PNW Contaminants Workshop – Nov 4 & 5, 2010
Day 1 Presentation Abstracts

8:45 – 9:30 am

[[Dixon Landers – EPA]]

Overview of the WACAP Science and Issues for the PNW Region

The Western Airborne Contaminants Assessment Project (WACAP) was initiated in 2002 by the National Park Service to determine if airborne contaminants where 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 and metals, including mercury. Atmospheric back trajectory modeling was performed for each site to determine the potential sources of contaminants. WACAP is designed so that contaminant pathways can be inferred based on the contaminants measured in the various environmental compartments. Passive air monitors in both Olympic and Mount Rainier NP 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 sources which have a large marine component. Hoh Lake sediments in Olympic NP show the lowest concentrations of metals and SOCs among all four lakes. In Olympic NP, both lakes show a decline in PCBs since their ban. In MORA, Golden Lake shows a PCB decrease but LP19 shows an increase since the ban. Mercury in all four lakes shows an increase toward the surface of the sediment cores. In LP19, this could be due to an increase in 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 due to landslides and the input of large wood. All four lakes showed a mid 20th Century increase in 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.

9:30 – 10:15 am

[[Staci Simonich – OSU]]

WACAP Air, Snow and Vegetation Results: A Focus on OLYM, MORA and NOCA

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 Pacific Northwestern (PNW) U.S. and in parks that were increasingly downwind of regional urban and agricultural areas. OLYM, MORA, and NOCA had pesticide and polycyclic aromatic hydrocarbon (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.

10:30 – 11:00 am

[[Staci Simonich – OSU]]

Contaminant Bioaccumulation in OLYM, MORA and NOCA

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 polybrominated diphenyl ether (PBDE) concentrations in WACAP were measured in Golden Lake in MORA. The fish in both parks had high mercury 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 mercury 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.

12:30-1:00 pm

[[Bob Black – USGS]]

Tissue Contaminants and Associated Transcriptional Response in Trout Liver from High Elevation Lakes of Washington

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 mercury and 28 organochlorine compounds in trout collected from 14 remote lakes in the Olympic, Mt. Rainer, and North Cascades National Parks. Mercury was detected in trout from all lakes sampled (15 to 262 µg/kg ww), as well as dichlorodiphenyldichloroethylene (DDE) and total polychlorinated biphenyls (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 dry weight (ww), 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.

1:00-1:30 pm

[[Lil Herger / Gretchen Hayslip – EPA]]

EPA's Aquatic Ecological Monitoring in the Pacific Northwest

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.

This talk will describe the study design and protocols of these large-scale ecological assessments. We will give examples of the types of results generated with emphasis on the national parks. Finally will discuss how this type of design could be useful on the scale of a National Park.

1:30 – 2:00 pm

[[Don Steffeck – FWS]]

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

Air pollutants can harm ecological resources in a variety of ways and profoundly affect Fish and Wildlife Service (Service) 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 Service's 1994 Air Quality Management Plan (Plan) are to meet existing responsibilities, provide ecological information to protect the air quality related values of all Service Class I Wilderness areas, and enhance effective decision making and policy development for the Service'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 Service 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 Service 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 Service programs will coordinate their air quality activities.

2:00 – 2:30 pm

[[Keith Seiders – State of Washington, Dept of Ecology]]

Monitoring Toxic Contaminants in Fish

This presentation describes 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 mercury, 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 many Clean Water Act Section 303d 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 may be reviewed.

2:45 – 3:15 pm

[[Holly Davies – State of Washington, Dept of Ecology]]

State Regulation for Persistent Bioaccumulative and Toxic substances and the role of Chemical Action Plans

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 mercury, PBDEs, and lead have been used to set priorities for our actions both inside and outside of Ecology. The actions have been with existing authority, such as mercury collection, and with new authority, such as the ban on some uses of decaBDE. We are currently collecting information on sources of PAHs for the next CAP.

3:15 – 3:45 pm

[[Madonna Narvaez – EPA]]

Federal Regulatory Mechanisms on Toxic Air Contaminants

This talk will give a brief overview of the approaches EPA uses to address air toxics and the co-benefits of reducing ground-level ozone and particulate matter, 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, mercury, 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 mercury. 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.