

**State of Maine
River Flow Advisory Commission
Report on Current Hydrologic Conditions
March 1, 2012**

Overview:

The spring meeting of the River Flow Advisory Commission took place Thursday, March 1, 2012. The Commission meets annually in late winter to share information, examine potential for spring flooding and to renew operational protocols. Such factors as stream flow, long-term weather forecasts, snowpack, river ice conditions and reservoir levels are reviewed. This report summarizes the information presented on current hydrologic conditions as of this date.

After reviewing all hydrologic conditions, the Commission found that with below-normal snowpack and lesser river ice than is normal, flood potential in western, southern, central and downeast Maine is below normal for the time of year. In northern areas, however, risk factors are closer to the normal range.

Throughout this report, Internet addresses are listed for each category of information. The River Flow Advisory Commission web site provides a portal to all these different sites at:
<http://www.maine.gov/rfac>.

This site provides a connection to the ever-changing information critical to monitoring flood potential in the state.

At the end of the report, additional sources are provided for further information.

Background Climatology:

In 2011, Maine had an average annual temperature almost 2 degrees warmer than the long-term average. Historically this was the 4th warmest year in Caribou (tied with 1979), 9th warmest in Bangor and the 7th warmest in Portland. The temperature in Portland reached 100 degrees on July 22nd, the first time ever in the month of July, and the first time in over 35 years.

Temperatures for 2012 are also running considerably above normal.

The winter of 2010-2011 saw above-average snowfall. During the winter of 2010-2011, much of the eastern U.S. experienced record-breaking snow; seasonal average snow cover extent was 5th largest on record. In Maine, 2010 – 2011 snowfall was slightly below normal for the northern portions of the state, but central and southern sections were snowier than normal.

This above-average precipitation trend continued through the year, with Portland, Bangor and Caribou receiving above-average precipitation (although Augusta's total precipitation was slightly below normal).

The winter of 2011-2012 is on pace to be a below normal snow year. In fact, meteorological winter (December through February) is actually over. An odd fact is that snowstorms around Halloween and Thanksgiving were technically not "winter" storms.

Current Conditions and Flood Potential:

Stream Flows

Stream flows have been consistently in the normal range (25th to 75th percentile) since October of 2011.

High flows cause high water levels, and are principally caused by rain. Snowmelt, antecedent stream flow conditions, groundwater and soil moisture levels are contributing factor, but the overwhelming factor is rainfall.

Ice or debris in the water can cause anomalous high flows.

Headwater Storage Levels:

Brookfield Renewable Energy reports on the Penobscot, storages are currently approximately 40% above the rule curve, and have 90% of the long term average on the ground in the snowpack (6 inches of water versus the normal 6.7) Target drawdown date is March 31. Target level is 15 bcf, but may only reach 20 bcf, depending on inflow levels.

On the Kennebec, storages (including Moosehead, Brassua and Flagstaff Lakes) are 45% full (LTA is 43%) with a target of 35% by March 25th. Basin snow surveys showed 41% below normal; recorded precipitation in February was 44% below normal. Current river flow at Madison is 4000 cfs.

On the Androscoggin, storages (including Rangeley, Mooselookmeguntic, Richardson, Aziscohos and Umbagog Lakes) are at 57% (LTA 38%). The target is 44% (compared to long-term average draw-down of 31%) also by March 25th. Current flow out of Umbagog Lake is 1900 cfs.

Management of headwaters storage can reduce high flows. Ongoing cooperation between dam operators and the National Weather Service results in flows being managed and timed to reduce peak flows to the extent possible.

River basin managers draw down storage levels at this time of year to make room for spring rains and snowmelt. This allows them to “catch” excess runoff in regulated basins during spring flooding events, somewhat moderating river levels.

Small river basins in the state, such as the Mousam and Salmon Falls in York County, have little to no storage, and therefore little capability to manage flows. There is also less stream gaging on small basins than in the larger basins. In York County, close coordination among county, river towns, the State of New Hampshire and dam owners has helped with information sharing, but it is still necessary to pay close attention to weather forecasts and local conditions in order to anticipate flooding problems.

Ground Water

Groundwater statewide is generally in the normal range. Several locations saw a rise after Hurricane Irene, but are now close to expected levels.

Ground water recharge usually peaks later in the spring, as snow melts, before slowly falling through the summer.

It was noted that the Maine Geological Survey and USGS and other entities are collaborating on a statewide review of the groundwater monitoring network. At the same time, there is increased interest on the National level in potentially supporting a more robust, consistent groundwater monitoring network. It is unknown at this time how that will affect Maine.

For further information on stream flow and ground water:

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| USGS Maine Water Science Center | me.water.usgs.gov (Hydrologic Conditions Section) |
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Ice Conditions:

The USGS reports ice thicknesses statewide is below normal, with open channels on many rivers and streams in southern, central and eastern Maine.

Observed Ice conditions:

- Southern Maine (very thin to no ice)
- Central Maine (less than 1 foot to no ice)
- Eastern Maine (less than 1 foot to no ice)
- Northern Maine (less than 2 feet to no ice)

Although ice thicknesses may be below normal in many areas, the presence of any substantial ice creates a risk factor for ice jam flooding, especially if early rain lifts and moves the ice.

Ice jams can form and release rapidly during a rain or warm-up event. During an ice jam event on the Kennebec River in January of 2010, water levels in Augusta rose 3.2 feet in 30 minutes as the ice jam formed.

Emergency managers are urged to report observed ice jams or ice movement to the National Weather Service and MEMA. As was evidenced on the Kennebec in 2010, ice jam formation or movement can result in rapid water rise and necessitate quick action to protect life and safety.

The US Coast Guard is working with the USGS to assess the need to break ice in the lower Kennebec River, downstream from Gardiner. A decision will be made in the next few days whether ice-breaking will be needed; if so, a schedule will be determined and announced. USCG has one 140 foot ice-breaking tug, and three 65-foot cutters. The 140 footer can come up the river only as far as Richmond. The 65-footers can come up to Gardiner.

The USGS maintains a live web camera on the Kennebec River in Augusta to provide remote “eyewitness” observation of ice and water movement. The web cam images are accessible on the Internet at <http://me.water.usgs.gov>.

For more information on ice conditions:

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| Northeast River Forecast Center | www.weather.gov/nerfc |
| USGS Maine Water Science Center | me.water.usgs.gov |

Snowpack:

A full statewide snow survey was conducted February 27 through 29th

Some areas of far northern Maine have 2 to 3 feet of snow, but the depth drops off radically to the south. In some areas along the coast there are only trace amounts of snow.

Snowpack water content ranged from 5 to 7 inches in far northern Maine, to just 1 to 2 inches in southern and coastal sections.

These levels put water content in lowest 25% of recorded data across much of the state compared to historical averages, with a swath from Bangor west to the mountains in the lowest 10% of historic averages. However, in far northern Maine water content is in the normal range.

Snowpack density is a measurement of water as compared to depth of snow.

The snow in central and northern areas is fairly dry at this time, measuring mostly less than 25%. This indicates the snowpack can absorb some amount of additional water, essentially acting like a sponge during initial melting and winter rain events. However, closer to the south and coastal areas, densities of over 30% were measured, meaning the snow is “ripening”.

Snowpack density in the 35% to 45% range indicate the snowpack is “ripe”, or ready to release water when it rains, or temperatures warm up.

With the snow storm of March 1, some rain and a potential warm-up in the short term, and additional precipitation events, the snow survey picture, including depth, water content and density, will continue to change throughout the spring. Weekly snow surveys will be conducted from this point onward until measurable snow is gone.

The Maine Cooperative Snow Survey conducts surveys at sites across Maine from January until the snowpack is gone from the headwaters of our major rivers. Cooperators measure snow depth and water content at specific sites. The critical measurement “snow water equivalent” quantifies the amount of water that could potentially run off into the river basins. Snowmelt alone does not generally cause flooding in Maine, but can add to the runoff caused by rainfall.

Contributors to the Maine Cooperative Snow Survey include Federal and State agencies, hydroelectric power and paper companies and Canadian and New Hampshire environmental agencies.

For more information on snow survey data, updated weekly with every survey through the spring:

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| Maine Cooperative Snow Survey | http://www.maine.gov/rfac/rfac_snow.shtml |
| Sign up to receive e-mail notification of map postings | http://www.maine.gov/mema/mema_subscribe.shtml |

Weather Outlook:

The past two weeks have been colder and snowy across much of the state. However, forecast guidance indicates that we will be returning to the pattern that has dominated much of the winter so far.

The National Weather Service is forecasting a fast-track precipitation event; likely mostly rain, for the weekend, followed by cold temperatures for the start of the week. By mid-week, however, much of Maine may experience above normal temperatures.

This warmer than normal trend is expected to continue through most of March. The official 6 to 10 day and 8 to 14 day forecasts call for much above normal temperatures and normal precipitation.

This is in agreement with the expected pattern change.

Flood Potential:

Rainfall is the most significant risk factor in Maine flooding. Additional risk factors present in the spring include snowpack, frozen or saturated ground, absence of growing plants (which use up large amounts of water) and river ice.

As of March 1, flood potential in Maine is largely below normal, though closer to normal in the far north.

The National Weather Service in Gray, Maine reports that the flood potential is below normal in southern and western Maine. The potential for ice jam flooding is also below normal.

National Weather Service in Caribou reports that the winter/spring flood potential across northern Maine is slightly below normal, while the potential for ice jam flooding is near normal. Further south, across central and downeast Maine, the flood potential and the threat of ice jams is below normal.

The most important single factor in determining the severity of flooding is **rainfall**, how much and in how short a period of time. Major flooding on Maine rivers does not generally occur from snowmelt alone.

Ice jam flooding cannot be forecast. Local observation is critical as ice begins to break up and move. Ice jams can cause sudden flooding above the jam, as the water backs up, and below the jam if it breaks and releases a large amount of water.

The National Weather Service Forecast Offices in Caribou and Gray will issue Flood Potential Statements every two weeks throughout the spring. These reports will examine all current hydrologic factors and give an overall assessment of flood potential.

For more information on flood potential and for flood watches and warning should they arise:

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| NWS Gray | www.weather.gov/gray |
| NWS Caribou | www.weather.gov/caribou |
| NWS Flood Forecasts/MEMA site | www.maine.gov/mema/weather/flood.shtml |
| Sign up to receive weather alerts and other news | www.maine.gov/mema/mema_subscribe.shtml |

Preparedness and Mitigation:

Flood Insurance and Floodplain Management:

The Maine Floodplain Management Program (MFMP) of the State Planning Office stresses that flooding is always a threat to properties located within a floodplain, but even more so during winter's river ice and spring rains. Many people believe that their homeowner's or business owner's insurance policy will cover any flood related losses but unfortunately, these insurance policies DO NOT cover flood related damages.

In order to receive insurance protection related to flood damage, property owners and renters are urged to purchase flood insurance. For more details on the policies available, contact your insurance agent. There is a **30-day waiting period** before the policy goes into effect.

March and April are historically when flooding occurs in Maine, but heavy rains can cause flooding any time of the year. It is estimated that up to 75% of homes and businesses in floodplains in Maine are not covered by flood insurance. The average annual premium is \$898. Those who are worried about potential flooding should not wait to buy flood insurance. Those who wait may be left without any flood coverage when it is needed most.

As long as a community participates in the National Flood Insurance Program, residents, renters and business owners can buy flood insurance no matter where in the community they are located.

Additional assistance is available through the Maine Floodplain Management Program at the State Planning Office by calling 624-6200 or 1-800-662-4545 (in-state).

The MFMP and the Maine Emergency Management Agency (MEMA), in partnership with the Federal Emergency Management Agency (FEMA) have ongoing programs stressing "mitigation", or the reduction of risk from disasters. Flood mitigation can be as simple as moving perishable items out of a basement, elevating a furnace or improving drainage for a road that always floods. It can be as far-reaching as moving entire neighborhoods out of the floodplain.

Flooding is Maine's most costly hazard, affecting some community in the state every year, sometimes with disastrous results. Mitigation measures can not only save repair dollars in the long term, but may even make a community more attractive to development and business investment.

For more information on floodplain management and mitigation:

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| Maine Floodplain Management Program, State Planning Office | http://www.state.me.us/spo/flood |
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Preparedness and Safety:

Preparedness is key to minimizing the impact of flooding or any emergency. Individuals and families, businesses, schools and communities benefit from reviewing their vulnerability to flooding and ensuring that they have workable plans for dealing with the event. Everyone should stay aware of National Weather Service forecasts as the spring progresses, and talk to local officials and County Emergency Management Agencies if they have questions about flood preparedness in their communities, or how to build an emergency plan for family, business or school.

It is also critical during a flood event that all residents heed official warnings. The primary public safety concern during flood events is people driving through flooded roadways. During a flood no one should drive on submerged roads, as the stability of the road may have been severely damaged by flood waters. Highway crews will place signs and barricades to warn of flooded sections of road. Motorists who ignore these warnings and drive through flooded areas are gambling with their own safety and that of their passengers.

Nationwide, most flooding deaths occur when vehicles are caught in flood water. According to the National Weather Service, even 6 inches of fast-moving flood water can knock a person off his feet, and a depth of two feet will float a car.

The National Weather Service Forecast Offices in Caribou and Gray will incorporate this information, along with other preparedness tips, in statements issued during the New England flood awareness week later in March.

For more information on flood preparedness and safety:

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| Maine Prepares | www.maineprepares.com |
| NWS Caribou | www.weather.gov/caribou |
| NWS Gray | www.weather.gov/gray |
| County Emergency Management Agencies | www.maine.gov/mema/about/mema_county.shtml |
| Sign up to receive weather alerts and emergency news | www.maine.gov/mema/mema_subscribe.shtml |

Important Factors for Springtime Floods (in order of relative importance):

RAINFALL: This is the most important factor in determining the magnitude of significant floods in Maine. If precipitation during April and May are normal and evenly distributed, then streamflow will be in the normal range. However, if significant rainfall occurs over a short period of time, flooding could result.

SNOW COVER: This is a secondary factor and can add to rainfall events. As the snow pack becomes more “ripe” (nearly saturated), it can melt quickly and significantly add to a flood peak. The most accurate measurement of snow cover is “snow water equivalent”. Snow water equivalent is the amount of liquid water contained in the snow. Snowmelt alone should not produce major floods.

RIVER ICE: Ice jams can cause increased damage by temporarily blocking rivers and streams and causing higher water levels behind the jam. Peak flows downstream increase when jams break up and quickly release stored water.

TEMPERATURE: Warm days with freezing night temperatures allow a gradual melting and runoff of the snowpack. A sudden warm up, especially when coupled with significant rainfall, can send large amounts of runoff into rivers and streams.

RESERVOIR STORAGE: Maine's headwater storage reservoirs typically reach their annual low water levels in March. These reservoirs can moderate downstream flood peaks if rainfall occurs above the storage dams while the reservoir's water levels are down. The reservoir systems have limited ability to moderate flood peaks in the lower parts of the river basins if large amounts of rain fall or if heavy rains fall downstream of the storage dams.

Conclusion:

After reviewing all hydrologic conditions, The River Flow Advisory Commission found that as of March 1, 2012, with below-normal snowpack and lesser river ice than is normal, flood potential in western, southern, central and downeast Maine is below normal for the time of year. In northern areas, however, risk factors are closer to the normal range.

The current conditions information in this report represents a “snapshot” of conditions throughout the state as of March 1, 2012. Many new factors will influence the flood potential in Maine as the spring progresses. These factors will be monitored closely.

National Weather Service and emergency management reports should be watched throughout the spring, and local officials should monitor the flood-prone areas for each community. In particular, rivers should be monitored closely as ice begins to break up and move, as ice-jam related flooding can arise quickly and have locally devastating impact. Property owners, business owners and renters in flood-prone areas should check their insurance coverage to be sure that they are protected against flooding damages.

The Maine River Flow Advisory Commission is composed of representatives from major river basin management operations, state agencies, federal agencies and the University of Maine. The Commission was originally formed after the spring floods of 1983 to improve the exchange of hydrologic information collected by the members, to review the data, and to provide information to emergency action agencies and the public. It was created in statute by the Legislature in 1997.

No additional spring meetings for the Commission are planned. Commission members will continue to share information through the spring, and will meet again if conditions warrant.

Information Resources:

For additional information on particular aspects of this report, please contact:

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| Rob McAleer/Lynette Miller , Maine Emergency Management Agency | Flood preparedness and mitigation | 207-624-4400 |
| Bob Lent/Greg Stewart , USGS | Stream flow, ice conditions, snow survey | 207-622-8201 |
| Tom Hawley/John Cannon , National Weather Service, Gray, Maine | Flood potential for central and southern Maine; flood forecasting | 207-688-3216 |
| Maureen Hastings , National Weather Service, Caribou, Maine | Flood potential for northern and eastern Maine; flood forecasting | 207-492-0180 |
| Robert Marvinney , Maine Department of Conservation, Maine Geological Survey | Snow survey | 207-287-2801 |
| Sue Baker , State Planning Office, Floodplain Management Program | Floodplain management, flood insurance and mitigation | 207-624-4200 |

Links to further information on all sections of the report, updated as conditions change:

<http://www.maine.gov/rfac>

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