Climate of Astoria

I. Revision Notes.

This is the fourth revision of the Climate of Astoria, which was originally issued in 1996.

This revision updates data through Jan 2024.

II. Geographical Overview.

Astoria's perennially verdant landscape is hemmed by rather low mountains to the north, east and south. To the west, it is open to the Pacific Ocean, with over four miles of low green dune lands between the river and the Astoria airport, as well as the last 10 miles of the Columbia River.

North of the Astoria airport, 8 to 12 miles distant, the Washington 'hills' rise to 1000 - 1200 feet. Often, fog and stratus will bank against these hills during, and even before a storm. East to northeast for 2 to 4 miles, the Astoria hills rise to about 600 feet. To the east to southeast, for 4 to 14 miles, consecutively rise the ridges of the Coast Range. The highest point near Astoria is the prominent landmark of Saddle Mountain, rising to 3283 feet above sea level. After the passage of a strong winter cold front, fresh snow on the mountain will mark the freezing level. An arm of the Coast Range extends from east of Astoria and to the south, and ends 15 miles to the southwest at Tillamook Head, just south of the town of Seaside.

From Seaside northward to the south bank of the Columbia River are 18 miles of sandy beaches. Behind these beaches lies a 2 to 3 mile wide stretch of dunal lands, exposed to the ocean winds. Homes and farms shelter in the depression, which parallels the crests of the undulating terrain. Here also are shallow fishing and swimming lakes, and cranberry bogs, disposed to fog and frost. Similar areas continue north of the Columbia River in Washington.

Because of the damp climate, it is necessary to convert to ensilage much of the hay grown on the dairy and other farms that dot the lower lands, particularly along Youngs River and the Lewis and Clark River. Forest cover much of the surrounding hills and uplands.

The airport sits by the south bank of the Columbia estuary, and west of Youngs Bay on their flood plain or tidal flats. Low dikes shut out their waters, and partially rim the field. This increases the bog-like characteristics in collecting chilly air, with fog and/or frost. When air temperatures drop below water temperatures, fog forms easily, or will roll in from the Pacific Ocean, Columbia River, and/or Youngs Bay. This fog will often roll into the airport area late in the afternoon to the evening hours, and persist well into the following day. However, midday cloud ceilings and visibilities are generally above flight minimums. During the summer months, a sea breeze commonly blows inland up the Columbia River by early afternoon, thus stopping the diurnal rise in temperature. In winter, cold air may funnel down the Columbia River from further inland. This area is also a favorite flying destination for general recreational pilots.

III. Climatological Summary.

Weather hazards occasionally occur. For flying concerns, the greatest are fog and low clouds that often obscure surrounding terrain, and gales. Even with moderate surface wind speeds, wind and turbulence at 800 feet may be severe enough to upset a heavy plane. Storms over the Pacific may sink or wreck ships. Even in fair weather, winds and wave may combine to produce a type of breaker known as the 'widow-maker' and swamp a boat quickly. Heavy winter rains can inundate the lowlands and cause landslides. High tides enhanced by storm surge from gales can push seawater across highways or up higher onto beaches. Powerful winter storms bring strong winds, which can topple power lines and trees. Showers of small hail may briefly whiten the ground in nearly any month.

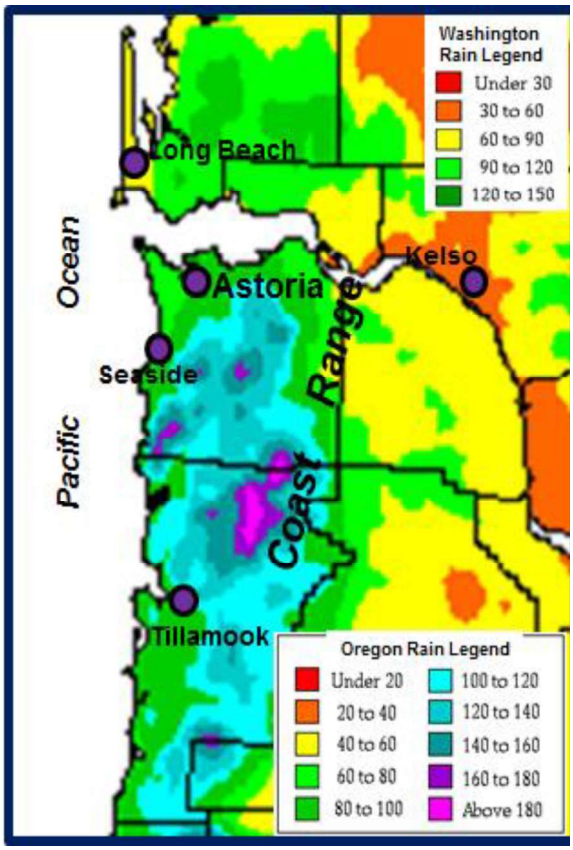

Figure 2 : Rainfall Distribution around Astoria.

Rain is a part of life during autumn and winter. Nearly 90 percent of the annual rainfall occurs between early October and mid-May. In fact, only about 2 percent of our rain occurs in July and August. It is not uncommon to see relatively dry, with little rain in both July and August. The first autumn rain often arrives about early September, but it generally is not until early October for the rain to increase in frequency. Terrain differences can bring significant changes in rainfall. Along the coast, rainfall is generally 65 to 90 inches. But just inland, the Coast Range receives over 120 inches of rain per year (*figure 2*).

Precipitation falls mostly as rain, with an average of fourteen days per year recording measurable snow. Snow accumulations are rarely more than one inch, and often melt within a day. On average, Astoria receives 1.4 inches of snow annually. Most likely areas of snow will be the higher terrain above 800 feet. Too many times, warm air pushing in from the Pacific quickly ends the threat of low elevation snow. However, occasionally, significant snow can occur, such as in late January of 1969 with nearly 2 feet of snow.

The winter season is characterized by mild temperatures, frequent cloudy skies, and rain. Winds are predominately either southerly during the mild rainy spells, or northerly during the colder dry spells. Outbreaks of cold arctic air from east of the Cascades will occasionally spill into Western Oregon via the Columbia River Gorge, bringing chilly east winds. During these cold air events, if a moist Pacific front pushes into the region, rain will occur. Initially, the warm south winds may not be strong enough to scour out the cold air from the lowlands. As a result, the rain falls into the shallow layer of sub-freezing air, with freezing rain, sleet, and sometimes snow resulting. Often this phase is of short duration, with temperatures warming

and ending the threat of freezing/frozen precipitation.

Temperatures are generally mild during the cool season, with highs in the middle 40s to lower 50s and lows in the 30s. It is common to see overnight winter low temperatures into 20s. During cold nights in winter, with an arctic air mass in place over the region, winds are often light under clear skies. This allows for rapid temperatures falls once the sun sets. At that time, temperatures can plummet below 20°F. Such cold temperatures are rare, averaging about twice per winter. The most notable cold snaps occurred in 1990 and 1972. During the 1990 and 1972 cold snap, Astoria recorded its lowest temperature at 6°F above zero.

Spring is a transitional time as the weather pattern shift from winter to summer. However, spring is not all that warm, and often, not all that dry. March and April are often damp and cool, with only a few warm dry days. May and June turn more dry, and see the most of the warming weather. Generally, afternoon temperatures are rather stable, with highs in the upper 50s to middle 60s. However, it is not uncommon to see temperatures into the 80s during late April through June. This will occur when winds blow from the land out to sea (offshore flow). The warmest day in May was 93°F, occurring in 2008. Even though the number of rainy days decreases in May and June, there are still plenty of cloudy days.

Summer finally arrives in early July, when afternoon highs in the upper 60s to lower 70s occur with regularity. High pressure over the Pacific builds in the summer, with north to northwest winds prevailing in the afternoons and evenings. This high also shuts off the moisture source, allowing summers to often be dry and warm. Temperatures will often reach the lower to middle 70s, but these warm days do not last long before the cooler ocean air moves inland and cools the region back into the 60s. Temperatures above 100 degrees are quite rare, only occurring twice since 1890. Hottest temperature recorded Astoria was 101°F, occurring on 1st of July 1942 and 27th of June 2021.

Autumn is the reverse of spring. September is still warm and dry, but by early to mid-October, the wet autumn weather arrives with high temperatures in the 50s. As the night time hours increase, the valley cools more, allowing fog to form on clear nights. Fog can be quite dense during the late night and early morning hours, and can persist for several days.

Destructive windstorms are common in Astoria, as strong fronts and low pressure systems arrive from the Pacific. Astoria is often spared the strongest winds, due to proximity of the hills to south and southeast. These hills act as a block for the strong southerly winds. However, strong south winds will blow across the lowlands between the Pacific and Astoria. Surface winds often exceed gale force (50 mph or greater) and have commonly exceed 70 mph. Such strong winds predominately occur between October and March. The strongest winds occurred during the infamous Columbus Day storm of 1962, when south winds peaked at 104 mph.

Thunderstorms can occur during any month, but are not common. Thunderstorms in the winter and spring are weak, producing small hail and brief gusty winds. However, those in summer can produce prolific lightning, strong winds and larger hail. Occasionally, thunderstorms will produce funnel clouds, but tornadoes are rare. A few times per year, some funnels to touch the ocean surface, resulting in a waterspout.

On average, the last occurrence of minimum temperatures of 32°F or colder in the spring is 25 March, while the first of autumn occurs near 15 November. However, minimum temperatures of 32°F have occurred as late in spring as 12 May (in 1985) and as early in autumn as 7 October (in 1983).

IV. Station Observing History.

Astoria's weather records date back to October 1850, with some breaks. In November 1883, the Weather Bureau established a station at Astoria, and the records have been nearly continuous since. In 1948, an experimental agriculture station, Astor Experimental Station, was created. This station, located about 3 miles to south of Astoria, just off the Nehalem Highway, near where the Wallooskee River empties into Youngs River. This station continued until 1973. This site provided supplemental data for our records when data from Astoria was incomplete.

Between 1883 and 1953, the Astoria station moved about several locations in downtown Astoria (*figure 3*). In 1953, the United States Weather Bureau (USWB) established a new first-order weather station at the Clatsop County Airport, located to the southwest of downtown Astoria on the west side of Youngs Bay. Staff now observed and recorded weather observations 24 hours per day. The primary reason for the new weather station was due to the increased air traffic along the coast. Many of the aircraft needed to land and refuel between the two cities. Astoria, like North Bend and Newport, became stopping points for aircraft. The new weather stations supplied weather information to pilots, making these pilot weather briefings a significant operation and the new offices. Old weather equipment was replaced, and other equipment such as wind anemometers and barometers were added. In

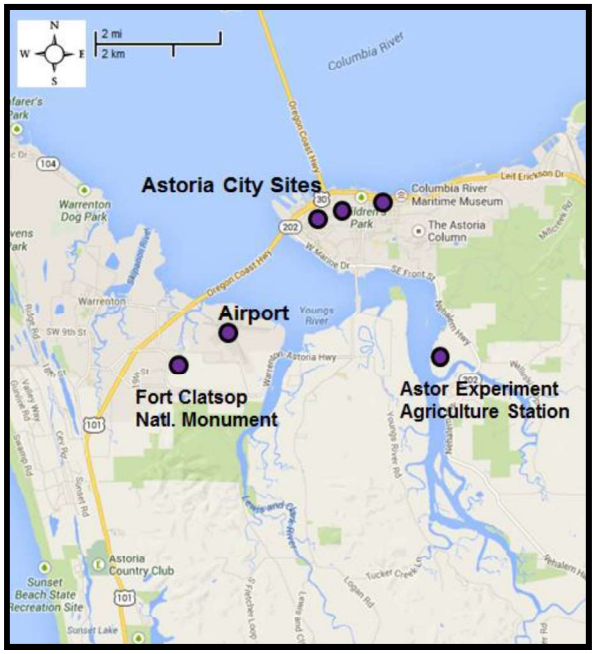

Fig 3: Observation sites around Astoria.

addition to the pilot weather briefings and weather data collection, the new Astoria weather office issued regular public and coastal marine weather forecasts and if necessary, local storm warnings.

On 1 March 1993, the Automated Surface Observing Station (ASOS) became fully operational. The National Weather Service (NWS) continued operations at Astoria through December 1995. Afterwards, weather forecasts, services and warning operations were transferred to the NWS office in Portland.

Climate data continue to be collected, but snowfall was no longer measured due to ASOS inability to measure snowfall and snow depth. Supplemental snow data for Astoria (1993-2005) was been provided via the data collected at the Fort Clatsop National Monument, located 1.6 miles southwest of the airport.

V. Updating this Study.

For future updates to the data in this study, refer to the latest climatic data published by the National Climatic for Environmental Information, or contact the National Weather Service in Portland.

Astoria climate and past weather data is also available on our website:

http://weather.gov/Portland

Following gives details on the movement of Astoria's weather equipment.

Astoria **Observation Equipment History and Locations**	**Occupied**		**DISTANCE MOVE (mile)**	**LATITUDE**	**LONGITUDE**	**Elevation (in feet) Above**								
						Sea Level	**Ground**							
	FROM	**TO**				**GROUND TEMPS**	**WIND EQUIPM**	**EXTREME TEMP**	**PSYCHROMETER**	**SUNSHINE**	**TIPPING BUCK**	**WEIGHING BUC**	**8 INCH RAIN**	**HYGROTHERM**
Cooperative Sites														
Astoria sites n/a	1 Dec 1850	30 Nov 1883	n/a	46°11'	123°50'									
Pythian Building	1 Dec 1883	28 Feb 1897	n/a	46°11'	123°50'	15	60	39					56	
Savings Bank Bldg	9 Nov 1910	18 Jul 1916	n/a	46°11'	123°50'	16	10	64					64	
530 Bond St.	19 Jul 1916	26 Nov 1917	n/a	46°11'	123°50'	24	11							
Kinney Bldg. 510 Commercial	15 Jan 1918	11 May 1919	n/a	46°11'	123°50'	36	12							
Exchange St/12th	26 Jun 1930	1 Aug 1942	n/a	46°11'	123°50'	10	18	14					14	
212 Harrison	5 Nov 1945	1 Jan 1961	0.5W	46°11'	123°50'	220	22							
Airport Sites														
Clatsop Airport	15 Nov 1946	15 Jan 1953	3 SW	46°09'	123°53'		67	5	4			4	4	
Clatsop Airport	15 Jan 1953	7 Oct 1964	none	46°09'	123°53'	8	46	6	5			4	4	4
Clatsop Airport	7 Oct 1964	11 Feb 1976	none	46°09'	123°53'	8	20	6	5			4	4	4
Clatsop Airport	11 Feb 1976	1 Mar 1993	400 ft S	46°09'	123°53'	8	20	5	5		5	5	4	4
Clatsop Airport (ASOS)	1 Mar 1993	present	none	46°09'	123°53'	9								
Supplemental Data Sites														
Astor Ex. Station	1 Jul 1948	1 Jul 1973	3 SE	48°08'	123°49'	39								
Ft. Clatsop Natl. Monument	1 Jul 1998	present	1.5 SW	48°08'	123°52'	42								

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