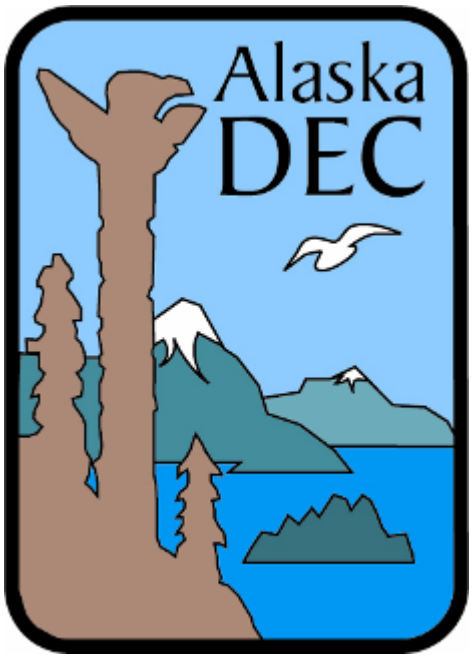
Alaska's 2010 Air Monitoring Network Plan

Chapter 1 - Introduction



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1 INTRODUCTION

The State of Alaska has a longstanding program of monitoring air quality. Alaska is a large state (572,000 square miles) with a small population (686,300). It is not possible to monitor the air quality in every community, so the Department of Environmental Conservation (DEC) has taken a three-pronged approach to the monitoring network design:

- Monitoring larger communities to cover the largest possible population exposure.
- Monitoring designated smaller towns that are representative of multiple communities in a region. Generally this monitoring is done with Special Purpose Monitoring Sites (SPM).
- Monitoring in response to air quality complaints. This is performed using SPM samplers.

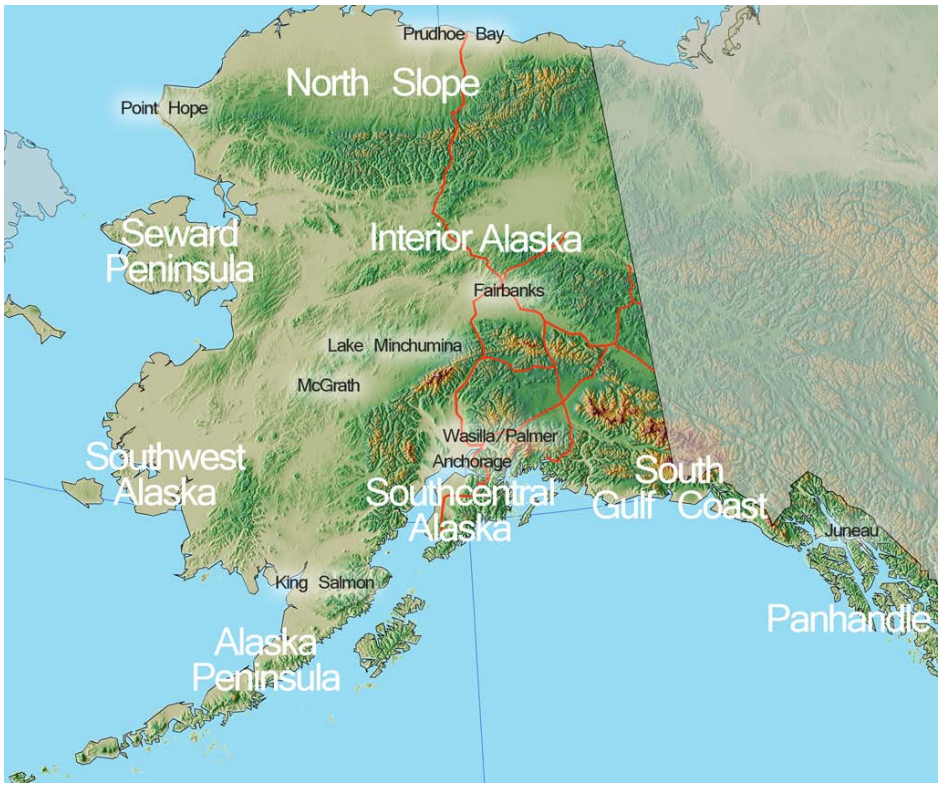
The largest population centers in Alaska are the Municipality Anchorage, the city of Fairbanks, the Matanuska-Susitna Borough, and Juneau (279,240, 34,500, 76,006 and 30,700 people, respectively). There are no other communities with populations over 10,000. Several towns have populations between 1,000 and 10,000, and there are many communities with less than 1,000 people.

1.1 *Geography*

Alaska comprises one sixth of the United State's landmass, spanning 20 degrees of latitude (51°N – 71°N). Alaska contains 65% of the U.S. continental shelf, more shoreline than the rest of the 49 states combined, 17,000 square mile of glaciers, 3,000,000 lakes that are over 20 acres in size, and receives 40 % of the U.S. fresh water runoff. Figure 1.1 shows a map of Alaska and the diverse climate regions described below.

The **Panhandle** is a temperate rain forest in the southeastern part of Alaska that is mainly comprised of mountainous islands and protected marine waterways. Rainfall exceeds 100 inches per year in many areas. Most communities are small and have less than 5,000 year-round residents. Juneau, the State's capital, is the largest city in the region with a population of approximately 30,700.

The **South Gulf Coast** is one of the wettest regions in the world. Yakutat receives over 150 inches of non-thunderstorm rain per year and Thompson Pass averages over 700 inches of snow annually. The area is covered with rugged mountains and barren shoreline and is the target of many Gulf of Alaska storms. This coastline only contains a handful of small fishing communities.



<u>Figure 1:1</u>: Maps of Alaska - the majority of the Aleutian Islands (west) are omitted.

South-central Alaska is fairly temperate in comparison to the rest of Alaska. Rainfall varies widely across the region, averaging between 15 inches per year in the Matanuska-Susitna (Mat-Su) Valley and 60 inches per year in Seward. This region contains 60% to 70% of the state's population with Anchorage, the state's largest city, home to 279,240 people. Bounded by active volcanoes on the southwest and glacial river plains to the northeast, this sector of the state has experienced 24-hour dust levels in excess of 1,000 $\mu g/m^3$.

The **Alaska Peninsula** and its westward extension, the Aleutian Chain, form the southwestern extension of the mountainous Aleutian Range. This region is comprised of remote islands and small, isolated fishing villages. This area is one of the world's most economically important fishing areas, as well as a vital migratory route and nesting destination for birds.

Southwest Alaska encompasses the vast Yukon-Kuskokwim River Delta, a wide low-lying area formed by two of the state's major river systems and dotted with hundreds of small lakes and streams. This region is heavily impacted by storm systems which rotate northward into the Bering Sea. Communities in this region receive between 40 and 70 inches of precipitation each year. This portion of the state is quite windy, experiencing winds between 15 – 25 miles per hour throughout the year. These winds, coupled with fine delta silt, help to create dust problems for some southwestern communities. Rural villages normally contain fewer than 500 people and are located along the major rivers and coastline. Regional hub communities, such as Galena and Bethel, may have up to 6,300 residents.

Interior Alaska describes the vast expanse of land north of the Alaska Range and south of the Brooks Range. This region contains Fairbanks, Alaska's second largest city, with a population of 32,000 people (84,000 in the borough). The climate varies greatly with clear, windless, -50°F winter weather giving way to summer days with 90°F temperatures and afternoon thunderstorms. Sectors of this region also experience blustery winds and high concentrations of re-entrained particulates from open riverbeds.

The **Seward Peninsula** is the section of Alaska which extends westward into the Bering Sea between Norton Sound and Kotzebue Sound. This hilly region is barren and windswept with 15-25 mile per hour winds common. Rainfall in this region averages between 15 and 24 inches per year. Villages in this region are small except for Nome which has over 3,000 people.

The **North Slope** region, located north of the Brooks Range, is an arctic desert receiving less than ten inches of precipitation annually. Wind flow is bimodal, with the easterlies dominating the meteorological patterns. Winter wind speeds average 15-25 mile per hour dropping off slightly during the summer. The North Slope is extremely flat and supports huge summertime populations of bears, caribou, and migratory birds.

1.2 *Topography*

Alaska is topographically varied. The state contains seven major mountain ranges, which influence the majority of all regional wind flow patterns. The mountains channel flow, create rotor winds, cause up slope and down slope flow, initiate drainage winds, produce wind shear and extreme mechanical turbulence. For air quality impact analyses, Alaska's rugged mountains can only be described as complex; complex terrain making most air quality models unsuited for use in the state. The complexity of most local meteorology renders the use of site specific meteorological data inadequate for control strategy development.

1.3 *Economy*

The Alaskan economy is centered on the oil industry, the mining industry, commercial fishing, logging and tourism. Of the five, only the oil and mining industries provide a year-round source of income to the state and require the full time operation of stationary, power generation equipment. The mining industry is scattered across the state with a lead and zinc mine near Kotzebue, a coal mine at Healy, a silver mine near Juneau, and major gold mine north of Fairbanks. Numerous smaller mining ventures exist across the state.

The state's oil industry operates production wells in Cook Inlet and on the North Slope. North Slope oil is pumped 800 miles through the Trans-Alaska Pipeline System (TAPS) to Valdez for shipment to refineries in the lower 48 states. The TAPS has several pump stations to maintain the flow of oil in the pipeline. The majority of new oil exploration work is being conducted on the North Slope. There are four in-state refineries; Flint Hills Res. LLC. (North Pole) and PetroStar's (Valdez and North Pole) process small amounts of North Slope crude. Cook Inlet crude is processed at the Tesoro refinery in Nikiski, located near Kenai, Alaska.