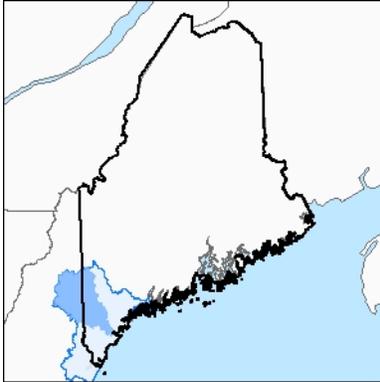


6.0 Saco River Basin (Western Maine Coastal)



The Western Coastal Drainage Basin includes many small rivers draining directly to the Atlantic Ocean including the Presumpscot, the Piscataqua, the Kennebunk, the Mousam, and the Salmon Falls Rivers. Flooding within the western coastal drainage basin is predominantly caused by coastal processes. The Saco River Basin is the largest river basin located within the Western Coastal Drainage Basin. This section of the report describes historical riverine flooding within the Saco River Basin. Large communities within this basin include Fryeburg, Westbrook, and Kennebunk.

6.1 Watershed Description

The Saco River Basin occupies approximately 1,700 square miles of southwestern Maine. The headwaters of the Saco River are located at Crawford Notch in the White Mountains of New Hampshire, 75 miles from the mouth at Biddeford, Maine.

Table 47 presents the major tributaries to the Saco River along with their respective drainage areas.

Table 47. Saco River, Tributaries from Upstream to Downstream and Drainage Areas

| Tributary | Drainage Area (square miles) |
|-----------------------------|---|
| Upper Saco River | 190 |
| Swift River | 90 |
| Conway Tributaries | 170 |
| Saco River-Lovewell Pond | 280 |
| Saco River at Ossipee River | 110 |
| Bearcamp River | 150 |
| Pine River | 90 |
| Ossipee Lake Drainage | 90 |
| Ossipee River | 120 |
| Little Ossipee River | 190 |
| Saco River at mouth | 220 |
| Total | 1,700 |

Figure 44 illustrates the location of the Saco River Basin within Maine.

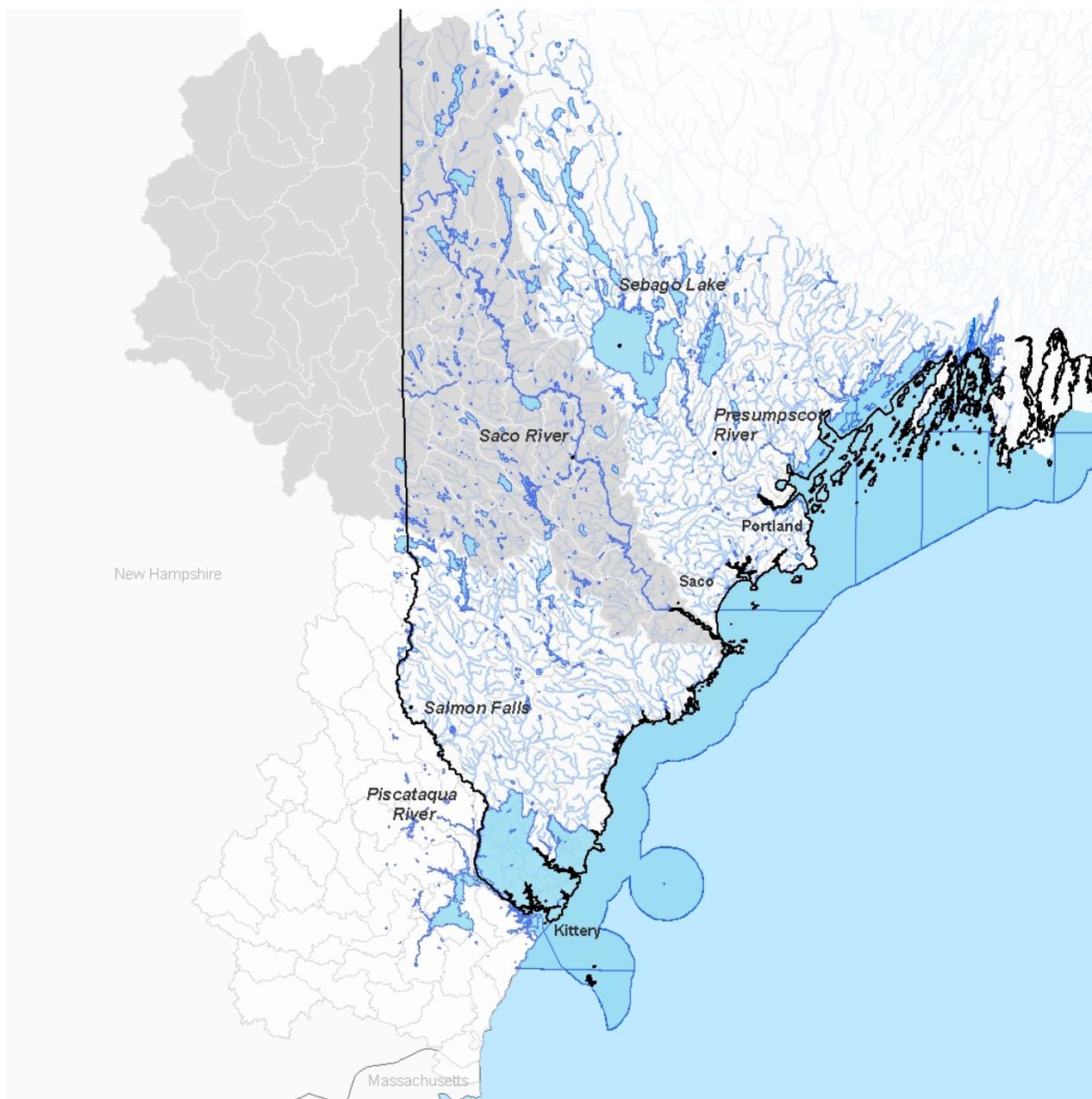


Figure 44. Western Coastal Drainage Basin Featuring the Saco River

6.2 Dams and Reservoirs

In general, dams in Maine are not constructed as flood control structures. However, the dams with large impoundment capacity can be useful for controlling flood discharges if their reservoirs are below capacity. Many dams in the lower reaches of Maine's rivers are run-of-river dams, and have little or no capacity to capture and hold runoff during floods (MGS, 2005).

The collaborative dam database indicates that the Saco River Basin contains approximately 44 dams. Ten of the dams within the river basin are used for generating hydroelectric power, three are used for flood control

and stormwater management, three are used for water supply, and fourteen are used for recreational use. Eleven dams are used for “other” purposes.

The storage capacity of impoundments in the Saco River Basin is approximately 96,000 acre-feet. Appendix E contains the list of dams located within the Saco River Basin and included in the collaborative dam database.

6.3 Precipitation

Average annual precipitation within the Saco River Basin is 44.8 inches with a high proportion of rainfall occurring during November and December. Annual snowfall ranges from forty inches near the Atlantic Coast to 115 inches in the mountainous headwaters. The water content of the snow averages five inches over the entire basin.

6.4 Population

The Saco River Basin contains all or portions of two cities (Saco and Biddeford), twenty-nine towns, two unincorporated areas, and falls within three counties. Table 48 presents the historical population data within the Saco River Basin. The population within the drainage basin has increased since the 1970s, and the number of people residing in the cities continues to increase.

Table 48. Saco River Basin, Population within Maine

| Census date | Population | Population in cities |
|-------------|------------|----------------------|
| 1970 | 38,900 | 20,600 |
| 1980 | 50,100 | 20,800 |
| 1990 | 59,200 | 22,600 |
| 2000 | 67,100 | 24,000 |

6.5 Historic Flooding Events (1970 – 2007)

Flooding within the Saco River Basin is most often caused by heavy precipitation alone or moderate precipitation in combination with melting snowpack. Table 49 presents the list of major and minor flood events identified within the Saco River basin between 1970 and the present using the sources of data described in Section 1 of this report. The flood events indicated with an “x” are described in greater detail in the following sections of the report.

Table 49. Saco River Basin. Identified Flood events

| Date | Flood Location | Flood Documentation | Damages |
|--------------------|---------------------------------------|---------------------|---------|
| March 1977 | Little Ossipee River | USGS | |
| x March 1983 | Mousam River | USGS | |
| x March/April 1987 | Saco River, Ossipee River | USGS | |
| x October 1996 | Little Ossipee River, Mousam River | USGS | |
| x May 2006 | | Photo Record | |

CRREL – Ice jam database, USGS – Streamgauge record, ACOE – 1987 study, FIS – Flood Insurance Study, IHMT – Interagency Hazard Mitigation Report

The USGS record of peak discharge and stage at streamgages within the Saco drainage basin indicate major high flow events, which may have resulted in flooding. Appendix B contains a streamgauge inventory of all

active and historical gages in the Saco River Basin. Table 50 presents the highest recorded daily discharge at selected streamgages. The flood of record for the drainage basin occurred in March 1936. The flood of record for the Mousam River occurred In March 1983.

Table 50. Saco River Basin, Flood of Record at Streamgages

| Site | Site Name | Date | Discharge (cfs) | Gage Height |
|----------|---|-----------|-----------------|-------------|
| 01065500 | Ossipee River at Cornish, Maine | 3/21/1936 | 17,200 | 16.32 |
| 01066000 | Saco River at Cornish, Maine | 3/21/1936 | 46,600 | 21.9 |
| 01066500 | Little Ossipee River near south Limington, ME | 3/19/1936 | 8,530 | |
| 01067000 | Saco River at West Buxton, ME | 3/22/1936 | 58,200 | |
| 01067500 | Saco River at Salmon Falls, ME | 3/22/1936 | 59,000 | 30.2 |
| 01069500 | Mousam near West Kennebunk, ME | 3/20/1983 | 4,020 | 5.64 |
| 01072500 | Salmon Fall River near South Lebanon, ME | 3/19/1936 | 5,490 | 12.31 |

6.5.1 Notable Historical Floods

Flooding within the Saco River basin typically occurs in the spring as the result of snowmelt or in combination with rainfall. The flood of record occurred in March 1936 on the lower reaches of the Saco River Basin and was exacerbated by ice jams. In Hiram, Maine, this event represented the event with a 375-year return period. The event in 1953 is considered the one hundred year return period event.

6.5.2 March 1983

The Mousam River experienced a flood of record during March of 1983. At the time of publication no additional information was available to describe this flood event.

6.5.3 March/April 1987

The Saco River Basin received approximately three inches of precipitation between March 31 and April 1, 1987. The rainfall was accompanied by warm temperatures and melting snowpack. Three days later, a second storm dropped approximately two inches of rain over the saturated basin. Table 51 presents the presents the observed stage, discharge, and recurrence interval (where available) for the March/April 1987 flood. The USGS estimated the return period of the flows on the Saco River to be one hundred to five hundred years.

Table 51. Saco River Basin, USGS Streamgage Peaks, March/April 1987

| Station | Name | Stage | Discharge (cfs) | Estimated Recurrence Interval (years) |
|----------|---------------------------------|-------|-----------------|---------------------------------------|
| 01065500 | Ossipee River at Cornish, Maine | 10.9 | 9,460 | 25 |
| 01066000 | Saco River at Cornish, Maine | 16.54 | 31,300 | 100-500 |

6.5.4 October 1996

[At the time of publication, there is no information available to describe this flood event.]

Table 52. Saco River Basin, USGS Streamgage Peaks, October 1996

| Station | Name | Stage | Discharge (cfs) | Estimated Recurrence Interval (years) |
|----------|---|-------|-----------------|---------------------------------------|
| 01066100 | Saco River at Cornish, Maine | 5.95 | 352 | 10-25 |
| 01066500 | Little Ossipee River near South Limington, ME | 7.02 | 5,800 | 25-50 |

6.5.5 May 2006

The photo record indicates that flood damages occurred in Wells, Maine during May 2006. Table 53 presents the observed stage, discharge, and recurrence interval (where available) for the May 2006 flood. Figure 45, Figure 46, Figure 47, Figure 48, and Figure 49 illustrate the damages incurred during this event.

Table 53. Saco River Basin, USGS Streamgage Peaks, May 2006

| Station | Name | Stage | Discharge (cfs) | Estimated Recurrence Interval (years) |
|----------|------------------------------|-------|-----------------|---------------------------------------|
| 01066000 | Saco River at Cornish, Maine | 10.34 | 14,900 | 2-5 |



Figure 45. Captain Thomas Road, Wells, Maine. Bridge Washout, May 14, 2006



Figure 46. Captain Thomas Road, Wells, Maine. Bridge Washout, May 14, 2006



Figure 47. Cole's Hill Road. Bridge Washout, May 14, 2006



Figure 48. Skinner Mill, Wells. May 14, 2006



Figure 49. Swamp John Road, Wells. May 14, 2006

7.0 Presumpscot River Basin (Western Maine Coastal)



Historically, the Presumpscot River Basin received little damage as a result of flooding. In a 1977 report, the ACOE discounted the Presumpscot as having little to no risk of flooding. The New England River Basin Commission wrote in a 1981 report that “flooding is not a major problem in the basins due to storage capacity of numerous natural and manmade lakes above Sebago Lake and the small size of the watersheds.” Since April 1993, the river has surprised residents several times and inundated Portland and surrounding communities causing extensive damage. Historical flood data on the Presumpscot River is sparse; there is little information available in the scientific record.

7.1 Watershed Description

The Presumpscot River originates at Sebago Lake and terminates in Portland, Maine. The river flows through the towns of Windham, Gorham, and Westbrook before exiting to Casco Bay. The watershed is very hill and is partially developed.

Table 54 presents the major tributaries to the Presumpscot River along with their respective drainage area.

Table 54. Presumpscot River, Tributaries from Upstream to Downstream and Drainage Areas

| Tributary | Drainage Area (square miles) |
|-----------------------------|---|
| Sebago Lake | 440 |
| Royal River | 140 |
| Presumpscot River | 210 |
| Scarborough River | 50 |
| Fore River | 50 |
| Casco Bay Coastal Drainages | 170 |
| Total | 1,070 |

Figure 50 illustrates the location of the Presumpscot River basin within Maine.

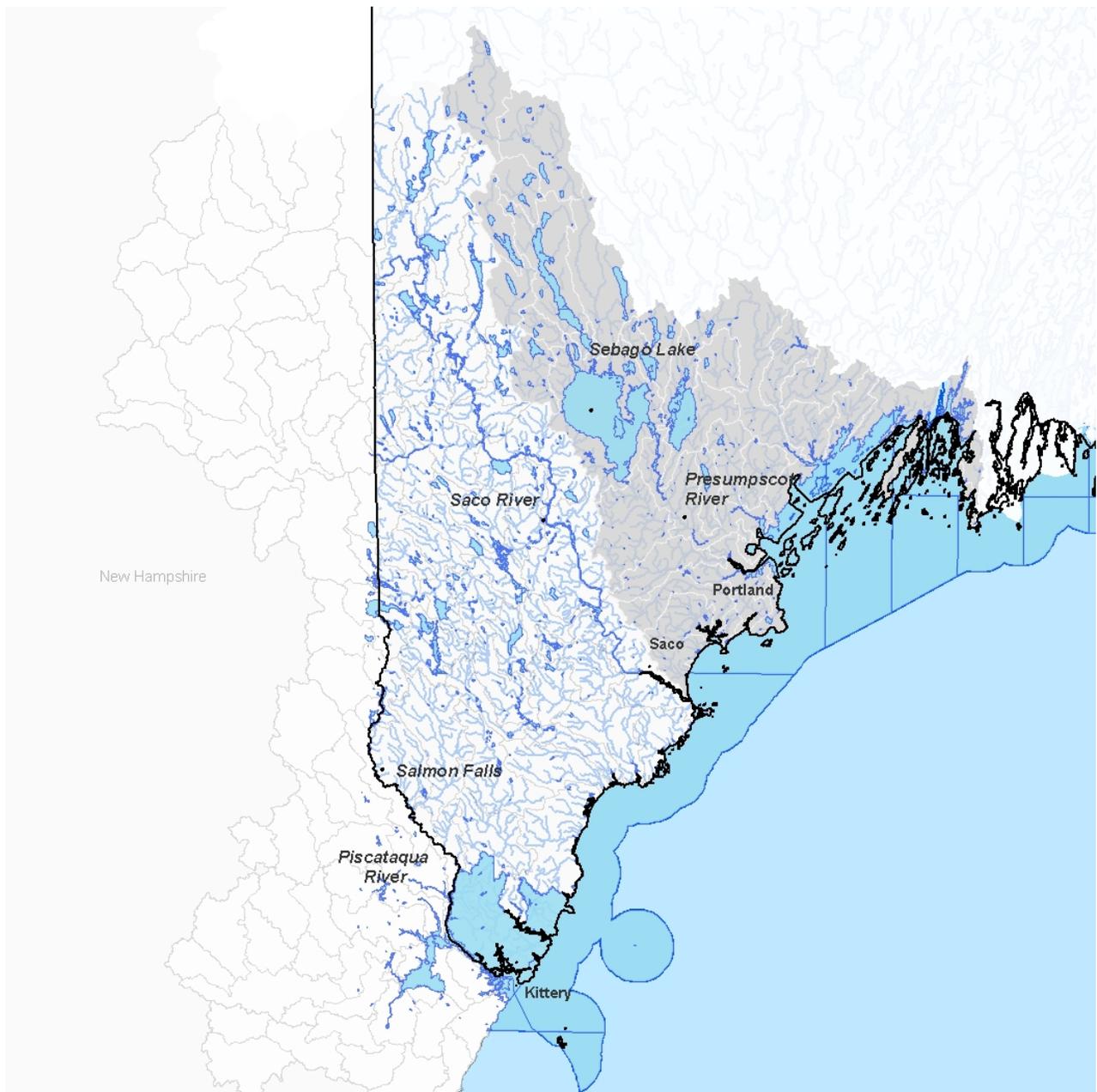


Figure 50. Western Coastal Drainage Basin Featuring the Presumpscot River

7.2 Dams and Reservoirs

In general, dams in Maine are not constructed as flood control structures. However, the dams with large impoundment capacity can be useful for controlling flood discharges if their reservoirs are below capacity. Many dams in the lower reaches of Maine's rivers are run-of-river dams, and have little or no capacity to capture and hold runoff during floods (MGS, 2005).

The collaborative dam database indicates that the Presumpscot River Basin contains approximately 44 dams. Nine of the dams are used for generating hydroelectric power, one for flood control and stormwater management, three for water supply, and four for recreational use. Three dams are used for “other” purposes.

The storage capacity of impoundments in the Presumpscot River Basin is approximately 367,000 acre-feet. Appendix E contains the list of dams located within the Presumpscot River Basin and included in the collaborative dam database.

7.3 Precipitation

Average annual precipitation within the Presumpscot River Basin is 44.8 inches with a high proportion of rainfall occurring during November and December. Annual snowfall ranges from forty inches near the Atlantic Coast to 115 inches in the mountainous headwaters. The water content of the snow averages five inches over the entire basin.

7.4 Population

The Presumpscot River Basin contains all or portions of two cities (including Portland and Westbrook), ten towns, and falls within two counties. Table 55 presents the historical population data within the Presumpscot River Basin. The population within the drainage basin has increased since the 1970s. The number of people residing in the cities has remained relatively constant.

Table 55. Presumpscot River Basin, Population

| Census date | Population | Population in cities |
|-------------|------------|----------------------|
| 1970 | 49,000 | 25,000 |
| 1980 | 58,000 | 24,000 |
| 1990 | 65,000 | 26,000 |
| 2000 | 73,000 | 26,000 |

7.5 Historic Flooding Events (1970 – 2007)

Flooding within the Presumpscot River Basin is most often caused by heavy precipitation or moderate precipitation in combination with snowmelt. The flood of record on the Presumpscot River occurred in March 1936. Gaging is generally inadequate to capture the flooding that has occurred recently on the Presumpscot River in Portland Maine. Table 56 presents the list of major and minor flood events identified within the Presumpscot River basin between 1970 and the present using the sources of data described in Section 1 of this report. The flood events indicated with an “x” are described in greater detail in the following sections of the report.

Table 56. Presumpscot River Basin. Identified Flood events.

| Date | Flood Location | Flood Documentation | Damages |
|----------------|-------------------|---------------------|---------|
| March 1977 | Presumpscot River | USGS, FIS | |
| April 1987 | Royal River | USGS | |
| x April 1993 | Presumpscot River | | |
| x April 1996 | Presumpscot River | USGS | |
| x October 1996 | Presumpscot River | USGS | |
| x October 1998 | Presumpscot River | USGS | |

CRREL – Ice jam database, USGS – Streamgage record, FIS – Flood Insurance Study, IHMT – Interagency Hazard Mitigation Report

The USGS record of peak discharge and stage at streamgages within the Presumpscot drainage basin indicate major high flow events, which may have resulted in flooding. Appendix B contains a streamgage inventory of all active and historical gages in the Presumpscot River Basin. Table 57 presents the highest recorded daily discharge at selected streamgages. The basin-wide flood of record occurred in March 1936. The flood of record at the headwaters of Sebago Lake occurred in 1917.

Table 57. Presumpscot River Basin, Flood of Record at Streamgages

| Site | Site Name | Date | Discharge (cfs) | Gage Height |
|----------|--|------------|-----------------|-------------|
| 01060000 | Royal River at Yarmouth, Maine | 3/13/1977 | 11500 | 8.46 |
| 01064118 | Presumpscot River at Westbrook, Maine | 10/22/1996 | 23300 | 34.1 |
| 01064140 | Presumpscot River near West Falmouth, ME | 3/14/1977 | 12500 | 21.11 |

7.5.1 April 1993

[At the time of publication, no additional information was available for this event]

Table 58. Presumpscot River Basin, USGS Streamgage Peaks, March/April 1993

| Station | Name | Stage | Discharge (cfs) | Estimated Recurrence Interval (years) |
|----------|--|-------|-----------------|---------------------------------------|
| 01064118 | Presumpscot River at Westbrook, Maine | 16.1 | 5,080 | <2 |
| 01064000 | Presumpscot River at outlet of Sebago Lake, ME | | 1,650 | 2-5 |
| 01060000 | Royal River at Yarmouth, Maine | 5.86 | 4,910 | 2-5 |

7.5.2 April 1996

[At the time of publication, no additional information was available for this event]

7.5.3 October 1996

[At the time of publication, no additional information was available for this event]

Table 59. Presumpscot River Basin, USGS Streamgage Peaks, October 1996

| Station | Name | Stage | Discharge (cfs) | Estimated Recurrence Interval (years) |
|----------|---------------------------------------|-------|-----------------|---------------------------------------|
| 01064118 | Presumpscot River at Westbrook, Maine | 34.1 | 23,300 | 100-500 |

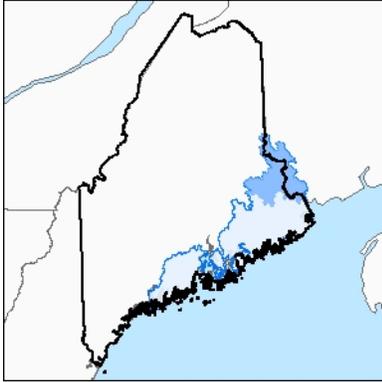
7.5.4 October 1998

[At the time of publication, no additional information was available for this event.]

Table 60. Presumpscot River Basin, USGS Streamgage Peaks, October 1996

| Station | Name | Stage | Discharge (cfs) | Estimated Recurrence Interval (years) |
|----------|--------------------------------|-------|-----------------|---------------------------------------|
| 01060000 | Royal River at Yarmouth, Maine | 6.41 | 5,840 | 5-10 |

8.0 St. Croix River Basin (Eastern Maine Coastal)



The Eastern Coastal Drainage Basin includes many small rivers draining directly to the Atlantic Ocean. The St. Croix River Basin is the largest river basin located within the Eastern Coastal Drainage Basin. This section of the report describes historical flooding within the St. Croix River Basin.

The St. Croix River forms the border between Maine and Canada with a major border crossing at the Route 1 Bridge at Calais – St. Stephen. [Additional information on the St. Croix River Basin was not available at the time of publication of this report]

8.1 Watershed Description

The St. Croix River Basin occupies approximately 1,650 square miles of northeastern Maine. Table 61 presents the major tributaries to the St. Croix River along with their respective drainage areas.

Table 61. St. Croix River, Tributaries and Contributing Areas

| Tributary | Drainage Area (square miles) |
|---------------------------------------|---|
| Spednick Lake | 410 |
| St. Croix River (2) at Spednick Falls | 220 |
| West Grand Lake | 230 |
| Big Musquash Stream | 120 |
| Big Lake at Peter Dana Point | 120 |
| Tomah Stream | 150 |
| St. Croix River (3) at Grand Falls | 70 |
| St. Croix River (6) at Robbinston | 330 |
| Total | 1,650 |

Figure 51 illustrates the location of the St. Croix River basin within Maine.