Chapter 6 - Flood History

6.0 Introduction

Major floods on the Skagit River are the result of winter storms moving eastward across the basin with heavy precipitation and warm snow-melting temperatures. Several storms may occur in rapid succession, raising antecedent runoff conditions and filling various river storage areas. Frequently, a low-elevation snowpack forms over large parts of the basin. Heavy rainfall and warm snow-melting complete the flood producing sequence. Minor floods usually last about three days, rising to major damage proportions in a day or less, reaching a flood crest in the next several hours, and receding rapidly in 24 hours or less. Floods of this variety have flood peaks less than 125,000 cfs below Concrete and are expected every 10 years or so. Minor floods described above become major floods when the primary flood ingredient, intense storm rainfall, is extended for a longer period of time, or multiple storm systems occur in rapid succession. Several minor rises usually occur every year, but major floods occur with less regularity. For example, two major floods have occurred in a single season, while several years have passed without a significant flood event. Winter rain-type floods usually occur in November or December but may occur as early as October or as late as February. (***Source: DRAFT SKAGIT RIVER BASIN, WASHINGTON, REVISED FLOOD INSURANCE STUDY, HYDROLOGY SUMMARY, MAY 1, 2008***)

Throughout the years, major flooding has occurred in the Skagit River Basin. Because of its geographic location, the Skagit River Basin is subject to winter rain floods and an increase in discharge during spring due to snowmelt runoff. Rain-type floods occur usually in November or December, but may occur as early as October or as late as February. Antecedent precipitation serves to build up ground water reserves. Frequently, a light snow pack is then formed over most of the entire basin. A heavy rainfall accompanied by warm winds completes the sequence which produces major floods. The heavy rainfall and accompanying snowmelt result in a high rate of runoff, as the ground is already nearly saturated from earlier precipitation. Two or more crests may be experienced within a period of a week or two as a series of storms move across the basin from the west. The winter floods have a considerably higher magnitude than the average annual spring high water. ***(Source: FLOOD CONTROL & OTHER IMPROVEMENTS, SEATTLE DISTRICT COE REPORT, APPENDIX B MARCH 1965)***

The magnitude and intensity of a storm cannot always be used as an index of the resultant river discharge. Other factors, such as temperature sequence, degree of soil saturation, and moisture content of the snowpack largely influence the rate of and total runoff produced by a particular storm. Conditions preceding a storm may be such that even a moderate storm could set in motion the related factors that, collectively, result in a flood. Conversely, conditions in the

drainage basin may be such that a severe storm results in only minor high water. ***(Source: FLOOD CONTROL & OTHER IMPROVEMENTS, SEATTLE DISTRICT COE REPORT, APPENDIX B MARCH 1965)***

6.1 Major Historic Floods on the Skagit River: Pre-Gaging

In 1918 and again in 1923 James E. Stewart, a USGS employee, visited the Skagit River Valley and made estimates of the 1815, 1856, 1897, 1909, 1917, and 1921 flood events. His work went unpublished until after his death. While his work product today remains controversial, it was published in 1961 and contained in USGS Water Supply Paper 1527. The estimates of flood flows contained in that paper have subsequently been revised downward by USGS in their Scientific Investigations Report 2007–5159.[1]

Mr. Stewart concluded that great floods occurred in l8l5 and l856 prior to the arrival of white settlers, and that the larger flood of l8l5 was probably as large as the greatest flood on the Skagit River within the last several hundred years. These floods are only estimates, though, as the USGS has stated that these estimates are based on high water marks that have a high degree of uncertainty. There is also some concern that large woody debris structures that developed over decades may have influenced these marks. (***Source: DRAFT SKAGIT RIVER BASIN, WASHINGTON, REVISED FLOOD INSURANCE STUDY, HYDROLOGY SUMMARY, MAY 1, 2008***)

About 1815: Highest flood; gauge height of 20 feet at Diablo Dam; at Rockport the river was at least 15 feet above the flood mark of the 1917 flood; at Concrete a gauge height of 69.3 feet; at Sedro Woolley the flood exceeded the 1909 flood by 7 feet, covered the highest ground in the town with 1.5 feet of water, about 10 feet of water in present business district, and a gauge height of 63.5 feet. ***(Source: USGS WSP 1527 STEWART/BODHAINE REPORT 1961)***

1856: Second highest flood; Reflector Bar (Diablo Dam) gauge height of 18.5 feet; Concrete gauge height of 57.3 feet; Sedro Woolley gauge height about 60 feet. ***(Source: USGS WSP 1527 STEWART/BODHAINE REPORT 1961)***

May 1894: **The town of Mount Vernon was entirely flooded**, small boats and rafts navigated the streets and the people were driven from their homes for safety to the hills. The damage to public and private property was great, and the suffering from exposure and sickness was distressing. All of these overflows have been caused by the ponding of the water in the river, resulting from the obstruction and closing the channels of the North and South Forks, above mentioned. There is comparatively little danger of loss from the overflow in the Winter,

[1] Mastin, M.C., 2007, Re-evaluation of the 1921 peak discharge at Skagit River near Concrete, Washington: U.S. Geological Survey Scientific Investigations Report 2007–5159, 12 p.

but in May and June, when the crops are most promising, the genial weather and hot suns melt the snow in the mountains, and the creeks and small rivers and mountain streams empty their waters into the Skagit which sweeps down with terrible fury completing its destructive mission. ***(Source: MEMORIAL TO THE SENATE AND HOUSE OF REPRESENTATIVES 10/21/1895 THE SKAGIT NEWS)***

November 16, 1896: From the description of early settlers, it is known that the flood of November 16, 1896, was the highest up to then, dating from the settlement of the valley (in or about 1878) and probably the highest from 1856. ***(Source: USGS WSP 1527 STEWART/BODHAINE REPORT 1961)***

Lower Sedro suffered heavily. A large number of cattle and small stock perished and buildings ruthlessly torn from their foundations were cast haphazard amid the heaps of debris. Mortimer Cook's store that has weathered the floods and storms of fifteen years, rose with the eddying waters and turned half way round before lodging against some trees and stumps. . . . South Burlington sustained great damage. Houses and barns were undermined and toppled to the ground and the winter's supply which they contained scattered on the tide. The fencing of years yielded to the flood and the clearings that represented the toil of a decade were covered with the debris of the surrounding forest. . . . West Mount Vernon is next in line of progress and received no favor from the impartial flood. The water, rising from one to two feet above the first floor of the dwellings, swept fences and everything movable before it. ***(Source: THE GREAT FLOOD -- THE SKAGIT ON A BIG TEAR -- THE SKAGIT VALLEY FROM THE BAKER VALLEY TO THE LACONNER FLATS WASHED BY THE RUINOUS FLOOD—STOCK AND IMPROVEMENTS CARRIED AWAY, 11/19/1896 SCT)***

November 19, 1897: On Wednesday morning, a very warm Chinook wind commended to blow which increased in force until evening, when it was almost a gale. This hot wind blowing directly on the snow which had been creeping down the hills for the last few weeks, cut it away with the rapidity of fire, and resulted in a raging torrent rushing down the valley of the Skagit on its way to the sea. The rise did not commence until Wednesday evening, as it usually takes from twelve to fourteen hours for the effects of a Chinook to make their appearance, and the same time to cease. By Thursday the river was still raising but still within the banks. During the night, however the water came with increased force, and early on Friday morning the alarm was whistled from the electric light plant which called for help only to find the water pouring over the levees in all directions. Some efforts were made to raise the levees and keep ahead of the water, but it came so fast that they were useless. In the southern part of the city, the very lowest quarter, a great break occurred in the levee, caused by the water pouring over the top, which swept everything before it with irresistible force. . . . All the business houses of the city (Mt.

Vernon) which were built level with the sidewalks were flooded, and there was a hasty scramble to get goods above the danger line. All the sidewalks and crossings were washed out, and many of them swept away to southern part of the city. After the flood Kincaid Street presented a sight that was dismal in the extreme, being washed out and lined with debris from one end to the other. All other parts of the city were in nearly as bad condition. ***(Source: DISASTROUS FLOOD -- MT. VERNON IS A HEAVY SUFFERER -- LEVEES OVERFLOWED AND SIDEWALKS WASHED OUT. A TORRENT OF WATER POURS THROUGH THE CITY. SEVERAL HOUSES WRECKED AND ONE OR TWO NARROW ESCAPES 11/22/1897 The Skagit News Herald "TSNH")***

Picture courtesy Roger Fox Collection

From Birdsview east, the highest the river has ever been due to a warm chinook wind and heavy rain, the river rose suddenly and after 36 hours the rain subsided suddenly. Cascade, Sauk, and Baker Rivers were high and caused a peak on the Skagit at the mouths of each stream. Because of the sudden stopping of the rain, channel storage greatly reduced the crest, as it was moving downstream. At Marblemount and Concrete, the flood was 1.3 feet and 3.6 feet higher, respectively, than the 1909 flood. ***(Source: USGS WSP 1527 STEWART/BODHAINE REPORT 1961 AND FLOOD CONTROL & OTHER IMPROVEMENTS, SEATTLE DISTRICT COE REPORT, APPENDIX B MARCH 1965)***

From Conway to salt water, **the flood poured over the top of the levee** the entire distance on the east side of the river. On the west side of the river several small breaks occurred letting through large volumes of water. But little damage was caused however. Quite a loss of hay and oats was caused in several sections where they were not placed high enough to be above the water, but nothing nearly so great as occurred a year ago. ***(Source: DISASTROUS FLOOD -- MT. VERNON IS A HEAVY SUFFERER -- LEVEES OVERFLOWED AND SIDEWALKS WASHED OUT. A TORRENT OF WATER POURS THROUGH THE CITY. SEVERAL HOUSES WRECKED AND ONE OR TWO NARROW ESCAPES 11/22/1897 THE SKAGIT NEWS HERALD "TSNH")***

November 16, 1906: Flood exceeded the 1897 flood in the diked districts on the delta, because of the dikes. In all other sections of the river the flood of 1906 was lower than that of 1897. ***(Source: USGS WSP 1527 STEWART/BODHAINE REPORT 1961)***

On Thursday evening, the Skagit River was the highest known for years. Some damage was done at various points on the river. West Mt, Vernon was flooded, but with very light damage. The west span of the bridge at that place was swept away. The draw on the railroad bridge was slightly damaged by a heavy drift but will soon be repaired. No water came within the corporate limits of Burlington except in the slough in the east part of town, and no damage was done. ***(Source: SKAGIT RIVER OUT OF ITS BANKS --WATER IN VALLEY HIGHEST KNOWN FOR YEARS—BURLINGTON HIGH AND DRY—VERY LITTLE DAMAGE 11/16/06 The Journal ("TJ"))***

While no great amount of damage resulted, it is never the less a fact that the old timer does not remember when the Skagit river contained as much water as it did Thursday night and Friday, and only prompt action on the part of the city officials (Mt Vernon) and citizens saved the town from being inundated. The dikes here were very secure and did not break but the torrents of water poured over them and it was only by prompt action on the part of the citizens, who labored like Trojans filling sacks of sand and placing them in the low places, that saved the city from another baptism worse than that of 1897, as the water was at least eight inches higher than it was during that memorable freshet ***(Source: HIGHEST WATER IN MANY YEARS – SKAGIT RIVER GOES ON BIG RAMPAGE -- ALL BRIDGES ARE DAMAGED AND DIKES BROKEN IN A NUMBER OF PLACES ALONG THE RIVER 11/19/06 TSN-H)***

November 30, 1909: A series of low pressure storms moved through the area, with the last storm moving in on November 26 and lasted through November 29th, dumping 8.3 inches of precipitation at Sedro Woolley. On the 26th and 27th the precipitation was in the form of snow above 2,500 feet. But on the 28th and 29th a warm rain melted snow up to 4,000 feet elevation. The result was the largest flood since the initiation of flood records. At the Reflector Bar (Diablo Dam), the crest was 2.4 higher than the 1897 flood. At Newhalem the gauge was 22.0 feet above the datum gauge. At Concrete, the gauge was 36.4 feet with water reaching the footing of a hotel near the cement plant. Downriver the flood breached a dike near Burlington, pushing water over most of the land between Burlington and the Swinomish Channel. The gauge height at Sedro Woolley was 56.5 feet. ***(Source: USGS WSP 1527 STEWART/BODHAINE REPORT 1961; FLOOD CONTROL & OTHER IMPROVEMENTS, SEATTLE DISTRICT COE REPORT, APPENDIX B MARCH 1965)***

Some among the oldest settlers of Skagit County are found to make the statement that never before have they seen the river rise to the marks reached during the flood, which came during the first part of the present week. . . . At about 10 o'clock Monday night, W.H. Joyce who lives just east of town, gave the alarm by phone, announcing that the water had broken over the county road east of the Jewell place and was running down the big slough towards the east part of town which is quite timely settled. . . . Down at the east end of Fairhaven avenue the current was very swift and the bridge went out . . . leaving some forty people shut out in this lowest land and in a swift current of water. . . . Thursday was a great day in Burlington and many talked of camping on the heights Tuesday night, but the change came about noon, the water went down rapidly and **Burlington has perhaps received less damage then any other town on the Skagit.** . . . While the East Mt. Vernon dyke held good, a snapshot from the auction building on the hill at Mt. Vernon shows a sea of water from Mt. Vernon to LaConner. Much damage was done in West Mt. Vernon and the hundreds shut in. LaConner was underwater as well as the entire flats from LaConner to Bayview and Mt. Vernon. ***(Source: HIGH WATER ON SKAGIT RIVER BREAK ALL PAST RECORDS. FAIRHAVEN AVENUE FLOODED WITH A FOOT AND A HALF OF WATER RIVER RAISES TWENTY-FOUR FEET ABOVE LOW WATER MARK -- MARK—ABOVE ALL PAST RECORDS, 12/3/09 The Journal)***

Burlington had about one foot of water in some of the streets, and there were many buildings over the town that were not even surrounded by water. Neither the railroad bridge south of town, or the steel bridge at Mt. Vernon is washed away. The account published in the Reveille on Wednesday was simply a piece of Yellow Journalism. ***(Source: REVEILLE EXAGGERATES HIGH WATER, 12/3/09 B.J.)***

. . . Everybody anticipated the worst and up to this writing no one has complained of being disappointed and old timers agree that there has been no high water period to equal it since 1897. This last is the second rise of the river within a period of about two weeks, the first being not nearly so great in volume of water or extent of damage. Throughout the past five weeks there has not, all told, been two days of sunshine, and the clouds meant rain, rain, rain, in the valley and on the flats either all of every day or at some period each day. When it rained on the lower levels it snowed on the hills, and it piled up high and stayed until the 36 hours of warm winds of last week poured it down upon us through the river bed and over the lowlands in an avalanche of ranging water. . . . It was then that the knowing ones began to realize that '87 had a rival on its way. All day the water, the raging torrent surged upward at the rate of 12 to 14 inches an hour. To add to the miserable uncertainty of whatever might yet be in store rain fell continuously while the weather continued mild. . . . The river cut a channel from a point just west of the N.P. bridge through the John Smith ranch and woods to the southwest through which it flowed into the old channel again below the Sterling Bend. The house of William Miller, which faced west before

the flood, is now fronting east and is on a neighbors land across the road. Mr. Miller's ranch is between here and Burlington and he is one of the oldest residents of the county. His orchard and ranch are masses of debris. ***(Source: THE SKAGIT RAMPAGE OF 1909 PRINTED JANUARY 2, 1974 WHICH RETYPED THE ORIGINAL ARTICLE THAT APPEARED IN THE SKAGIT COUNTY TIMES DECEMBER 2, 1909.)***

December 30, 1917: This flood was remarkable for the length of time it remained high, rather than the crest, which was comparable to the 1896 flood and was 2.5 feet below the 1909 flood crest. At Sedro Woolley, the gauge was 54.1 feet. (***Source: USGS WSP 1527 STEWART/BODHAINE REPORT 1961)***

Four weeks of rains and Chinooks finally resulted in a freshet Saturday night that for a time threatened to inundate the entire valley. The warm winds from the south melted the snows, it is said, up to the 6000-foot level and brought the combined waters of the Upper Skagit, the Sauk, Baker and numerous tributary streams down to the lower valley in greater and more continuous volume than has ever been recorded in the history of the country. . . . The heaviest individual losers are those individuals that were in the path of the dike breaks. The break at Sterling Bend and that at Stevens slough immediately north of the Great Northern bridge wrought the greatest damage. . . . Mount Vernon, on both sides of the river, was dry throughout the freshet. The water from Sterling bend went over the Olympia marsh and the Samish. Edison also reported a couple of feet of water. (***Source: DIKES BREAK IN A NUMBER OF PLACES AND LET WATER IN OVER A LARGE AREA OF LOW LANDS – SOME STOCK IS LOST; 1/4/18 ARGUS)***

At about midnight the expected break in the dike came. In fact there were at least **ten serious washouts.** Four occurred in the Riverside bend, three across the river in the Avon district, at North Riverside, one at Freeman's old place on the Baker River logging railway right-of-way, southeast of Burlington, one south of Mt. Vernon, and another at the Clear Lake wood yards, north of Mt. Vernon. These artificial spillways naturally afforded an immediate outlet for the surplus water to pour through, and the river immediately began to fall, and all danger from further flood damages was past. ***(Source: VALLEY DIKES BREAK IN DOZEN PLACES – SKAGIT INUNDATES LOWLANDS – NO LIVES LOST – ONLY FEW HEAD OF STOCK DROWNED – CONSIDERABLE PROPERTY DAMAGED – RIVER CHANNEL AND DIKES INADEQUATE TO CARRY AWAY SURPLUS WATER – SPILLWAYS NEEDED TO RELIEVE RIVER CHANNEL DURING FLOOD PERIODS 1/4/18 B.J.)***

Picture courtesy Roger Fox Collection

Because Mt. Vernon's big dikes kept it dry, or Burlington is so fortunately situated that it does not require a system of dikes to protect it from floods is mighty poor consolation to the people of the delta districts threatened with overflow and devastation every recurring flood,. . . ***(Source: MID-WINTER FLOOD GREATEST IN MEMORY OF OLDEST INHABITANT 1/4/18 B.J.)***

December 12-13, 1921: The weather in November of 1921 was below average temperatures and excessive precipitation. December was cold, but snowfall was less than average, much of which was melted off by excessive rain on the 10th and 12th. Between 6:00 p.m. of the 9th and midnight on the 12th Silverton (in Snohomish County, east of Everett) received 14.2 inches of precipitation, David Ranch near Ross Dam received 10.2 inches and 3.4 inches fell at Sedro Woolley. Twenty-four hour maximum rainfall records at these stations were 5.9, 5.0, and 2.0 inches, respectively. These conditions created the second largest flood on record and caused a dike break just above the Great Northern Railway bridge between Mount Vernon and Burlington, dumping 60,000 cubic feet per second (cfs) of water into the Samish River Delta area. ***(Source: USGS WSP 1527 STEWART/BODHAINE REPORT 1961; FLOOD CONTROL & OTHER IMPROVEMENTS, SEATTLE DISTRICT COE REPORT, APPENDIX B MARCH 1965)***

Skagit Valley has been in the grip of a flood for the past week. Torrential rains and strong southerly winds, amounting to gales at times, preceded the onrush of waters from the melting snow of the Cascade mountains, that came pouring down the Skagit river in a volume that almost equaled that of the memorable flood of 1909, when the river rose to 26 feet 4 inches, just 1½ inches higher than the present flood measured.[2] . . . The first break occurred at McKay's place, Burlington. The low lying land was soon covered with water. On Tuesday morning the scene north of the city was one broad expanse of water, with dwelling houses, barns, hay stacks, fences and trees standing in it. From 3 to 6 feet of water was recorded in this section of the flood area,

[2] At Mt. Vernon 1½ inches lower than 1909. 26.4 feet would be 34.4 feet at current gage. 3 feet lower than 1990 and 1995.

the lower floors of the houses being flooded, and the inhabitants taking to the second story. The flood waters reached as far west as Avon. At the North Fork near Conway the next break was reported. This break caused the flooding of Conway, Milltown, Stanwood and the Skagit delta. The whole region from Mount Vernon to Sylvana is all under flood waters. ***(Source:*** **SKAGIT RIVER CAUSES FLOOD** ***12/15/21 MVH)***

The river continued to rise until it reached a mark of 24 feet 10 inches, or two inches below that set in 1909. This was late Monday night. Then came reports of a break in the dike in Burlington and soon after the dike at Conway south of here broke. Both these town were flooded. About 4:30 Tuesday morning, the dike near Charles Wiles place, a short distance west from Riverside Bridge and on the south bank of the river went through. Within a few hours the flats between the bridge and Mt. Vernon were covered with several feet of water. Other breaks occurred at intervals south of Mt. Vernon at Pritchard's, two below the Sheriffs place and two on the north fork. With the breaking of the dikes the river began to drop slightly. ***(Source: SKAGIT RIVER FLOODS VALLEY WHEN DIKES GO--MUCH DAMAGE TO FARMS AND SOME STOCK LOST-- DIKES GAVE WAY EARLY TUESDAY AT 24 FT 10 INCHES 12/15/21 Argus)***

. . . Six weeks of excessive rains, followed last Sunday night till Monday noon by compelling Chinook breezes at the beginning of which the Skagit River was ban full, opened the flood gates in the foothills, and mountains of water poured out to the sea, inundating the greater portion of the valley of the Skagit. . . .Monday night, December 12, the dikes east and southeast of Burlington broke. Tuesday morning at six o'clock the flood water covered Fairhaven Avenue, and in part the residence districts of the city. At this time the entire lowlands lying east, west, south and in part northwest of Burlington were inundated. The depth of water is on relative, the lamentable fact being that the area of low lands covered with water was wide-spread. That certain spots escaped water, neither lessons the flood evil nor removes its threatening menace as the destruction wrought during the last three recurring flood periods of 1909, 1917 and 1921 encompass a wide area of lowlands, some districts suffering greater damages than others, the river in its flood course to the sea, evidently changing or seeking an outlet wherever river dikes could first be swept away. . . . While flood damages in Burlington have been large, the flood waters disappeared from the principal business and residence streets within 12 hours following the overflow. ***(Source:*** **BIG FLOOD INUNDATES SKAGIT VALLEY** ***12/16/21 B.J.)***

Fairhaven Avenue – Burlington – Looking West – 12/13/21
Picture courtesy of Corps of Engineers

After being on its good behavior for four years, the Skagit River went on a rampage again Monday, and when the flood reached its crest at midnight Monday night it was found that the highest mark in the history of Concrete had been reached. The steady rain of Saturday and Sunday brought the river to flood stage Sunday night, and it was then feared that the river would go over its banks before midnight. The weather turned colder in the evening, and by midnight the river was at a standstill, and by morning had fallen about 18 inches. Early Monday forenoon the rain started again, accompanied by a Chinook wind, and the Skagit soon began to rise rapidly again, reaching its greatest height about midnight. … In Crofoot Addition only three residences remained above the high water mark, the water being to a depth of an inch to 14 inches in the others. … The damage caused in this vicinity and throughout the upper valley was considerably less than during the flood of four years ago, except at Sauk, although the water was almost two feet higher than in 1917. … At Sauk the water was from four to six feet deep in the store and residences, and the total loss is heavy. … There is some argument as to whether this flood was higher than that of 1909, but the general opinion seems to be that it was just as high or a few inches higher than the mark reached that year. (***Source:*** ***SKAGIT RIVER GOES ON WILD RAMPAGE; LIGHT DAMAGE HERE*** ***12/17/21*** ***C.H.)***

The flood of 1921 is the biggest flood in the history of the Skagit, according to old timers, who recall the floods of 1879, 1888, 1897 and on up to the big flood of 1909 and the 1917 freshet. Mrs. Dreyer, who lives west of town, tells of the big flood of 1888, when in some places the river backed up higher than this year. She says that not so much damage was done then because there were practically no dikes and the water spread over the lowlands more gradually. Measurements at The Dalles, near Concrete, show that the flood water this year reached a point two feet higher than at any previous time in the memory of the oldest settler. Charley Moses says that it was the biggest flood, with the biggest volume of water ever carried in the Skagit. At Van Horn the water was 14½ inches higher than it had ever been. In 1909 the river in the upper valley was only about two-thirds as wide as it is now. Hundreds of acres of land are being washed away every year, by both Skagit and Sauk rivers. W. A. Ellison says he has been on the

upper river for 21 years and this is the biggest flood he has seen or heard old timers tell about. ***(Source: BIGGEST FLOOD IN SKAGIT HISTORY SAY OLD-TIMERS 12/22/21 CT)***

Old timers in the Skagit valley, who have seen all the floods in the Skagit valley since the early 80's say that the recent flood carried a greater volume of water than any previous flood since the county was settled, surpassing even the famous high water of 1897. The fact that the river did not reach marks set in former years at some points in the upper valley is accounted for by the widening of the river since that time. In all places where the banks of the river have remained unchanged the 1921 mark is considerably above that of any previous flood known to settlers. ***(Source: FLOOD WAS HIGHEST IN SKAGIT COUNTY HISTORY 12/31/21 C.H.)***

6.2 Major Historic Floods on the Skagit River: Post-Gaging

In December 1924 a permanent gauge was installed in The Dalles. ***(Source: USGS WATER SUPPLY PAPER 612 1929)*** Also, since 1924, to some degree, all subsequent flood events have been influenced by the construction of the dams. Five major hydroelectric dams have been built in the Skagit River basin, with three of them being basically run-of-the-river and two of them – Ross and Upper Baker—having significant storage. Under provisions in their FERC licences, both dams provide flood control storage. Seattle City Light has constructed three of the five hydroelectric power dams on the main Skagit River: Ross, Diablo and Gorge dams. The two dams on the Baker River are owned by Puget Sound Energy. Ross, Diablo, and Gorge dams lie in a canyon about 10 miles long. These dams control runoff from 37 percent of the entire basin. ***(Source: CORPS OF ENGINEERS ALTERNATIVES FOR COMPENSATION FOR FLOOD STORAGE CAPACITY, UPPER BAKER RESERVOIR, JANUARY 22, 2003)***

Synopsis Of Dam Construction and flood Control Events

Year	Significant Construction or Flood Control Event
1924	Low Gorge Dam completed
1925[3]	Lower Baker Dam completed Raised 33 feet in 1927 to 293 feet[4]
1930[5]	Diablo Dam completed
1940	Ross Dam 1st step construction completed

[3] 10/24/25 Mount Vernon Daily Herald

[4] 5/19/27 Concrete Herald

[5] 8/28/30 Concrete Herald

1949[6]	Ross Dam 2nd and 3rd step construction completed
1954	120,000 acre-ft of flood storage required in Ross Reservoir by FERC license
1956	16,000 acre-ft flood storage required in Upper Baker Reservoir by FERC license
1959[7]	Upper Baker Dam Completed
1961[8]	High Gorge Dam completed
1977	An additional 58,000 acre-ft flood storage in Upper Baker Reservoir authorized by Congress (Total flood storage = 74,000 acre-ft).

February 27, 1932: The flood of February 1932 would probably have been much more serious if there had been no upstream storage. The storage probably reduced the peak by about 35,000 cfs at the gaging station near Concrete. In the lower reaches of the river, between Sedro-Woolley and Mount Vernon, the dikes failed in two places and caused flooding of farm land and many homes. Also, several dike failures occurred along the distributaries near the mouth. Two gages were in operation along the main stem during this flood and good records were obtained at these points. The gages were located at Newhalem and at The Dalles near Concrete. The crest at Newhalem, which was affected to some extent by storage, was only 1.4 feet below that of the 1921 flood. The crest at the gage near Concrete has been listed as being 5.7 feet lower than that of the 1917 flood, but again upstream storage was a factor. (***Source: USGS WSP 1527 STEWART/BODHAINE REPORT 1961***)

While many parts of Skagit County and Western Washington suffered heavy damages from flood waters last Saturday, Sunday and Monday[9], Burlington, on three sides, emerged practically untouched and losses in the immediate adjacent country were comparatively light. West Conway, Skagit City and up-river communities suffered most from rising waters of the Skagit River, which flooded an extensive countryside for the first time in ten years. The great power dams in Baker river and the Upper Skagit and rather elaborate diking systems in the lower valley, proved only partial protection from a mighty river filled to overflowing, after two days of warm Chinook winds had melted snow in the mountains. . . . Anxiety was felt for a few hours following the break in the dike south of town Sunday noon, but was dispelled when the Great Northern railway fill gave way, allowing the water to sweep over the fields to the West and Southwest. Strong Chinook winds of Thursday and Friday filled the Skagit to the top of its

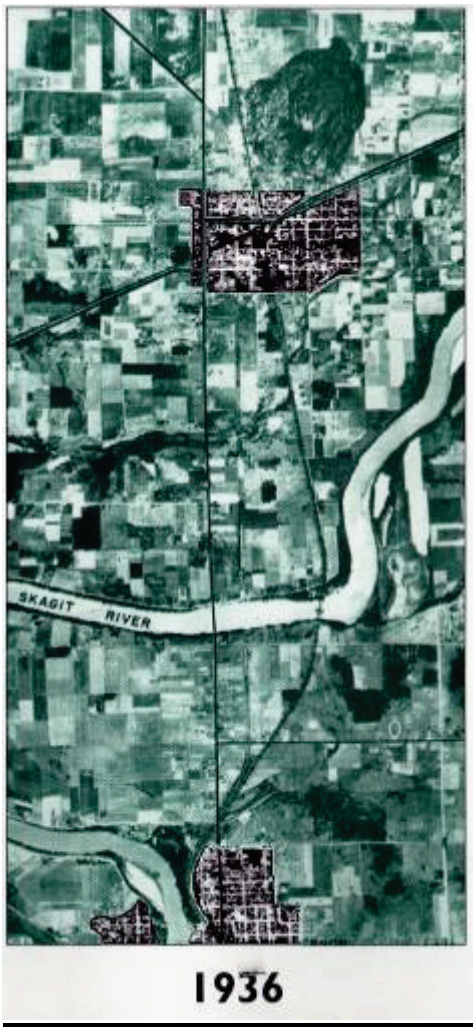
[6] **8/25/49 Concrete Herald**

[7] **7/16/59 Concrete Herald**

[8] **1/12/61 Concrete Herald**

[9] February 27, 28, & 29th.

banks, and Saturday water began overflowing and covering the land up to the dikes. Shortly after midnight Saturday water had risen to a height of less than two feet from the top of the dike east of Burlington. Sunday morning, with water backed up from the Burlington dikes to Clear Lake, a distance of between six and seven miles, the situation became dangerous. The dike was becoming soft in many places and the water continued to rise gradually. Old-timers expressed the belief that there was more water back of the dikes than in any previous flood. A screaming fire siren at 12:10 Sunday noon announced to Burlington that a dike had been broken. Water came crashing through in torrents at the LeMar place, nearly a mile south of Burlington. . . . The flood, temporarily checked by the railroad fill and quickly filling to a depth of three and four feet the fields near the break in the dike, rushed north, emptied into the sloughs, and backed up into Burlington. . . . A few minutes after the river broke through the dike water began to seep through the base of the G. N. fill a mile south of the depot and by three o'clock broke through, lessening the flow into the Burlington sloughs, but sweeping the fields westward. . . . The water level at the dike east of Burlington was down 54 inches Monday morning, and by ten o'clock cars were getting through water on the blacktop road to Bay View. Traffic began making use of the highway between Burlington and Mount Vernon by three o'clock. ***(Source: BURLINGTON ESCAPES FLOOD WHICH TAKES BIG TOLL IN SKAGIT COUNTY AND STATE 3/4/32 B.J.)***



(Picture Source:** Skagitonians To Preserve Farmland**)

Picture above depicts the City limits of Burlington in 1936. The reference in the article above to "nearly a mile south of Burlington" would have put the break in the general vicinity of Gages Slough.

November 28, 1949: : The flood of November 1949 is a good example of the flattening of a flood crest as it moves downstream. Channel storage had a marked effect on the sharpness of the peak between Concrete and Mount Vernon. The peak discharge of 154,000 cfs near Concrete was reduced to 114,000 cfs near Mount Vernon. Precipitation records in the basin at the time of this flood partly explain the reduction in crest in the lower reaches of the channel. The Sedro Woolley gage indicates that very little rain fell in the lower part of the basin. ***(Source*: FLOOD CONTROL & OTHER IMPROVEMENTS, SEATTLE DISTRICT COE REPORT, APPENDIX B MARCH 1965)**

The Skagit River, a few days ago a peaceful stream, turned into a raging torrent last night, spilling over its banks in several spots, marooning many families and causing untold damage to property and loss to livestock. The flood, which reached its peak here at 4:40 a.m., this morning with a crest of 26.5 feet, was the worst in Skagit County for the past 27 years. . . . Yesterday afternoon and last night the entire community of Hamilton was cut off from the outside world and travel to the eastern end of the county is still at a standstill. Most of the families living in and around the community of around 200 persons, left their homes before the water spilled through the streets to a height of about two feet. Amphibious ducks, operated by private individuals and members of the state patrol, evacuated approximately 50 marooned persons there during the evening. This morning hundreds of acres of land in the Fir Island district near Conway are under water due to at least three breaks in river dikes. . . . A trestle and 165 feet of the Great Northern's main line railroad track just south of Conway was washed out during the evening… . . . The main business district of Mount Vernon was seriously threatened during the night but flood crest stopped two feet short of the top of the dike. . . . Greatest flood damage in Skagit County was centered today in the Conway district where workers were unable to stop a dike breaking through at Fisher's slough and above Conway on the North Fork. ***(Source: WORST FLOOD IN YEARS PASSES; CREST FALLING 11/28/49 MVDH)***

Burlington, due to a number of reasons, was one of the few towns in the Skagit Valley suffering only minor damage last Sunday night and Monday during one of the worst floods in over 25 years. Lyman, Hamilton, Mount Vernon, Conway, and Stanwood communities suffered the worst. The factors that saved both Burlington and Sedro-Woolley, five miles to the east from the fate of other towns were first, that the Seattle City Light retained hundreds of tons of water behind their dams up-river, second, dikes breaking near Conway relieved the pressure here, . . . The high stage came about 4:30 Monday morning with a crest at near the 26 foot mark.. . .***(Source: BURLINGTON ESCAPES SERIOUS DAMAGE DURING DEVASTATING SKAGIT FLOOD 12/1/49 B.J.)***

February 10 - 11, 1951: The 1951 flood was an example of a long duration flood. Although the peak discharge was smaller, the duration of high water was considerably longer than the 1949 flood. At Concrete, the crest reached a discharge of 129,000 cfs (10-year flood frequency) compared with 153,000 cfs (14-year flood frequency) in the 1949 flood. The difference though, can be seen when comparing the Mount Vernon discharge. For 1951, the crest reached 144,000 cfs (15-year flood frequency) compared with 114,000 cfs (5-year frequency) in 1949. This flood caused a major levy break near Conway. ***(Source: FLOOD CONTROL & OTHER IMPROVEMENTS, SEATTLE DISTRICT COE REPORT, APPENDIX B MARCH 1965)***

The worst Skagit river flood since 1921 inundated thousands of acres of rich Skagit valley farmlands over the weekend and left two county towns, Stanwood and Hamilton, standing in water ranging up to six feet deep. . . . **Fir Island Flooded** Water from the Conway break spread over an estimated 4,480 acres, to a depth ranging from a few inches to several feet. . . . Highway 99 was closed to traffic yesterday afternoon and was under water for four and a half miles today. . . . **Crested At 28.2** The river reached a crest at 28.2 at 5 a.m. yesterday and held very near to that mark for several hours before feeling the effect of cooler weather on the upper Skagit. . . . Hamilton residents evacuated without incident but some chose to remain on the second flood of their homes. Eight families were taken out of the flooded Nookachamps valley Saturday by civilian "ducks". . . . One of the most serous threats to the dike was in the river bend area west of the Riverside bridge where leaks and boils in the road which parallels the dike caused concern throughout Saturday night and Sunday. . . . Across the river, from the bridge to the Avon vicinity, the dike held but showed the same tendency toward seepage, with water bubbling up in the road and adjoining fields until stopped by the sandbag treatment. . . . A portion of the drawrest on the West Side Bridge across the Skagit was swept away and there were times at the crest of the flood when the bridge was felt to sway noticeably, but held fast. The new rip rapping on the dike in downtown Mt. Vernon came through with flying colors and the higher level of the dike was credited with preventing serious flooding of business buildings along the riverfront. (***Source: THOUSANDS OF ACRES FLOODED IN RICH VALLEY, 2/12/51 MVDH***)

1951 Flood Damage between Burlington & Sedro-Woolley on Highway 20
Picture courtesy Roger Fox Collection

December 4, 1975: On November 30th, a cold front moved into the Skagit area covering the area between Burlington and the Cascades with a moderate amount of snow. On December 1st a new front moved into the area raising the freezing level higher up in the mountains and dumping rain on the valley as the temperature continued to raise. Melting snow and rain water began swelling ditches, streams, and the Skagit River, which began flooding some time Tuesday night.

The weather continued to stay warm and rainy through Wednesday with wind coming up in the afternoon causing wave action which threatened dikes and other structures along the river. Several critical periods were met during the flood when tides were high and winds strong. Peak high water level was reached Thursday night when the river crested at 35.6 feet at the Riverside Bridge in Mount Vernon. Twenty-six feet of water in the river at this point is considered flood stage by the Skagit County Engineers. Clear weather and cooler temperatures beginning Thursday affected immediate receding along the river as soon as the crest passed. By Friday, December 5th, the water level was dropping and water receded at a remarkably rapid rate. The river lacked only 2,000 cfs of becoming a flood of the same magnitude as the 1951 flood which caused a major levee break near Conway. At the time of the flood crest at Concrete (which amounted to a measured value of 122,000 cfs) the inflow into Ross Reservoir was approximately 24,000 cfs, therefore, the added inflow into Ross Reservoir that was not released, namely, 19,000 cfs would have added substantially to the Concrete crest, thereby creating a peak flow of approximately 141,000 cfs. Ross Dam had control over approximately 17 percent of the river flow at that time. It has been calculated that the control they had enabled them to reduce the flood level at Concrete by approximately 2.5 feet. ***(Source: SKAGIT RIVER FLOODING: AN OVERVIEW, SKAGIT COUNTY RURAL DEVELOPMENT COMMITTEE, MARCH 1976)***

Old man Skagit River has once again demonstrated its disregard toward the domain of man. And the latest flooding dramatically illustrates the need for better flood protection in the Skagit Valley. Many proposals have been advanced and numerous ideas studied to give citizens of the Skagit Valley better protection from floods. But little has been achieved. Perhaps this most recent flooding will provide emphasis to obtain the needed flood protection. We hope so. . . . The Skagit County Commissioners have long been on record as favoring increased flood control measures and have even visited Washington, D.C. to urge such steps be taken. We are in agreement that something must be done and soon. Better levees and increased water storage in the baker Lake reservoir and Seattle City Light dam system are among some obvious partial answers to the flood threat. (***Source: SVH EDITORIAL – SKAGIT RIVER SPEAKS WITH MIGHTY VOICE, 12/3/75 SVH)***

Flooding between 1976 and 1989: Floods with magnitudes of 135,800, 148,700, 100,000, 109,000, 119,000 cfs occurred in Concrete on December 18, 1979, December 26, 1980, December 4, 1982, January 5, 1984, and November 11, 1989 respectively. The Town of Hamilton was completely inundated each time. Cockreham Island levees overtopped and failed in 1979 and 1980. The levee system protected the Lower Skagit Valley and most of the damage occurred upstream of Sedro Woolley. Each of these floods was incurred by heavy, warm rains accompanied by a melting of the snow accumulation in the lower elevations. **(Source: *SKAGIT COUNTY CFCMP 1989* AND *HISTORIC FLOOD FLOWS OF THE SKAGIT RIVER*, www.skagitriverhistory.com)**

November 9-12, 1990: Rain began in the Skagit basin in the early afternoon of November 8 and continued to fall through November 10. It became apparent early November 9 that a flood was imminent as river discharges throughout the basin began rising significantly.

Concrete: The Skagit River at the Concrete gage went above the zero damage stage of 28 feet (62,500 cfs at 1:00 p.m. and continued above the major damage stage of 32 feet (90,000 cfs) by 6:00 p.m. on Friday, November 9. At 1:00 p.m. on November 10th the river crested at 40.20 feet which corresponds to a peak discharge of 148,000 cfs and a return interval of 21 years. The river stage at Concrete remained above major damage for 42 hours and above zero damage for 106 hours.

Mt. Vernon: The Skagit River at the Mount Vernon gage exceeded the zero damage stage of 28 feet (68,000 cfs) early November 10 at 3:00 a.m. and the major damage stage of 30 feet (80,200 cfs) by noon. By 8:00 p.m. on the tenth, the river rose to a stage of 34 feet, 112,000 cfs. And by 10:00 a.m. on Sunday, November 11, the flood peaked at Mount Vernon with a crest stage of 36.60 feet, a peak flow of 142,000 cfs, and a return interval of 17 years. Time above zero and major damage was 83 and 53 hours, respectively.

Flood Control Regulation: Flood control regulation by the U.S. Army Corps of Engineers (the Corps) of the Skagit and Baker River projects prevented major flood damages in the lower Skagit River valley and Mount Vernon areas. Seattle City Light (Ross Dam on the Skagit River) and Puget Sound Power and Light[10] (Upper Baker Dam on the Baker River) effectively responded to the Corps' flood control regulation operations. Flood control regulation of the projects was initiated by the Corps at 11:00 a.m. Friday November 9 and did not end until the first week of December. Water levels at both projects were well below their flood control pool elevations at the onset of the flood and filled to within about a half a foot of full pool during the event, using 112,000 acre-feet (AF) in Ross and 82,000 AF at Upper Baker.

(***Source: FLOOD SUMMARY REPORT, NOOKSACK, SKAGIT AND SNOHOMISH RIVER BASINS, NOVEMBER 1990 EVENTS, JULY 18, 1991.)***

Fearing that the Skagit River might breach the storm-saturated dike any minute and flood their farm community south of Mount Vernon, they grabbed a blanket and got out. But the dike didn't break until 1 p.m. and after that the floodwaters spread with agonizing slowness. Unable to return home, the Viscallas spent most of the day worrying about what might happen. (***Source: DIKES BREAK ON FIR AND EBY ISLANDS: "HERE WE GO AGAIN", SEATTLE PI NOVEMBER 12, 1990)***

[10] Now Puget Sound Electric ("PSE")

. . .neighbors who asked not to be identified, were listening to the radio at about 1:30 p.m. when they head a report that about 100 feet of the dike on Dry Slough Road had blown and Fir Island was flooding. . . . Although they had lived on the island for 35 years, . . . they had never been scared of the flooding like they were this year. (***Source: FIR ISLAND RESIDENTS SURPRISED BY EARLY MORNING EVACUATION. SKAGIT VALLEY HERALD, NOVEMBER 12, 1990)***

Eventually, the men lost the battle. The dike gave way at about 1:30 p.m. Sunday causing major flooding on Fir Island. An estimated 500 people and several thousand head of cattle were evacuated from the island, which is surrounded by the north and south forks of the Skagit River, said John Hunter, chief field deputy with the Skagit County Sheriff's office. About three herds remain on the island," he said. . . . The situation was made worse by a high tide at noon Sunday, which held water back, Sheahan said. (***Source: A GRIM RACE AGAINST RISING WATER – DIKES BREAK DESPITE EFFORTS TO STEM FLOOD. SKAGIT VALLEY HERALD, NOVEMBER 13, 1990)***

Hamilton – On Saturday, (November 10, 1990) more than six feet of water submerged parts of Hamilton from its southern boundary on the banks of the Skagit River to the north end of town near Highway 20. . . . On Sunday, residents and business owners returned to Hamilton and began what probably will be a long process of cleaning up and drying out. (***Source: RESIDENTS MOP UP AS RIVER GOES DOWN. SKAGIT VALLEY HERALD, NOVEMBER 12, 1990)***

Allen – As Tim Knapp looked out the front door of his Chuckanut Drive home Saturday morning, four feet of water surrounded him. . . . "It floods every year here, but this was the worst," he said. The water got even higher on Sunday when the Samish River peaked at 22.65 feet." (***Source: TOWN OF ALLEN IS HIT HARD BY FLOOD WATERS. SKAGIT VALLEY HERALD, NOVEMBER 12, 1990)***

"I've got 7 feet of water at my house," said Ruth Wylie, Skagit County commissioner and long-time resident of Fir Island. "It's raining, and there's more rain in the forecast. It looks pretty glum right now." Officials had hoped the 150-foot-wide hole on the saltwater dike at the mouth of Dry Slough would lower the water levels on Fir Island. Water is emptying into Skagit Bay, and Wylie said last night that the swath in the dike will be widened to 250 feet. . . . "If the entire dike breaks, then Fir Island becomes a part of Skagit Bay," Nelson said. The river dike that broke Sunday afternoon started as a 50-foot gap and doubled in size "with minutes," according to area resident Pat Dozier, who was among a dozen workers frantically trying to patch the dike. (***Source: FIR ISLAND IN DANGER OF BECOMING PART OF BAY – FLOOD WATER COMING IN FASTER THAN ITS RECEDING, SEATTLE TIMES NOVEMBER 13, 1990)***

In the 1951 flood, there were dikes on either side of Dry Slough, so when the dike broke, it covered just half the Fir Island, Tellesbo said. This year, with no dikes in the middle of the island, water has covered almost all of it. On Monday, Dike District 22 commissioners decided to cut a hole in a saltwater dike at the south end of the island in an effort to drain the island. In 1951, they didn't need to. "It came so fast the water broke out at least three sections of dike at the bay," Tellesbo said. After the flood in 1951, "It was pretty tough going. We couldn't put in a crop in at all that year because of the sand, brush, and timber left behind by the flood." (***Source: "NEVER SEEN A RIVER AS BAD AND AS HIGH" SKAGIT VALLEY HERALD, NOVEMBER 13, 1990)***

Levee Break on Fir Island
Picture courtesy Corps of Engineers

November 21-26, 1990: Rain began to accumulate the morning of November 21 and continued at the rate of about 0.1 to 0.2 inch per hour until noon on November 22. Only 0.3 inch was recorded at Marblemount during the next 24 hours. But then accumulations of 0.1 to 0.3 inch per hour were recorded for the next 24 hours. In the Skagit basin, total precipitation accumulations were less for this event than for the November 9-12 event and hourly accumulations were generally less intense. The ground was still well saturated and portions of the basin still had standing water from the November 9-12 flood.

Concrete: The discharge at the Concrete gage responded to the rainfall and began to rise early on November 22. The river worked its way to just above zero damage flood stage by 4:00 a.m. on the 23rd. It leveled off at 28.4 feet and then receded to just below 28.0 feet before rising steadily to a peak stage of 39.89 feet by 6:00 p.m. November 24. The discharge receded steadily after the peak.

Mt. Vernon: The Skagit River at the Mount Vernon gage began to rise by 7:00 a.m. November 22 and rose past zero damage flood level by 6:00 p.m. the next day. It crossed the major damage flood stage about 24 hours later and peaked at 37.40 feet to establish a new flood of record on November 25 at noon for the period of record 1940-1991. A steady recession brought the flow below major damage by 11:00 a.m. and below zero damage by 5:00 p.m. on November 26.

Flood Control Regulation: Ross and Upper Baker multipurpose reservoirs were again effectively used in diminishing the impact of flooding for this event. Flood control regulation by the Corps for the Veterans Day weekend flood was not totally complete when forecasts for the Thanksgiving Day weekend event were beginning to come in. . . . Upper Baker was drafted to elevation 707.5 feet (below normal winter flood control pool of 707.9 feet) and Ross was drafted to 1,592.0 feet (normal winter flood control pool) by midday November 22 in anticipation of the forecast flood. Storage of flood waters began to slowly fill both projects late on November 22. As inflows rose and regulated discharges were reduced the rate of storage accelerated. Ross reached a maximum elevation of 1,600.4 feet before evacuation began around 7:00 a.m. on November 26. It was just 2.1 feet below normal full pool and used 80 percent of its flood control storage. Upper Baker filled to within 3.3 feet of normal full pool to elevation 720.7 feet before evacuation began at 9:00 a.m. November 27. Upper Baker filled 79 percent of the allotted flood control storage.

Effects of Flood Control Regulation: The maximum inflow into Ross reservoir was calculated to be 36,000 cfs. The peak flow into Upper Baker was calculated to be 28,000 cfs. The regulated peaks of 146,000 cfs and 152,000 cfs at Concrete and Mount Vernon respectively would have been 182,000 cfs and 180,000 cfs if left unregulated (as estimated by the National Weather Service River Forecast Center's Skagit Basin Model). This represents a theoretical reduction in stage of 3.5 feet at Concrete and 4.5 feet at Mount Vernon.

(***Source: FLOOD SUMMARY REPORT, NOOKSACK, SKAGIT AND SNOHOMISH RIVER BASINS, NOVEMBER 1990 EVENTS, JULY 18, 1991.)***

The Skagit River is expected to crest in Concrete at 29.5 feet at 10 a.m. Saturday, and at 29 feet in Mount Vernon 12 hours later, Skagit County Flood Control Engineer Don Nelson said today. The river is forecast to reach flood stage –28 feet – at 4 p.m. Saturday in Mount Vernon. . . . Nelson said he's not too concerned about the soggy dikes on Fir Island holding, "because 29 feet don't put very much water on them. There won't be much pressure on them. Twenty-nine feet is way below the 35 feet we had (two weeks ago)." . . . (***Source: SKAGIT EXPECTED TO CREST SATURDAY, SKAGIT VALLEY HERALD, NOVEMBER 23, 1990)***

The National Weather Service forecasted more rain today. The Skagit River was expected to reach 31 feet I Mount Vernon by noon, forecaster Bruce Rennek said Friday night. Flood stage is 28 feet. "It's going to test the new dike that the Corps put in," Rennek said. "We're going to find out in a real hurry whether or not it will hold. (***Source: RAIN SWELLS SKAGIT AGAIN, SKAGIT VALLEY HERALD, NOVEMBER 24, 1990)***

Once again, the river beat Fir Island. The north fork of the Skagit River prevailed over residents efforts to hold it back yesterday, and, breaking through a temporary levee, flooded the river-delta community for the second time in two weeks. The river gushed through the 31-foot-high closure at about 11 a.m. and just kept rising. (***Source: FIR ISLAND IS HIT BY SECOND FLOOD IN TWO WEEKS, SEATTLE POST INTELLIGENCER, NOVEMBER 25, 1990)***

The river wiped out a temporary dike on Fir Island that was built to patch a 250-foot gap in a dike that broke two weeks ago. The original hole has now widened to 350 feet, officials said today. . . . But dikes upstream around Mount Vernon and Burlington came perilously close to breaking, dike district officials said. "If it was any closer, the Skagit Valley Herald would be wet," said Arnie Moores, a Dike District 17 commissioner. (***Source: DIKE DISTRICT OFFICIALS SCRAMBLE TO PROTECT RESIDENTS FROM RIVER, SKAGIT VALLEY HERALD, NOVEMBER 26, 1990)***

NOVEMBER 1995: The 1995 floods were unique from the standpoint the river reached flood stage five times in a period of 21 days. The first was on November 8, 1995. The river crested at Concrete on The Dalles gage at 39.45 or 143,000 cfs, and at Mt. Vernon 31.62 or 89,900 cfs. The river stayed high for the next three weeks, reaching flood stage three more times. Finally, on November 29, 1995 the Skagit River crested at its highest level at The Dalles since the gage was put there in 1924. A record, which would be surpassed later by the 2003 flood event. It crested at 41.57 feet or 160,000 cfs resulting at a crest at Mount Vernon of 37.32 or 141,000 cfs. ***(Source: SEE APPENDIX A: HISTORIC FLOOD FLOWS OF THE SKAGIT RIVER, WWW.SKAGITRIVERHISTORY.COM)***

HAMILTON – The 1995 flood washed out David Buchanan with little warning. He left for classes at Bellingham vocational college early yesterday with no indication his 35-foot mobile home would be underwater by early afternoon. . . . Forecasts grew ominously worse yesterday. That morning in Concrete, Skagit County flood watcher Wally Shaver reported levels of 31 feet. The rising Skagit River had blocked one road leading from his community of Cape Horn. Little did he know the river would rise to 39.3 feet early this morning. The level is almost a dozen feet above flood stage and nearly the same reached during the 1990 floods that caused widespread devastation and more than $40 million in damage. . . . Intense rains that dumped more than 7 inches in 36 hours are blamed. (***Source: WEATHER BREAK HELPED PREVENT WORSE FLOODING, OFFICIALS SAY, SKAGIT VALLEY HERALD, 11/9/1995)***

November 28 - 29, 1995: Flows on the Skagit River reached 160,000 cfs at Concrete and 141,000 cfs at Mount Vernon during the November 28-30, 1995 flood. Concrete was above zero damage stage for four days and above major damage (90,000 cfs) for one and a half days. Mount Vernon was above zero damage stage for approximately 4 days and above major damage for approximately 3 days. As a result of the reservoir regulation and sandbagging efforts, levees at

Mount Vernon and Fir Island were able to withstand the flood without failing. Runoff stored at Ross and Upper Baker was estimated to have reduced flood levels by about 5 feet and 2 feet at Concrete and Mount Vernon, respectively.

The Seattle District Reservoir Control Center (RCC) took control of Ross flood control storage on November 28th when the National Weather Service forecast a storm that would produce record-level flooding. Ross filled to an elevation of 1,602.38 feet on November 30, using 118,623 acre-feet of the total active flood-control storage of 120,051 acre-feet. Ross inflow peaked at about 46,500 cfs at 1400 hours on November 29th shortly after the Skagit River near Concrete had peaked at 160,000 cfs. Discharges at Concrete had receded to 90,000 cfs by the afternoon of the 30th. Efforts to increase discharge and pass inflow at Ross were delayed nearly two days by the high inflow and the limitation on discharge of 26,000—28,000 cfs through the Project.

On November 28th at 1135 hours, RCC took control of Upper Baker flood control storage when the reservoir was at elevation 707.9 feet. Upper Baker Dam filled to an elevation of 719.1 feet on November 30, using 63,800 acre-feet of the 74,000 acre-feet of total flood-control storage at Upper Baker. Peak inflow into Upper Baker was 31,000 cfs. This flood set a new crest-stage record at the Concrete gage despite the regulation at Ross and Upper Baker. The Concrete gage reached a crest of 41.57 feet. The Mount Vernon gage reached a crest of 37.34 feet, approximately equal to the record stage of 37.37 feet during the November 25, 1990 flood.

Reservoir inflow caused Ross Lake to fill to elevation 1,602.38 feet, which is within 0.12 feet of the maximum full flood control pool. Upper Baker started to evacuate storage at 1800 hours on November 30, nearly a day after the River crested at Concrete. The flood storage evacuation was delayed until the flow at Concrete receded below 90,000 cfs in response to reports from the field flood engineers indicating that levees were still holding but a prolonged duration of high river flow was likely to cause failure. Mount Vernon was 0.5 foot above major damage for an extra half day, but the initial height was reduced due to this special evacuation. ***(Source: FEASIBILITY SCOPING MEETING READ-AHEAD REPORT, USACE 2009)***

COCKERHAM ISLAND – The Kaaland's 100-year-old farmhouse has never flooded. However, Cockerham Island, situated between the riverside communities of Hamilton and Lyman, is again what its name implies. Roads are covered with water and cars and trucks can no longer pass. Ron has vowed to stay. Meanwhile, the Skagit continues to rise. Crests of 45 feet in Concrete and 39 feet in Mount Vernon are expected at midnight tonight and 10 p.m. tomorrow, respectively 1990 levels were 39.89 in Concrete and 37.37 in Mount Vernon. ***(Source: SKAGIT RIVER CLIMBING TOWARD RECORD LEVELS, SKAGIT VALLEY HERALD, 11/29/1995)***

During the 1990 and 1995 floods, the stages at Mount Vernon were nearly equal, 37.34 feet and 37.37 feet, respectively. A major levee failure at Fir Island during the November 1990 flood increased the river slope and velocity below Mount Vernon, causing an artificially low crest stage at the Mount Vernon gage. The month of November 1990 included significant floods on November 9-11 (the first flood) and November 24-25 (the second flood). The first flood was slightly larger in volume than the second flood, but peak discharges were similar during both floods, having approximately a 5 percent exceedance frequency at the Concrete streamgage. Total flood storage used at both projects amounted to approximately 194,000 acre-feet during the first flood and approximately 153,900 acre-feet during the second flood. The above volumes include 112,000 acre-feet stored in Ross and 82,000 acre-feet stored in Upper Baker during the first and 100,000 acre-feet stored in Ross and 53,900 acre-feet stored in Upper Baker during the second flood. Inflow to both projects peaked on November 10, 1990 (first flood) as follows; 46,000 cfs at 2400 hours at Ross, and 33,000 cfs at 1000 hours at Upper Baker. Outflows at both projects were regulated to a minimum of 5,000 cfs through the main part of the flood. (***Source: DRAFT SKAGIT RIVER BASIN, WASHINGTON, REVISED FLOOD INSURANCE STUDY, HYDROLOGY SUMMARY, MAY 1, 2008***)

Sandbagging along Whitmarsh Road, Burlington
Picture courtesy Dike District 12

Floods of October, 2003: In the Skagit River Basin, record floods were recorded at several sites during the October 21st event. Ross Reservoir inflow peaked at 53,000 cfs, which was the largest inflow recorded since the dam was constructed in 1956. The Sauk River near Sauk (flood hydrograph not displayed) also recorded the largest flow in it 73 year record and it was computed to have a 100 year return period. At Concrete, the Skagit River peaked at 42.2 feet or 14.2 feet above flood stage, which was the largest event in its 77-year record.

Effects of Reservoir Storage and Routing on the Lower Skagit: Dry conditions prior to the event caused reservoirs levels to be lower than normal. Although the reservoirs in the Skagit Basin have limited flood storage capacity, the additional capacity increased the ability to reduce

downstream discharge. A comparison of regulated stream flow measured at Concrete with simulated unregulated flow shows the degree that river stage was affected by reservoir regulation of runoff. The simulation indicates that the Skagit River at Concrete would have peak around 46.0 feet if there were no dams within the basin. The highest observed stage at Concrete was 42.2 feet.

Ross Reservoir Inflow		
Method of Inflow Computation	**Est. Time of Peak**	**Inflow~CFS**
Maximum 1-hour inflow Computed During the flood	20-Oct-00	53,300
Maximum 1-hour Inflow Estimated by Seattle City Light After the Flood	21 Oct 0400	44,800
Maximum 1-hour Inflow Computed by the Seattle District, Corps of Engineers Based on 5 Hour Moving Average	21 Oct 0200	45,000
Upper Baker Reservoir Inflow		
Method of Inflow Computation	**Est. Time of Peak**	**Inflow~CFS**
Maximum 1-hour inflow Computed During the flood	20 Oct 1800	41,600
Maximum 1-hour Inflow Estimated by Puget Sound Energy After the Flood	20 Oct 1800	41,600
Maximum 1-hour Inflow Computed by the Seattle District, Corps of Engineers Based on 5 Hour Moving Average	20-Oct-00	37,000

Flood Damages Prevented: Reservoir flood control in the Skagit basin is provided in two projects; Seattle City Light's Ross project and Puget Sound Energy's Upper Baker project. Flood control plans for the projects require that storage space in the reservoirs be gradually increased in anticipation of the winter flood season. According to flood control plans Ross and Upper Baker projects were required to have a minimum of 20,000 and 8500 acre-feet of space respectively on October 15th, just prior to commencement of this storm event. Fortuitously, both reservoirs were below their required rule curve storage principally because of the dry conditions that had prevailed earlier in the summer and fall. On October 15th Ross project had 187,000 acre-feet of space and Upper Baker project had 65,000 acre-feet. This lucky

circumstance facilitated greater flood damage reduction than would have been the case if the reservoirs had been at the maximum elevation permitted by the respective water control plans.

Skagit basin flooding during the October 2003 event was driven by heavy rainfall during two consecutive storm events that were separated by only several days. Rainfall was particularly intense on October 16th and October 20th. For instance, record 24-hour rainfall totals were recorded at Ross Dam (5.63 inches) and Upper Baker Dam (6.60 inches) on October 16th. Both records are noteworthy because each of these gages has a record length greater than 35 years. Other noteworthy 24-hour rainfall totals include 5.3 inches at Ross Dam on October 20th (second wettest 24-hour period of record), 6.8 inches at Darrington on October 20th (second wettest 24-hour period of record), and 6.82 inches at Diablo Dam (wettest 24-hour period of record in October). . . . It is also noteworthy that conditions were actually quite dry throughout the basin during an extended period preceding the October 16th and 20th storm events. This suggests that the heavy rainfall during the first storm event on October 16th was sufficient to prime the basin for the flooding that resulted following the arrival of the second storm event on October 20th. This resulted in large instantaneous peak flows in the upper basin including a 124-year recurrence flow at the Sauk River at Sauk gage (119,000 cfs), an 92-year recurrence flow at the Thunder Creek near Newhalem gage (17,600 cfs), an 70-year recurrence flow for the inflow to Upper Baker Dam (37,000 cfs), and a 50-year recurrence flow for the inflow to Ross Dam (45,000 cfs). . . . While the maximum 24-hour rainfall totals associated with the 1990 and 1995 events were lower than the maximum 24-hour totals during the 2003 event, the rainfall amounts preceding these events were much greater than the rainfall amounts preceding the 2003 event. For example, the fall months of both 1990 and 1995 were quite wet with November 1990 (31.3 inches) and November 1995 (30.9 inches) being the wettest two months of record at the Upper Baker Dam gauge. Although the intensity of the short-duration rainfall associated with the 1990 and 1995 events was less than similar duration rainfall during the 2003 event, the consistently wet conditions preceding the 1990 and 1995 events resulted in larger overall runoff volumes and hence longer duration peak flows, which results in a higher peak flow at Mt. Vernon relative to the 2003 event. The 3-day peak flows for the 2003 event are not nearly as unusual as the instantaneous peak flows. The 3-day peak flows for the Sauk River at Sauk gage, the inflow to Upper Baker Dam, and the inflow to Ross Dam for the 2003 event have recurrences of 10-year, 25-year, and 14-year, respectively; significantly less than the peak recurrences. . . .

These longer duration flows play a large role in the flooding that is seen down at Mount Vernon. This is because the Skagit River basin below Concrete has many low-lying areas in the overbank areas that can collect water and, therefore, remove water that is available to move downstream. In river systems such as this, downstream flooding is more affected by how long it floods in the upper basin than how high the water gets at the peak. For example, if the flows

only stay high for a short period of time, then a lot of this water can be lost in low-lying ponds as the flood wave moves downstream. If the flows stay high for a long time, then these low lying ponds fill up and so when the peak passes, very little of the water gets lost in the overbank (the November 1990 flood occurred this way so the peak flow at Concrete was also seen at Mount Vernon). The October 2003 flood on the Skagit was a short duration flood so a significant amount of the water was lost to the filling of the overbank low spots as the flood wave moved downstream. This is illustrated by the fact that the peak flow at Concrete was 166,000 cfs, a 24-year recurrence, while the peak flow downstream at Mount Vernon was less, 129,000 cfs, a 14-year recurrence. . . . The Seattle District, U.S. Army Corps of Engineers estimates damage prevented by flood control at Seattle City Light's Skagit River project and Puget Sound Energy's Baker River project is $58,942,000.

(Source: CORPS OF ENGINEERS POST FLOOD REPORT, OCTOBER 2003 FLOOD, JUNE 2004)

Some of the heaviest rainfall in years swelled the Skagit River to record flood levels today as volunteer crews spent the day piling sandbags along the downtown Mount Vernon waterfront and along dikes to head off the 38-foot crest predicted by this evening. Patients at a Sedro-Woolley hospital and residents of a nearby nursing home were evacuated to facilities in Mount Vernon this morning. Shelters were opened for the scores of people evacuated from low-lying areas from Burlington to Marblemount. Schools were closed throughout the county except for Anacortes. Skagit Valley College was also closed. School officials said closures will be decided on a day-to-day basis. The Skagit River crested at 41.7 feet – nearly 14 feet above flood stage – at Concrete about 6 a.m. today. Forecasters predict the river will crest at 38 feet – 10 feet above flood stage – when it hits Mount Vernon at about 8 p.m. today. ***(Source: FLOODING FORCES MORE EVACUATIONS, SKAGIT VALLEY HERALD, OCTOBER 21, 2003)***

The difference between the Skagit River at Concrete and the Skagit River at Mount Vernon is the bowl-shaped valley that is the Nookachamps basin. The area stretches east of Burlington and Mount Vernon encompassing Francis Road, Barney Lake and the Clear Lake area. By Tuesday afternoon, it was entirely under water. . . . The Nookachamps basin, named for the creek that flows into the Skagit River, effectively divides the valley into two parts. In the upper valley the river roams free, submerging whole towns at will. In the lower valley, it is forced to wind snake-like, between Burlington and Mount Vernon before heading south to the fork, where it goes around an area that used to be the river's delta but is now Fir Island. . . . **River or Lake?**: The levee system begins at about where Lafayette Road and District Line Road meet Highway 20, just east of Burlington. From there, people could see the Skagit River turn into a lake. One had to look very closely to see the water moving, but it was moving. . . . At about 4 p.m., a trickle of water started coming over Lafayette Road, just west of District Line Road. Within 20 minutes, it was a sheet of water heading into a ditch on the other side, where

it would slowly find its way, officials hoped, into Gages Slough. . . . **Changing Forecast**: Predicting the crest is tricky, said Dana Felton, a meteorologist with the service's Seattle office. A computer model, calibrated for the Skagit's topography and hydraulics, was continuously revised. There are dozens of variables, he said, including how saturated the ground is and how much water each tributary contributes. Although most people count on the crest of the river hitting Mount Vernon 12 hours after it hits Concrete, the window tends to be 12-15 hours, Felton said. Tuesday's 17 hour difference is unusual, he said. **Emptying the Dams**: Even with the flood officially past Concrete, the waters were remaining high at the town, thanks to the U.S. Army Corps of Engineers. The Corps was frantically draining Baker Lake, the reservoir behind Upper Baker Dam, to make room for today's expected rain, said Marian Valentine, who controlled the dam from the Corps' office in Seattle. "I feel like we need to empty the reservoir to hold as much as we can," Valentine said. "We're going to keep it low and try to keep it off the levees if we can." That meant keeping flows at Concrete as high as 90,000 cfs – still above flood stage. By Wednesday morning, the river was allowed down to 85,000 cfs and 31.5 feet, 3.5 feet above flood stage. Ross Dam, which holds back a lake that stretches into Canada, almost filled up during the rains Tuesday. That, too, was being emptied at about 25,000 cfs Tuesday night, although the streams feeding the lake were still pumping in nearly that same amount of water. ***(Source: NOOKACHAMPS BASIN SOAKS UP THE PRESSURE. SKAGIT VALLEY HERALD, OCTOBER 21, 2003)***

The raging Skagit River appeared to have done its worst by this morning as record floodwaters began to recede after submerging wide areas of the valley and causing the evacuation of as many as 4,000 people. Despite a record crest of 42.2 feet at Concrete just before dawn Tuesday morning, the crest near midnight at the Mount Vernon revetment fell short of what had been predicted, rising to 36.2 feet and sparing the city's downtown district from serious damage. . . . County officials estimated that between 3,000 and 4,000 people were evacuated from their homes throughout flood prone areas of the Skagit Valley on Tuesday. Although a flood warning remained in effect, officials believed that the river has seen its highest crest for now. . . . Residents were asked to evacuate from Fir Island, Clear Lake and Gages Slough area of Burlington, west Mount Vernon, and the Nookachamps basin, said Dan Berentson, a Skagit County spokesperson. ***(Source: SKAGIT RIVER DROPPING AS CREST PASSES, SKAGIT VALLEY HERALD, OCTOBER 22, 2003)***

Hamilton Inundated in 2003
Picture courtesy Skagit County Public Works

November 6, 2006: The Skagit River reached flood stage at 6:30 a.m. today, and was predicted to crest at above 40 feet at Concrete just after midnight Tuesday, with a peak flow predicted of 148,000 cubic feet per second. The crest was predicted to reach Mount Vernon Tuesday evening, with a height of nearly 35 feet and a peak flow of 115,000 cfs. . . . In downtown Hamilton, where the 2003 high water mark is posted on both the Post Office and the local general store, Postmaster Susan Dills put out today's mail in the office's postal boxes. She said she planned to close at noon to move her belongings out of her garage. The rest of her house should be above the rising water. She wasn't too worried about the Post Office. "In 2003, I had 3 feet of water in here, and it didn't affect my mail," she said. . . . Historical crests: Recorded at Mount Vernon gauge (flood stage is 28 feet): 37.37 feet, Nov. 25, 1990; 37.34 feet, Nov. 30, 1995; 37.00 feet, Nov. 11, 1906; 36.85 feet, Nov. 2, 1951 36.61 feet, Nov. 11, 1990, 36.2 feet, Oct. 21, 2003 ***(Source: RESIDENTS ALONG SKAGIT BRACE FOR MAJOR FLOODING, SKAGIT VALLEY HERALD, NOVEMBER 6, 2006***)

HAMILTON — Families, National Guard troops and volunteer rescue workers stood at the end of Pettit Street on Tuesday afternoon and watched the muddy waters of the Skagit River begin to recede from the town. The worst was over after the river crested here early Tuesday morning, but town officials said residents would have to wait at least overnight to inspect the damage to their homes. Near the north end of Pettit Street, guardsmen huddled around one of the four camouflage high-water trucks they brought to rescue anyone stranded in the flooded areas. Fire department volunteers in long chartreuse raincoats smoked cigarettes and talked at the edge of the water, ready to take part in a rescue if needed. . . . Thirty-five people stayed in shelters in Hamilton, Concrete and Sedro-Woolley Monday night, according to the American Red Cross. The shelter in Hamilton's First Baptist Church housed 17 people Monday night, and the Red

Cross had served 152 meals there through lunch Tuesday. ***(Source: SOME HAMILTON RESIDENTS RIDE OUT FLOODWATERS, MANY OTHERS EVACUATE, SVH, 11/8/2006***)

Flood Fighting Efforts to Save Water Treatment Plant
Picture courtesy Willy LaRue, City of Anacortes

HISTORICAL FLOOD FLOWS OF THE SKAGIT RIVER[1]

DATE	C.F.S. CONCRETE	RIVER LEVEL	C.F.S. S-W	C.F.S. M.V.	RIVER LEVEL M.V.[2]
1815	500,000 510,000[3]	69.3	400,000	54.56 (Sedro Woolley ("S-W")Gage)	
1856	350,000 340,000[4]	57.3	300,000	51.06 (S-W Gage)	
11/16/1896			185,000	45.86 (S-W Gage)	
11/18/1897	275,000 265,000[5]	51.1	190,000	45.96 (S-W Gage)	
11/16/06			180,000	180,000[6]	37.00
11/18/08			97,000	N/A	N/A
11/30/09	260,000 245,000[7]	49.1	220,000	47.56 (S-W Gage)	
11/21/10			114,000	N/A[8]	N/A
12/30/17	220,000 210,000[9]	45.7	195,000	N/A	N/A
12/12/21	240,000 228,000[10]	47.6	210,000	140,000[11]	N/A
12/12/24	92,500	32.44	N\A	N/A	N/A
10/16/26	88,900	32.03			
1/12/28	95,500	32.90			
10/9/28	74,300	29.94			
02/27/32	147,000	39.99	157,000	N/A	N/A
11/13/32	116,000		125,000	N/A	N/A
12/22/33	101,000	33.60	110,000	N/A	N/A
01/25/35	131,000	37.90		N/A	N/A
06/19/37	68,300	28.97			
10/28/37	89,600	32.16			
5/29/39	79,600	30.70			
12/2/41	76,300	30.17		65,300	25.99
12/3/43	65,200	28.49			
02/8/45	70,800			59,800	25.77
10/25/46	82,200	31.14		64,900	27.80
10/26/45	102,000	34.00	N/A	94,300	30.25
10/19/47	95,200	32.99	N/A	69,400	28.68
11/28/49	154,000	40.8	149,000	114,000	34.21
11/26/50			N/A	68,400	28.19

[1] Pool levels are supposed to be at 1592.1 at Ross and 707.9 ft at Upper Baker Reservoir before the simulation begins.
[2] Authors Note: Flood stage is at 28.0 feet.
[3] Updated figure from USGS Scientific Investigations Report 2007-5159, Re-evaluation of the 1921 Peak Discharge at Skagit River near Concrete, Washington.
[4] Ibid.
[5] Ibid.
[6] This figure is incorrect. The levees in 1906 could not have held 180,000 cfs. The figure is a typo contained in the 1965 COE report.
[7] Updated figure from USGS Scientific Investigations Report 2007-5159, Re-evaluation of the 1921 Peak Discharge at Skagit River near Concrete, Washington.
[8] N/A = Not Available.
[9] Updated figure from USGS Scientific Investigations Report 2007-5159, Re-evaluation of the 1921 Peak Discharge at Skagit River near Concrete, Washington.
[10] Ibid.
[11] Extreme difference between Sedro Woolley and Mt. Vernon was due to break in dikes upriver on Burlington side of river. Source: COE report 1/31/25.

DATE	C.F.S. CONCRETE	RIVER LEVEL	C.F.S. S-W	C.F.S. M.V.	RIVER LEVEL M.V.[2]
12/25/50			N/A	74,000	29.08
02/11/51	139,000	38.99	150,000	144,000	36.85
02/1/53	66,000	28.61		65,700	27.76
10/26/55			N/A	84,900	30.69
11/04/55	106,000	34.48	113,000	107,000	33.52
04/30/59	90,700	32.36	92,000	92,300	31.68
11/24/59	89,300	32.17	91,000	91,600	31.58
11/21/60			N/A	70,200	28.51
12/16/60			N/A	70,200	28.51
01/16/61	79,000	30.61	N/A	76,000	29.40
11/20/62	114,000	35.73	N/A	83,200	30.44
10/22/63	73,800	29.80	N/A	N/A	N/A
11/27/63	84,200	31.41	N/A	72,100	28.80
06/22/67	72,300	29.59	N/A	72,000	28.78
10/28/67			N/A	72,700	28.89
01/21/68			N/A	70,900	28.43
06/03/68			N/A	68,800	28.09
01/31/71			N/A	70,300	28.52
07/13/72	91,900	32.54	N/A	80,600	30.07
01/16/74	79,900	30.75	N/A	77,600	29.64
12/4/75	122,000	36.88	N/A	130,000	35.66
12/2/77	70,300	29.27		65,600	27.59
12/19/79	135,000	38.57	N/A	112,000	33.99
12/27/80	148,700	40.19	N/A	114,000	34.16
12/04/82	100,000	33.82	N/A	71,600	28.65
01/05/84	109,000	34.94	N/A	88,200	31.14
01/19/86	93,400	32.75	N/A	72,800	28.84
11/24/86	83,500	31.30	N/A	70,700	28.49
10/16/88	74,100	29.86	N/A	56,700	25.77
11/11/89	119,000	36.39	N/A	88,220	31.14
12/05/89			N/A	95,480	32.39
11/11/90	142,000	40.20	N/A	142,000	36.60
11/24/90	146,000	39.89[12]	196,000[13]	152,000	37.37
11/08/95	143,000	39.45	N/A	89,900	31.62[14]
11/11/95	72,900	29.67	N/A	59,200	26.60
11/14/95	67,700	28.86	N/A	57,100	26.18
11/25/95	63,200	28.11	N/A	61,500	27.03
11/29/95	160,000	41.57	N/A	133,000[15] 141,000[16]	37.32
02/09/96	88,900	32.11	N/A	81,800	29.27
03/20/97	74,740	29.96	N/A	74,980	29.52[17]

[12] Flooding in Western Washington from 21 to 26 November 1990, COE MFR, 11/29/90
[13] INFO OBTAINED FROM COE 1993 RECON STUDY FAX DATED 3/29/93.
[14] Info obtained from USGS
[15] First reported by the COE.
[16] Currently being reported by USGS (10/27/02)
[17] Info obtained from COE Internet Web Site

DATE	C.F.S. CONCRETE	RIVER LEVEL	C.F.S. S-W	C.F.S. M.V.	RIVER LEVEL M.V.[2]
11/13/99	101,000	33.80	39.20	78,600	29.88[18]
11/15/01	65,100	28.40	N/A	67,400	28.0[19]
01/08/02	95,600	33.06	38.50	78,700	29.9[20]
06/29/02	63,900	28.23	35.02	58,100	26.25
10/17/03	94,200	33.04		73,400	29.03
10/21/03	166,000[21]	42.21	42.02	129,000	36.19
11/19/03	79,323	30.82	37.31	70,129	28.48
11/05/06	63,500	28.25	34.33	52,500	24.84
11/07/06	145,000	39.79	42.21	110,000	33.85
12/04/07	77,900	30.60	37.85	81,000	27.98
11/12/08	66,023	28.69	36.67	77,095	27.49
01/08/09	62,420	28.08	37.87	70,783	28.55

As of December 31, 1999, the Skagit River reached flood stage 66 times since January 1, 1900 for an average of once every 1.5 years.

As of December 31, 2009, the Skagit River has reached flood stage 11 times since January 1, 2000 for an average of once every 1.1 years.