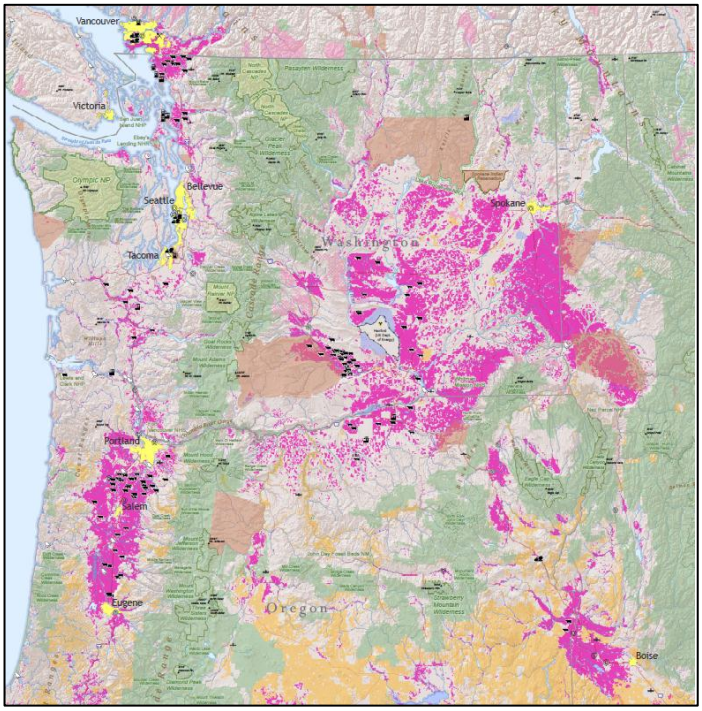
Pacific Northwest (PNW) Contaminants Workshop

Meeting Report

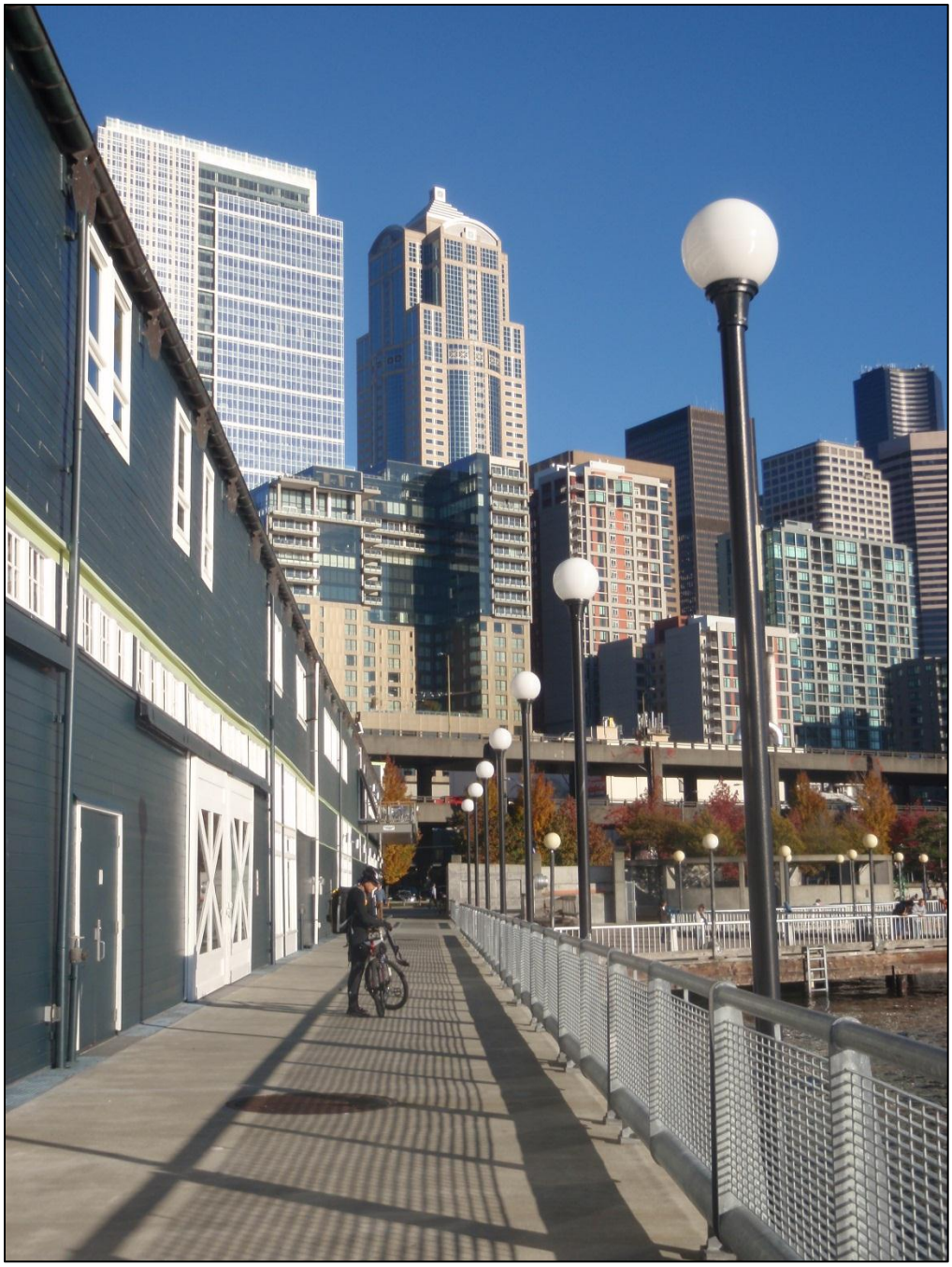
A Strategy for Science and Outreach

Workshop held November 4 & 5, 2010
U.S. Environmental Protection Agency, Region 10
Seattle, Washington



Prepared by
National Park Service – Air Resources Division

February 2011



Seattle, Washington: November 3, 2010. (Photo: Colleen Flanagan, NPS)

This report is available from the Pacific Northwest Contaminants Workshop web page (http://www.nature.nps.gov/air/studies/air_toxics/wacap/pnwWorkshop/index.cfm), hosted by the Air Resources Division of the National Park Service.

Executive Summary iv
Introduction iv
Workshop Summary v
1. Acknowledgements 1
1.1. Organizing Committee 1
1.2. Host 1
1.3. Participants and Presenters 1
1.4. Meeting Facilitators 1
1.5. Meeting Report Review 1
2. Agenda 2
3. Presentations 4
3.1. Review of WACAP Results for PNW national parks: Mount Rainier, Olympic, North Cascades 4
3.1.1. Dixon Landers, EPA 4
3.1.2. Staci Simonich, OSU 4
3.1.3. Staci Simonich, OSU 4
3.2. Review from other federal and state agencies on toxic air contaminant science and policy programs in the PNW region 5
3.2.1. Bob Black, USGS 5
3.2.2. Gretchen Hayslip, EPA 5
3.2.3. Don Steffeck, FWS 5
3.2.4. Keith Seiders, ECY 6
3.2.5. Holly Davies, ECY 6
3.2.6. Madonna Narvaez, EPA 6
4. Workshop Results 8
4.1. Gaps and Needs 8
4.1.1. Source Attribution and Transport 8
4.1.2. Contaminants Monitoring and Risk Assessment 8
4.1.3. Outreach Communication and Information Exchange 9
4.2. Breakout Sessions 9
4.2.1. Source Attribution and Transport 10
4.2.2. Contaminants Monitoring and Risk Assessment 12
4.2.3. Outreach Communication and Information Exchange 13
4.3. Next Steps 15
5. PNW Contaminant Program Links 16
6. List of Abbreviations 17
7. Annotated Participant List 18
8. Supplementary Resources 22
8.1. Invitation Letter 22
8.2. Breakout Session Template for Day 2 25
8.3. Background materials: PNW Contaminants Workshop 27
8.3.1. Public Lands and Air Pollution Sources in the Pacific Northwest 27
8.3.2. WACAP Graphical Summaries for PNW parks 28
8.3.3. Olympic National Park – WACAP Announcement 28
8.4. Workshop Logistics 28
8.5. Photo of Workshop Participants 28

Executive Summary

Introduction

The National Park Service (NPS) Air Resources Division (ARD) and a multiagency steering committee convened 45 participants from 10 organizations on November 4-5, 2010 at the U.S. Environmental Protection Agency (EPA) Region 10 office in Seattle, Washington in order to better understand and to discuss airborne toxics deposition and accumulation in the Pacific Northwest (PNW). Numerous studies, including the Western Contaminants Assessment Project (WACAP), indicate that atmospherically-deposited contaminants are accumulating in fish and other ecosystem components (e.g., vegetation, sediment, snow) in the PNW. The WACAP study provided a preliminary overview of contaminant levels and effects in high altitude and high latitude national park ecosystems of the western U.S. and Alaska. WACAP found airborne toxics such as mercury (Hg), polychlorinated biphenyl compounds (PCBs), flame retardants (PBDEs), combustion by-products (PAHs), and current- and historic- use pesticides in the remote and relatively pristine Cascade ecosystems of Mount Rainier (MORA), Olympic (OLYM), and North Cascades (NOCA) national parks. Given similar findings elsewhere in the region, representatives of EPA, U.S. Forest Service (USFS), U.S. Geological Survey (USGS), U.S. Fish & Wildlife Service (FWS), Washington Department of Ecology (ECY), Washington Department of Health (DOH), Environment Canada, Central Washington University, Oregon State University (OSU), University of Washington (UW), and NPS met to discuss current activities and potential next steps.

WACAP scientists from EPA and OSU presented findings pertaining to MORA, OLYM, and NOCA, while presentations by the USGS, EPA, FWS, and ECY provided toxics research and policy results from throughout the region. Recommendations developed during subsequent small group discussions addressed how to best facilitate combining further efforts on monitoring, outreach, and source attribution. Dr. Kathy Tonnessen, along with Tonnie Cummings, both of the NPS, facilitated the workshop.

Objectives of the Workshop were to:

1. **Provide** an overview of key WACAP findings for the PNW and other regional airborne contaminant studies pertaining to Hg, PBDEs, PAHs, and pesticides, gaining an understanding on the state of knowledge regarding contaminant occurrence, distribution, and ecological effects and human health consequences;
2. **Identify** gaps in research and monitoring, future assessment needs, and potential funding sources;
3. **Develop** strategies to address research and monitoring needs, and public outreach efforts pertaining to states/regulatory agencies, source control/modeling, information transfer, and general public education on safety issues/public health;
4. **Build** upon partnerships developed between the NPS, USGS, USFS, FWS, EPA, State of Washington, and WACAP scientists, as well as develop others among tribal, federal, state, and local agencies, collaborating on an effective outcome.

The PNW Contaminants Workshop web page, http://www.nature.nps.gov/air/Studies/air_toxics/wacap/pnwWorkshop/, provides access to workshop-related information. This includes the workshop report, conclusions, next steps, presentations, and supplementary resources including WACAP findings at PNW national parks.

Workshop Summary

Major conclusions and recommendations developed as a result of the PNW Contaminants Workshop include:

1. **WACAP and other EPA, USGS, USFS, FWS, ECY, and university research and monitoring projects have documented the presence and effects of contaminants to ecosystems in the PNW.**
   - Results indicate that many sites in this region have high contaminant levels in fish, sediments, and/or vegetation (e.g., conifer needles, lichens). Types of contaminants found include historic-use and current-use pesticides, PBDEs, PCBs, and Hg.
   - In intensively studied lakes at both high and low elevations, levels of Hg, PCBs, DDE (a by-product of DDT, a historic use pesticide), and other contaminants in fish exceed wildlife and human health thresholds. Physical and genetic effects in fish from contaminated lakes have been documented.
   - High forest productivity in the region may introduce significant contaminant loads to the ecosystem via canopy throughfall and needle litterfall.
   - Sources of airborne contaminants vary depending upon the specific compounds. Regional sources include ship emissions, urban areas, power plants, industrial manufacturing, and agriculture; long-range sources and transport also contribute.
2. **Continued collaboration among federal, state, and local agencies in the PNW is needed to study and promote awareness about regional contaminants issues.**
   - Coordinating and enhancing new and existing efforts among agencies will enable us to leverage resources, share information, better understand the impacts of contaminants, and develop effective actions to reduce emissions, deposition, ecological impacts, and potential human and wildlife health effects of toxic air contaminants.
   - **Recommendation**: An interagency PNW contaminants workgroup should be formed to coordinate and facilitate science, education, and outreach related to contaminants issues in the region.
3. **To better understand source attribution, transport, and cycling in the PNW, we need more robust data on current-use chemicals and Hg.**
   - While exposure of natural resources in the PNW to contaminants has been documented, little is known about the locations and quantities of current-use chemical application, the sources of Hg and historic-use chemicals that have been detected in national parks, forests, and other natural areas, or the environmental factors (e.g., mercury methylation) facilitating biological exposure and accumulation.
   - **Recommendation**: Through the PNW contaminants workgroup, improve understanding of contaminant sources by: (1) encouraging PNW states/provinces to develop registration requirements for all pesticide usage; (2) compiling up-to-date cropland, land use, and population maps; and (3) initiating mercury monitoring and modeling specific to source type attribution and methylmercury production.
4. **Existing contaminants data and efforts in the PNW require evaluation to optimize on-going and new monitoring and research programs.**
   - Wide and varied contaminant programs exist among agencies. A summary of those programs in the PNW is needed to identify data gaps, coordinate existing programs, facilitate collaboration, provide a more complete picture of current efforts, and develop a research and monitoring strategy for the region.
   - **Recommendation**: By way of the PNW contaminants workgroup, develop a clearinghouse for contaminant information to improve collaboration and coordination of contaminant monitoring and research activities in the region.

1. Acknowledgements

1.1. Organizing Committee

Bill Baccus, Olympic National Park
Bob Black, U.S. Geological Survey
Tamara Blett, NPS Air Resources Division
Tonnie Cummings, NPS Pacific West Region
Jay Davis, U.S. Fish & Wildlife Service
Colleen Flanagan, Chair, NPS Air Resources Division
Chad Furl, Washington Department of Ecology
Gretchen Hayslip, U.S. Environmental Protection Agency
Lillian Herger, U.S. Environmental Protection Agency
Jack Oelfke, North Cascades National Park
Janice Peterson, U.S. Forest Service
Barbara Samora, Mount Rainier National Park
Kathy Tonnessen, NPS, Rocky Mountains Cooperative Ecosystems Studies Unit

1.2. Host

U.S. Environmental Protection Agency, Region 10

1.3. Participants and Presenters

Roger Andrascik
Bill Baccus
Mignonne Bivin
Bob Black
Don Campbell
Liz Carr
Tonnie Cummings
Holly Davies
Jay Davis
Collin Eagles-Smith
Robert Elleman
Colleen Flanagan
Steven Fradkin
Chad Furl
Linda Geiser
Reed Glesne
Rick Graw
Joan Hardy
Gretchen Hayslip
Lillian Herger
Dan Jaffe
Anne Johansen
Bob Kotchenruther
Dixon Landers
Mike Larrabee
Chris Lauver
Rebecca Lofgren
Stefan Lofgren
Dave McBride
Patrick Moran
Madonna Narvaez
Jack Oelfke
Tony Paulson
Janice Peterson
Ashley Rawhouser
Regina Rochefort
Barbara Samora
Corinne Schiller
Jill Schrlau
Keith Seiders
Rich Sheibley
Staci Simonich
Don Steffeck
Kathy Tonnessen
Herman Wong

*Please see the annotated participant list (Section 7) for affiliations and addresses.

1.4. Meeting Facilitators

Kathy Tonnessen and Tonnie Cummings

1.5. Meeting Report Review

Bill Baccus
Bob Black
Tamara Blett
Tonnie Cummings
Jay Davis
Collin Eagles-Smith
Chad Furl
Linda Geiser
Gretchen Hayslip
Barbara Samora
Corinne Schiller
Kathy Tonnessen

2. Agenda

Pacific Northwest (PNW) Contaminants Workshop
November 4-5, 2010
U.S. EPA Region 10, Seattle, WA
FINAL AGENDA

Objectives:

1. **Provide** an overview of key Western Airborne Contaminants Assessment Project (WACAP) findings for the Pacific Northwest and other regional airborne contaminant studies pertaining to Hg, PBDEs, PAHs, and pesticides, gaining an understanding on state of the knowledge regarding contaminant occurrence, distribution, and ecological effects and human health consequences;
2. **Identify** gaps in research and monitoring, future assessment needs, and potential funding sources;
3. **Develop** public outreach efforts pertaining to states/regulatory agencies, source control/modeling, information transfer, and education on safety issues/public health;
4. **Build** upon partnerships developed between the National Park Service, U.S. Geological Survey, U.S. Forest Service, U.S. Fish & Wildlife Service, U.S. Environmental Protection Agency, State of Washington, and WACAP scientists, as well as develop others among tribal, federal, state, and local agencies, collaborating on an effective outcome.

Wed, 11/3 – 5:00pm Mixer at Hotel Vintage Park

Thurs, 11/4 – 8:30am-5:00pm Understanding Contaminant Distribution & Effects		
	Topic	**Presenter/Discussion Leader**
8:00am	Morning bagels and coffee	
8:30am	Welcome and Introductions	Kathy Tonnessen, NPS RM-CESU, facilitator, with representatives from NPS, USGS, USFS, FWS, EPA, State of WA
8:45am	Overview of the WACAP Science and Issues for the PNW Region	Dixon Landers, EPA
9:30am	WACAP Air, Snow and Vegetation Results: A Focus on OLYM, MORA, and NOCA	Staci Simonich, OSU
10:15am	BREAK	
10:30am	Contaminant Bioaccumulation in OLYM, MORA, and NOCA	Staci Simonich, OSU
11:00am	Questions & Answers with WACAP experts	Landers, Simonich, et al.
11:30pm	LUNCH	
12:30pm	Tissue Contaminants in Trout from High Elevation Lakes of Washington	USGS/Bob Black
1:00pm	EPA's Aquatic Ecological Monitoring in the Pacific Northwest	EPA/Lil Herger and Gretchen Hayslip
1:30pm	Evaluation of Air Pollutants by the FWS-Current Efforts & Planning for Action	FWS/ Don Steffeck
2:00pm	Monitoring Toxic Contaminants in Fish	WA Dept of Ecology/Keith Seiders

2:30pm	BREAK	
2:45pm	State Regulation for Persistent Bioaccumulative and Toxic Substances and the Role of Chemical Action Plans	WA Dept of Ecology/Holly Davies
3:15 pm	Federal Regulatory Mechanisms on Toxic Air Contaminants	EPA/Madonna Narvaez
3:45pm	Participants provide information on other data/programs on toxic air contaminants in the PNW	All
4:45pm	Set stage for Day 2	Kathy Tonnessen, facilitator
5:00pm	ADJOURN for Day 1	

Fri, 11/5 – 8:30am-12:00pm Developing Strategies & Building Partnerships		
	Topic	**Presenter/Discussion Leader**
8:00am	Morning bagels and coffee	
8:30am	Summary of What We Know	Kathy Tonnessen, facilitator
8:45am	Summary of Gaps and Recommendations – What We Need to Know	Tonnie Cummings, NPS PWRO, with PNW Steering Committee
9:00am	Small group discussions Proposed breakout group topics: o Source Attribution; o Contaminants Monitoring; o Human & Wildlife Thresholds & Risks; o Outreach & Communication	Breakout groups, with Tonnie Cummings, NPS PWRO
10:30am	BREAK	
10:45am	Breakout/small group presentations	Breakout group leaders
11:15am	Synthesis – Moving forward with PNW Contaminants	Tonnie Cummings, NPS PWRO
11:45am	Closing – Revisit workshop objectives	Kathy Tonnessen, facilitator
12:00pm	ADJOURN	

3. Presentations

Nine speakers gave presentations on the first day of the workshop. The presentations are summarized below and are available from the active links or from the workshop: http://www.nature.nps.gov/air/Studies/air_toxics/wacap/pnwWorkshop/index.cfm.

3.1. Review of WACAP Results for PNW national parks: Mount Rainier, Olympic, North Cascades

3.1.1. Dixon Landers, EPA:

Overview of the WACAP Science and Issues for the PNW Region (45 min)

WACAP was initiated in 2002 by the NPS to determine if airborne contaminants were having an impact on remote western ecosystems. Multiple sample media (snow, water, sediment, fish and terrestrial vegetation) were collected from 2003–2005 in watersheds from eight primary national park units ranging in latitude from California to Alaska and east to the Rocky Mountains (Colorado and Montana). Additional vegetation samples were collected from 12 secondary parks. The objective was to evaluate contaminant flux, pathways and impacts of semi-volatile organic compounds (SOCs) and metals, including Hg. Atmospheric back trajectory modeling was performed for each site to determine the potential sources of contaminants. WACAP was designed so that contaminant pathways could be inferred based on the contaminants measured in the various environmental compartments. Passive air monitor samples in OLYM and MORA were very similar, dominated by endosulfans, HCB, and a-HCH. Low concentrations of g-HCH, chlordanes, and trifluralin were also detected in both parks. Both parks are dominated by airmasses from the NNW while precipitation is dominated by SSW airmasses which have a large marine component. Hoh Lake sediments in OLYM showed the lowest concentrations of metals and SOCs among all four lakes sampled at OLYM and MORA (two at each park). In OLYM, both lakes showed a decline in PCBs since their ban. In MORA, Golden Lake showed a PCB decrease but Lake LP19 showed an increase since the ban. Mercury in all four lakes showed an increase toward the surface of the sediment cores. In LP19, this could be due to an increase in total organic carbon (TOC) while the other lakes probably exhibit influence from regional sources of atmospheric Hg. PJ Lake sediment profiles in OLYM are a bit of an outlier due to consistent catastrophic inputs of sediment from landslides and the input of large wood. All four lakes showed a mid 20th Century increase in spheroidal carbonaceous particles (SCPs) that decreases in recent years toward the surface suggesting that sources of mercury deposited in the last few decades are not associated directly with high temperature combustion of fossil fuels.

3.1.2. Staci Simonich, OSU:

WACAP Air, Snow and Vegetation Results: A Focus on OLYM, MORA, and NOCA (45 min)

The WACAP studies in OLYM, MORA, and NOCA provided a unique opportunity to study how the distribution and concentrations of air pollutants changed from west (OLYM) to east (NOCA) within the PNW and in parks that were increasingly downwind of regional urban and agricultural areas. OLYM, MORA, and NOCA had pesticide and PAH concentrations in the various environmental media that were mid-range among the other WACAP parks. Some of the differences between the concentrations in OLYM, MORA, and NOCA were due to different PAH sources, as well as localized current use pesticide application near the individual parks. For all PNW parks with high productivity forests, the total accumulation of these compounds in the forest ecosystem is significant.

3.1.3. Staci Simonich, OSU:

Contaminant Bioaccumulation in OLYM, MORA, and NOCA (30 min)

The bioaccumulation and potential ecosystems effects of air pollutants were studied in OLYM and MORA as part of WACAP. OLYM and MORA fish contained low to mid-range concentrations of pesticides as compared to the other WACAP parks studied. However, the highest fish PBDE concentrations in all 8 WACAP parks were measured in Golden Lake in MORA. The fish in MORA and

OLYM had high Hg concentrations and exceeded contaminant thresholds for piscivorous mammals and birds, as well as humans. In addition, the fish in both parks showed evidence of macrophage aggregates and their prevalence was positively correlated with Hg concentrations in the fish. Also, contaminants from the air are actually partitioning into conifer needles and accumulating in needle biomass. Given high productivity of PNW forests, there is significant contaminant loading, transfer, and potential effects of SOCs on terrestrial ecosystems from litterfall.

3.2. Review from other federal and state agencies on toxic air contaminant science and policy programs in the PNW region

3.2.1. Bob Black, USGS:

Tissue Contaminants and Associated Transcriptional Response in Trout Liver from High Elevation Lakes of Washington (30 min)

The cold temperatures and large amount of precipitation in the Olympic and Cascade ranges of Washington are thought to enhance atmospheric deposition of contaminants. However, little is known about contaminant levels in organisms in these high elevation lakes. We measured total Hg and 28 organochlorine compounds in trout collected from 14 remote lakes in OLYM, MORA and NOCA. Mercury was detected in trout from all lakes sampled (15 to 262 µg/kg ww), as well as DDE and tPCB (<25 µg/kg ww). In sediments, organochlorines were below detection, while median total and methyl mercury were 30.4 and 0.34 µg/kg dw, respectively. Using fish from two lakes, representing high and low contaminant levels, we examined transcriptional response in the liver using a custom-made low-density targeted rainbow trout cDNA microarray. We detected significant differences in liver transcriptional response, including changes in metabolic, endocrine, and immune-related genes, in fish collected from the contaminated lake compared to the uncontaminated lake. Our results suggest that local urban areas contribute to the observed contaminant patterns in these lakes, while the transcriptional changes point to a biological response associated with exposure to these contaminants in fish.

3.2.2. Gretchen Hayslip, EPA:

EPA's Aquatic Ecological Monitoring in the Pacific Northwest (30 min)

Environmental monitoring provides the information necessary for describing the condition of aquatic ecosystems and for assessing the effectiveness of pollution reduction activities. In the 1990s, the EPA identified a lack of data necessary to accurately characterize the condition of the Nation's surface waters and responded by designing a series of statistically-based surveys to produce information on the condition of lakes, streams, rivers, coastal waters and wetlands. These national surveys are conducted in partnership with States and Tribes. Results of the 2000-2003 National Lake Fish Tissue Study, a nationwide assessment of 500 lakes and reservoirs selected randomly in the lower 48 states, with a total of 30 sites sampled in Region 10, indicate exceedances of the human health threshold for Hg, total PCBs, and total DDT at 20%, 7%, and <4% of lakes sampled in the region, respectively. The ecological endpoint for Hg and total DDT concentrations in fish composites was exceeded in 30% and 20% of the lakes, respectively. Further recommendations include: add fish tissue samples to the 2012 National Lakes Survey, continue sampling across the same range of lake sizes, and keep Hg as the highest priority analyte.

3.2.3. Don Steffeck, FWS:

Evaluation of Air Pollutants by the U.S. Fish and Wildlife Service – Current Efforts and Planning for Future Actions (30 min)

Air pollutants can harm ecological resources in a variety of ways and profoundly affect FWS trust resources, including refuge lands and waters; trust species, such as endangered species, migratory birds, anadromous fish, and marine mammals; and the habitats these species depend upon. Impacts from airborne contaminants can occur indirectly, for example through climate change, or directly through bioaccumulation of contaminants, habitat degradation, or reduced visibility in refuge wilderness areas. These effects can create an imbalance in natural ecosystems at the landscape scale, and long-term changes due to airborne pollution may include shifts in types of plant and animal species, increase in insect and

disease outbreaks, and disruption of ecosystem/habitat processes. The objectives of the FWS's 1994 Air Quality Management Plan (Plan) are to meet existing responsibilities, provide ecological information to protect the air quality related values of all FWS Class I Wilderness areas, and enhance effective decision making and policy development for the FWS's air quality program. The Plan recognizes that proper management of air resources is vital to protecting and maintaining the Nation's fish and wildlife resources. Current efforts focus on the National Wildlife Refuge System. A FWS air quality group comprised of representatives from the Environmental Contaminants and Refuges programs has formed to evaluate how to better address the increasing air quality needs for the FWS and to enhance effective conservation delivery. The group recognizes the need to update the 1994 Plan, incorporate current issues, such as climate change and air toxics, and recommend how various FWS programs will coordinate their air quality activities. A white paper is forthcoming and will speak to the establishment of the air quality team, actions to address air quality, and funding and staffing initiatives.

3.2.4. Keith Seiders, ECY:
Monitoring Toxic Contaminants in Fish (30 min)

This presentation described one part of the Washington State Toxics Monitoring Program (WSTMP). The goal of the Exploratory Monitoring component of this effort is to characterize toxic contaminants in freshwater fish across Washington where historical data are lacking. Results from 2001-2008 show that many PBTs such as Hg, PCBs, dioxins and furans, chlorinated pesticides, and PBDE flame retardants are often found in fish. Levels of these contaminants in fish vary across the state and are associated with land use and kind of fish sampled. Results have led to numerous Clean Water Act Section 303d (i.e., impaired water quality) listings for PCBs, dioxins, DDE, chlordane, and other chemicals. A Long Term monitoring component was added in 2009 with the goal of tracking changes in fish contaminant levels over time at selected sites. DOH's advice about risks and benefits of consuming fish was reviewed.

3.2.5. Holly Davies, ECY:
State Regulation for Persistent Bioaccumulative and Toxic substances and the role of Chemical Action Plans (30 min)

Ecology published our strategy to reduce PBTs in 2000. Because PBTs remain in the environment for a long time (persist) and build up within organisms and in the food chain (bioaccumulate), there is a longer period of exposure and a longer time to build up to a harmful level of exposure. PBTs transfer easily among air, water, and land, and span boundaries of programs, geography, and generations.

After working with an advisory committee and getting input from the public, the PBT Rule was published in January 2006. The goal of the PBT Rule is to reduce and phase out PBT uses, releases, and exposures in Washington to reduce and eliminate threats to human health and the environment. The focus of our work on PBTs is preparing and implementing Chemical Action Plans (CAPs). A CAP is a plan that identifies, characterizes, and evaluates uses and releases of a specific PBT, or group of PBTs and recommends actions to protect human health and the environment.

The completed CAPs for Hg, PBDEs, and lead have been used to set priorities for our actions both inside and outside of ECY. The actions have been with existing authority, such as Hg collection, and with new authority, such as the ban on some uses of decaBDE (one of many PBDE flame retardant compounds). We are currently collecting information on sources of PAHs for the next CAP.

3.2.6. Madonna Narvaez, EPA:
Federal Regulatory Mechanisms on Toxic Air Contaminants (30 min)

This talk gave a brief overview of the approaches EPA uses to address air toxics and the co-benefits of reducing ground-level ozone and particulate matter, which can contribute significantly to impaired visibility in places, such as national parks, that are valued for their scenic views and recreational opportunities.

Prior to 1990, the Clean Air Act directed EPA to regulate toxic air pollutants based on the risks each pollutant posed to human health. Specifically, the Act directed EPA to:

- Identify all pollutants that caused "serious and irreversible illness or death."
- Develop standards to reduce emissions of these pollutants to levels that provided an "ample margin of safety" for the public.

However, debates on risk assessment methods and assumptions, the amount of health risk data needed to justify regulation, analyses of the costs to industry and benefits to human health and the environment, and decisions about "how safe is safe" made a risk-based approach to air toxics regulation very difficult. In 20 years, EPA has only been able to regulate seven pollutants (asbestos, benzene, beryllium, inorganic arsenic, Hg, radionuclides, and vinyl chloride). With the Clean Air Act Amendments of 1990, Congress recognized the limitations of a chemical-by-chemical risk-only based approach, and adopted a new strategy. Specifically, Congress revised Section 112 of the Clean Air Act to mandate a more practical approach to reducing emissions of toxic air pollutants – "Technology First, Then Risk." EPA has developed regulations affecting 82 categories of sources, including pulp and paper plants, refineries, chemical plants, aerospace manufacturers and steel mills, as well as smaller categories such as dry cleaners, collision repair facilities, and metal refinishers and fabricator facilities. In addition, EPA is developing regulations specifically for coal-fired power plants, cement manufacturing facilities, and gold mining operations to control air emissions of Hg. To date, EPA has primarily focused efforts to reduce emissions of toxic air pollutants on technology-based or Maximum Achievable Control Technology (MACT) emission standards. Over the next few years, EPA will continue to work with industry; environmental groups; state, local, and tribal agencies; and other interested groups to develop standards for the remaining source categories that will reduce air toxics emissions even further.

4. Workshop Results

The Pacific Northwest (PNW) Contaminants Workshop provided the foundation for understanding the presence and effects of airborne contaminants on ecosystems in the region. Identified areas of future progress included contaminant science, outreach, and source attribution and transport.

4.1. Gaps and Needs

On Day 1, workshop presenters discussed results from PNW toxics research/policy and plans for future monitoring/action, along with suggestions about information gaps, needs, and multiagency collaboration. Other participants contributed information and suggestions throughout Day 1 and during a round robin session at the end of the day. A list of gaps and needs was compiled from the presentations and discussion on Day 1, and refined during small group breakout sessions on Day 2. The second day of the workshop focused on addressing data and information gaps, and developing a process to accomplish high priority needs. Each of the three breakout groups reviewed and prioritized items from the lists below to address questions posed by the breakout session guidelines (Section 8.2).

4.1.1. Source Attribution and Transport

While we have a basic understanding of contaminant transport in the PNW, how can we better identify the sources of contaminants and how can we improve regulation of these pollutants for the region, including Canada?

1. Need better data on current use pesticides and mercury including application, distribution, location, and land use practices;
2. Need better and finer resolution back trajectory data;
3. Need better inventory of emission sources and atmospheric observations;
4. Need to deploy mobile mercury lab in the PNW (similar to the USGS Mobile Atmospheric Mercury Lab run by Dave Krabbenhoft, which has the capability for rapid deployment and advanced study of mercury in the atmosphere);
5. Explore opportunities to build upon existing studies;
6. Define areas of overlap and areas of distinction in an effort to better collaborate between agencies;
7. Spatial resolution, combination of chemistry and modeling, needed to better predict on a watershed scale what contaminants and where concentrations will be high and low.

4.1.2. Contaminants Monitoring and Risk Assessment

Given our current understanding of contaminant distribution and effects in the PNW, what contaminants should be monitored and what approaches for assessing risk should be used in the future, including for both human and wildlife health thresholds?

1. Need to find financial support for a Mercury Deposition Network (MDN) site on the Olympic Peninsula;
2. Improve chemical breadth and spatial coverage of baseline monitoring data;
3. Do ecological process-based monitoring and assessment;
4. Need for additional evaluation and synthesis of existing datasets;
5. Develop and test new sampling technology;
6. Monitor selenium simultaneously with Hg in fish tissue;

7. Work with DOH on fish tissue sampling methods that should be used for human health endpoints;
8. Develop consistent protocols and endpoints for conducting risk assessments for wildlife and other biota, including non-lethal sampling;
9. Explore opportunities to build upon existing studies;
10. Consider logging and forest fire when assessing methylmercury bioaccumulation;
11. Consider monitoring efforts for black carbon and nanoparticles;
12. Define areas of overlap and areas of distinction in an effort to better collaborate between agencies;
13. Integrate toxics monitoring with other monitoring such as ambient or long term ecological monitoring;
14. Look again at biomarker data in fish;
15. Consider high resolution recent history from fish otoliths;
16. Develop of robust bio-indicator toolbox for multi-habitat assessments (e.g., fish-eating birds such as osprey are commonly used as sentinel species, but ospreys are rarely found in high elevation lakes and data on ospreys does not account for many other food web pathways);
17. Key habitat types (i.e., lakes, wetlands, etc.) and sentinel species associated with habitats;
18. Mercury flux – bioaccumulation – connect to carbon cycle;
19. Statistics/long term trends vs. short term change.

4.1.3. Outreach Communication and Information Exchange

Given contaminants research findings for the PNW from WACAP and other projects, what key messages, audiences, and products might be used to improve awareness within, among, and outside the agencies?

1. Develop a clearinghouse for data and information sources, and communicate on upcoming work;
2. Need for additional evaluation and synthesis of existing datasets;
3. Develop an interagency consortium to address contaminant issues within protected areas in order to prioritize issues and collaborate on funding;
4. Define areas of overlap and areas of distinction in an effort to facilitate productive collaboration among agencies;
5. Improve regulatory tools;
6. Better communicate the fish consumption message among and between agencies.

4.2. Breakout Sessions

In an effort to develop action items and define next steps for contaminant science and outreach in the PNW, on Day 2 workshop participants broke out into three smaller groups: (1) source attribution and transport, (2) contaminants monitoring and risk assessment, and (3) outreach communication and information exchange. Each breakout group referred to the list of gaps and needs presented in Section 4.1, and used the template in Section 8.2 to prioritize and expand on items in the list.

4.2.1. Source Attribution and Transport

Participants

Bob Black (facilitator), Barbara Samora (recorder); Don Campbell, Holly Davies, Robert Elleman, Rick Graw, Ashley Rawhouser, Corinne Schiller, Rich Sheibley, Staci Simonich.

Priority Gaps and Needs

1. Need better data on current-use pesticides and Hg
   - Where are they being used, quantities; regional use data (including Canada); contribution from forest fires.
   - Identify sources for known problems (e.g., Lake Ozette in OLYM)
   - Better define background sources at all scales to inform public and regulatory agencies about problems
   - Need accurate microscale models – collect meteorological data at sites that can inform source attribution
2. Develop a clearinghouse for contaminants information (portal with links to other data/information sources)
3. Understand sources for historic-use pesticides.

Gap/Need Addressed	*(1) Need better data on current-use chemicals and mercury*	*(2) Develop clearinghouse portal for contaminant information*
Desired Future Outcome	• Registration of all pesticides, • More up-to-date cropland, land use, and population maps, and • More mercury monitoring in the area to identify sources (more detailed than MDN).	Improved information sharing. Clearinghouse incorporating links to data/information sources and available funding sources that address issues common to all agencies.
Summary of available resources and existing models	California sets the standard for pesticide regulation. USGS (Krabbenhoft) and the mobile mercury monitoring approach begins to address sources of regional mercury.	Pacific Northwest Aquatic Monitoring Partnership (PNAMP); CREEC (Consortium for Research and Education on Emerging Contaminants) serve as existing models
Available Funding Sources	NPS and USGS can develop a proposal for mobile mercury monitoring through the NPS-USGS partnership funding source. NWAIRQEST/MM5Consortium may be able to assist in modeling.	NPS and USGS can write a proposal for developing a portal through the NPS-USGS partnership funding source. USGS and WA Department of Ecology can approach the Puget Sound Partnership.
Challenges & Obstacles	Influencing regulators to move towards the California pesticide model. (Federal land managers can work to influence regulators and the public.)	The creation of an initial portal web site should be relatively inexpensive so has fewer challenges and obstacles.

Recommended Action(s)/ Timeframes/ Responsible parties	• USGS – provide link to NAWQA pesticide data • NPS and other modelers – assist in assessing sources of current use chemicals and Hg. • Host a clearinghouse with links to data/information sources (see #2 need addressed). • All agencies can contribute to educating the public to gain support.	USGS and NPS will explore possibility of hosting a site (USGS initially hosted the CREEC site which was eventually turned over to a non-profit agency to maintain). Additionally, consider improving upon ECY website established for pesticides. There is already a link set up on the site to other agencies; however the link currently does not include data sources and information specific to contaminants. USGS NAWQA contaminants information and data: http://water.usgs.gov/nawqa/

Additional Breakout Group Notes

Items important to address:

- Best Management Practices to minimize historic use pesticide re-volatilization.
- Develop regional/interagency action plan: agree on priorities for implementation.
- Need clearinghouse that includes pesticide use information; existing sources of data for all contaminants (i.e., air quality stations).
- Lake Chelan example: DDT problem; multi-agency land management (including NOCA and USFS Class I area/Wilderness).
- Ongoing watershed planning, including ongoing state Total Maximum Daily Load (TMDL) work in watersheds adjacent to the national parks.
- Consider microscale modeling for Lake Chelan.
- Add contaminants monitoring to existing air quality stations in protected areas and consider passive air sampling techniques.
- University of Washington has 4km grids modeling air masses moving over region, including protected areas. Data are archived and available for use.
- Suggestion to use Mount Rainier National Park lakes as a case study to determine effect of reductions in Hg from Trans Alta Centralia power plant.

4.2.2. Contaminants Monitoring and Risk Assessment

Participants

Gretchen Hayslip (facilitator), Jay Davis (recorder); Collin Eagles-Smith, Steven Fradkin, Reed Glesne, Lillian Herger, Anne Johansen, Tony Paulson, Janice Peterson, Regina Rochefort, Jill Schrlau, Keith Seiders.

Priority Gaps and Needs

1. Evaluation of existing data and efforts (monitor)
    a. SOPs; standard operating procedures
    b. Indicator selection
    c. Habitat selection
    d. Objective (management)
    e. Breadth of activities
    f. Selenium analysis
    g. End points
2. Optimize monitoring networks (existing and recommended) to fill data gaps
    a. Selenium analysis
    b. New analytes (nanoparticles and black carbon)
3. Define goals and objectives (monitoring)

Gap/Need Addressed	*(1) Evaluate Existing Data and Efforts*	*(2) Optimize Monitoring Network*
Desired Future Outcome	• Summary (metadata) • Overall understanding • Full participation • Compiled/compilation • Dissemination of information • Overlaps (efforts, objectives, pool resources) • Archive samples • Maximize and coordinate existing programs (coordinate with other programs, e.g., PSP)	• Vision • Define collaboration and/or roles • Commitment to the network • Strategy to address goals • Prioritize • Fill gaps when possible • Coordinated/collaborative monitoring program • Comprehensive understanding of the impacts of air contaminants on the protected areas (ecosystem and components)
Summary of available resources and existing models	PNAMP	
Available Funding Sources		
Challenges & Obstacles	• On-going updates • appropriate data • money • time • resources • participation • scope of the effort	• Money; including long-term • Scale (temporal/spatial) • Participation • Consensus • Personnel • Resources: 2 people permanently funded for all air quality issues

Recommended Action(s)/ Timeframes/ Responsible parties	• Describe – each program provides a description (SOP, etc); the "what/where/why/how"– to make this happen, we need scope, updates, time, resources, and participation. • Coordinate – NPS (specifically Tonnie), all agencies involved – Full participation, compiled/compilation, dissemination of information, overlaps (efforts, objectives, pool resources), archive samples, • Formalize/coordinate efforts/build a community (monitoring data) – responsibilities: NPS as chair with other agencies as board members	• Define and Merge Goals (Forum/monitoring committee with participating agencies) • Identify Gaps (Forum/monitoring committee with participating agencies) • Design a coordinated program (Forum/monitoring committee with participating agencies) • Implement program (each entity has a role) • Sell/reports

4.2.3. Outreach Communication and Information Exchange

Participants

Chad Furl (facilitator), Bill Baccus (recorder); Roger Andrasik, Liz Carr, Colleen Flanagan, Linda Geiser, Dixon Landers, Rebecca Lofgren, Dave McBride, Jack Oelfke, Don Steffeck, Kathy Tonnessen.

Priority Gaps and Needs

1. Develop an interagency consortium to address contaminant issues within protected areas in order to prioritize issues and collaborate on funding.
2. Develop a clearinghouse for contaminants information; communicate on upcoming work.
3. Better communicate the fish consumption message among and between agencies.

Gap/Need Addressed	*(1) Develop an interagency consortium for contaminants in protected public lands to prioritize issues and collaborate on funding.*
Desired Future Outcome	An interagency and international consortium (i.e., workgroup) that studies airborne contaminants in public lands with a focus on impacts to sentinel sites and other urban and agricultural gradients. • Clearinghouse for science communications. • Coordinate outreach products on toxics issues. (E.g., WACAP dataset was not robust enough for DOH to issue an actual fish consumption advisory.) Use human and wildlife health concerns as driver to fund future research efforts and protect ecosystems as a positive byproduct. • Discuss project proposals, new findings and research, technologies • A specific focus area for consortium… (e.g., Air Toxics Focus group for Puget Sound, PNW, Washington and Oregon, etc.) • Incorporate or involve university researchers.

Summary of available resources and existing models	Existing models for working groups include: • Columbia River Toxics Reduction Workgroup. This group gives workshops every few months. • Puget Sound Partnership • NPS NCCN Research Learning Network might be a resource for small studies and outreach products. • State of Montana and NPS collaborated to develop a fish consumption advisory for park lands. Also a coordinated effort for Lake Roosevelt in Washington State.
Available Funding Sources	• No obvious funding sources were identified by this working group. This is a major challenge for creation of the consortium. It will need to rely initially on agency staff. • DOH has difficulty funding studies to develop human health advisories.
Challenges & Obstacles	• Defining the spatial scope. • Geographical scope currently includes Washington, British Columbia and Oregon. It will likely be necessary to initially limit the consortium/workgroup to a smaller, more specific geographical area. • National parks are relatively free of anthropogenic changes; the presence of toxics in these sentinel systems is confounded by few other factors. However, if we fine-tune the scope too much (i.e., only parks & wilderness areas), we lose data and important information, so there's a need to somehow best represent other protected areas and/or public lands.

Recommended Action(s)/ Timeframes/ Responsible parties	• Develop a method to share ongoing & completed toxics research and existing data sets.
	  o E.g., EPA's northwest Hg technical exchange forum.
	  o Start with a multiagency list of toxics research (Perhaps the most fitting place to begin.)
	  o Evolve to a more sophisticated database format
	  o Identify opportunities to use and analyze existing datasets to answer current questions.
	• Communicate information about airborne toxics to public and educational entities.
	  o fish consumption advisories
	  o NPS research briefing statements
	  o Public outreach
	• Keep a list of potential funding sources and prioritized list of future research projects.
	• Create a fact sheet about the consortium. Develop a "dog and pony show," present to other air quality and toxics groups to further potential collaboration. Columbia River Toxics Reduction Group – Puget Sound Partnership
	• Communicate research to policy makers. With a common message, this interagency group can provide a powerful voice for resolving regulatory issues.

4.3. Next Steps

The PNW Contaminants Workshop provided a foundation for sharing information to improve understanding of the presence and effects of airborne contaminants on ecosystems in the PNW. Breakout groups identified the overarching need for an interagency workgroup to continue to focus on contaminant issues in the PNW and recommended developing such a group. The NPS will take the lead in forming the PNW Contaminants Workgroup in early 2011.

The following workshop participants were nominated as core members of a PNW Contaminants Workgroup:

- Tonnie Cummings (NPS)
- Linda Geiser/Rick Graw (USFS)
- Gretchen Hayslip/Lillian Herger (EPA)
- Bob Kotchenruther (EPA)
- Don Steffeck/Jay Davis (FWS)
- Chad Furl/Keith Seiders (ECY)
- Dave McBride/Liz Carr (DOH)
- Tony Paulson/Bob Black (USGS-WRD)
- Collin Eagles-Smith (USGS-BRD)
- Corinne Schiller (Environment Canada)

Workshop participants also suggested the following groups and individuals as potential contributors to a PNW Contaminants Workgroup:

- Washington DOH
- Washington Department of Fish and Wildlife
- Oregon DEQ Department of Environmental Quality (Agnus Lut)
- Idaho (if the PNW includes Idaho?)
- Environment Canada/British Columbia
- Air Quality Authorities??
- Local clean air agencies
- NRCS (and other groups with agricultural expertise)
- Bureau of Land Management
- Tribes?
- UW (Dan Jaffee)
- OSU (Staci Simonich, Carl Schreck & Mike Kent)
- WSU (Brian Lamb)
- Other universities

5. PNW Contaminant Program Links

There are several planning and assessment programs by federal and state partners in the PNW. Coordination among agencies and programs is encouraged to streamline planning and implementation of projects, and to ensure resources are used on issues of highest priority. Some of these efforts include (and are provided by the active links below):

- National Park Service Inventory & Monitoring Program, North Coast and Cascades Network
- National Park Service/U.S. Environmental Protection Agency, et al. Western Airborne Contaminants Assessment Project
- Pacific Northwest Aquatic Monitoring Partnership
- Puget Sound Partnership
- State of Washington
    - Department of Health, Fish Facts for Healthy Nutrition
    - Department of Ecology
        - Environmental Toxics Monitoring
        - PBT Initiative > Chemical Action Plan
        - Washington State Toxics Monitoring Program
- U.S. Environmental Protection Agency
    - Environmental Monitoring & Assessment Program
        - National Lake Fish Tissue Study
        - National Lake Assessment
        - National Rivers and Streams Assessment (NRSA)
    - National Center for Environmental Assessment: Ecological Risk Assessment
    - Pesticides: Endangered Species Protection Program
    - EPA Region 10 Mercury Strategy Framework
- U.S. Fish & Wildlife Service
    - Environmental Contaminants Program
    - Refuge Air Quality Program
    - Strategic Habitat Conservation
- U.S. Forest Service
    - Home page
    - Forest Inventory and Analysis National Program
- U.S. Geological Survey, National Water Quality Assessment Program (NAWQA)
    - Puget Sound Basin NAWQA
    - Water Quality in the Yakima River Basin
    - Central Columbia Plateau - Yakima River Basin
    - Water Quality in the Willamette Basin
    - PNW Contaminant Ecology Program – Corvallis Research Group (website forthcoming)
- Washington State University, Northwest International Air Quality Environmental Science and Technology (NW-AIRQUEST)

6. List of Abbreviations

ARD	Air Resources Division (NPS)
CAP	Chemical Action Plan
CREEC	Consortium for Research and Education on Emerging Contaminants
CUP	current-use pesticide
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DOH	Washington Department of Health
ECY	Washington Department of Ecology
EPA	U.S. Environmental Protection Agency
FWS	U.S. Fish & Wildlife Service
HCB	hexachlorobenzene
a-HCH	alpha-hexachlorocyclohexane (a.k.a., lindane)
g-HCH	beta-hexachlorocyclohexane
Hg	mercury
HUP	historic-use pesticide
MACT	Maximum Achievable Control Technology
MDN	Mercury Deposition Network
MORA	Mount Rainier National Park
NAWQA	National Water Quality Assessment Program (USGS)
NCCN	North Coast and Cascades Network (NPS)
NOCA	North Cascades National Park
NP	national park
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NW AIRQUEST	Northwest International Air Quality Environmental Science and Technology
ODEQ	Oregon Department of Environmental Quality
OLYM	Olympic National Park
OSU	Oregon State University
PAH	polycyclic aromatic hydrocarbon
PBDE	polybrominated diphenyl ether
PBT	Persistent, bioaccumulative toxic
PCB	polychlorinated biphenyl
PNW	Pacific Northwest
PNAMP	Pacific Northwest Aquatic Monitoring Partnership
PWR	Pacific West Region (NPS)
RM-CESU	Rocky Mountains Cooperative Ecosystem Studies Unit
SCP	spheroidal carbonaceous particle
SOC	semi-volatile organic compound
SOP	standard operating procedure
TMDL	Total Maximum Daily Load
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
UW	University of Washington
WA	Washington
WACAP	Western Airborne Contaminants Assessment Project
WSTMP	Washington State Toxics Monitoring Program
WSU	Washington State University

7. Annotated Participant List

PNW Contaminants Workshop attendees **bolded**; other invited participants included in non-bold text.

Roger Andrascik, Chief of Natural & Cultural Resources, Mount Rainier National Park
roger_andrascik@nps.gov
360-569-2211 ext. 3380
55210 238th Ave. E
Ashford, WA 98304

Bill Baccus, Physical Science Technician, Olympic National Park
Bill_Baccus@nps.gov
360-565-3061
600 E. Park Ave.
Port Angeles, WA 98362

Mignonne Bivin, Plant Ecologist, North Cascades National Park
Mignonne_Bivin@nps.gov
360-854-7335
7280 Ranger Station Road
Marblemount, WA 98267

Bob Black, Hydrologist, USGS-Water Science Center
rwblack@usgs.gov
253-552-1687
943 Broadway, Suite 300
Tacoma, WA 98402

Tamara Blett, Ecologist, Air Resources Division, National Park Service
Tamara_Blett@nps.gov
303-969-2011
P.O. Box 25287
Denver, CO 80225

Tonnie Cummings, Ecologist, Pacific West Region, National Park Service
Tonnie_Cummings@nps.gov
360-816-6201
612 E. Reserve St.
Vancouver, WA 98661

Don Campbell, Research Hydrologist, USGS-Water Resource Division
dhcampbe@usgs.gov
303-236-5022
MS 418 Denver Federal Center
Denver, CO 80225

Liz Carr, Health Services Consultant, Washington Dept of Health
Liz.Carr@doh.wa.gov
360-236-3191
P.O. Box 47846
Olympia, WA 98504

Holly Davies, Chemical Action Plan Developer, Washington Dept of Ecology
hdav461@ecy.wa.gov
360-407-7398
P.O. Box 47600
Olympia, WA 98504

Jay Davis, Environmental Toxicologist, US Fish and Wildlife Service
jay_davis@fws.gov
360-753-9568
510-Desmond Dr. SE, Suite 102
Lacey, WA 98503

Collin Eagles-Smith, Supervisory Research Ecologist, USGS Corvallis Research Group
ceagles-smith@usgs.gov
541-750-0949
3200 SW Jefferson Way
Corvallis, OR 97331

Robert Elleman, Meteorologist, US Environmental Protection Agency-Region 10
elleman.robert@epa.gov
206-553-1531
1200 Sixth Avenue, OEA-095
Seattle, WA 98101

Colleen Flanagan, Ecologist, Air Resources Division, National Park Service
Colleen_Flanagan@nps.gov
303-969-2806
P.O. Box 25287
Denver, CO 80225

Steven Fradkin, Coastal Ecologist, Olympic National Park
steven_fradkin@nps.gov
360-374-1222
600 E. Park Avenue
Port Angeles, WA 98362

Chad Furl, PBT Chemical Coordinator, Washington Dept of Ecology
cfur461@ecy.wa.gov
360-407-6060
P.O. Box 47710
Olympia, WA 98504

Linda Geiser, Ecologist, US Forest Service
lgeiser@fs.fed.us
541-231-9452
P.O. Box 1148
Corvallis, OR 97339

Reed Glesne, Aquatic Ecologist, NPS-North Cascades NP
reed_glesne@nps.gov
360-854-7315
728 Ranger Station Rd
Marblemount, WA 98267

Rick Graw, Air Resource Management Specialist, US Forest Service
rgraw@fs.fed.us
503-808-2918
P.O. Box 3623
Portland, OR 97208

Joan Hardy, Toxicologist, Washington Dept of Health
Joan.Hardy@doh.wa.gov
360-236-3173
7171 Cleanwater Lane, Bldg. 2
P.O. Box 47846
Olympia, WA 98504

Gretchen Hayslip, Monitoring Coordinator, US Environmental Protection Agency-Region 10
hayslip.gretchen@epamail.epa.gov
206-553-1685
1200 Sixth Avenue, ES-097
Seattle, WA 98101

Lillian Herger, Fisheries Biologist, US Environmental Protection Agency-Region 10
herger.lillian@epamail.epa.gov
206-553-1074
1200 Sixth Ave., Suite 900, OEA-095
Seattle, WA 98101

Dan Jaffe, Professor, University of Washington
djaffe@uw.edu
425-352-5357
18115 Campus Way NE
Bothell, WA 98011

Anne Johansen, Associate Professor, Chemistry Department, Central Washington University
johansea@cwu.edu
509-963-2164
400 E. University Way
Ellensburg, WA 98926-7539

Tim Kiser, US Fish and Wildlife Service, Upper Columbia River Fish and Wildlife Office
tim_kiser@fws.gov
509-893-8023
11103 E. Montgomery Dr.
Spokane, WA 99206

Robert Kotchenruther, Environmental Scientist, US Environmental Protection Agency-Region 10
kotchenruther.robert@epa.gov
206-553-6218
1200 Sixth Avenue, Suite 900, OEA-095
Seattle, WA 98101-3140

Dixon Landers, Senior Research Environmental Scientist, US EPA NHEERL, Western Ecology Division
Landers.Dixon@epa.gov
541-754-4427
200 SW 35th Street
Corvallis, OR 97333

Mike Larrabee, Physical Science Technician, North Cascades National Park
mike_larrabee@nps.gov
360-854-7333
810 State Route 20
Sedro Woolley, WA 98284

Andrea LaTier, Biologist/Toxicologist, US Fish and Wildlife Service
andrea_latier@fws.gov
360-753-9593
510 Desmond Dr. SE, Suite 102
Lacey, WA 98503

Chris Lauver, Research Coordinator, NPS Pacific Northwest CESU, Univ. of Washington
chris_lauver@nps.gov
206-685-7404
Box 352100
University of Washington, WA 98195

Rebecca Lofgren, Biological Technician, Mount Rainier National Park
Rebecca_Lofgren@nps.gov
360- 569-2211 ext. 3371
55210 238th Ave. E
Ashford, WA 98304

Stefan Lofgren, U.S. Park Ranger, Mount Rainier National Park
Stefan_Lofgren@nps.gov
360-569-2211 ext. 6007
55210 238th Ave. E
Ashford, WA 98304

Dave McBride, Toxicologist, Washington Dept of Health
Dave.McBride@doh.wa.gov
360-236-3176
PO Box 47846
Olympia, WA 98504

Callie Meredith, Toxics/PBT Monitoring Program, Washington Dept of Ecology
came461@ecy.wa.gov
360-407-6965
PO Box 47710
Olympia, WA 98504

Patrick Moran, Biologist, USGS- Washington Water Science Center
pwmoran@usgs.gov
253-552-1644
930 Broadway, Suite 300
Tacoma, WA 98402

Madonna Narvaez, Air Toxics Team Leader, US Environmental Protection Agency- Region10
narvaez.madonna@epa.gov
206-553-2117
1200 Sixth Avenue, Suite 900,
MC: AWT-107
Seattle, WA 98101-3140

Dale Norton, Manager of Toxics Studies Unit, Washington Dept. of Ecology
dnor461@ecy.wa.gov
360-407-6765
PO Box 47600
Olympia, WA 98504

Jack Oelfke, Chief of Resources Management, North Cascades National Park
jack_oelfke@nps.gov
360-854-7310
810 State Route 20
Sedro Woolley, WA 98284

Anthony Paulson, Supervisory Research Hydrologist, USGS- Washington Water Science Center
apaulson@usgs.gov
253-552-1681
930 Broadway, Suite 300
Tacoma, WA 98402

Janice Peterson, Air Resource Specialist, US Forest Service
jlpeterson@fs.fed.us
206-732-7845
400 N. 34th St., Suite 201
Seattle, WA 98103

Ashley Rawhouser, Aquatic Ecologist, North Cascades National Park
ashley_rawhouser@nps.gov
360-854-7317
810 State Route 20
Sedro-Woolley, WA 98284

Jon Riedel, Geologist, NPS-North Cascades NP
jon_riedel@nps.gov
360-873-4590 ext. 21
728 Ranger Station Rd
Marblemount, WA 98267

Regina Rochefort, Ecologist, North Cascades National Park
regina_rochefort@nps.gov
360-854-7202
810 State Route 20
Sedro-Woolley, WA 98284

Barbara Samora, Biologist, Mount Rainier National Park
barbara_samora@nps.gov
360-569-2211
55210 238th Ave. E
Ashford, WA 98304

Corinne Schiller, Senior Research Scientist, Environment Canada
corinne.schiller@ec.gc.ca
604-664-9125
201-401 Burrard St.
Vancouver, BC V6C 3S5

Jill Schrlau, Faculty Research Assistant, Oregon State University
Jill.Schrlau@oregostate.edu
541-737-9208
1007 Agriculture & Life Sciences, #1161
Corvallis, OR 97331

Keith Seiders, Environmental Assessment Program, Washington Dept of Ecology
keith.seiders@ecy.wa.gov
360-407-6689
PO Box 47710
Olympia, WA 98501

Rich Sheibley, Research Hydrologist, USGS-Washington Water Science Center
sheibley@usgs.gov
253-552-1611
930 Broadway, Suite 300
Tacoma, WA 98402

Staci Simonich, Associate Professor, Oregon State University, Dept. of Environmental and Molecular Toxicology and Dept. of Chemistry
staci.simonich@orst.edu
541-737-9194
1141 Agricultural and Life Sciences
Corvallis, OR 97331-7301

Don Steffeck, Division Chief, US Fish and Wildlife Service
don_steffeck@fws.gov
503- 231-2198
911 NE 11th Ave
Portland, OR 97232

Kathy Tonnessen, Research Coordinator, Rocky Mountains-CESU, National Park Service
Kathy_Tonnessen@nps.gov
406-243-4449
Univ. of Montana, College of Forestry
Missoula, MT 59812

Dave Uberuaga, Superintendent, Mount Rainier National Park
Dave_Uberuaga@nps.gov
360-569-2211
55210 238th Ave. E
Ashford, WA 98304

Herman Wong, Atmospheric Scientist, US Environmental Protection Agency-Region 10
wong_herman@epa.gov
206-553-4858
1200 Sixth Avenue, OEA-095
Seattle, WA 98101

8. Supplementary Resources

8.1. Invitation Letter

United States Department of the Interior

NATIONAL PARK SERVICE
Mount Rainier National Park
55210 238th Ave. East
Ashford, WA. 98304

IN REPLY REFER TO:

Dear Colleague,

You are invited to participate in a post-WACAP (Western Airborne Contaminants Assessment Project) Workshop for the North Coast and Cascades region, hosted by the National Park Service, in conjunction with the US Forest Service, US Fish & Wildlife Service, US Geological Survey, US Environmental Protection Agency and State of Washington. The Pacific Northwest (PNW) Contaminants Workshop will be held November 4-5, 2010 at the EPA Region 10 office, 1200 6th Ave, downtown Seattle.

The National Park Service conducted the multiagency WACAP study in 2002-2007 to evaluate potential threats to national park ecosystems from airborne contaminants and likely sources of those contaminants, addressing concerns about the persistence, toxicity, and bioaccumulative properties of airborne contaminants such as mercury and pesticides. Released in spring 2008, WACAP provided a preliminary, regional overview of the contaminant situation at twenty western national parks from the Arctic to the Mexican border, including Washington's Mount Rainier (MORA), Olympic (OLYM) and North Cascades (NOCA) National Parks (NPs).

Key findings from the WACAP report indicate that out of over 100 organic contaminants tested, 70 were found at detectable levels in air, snow, water, lichen, conifer needles, lake sediment, and/or fish in national parks. While concentrations of most of these contaminants were below levels of concern, others were found to have accumulated above levels of concern in sensitive resources such as fish. Seven ecosystem indicators were sampled at Mount Rainier, Olympic and other "core" parks in the WACAP study, while only air and vegetation were sampled at North Cascades NP and other "secondary" parks. (However, snow and fish have been sampled and analyzed from all three parks, including North Cascades, in other studies, as below.) High concentrations of mercury were found in snow and fish at OLYM and MORA with all fish from both parks exceeding health thresholds for one or more species of wildlife and some fish exceeding health thresholds for humans. Some concentrations of semi-volatile organic compounds in fish were low in OLYM and mid-range at MORA with the exception of emerging contaminants (PBDEs, flame retardants) and a historically-used pesticide (dieldrin). Additionally, one male fish from Golden Lake (MORA) had elevated concentrations of an estrogen-responsive protein in the blood generally found only in females, suggesting potential effects on fish reproduction from xenoestrogenic contaminants. Semi-volatile organic compounds (mostly current and historic use pesticides and PAHs, a combustion byproduct) detected in lichen and conifer needles were similar at all three parks and were at mid to upper ranges compared to concentrations at other WACAP parks. The discovery of relatively high levels of mercury and pesticides in the vegetation reflects the ability of NW forests to scrub contaminants from the air. Because forest productivity is high (i.e. NW parks have dense forests which grows at a rapid rate), contaminants scrubbed from the air could contribute significant contaminant loads to the ecosystem via canopy through-fall and needle litter-fall.

Research results from other similar studies sponsored by the US Geological Survey (USGS), US Forest Service (USFS) and US Environmental Protection Agency (USEPA) also indicate the presence of airborne contaminants in remote ecosystems of the Pacific Northwest. A recent USGS study of fish from lakes in the three NW parks examined similar compounds and found generally low contaminant levels, although one sample from one lake in North Cascades NP approached the human consumption advisory level for mercury. Further, the USGS study evaluated the gene expression pattern in the fish and found

suggestion of a biological impact at multiple levels (e.g., growth, reproduction, stress response, metabolism, immune response) associated with these relatively low contaminant levels. The USFS has conducted a multitude of studies regarding contaminant concentrations in sensitive lichen species in the NW, and the USEPA has several long-term monitoring programs that have investigated contaminant concentrations in fish tissue and surface waters.

Given the realized concern and to address potential risks to ecosystem and human health, the multiagency consortium is hosting a Pacific Northwest Contaminants Workshop to discuss, clarify and expand on WACAP findings and other regional airborne contaminant studies.

Objectives of the PNW Contaminants Workshop include to:

1. **Provide** an overview of key WACAP findings for the Pacific Northwest and other regional airborne contaminant studies pertaining to Hg, PBDEs, PAHs, and pesticides, gaining an understanding on state of the knowledge regarding contaminant occurrence, distribution, and ecological effects and human health consequences;
2. **Identify** gaps in research and monitoring, future assessment needs, and potential funding sources;
3. **Develop** strategies to address research and monitoring needs, and public outreach efforts pertaining to states/regulatory agencies, source control/modeling, information transfer, and general public education on safety issues/public health;
4. **Build** upon partnerships developed between the National Park Service, US Geological Survey, US Forest Service, US Fish & Wildlife Service, US Environmental Protection Agency, State of Washington, and WACAP scientists, and develop among others including Tribal, Federal, State and Local agencies, collaborating on an effective outcome.

Access meeting logistics, agenda, and background materials pertaining to WACAP findings in Washington's NPs at the PNW Contaminants Workshop webpage: http://www.nature.nps.gov/air/Studies/air_toxics/wacap/pnwWorkshop/. Also visit http://www.nature.nps.gov/air/Studies/air_toxics/wacap.cfm for the WACAP report, fact sheet, key findings, and related publications, presentations, etc. Bring questions to the workshop or share them with us in advance.

We will be asking attendees to come to the workshop prepared to provide information on other data/programs regarding toxic air contaminants in Washington; and agency plans, if any, for follow up monitoring, research and assessment. Expect to receive occasional reminders over spring/summer 2010 and resumed correspondence thereafter. Please continue to visit the Pacific Northwest Contaminants Workshop webpage as it will be continually updated.

Feel free to forward this information to colleagues working directly on specific aspects of the airborne contaminants issue in the Washington and northern Oregon region, with whom you think might be interested in attending. However, since workshop space is limited, we need to hear from everyone regarding attendance. Please RSVP to Barbara Samora, Mount Rainier National Park, barbara_samora@nps.gov, ASAP.

A block of rooms are reserved at the Hotel Vintage Park at 1100 Fifth Avenue, Seattle, WA., (206) 624-8000 (800) 624-4433. Rooms are available at the government rate of $135 per night (subject to occupancy tax). There is an additional charge of $15/night per person for each additional person in the room. Rooms will be held until September 20, 2010. Ask for the block of rooms under the Contaminants Workshop group.

We hope you and/or your colleagues can join us and we look forward to seeing you in November. If you have questions or comments please call or e-mail one of the steering committee members listed below.

Sincerely,

/s/

Barbara Samora, on behalf of the Pacific Northwest Contaminants Workshop Steering Committee
Aquatic and Atmospheric Program Coordinator
Mount Rainier National Park

Steering Committee:

National Park Service

Air Resources Division
Tamara Blett, Ecologist Tamara_Blett@nps.gov
Colleen Flanagan, Ecologist Colleen_Flanagan@nps.gov

Mount Rainier National Park
Barbara Samora, Biologist/Aquatic and Atmospheric Program Manager, barbara_samora@nps.gov

North Cascades National Park
Jack Oelfke, Chief, Natural Resources jack_oelfke@nps.gov
Jon Riedel, Geologist jon_riedel@nps.gov

Olympic National Park
Bill Baccus, Physical Science Technician, bill_baccus@nps.gov
Steven Fradkin, Coastal Resources Specialist steven_fradkin@nps.gov

Pacific West Region
Judy Rocchio, Air Quality Coordinator Judy_Rocchio@nps.gov

Washington State Department of Ecology
Chad Furl, Environmental Assessment Program cfur461@ecy.wa.gov

US Environmental Protection Agency
Gretchen Hayslip, Region 10 hayslip.gretchen@epa.gov
Lillan Herger, Region 10 herger.lillian@epa.gov

US Fish & Wildlife Service
Jay Davis, Environmental Contaminants Specialist jay_davis@fws.gov

US Forest Service
Janice Peterson, Air Resource Specialist jlpeterson@fs.fed.us

US Geological Survey
Bob Black, Aquatic Ecologist rwblack@usgs.gov

PWR Workshop Facilitator:
Kathy Tonnessen, National Park Service- Rocky Mountain Cooperative Ecosystem Studies Unit Kathy_Tonnessen@nps.gov

8.2. Breakout Session Template for Day 2

Refer to Agenda at Section 2, and results of breakout groups at Section 4.2.

Please use this template in your breakout groups. The focus of each small group may reflect the following proposed topic areas:

I. Source Attribution & Transport - Using atmospheric & ecosystem monitoring & modeling to develop a weight of evidence;
II. Contaminants Monitoring & Risk Assessment - Setting priorities for types of contaminants & approaches in the future;
III. Outreach Communication & Information Exchange - Identifying key messages, audiences & products, including human & wildlife health thresholds.

1. **Work** with the breakout group leader and recorder. Take a moment to read the template from beginning to end. Then, start your session.

2. **Refer** to the list of gaps and needs regarding airborne toxics in the Pacific Northwest that were developed from yesterday's meeting. Add, edit, and make more concise. Prioritize the top three issues pertaining to your breakout topic.

3. **Identify** how to fill those top three gaps or needs.
   a. What are the desired future outcomes, e.g. what product might result from current findings on PNW toxics?
   b. What resources or existing models are currently available to achieve the desired outcomes, e.g. what PNW programs are already in place?
   c. Brainstorm: what activities are recommended to reach the desired outcomes?

4. **Specify** available funding sources for this initiative. If funding is currently unavailable, identify a path toward gaining funds.

5. **Select** one or two of the highest priority actions to move forward with, and identify those individuals responsible for taking the lead in moving each issue towards the desired outcome.

6. **Utilize** the attached framework as a guiding tool when addressing each of the above points.

Issue: _____

Recommended Activities:

_____
_____
_____
_____
_____
_____

Responsibilities:

_____
_____
_____
_____
_____

Outcomes

_____
_____
_____
_____
_____
_____
_____

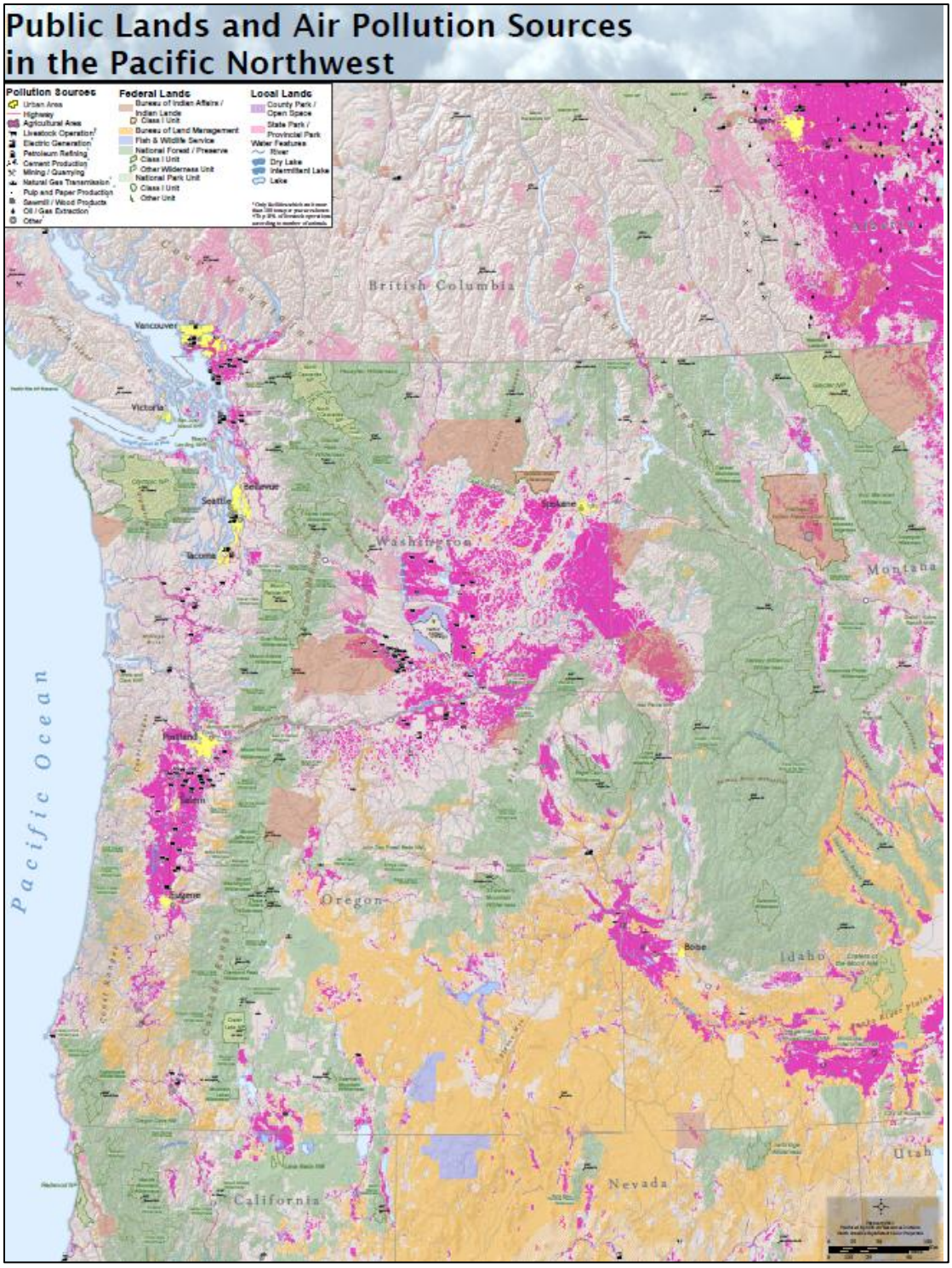
Resources and _____
Existing Models _____
_____
_____

Other Comments: _____
_____
_____

Challenges:

8.3. Background materials: PNW Contaminants Workshop

8.3.1. Public Lands and Air Pollution Sources in the Pacific Northwest[1]



[1] The full size "Public Lands and Air Pollution Sources in the Pacific Northwest" map is available from the Pacific Northwest Contaminants Workshop web page: (http://www.nature.nps.gov/air/studies/air_toxics/wacap/pnwWorkshop/index.cfm).

8.3.2. WACAP Graphical Summaries for PNW parks

8.3.3. Olympic National Park – WACAP Announcement

These informational materials and more are available from the PNW Contaminants Workshop web page (http://www.nature.nps.gov/air/Studies/air_toxics/wacap/pnwWorkshop/index.cfm).

8.4. Workshop Logistics

EPA provided logistical information for visitors to the Region 10 office in downtown Seattle, including nearby hotels, restaurants, and transportation choices: http://www.nature.nps.gov/air/Studies/air_toxics/wacap/pnwWorkshop/docs/Visiting-EPA-R10-Offices.pdf.

Building security was addressed by providing EPA workshop participant names in advance. Each participant was also asked to bring an ID.

8.5. Photo of Workshop Participants

Back row, standing (L – R): Ashley Rawhouser, Mike Larrabee, Corinne Schiller, Jay Davis, Staci Simonich, Chad Furl, Anne Johansen, Dave McBride, Stefan Lofgren, Collin Eagles-Smith, Janice Peterson, Dixon Landers, Barbara Samora, Reed Glesne, Bill Baccus, Roger Andrasik.

Middle row, standing (L – R): Lillian Herger, Tony Paulson, Holly Davies, Rich Sheibley, Tonnie Cummings, Rebecca Lofgren, Gretchen Hayslip.

Front row, kneeling (L – R): Steven Fradkin, Bob Black, Jill Schrlau, Keith Seiders, Kathy Tonnessen, Regina Rochefort, Linda Geiser, Rick Graw, Don Campbell, Jack Oelfke.