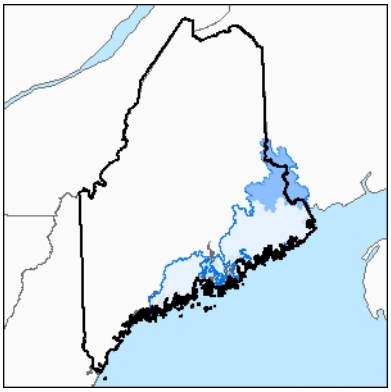
8.0 St. Croix River Basin (Eastern Maine Coastal)



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.

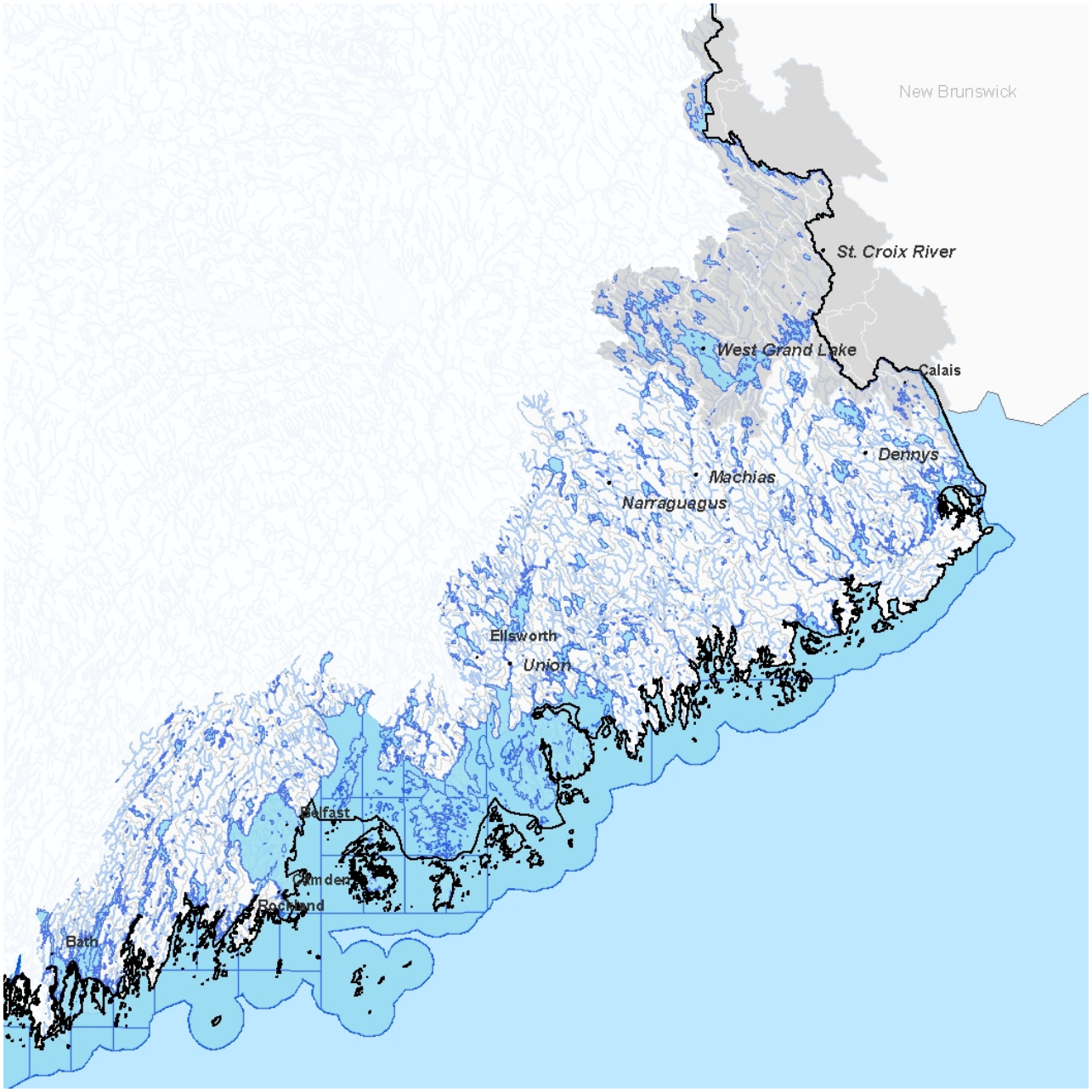


Figure 51. Eastern Coastal Drainage Basin Featuring the St. Croix River Basin

8.2 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 St. Croix River Basin contains approximately 20 dams. Three of the dams within the river basin are used for generating hydroelectric power, three are used for flood

control and stormwater management, two are used for water supply, and three are used for recreational use. Fourteen dams are used for "other" purposes.

The storage capacity of impoundments in the St. Croix River Basin is approximately 1,048,000 acre-feet. Appendix E contains the list of dams located within the St. Croix River Basin and included in the collaborative dam database.

8.3 Precipitation

The average annual precipitation in the St. Croix River Basin is approximately forty inches uniformly distributed throughout the year. The average annual snowfall in the St. Croix River Basin ranges between 70 and 100 inches with an average water content in March of three to six inches.

8.4 Population

The St. Croix River Basin contains all or portions of one city (Calais), seventeen towns, four plantations, one reservation, eighteen unincorporated areas, and falls within four counties. Table 55 presents the historical population data within the St. Croix River Basin.

Table 62. St. Croix River Basin, Population within Maine

Census date	Population	Population in cities
1970	8,300	4,000
1980	9,000	4,200
1990	8,700	4,000
2000	7,900	3,400

8.5 Historic Flooding Events (1970 – 2007)

Flooding within the St. Croix River Basin is most often caused by heavy precipitation or moderate precipitation in combination with snowmelt.

A 1981 report indicates that the worst flood in the basin occurred in May 1923. The second largest flood occurred in 1909 due to precipitation following a drought. One community FIS indicates that the flood of record in their town occurred in May 1961. [At the time of publication, no additional information was available to determine the event of record for the St. Croix River Basin.]

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 section of the report.

Table 63. St. Croix River Basin, Identified Flood Events

	Date	Flood Location	Flood Documentation	Damages
x	April 1973	St. Croix River	USGS, NERBC	$21,000 damages
	April 1976	St. Croix River	USGS	
	April 1983	Grand Lake Stream	USGS	
	April 1984			
	June 1984	St. Croix River	USGS	
	April 1996			
	December 2005			

CRREL – Ice jam database, USGS – Streamgage record, FIS – Flood Insurance Study, IHMT – Interagency Hazard Mitigation Report
NERBC – New England River Basin Commission

The USGS record of peak discharge and stage at streamgages within the St. Croix 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 St. Croix River Basin. Table 64 presents the highest recorded daily discharge at selected streamgages.

Table 64. St. Croix River Basin, Flood of Record at Streamgages

Site	Site Name	Date	Discharge (cfs)	Gage Height
01018500	St. Croix River at Vanceboro, Maine	6/3/1984	6,730	11.28
01019000	Grand Lake Stream at Grand Lake Stream, Maine	12/2/2005	3,990	7.75
01021000	St. Croix River at Baring, Maine	5/1/1923	24,100	

8.5.1 April 1973

Between April 21 and 23, 1973, rain fell on melting snowpack (NERBC, 1981).

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

9.0 Data Inventory

9.1 USGS Stream Gage Inventory

The USGS maintains a network of water-resource data collection sites across the United States, Puerto Rico, and Guam. The type of data collected at any one station may vary, but can be classified as either surface-water data or ground-water data. Surface water data collection stations typically maintain a continuous record of gage height (stage) and streamflow (discharge). This report includes an inventory of all historical and current stream gaging stations in Maine recorded within the National Water Information System (NWIS) database. The database is publicly available to users in real-time via the internet. Appendix B contains the inventory of stream gaging stations located in Maine and sorted by HUC 6 drainage basin.

9.2 USGS Peak Annual Discharge Inventory

The USGS has developed summary data for a large number of stream gaging stations. The NWIS database provides summary data including the peak annual flow and stage at most, but not all, stream gages. The peak annual discharge can be used to identify flood events in years where there has been only one event. The peak annual discharge can also be used to compare the discharge from flood events to the typical peak flow for years without measurable flooding. Appendix C contains the peak annual data for all gaging stations within Maine that report summary data.

9.3 Precipitation and Weather Data

The NOAA National Weather Service produces many data products that may be used to predict or analyze flood events. As a stakeholder in this study, the NWS has provided the location of weather stations within Maine and New Hampshire and total daily precipitation data recorded at weather stations for the days leading up to and during flood events listed the Maine disaster declaration list. The NWS has also provided maps showing 24-hour precipitation data, surface weather, pressure data, and temperature data across the United States. Appendix D contains the data compiled for the purpose of this study.

9.4 Dams

The Maine Office of Geographical Information Systems (MEGIS) distributes a geo-spatial database of dams located within Maine. The database combines dam surveys initiated by the US Army Corps of Engineers 1987 Dam Survey, the Maine Department of Environmental Protection (MEDEP), and the Bureau of Land & Water Quality. In 2004, the MEDEP released the data to the Maine Emergency Management Agency for use in emergency planning.

Appendix E presents the database of dams sorted by primary drainage basin within Maine. For each dam, the table in Appendix E presents the unique dam identification number, the official and common name of the dam, the name of the river on which the dam is located, the name of the dam owner, and the primary purpose(s) of the dam. Dams may be classified for use in the following categories: irrigation, hydroelectric power generation, flood control and stormwater management, navigation, water supply, recreation, fire protection, fish and wildlife habitat, debris control, tailings management (mining), and “other”. The database also includes the storage capacity of the dam and the maximum discharge capacity from the impoundment.

9.5 Population

MEGIS distributes the U.S. Census population data in a geo-spatial database for the census data gathered between 1950 and 2000. This geo-spatial data was used to estimate the population in the Maine River Basins

for the corresponding census years. For towns falling along the watershed divide between two drainage basins, the population in each drainage basin was estimated using the area-weighting method.

Appendix F presents the historical population data for each of the six drainage basins presented in this study. The communities within each drainage basin are also included. For communities falling within two or more drainage basins, the proportion of the total population assigned to each drainage basin is proportional to the total land area falling within each drainage basin.

9.6 Ice Jam Data

The CRREL Program at the US Army Corps of Engineers specializes in applying science and engineering to complex environments, materials, and processes with unique competencies related to the Earth's cold regions. The Ice Engineering Research Division of CRREL maintains a database of ice jams across the United States with records from 1896 to the present day. The database is populated with information obtained through personal knowledge via site visit, phone conversation, detailed study, or literature reference. The database is heavily populated with ice jam events occurring at USGS water-stage gages, which often maintain a record of the stage and discharge during the ice jam event, but do not maintain a record of ice thickness, extent, likely causes, and damages associated with the event.

Appendix G presents the CRREL ice jam database for all jams observed in Maine from 1970 to the present (2007). The table contains information on the jam date, type, location (in latitude and longitude), the associated USGS stream gage, a detailed description of the jam, a comment on damages, the availability of supplemental visual observations (photos), and the availability of supplemental reports.

9.7 Snow Pack Data

The Maine Geological Survey (MGS) maintains raw and summary data of snow pack information within Maine. The snowpack database includes survey stations and locations, date of observation, elevation of station, depth of snow, water content, and snow density. Data for the year 2007 is available via the MEMA internet site.

Marc Loiselle of the MGS has provided the historical data in a personal geodatabase format. The database is included in Appendix H on a compact disk.

9.8 Disaster Declarations

The Federal Emergency Management Agency publishes and distributes a list of disasters and supporting information via the FEMA internet website. Disaster declarations may be made for any type of natural hazard including flooding, mudslides, ice jams, fire, hurricane, high winds, ice storms, etc… Appendix I contains a list of all 45 disaster declarations made on behalf of the State of Maine between 1954 and 2007.

9.9 Digital Floodplain Mapping

The Federal Emergency Management Agency publishes Flood Insurance Rate Maps (FIRMs) for communities participating in the National Flood Insurance Program. Within Maine, some but not all of the paper based FIRMS have been converted to geospatial data sets called Q3 floodplain boundaries. Geospatial Q3 data has been created on a county-wide basis for communities within Cumberland, Hancock, Kennebec, Oxford, Penobscot, Sagadahoc, Waldo, Washington, and York Counties. The digital Q3 floodplain boundary data, originally published in 1996/1997, is available through MEGIS. Although Q3 data is available at the county-wide level, some communities within the county may not have floodplain boundary information. FEMA is currently implementing a Map Modernization Program, which will ultimately result in the production of native digital flood insurance rate maps for a large portion of the United States. Appendix J presents the availability of Q3 digital floodplain boundary data organized by drainage basin and county.

9.10 Storm Event Database

The National Climatic Data Center (NCDC) of NOAA distributes a description of extreme weather events in a searchable database via the World Wide Web. The data in the Storm Event database originates from National Weather Service publications based information obtained from county, state, and federal emergency management officials, local law enforcement officials, skywarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry, and the general public. The event record within the database includes the dates of the beginning and end of the event, the location of the event, magnitude, fatalities, injuries, property damage, and crop damage. The description of the event often includes the weather conditions leading to the event. The Storm Event database includes information for events dating from April 1993 to the present. Three hundred and nine events are identified between April 4, 1993 and October 10, 2007. Future efforts for expanding this report may include adding the narrative text included in the Storm Event database. The web address to the searchable storm event database is included here.

http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms