Winter sampling of snowpack in eight western parks to assess deposition of toxic compounds

By Tamara Blett

PESTICIDES AND INDUSTRIAL by-products may be leapfrogging over urban and rural areas to deposit in high-elevation ecosystems such as Rocky Mountain National Park, Colorado. Scientific studies in the Arctic have revealed that organic compounds with low vapor pressures move, in several successive stages of deposition and evaporation, toward colder areas of the biosphere, such as the poles, and upward in mountainous regions to settle in high-elevation snow. Through this "cold condensation" phenomenon, areas of some western national parks may become sinks for these compounds, known as persistent organic pollutants. In 2003, U.S. Geological Survey (USGS) researchers Don Campbell, Alisa Mast, and George Ingersoll began a three-year field sampling project to examine snowpack chemistry in Rocky Mountain National Park and seven other western and Alaskan parks to determine how much of these toxic compounds is being deposited at high-elevation and high-latitude park sites.

Air masses over the western United States may contain pollutants from sources as far away as Europe and Asia, and from local or regional sources in North America. Scientists suspect that some air masses contain persistent toxic compounds, such as pesticides like DDT, and industrial by-products like PCBs and dioxin. Snow is efficient in removing pollutants from the atmosphere and depositing them in high-elevation terrestrial and aquatic ecosystems. Snowfall provides 50% to 90% of annual precipitation in high-elevation and high-latitude areas of the western United States. In many of these areas, seasonal snowpacks that accumulate during the fall, winter, and spring contain an integrated record of chemicals deposited during the snow season.

"Information acquired through this project will enhance scientific understanding of the global transport of airborne contaminants and their associated effects on sensitive ecosystems in western parks."

Once deposited, persistent organic pollutants can accumulate and concentrate in food webs where they can impact reproductive success, growth, behavior, disease, and survival of animals high on the food chain, such as fish, birds, and mammals. Additionally, glacial melt and

U.S. Geological Survey scientist Don Campbell collects snow samples at Rocky Mountain National Park that will later be examined in the laboratory for toxic compounds, including mercury. The project is part of a coordinated three-year study in eight western national parks to assess levels of contaminants that travel long distances in the air and are deposited in high-elevation and high-latitude ecosystems where they can concentrate in food webs.

snowmelt contribute to primary water sources for people residing in the mountain West and Arctic areas. Many communities obtain their drinking water almost entirely from snow and glacier meltwater. These water sources may contain airborne contaminants.

Snow is being sampled at two sites in each park for three consecutive years. These sites are located in or near two watersheds in each park selected for comprehensive water, sediment, and biological sampling. Snow samples are collected by USGS researchers with assistance from the National Park Service and other partners. Crews collect samples near the time of annual maximum snow accumulation but before the onset of spring snowmelt. Researchers dig two large snow pits and then cut a vertical column of snow from each pit. Sampling crews must use clean techniques to shovel, bag, and transport approximately 40 gallons (150 liters) of snow from each site, which will yield about 13 gallons (50 liters) of meltwater for analysis. Access to the sites is by aircraft, snowmobile, skiing, snowshoeing, hiking, or pack animals. Samples collected from each snow pit are analyzed for major ions, nutrients, dissolved organic carbon, trace metals, mercury, particulate matter, and organic contaminants.

The snow sampling project is part of the Western Airborne Contaminants Assessment Project (WACAP) to determine the risk from airborne contaminants to ecosystems and food webs in western national parks. Biological effects analysis of airborne contaminants from six ecosystem components (snow, water, sediment, lichen, bark, and fish) is being conducted in eight key parks in the West and Alaska (Rocky Mountain, Glacier, Sequoia, Olympic, Mount Rainier, Denali, Noatak, Gates of the Arctic). Contaminant concentrations in moose consumed by subsistence hunters will also be assessed in Alaska. The Environmental Protection Agency, USGS, USDA Forest Service, Oregon State University, and University of Washington are working in partnership with the National Park Service on this assessment. Information acquired through this project will enhance scientific understanding of the global transport of airborne contaminants and their associated effects on sensitive ecosystems in western parks. It will also help the National Park Service determine what actions may be needed to mitigate potential effects or protect subsistence populations. Some contaminant signals or combinations may be used to determine where the industrial by-products or pesticides originate and whether these sources are local, regional, national, or international. Contaminant deposition in the snowpack will be related to contaminant levels in air, lake water, lake sediments, plants, and fish, thereby linking ecosystem impacts to airborne contaminant pathways. ■

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Partnering to reduce risk of West Nile Virus

By Betsie Blumberg

The combined efforts of volunteers and several government agencies are reducing the risk of West Nile Virus at Allegheny Portage Railroad National Historic Site and adjacent state game land in Pennsylvania. Trash and tires had been dumped illegally on these lands over many years, creating breeding habitat for mosquitoes that may carry the disease. On two separate cleanup days in 2003, cooperating agencies eliminated these breeding grounds.

Good riddance to bad rubbish! Trucks dispose of tires abandoned at Allegheny Portage Railroad National Historic Site and adjacent state game lands, reducing breeding habitat for mosquitoes, carriers of West Nile Virus.

In June, volunteers from the local Target store worked with Pennsylvania Cleanways of Blair County, the Pennsylvania Game Commission, and the National Park Service to collect 8 tons of trash and tires from one large dump on the game land and along several miles of historic portage trace at the national historic site. The park law enforcement officer, Tom Stinedurf, coordinated the event with Dave Thomas of Pennsylvania Cleanways. That cleanup was so successful that Thomas contacted the national historic site again about three old dumps on park and game land where hundreds of tires had accumulated.

The result was a project involving six government agencies, coordinated by Stinedurf, Thomas, and Natural Resource Manager Kathy Penrod of Allegheny Portage Railroad. On the cold and rainy cleanup day in October, prisoners from the state correctional institution at Cresson did the work, heavy equipment brought in by the Pennsylvania Game Commission moved and loaded the tires and trash, and trucks and drivers from the Pennsylvania Department of Transportation and Blair County Solid Waste and Recycling hauled it away. Together they removed about 1,400 tires and 5 tons of trash.

By the end of the cleanups the dumps were gone for good. The sites are now clear and will no longer attract trash. And, most importantly, they no longer support breeding ground for potential carriers of West Nile Virus. ■

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