

# Environmental Protection Agency

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The U.S. Environmental Protection Agency's (EPA) Arctic-related work is designed to protect the health of Arctic residents and safeguard the Arctic environment. EPA research in the Arctic is focused on the source, transport, fate, and effects of contaminants in the environment; risks and benefits of subsistence foods; global climate change; and UV-B radiation. An emerging EPA effort to develop an Arctic strategy will help the agency coordinate activities and target resources more effectively. EPA Arctic priorities are:

- Research and development;
- Regional implementation; and
- International activities.

Within this framework, EPA research continues to focus on three primary objectives:

- Improve basic knowledge about Arctic stressors and effects;
- Understand and reduce risk to Arctic residents and the Arctic environment; and
- Implement innovative technologies to solve environmental problems.

These primary objectives are being addressed through a variety of research and management efforts. The following discussion provides a brief summary of EPA-sponsored research projects, each highlighted under a particular objective, although individual projects may address more than one objective.

## *Arctic Stressors and Effects*

EPA has increased the understanding and awareness among regional, national, and international partners concerning the risks associated with contaminants in the U.S. Arctic. Activities include leading international efforts to assess heavy metals in the Arctic, investigating mercury deposition, and partnering on enhancing education about Arctic contaminants.

### *Arctic Monitoring and Assessment Programme Phase II Assessment: Heavy Metals*

AMAP is one of five working groups operating

	Funding (thousands)	
	FY 02	FY 03
Research and Development	200	377
Regional Activities	100	100
International Activities	100	100
Total	400	577

under the direction of the Arctic Council, a high-level, eight-nation, international forum implementing the Arctic Environmental Protection Strategy. AMAP's mission is to assess environmental contamination in the Arctic. The first AMAP assessment was published in 1998. An important and comprehensive document, the assessment highlighted potential risks to the Arctic from contaminants. However, U.S. data were missing from the first assessment. As AMAP Phase II began, in 1998, the U.S. was requested to serve as the lead country for the assessment of heavy metals. In March 1999 the EPA Office of Research and Development (ORD) agreed to fulfill this role.

Initial efforts defined the scope and features of the heavy metals assessment, completed at the international workshop Heavy Metals in the Arctic held in Anchorage, Alaska, during September 1999. In 2000, EPA funded scientists to identify and assemble research results from 1996 to the present and earlier work not represented in the AMAP Phase I assessment. In June 2001, EPA sponsored another international workshop, Trends and Effects of Heavy Metals in the Arctic, in McLean, Virginia, where new research results were reported in preparation for writing the assessment. Since then, multiple drafts of the assessment have been generated and submitted to the international scientific community for review and comments.

In July 2002, a semi-final draft was submitted to the AMAP Secretariat to support the publication of the primary report to the Arctic Council Ministers and the larger international public. This document, *Arctic Pollution 2002*, provides summarizes the results, conclusions, and recommendations of all five AMAP Phase II assessments, including

human health, heavy metals, persistent organic pollutants, radioactivity, and changing transport pathways.

In October 2002, *Arctic Pollution 2002* was first distributed at the Second AMAP Symposium on Contaminants in the Arctic, held in Rovaniemi, Finland. At this meeting, EPA staff, serving on behalf of the U.S. as lead country and as chair for the international heavy metals assessment team of 23 scientists, presented the technical results of the heavy metals assessment and served on the U.S. delegation to the Arctic Council for the ministerial meeting in Inari, Finland, convened immediately after.

To finalize the scientific document, a formal external peer review was planned and executed by EPA. Ten experts, not previously engaged in the process, reviewed the document in its entirety, and two additional scientists reviewed specific chapters. Comments were incorporated into the draft and submitted to the AMAP Secretariat in July 2003 for formal editing and final publication.

#### *Mercury and Arctic Sunrise*

One of the key findings in the AMAP Phase II heavy metals report is the transformation of mercury in the Arctic at polar sunrise. EPA has been instrumental in investigating the nature and geographical extent of the phenomenon termed “Arctic sunrise,” where atmospheric elemental gaseous mercury levels have been shown to drop drastically during the Arctic spring, when sunlight returns to the region. The majority of atmospheric mercury is present in elemental form, but reactive gaseous mercury has much higher wet and dry deposition rates. Thus, speciation of mercury is of particular interest in the Arctic because of the sunrise phenomenon and the greater local impact of reactive forms.

Since 2000, EPA scientists have designed and implemented a series of mercury speciation studies. Successful work first completed in Barrow, Alaska, led to implementation of partnership studies during 2002 and 2003 at the Italian South Pole Atmospheric TerraNova Science Research Base and at the Norwegian Polar Research Base at Ny Alesund. EPA scientists trained collaborators and helped design and install specialized instrumentation at all three polar monitoring sites. The primary objectives of monitoring studies conducted during polar sunrise were threefold:

- Measure and speciate the various forms of mercury in air and snow [elemental mercury (HgO), reactive gas phase mercury (HgX<sub>2</sub>,

where X is a halide), and fine-particle-bound mercury (HgP)];

- Obtain snow samples for subsequent chemical analysis; and
- Obtain air quality data and meteorological measurements.

These measurement campaigns were designed to obtain information on the factors that lead to mercury depletion events (MDEs) to better understand and model the impact of MDEs on the half-life of mercury in the atmosphere and the potential bioavailability of mercury transformation products. The instrumentation and methods developed by EPA to speciate mercury are being used by atmospheric scientists in the U.S., Canada, Norway, Italy, Germany, Denmark, and Sweden, and study results are being published in the scientific literature.

#### *UV Monitoring*

EPA, in collaboration with the National Park Service, continues to maintain a network of ground-based UV monitoring instruments at 14 national parks and 7 urban locations in the U.S. One of these PRIMENet (Park Research and Intensive Monitoring of Ecosystems Network) sites is in Denali National Park, Alaska. While below the Arctic Circle, the site offers useful data for northern regions in comparison with other areas.

U.S. Federal agencies continue to coordinate their efforts to operate a network of ground-based UV monitoring instruments in response to a U.S. Global Climate Research Program plan published in 1995. Participating agencies are EPA, USDA, NOAA, NSF, the Smithsonian Institution, NASA, and DOE.

The USGCRP FY 2000 document *Our Changing Planet* calls for the need to understand changes in UV fluxes and how these changes affect human health and the productivity of ecosystems. Through PRIMENet, data from Denali National Park and other UV monitoring sites provide a valuable basis for primary research and assessments of the consequences of climate change.

#### *Understanding and Reducing Risk*

EPA and others have broadened the risk assessment approach to effectively bring together scientific research and management strategies to enhance risk reduction. In the Arctic this specifically targets reducing risk to humans potentially exposed to contaminants in traditional foods, as well addressing the profound changes occurring

in the Arctic and Bering Sea region from the combined effects of many stressors. EPA is focusing resources and time in the Arctic to integrate ecosystem-level risk assessment with human health and cultural risk.

#### *Benefits and Risks of a Traditional Diet*

EPA ORD is working with Native, academic, state, and other Federal agencies on evaluating both the nutritional benefits and the potential health risks of contaminants in wild-caught food. Through a grant to the Aleutian/Pribilof Islands Association (APIA) from the National Institute of Environmental Health Sciences (NIEHS), scientists are working with two Native communities, St. Paul and Atka, to identify preferred food consumption, the proportion of wild and store-bought foods consumed, and the levels of contaminants in foods, as well as the values and benefits of collecting and consuming traditional foods. EPA was instrumental in assembling the research team and facilitating the research design during 2000 and 2001. During 2002 and 2003, EPA played a key role in facilitating the development of community goals, generating hypotheses, and linking assessment goals and conceptual model development to data collection activities.

#### *Heavy Metals and Persistent Organic Pollutants in Traditional Foods*

Increasing concern by Native people in Alaska about the levels of pollutants in traditional foods led EPA (Region 10, ORD) to provide funding to the Sea Otter and Sea Lion Commission, a Native-based scientific organization, to assess the levels of heavy metals and persistent organic pollutants (POPs) in seagull eggs used for subsistence. The commission used funding to train local people to collect and transport eggs and prepare specimens and to support lab analysis. Collections were completed during 2000 and 2001. The results, published in 2003, were encouraging for local communities since levels of POPs and heavy metals were low.

### *Implementing Technologies*

Introducing and implementing innovative technologies and management opportunities has been a cornerstone within EPA. In the Arctic, EPA continues to focus on reducing contaminants reaching the Arctic through long-range transport and building capacity within the U.S. Arctic to reduce potential environmental impacts.

#### *Reducing Atmospheric Mercury Releases from Arctic States*

The Arctic Council agreed to act to reduce exposures to a number of priority pollutants in the Arctic region. To accomplish this, the Arctic Council Action Plan (ACAP) Mercury Project was initiated in 2002. The project is being led by the Denmark Environmental Protection Agency, all eight Arctic nations are participating, and four, including the U.S., are providing funding. The EPA is coordinating U.S. involvement.

The project objective is “to contribute to a reduction of mercury releases from the Arctic countries; partly by contributing to the development of a common regional framework for an action plan or strategy for the reduction of mercury emissions, and partly by evaluating and selecting one or a few specific point sources for implementation of release reduction measures. The reduction of mercury releases...should serve as a demonstration of existing possibilities, giving inspiration to other measures in the region.”

Initial work in 2003 centered on developing a detailed inventory questionnaire that addressed releases, usage, and disposal and was completed by each country. In August 2003, EPA provided the U.S. response using the questionnaire. All data are publically available, and most are from U.S. inventories, for example, the latest (1999) National Emissions Inventory for air emissions and the 2001 Toxics Release Inventory for solid waste disposal and water discharges. It is expected that in late 2004, Denmark will make available a Regional Inventory Report reflecting information submitted by the various countries. About the same time, it is expected that Denmark will make available a detailed Russian Inventory Report, which was developed by a Russian Federation team of scientists with the assistance of the ACAP project. Now the ACAP project is considering candidate control demonstrations in the Russian Federation that can provide new scientific information and inspiration for all Arctic countries.

#### *Reducing PCBs in Russia*

The Russian Federation depends on PCBs and PCB-containing equipment, and it has not accepted the Protocol on Persistent Organic Pollutants (POPs) of the Convention on Long-Range Transboundary Air Pollution (LRTAP) because of its inability to phase out PCB use. To assist Russia in phasing out PCB use, EPA proposed a multilateral technology transfer and demonstration project under the auspices of the Arctic Council Action

Plan (ACAP). The objective of this multilateral cooperative pilot program is to protect the Arctic ecosystems and indigenous U.S. populations by assisting the Russian Federation in:

- Developing an inventory, or source term, for PCBs in the Russian Federation;
- Ceasing the use of PCBs;
- Developing and constructing or retrofitting facilities for the production and use of PCB alternatives;
- Providing safe disposal and destruction of PCBs and PCB-contaminated equipment and material; and
- Remediating PCB sites that have the greatest potential to impact the Arctic.

The project has been implemented in three phases. Phase I, implemented during 1997–1999, organized the effort and developed an inventory of PCBs in Russia. During Phase II, feasibility studies were conducted to identify effective collection, storage, destruction, and remediation techniques, as well as to identify alternative dielectric fluids and technologies to convert and retrofit facilities so that they produce and use PCB alternatives. Phase III, begun in mid-2002, is based on a pilot project that implemented the use of alternative dielectric fluids. The destruction of PCBs in active use in Russia has begun.

#### *General Assistance Program Grants*

EPA Region 10 continues to support capacity building for Federally recognized tribes in Washington, Oregon, Idaho, and Alaska for managing community-based environmental protection programs. The total General Assistance Program (GAP) investment, while not represented in the research budget, represents an annual investment of over \$21 million for Region 10 across the four states, with approximately \$17.5 million going to Alaska Tribes.

Access by Alaska Native villages to GAP funds has resulted in research to develop sustainable technologies amenable to the Arctic bush that assist in achieving local environmental goals. Fund-

ing has enabled the pursuit of low-tech alternatives for pollution prevention, specifically in the areas of waste oil recycling and the use of anti-freeze washers and can crushers. Practical implementation of management alternatives based on this research has had a direct impact on the ability of Alaskan villages to protect watersheds and extend the life of rural Alaskan landfills. EPA is continuing to document emerging management strategies and technologies that are reducing local environmental pollution and improving quality of life.

### *Arctic Strategy Development*

EPA continues to recognize the importance of rapid changes occurring in the Arctic that are significantly impacting humans and the environment. Contaminants, climate change, and resource development are contributing factors changing terrestrial and marine ecosystems and threatening the health and abundance of subsistence and commercially harvested foods.

EPA Region 10 initiated an effort in FY 2003 to develop a strategy for agency work in the Arctic. A series of meetings were held with key staff and managers within EPA who are engaged in Arctic-related work. The purpose was to gain insights about priorities and develop a better understanding of current activities, as well as the staff and offices supporting them. Conversations with Alaska tribes and Native organizations also occurred during FY 2003 and will continue in FY 2004. Input obtained from these discussions will be used to shape the emerging strategy.

A draft EPA Region 10 Arctic strategy will be released in FY 2004 for agency review. The draft will propose EPA's role in the Arctic and serve as a guide or framework for wider agency discussion on developing EPA infrastructure and interest in the Arctic consistent with the agency's mission. The strategy is likely to include key research recommendations (such as sources, transport pathways, and impacts of contaminants) and identify opportunities to mitigate risk.