Climate of Alaska

Introduction

This publication consists of a narrative that describes some of the principal climatic features and a number of climatological summaries for stations in various geographic regions of the State. The detailed information presented should be sufficient for general use; however, some users may require additional information.

The National Climatic Data Center (NCDC) located in Asheville, North Carolina is authorized to perform special services for other government agencies and for private clients at the expense of the requester. The amount charged in all cases is intended to solely defray the expenses incurred by the government in satisfying such specific requests to the best of its ability. It is essential that requesters furnish the NCDC with a precise statement describing the problem so that a mutual understanding of the specifications is reached.

Unpublished climatological summaries have been prepared for a wide variety of users to fit specific applications. These include wind and temperature studies at airports, heating and cooling degree day information for energy studies, and many others. Tabulations produced as by-products of major products often contain information useful for unrelated special problems.

The Means and Extremes of meteorological variables in the Climatography of the U.S. No.20 series are recorded by observers in the cooperative network. The Normals, Means and Extremes in the Local Climatological Data, annuals are computed from observations taken primarily at airports.

The editor of this publication expresses his thanks to those State Climatologists, who, over the years, have made significant and lasting contributions toward the development of this very useful series.

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Topographic Features- Alaska is the westernmost extension of the North American Continent. Its east-west span covers a distance of 2,000 miles and from north to south a distance of 1,100 miles. The State's coastline, 33,000 miles in length, is 50 percent longer than that of the conterminous United States. In addition to the Aleutian Islands, hundreds of other islands, mostly undeveloped, are found along the northern coast of the Gulf of Alaska, the Alaska Peninsula and the Bering Sea Coast. Alaska contains 375 million acres of land and many thousands of lakes.

There are 12 major rivers plus three major tributaries of the Yukon, all of which drain two-thirds of the State.

The two longest mountain ranges are the Brooks Range which separates the arctic region from the interior and Alaska-Aleutian Range which extends westward along the Alaska Peninsula and the Aleutian Islands, and northward about 200 miles from the Peninsula, then eastward to Canada. Other shorter but important ranges are the Chugach Mountains which form a rim to the central north Gulf of Alaska and Wrangell Mountains lying to the northeast of the Chugach Range and south of the Alaska range. Both of these ranges merge with the St. Elias Mountains, extending southeastward through Canada and across southeastern Alaska as the Coast Range. Numerous peaks in excess of 10,000 feet are found in all but the Brooks Range. The highest peak in North America, Denali, (20,320 feet) is located in south-central Alaska. Many other peaks tower above 16,000 feet with nearly all of the inhabited sections of the State are at 1,000 feet elevation or less.

Permafrost, permanently frozen subsoil, is a major factor in the geography of Alaska. It exists where summer heating fails to penetrate to the base of the layer of frozen ground. Permafrost covers most of the northern third of the State. Discontinuous or isolated patches also exist over the central portions in an overall area covering a third of the State. No permafrost exists in the south-central and southern coastal portions including southeastern Alaska, the Alaska Peninsula and the Aleutian chain.

The geographical features already mentioned have a significant effect on Alaska's climate, which falls into five major zones. These zones are: (1) a maritime zone which includes southeastern Alaska, the south coast and southwestern islands; (2) a maritime-continental zone which includes the western portions of Bristol Bay and west-central zones. In this zone the summer temperatures are moderated by the open waters of the Bering Sea, but winter temperatures are more continental in nature due to the presence of sea ice during the coldest months of the year; (3) a transition zone between the maritime and continental zones in the southern portion of the Copper River zone, the Cook Inlet zone and the northern extremes of the south coast zone; (4) a continental zone made up of the remainders of the Copper River and west-central divisions, and the interior basin; and (5) an arctic zone.

Temperature- Alaskan mean annual temperatures range from the low 40s under the maritime influence in the south to 10 degrees Fahrenheit (° F) along the arctic slope north of the Brooks Mountain Range. The greatest seasonal temperature contrast is found in the central and eastern portion of the continental interior. In this area, summer heating produces average maximum temperatures in the upper 70s with extreme readings in the 90s. The highest recorded temperature for the State is 100° F at Fort Yukon on June 27, 1915. In winter, the lack of sunshine permits radiation to lower temperatures to the -50s and occasionally colder for two or three weeks at a time. Average winter minima in this area are -20 to -30° F. The coldest temperature ever recorded in Alaska was -80° F at Prospect Creek on January 23, 1971.

Elsewhere in the State, temperature contrasts are much more moderate. In the maritime zone, the summer to winter range of average temperatures is from near 60° F to the 20s. In the transition zone, temperatures range from the low 60s to near 0; in the maritime-continental zone, the range is from the low 60s to -10. The arctic slope has a range extending from the upper 40s to -20° F.

Winter temperatures play a principal role in the flow of most of Alaska's rivers. Freezing usually begins in late October and extends into May; thick layers of ice form, permitting passage heavy equipment. In many areas, construction work and oil exploration is done in winter because both the ground and the streams are frozen hard enough for the use of the heaviest of equipment. Several rivers cease to flow completely during the coldest months.

Precipitation- In the maritime zone, a coastal mountain range coupled with plentiful moisture produces annual precipitation amounts over 200 inches in the southeastern panhandle, and up to 150 inches along the northern coast of the Gulf of Alaska. Amounts decrease to near 60 inches on the southern side of the Alaska Range in the Alaskan Peninsula and the Aleutian Island sections. Precipitation amounts decrease rapidly to the north, with an average of 12 inches in the continental zone and less than six inches in the arctic region.

Snowfall makes up a large portion of the total annual precipitation. Yakutat, for example, averages 172 inches of snow annually, and has a total annual precipitation (rain plus water equivalent of snow) of about 160 inches. Along the arctic slope, Barrow receives an average of 27 inches of snow annually and a total precipitation amount of slightly more than four inches. Most of the areas of heavy snow have relatively mild temperatures which normally prevent total depths from becoming excessive. Snow removal equipment is able to keep highways and airports operational most of the time.

For the State, the greatest annual amount of precipitation occurred at MacLeod Harbor on Montague Island in the Gulf of Alaska with 332.29 inches in 1976. This station also holds the record for the greatest monthly total with 70.99 inches being recorded during November 1976. The maximum amount logged in 24 hours is 15.20 inches in the southeastern, panhandle town of Angoon on October 12, 1982.

Snowfall extremes are all credited to a station at Thompson Pass north of Valdez. The station was in operation from the early 1950s through the mid 1970s. The period from 1952 - 1955 was particularly snowy as shown by the following record measurements: season (1952 - 1953) 974.5 inches, month (February 1953) 298 inches; and 24-hour (December 1955) 62 inches.

A normal storm track along the Aleutian chain, the Alaska Peninsula, and all of the coastal area of the Gulf of Alaska exposes these parts of the State to a large majority of the storms crossing the North Pacific, resulting in a variety of wind issues. Direct exposure results in frequent occurrences of winds in excess of 50 mph during all but the summer months. Shemya, on the western end of the Aleutian Islands, experienced a wind gust estimated at 139 mph (estimated because the wind recorder pen could only record up to 128 mph). Wind velocities approaching 100 mph are not common but do occur, usually associated with mountainous terrain and narrow passes. Strong winds take their toll of both merchant and fishing vessels.

An occasional storm will develop over or move over the Bering Sea then move north or northeastward, creating winds along the western coastal area. Because of the low, flat ground in many places along the coast, flooding may ensue during the time of onshore winds. Winter storms moving eastward across the southern Arctic Ocean cause winds of 50 mph or higher along the arctic coast. Except for local strong wind conditions, winds are generally light in the interior sections.

Strong winds, or in fact any wind occurring in the areas of extreme cold, create a hazard to persons exposed for even a brief period of time.

Climate and the Economy- Wooded areas in the state total approximately 100 million acres of both commercial and non-commercial timber. Timber is one of Alaska's top industries with southeastern Alaska as the principal production area. Lumber and pulp mills are important contributors to the economy in that portion of the state. In south-central Alaska, high, barren mountains and numerous glaciers limit the forest to 10 to 20 percent of the total area. No commercial timber is found north of the Brooks Range or along the western coastal region. Western interior forested areas are limited to small isolated patches without permafrost.

The largest acreages of farming are devoted to grass crops for hay, silage and pasture. Rangelands are widespread over the Alaskan mainland. Caribou forage on these rangelands. Cattle and sheep are raised in areas the Kenai Peninsula, the Alaska Peninsula and the Aleutian Islands. Vegetable crops, such as potatoes and cabbage, are grown in the Matanuska Valley north of Anchorage. The Tanana Valley near Fairbanks provides fresh dairy products. Within the agricultural areas, the growing season averages 80 to 110 days. This is a short growing season, but coupled with the daily potential of 16 to 19 hours of sunshine and especially fertile soil, Alaska produces some of the finest and largest vegetables grown anywhere.

Oil is found along the North Slope, the Kenai Peninsula and offshore of the Cook Inlet. The Trans-Alaska Pipeline was completed in 1977. Crude petroleum is transported from the Prudhoe Bay Field to a refinery in North Pole and then to Valdez, a deepwater port in the northern Gulf of Alaska. The petroleum is then loaded into oceangoing tankers.

Coal has been mined in the Healy area, and there are several other large deposits. Gold, bornite and platinum are also found in the State.

The fishing industry, which includes the taking of crabs and shrimp, is another leading industry in Alaska. Commercial fishing occurs along the entire Alaska coast but is most heavily concentrated in the southeastern Bering Sea, along the Aleutian Islands and around the coast of the Gulf of Alaska. Salmon, halibut and king crab are all commercially important.

The number of tourists increases each year. Tourism extends to many parts of the state and includes cruises along the coast of southeastern Alaska and train rides into the interior. Hunting, fishing and wildlife watching draw thousands of people to Alaska each year which contributes to the economy.