

Project Status Statement

Bureau: National Park Service (NPS)
Issue: The Western Airborne Contaminants Assessment Project
Park Site: National Park Service, Air Resources Division
Date: February 2009

BACKGROUND:

Toxic persistent organic compounds and metals are carried in air masses from sources as far away as Europe and Asia, and as close as the local county. The objective of the Western Airborne Contaminants Assessment Project (WACAP) was to inventory and analyze the concentration and biological effects of airborne contaminants in the air, snow, water, lake sediment, lichen, conifer needles, and fish of national park ecosystems using a network of eight core parks (Sequoia, Rocky Mountain, Denali, Noatak, Gates of the Arctic, Olympic, Mount Rainier, and Glacier) in the West and Alaska. More limited assessment focusing on vegetation was conducted in twelve secondary parks.

Airborne contaminants can pose serious health threats to wildlife and humans, as some of these compounds tend to "biomagnify" in the food chain. Biological effects of airborne contaminants can include impacts on reproductive success, growth, behavior, disease, and survival of fish, wildlife, and humans, if these compounds accumulate to toxic levels. WACAP was designed to determine: (1) if contaminants are present in western national parks; (2) where contaminants are accumulating (geographically and by elevation); (3) which contaminants pose a potential ecological threat; (4) which indicators appear to be the most useful to address contamination; and (5) the sources for contaminants measured at the national park sites.

The project, conducted from 2002 to 2007, was coordinated by NPS Air Resources Division staff members in Denver. Other participating institutions included the US Environmental Protection Agency (EPA), the US Geological Survey (USGS), the USDA Forest Service, Oregon State University and the University of Washington. National park resource managers worked with scientists from the collaborating agencies to plan and conduct the WACAP study. Both the WACAP research plan and final report were reviewed by separate international peer review panels arranged by EPA and NPS. Internal agency reviews (EPA and USGS) were also conducted on the final report.

STUDY RESULTS:

WACAP findings were released in February 2008 and posted at the project website: http://www.nature.nps.gov/air/Studies/air_toxics/wacap.cfm. The final WACAP report and report hard copies were distributed to WACAP Principal Investigators (PIs), report authors, peer reviewers, NPS units, collaborators, and other interested parties in October 2008. A database containing all the physical, chemical, and biological data collected in the study will be made available on NPS and EPA websites in spring 2009. Key results from the 8 core WACAP parks include:

- Measurable amounts of both current use and historic (banned in the U.S.) contaminants were found in snow, water, vegetation, fish and lake sediment at all 8 parks;
- Parks nearest agricultural areas (Sequoia, Rocky Mountain, Glacier) contained higher levels of both currently used pesticides and pesticides banned some decades ago;

- Historical records of contaminants in lake sediments showed that the ban in the U.S. (in the 70s - 90s) of several key contaminants (e.g., DDTs, dieldrin, chlordanes) has served to reduce deposition of these compounds to lake sediments in some parks further away from agricultural sources, but they are continuing to accumulate in lake sediments of many parks close to agricultural sources;
- Contaminants generally increased with elevation, so high elevation areas in parks may be at extra risk for contamination;
- Average contaminant concentrations of mercury in fish in many parks exceeded risk thresholds for health impacts to fish-eating birds and mammals, and concentrations of DDT in some fish at Sequoia and Glacier and chlordanes in one fish at Glacier exceeded risk thresholds for health impacts to fish-eating birds;
- Concentrations of mercury, dieldrin, and DDT found in some fish from some parks exceeded EPA human health thresholds;
- Some "intersex" fish (male and female reproductive structures in the same fish) were found in Rocky Mountain and Glacier (but not in any of the other 6 parks in the study); and
- Some "new" contaminants like PBDEs (flame retardants commonly applied to furniture fabric) show increasing presence in park ecosystems.

Full findings and extensive results are found in the final report, including park specific summaries and recommendations for future work.

IMPACT & ACTIONS:

Outcomes from the study included: press coverage from 200+ local, national, and international media outlets; a request by Senator Feinstein for EPA responses regarding WACAP at a Senate hearing; a request for briefing by EPA's Office of Air Quality Planning and Standards (OAQPS), due to agency concerns over environmental effects; a National Academy of Sciences (NAS)-convened review panel on The Significance of International Transport of Air Pollutants that includes two WACAP PIs; and a presentation given to the Committee on Environment and Natural Resources (CENR)'s Air Quality Research Subcommittee (AQRS).

The implications of WACAP's findings are being considered in numerous venues, including: (1) EPA's Environmental Monitoring and Assessment Program (EMAP, for the possible inclusion of NPS waterways and contaminant analysis); (2) NPS Office of International Affairs (slated to highlight WACAP on their website and in upcoming newsletters); and (3) NPS Office of Public Health (prepared a briefing on WACAP concerns and is developing a DOI-wide guidance on fish consumption).

Results from this project add considerably to the state of the science concerning contaminant occurrence and subsequent biological effects in remote national park ecosystems. The WACAP study produced eight published journal articles by project PIs, and more are in preparation and/or review. In addition, several articles for NPS publications, and otherwise, such as Park Science, Alaska Park Science, Natural Resource Year in Review, Pacific Northwest (PNW) Cooperative Ventures, and Alaska's Caribou Trails, are available. Various new methods developed by WACAP scientists also furthered the science of contaminants assessment in ecosystems.

In an effort to facilitate communication, to foster research and collaborative monitoring initiatives on toxics in the environment, and to further understand the effects of airborne contaminants, the

state of Montana and Glacier NP hosted an interagency, post-WACAP contaminants workshop in April 2008. Sequoia/Yosemite/Lassen Volcanic NPs are planning a similar follow-up workshop in spring 2009 for the Sierra Nevada – Southern Cascades region, and a related Rocky Mountain regional workshop on contaminants may occur in the future.

A FY08-FY10 study led by Dr. Carl Schreck at Oregon State University (WACAP Fish investigator) on the extent of endocrine disruption in fish across western and Alaskan national parks exemplifies one such WACAP follow-up research project. Additional work proposed includes (1) EPA Region 8's Regional Applied Research Effort (RARE) study on biomarkers of intersex in fish at ROMO and (2) Fish and Wildlife Service (in partnership with NPS) investigation of chemical concentrations in fish at ROMO, GLAC and GRTE, and the potential impact on threatened and endangered species.

Numerous presentations on WACAP results have been given by WACAP researchers and NPS staff, including at such venues as the: Society of Environmental Toxicology and Chemistry (SETAC), Alaska Forum on the Environment, California Forest Pest Council, National Atmospheric Deposition Program (NADP) Meeting, University of Colorado-Boulder, and California Nonpoint Source Pollution Conference. Future planned presentation venues include the Consortium for Research and Education on Emerging Contaminants (CREEC; a scientist and stakeholder group from the Central Rocky Mountains), George Wright Society, and EPA Region 8 WISE seminar series.

POSITION OF INTERESTED PARTIES:

Upon release of the report, there was significant political interest in WACAP findings that included inquiries from the White House regarding anticipated media and public reactions and next steps. The Department of the Interior was substantially involved regarding the issue of subsistence fish consumption concerns by native populations in Alaska.

The Pesticide Action Network has been utilizing WACAP findings in their documents and briefings. The agricultural community has not yet become substantially engaged in this issue.

Some parks posted fish consumption advisories for lakes sampled by WACAP, either through bulletins at trailheads, newsletters, or in communication to backcountry rangers.

NPS PERSPECTIVE:

Bioaccumulation of toxic compounds is occurring in western and Alaskan parks and is of concern for both ecosystem and human health. The implications of such a study provide a cautionary message that increases awareness of impacts to National Park Service ecosystems.. Results illustrate the deleterious consequences of airborne contaminants upon park natural resources legally mandated to remain "unimpaired" (NPS Organic Act, 1916). The NPS would rather the detection of fewer contaminants and lower concentrations of contaminants in park ecosystems, especially for contaminants like mercury and dieldrin where concentrations in WACAP fish were above thresholds for potential negative health effects on birds and/or wildlife, and in some cases for people. The results not only provide impetus for more in-depth studies, but also provide one of motives needed for additional protection of national park resources. In summary, the interagency, interdisciplinary, peer reviewed WACAP study demonstrates cause for concern for these remote, once pristine, western and Alaskan national park ecosystems due to the airborne transport and deposition of a variety of human-made chemicals and the human mobilization of mercury.

WHAT'S NEXT:

WACAP was designed as a “scoping study” that has provided an indication of contaminants of concern in respective parks and regions. More follow-up work, both inside and outside parks, by NPS and other agencies would be needed to learn how widespread the problems are. Individual parks are encouraged to work with other groups and agencies to talk about the findings and suggest further surveys or research that may be needed to understand the extent and impact of contaminants on local ecosystems. In addition, NPS can work with partners to cooperatively look for funding, distribute or connect people to the reports or summaries, and take educational initiatives that communicate all the courses of action, warnings, on a park specific basis, etc. To the extent that sources of some contaminants to park ecosystems were tentatively identified in the project, future efforts to coordinate with regulatory entities could identify strategies to reduce contaminant loads from US and international sources.

CONTACTS:

Christine Shaver, Chief, Air Resources Division, National Park Service (303-969-2074, chris_shaver@nps.gov)

John Vimont, Chief, Research and Monitoring Branch, Air Resources Division, National Park Service (303-969-2808, john_vimont@nps.gov)

Tamara Blett, Ecologist, Research and Monitoring Branch, Air Resources Division, National Park Service (303-969-2011, tamara_blett@nps.gov)

Colleen Flanagan, Ecologist, Research and Monitoring Branch, Air Resources Division, National Park Service (303-969-2806, colleen_flanagan@nps.gov)