PARTICULATE MONITORING PROGRAM

The National Park Service (NPS) is responsible for the protection and ehancement of air quality related resources in the areas it manages by ensuring compliance with directives, regulations, and applicable requirements of the NPS Organic Act of 1916 and the Clean Air Act as amended in 1977. The Organic Act mandates the National Park Service to:

> "...conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

More recently, the Clean Air Act assigned to the Federal Land Manager (FLM) "the affirmative responsibility to protect the air quality related values [including visibility] of class I lands." Sections 160-169 of the Act established a detailed policy and regulatory program which provides guidance to the NPS in meeting these mandates.

This monitoring program enables the NPS to carry out its responsibilities, in part, as outlined in these Acts by gathering and analyzing fine particulate data in selected park units. The monitoring network consists of 27 dichotomous samplers of the stacked filter design located at sites listed in Table 1. The samplers collect particulate matter in two size fractions; coarse particles with diameters larger than 2.5 microns and fine particles with a diameter smaller than 2.5 microns. The particulate monitoring program objectives are as follows:

1) to establish a fine particulate baseline data that can be used in trend analysis in the National Park System;

2) to determine the relative importance of various atmospheric particulates to visibility impairment;

3) to identify pollutant transport corridors. Parks are impacted by multiple sources that are sometimes hundreds of kilometers distant. Establishing the origins of "clean" and "dirty" air will help in siting new industrial sources where their emissions will minimally impact park units;

4) to identify which of the many current emitting source types are contributing to atmospheric fine particulate loading and in turn visibility impairment within the NPS system.

Future national energy needs demand development of new oil fields, coal production facilities, and implementation of new technologies for extracting petroleum from oil shale and tar sands, all potentially in areas that are in proximity to NPS units. If NPS is to have meaningful input into decision-making processes that relate to siting of new emitting sources or control of existing and future air pollution sources, it is imperative to maintain on-going monitoring and data interpretation programs that physically quantify air pollution impacts. These effect and source/receptor relationships. For instance, it is now clear that under certain meteorological conditions copper smelter activity in southern Arizona impacts the Grand Canyon, Bryce Canyon, and Canyonland National Parks more than the coal-fired power plants near these parks. It is also clear that there are pollution "corridors" and conversely clean air "corridors" that correspond to origin and transport of "dirty" and "clean" air. The only time that air within Grand Canyon National Park becomes clean is when air parcels arrive from certain areas to the north. However, much work remains to be done to more fully understand these relationships, both in Grand Canyon and in other park units.

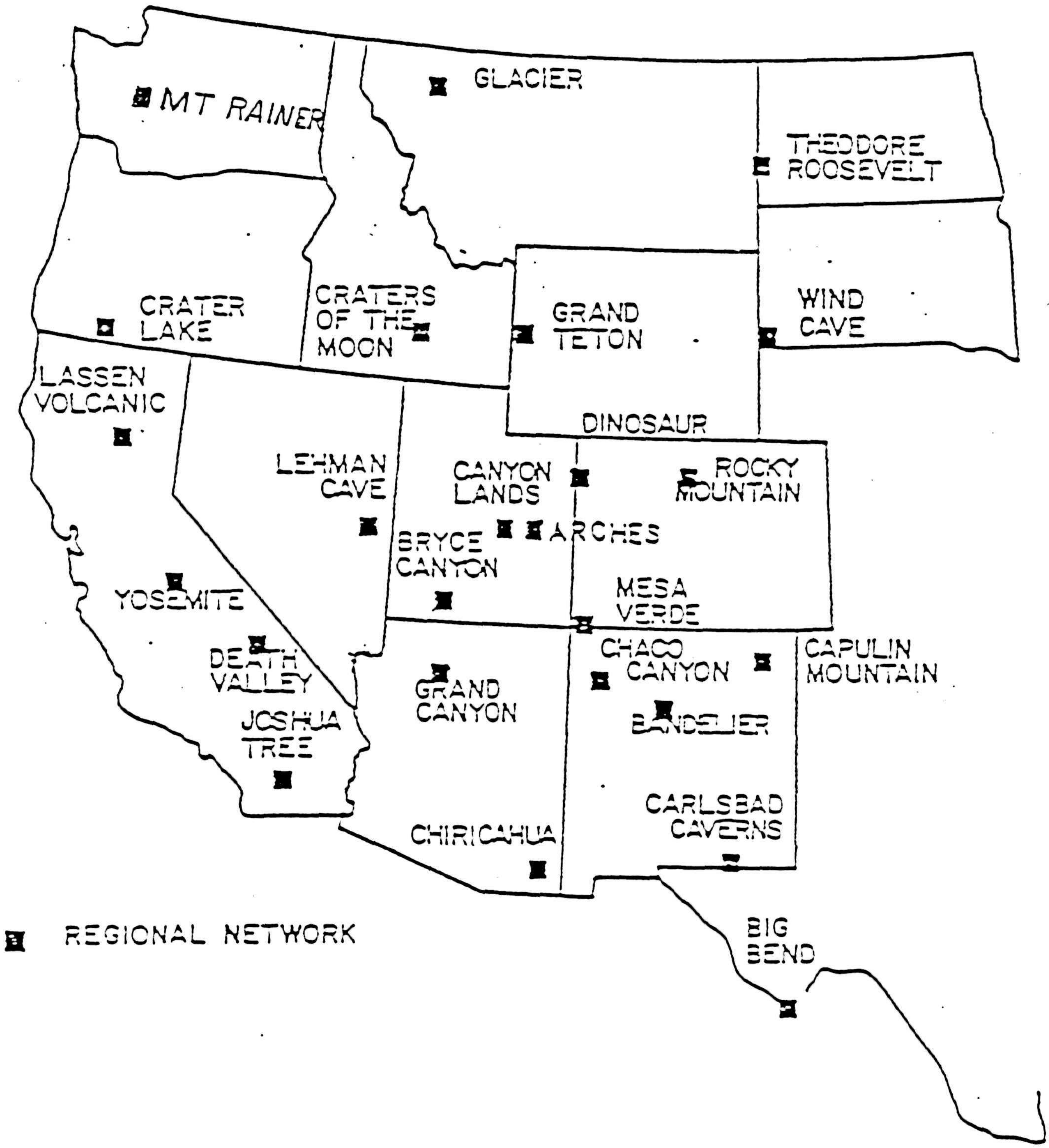
The particulate monitoring program compliments the visibility monitoring program. Both programs provide NPS with continuous baseline visibility and fine particulate data, allowing NPS to identify those atmospheric pollutants responsible for visibility reduction in the parks. This effort focuses on the reduction and analysis of collected data. Such analyses require unique sophisticated equipment capable of measuring miniscule particules. Both elemental and statistical analyses are performed on the particle samples, and compared with baseline data collected in the past. Using the baseline particulate and visibility data to identify trends of deterioration, and to recommend appropriate mitigation measure as necessary. The Park Service will continue to operate and maintain a monitoring network benefiting the entire system.

TABLE 1

NPS REGIONAL PARTICULATE MONITORING NETWORK

Arches National Monument, Utah
Bandelier National Monument, New Mexico
Big Bend National Park, Texas
Bryce Canyon National Park, Utah
Buffalo National River, Arkansas
Canyonlands National Park, Utah
Capulin Mountain National Monument, New Mexico
Carlsbad/Guadalupe National Parks, New Mexico/Texas
Chaco Culture National Monument, New Mexico
Chiricahua National Monument, Arizona
Craters of the Moon National Monument, Idaho
Crater Lake National Park, Oregon
Death Valley National Monument, California
Dinosaur National Monument, Colorado
Glacier National Park, Montana
Grand Canyon National Park, Arizona
Grand Teton National Park, Wyoming
Joshua Tree National Monument, California
Lassen Volcanic National Park, California
Lehman Caves National Monument, Nevada
Mesa Verde National Park, Colorado
Mount Rainier National Park, Washington
Rocky Mountain National Park, Colorado
Shenandoah National Park, Virginia
Theodore Roosevelt National Park, North Dakota
Wind Cave National Park, South Dakota
Yosemite National Park, California

NPS SAMPLING SITES

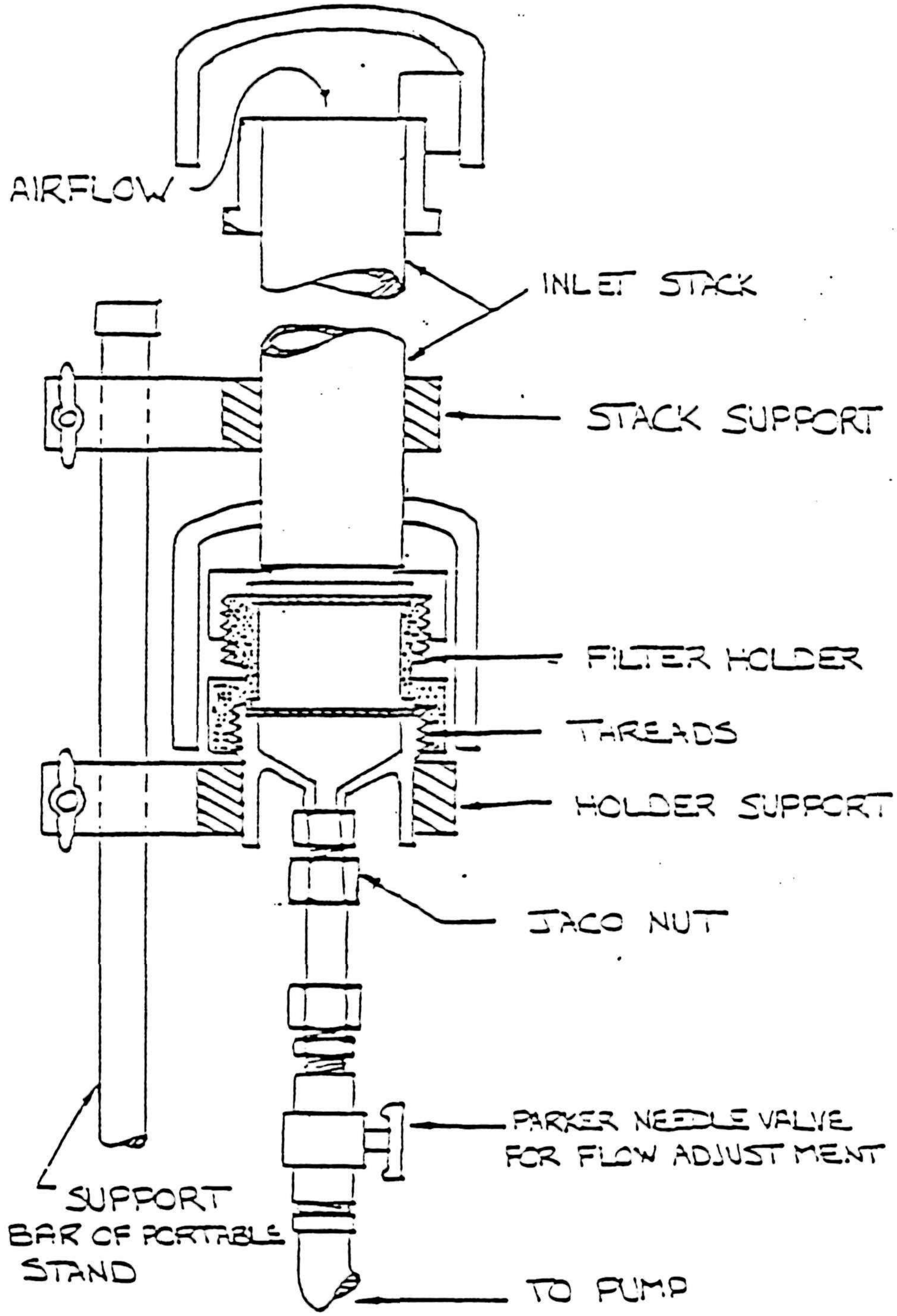


Monitoring sites not shown on this map include Buffalo National River and Shenandoah National Park.

DICHOTOMOUS SAMPLER

The dichotomous sampler (stacked filter unit) at Mount Rainier National Park is like a large vacuum cleaner in which air flows through a series of two filters. The first filter captures coarse particles with a diameter of 2.5 microns or larger. The second filter captures fine particles with a diameter as small as 0.3 microns. The chemical make-up of the particulate matter collected on the filters helps determine the type and origin of the particles. Coarse particles tend to be alkaline and are largely composed of soil related elements. The coarse particles usually originate from the abrasion of solid materials, sea spray, volcanoes, ash from solid fuels, pollen and major fires such as wild or prescribed forest fires, or agricultural burning. Fine particles are primarily composed of sulfates, nitrates and organic compounds. The sulfates and nitrates originate from a chemical transformation in the atmosphere of sulfur dioxide and nitrogen dioxide which is associated with industrial, vehicular, or urban sources that burn fossil fuels. Sulfates and nitrates not only affect visibility, but are also major constituents of acid precipitation. The organic compounds are comprised of soot, lead, arsenic and ammonium salts and orginate from sources such as automobiles, smelters and forest fires.

The sampler operates continously and two 72 hour samples are collected by a park ranger each week.



The Stacked Filter Unit