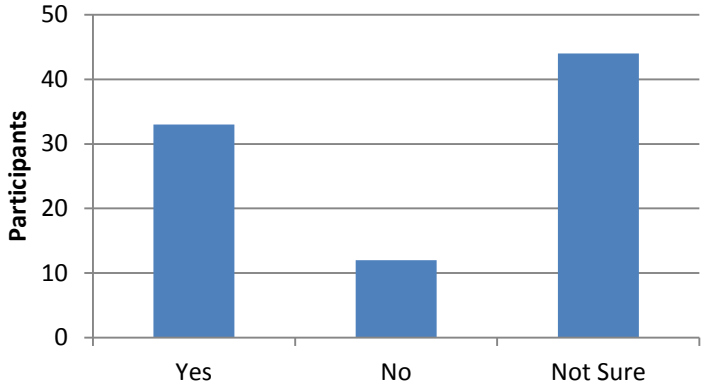
8. Are there particular priorities you think should be focused on?
   - changes in benthic, fish utilization various habitats
   - symposium sidestepped the direct connection between the watershed and the bay
   - commitment to a much more effective and efficient permit streamlining for restoration projects
   - What can everyday people do?
   - Status of Cherry point herring stock or forage fish status in general would have been useful to hear
   - same as 5 and 7
   - ocean acidification, toxic clean-up, restoring balance among low food chain microorganisms
   - depends on availability of resources
   - pollution, gp
   - perhaps hot topics - stars, climate change session
   - salmon recovery, restoration of nearshore habitats
   - clean up efforts and regulations for preventing debris and chemicals from getting into water
   - beach soft banking, less rip rap, seems doable
   - data on wave action throughout bay; data on beach/sediment movement (seasonal); storm event
   - bacteria and sediment
   - What is going on 2009 that is recent and unique to Bellingham Bay?
   - land use regulation
   - legacy wood waste dumping in bay by GP and prior entities approx wM/yds 1950-1970
   - infractions focused on contractors that install new projects without proper permits
   - stormwater and its implication for contamination
   - more focus on solutions and ways to move forward (not easy but need to push forward)
   - I heard a lot of pointing fingers at times of how some people blamed others for the state - which I don't see as productive. So using more collaboration team work so were moving forward
   - further outreach to community members
   - shoreline restoration; deciding on priorities
   - improved habitat
   - what about Victoria sewage?
   - upholding both ends of the Point Elliot Treaty
   - this is a good start, let's focus on one topic next time ; this is ground work. Lets focus on N next time
   - see #12
   - collaboration; turning research into action
   - climate change
   - reach out to City and County councils and public
   - coastal restoration
   - Bellingham and Whatcom County population management
   - buy land, move development back from waterways. Allow the river to maintain active floodplain
   - acidity
   - land use change
   - reduction of development in rural areas, better management practices on land use, storm water management
   - education, what is working? What is not?
   - successful restoration/habitat improvement programs; BMPs that are effective
   - nutrients, HABs
   - education materials developed for general public
   - toxins from toxic bay shores by planting industrial hemp
   - prevention of pollutions and maintenance of oxygen levels
   - Nooksack runoff and sediment transport, ammonium, sediment benthic communities
   - role of the Nooksack on condition of Bay

- acidity of water
- Why is Corp of Engineers not here?
- forage fish
  this was very comprehensive

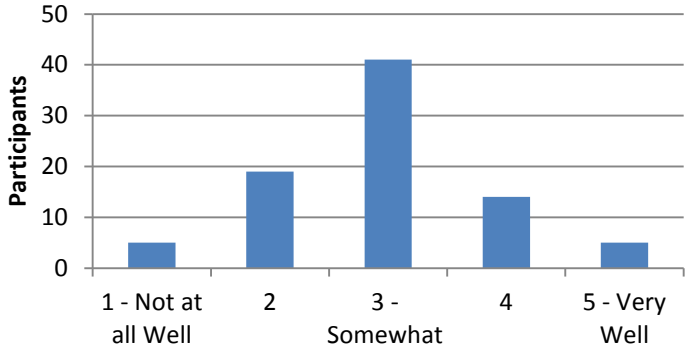
9. How useful was the Symposium in networking and identifying potential partners or collaborators?



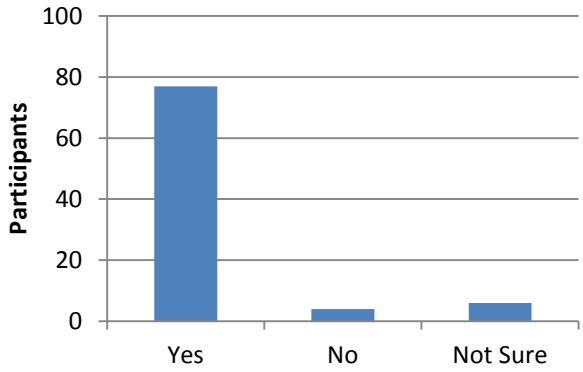
Do you anticipate any new partnerships and/or collaborative projects as a result of this Symposium?



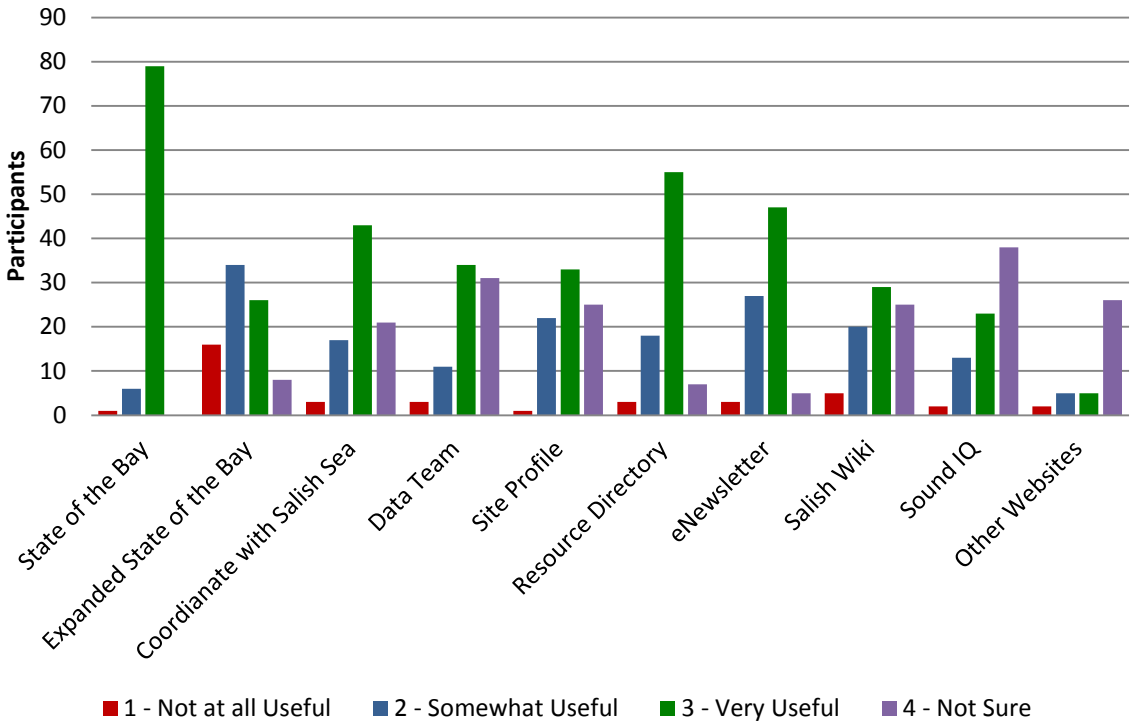
10. Feedback given as part of the registration for this event indicated that many people obtain information on the Bay through various avenues (e.g. newspaper, agencies, and colleagues). How well do you think these avenues keep you informed about Bellingham Bay?



11. Do you think additional effort should be made to expand avenues for keeping informed about Bellingham Bay?



12. One of the objectives of the Symposium is to identify possible approaches for on-going data sharing and enhancing communication and coordination. Please rate the following suggestions/actions in terms of how well you think they meet this objective.



Do you have any other suggestions that are not listed above (including any mentioned during this session)?

- make data analysis and interpretation available on web
- On-going forum with opportunity for key stakeholders engagement would be ideal BBHAT sort of served this purpose but they meet too infrequently
- Most important this is drawing together proceedings and creating document (white, grey peer reviewed) describes major trends, findings, gaps, and future direction
- more effective link and coordination with MRC, Salish Sea Conference, Bham Bay Pilot, PSEMP; Coordinate with don't compete with
- interactive map of all monitoring going on in the Bay of different parameters and by different agencies
- publishing video of the symposium online like Ted talks
- facebook page

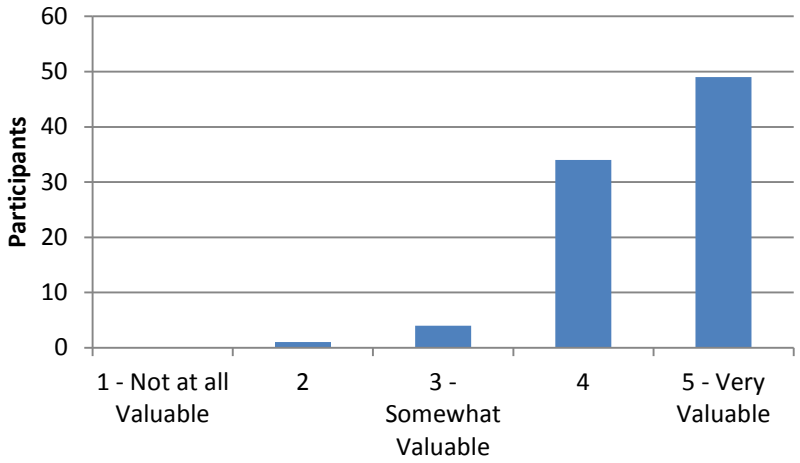
- what about hatcheries? Very little mentioned
- the talks are good, but it was a long day. Too much information by ?; Salish Sea conference already so large
- A networking session, don't do posters during break
- more time for questions and collaboration
- hold a follow-up symposium focused on how upland influences Bay, actions/policy, market based approaches and funding and regulations and how to use to achieve goals
- compiled list of actions
- Very well organized schedule, it was valuable to have general introductions to the Bay (maps, history) followed by the research; combined perspective was also valuable
- As a student, access to the speakers presentation, papers and contact information would be very useful
- Maybe use social media (twitter, instagram) to get attention of WWU students; contact WWU communication students maybe
- data gaps list - coordinate with Masters students or undergrads at WWU and WCC and other research inst.
- document of key findings published after SOTB even for reference by researchers/managers, especially focusing on data gaps that were identified by participating researchers
- groups/action teams; defining zones
- A website organized by Bellingham Bay science consortium
- Have a subgroup ? On a specific topic each year (e.g. year of the fecal)
- BNSF and ACOE should be here for resilience planning in fare of climate changes impacts (e.g. increased waves surge vs shoreline armoring
- facebook page, keep to county level; county should document every study by watershed
- slow change as difficult concept for humans to grasp as meaningful in present time and future
- more work on chemistry
- specific website with projects, links, work, etc. related to the bay
- water quality section of grow Northwest Magazine, Cascadia weekly; public outreach campaign
- Need to reach outside of this audience, more school group, more local papers
- Reach K-12 students so they better understand problems and solutions. Very young kids are motivated when they get information they can understand
- have a symposium for educators showing how to use this data for educating the public. Feature column Bellingham Herald version of "Water Whys" (used to been KGMI/KISM) to inform general public of issues and projects
- Need to focus good data to local and state policy makers to increase funding to increase "action";County and City presentations including small cities
- Make SOB semi-annual
- Nwstraits.org

13. Were there some sessions that were especially important to you and if so, what were they?

- sediment, community structure over time, long-term trends
- Liked the general topics broken into section presentations. I don't follow research so it was a lot of information and somewhat rushed
- Loved the Lummi welcoming and all those at beginning intro helped set the state. More audience engagement and facilitated discussions would have been great
- Important to connect to local government and governance
- salmon and estuary/nearshore habitats
- Local govt and regional research perspective were excellent sessions and complemented each other well
- Most were important because it is all connected
- biological, data
- I enjoyed the variety of information all were of equal importance as the ocean and all waters are linked
- each one had importance and benefits - too tough to choose
- all topics interact so all were very important

- the actionable/synthesis is valiant effort but so many people had already left conference
- regarding specific issues regarding seagrass, marine mammals, shellfish, sea stars
- Physical processes as inspiration for Jeff Co. MRC (esp. restoration prioritization by CGS)
- Juvenile salmon in the nearshore because I participated in that project
- all
- stormwater monitoring - some good data but still many data gaps; sediment quality in Bellingham Bay - drastic change in benthos in only a few years
- Bert's history, PSAP monitoring gaps, combined perspective panel
- biological processes
- local govt.
- All were great. Very interesting information shared
- key issues
- overall thank-you
- chemistry/water quality presentation b/c I am interested in a potential career in stormwater management.
- Biological ecosystems and water quality were important because the most current research and findings are useful in deciding where to direct efforts of student research in the field of ecology
- I found Randy's message very interesting about the need to move forward when do we have enough science to make good decisions?
- I found the local govt perspective, biological processes, PSEMP
- The ones introducing models for monitoring (directly help make my research more thorough)
- session about regulations and what they are dealing with; nutrient and do session
- habitat, this is direct impact to improve conditions
- starfish, physical processes
- all were equally useful
- I got something out of each session
- all physical, Valerie, Brandi
- data driven presentations best
- history from Bert Webber; DOH web managing; overall stormwater data
- last couple panels for symposium synthesis
- last session wrap up and hearing from audience
- ones with rich discussion
- combined perspective, making the parts fit
- local government perspective
- physical processes; chemistry and water quality
- all were valuable, good to have all sides of the story
- understanding research ?
- chemistry, physical, biological - a good group of presenters in each session
- coastal restoration work
- Bert's overview
- I'm glad Native Americans were given chances to share their needs and perspectives. We need to work with them not against them
- sea star wasting, key issues session, review by Bert Webber
- physical processes - closest to my work focus
- the chemistry and water quality session, Bert Webbers talk, physical process session
- Jon Hutchings session on funding
- all technical sessions
- Eric Grossmans and Chris Krembs presentations were great!
- Bert Webber! Also Lummi welcoming, biological ecosystems
- Bert Webber, Valerie Partridge, Ben Miner
- I got most out of the physical processes panel; probably I leaned the most and the quality of the presenters

14. Please rate the overall value of this Symposium.



15. Do you have any other questions, comments, or suggestions?

- More time for questions and interaction
- compile and make list of data gaps available; more about public engagement efforts, this was heavy in research but devoid of discussion over ? Efforts to address these issues including how to communicate about them; more time for questions throughout the symposium. almost every panel was full of men, consider potential to diversify by gender
- Great symposium
- panel focusing on key hurdles and or creative solutions; not enough time to look at posters; would love to serve on next planning committee for next symposium Hilary@VedEnv.com
- Water cooler would be great, loved the specific focus, Bellingham Bay field trip?, include some social science, crowded agenda, break necessary for networking
- Thank-you, so cool!
- Make available resources pertinent to all presentation s for further info on the topic, Post presentation videos; more outreach - publicly available accurate and balanced and detailed infor isn't coming out
- It was a long day of presentations - keeping to the schedule and not cutting breaks short would keep the audience more refreshed and engaged. Overall great symposium.
- Need more time for breaks to be valuable; Speakers should be encouraged to stay on time by having someone keep time and raise a sign when they have 2 minutes left (for example). This has worked well in past conferences so everyone sticks to their allotted time slot. Should be enforced so breaks don't get cut down.
- Please compile and share recommended data gaps, more networking time needed
- There was so much similar data presented very fast and some of the overlap was redundant yet confusing
- Next time had an option for composting of used plates, food and napkins for food services
- all hatchery managers should be invited; maybe get BTC fisheries students informed; wish all salmonids were of concern not just listed species
- keeping approximately this size is good. Perhaps less speakers
- A pamphlet with resources, where presenters are from/what they do, use, etc.; less sitting time, keep us moving
- Break out groups? Set timer for speakers so room for questions, hard to sit through 2.5 - 3 hours with 15 minute break
- Summarize data needs from various stakeholders and agencies and collaborate to secure funding
- more networking time, maybe fewer speakers or make it a couple of days so there isn't such a time crunch
- This was an incredibly long time to be sitting. I might suggest letting everyone stand in their place and stretch for a minute in between each presentation.
- Trying to keep speakers to a specific time limit; emphasizing conclusions in a basic way so people without a science background can understand
- Thanks, congratulations on a good event
- Really great idea. But there was a lot of info and a long time to sit and listen to lectures, But I really enjoyed hearing about all the data that out there about Bellingham Bay

- not enough time for networking; more time for interaction. I encourage you to look at Salish Sea Forum format (Nichole Fagin) where there are presentation but majority of time is small group work then larger interactive workshop
- Low do in Silver Creek and link to low return of juvenile Chinook.
- Thank you so much! This was so helpful to me personally in bringing me up to speed on the general overview of the state of the bay. I hope that the many other scientists, students, policy makers, educators who would be interested in it can easily access and become aware of the video and presentations from today.
- Thank you
- Disposal of lunch plates, cups etc unclear. Should be zero waste event.
- Not everyone is well versed in the terminology. Definitions and why they are important e.g. stratification, hypoxia, flatu… Also the maps with scientific data I was not sure what I was looking at. More networking time.
- Thanks!
- get all info in one place; The video going on in the background during introductions was incredibly distracting. The projection screen was too low; obscured for people sitting in the back. It was incredibly powerful to sit and overlook the Bay during this conference! Very good venue thanks for the delicious food, thanks to keeping with the schedule as well.
- great work
- build in more time for questions, work with WWU to build in some of these projects into class curriculums
- great food; a bigger venue so more people can attend; I really like that we all heard the same presentations though - having to decide which track to attend like at bigger conferences is stressful. I liked that I didn't have to decide here. Also likes that the event was held the same week as the state of the union address.
- subgroups for continued collaboration on specific research and/or management topics
- Hard to read many slides - graphs and charts; no time for questions a lot of empty seats for a full event that people were turned away from
- The symposium was excellent. Not being science based may have affected my rating to be low as I won't utilize the networking as much.
- session chairs need to moderate their speakers to stay within given time limits. Most all ran too long.
- graphic Chris Krembs with data; get together; big questions and develop models around them ????
- Thanks for a very well organized symposium
- presenters should explain scientific terms better
- would love to partner in water level implementation from Bellingham Bay to Padilla Bay
- put time limit on presentations; shorten symposium or split into two days
- thanks!
- connect with educated activists
- The most useful thing for advocacy understanding of Bell Bay science/health/processes would be longer term funding, 1-2 year duration grants are not appropriate
- as 80 yrs old opening speakers were not heard by me - please have mikes ready for switch
- We need a proceedings or published summary available (and directory and contacts for speakers) on a website for all - the posters, the conclusions and the research needs at the minimum. Not so much about organizing the conference - you have lived it for others but we the audience aren't really concerned with this. Whish more elected officials had stayed. this is important . They should listen with their own ears, not staffers.
- more information on acid water
- Keep on time! The lack of presenter moderation took away from questions and networking time.
- The folks here today are the choir, we need other groups present. Too many agencies and organizations working independently on water issues. We need a coordinated approach and effort and outreach materials. Lets not confuse the citizens we work with and for.
- Well done! I appreciated having Lummi Nation representatives but
- list of poster presenters and their topics especially students who stepped up to present. Lunch was awesome, Avenue rocks! More networking time
- Thank you! Need contact information name, email, and association. Send us email address of presenters plus list of participants and post presenters power points and posters on-line; summary of all needs and gaps identified by speakers

- maybe a time for facilitated discussion groups earlier in the day; the general public is not well -informed about water quality issues; have presenters summarize their scientific data and explain implications as a higher percentage of their presentations (less time on the details of their studies)
- Initially I missed the symposium and wasn't happy, better advertising
- great to have experts doing current research involved in the symposium, like the session format, good PowerPoint's by all the presenters, like the Lummi involvement
- Thanks to Sue and sub-committee; few policy makers here. Mayor and Executive left. Carl Weimer and Pinky Vargus; Get exposure to electeds beyond Carl; Pinky here was only City Council person attending; Mayor and Executive welcome us then leave. So much for political support.
- Loved the Lummi greeting albeit a bit long
- Have brainstorm for not just research needs but actions that can be taken and how citizens can get involved
- Publish presentations
- shorter presentations, more panel discussion
- Breaks/networking opportunities could be longer or more frequent. It's difficult to sit through ~ 8 hours of presentations and it would be great to be able to interact with people more.
- Do it again next year!
- too much, too heavy, need more time

Public Speaker Series Summary Report

Attachment D: Bellingham Bay Symposium Research Needs

State of the Bay Research Symposium
Research Needs/Next Steps
March 12, 2015

Note: The information summarized in this paper comes from the PowerPoint slides used by presenters, the list compiled by Jon Hutchings in the "Combined Perspective" session, and suggestions made in the program evaluation. It does not include any suggestions that may have been made verbally by presenters during their presentations (except for Combined Perspective session).

Key Issues, Challenges, and Research Needs - Local Government Perspective

Whatcom County

- Key Challenges - Finding sources, private property issues, weather patterns, public resistance, trans-border sources
- Research Needs - Determining sources of pollution; evaluating effectiveness of Best Management Practices (BMPs); pollution transport

City of Bellingham

Port of Bellingham

- Key Challenges - High costs and limited funding, historic contamination, 150 years of owners and operators, highly modified systems, permitting uncertainty

Physical Processes

Eric Grossman, U. S. Geological Survey - Information Needs

- Aggradation rates and phasing of sediment transport, metrics to detect sediment management effects
- Quantitative assessment of nearshore ecosystem function to recover losses, offset estuary demands
- Value of habitats as "Green Infrastructure" to help mitigate impending natural hazards

Tarang Khangaonkar, Pacific Northwest National Laboratory - Summary and Discussion

- Salish Sea Model (SSM) / Bellingham Bay Sub-basin
    - Existing scenarios - 2006, 2007, and 2008
    - Future SLR and climate scenarios - Y2020, Y2040, Y2070
- Bellingham Bay Model (BHM)– high resolution model (2009)
    - Intertidal hydrodynamics
    - Oil spill / particle tracking tool
- Characterization of influence of Fraser River …
- Accurate computation of residence / flushing time …
- Fish like particle / larvae tracking …
- Other research applications development needs …
    - Local effects of nutrients and sediment loads
    - Sediment diagenesis effects
    - pH / ocean acidification impacts
    - Submerged aquatic vegetation / eel grass

Jim Johannessen, Coastal Geologic Services, Inc

Data Gaps Identified (CGS 2013):

- Juvenile salmonid utilization of the marine and estuarine shorelines (Similar to Beamer and Fresh 2012)
- Vulnerability assessment of nearshore habitat types to climate change impacts
- Detailed studies of coastal tributaries
- Data compilation and analysis of wave and erosion rates

Other Data Gaps:
- Wave data – long term
- Water level data – long term
- Longer term beach monitoring and analysis
- Restored beach sediment transport processes/thresholds
- Robust forage fish spawning sampling

Conclusions
- think big
- time to reimagine our aging shoreline infrastructure
- need to give up some (old fill) space
- make enhancement a part of cleanup
- sea level rise can be an opportunity; change is needed
- education & outreach is essential—ongoing
- streamline design & permitting for restoration/enhancement
- design at intersection of resource and owner goals

Mark von Prause, Washington Department of Ecology, Marine Monitoring Unit
Related Challenges and Priority Gaps
- To determine what drivers are responsible for the uptake and release of freshwater nitrogen in the Nooksack River (Regional Modeling)
- To determine the mechanisms responsible for the overall processing of nitrogen in the Nooksack River. Are watershed processes playing a significant role in the reduction of nitrogen and concentration and flux observed near Brennan?
- A need for continuous monitoring for turbidity and nutrients at Brennan to understand the transport dynamics associated with changes in seasonal flows.

Chemistry and Water Quality

Christopher Krembs, Washington Department of Ecology
- Inter-annual variability in phytoplankton biomass could explain changes in macro-nutrients?
- What controls phytoplankton inter-annual variability could also control nutrients in Puget Sound?

Valerie Partridge, Washington Department of Ecology
Challenges and Opportunities Benthos
- Research Gaps:
    - Life histories
    - Trophic webs, interactions
- Challenges
    - Funding & staff not unlimited
    - Not over-sampling fixed stations
- Opportunities
    - Program revision

Brandi Lubliner, Washington Department of Ecology
Recommendations
- Stormwater Management
    - Discharges from basins with predominantly commercial and industrial land uses are a priority for housekeeping and treatment BMPs
        - Hydrocarbons, metals, total nutrients
    - Build-up during the dry season does occur for metals, hydrocarbons and total nutrients
        - Housekeeping BMPs such as street sweeping useful prior to fall rains

- Further analysis
- Future monitoring and modeling

Biological Ecosystems

Jude Apple, WWU Shannon Point

- Work with modelers to integrate *in situ* measurements into existing circulation models
- Use models to predict transport of low DO waters into water column and nearshore habitats
- Reduce organic matter delivery and production
  - Riverine input of woody debris
  - Nutrient management to reduce phytoplankton blooms, considering timing of loading and nutrient ratios (e.g. Ecology Nooksack data)

Marco Hatch, Director National Indian Center for Marine Environmental Research and Education

- We need to coordinate our efforts
- Eelgrass in Bellingham Bay faces multiple stressors
  - H_2S
  - Disease
- Work with Indigenous researchers

Eric Beamer, Skagit River Cooperative

Preliminary take home ...

- Nooksack delta and Bellingham Bay shoreline habitats are consistently used by juvenile Chinook salmon
- Within system (Nooksack) and out of System (Whidbey Basin) juvenile Chinook are present.
- In B'ham Bay, protected nearshore and lagoon habitats with freshwater are important early in the year
  - Fish are present long enough to be influenced by good and bad (food, toxins, etc)
- Progeny from local spawners (Whatcom Creek) likely have a (minor but detectable) influence on juvenile Chinook distribution within B'ham Bay.
- Within the system, landscape Connectivity is important
  - Linkage between estuary connectivity and WRIA 1 nearshore projects ideas beyond B'ham Bay (north). Likely not any value to Nooksack Chinook, but might be valuable if connectivity is improved
- Silver Creek and upper estuary connected to Silver Creek
  - Investigate DO further
  - Improve river and tidal flushing; improve watershed inputs

Major Needs (To Dos)

- Update Nooksack River juvenile Chinook outmigration estimates by life history type (migrating fry, parr, & yearling)
- Update system density dependence analyses with better outmigration results & include effects of Whatcom Creek
- Update bioenergetics with better density (outmigrant) data
- Update with 2014 genetic origin result
- Incorporate results into "tool"
- Apply results to salmon recovery planning efforts in WRIA 1

Regional Research Perspective

Ken Dzinbal, Monitoring Program Manager, Puget Sound Partnership

Results

- Produced a final list of 56 monitoring gaps (July 2014)
- Gaps were subsequently classified into 3 policy categories:
  - Gaps directly supporting the Vital Sign indicators
  - Gaps that support one of the Partnership's three strategic initiatives (habitat, shellfish and stormwater)
  - Gaps related to other scientific priorities (e.g., ocean acidification)

- Gaps in 9 Vital Signs:
- Gaps that support one of the Partnership's three strategic initiatives:
    - Stormwater (21 gaps identified)
    - Habitat (24 gaps identified)
    - Shellfish (14 gaps identified)

  Gaps addressing other scientific priorities
    - Ocean acidification (9 gaps)
    - Climate change (12 gaps)
    - Food web dynamics
    - Species status

Combined Perspective

Suggestions from Panelists and Audience

- Implications of changing Nooksack estuary channel on sedimentation, FC, recovery plans
- Sediment and chemical constituent delivery to bay, where it is coming from.
- Biotic indicators in Nooksack
- Variability in sediment loading from Nooksack
- Applications and validation of circulation models in Bellingham Bay
- Portfolio of status and trends work + portfolio of predictive models, develop monitoring program around models
- Conceptual model of influences and factors on bay – BBay specific education and outreach that captures our collective understanding.
- More opportunities for collaboration and information sharing
- Advance conceptual models into something more numerical
- What happened in the watershed between 2004 and 2008 related to FC?
- Basic data collection = circulation model,
- Flagellate populations
- What do we not need to do in order to act…
- Unified messages and collaborative questions – sharpen the questions and improve their place-base.
- More and better spatial resolution for all PSP measures
- Climate change impacts…
- Turn collaboration and research into community will to act.
- Leverage data collection using mosquito fleet and college students.
- Industrial hemp plantings to remove toxins
- Create discipline groups out of this symposium to continue collaborations. Meet on a regular schedule.
- Include activists and other community members in collaborations.
- Can dredging resolve sediment loading issue?
- Can law enforcement officers patrol pollution problems?
- Policy group?
- Nexus in data gaps, overlaps that can be funded among governments and among subjects.
- Characterize uniqueness of Bellingham bay challenges.

Program Evaluation Suggestions for Additional Research Needs

- forage fish
- data on all such dynamics discussed today - along the ?
- what is value added of federal and state regulatory oversight
- Need to monitor long-term at strait of Juan de Fuca to know what is entering water from Pacific and how this is changing over time - has great influence on Puget Sound conditions
- impact of radiation and migration of debris and invasive species from Japan
- agriculture impacts

- how wetland loss plays into WQ, flooding, sediment transport and potential for restoration
- How quickly do the levels peak and decline (ammonium) - any connection to on-site septic systems?
- biotoxins
- baseline marine sediment cores to pre-history depth ~10000 years
- affects of Bellingham Bay off shore disposal site
- the idea of using hemp for contaminant remediation deserves looking into
- PCPs endocrine disruptors and their effects
- more on phytoplankton
- economic research, how is the state of the Bay linked to our economy
- upriver issues - what is causing fecal coliform increase- maybe increased herds of deer
- local anthropogenic impact vs external effects such as Canadian pollution and climate change
- endocrine disruptors
- salt marsh (if ever present in Bay) can it be restored/can it migrate?
- hatchery and salmon forming impacts on wild salmon
- connect more directly with land use decisions
- inland source contribution to state of the bay such as land use, glacier melt and quality and forestry practices
- impacts of land use on water quality, solutions
- toxic soil
- effects of urbanization such as increased driving of gas powered vehicles in terms of runoff into Bay
- taking groups of data/presentations and synthesizing
- sociological/cultural effects - touched on a little bit but never a focus, economics?

Public Speaker Series Summary Report

Attachment E: Bellingham Bay Symposium Resource Directory

Bellingham Bay Research Symposium

Resource Directory - Version June 26, 2015

http://whatcom.wsu.edu/nr/sotb

Physical Processes

Symposium Presentations

Presentation Title: Seafloor Mapping and Sediment Transport Studies of Dynnamic Historic Change Across the Nooksack River Delta

Researcher: Eric Grossman, PhD, U.S. Geological Survey Pacific Coastal and Marine Science Center and Research Faculty Department of Geology, Western Washington University

Bio Brief: Dr. Eric Grossman is a coastal and marine geologist who conducts research on hydrodynamics, sediment transport and coastal change to inform how land use and climate change influence ecosystems, infrastructure and communities. He has published extensively on sea level rise, coastal geologic framework, coastal dynamics, and more recently on assessments of coastal vulnerability and resilience relative to ecosystem restoration and community health

Abstract: Analyses of geophysical data indicate that the Nooksack River Delta has experienced the greatest amount of historical sedimentation and progradation of western Washington deltas. While the river's load of sand has helped to extend the delta seaward up to 1.5 km since the mid-1800s, the fine fraction of muds have largely been exported to deeper areas of Bellingham Bay and beyond. This is in part due to naturally high sediment loads sourced from the steep, young geology of the North Cascades, but also to land use activities including forestry practices, levees and channelization for flood mitigation that have modified flows and rerouted sediment through time. New measurements of the fluvial sediment load helps to quantify the sediment budget including the amount of sediment being retained within the lower river and delta and that which is exported and affects marine water quality and benthic habitats. Coupled climate change and hydrology models project a 3-6 times increase in fluvial sediment delivery by 2080, which will likely influence channel aggradation, flood risk, ecosystems, habitat restoration, and water quality as more precipitation occurs as rain than snow and sea-level rise traps more sediment in channels.

Website/Links: : http://www.skagitclimatescience.org
http://puget.usgs.gov/

Presentation Title: Shoreline Change and Nearshore Enhancement Opportunities in Bellingham Bay

Researcher: Jim Johannessen, MS, Licensed Eng. Geologist, Coastal Geologic Services, Inc.

Bio Brief: Jim Johannessen runs Coastal Geologic Services Inc. in Bellingham, which specializes in beach, bluff and estuarine processes, coastal erosion mitigation, coastal restoration, and applied coastal management consulting. Jim has designed over 70 implemented beach and estuary restoration/enhancement projects throughout the Puget Sound area since starting CGS in 1993, including Marine Park and Boulevard Park in Bellingham and Lummi Shore Road beach nourishment. Jim and CGS have produced restoration designs and guidance documents for the Army Corps, WDFW, and many tribes and local governments.

Abstract: The short talk will provide an overview of finding and research needs for coastal processes and nearshore restoration planning and design in Bellingham Bay. Major shore changes will be outlined, existing data and results of the recent WRIA 1 nearshore habitat prioritization, and research needs will be outlined. Posters will also be displayed.

Website/Links: www.coastalgeo.com,

http://www.cob.org/documents/pw/environment/restoration/master-plan/wria1-nearp-report.pdf, http://wdfw.wa.gov/publications/01583/

Presentation Title: Circulation Model for Bellingham Bay

Researcher: Tarang Khangaonkar, PhD, Pacific Northwest National Laboratory (PNNL)

Bio Brief:

Abstract:

Website/Links:

Presentation Title: A Review of Long Term Freshwater Quality Trends for the Nooksack River at Brennan

Researcher: Markus von Prause, Washington State Department of Ecology, Freshwater Monitoring Unit

Bio Brief: Markus Von Prause recently works for the Washington State Department of Ecology's River and Stream Monitoring Program as a Water Quality Scientist. His expertise focuses on freshwater quality monitoring and reporting for the state of Washington.

Abstract: The Washington State Department of Ecology (Ecology) and its predecessor agency have operated an ambient water quality monitoring program since 1959. Since 1971, the program has been monitoring freshwater quality on the Nooksack River (Station 01A050-Nooksack River @ Brennan). The principal goals of the ongoing program are to monitor long term trends in water quality in the Nooksack River, support a probabilistic monitoring program and support Clean Water Act Section 303(d) reporting.

This presentation includes:

- An overview of Ecology's freshwater ambient monitoring program.
- A review of current water quality index trends (1994-2013) for the long term station 01A050 (Nooksack River @ Brennan).
- A summary of annual and seasonal nitrogen /phosphorus concentrations, flux/yield trends (1994-2013) residing in the Nooksack River at Brennan.
- Potential drivers affecting annual and seasonal nitrogen /phosphorus concentrations & flux/yield trends.

A description of Ecology's long-term monitoring program and access to historical data can be found on Ecology's Internet web site.

Website/Links: www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html

Other Current/Recent Research

Topic: Woody Debris

Short Description: Todd Eastman investigated origins of wood debris covering local marine shorelines. Monitored project sites with systematic photo documentation, weather and tide data collection, debris volume estimates and benthic population analysis. Reported project findings and recommendations.

Organization/Contact: Todd Eastman, Kulshan Environmental Services, 360-319-1163

Link: http://kulshanservices.com/uploads/2/8/4/7/2847886/todd_eastman_cv.pdf

Topic: Bellingham Bay Circulation and Residence Time Modeling

Short Description: The use of efficient and effective, freely available software is illustrated by a project to model circulation and tracer

transport in Bellingham Bay in northern Puget Sound

Organization/Contact: Bert Rubash, Raincoast GeoResearch; kilaruba@copper.net

Link:

Topic:

Short Description:

Organization/Contact:

Link:

Additional Resources including Past Research

Topic:

Short Description:

Organization/Contact:

Link:

Chemistry and Water Quality

Symposium Presentations

Presentation Title:

Researcher: Christopher Krembs, Washington State Department of Ecology

Bio Brief:

Abstract:

Website/Links:

Presentation Title: Sediment Quality in Bellingham Bay - Decadal Trends and Current Patterns

Researcher: Valerie Partridge (presenter), Margaret Dutch, and Sandra Weakland, Washington State Department of Ecology, Marine Monitoring Unit; Lucy McInerney, Washington State Department of Ecology, Toxics Cleanup Program

Bio Brief: Valerie Partridge is a member of the Marine Monitoring Unit of the Washington State Department of Ecology's Environmental Assessment Program. She conducts statistical analyses of data from the Puget Sound Ecosystem Monitoring Program (PSEMP) sediment monitoring programs.

Abstract: As part of its ongoing marine sediment monitoring program, the Washington State Department of Ecology has sampled sediments in northern Bellingham Bay for chemical contaminants, toxicity, and benthic invertebrate communities (benthos). In this talk, results will be presented for benthos and chemistry from the 2010 survey of Bellingham Bay. These results will be placed into context with regional results from 1997 and 2006, as well as pan-Puget Sound results from 1997-2003 and 2004-2014. In addition, benthos results from the annual sampling of one long-term station in central Bellingham Bay will be presented.

Website/Links: www.ecy.wa.gov/programs/eap/sediment

Presentation Title: Fecal Coliform Monitoring in Marine Water to Classify Commercial Shellfish Growing Areas

Researcher: Jean Snyder, Washington State Department of Health, Office of Shellfish and Water Protection

Bio Brief: Jean Snyder is the Restoration Program Lead at Washington State Department of Health in the Office of Shellfish and Water Protection. She works to protect public health by classifying shellfish harvest areas and working with internal and external partners to find and correct nonpoint fecal pollution sources that reduce marine water quality and cause closures of commercial and recreational shellfish beds.

Abstract: WDOH staff continually analyzes marine growing areas to make sure shellfish harvested are safe to eat. This work involves completing an evaluation of the growing area, assigning a classification and monitoring water quality for changes. This talk will briefly provide an overview of this process including marine water quality monitoring for fecal coliform. Then, this talk will discuss the fecal coliform trends in Portage Bay and introduce WDOH's new Commercial Shellfish Map Viewer.

Website/Links: http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/GrowingAreas

Presentation Title: Stormwater Data Characterization: Results from Phase I Monitoring 2007-

Researcher: Brandi Lubliner, Washington State Department of Ecology

Bio Brief: Brandi Lubliner, PE works for the Washington State Department of Ecology in the Water Quality

Program as a stormwater engineer and permit monitoring coordinator.

Abstract: Ecology requires monitoring under the NDPES Municipal Stormwater Permits. In the prior permit (2007-2013) monitoring was conducted stormwater outfalls by the Phase I permittees. In the current permit (2013-2018) Ecology gave the option to Phase I and Phase II permittees of continued outfall monitoring or choose a new paradigm of pooling resources for regional scale stormwater impacts monitoring in receiving waters. This talk will briefly explore the results of the outfall monitoring compilation study and the planned monitoring under the current permit.

Website/Links: http://www.ecy.wa.gov/programs/wq/stormwater/municipal/s8dswmonitoring.html
http://www.ecy.wa.gov/programs/wq/stormwater/municipal/rsmp.html

Other Current/Recent Research

Topic: Eyes over Puget Sound

Short Description: Washington Department of Ecology's Marine Monitoring Unit conducts a variety of marine observations including monthly sampling at 40 core monitoring stations. A floatplane is used to cover the widely distributed station network. Photos are taken of Puget Sound water conditions during routine transit. "Eyes Over Puget Sound" is the result.

Organization/Contact:

Link: *http://www.ecy.wa.gov/programs/eap/mar_wat/surface.html*

Topic: Puget Sound and the Straits Dissolved Oxygen Assessment: Impacts of Current and Future Nitrogen Sources and Climate Change through 20170

Short Description: Washington State Department of Ecology and Pacific Northwest National Laboratory have developed circulation and water quality models of the Salish Sea. This includes all of Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia. The purpose is to evaluate relative impacts on dissolved oxygen from human nutrient loads, Pacific Ocean conditions, and climate change.

Organization/Contact: Dept Ecology Andrew Kolosseus (website contact); Mindy Roberts, Dept Ecology; Tarang Khangaonkar PNNL

Link: *http://www.ecy.wa.gov/programs/wq/PugetSound/DOModel.html*

Publication: *Puget Sound and the Straits Dissolved Oxygen Assessment: Impacts of Current and Future Human Nitrogen Sources and Climate Change through 2010*, Publication Number 14-03-007

Topic: Marine Water Condition Index (MWCI)

Short Description: The Marine Water Condition Index (MWCI) is one of the Puget Sound Partnership's vital signs. The Puget Sound Dashboard of Vital Signs was established in 2010 to help identify whether progress is being made in restoring Puget Sound. The MWCI provides information on regional trends and key questions underlying the MWCI.

Organization/Contact: Christopher Krembs, Washington State Department of Ecology

Link: *http://www.ecy.wa.gov/programs/eap/mar_wat/index.html*

Publication: *Marine Water Condition Index: Washington State Department of Ecology*, Publication Number 12-03-013

Topic: Fecal Coliform Monitoring

Short Description: Molluscan shellfish such as clams, oysters, and mussels feed by filtering large volumes of seawater. Along with food particles they can also absorb bacteria, viruses, and other contaminants that are present. If contaminant levels are high enough, shellfish harvested from these areas can make people sick. Staff working in the Growing Area Program continually analyzes marine growing areas to make sure shellfish there are safe to eat. This work involves: completing an evaluation of the growing area; assigning a classification to the area based on the results of the evaluation; and monitoring shellfish growing areas for changes in water quality.

Organization/Contact: Department of Health, Jean Snyder, jean.synder@doh.wa.gov, 360-236-3349

Link: http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/GrowingAreas#classify

Topic: BEACH Monitoring

Short Description: The Washington BEACH Program is led jointly by the Washington State Departments of Ecology and Health, and consists of county and local agencies, tribal nations, and volunteers.
The mission of the BEACH Program is to reduce the risk of disease for people who play in saltwater by:

- Monitoring bacteria levels at popular, high risk beaches.
- Notifying users when bacteria results are high or when a known pollution event, such as a sewage spill, has occurred.
- Educating the public about the risks associated with polluted water and what each of us can do to reduce that risk.

There are 4 monitoring sites in Whatcom County – two in Bellingham Bay (Marine Park, Little Squalicum Park)

Organization/Contact:

Link: http://www.ecy.wa.gov/programs/eap/beach/index.html

Topic: Caged Mussel Study

Short Description: In the winter of 2012-13 the Washington Department of Fish and Wildlife, with the help of citizen science volunteers, other agencies, tribes, and non-governmental organizations, conducted the first synoptic, Puget Sound-wide assessment of toxic contaminants in nearshore biota. This study focused on toxic contaminants generated primarily from terrestrial sources, and conveyed to Puget Sound nearshore habitats via stormwater and other hydraulic watershed processes. Native mussels were used as indicators of the degree of contamination of nearshore habitats. Relatively uncontaminated mussels were transplanted from an aquaculture source to 108 locations along the Salish Sea shoreline, including Bellingham Bay. At the end of the study we determined three biological endpoints (mortality, growth and condition index) and measured the concentration of several major contaminant classes in mussels: polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs, or flame retardants), chlorinated pesticides (including dichlorodiphenyltrichloroethane compounds, or DDTs) and six metals (lead, copper, zinc, mercury, arsenic, cadmium).

Organization/Contact: Jennifer.Lanksbury@dfw.wa.gov

Link: http://wdfw.wa.gov/publications/01643/

Topic: Toxic Contaminants in Dungeness Crab and Spot Prawns

Short Description: In 2011-2012 the Washington Department of Fish and Wildlife (WDFW) conducted a Puget Sound-wide assessment of toxic contaminants in Dungeness crab (*Metacarcinus magister*) and spot prawn (*Pandalus platyceros*); its purpose was to (a) evaluate the geographic extent and magnitude of toxic contaminants in these two crustacean species in Puget Sound and (b) to provide contaminant data to Washington State Department of Health (DOH) to conduct a human health risk assessment. The study was designed to sample animals typically taken in fisheries, across areas typically fished, and using typical sport-fishery gear. In addition, within each species, we sought to hold potentially confounding biological covariates (such as size and sex) constant across sampling areas. Data summaries herein are focused on a comparison of contaminant concentrations in crustacean tissues across sampling areas in Puget Sound. Evaluation of the significance of contaminant levels on human health will be conducted by DOH. Bellingham Bay was included in the monitoring sites.

Organization/Contact: Washington Department of Fish and Wildlife, Andrea Carey, Laurie Niewolny, Jennifer Lanksbury and James West

Link: http://wdfw.wa.gov/publications/01608/wdfw01608.pdf

Topic: Sediments and Toxins

Short Description:

Organization/Contact: Ruth Sofield, PhD, Western Washington University

Link:

Topic: Investigations of the macrobiota, sediment characterization, organic and inorganic pollutants in the Sound

Short Description: The project is investigating the recent microbiota of Puget Sound, from samples collected by Washington Department of Ecology (Puget Sound Ambient Monitoring Project) over the last 10 years. This sampling program continues and is the basis for the monitoring program that involves investigations of the macrobiota, sediment characterization, organic and inorganic pollutants in the Sound; until now no studies have been done on the foraminifera, ostracods and diatoms. These microscopic organisms are very sensitive to their physical environments in terms of temperature, salinity, water-depth, light, sediment-water interface conditions, oxygen and pollutants. The objective is to provide a biotic signal of abiotic conditions that have changed over the last 10 years, and compare these results with similar studies of estuaries and fjords microbiota from around the world. Project team includes Dr. Ruth Martin and undergraduate students from the Earth & Space Sciences Department, as well as Dr. Brian Sherrod of the U.S. Geological Survey and Richard Groomer.

Organization/Contact: Elizabeth Nesbitt, PhD, Earth & Space Sciences Department and Burke Museum, University of Washington

Link: http://www.burkemuseum.org/paleontology/people_nesbitt

Topic: Marine Sediment Monitoring

Short Description: Because pollutants can adversely affect the organisms living in the sediment, our team of Ecology scientists has monitored Puget Sound sediment quality for over two decades. We measure levels of chemicals and toxicity, and identify and count invertebrates living in sediment samples to determine the overall condition of the bottom of Puget Sound. We use Puget Sound Sediment Quality Indicators to communicate the current condition and changes in sediment quality to the interested public, decision makers, scientists and others. These indicators are a useful tool for the development of strategies to protect Puget Sound for this and future generations. Multiple sites are included from Bellingham Bay.

Organization/Contact: Pete Adolphson, 360-407-7557 *Pado461@ecy.wa.gov*

Link: http://www.ecy.wa.gov/PROGRAMS/eap/psamp/index.htm
http://www.ecy.wa.gov/PROGRAMS/eap/psamp/PSindicators/SQTIStraitofGeorgia1997N2006.pdf

Topic: Nitrogen Budget

Short Description:

Organization/Contact: David Schull, PhD, Western Washington University

Link: David Schull's research interest page http://faculty.wwu.edu/shulld/research.html

Topic: Pharmaceuticals and Personal Care Products (PPCPs) & Perfluorinated Chemicals (PFCs) in Puget Sound Sediments

Short Description: PPCPs and PFCs released into the environment by human activity are of growing concern. Recent studies have documented measurable levels of PPCPs and PFCs in ground, resh, and estuarine waters, and biota in Puget Sound and Washington watersheds.

Organization/Contact: Maggie Dutch and Sandra Weakland, Washington Department of Ecology, and Bharat Chandramouli, AXYS Analytical Serivces, Ltd., Sidney, British Columbia, Canada

Link: *https://fortress.wa.gov/ecy/publications/publications/1103051.pdf*

Publication: *Quantification of pharmaceuticals, personal care products, and perfluoroalkyl substances in the marine sediments of Puget Sound, Washington, USA, Edward R. Long, Margaret Dutch, Sandra Weakland, Bharat Chandramouli, and Jonathan P. Benskin, Environmental Toxicology and Chemistry, Volume 32, Issue 8, pages 1701-1710* http://onlinelibrary.wiley.com/doi/10.1002/etc.2281/abstract

Topic: Stormwater

Short Description:

Organization/Contact:

Link: Coastal Habitats in Puget Sound, USGS has an Effects of Urbanization project web link http://puget.usgs.gov/urban/index.html http://puget.usgs.gov/urban/contacts.html

Topic: Multiple water quality parameters

Short Description: Monitoring water quality at Lummi Shellfish hatchery intake. Multiple parameters have been monitored over time for status and trends, and real-time for hatchery operation.

Organization/Contact: Pacific Shellfish Institute, suhrbier@pashell.org

Links: http://www.pacshell.org/

Additional Resources Including Past Research

Topic:

Short Description:

Organization/Contact:

Links:

Resource: Eyes under Puget Sound: Life is stressful at the bottom of Bellingham Bay

Info: Maggie Dutch and Valerie Partridge with the Washington Department of Ecology's Marine Sediment Monitoring Team conducted a bay-wide survey in 2010 to characterize the sediment quality at the bottom of Bellingham Bay. Sediment from 30 locations was collected as part of the survey.

Link: *http://ecologywa.blogspot.com/2014/01/eyes-under-puget-sound-life-is_8.html*

Biology and Biological Processes

Symposium Presentations

Presentation Title:

Researcher: Jude Apple PhD,

Bio Brief: Dr. Jude Apple is a marine scientist at Western Washington University's Shannon Point Marine Center. His research investigates factors contributing to low dissolved oxygen in bottom waters of Bellingham Bay, as well as interactions between ocean carbonate chemistry and the role of planktonic microbes in ocean acidification".

Abstract:

Website/Links:

Presentation Title: Seagrass in Portage Bay

Researcher: Marco Hatch, Director National Indian Center for Marine Environmental Research and Education

Bio Brief:

Abstract:

Website/Links:

Presentation Title: Juvenile Chinook Salmon Assessment of the Nooksack Estuary and Bellingham Bay Nearshore

Researcher: Eric Beamer Research Director Skagit River System Cooperative

Bio Brief: Eric Beamer is the Research Director for Skagit River System Cooperative, where he has worked examining salmon freshwater and estuarine ecology since 1984. Mr. Beamer is the principal investigator on projects in the following fields of research: landscape processes influencing habitat conditions, identification of juvenile Chinook salmon life history patterns, and factors influencing wild Chinook salmon production, monitoring Chinook salmon in the tidal delta and nearshore, studies of the use of non-natal estuaries by juvenile Chinook

salmon.

Abstract: This project is an assessment of juvenile salmonid use of the Nooksack estuary and Bellingham Bay shoreline habitats with an emphasis on juvenile Chinook salmon. The scope of work examines juvenile Chinook salmon density dependence in the Nooksack estuary, and uses a bioenergetics approach to examine how competition for prey in different habitat types (with variable connectivity and habitat-specific temperature) influences growth and residency, and by extension habitat capacity in the Nooksack estuary. Juvenile salmon outmigrating from the Nooksack River are also potentially using shoreline habitats of the Bellingham Bay and conditions within the Nooksack estuary may influence the timing and size of fish entering Bellingham Bay. Therefore, juvenile salmon are also assessed in selected Bellingham Bay shoreline areas including City of Bellingham sites. The primary outcomes of the assessment are:

1. Assessment of system-wide density dependence in the Nooksack estuary on juvenile Chinook salmon.
2. Bioenergetics modeling of habitat-specific growth potential that factors prey inputs, diet, temperature, and local rearing densities of juvenile Chinook salmon in the Nooksack estuary.
3. Description of temporal, spatial and habitat type patterns of juvenile Chinook salmon that use the Bellingham Bay shoreline.

The State of the Bay presentation reports on all three aspects of the project but focuses on Bellingham Bay results.

Website/Links: http://www.skagitcoop.org/index.php/research/

Presentation Title: Sea Star Wasting Disease

Researcher: Benjamin Miner, PhD, Western Washington University; Benjamin.miner@wwu.edu, 360-650-3640

Brief Bio: Dr. Benjamin Miner is an associate professor in the Biology Department at Western Washington University. He investigates how the environment influence the ecology and evolution of marine organisms. Recently he has studied the dramatic die-offs of sea stars along the west coast of North America.

Abstract:

Website/Links:

Other Current/Recent Research

Topic: Biotoxins

Short Description: Shellfish in both recreational and commercial harvest areas are routinely tested for biotoxins known to be present in Washington marine waters, such as Paralytic Shellfish Poison, Amnesic Shellfish Poison, and Diarrhetic Shellfish Poison. When toxins are detected at dangerous levels, DOH closes area to harvesting and works in coordination with local Health Departments. A toll-free Shellfish Safety Hotline is available that identifies beaches that are closed to recreational harvest. The closure information is updated when conditions change. There is a monitoring site at Squalicum Harbor.

Organization/Contact: State Department of Health, Jerry Borchert, *360-236-3328 jerry.borchert@doh.wa.gov; Clara Hard*

Link(s): http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/BiotoxinsIllnessPrevention/Biotoxins

Topic: Harmful Algal Blooms and Marine Biotoxins

Short Description: The Northwest Fisheries Science Center has been active in research on marine biotoxins and harmful algal blooms for over 50 years. The Harmful Algal Blooms (HABs) Program website is a resource for understanding HABs and marine biotoxins. *In Puget Sound, the toxic alga Alexandrium catenella threatens people who eat shellfish contaminated with the algal toxin. Previous studies identify "seedbeds" of Alexandrium resting stages (cysts) on the bottom near areas where shellfish frequently attain high levels of toxin. We will map the distribution of cysts and evaluate areas favorable for Alexandrium cyst germination and cell growth. Models will predict when and where toxic blooms occur, both now and in response to climate change.*

Organization/Contact: NOAA Northwest Fisheries Science Center

Link: *http://www.nwfsc.noaa.gov/hab/index.html*

Topic: Marine Birds

Short Description: John Bower has spent 25 years studying the natural world. Getting his start as a birdwatcher, his research includes acoustic communication in bowhead whales and song sparrows, as well as population ecology of Pacific Northwest marine birds.

Organization/Contact: John Bower, PhD, Western Washington University John.Bower@wwu.edu

Link: Changes in Marine Bird Abundance the Salish Sea: 1975-2007
http://www.marineornithology.org/PDF/37_1/37_1_9-17.pdf

Topic: Delta infauna (benthic)

Short Description: Monitoring work includes research on the Nooksack River delta and the restoration project at Boulevard Park.

Organization/Contact: Brian Bingham, PhD, Western Washington University, Brian.Bingham@wwu.edu

Link: https://huxley.wwu.edu/people/bingham

Topic:

Short Description:

Organization/Contact:

Link:

Additional Resources including Past Research

Resource: SoundToxins

Short Description: SoundToxins, a diverse partnership of Washington state shellfish and finfish growers, environmental learning centers, Native tribes, and Puget Sound volunteers, is a monitoring program designed to provide early warning of harmful algal blooms and *Vibrio parahaemolyticus* events in order to minimize both human health risks and economic losses to Puget Sound fisheries. SoundToxins is managed by NOAA's Northwest Fisheries Science Center, Washington SeaGrant, and Washington State Department of Health. There is no work happening in Bellingham Bay (but there could be).

Organization/Contact:

Link: *http://www.soundtoxins.org*

Topic: Climate Change and Harmful Algal Blooms

Short Description: Climate change has the potential to affect the occurrence and severity of harmful algal blooms (HAB) because the growth, toxicity, and geographic distributions of HAB species (like all phytoplankton) are impacted by environmental variability. Additionally, the susceptibility of shellfish, fish, and marine animals to the impacts of HABs can be exacerbated by other stressors that are also caused by climate changes.

Organization/Contact:

Link: *http://www.cop.noaa.gov/stressors/extremeevents/hab/current/CC_habs.aspx*

Topic: Modeling Favorable Habitat Areas for Alexandrium catenella in Puget Sound and Evaluating the Effects of Climate Change

Short Description: In Puget Sound, the toxic alga Alexandrium catenella threatens people who eat shellfish contaminated with the algal toxin. Previous studies identify "seedbeds" of Alexandrium resting stages (cysts) on the bottom near areas where shellfish frequently attain high levels of toxin. We will map the distribution of cysts and evaluate areas favorable for Alexandrium cyst germination and cell growth. Models will predict when and where toxic blooms occur, both now and in response to climate change. Bellingham Bay was included in the cyst monitoring. The project was completed in 2013

Organization/Contact: Quay Dortch, NOAA NCCOS

Link: http://coastalscience.noaa.gov/projects/detail?key=148

Topic: Forage Fish Study of Inner Bellingham Bay

Short Description: The purpose of the study is to provide data specific to surf smelt and sand lance spawning at beach sites in inner Bellingham Bay. The study will help clarify and focus potential state and federal regulatory in-water work restrictions that affect the timing of cleanup and habitat restoration actions proposed through the Bellingham Bay Demonstration Pilot. Scheduled completion is 2015, and is being conducted by Fairbanks Environmental Services under contract with the Port of Bellingham.

Organization/Contact:

Link:

Topic: Marine Forage Fishes in Puget Sound

Short Description: Forage fish species occupy marine/estuarine nearshore habitat. The three most common forage fish species are Pacific herring, surf smelt and sand lance; many of the intertidal and shallow subtidal areas within the Puget Sound Basin constitute spawning habitat for these species. Nearshore ecosystems also provide important nursery and feeding grounds for these species during their first year of life. Other forage fish species do not spawn on the beaches but do use the nearshore habitats during other parts of their life histories. This technical report is part of a series of technical reports associated with Puget Sound Nearshore Partnership's list of valued ecosystem components that are meant to represent a cross-section of organisms and physical structures that occupy and interact with the physical processes found in the nearshore.

Organization/Contact:

Link: http://www.pugetsoundnearshore.org/technical_papers/marine_fish.pdf

Publication: Marine Forage Fishes in Puget Sound, Puget Sound Nearshore Partnership Report No. 2007-03, Dan Penttila, Washington Department of Fish and Wildlife

Topic: Birds and Mammals that Depend on the Salish Sea: A Compilation

Short Description: A compilation of the 172 bird and 37 mammal species that depend on the Salish Sea marine ecosystem. Of these species, 72 bird and 29 mammal species are both highly dependent on intertidal

or marine habitat as well as on marine derived food. One hundred bird species and 8 mammal species that use the Salish Sea marine ecosystem have varying degrees of dependence on the marine and terrestrial ecosystems to meet significant life history needs. This comprehensive list of avian and mammal fauna for the Salish Seas serves as a foundation for determining the occurrence of new species and the disappearance of others, enables selection of species as indicators for ecosystem health, and provides a basis for identifying the mechanisms responsible for marinebird and mammal declines.

Organization/Contact:

Link: http://www.bioone.org/doi/abs/10.1898/10-04.1?journalCode=nwnt&

Publication: Birds and Mammals that Depend on the Salish Sea: A Compilation, Joseph K. Gaydos and Scott F. Pearson, Corresponding Editor: Thomas Jung. Northwestern Naturalist 92(2): 79-94. 2011

Resource: Puget Sound Nearshore Ecosystem Restoration Project

Short Description: The Puget Sound Nearshore Ecosystem Restoration Project (PSNERP) is a collaborative effort between government agencies, universities, tribes, and environmental organizations. PSNERP is conducting a General Investigation study led by the U.S. Army Corps of Engineers and the Washington Department of Fish & Wildlife. This study is designed to improve our understanding of changes to nearshore ecosystems, significant ecosystem problems, and potential solutions to those problems.

Organization/Contact: pugetsoundnearshore@dfw.wa.gov

Link: http://www.pugetsoundnearshore.org/index.html

Resource: Conservation and Ecology of Marine Forage Fishes – Proceedings of a Research Symposium, September 2012

Short Description: The *2012 Research Symposium on the Conservation and Ecology of Marine Forage Fishes* was convened September 12-14, 2012 as a collaborative effort of the Northwest Straits Commission Forage Fish Program, U.S. Geological Survey, Washington Dept. of Fish and Wildlife, and the Puget Sound Partnership. The primary objectives were to (1) review current research and management related to marine forage fish species; and (2) identify priority science and policy needs and actions for Washington, British Columbia, and the entire West Coast. The proceedings of the symposium are available as a publication of the US Geological Survey (Open-File Report 2013-1035)

Organization/Contact:

Link: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1115&context=usgspubs

Resources: The Skagit River System Cooperative

Short Description: The Skagit River System Cooperative (SRSC) works locally and regionally for salmon recovery. Their research advances the region's knowledge of salmon, supports the need for habitat restoration, and identifies restoration techniques. The Skagit River System Cooperative coordinates their research efforts with federal, state and local agencies, and volunteer groups. The SRSC Research Department has a variety of documents available related to fish use of nearshore, pocket estuary, and river delta sites within the greater Skagit estuary and Whidbey Basin. An interactive map is also available at their website.

Link: http://www.skagitcoop.org/index.php/research/

Resource: Marine Mammals NOAA Fisheries Office of Protected Resources

Short Description: NOAA Fisheries Office of Protected Resources includes information on marine mammals including status of populations under the Marine Mammal Protection Act.

Organization/Contact:

Link: http://www.nmfs.noaa.gov/pr/species/mammals/

Resource: Marine Mammal Research Unit

Short Description: The Marine Mammal Research Unit at University of British Columbia conducts research to enhance marine mammal conservation and reduce conflicts with human uses.

Link: http://mmru.ubc.ca/

Ecosystem Recovery

Additional Resources

Resource: Salish Sea Currents

Info: An online magazine featuring the latest science from the 2014 Salish Sea Ecosystem Conference. Sponsored by EPA, Puget Sound Partnership, and 2014 Salish Sea Ecosystem Conference

Link: *http://www.eopugetsound.org/magazine*

Resource: Encyclopedia of Puget Sound

Info: The Encyclopedia of Puget Sound is a free, open access website where scientists, policymakers and educators find and share information about the state of the Puget Sound ecosystem- its species, its features, its health and its people. It is published by the University of Washington Puget Sound Institute and represents the collective knowledge of leading experts from state and federal agencies, academic institutions and Puget Sound area tribes. It is intended as a primary source for synthesized and integrated scientific information about the Puget Sound and Salish Sea watersheds.

Link: *http://www.eopugetsound.org*

Resource: Puget Sound Ecosystem Monitoring Program

Info: The Puget Sound Ecosystem Monitoring Program is a collaboration of state, federal, tribal and local government agencies, non-governmental organizations, watershed groups, business, academic researchers, local integrating organizations and other private and volunteer groups and organizations dedicated to monitoring environmental conditions in Puget Sound.

Link: *https://sites.google.com/a/psemp.org/psemp/home*

Resource: Salish Sea Marine Survival Project

Info: The Salish Sea Marine Survival Project leverages human and financial resources form the US and Canada to determine the primary factors affecting the survival of juvenile salmon and steelhead in the Salish Sea. Over 40 organizations are working together on this massive transboundary effort, which is being coordinated by Long Live the Kings and Pacific Salmon Foundation.

Link: *http://www.lltk.org/rebuilding-populations/salish-sea-marine-survival/overview*

Resource: ECOconnect

Info: The Washington Department of Ecology maintains a blog where staff in Ecology's 11 environmental programs posts information on their activities.

Link: *http://ecologywa.blogspot.com*

Public Speaker Series Summary Report

Attachment F: Speaker Series Event Evaluation (General)

Speakers Series Event Evaluation

Please provide us your thoughts - we value your input and will use it to understand the value of this event and for future planning.

Name of Event: _____

1. How did you hear about this event (check all that apply)?
   ____ email, if yes from whom?
   ____ word-of-mouth
   ____ poster
   ____ other, please specify

2. Was the time and location acceptable?
   ____ yes; ____ no, if no what changes would you suggest

3. How would you rate your knowledge of the topic before and after the event?

Before	1	2	3	4	5
After	1	2	3	4	5
	Very Knowledgeable		Somewhat Knowledgeable		Not at all Knowledgeable

4. Do you anticipate sharing what you learned with others or using the information in another way?
   ____ yes; ____ no; ____ maybe;
   If yes we would appreciate knowing how you expect to use the informaiton.

5. Were there particular aspects of the event that were especially useful?

6. Were there topics you wished had been covered that weren't and if so, what were they?

7. Do you have any suggestions for future topics?

8. Do you have any other comments or suggestions for us to consider?

Another Speakers Series Event Sponsored by

MRC Whatcom County

WW Whatcom Watersheds Information Network

Northwest Straits Initiative