

Chapter 8

Water Resources

Introduction

The focus of this chapter is freshwater resources, including lakes and ponds, rivers and streams, wetlands, and groundwater. A discussion of marine or saltwater resources, including beaches, harbors, and tidal streams is included in Chapter 9 Marine Resources.

Rivers and surface water bodies play a key ecological role carrying water and nutrients and providing habitat and food for many species. Freshwater resources also provide numerous ecosystems services, or benefits to people and communities. These include:

- Supporting services, such as maintaining floodplain fertility and primary production.
- Provisioning services, such as water for drinking, domestic use, agriculture, and industrial use, non-consumptive uses like transportation and generating power, and food and medicines.
- Regulating services, such as maintaining water quality through natural filtration and water treatment, erosion and flood control.
- Cultural services, including recreation (kayaking, hiking, fishing), tourism, and existence values, such as the appreciation of free-flowing rivers.¹

Resource Inventory

Rivers & Streams

Kennebunkport has two major watercourses: the Kennebunk River and the Batson River. The Kennebunk River flows 15 miles from Kennebunk Pond in Lyman to the Atlantic Ocean, where it forms the boundary between Kennebunk and Kennebunkport. The entire length of the river within Kennebunkport — approximately 5.2 miles from its mouth — is tidal. The river provides a scenic backdrop to Dock Square. The Kennebunk River watershed is approximately 38 square miles, five of which are in Kennebunkport. The remainder of the watershed drains roughly equal areas of the Towns of Lyman, Arundel, and Kennebunk.

As of October 2020, the York County Soil and Water Conservation District is in the midst of a two-year effort to prepare a watershed-based plan for the Kennebunk River. The plan will compile information about natural resources, nonpoint source and bacteria problems, and identify locally supported watershed goals, objectives, and action strategies for protecting the River and its tributaries.²

The 2012 Comprehensive Plan references past studies of freshwater resources, such as *A Guide to the Kennebunk River and Its Tributaries for Arundel, Kennebunk, and Kennebunkport*. This 1986 joint study of water resources in the Towns of Kennebunkport, Kennebunk, and Arundel documented changes in growth; commercial uses on the Kennebunk River; the relationship between wildlife diversity and development on the River; and background information on wetlands. The study also suggested that the Towns coordinate adoption of protective ordinances, including the following land use ordinances: Shoreland Zoning amendments, Wetlands Ordinance, Groundwater Protection Ordinance.

The Batson River watershed comprises a majority of the area of the Town. The river enters Goosefare Bay between Marshall Point and the western end of Goose Rocks Beach. The river is tidal for approximately three-quarters of a mile from its mouth to the dam just downstream of Route 9 (Mills Road). There are over 15 miles of perennial streams within the Batson River watershed.

Other streams include the Little River and Beaver Pond Brook, which lie outside of the Kennebunk River and Batson River watersheds. The Little River originates from the wetlands by Proctor Road and lies mostly within Biddeford, entering Kennebunkport at Route 9 near the Biddeford line and forming a portion of the town boundary. Beaver Pond Brook also empties into the ocean near this location (Figure 8-1).

Streams, Rivers & Ponds With Drainage Divides

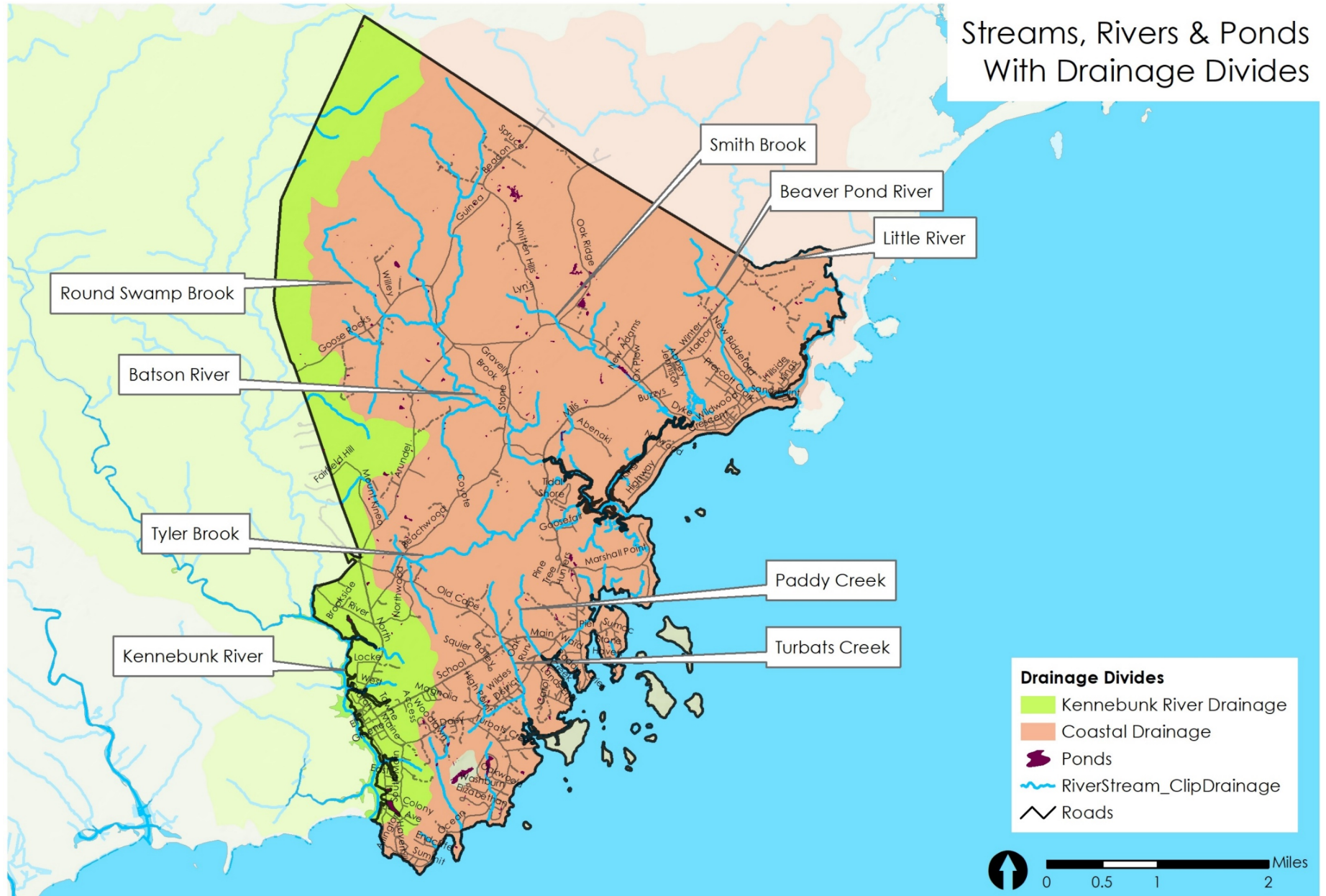


Figure 8-1 Streams, rivers, and ponds with drainage divides (Source: ME GIS)

Lakes and Ponds

While the state does not recognize a definitive difference between lakes and ponds, ponds generally have a small surface area and shallower depth. Sunlight is able to penetrate to the bottom of a pond whereas deep areas of lakes receive no sunlight.³

As shown in Figure 8-1, Kennebunkport has several small, scattered ponds. These ponds are not large or deep enough for recreational use other than fishing. There are no Great Ponds in Kennebunkport.

"Great pond" means any inland body of water which in a natural state has a surface area in excess of 10 acres and any inland body of water artificially formed or increased which has a surface area in excess of 30 acres except for the purposes of this article, where the artificially formed or increased inland body of water is completely surrounded by land held by a single owner. (Source: Maine DEP)

Although it is not classified as a Great Pond, Lake of the Woods is protected by the Resource Protection Zone of the Town's Land Use Ordinance (LUO). Lake of the Woods is located off Ocean Avenue near Walkers Point and was donated to the Kennebunkport Conservation Trust in 1981.⁴

Wetlands

Wetlands provide flood storage, groundwater recharge and discharge, erosion control, and critical habitat for fish and wildlife. Wetlands are important to the tourism, recreation, forestry, fishing, and hunting industries.⁵ Freshwater wetlands include

¹ Note that the in the Land Use Chapter, acres of generalized land use data obtained from the NOAA C-CAP national dataset indicates that wetlands comprise approximately 2,888 acres of land in Kennebunkport.

freshwater swamps, marshes, bogs and similar areas that are inundated or saturated by surface or groundwater at a frequency and for a duration sufficient to support wetland vegetation. Great ponds, coastal wetlands, rivers, streams, or brooks are not considered freshwater wetlands by the State of Maine (38 MSRA 480-b(4)).

According to National Wetlands Inventory (NWI) data, wetlands account for approximately 3,300 acres (25%) of Kennebunkport.¹ Palustrine wetlands comprise just over half of wetlands (Table 8-1). Palustrine wetlands are nontidal, have a salinity due to ocean-derived salts of less than 0.5%, and are dominated by trees, shrubs, persistent emergents, and emergent mosses or lichens.⁶ Wetlands identified as open water comprise approximately 54 acres. Combined with palustrine wetlands, these freshwater resources account for a total of 2,015 acres.

Table 8-1 Wetland acreage by type (National Wetlands Inventory (NWI))

| System | Acres | Percent of Wetland Area |
|------------|---------|-------------------------|
| Palustrine | 1,960.9 | 51.5% |
| Marine | 991.7 | 26.0% |
| Estuarine | 802.3 | 21.1% |
| Open Water | 53.8 | 1.4% |
| Total | 3,308.7 | 100% |

Palustrine wetlands and significant aquatic habitat identified by the Maine Department of Inland Fisheries and Wildlife, are shown in Figure 8-2.

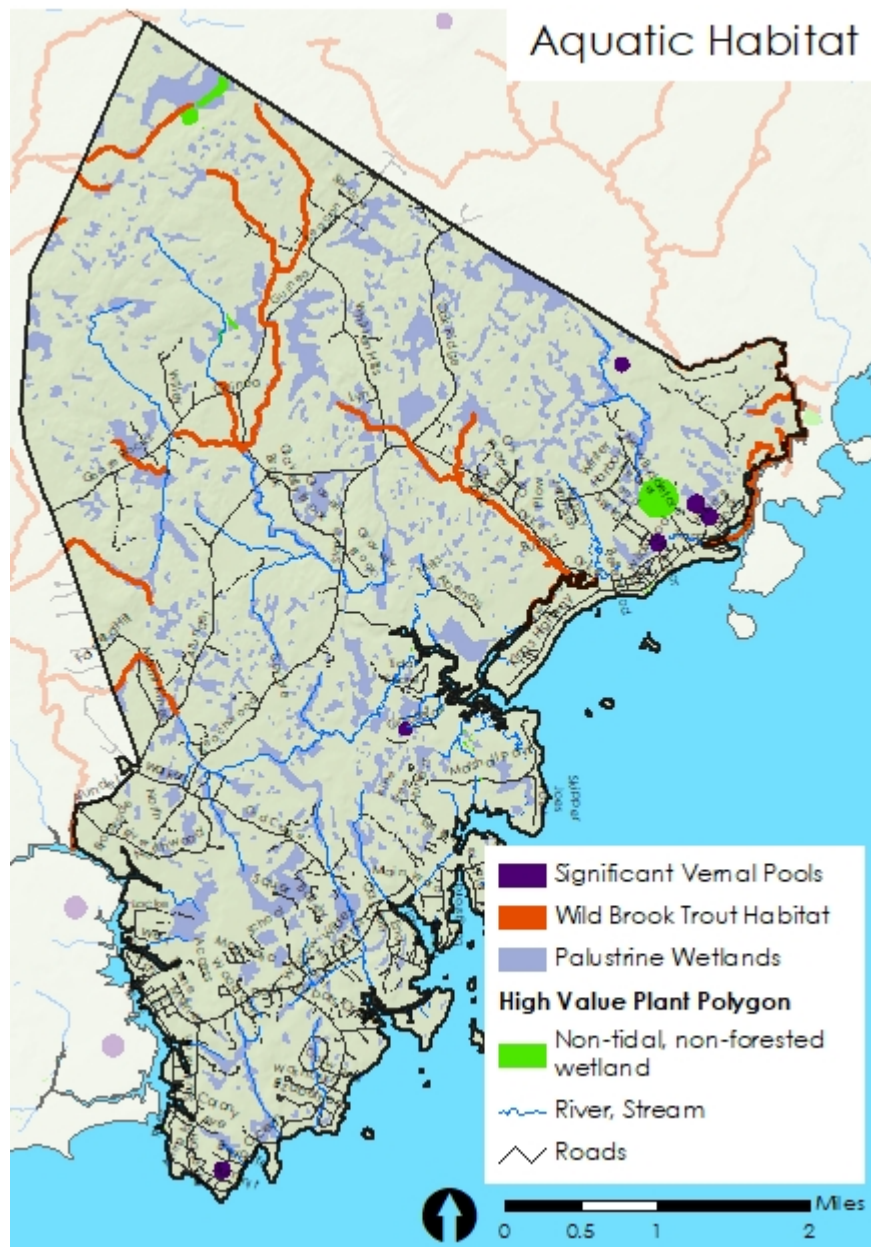


Figure 8-2 Aquatic Habitat (Source: MDIFW, MDMRS)

The State of Maine has developed wetlands characterization data based off the NWI. Wetland areas are characterized based on six wetland functions and values: flood flow alteration, sediment retention, finfish habitat shellfish habitat, plant and animal habitat, and cultural value. Figure 8-3 displays the percent of freshwater wetland acres in Kennebunkport that meet the criteria for these functions. As shown in this figure, 73% of freshwater wetlands meet the criteria for providing plant and animal habitat, while only 4% meet the criteria for providing cultural value. A map of freshwater wetlands and the number of functions is displayed in Figure 8-4. The acres of freshwater wetland area that meets zero, one, or more than one of the functions is reported in the chart in Figure 8-5.

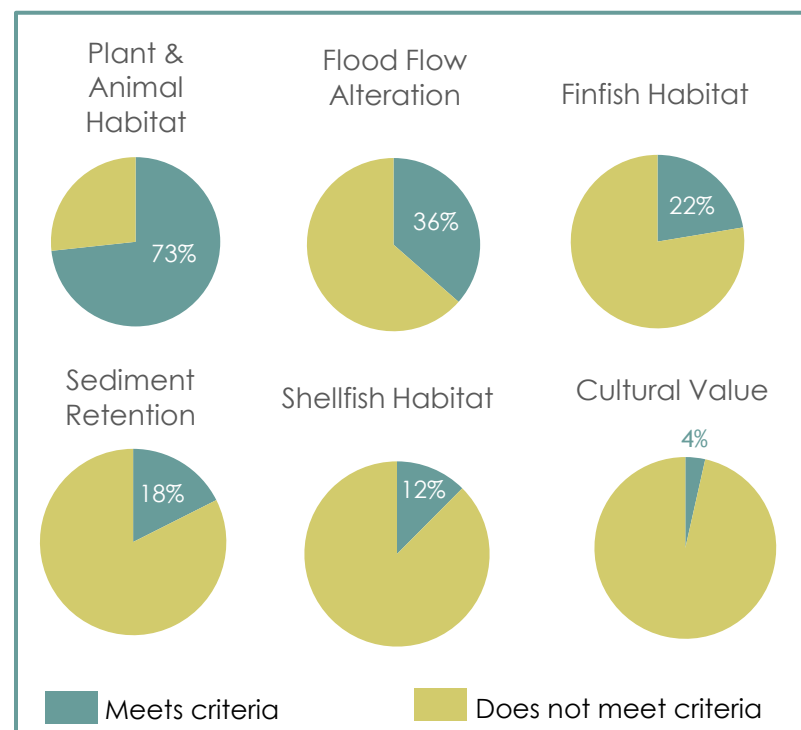


Figure 8-3. Area of freshwater wetlands (palustrine and open water) that meet the criteria for each wetland function (Source: ME GIS)

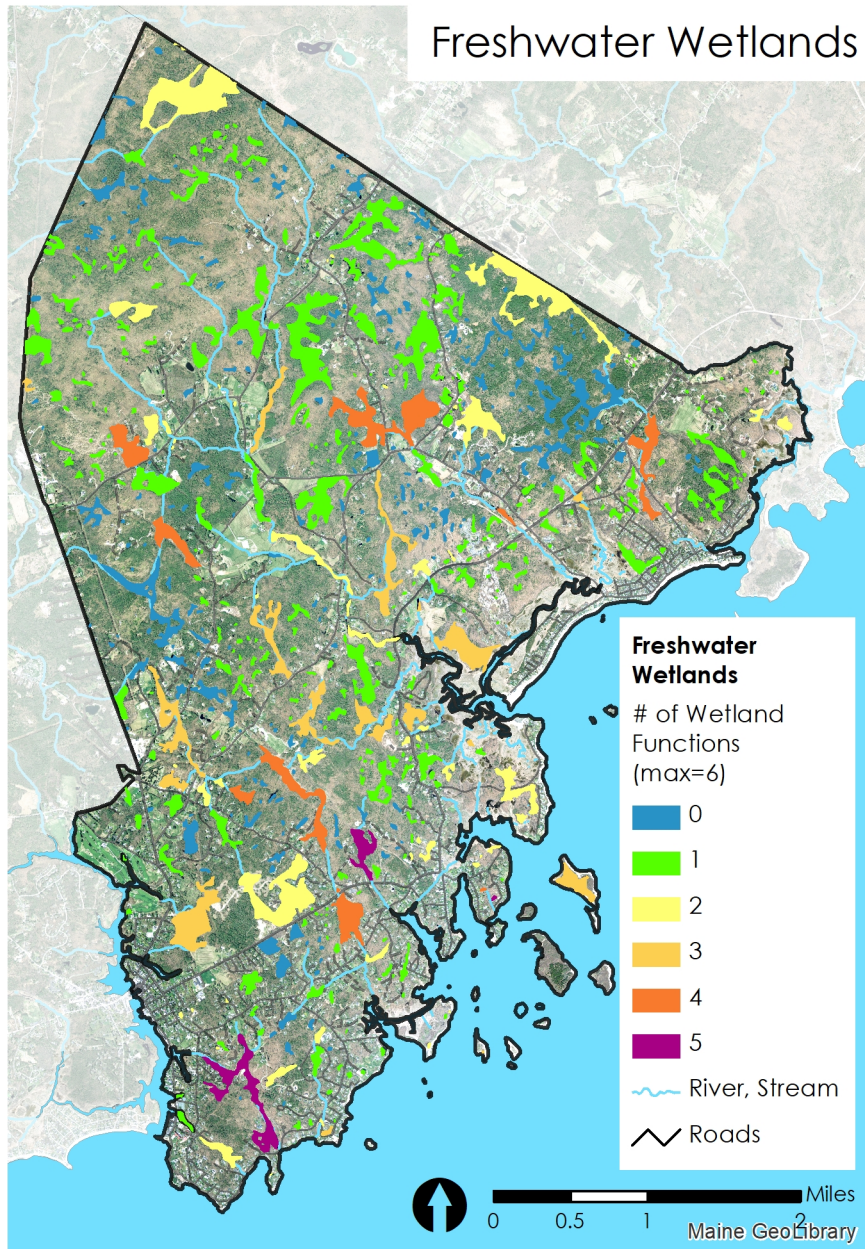


Figure 8-4 Freshwater wetlands and functions for which criteria are met (Source: ME GIS)

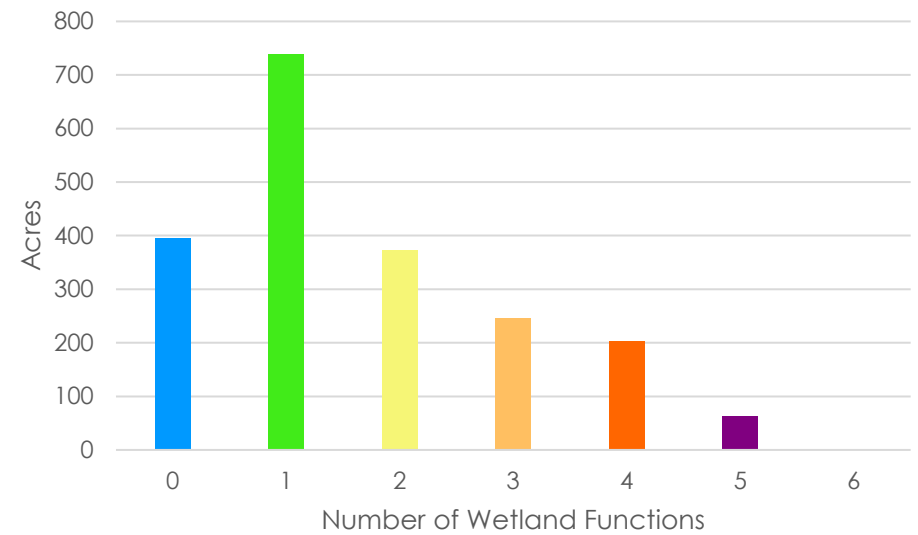


Figure 8-5 Acres of freshwater wetlands (palustrine and open water) that meet the criteria of 0 to 5 of the State's wetland function criteria (total acres =2,015) (Source: ME GIS)

Drinking Water Supply

Groundwater provides 60% of drinking water in the state.⁷ The drinking water supply for Kennebunkport consists of private wells, public wells, and surface and groundwater supplied by the Kennebunk, Kennebunkport, and Wells Water District (KKWWD).

There are six public wells in Kennebunkport (Figure 8-6): Kennebunkport Camping, Ocean Woods Resort, Seashore Trolley Museum #1 & #2, Ocean Woods Resort, and Hidden Pond LLC. All but the Kennebunkport Camping public well are non-community public water supplies that serve at least 25 persons, but not necessarily the same persons, for at least 60 days per year. The Kennebunkport Camping well is inactive. The Hidden Pond well is a bedrock well with a depth of 520 feet and is considered to be at low risk for contamination based on well type and site geography, low risk of acute contamination, and low risk for future acute contamination. The Ocean Woods Resort is a bedrock well with a depth of 480 feet. This well is rated as at low risk for contamination based on the well type and site geology as well as for acute contamination, but high risk for future acute contamination due to the fact that the well owner owns less than 50 feet of the land within the 700 foot Well Head Protection Radius associated with the well. A bedrock well at the Inn at Goose Rocks was rated as moderate risk for existing contamination based on well type and site geology, acute contamination, and future risk of acute contamination.⁸

Table 8-2 displays public waters supply wells. Approximately 1,410 parcels (40% of all parcels in town) are served by the KKWWD. Lots that are not served by public wells or KKWWD are served by private wells.

Drinking water wells in Kennebunkport may be vulnerable to groundwater rise associated with sea level rise.

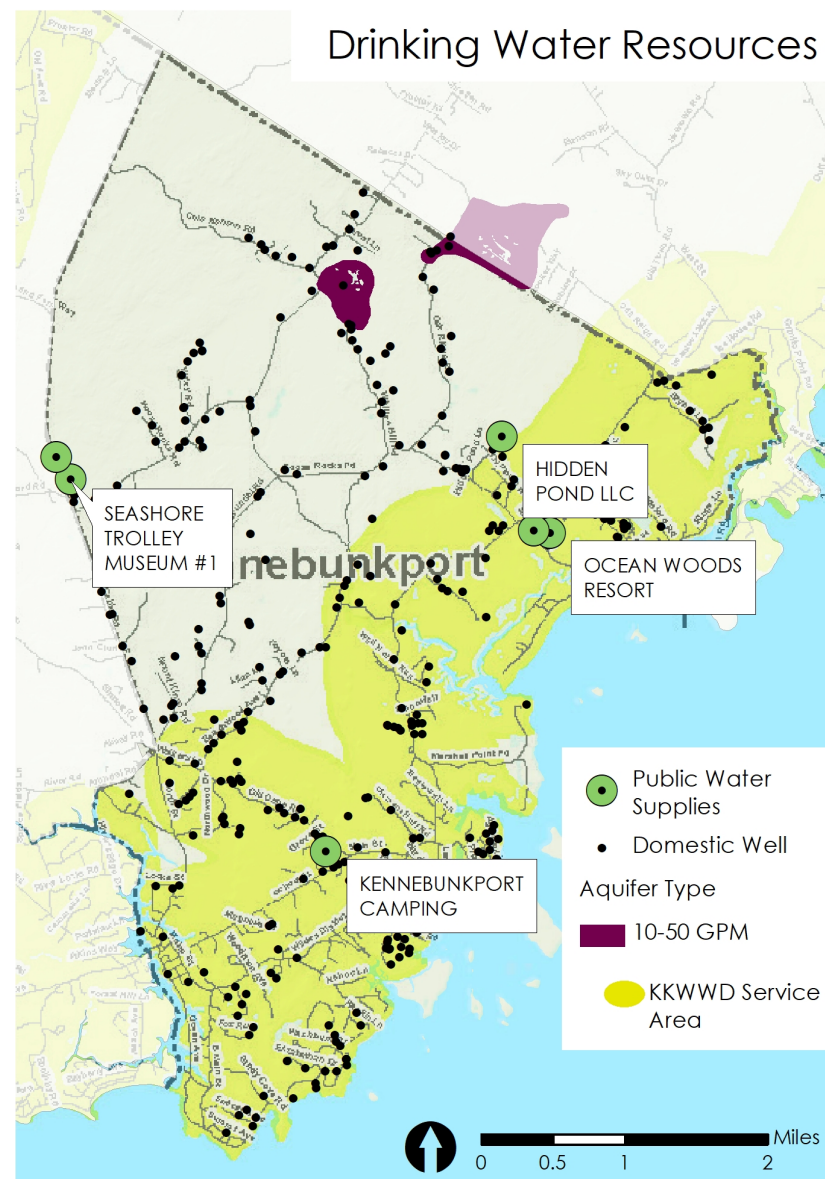


Figure 8-6 Drinking water resources (Source: ME GIS, KKWWD, MGS)

Table 8-2 Public Water Supply Well in Kennebunkport

| System Name | Kennebunkport Camping | Ocean Woods Resort | Seashore Trolley Museum #1 | Seashore Trolley Museum #2 | Ocean Woods Resort | Hidden Pond LLC |
|-----------------|-----------------------|--------------------|----------------------------|----------------------------|--------------------|-----------------|
| Facility ID | 16970101 | 16619101 | 11634101 | 111634101 | 16619102 | 94947101 |
| Federal ID | ME0016970 | ME0016619 | ME0011634 | ME0111634 | ME0016619 | ME0094947 |
| System Type | NP | NC | NC | NC | NC | NC |
| Population | 205 | 250 | 25 | 116 | 250 | 308 |
| Number of Wells | 0 | 2 | 1 | 1 | 2 | 1 |
| GPM | | | | | 10 | 6 |
| Depth | | | 200 | 200 | 480 | 520 |
| System Status | I | I | I | A | I | A |
| Facility Status | I | A | A | A | A | A |

NC=Non-community, I=inactive, A=active

Aquifers

There are 118 acres of high yield sand and gravel aquifers in Kennebunkport.⁹ Figure 8-6 shows the areas where ground water yields in excess of 10 gallons per minute can be expected. These areas include a region near the intersection of Guinea Road and Whitten Hill Road known as Beacon Corner and an area off Oak Ridge Road that extends into Biddeford. The portion of this aquifer that underlies Biddeford is protected by the City's Aquifer Protection Overlay District ([Biddeford Land Use Ordinance Article V, Section 10](#)). Kennebunkport does not have an aquifer protection overlay district.

As reported in the Town's 2019 Annual Report, groundwater sources produced 406.1 million gallons, accounting for 38.4% of all Town water production for 2019.¹⁰



Photo Credit: Tom Morgan

Kennebunk, Kennebunkport, and Wells Water District (KKWWD)

The KKWWD is a quasi-municipal water utility established in 1921 that supplies water to seven communities and a population of 28,000 to over 75,000, depending on the season.¹¹ All of the water that is provided by the KKWWD is derived from locations outside of Kennebunkport. One of the primary sources of water is the Branch Brook. The 12.5 square mile Branch Brook watershed provides a consistent, reliable source of drinking water to KKWWD.

The Branch Brook originates in Sanford and joins the Merriland River within the Rachel Carson Wildlife Refuge in Wells. The underlying geology of the watershed is comprised predominantly of sand and gravel deposits, which have a high capacity to store groundwater.¹²

The Branch Brook was the only source of supply to the water district until 1980 when peak daily water demand increased to 4 million gallons per day (MGD). KKWWD began purchasing up to one million gallons per day (MGD) of finished water from the Biddeford & Saco Water Company.¹³ When peak demand increased to 7 MDG in early 2000, KKWWD entered into a mutual aid agreement with the York Water District to allow for the bulk purchase of 1 MGD. KKWWD has pursued additional supplies of unfinished water from wells and finished water from utilities. Since 2015, KKWWD has produced approximately 3 MGD. Figure 8-7 displays the KKWWD annual water production along with water supplied to Kennebunkport.

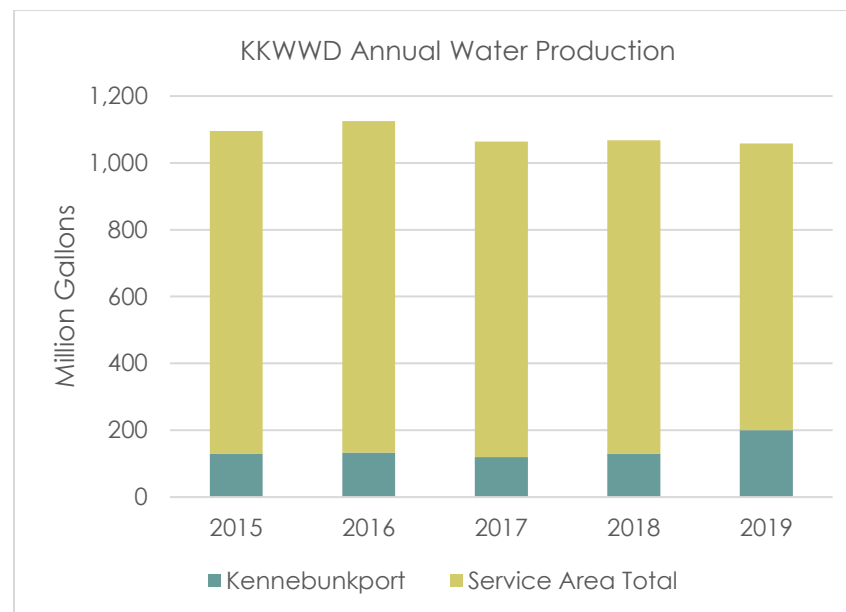


Figure 8-7 KKWWD Water Production and water supplied to Kennebunkport (Source: KKWD)

A USGS stream gauge² monitors the flow rate on Branch Brook. Summary statistics for water year 2019 and for the last decade are displayed in Table 8-3. Figure 8-8 shows the monthly average, minimum, and maximum flow rate for the last decade. The highest flow on Branch Brook occurs in March, while the lowest occurs in September.¹⁴

² The gauge is available at:

https://waterdata.usgs.gov/me/nwis/uv/?site_no=01069700&PARAMeter_cd=00065,0

Table 8-3 Summary statistics for Branch Brook near Kennebunk, USGS Station 01069700 (Source: USGS)

| | Water Year 2019 | | Water Years 2009-2019 | |
|------------------------|--|--------|--|-----------|
| | Discharge, Cubic Feet per Second (Daily Mean Values) | Date | Discharge, Cubic Feet per Second (Daily Mean Values) | Date |
| Annual total | 9,077 | - | - | - |
| Annual mean | 24.9 | - | 21.8 | - |
| Highest annual mean | - | - | 32.2 | 2010 |
| Lowest annual mean | - | - | 15.9 | 2016 |
| Highest daily mean | 174 | 27-Nov | 480 | 15-Mar-10 |
| Lowest daily mean | 6.19 | 30-Sep | 4.76 | 5-Sep-16 |
| Annual 7-day minimum | 6.57 | 24-Sep | 4.91 | 30-Aug-16 |
| Maximum peak flow | - | - | 536 ^a | 26-Feb-10 |
| Maximum peak stage | - | - | 11.35 ^{b,c} | 15-Mar-10 |
| Annual runoff (cfsm) | 2.32 | - | 2.09 | - |
| Annual runoff (inches) | 31.5 | - | 28.4 | - |
| 10 percent exceeds | 41.2 | - | 38.6 | - |
| 50 percent exceeds | 22.3 | - | 17.8 | - |
| 90 percent exceeds | 8.53 | - | 9.04 | - |

Notes: ^a Discharge is an estimate, ^b Gage height affected by backwater, ^c Max gage height not associated with peak discharge.

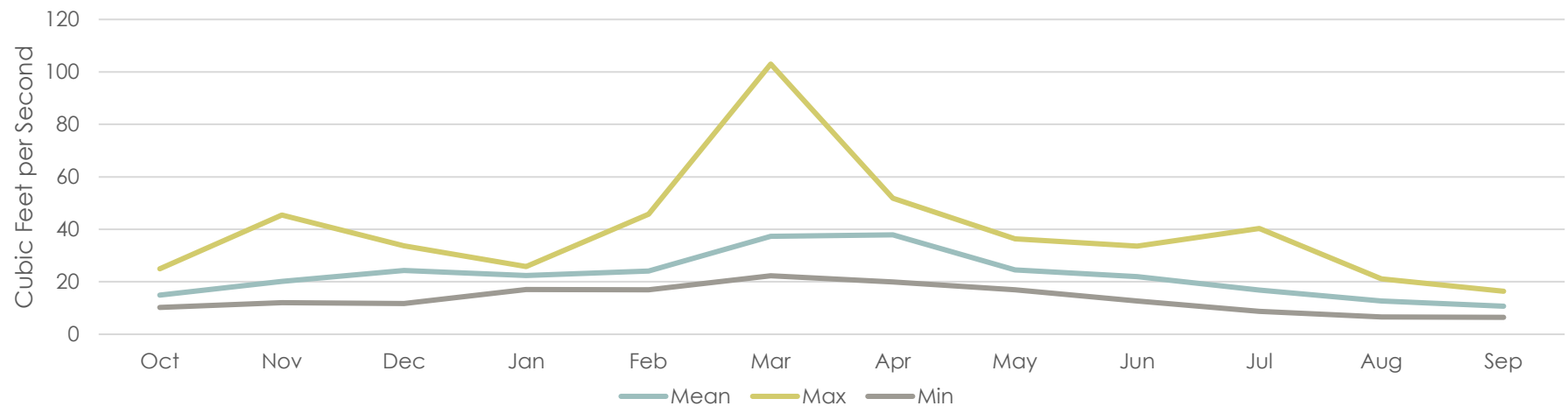


Figure 8-8 Branch Brook USGS Station 01069700 mean, maximum, and minimum flow by month between 2009 and 2019 (Source: USGS)

Floodplains

Floodplains are the areas adjacent to streams, rivers, and coastlines that experience occasional flooding. Floodplains are dynamic systems that can change over time. These landscape features provide habitat and floodwater storage. Floodplains are often associated with wetlands, fertile soils, rare and endangered plants and animals, and/or sites of archaeological and historical significance.¹⁵ Undeveloped floodplains provide economic, social, and environmental value.¹⁶ For these reasons, it is important to regulate land in these areas.

Kennebunkport regulates areas that are vulnerable to flooding through its [Floodplain Management Ordinance](#). The Town joined the Federal Emergency Management Agency (FEMA)'s National Flood Insurance Program (NFIP) on May 27, 1975. This program enables property owners to obtain flood insurance. Kennebunkport requires the recognition and evaluation of flood hazards in all official actions related to land use in the floodplain areas that comprise the Special Flood Hazard Area (SFHA). The SFHA is the extent area with a 1% annual chance of flooding, commonly referred to as the 100-year flood or the base flood.

Figure 8-9 displays a representation of the approximate extent of the SFHA associated with the current, effective Flood Insurance Rate Maps (FIRMS) from 1988, along with the preliminary flood maps from the 2017 update of the FIRMs. Areas that are included in both the current and preliminary maps are shown in green. FIRMs are used for flood insurance, planning, and regulating development or improvements to buildings in flood hazard areas. The extent of the current floodplain is based on a digital representation of certain features of the older, FIRMs Q3 flood data and does not reflect any

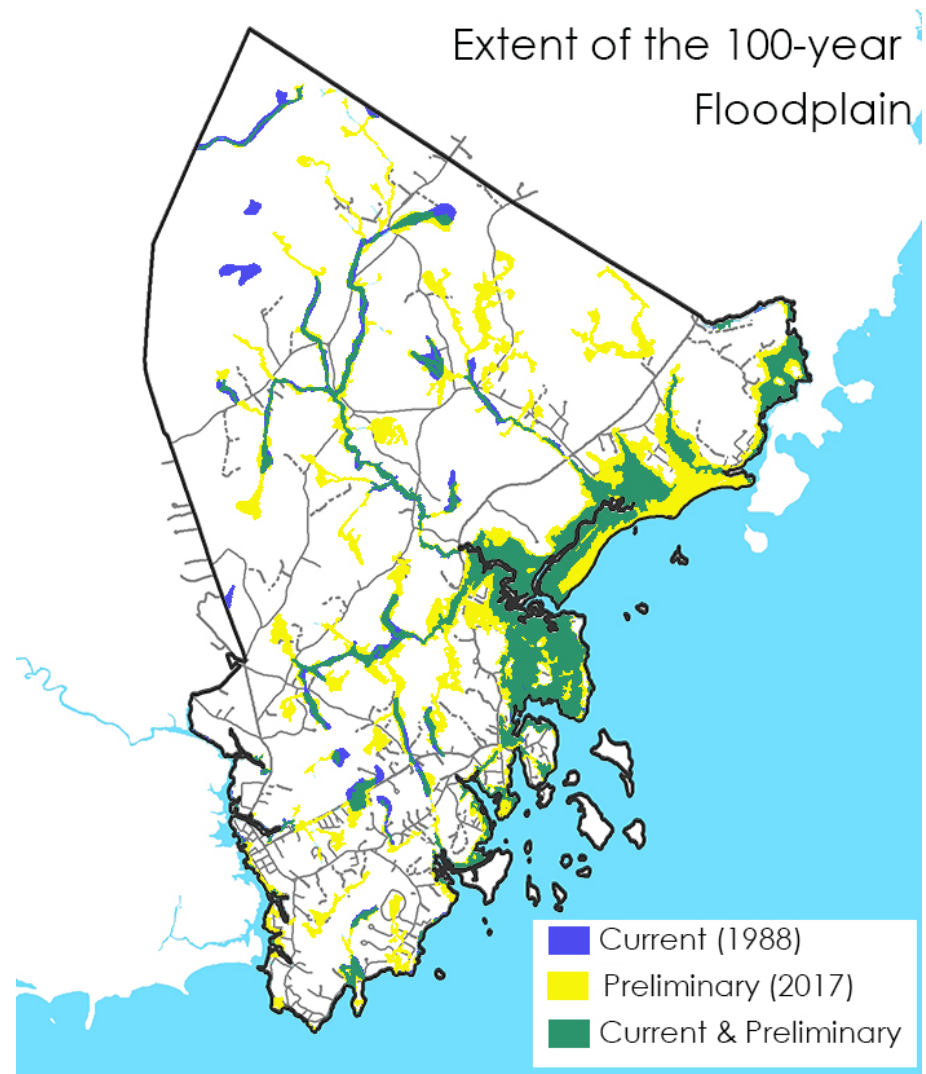


Figure 8-9 Approximate extent of the current and updated FEMA 100-year floodplain. Areas shown in green are areas that are included in both the current and preliminary floodplain extent. The current floodplain is based on Q3 map and does not reflect any map amendments. The portion of the floodplain that extends beyond the coastline into the ocean is not shown in this figure.

map amendments. The data is intended to provide a general indication of the location of SFHAs.

The preliminary FIRMs are based on more detailed topographical data with contours every two feet compared to the 10 to 20-foot contours of the 1988 maps. The FIRM update provides much more accurate information about flood vulnerability. The update will result in changes to flood zones and base flood elevations. Properties that did not previously fall within the 100-year floodplain may be mapped into this area (see yellow areas in Figure 8-9) and properties that were within the 100-year floodplain may no longer be located in the 100-year floodplain (see blue areas in Figure 8-9). Table 8-4 displays the acreage within the preliminary FIRM flood zones.

Table 8-4 Area within preliminary FIRM flood zones (Source: Q3 GIS, Preliminary FIRM GIS)

| Flood Zone | Acres in Effective Flood Zone | Acres in Prelim 2017 Flood Zone |
|------------|-------------------------------|---------------------------------|
| A | 512 | 744 |
| AE | 970 | 1,556 |
| VE | 558 | 2,036 |
| X | | 10,784 |
| X500 | 214 | |
| AO | <1 | |
| Open Water | | 14,115 |

Under the NFIP, flood insurance is required for properties within the SFHA that have a mortgage. As of October 2020, there are 373 policy holders with a total coverage of \$112,640,000 in Kennebunkport. Since joining in 1975, there have been 159 claims in town, totaling \$2,336,042. This averages to about 3.5 claims and \$52,000 in claims per year. Seven properties in Kennebunkport have experienced repetitive losses, or multiple claims. Two properties, designated as severe repetitive loss properties, have experienced a total of 15 combined losses¹⁷. The NFIP policies and claims for Kennebunkport and surrounding communities are shown in Table 8-5.

THE UPDATED FLOOD MAPS WILL INCLUDE:

- NEW COASTAL FLOOD HAZARD ANALYSIS
- REDELINEATED ZONE AE’S IN COASTAL AREAS AND SOME INLAND AREAS
- NEWLY MODELED ZONE A’S IN AREAS WITH TWO-FOOT TOPOGRAPHICAL CONTOURS
- NON-REGULATORY FLOOD RISK PRODUCTS, SUCH AS MAPS THAT SHOW THE DEPTH OF FLOODING WITHIN THE 100-YEAR FLOODPLAIN.
- CHANGES TO ZONE DESIGNATIONS.

Source: DACF Maine Floodplain Management Program

33,000 NUMBER OF STRUCTURES AT RISK OF FLOODING IN MAINE

75% HOMES AND BUSINESSES IN FLOODPLAINS THAT ARE NOT COVERED BY FLOOD INSURANCE

\$959 AVERAGE ANNUAL FLOOD INSURANCE POLICY PREMIUM IN MAINE

9,000 NUMBER OF 9,000 FLOOD INSURANCE POLICIES IN EFFECT IN MAINE

\$1.9 BILLION+ VALUE OF INSURANCE POLICY COVERAGE

Source: DACF Maine Floodplain Management Program

According to available GIS data, there are approximately 950 parcels that intersect the SFHA in Kennebunkport.¹⁸ This does not represent the number of structures in the SFHA.

Table 8-5 FEMA NFIP policies and claims report (Source: ME Floodplain Management Program)

| Town | Participating Properties | Total Claims | Total Payments (Buildings + Contents) |
|---------------|--------------------------|--------------|---------------------------------------|
| Kennebunkport | 373 | 159 | \$2,336,042 |
| Kennebunk | 22 | 65 | \$1,144,612 |
| Biddeford | 5 | 10 | \$82,332 |
| Wells | 14 | 37 | \$507,307 |

The Town of Kennebunkport does not currently participate in the NFIP’s Community Rating System, which is a voluntary incentive program that offers reduced premium rates to property owners in communities that exceed the minimum requirements for floodplain management. This program may be something the Town may wish to join.

Kennebunkport’s Floodplain Management Ordinance requires that the lowest flood (including the basement) of new construction or substantial improvement of any residential structure located within Zones AI 30, AO, and A to be elevated a minimum of two feet above the base flood elevation (BFE). In zones where the base flood elevation is not specified on the FIRM, the ordinance provides guidance about how to determine the appropriate elevation, which varies by zone. Non-residential structures in certain zones must similarly be elevated above the floodplain.

The Future Extent of the Floodplain

As precipitation increases and sea level rises, vulnerability to flooding will also increase. The extent of the area that has a 1% annual chance of flooding today will change. A greater number of coastal and inland properties will be vulnerable to occasional flooding. More properties will require flood insurance. One strategy to prepare for this is to require more separation between the base flood elevation (BFE) and the structures’ lowest floors. Kennebunkport’s Floodplain Management Ordinance already



Photo Credit: Tom Morgan

requires more freeboard³ (two feet) than the one foot required by the 2015 International Residential Code, which will help reduce the vulnerability of structures. Another strategy to adapt to future flood conditions is to expand the extent of the regulated area to include locations vulnerable to sea level rise.

As shown in Figure 8-10, the extent of a 1.2 foot sea level rise scenario generally falls within the bounds of the 100-year floodplain. However, flooding caused by a very high future sea level rise scenario extends farther inland than the 100-year

floodplain. Property owners within these areas that are outside of the 100-year floodplain but within areas that are vulnerable to sea level rise may not be aware of potential future flood impacts and likely do not have flood insurance. Actual future sea level rise will most likely fall somewhere in between the low (1.2 foot) and very high (10.9 foot) scenarios. The Maine Climate Council recommends committing to manage for 1.5 feet of relative sea-level rise by 2050 and 3.9 feet by 2100, as well as preparing to manage for 3 feet of sea level rise by 2050 and 8.8 feet by 2100.



Figure 8-10 Map showing the preliminary FEMA floodplain with two sea level rise scenarios (Source: FEMA, ME Geologic Survey, CAI Technologies)

³ Freeboard is a factor of safety usually expressed in feet above a flood level for

the purposes of floodplain management.

Water Quality

Classification of Maine Waters

Maine’s water classification program (38 M.R.S §464-470) includes designated uses, criteria, and an anti-degradation statement to determine water quality. The purpose of the program is to guide management of surface waters, protect the quality of surface waters for intended management purposes, and direct the State in achieving intended purposes that are not met.¹⁹

If a waterbody meets all standards, including the criteria established for its assigned classification, a determination of water quality attainment is made. The water quality attainment determinations in the 2016 Integrated Water Quality Monitoring and Assessment Report, prepared by the Maine Department of Environmental Protection (DEP) in 2018, are based on monitoring data collected in 2013 and 2014. The report is required by the Environmental Protection Agency (EPA) and summarizes water quality data collected by DEP and other agencies and organizations.

Atmospheric deposition of mercury has led to a statewide fish consumption advisory for all freshwaters, including those in Kennebunkport. The non-tidal portion of the Kennebunk River is rated Class B. Below the head of tide the river is Class SB. These classes have fewer restrictions on activities than class A waters but still maintain high water quality criteria.²⁰ Development, recreational use, and agriculture are identified as the primary sources of impacts to the river. The river is listed as impaired for bacteria.

One of several monitoring locations on the Kennebunk River is located at the Route 9 bridge. As this is a tidal area of the river (assessment unit ME0106000301_622R01), it is discussed in the Marine Resources. A total maximum daily load (TMDL) (category 4-A) was approved by US EPA on September 28, 2009.²¹

Water Quality Classes in Maine
 Freshwater rivers: AA, A, B, C
 Marine and estuarine waters: SA, SB, SC
 Lakes and ponds: GPA

| Components of Water Quality Classification | Examples |
|--|--|
| Designated Uses | Drinking water supply, recreation in and on the water, habitat for fish and other aquatic life |
| Criteria | Bacteria, dissolved oxygen, biological criteria |
| Anti-Degradation | Natural, free flowing |

Information on marine waters and beaches is included in the Marine Resources Chapter.

Stream Gages

The USGS monitors stream flow on the Kennebunk River at a station located at Downing Road in Arundel. This location is upstream of the portion of the river that is located in Kennebunkport. Figure 8-11 summarizes flow rate data from the last decade. The highest flow occurs in March, while September typically experiences the lowest flow rate.

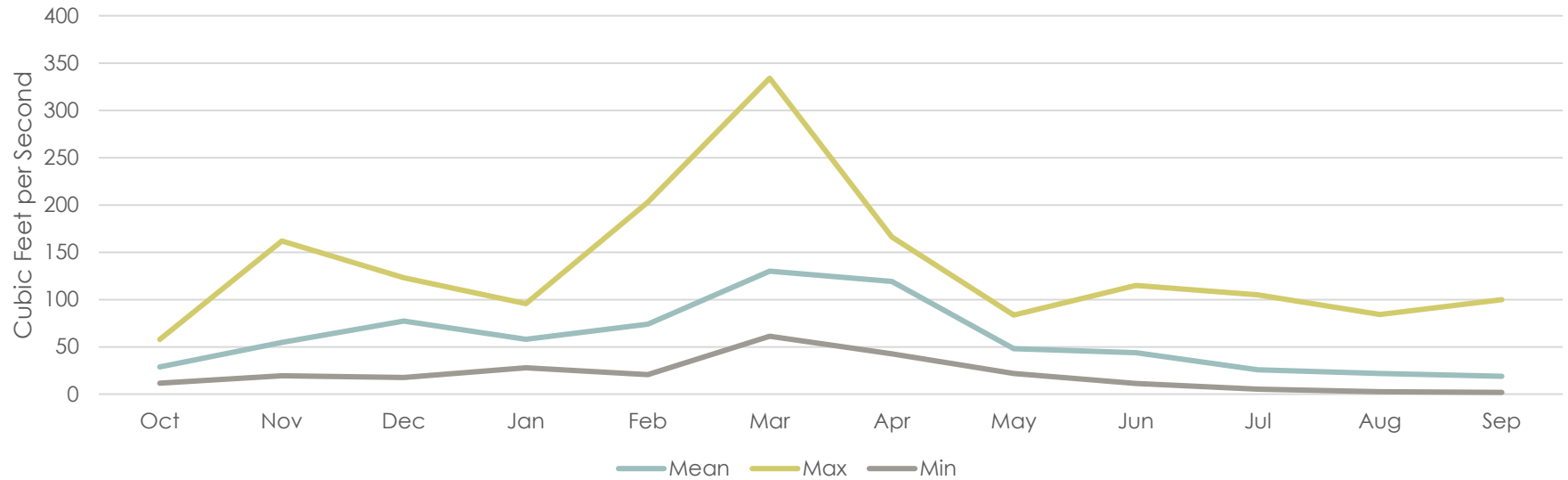


Figure 8-11 Kennebunk River Station 01067950 mean, maximum, and minimum flow by month between 2009 and 2019 (Source: USGS)

Threats to Water Quality & Water Resources

Non-Point Source Pollution

Non-point source and point source pollution are two categories of pollution that impact water quality. Non-point source pollution comes from a number of diffuse sources within a watershed, including stormwater runoff, underground storage tanks, and septic systems. The State defines non-point sources of pollutions as “facilities, activities, or any circumstance that cause rainfall, snowmelt, or irrigation water, running over land or through the ground, to pick up pollutants and to deposit them into rivers, lakes, coastal waters, or

38 M.R.S. § 401-1 is the State’s Nonpoint Source (NPS) Water Pollution Management Program. The program promotes the use of best management practices to prevent water pollution.

ground water.”²²

Stormwater runoff occurs when precipitation flows over surfaces rather than infiltrating into the soil. Stormwater runoff collects and carries pollutants such as sediment, fertilizers and nutrients, salts, metals, and other substances across impervious surfaces such as rooftops and paved areas, as well as other areas like lawns and farmland, to water bodies. Stormwater is managed to a degree by local land use regulations that limit impervious cover, require on site stormwater best management practices, and control fertilizer application.

Impervious Surface: That portion of a lot or site which is or will be improved with buildings, structures, driveways, parking lots, pedestrian walkways, signs and other improvements on the surface of the ground which are more impervious to water than the natural surface of the site. (Source: Kennebunkport Land Use Ordinance)

In Kennebunkport, development requiring review under LUO Article 10 Planning Board Site Plan Review must comply with performance standards established in Section C Stormwater Water Management. These standards require that surface water runoff is minimized and detained on-site if possible, and otherwise mitigated off-site. Drainage systems sized for a 50-year storm event are required for development that involves more than 10,000 square feet of impervious surfaces. Within Article 5 Shoreland and Resource Protection Overlay District, erosion and sedimentation control measures to are required to control potential runoff during construction, and all new construction and development must be designed to minimize stormwater runoff from the site in excess of the natural predevelopment conditions. Furthermore, standards of Article 5 prohibit discharge onto the ground or into waters of the State that would impair the designated uses or water classification of the water tributary stream or wetland. The Town’s Subdivision Regulations require that a stormwater management plan be prepared in accordance with the DEP’s *Stormwater Management for Maine: Best Management Practices* and an erosion and sedimentation control plan be prepared in accordance with the DEP’s *Maine Erosion and Sedimentation Control Handbook for Construction: Best Management Practices*.

Kennebunkport is not designated as a Municipal Separate Storm Sewer System (MS4). Designation is based on the decennial US Census data for urbanized areas.

According to the State’s database of registered storage tanks, there are two active underground tanks and one planned aboveground tank in Kennebunkport (Table 8-6). These tanks are located at Chicks Marina, Cape Porpoise Pier, and Kennebunkport Co in Dock Square. These locations are vulnerable to sea level rise, which could comprise the integrity of below ground tanks, in particular. Nearby, there are four active underground tanks along Western Ave and Beach Ave in Kennebunk. In Kennebunkport, nineteen registered underground tanks have been removed and six have been abandoned in place.

Table 8-6 Registered tanks in Kennebunkport

| Facility | Chicks Marina | Cape Porpoise Pier | Kennebunkport Co |
|---------------------|---|---|--|
| Status | Active | Active | Planned (installed 9/5/20) |
| Registration Number | 480 | 3361 | 17074 |
| Address | 75 Ocean Ave | 81 Pier Rd | Spring Street & Cross Street |
| Near Public Water | N | N | N |
| Near Private Water | N | N | N |
| On Aquifer | N | N | N |
| Tank Material | Jacketed Tank – Double-Walled | Jacketed Tank – Double-Walled | Steel – bare or asphalt coated |
| Tank Volume | 5,000 gal | 2,000 gal | 500 gal |
| Tank Leak Detection | Secondary containment with continuous electrical monitoring | Secondary containment with continuous electrical monitoring | Secondary containment with manual monitoring |
| Tank Type | Underground | Underground | Aboveground |
| Chamber(s) | Unleaded gasoline (3,000 gal), Diesel (2,000 gal) | Unleaded gasoline | Diesel |

The Water District discovered trace amounts of perfluorinated compounds (PFAS) in its Kennebunk River Well supply and stopped using water from that location.²³ The amount found was below the US EPA’s recommended Lifetime Health Advisory Level. In September of 2019, the well and a pilot study to test PFAS removal using pressurized granular activated carbon (GAC) filtration were shut down to allow for construction of a permanent facility for the GAC filter system.²⁴

Point Source Pollution

Point source pollution, as defined by the U.S. Environmental Protection Agency (EPA) is any single identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, ship or factory smokestack.

Within Kennebunkport, there is one permitted wastewater discharge into the Kennebunk River. The Department of Public Works discharges an average of 700,000 gallons of wastewater from homes and businesses into the river. This discharge is permitted by the Maine DEP and treated at the Town’s Wastewater Treatment Plant. Therefore, it is unlikely to be a source of pollution to the river.

Invasive Species

Aquatic invasive species pose a threat to water quality. According to the Maine Invasive Aquatic Plant Map there are no current or eradicated infestations of invasives (Variable Leaf Milfoil, Curly Leaf Pondweed, European Frog's Bit, Brittle water nymph, Hydrilla, or Eurasian Water Milfoil) in Kennebunkport as of January 2020.²⁵ Results of the State's vulnerability assessment and modeling of risk of becoming infested with an invasive aquatic plant show that Beaver Pond is at moderate risk of infestation.²⁶

Dams & Culverts

Dams alter the flow of water, which can cause the temperature of streams, ponds, or reservoirs to heat up. This can impact habitat for fish and wildlife and impede fish passage. There are over 1,000 registered dams in Maine and many more small dams that impact stream connectivity. Less than 20% of dams generate hydroelectric power.²⁷ There are two dams in Kennebunkport: the Turbats Creek concrete dam near Oakwood Drive on Batson River-Goosefare Bay (D5045) and the Batson River Dam (D5110) on Batson River.

There are six bridges and three culverts located on state and local roads in Kennebunkport. Data for private roads was not available.

Road crossings also impact stream continuity, water quality, and habitat. Approximately 42% of the over 8,600 culvert crossings surveyed throughout the state since 2007 act as physical barriers to fish movement. Within the Kennebunk River Watershed, approximately 43% of the 60 culverts surveyed act as barriers to fish movement. Forty-eight percent are potential barriers and 8% have no barrier.²⁸ A map of crossings and barriers is available at: <https://webapps2.cgis-solutions.com/MaineStreamViewer/>. Well-designed stream crossings accommodate wildlife, protect stream health, and reduce erosion and structural damage. Undersized crossings, shallow crossings, and perched crossings are common stream crossing problems. Maine's [Stream Smart Road Crossing Pocket Guide](#) provides guidance on designing stream road crossings that meet stream smart performance goals.²⁹

Principles for Stream Smart Road Crossings

- Set the crossing structure so that the natural, pre-disturbance streambed elevation is re-established or maintained.
- Size the span of the crossing to avoid pinching the stream channel and preferably, exceed the natural channel width. Tidal crossings will often require more span width than non-tidal crossings.
- Maintain natural slope and alignment of the stream channel.
- Ensure that natural substrate is maintained inside the crossing.

(Source: ME DMR)

Climate Change

Changes in the frequency and intensity of precipitation events will impact surface and groundwater in a variety of ways. Increased stream flow has already been measured. Over the last 75 years, annual average streamflow has increased at many sites in the Northeast.³⁰ Increased precipitation will cause an increase in stormwater runoff, leading to more erosion and sedimentation and pollution of water bodies.

Increased periods of extended drought will impact surface water levels and groundwater recharge. According to the US Drought Monitor, Kennebunkport was in an Extreme Drought (Category D3) as of October 2020. This stage is characterized by major crop and pasture losses and widespread water shortages or restrictions.³¹ The September 2020 [Quarterly Climate Impacts and Outlook for the Gulf of Maine Region](#) notes the unusually hot and dry conditions in the region in the summer of 2020, with temperatures ranging up to 5°F above normal and precipitation ranging from 50 to 75% of normal rates.³²

Warmer air temperatures also have an impact on freshwater ecosystems. Rising water temperatures can lower oxygen levels and alter freshwater systems.³³ This can impact the viability of certain species. Already, annual high winter-spring flow is occurring more than 10 days earlier than the mid-1900s.³⁴

Sea level rise will also likely impact freshwater resources as rising seas cause saltwater intrusion into groundwater resources. Kennebunkport's 2012 Comprehensive Plan recognized saltwater intrusion as a problem in neighborhoods along the shore, such as Windemere Place. Modeling of sea level rise induced groundwater rise in coastal New Hampshire found that groundwater is projected to extend up to 2.5 to 3 miles inland from the coast.³⁵ The Goose Rocks Fire House wells and areas in between the coast and firehouse have experienced some salinity. This will have implications ranging from declining viability of drinking water wells to increased threat of nonpoint source pollution from sources like septic systems.

Existing Protection & Preservation Measures

M.R.S.A. 38 §§435-449 require protection measures for shoreland areas within 250 feet of the normal high-water line of any great pond, river, or saltwater body, within 250 feet of the upland edge of a coastal wetland, within 250 feet of the upland edge of a freshwater wetland unless within 75 feet of the high-water line of a stream.

M.R.S.A. §438-A requires that municipalities adopt zoning and land use control ordinances with minimum guidelines to protect water resources. The guidelines must include provisions governing building and structure size, setback and location, and establishment of resource protection, general development, limited residential, commercial fisheries and maritime activity zones and other zones. Regulations must include permitted uses, criteria for issuing permits and nonconforming uses, land use standards, and administrative and enforcement procedures.

State laws that protect water resources include: Stormwater management and Site Location Law and Erosion and Sedimentation Control Law

Site Location of Development requires developers of large projects obtain permits from DEP before beginning construction.

Kennebunkport's Shoreland and Resource Protection Overlay Zones regulate uses within proximity to surface water resources. Figure 8-12 shows the location of Shoreland and Resource Protection Zones associated with different resources in Kennebunkport. Section 3.3 of the

Town’s [Land Use Ordinance](#) identifies the boundaries of the Shoreland Zone and Resource Protection Zone. Sections 4.13, 4.14, and 4.15 identify uses that are permitted without a permit in both the Shoreland and Resource Protection Zones, the uses permitted in the Shoreland Zone, and the uses permitted in the Resource Protection Zone, respectively. Uses that are allowed under 4.13 are generally limited to uses like recreation, natural resource management and analysis, essential services, emergency operations, timber harvesting, motorized vehicle traffic on road and established trails, mineral exploration disturbing less than 100 sq ft of ground surface area. Uses such as filling or earthmoving activities of less than five cubic yards of earth annually, clearing vegetation for construction, mineral exploration disturbing less than 100 sq ft of ground surface are examples of the types of uses permitted in the Shoreland Zone under Section 4.14, provided they are not in the Resource Protection Zone and are permitted in the underlying district. Uses permitted in the Resource Protection Zone include timber harvesting, clearing of vegetation for construction, filling or earthmoving activity less than five cubic yards annually, and similar uses approved by the Code Enforcement Officer. The Planning Board may permit uses such as agriculture, accessory structures, road and driveway construction, and public utilities and essential services within the Resource Protection Zone. LUO Article 5 includes a purpose statement and performance standards that apply to land uses in Shoreland, Stream Protection, and Resource Protection areas.

In addition to regulating use in the Shoreland and Resource Protection Zones, several town-wide provisions and development standards protect water resources (Table 8.7).

Table 8-7 Water resource protection measures that apply town-wide and under the Site Plan Review process (Source: Kennebunkport LUO)

| LUO Section | Summary |
|---|--|
| Section 6.4 Water Quality | <ul style="list-style-type: none"> No activity shall locate, store, discharge, or permit the discharge of any treated, untreated or inadequately treated liquid, gaseous, or solid materials of such nature, quality, obnoxiousness, toxicity, or temperature that run off, seep, percolate, or wash into surface or ground waters so as to contaminate, pollute, or harm such waters or cause nuisances, such as objectionable shore deposits, floating or submerged debris, oil or scum, color, odor, taste, or unsightliness, or be harmful to human, animal, plant or aquatic life. |
| Section 6.11 Sanitary Provisions | <ul style="list-style-type: none"> Requires that the system meets the requirements of the State of Maine Subsurface Wastewater Disposal rules, C.M.R. Chapter 241 |
| Section 6.7 Construction in Flood Hazard Areas | <ul style="list-style-type: none"> In areas designated within the 100-year flood plain, all new construction, additions, and modifications to existing structures, including piers, docks, wharves, bridges and causeways, shall conform to the Town’s Flood Plain Management Ordinance. |
| Article 10: Planning Board Site Plan | <ul style="list-style-type: none"> Requires review and approval for any use listed in Article 5 Shoreland and |

| | |
|---------------|---|
| Review | <p>Resource Protection Performance Standards</p> <ul style="list-style-type: none"> Establishes performance standards for activities including erosion control, stormwater management, and buffers |
|---------------|---|

The Subdivision Regulations contain performance standards to reduce the impact of development on water resources. A summary of these performance standards is included in Table 8-8.

Table 8-8 Performance standards for subdivisions to minimize impacts on water resources (Source: Town of Kennebunkport Subdivision Regulations)

| Subdivision Regulation Performance Standard | Summary |
|--|--|
| Article 11.1 Pollution | <ul style="list-style-type: none"> The proposed subdivision shall not discharge wastewater to a water body without a license from ME DEP Discharges of storm water shall be treated. When the subdivision is within the watershed of a great pond, the storm water shall be treated in order to remove excess nutrients. Homeowner association covenants will include a requirement to follow the guidelines in the most current edition of “Best management Practices for the Application of Turf Pesticides and Herbicides” |
| Article 11.2 Sufficient Water | <ul style="list-style-type: none"> Applicants must demonstrate that there is sufficient drinking water. Areas that are within the area designated in the Comprehensive Plan and subsequent amendments or revisions shall make provisions for connection to the public system (Sub Regs pg 31). Areas outside of this area utilize individual wells that are sited and constructed to prevent infiltration of surface water and contamination from subsurface wastewater disposal systems and other sources of potential contamination. |
| Article 11.3 | <ul style="list-style-type: none"> Proposed subdivisions shall not generate a demand on the source, treatment facilities, or distribution system of the servicing water company or district beyond the capacity of those system components |
| Article 11.4 Soil Erosion, Article 11.11 Impact on Water Quality or Shoreline | <ul style="list-style-type: none"> Performance standards to prevent soil erosion and sedimentation associated with constructure, development, and vegetation removal Performance standards to prevent change in temperature of water bodies |
| Article 11.12 Impact on Ground Water | <ul style="list-style-type: none"> Subdivisions may require a hydrogeological assessment to evaluation the effect |

| Subdivision Regulation Performance Standard | Summary |
|---|--|
| Quality | of the subdivision on groundwater resources. No subdivision shall increase any contaminant concentration in the groundwater to more than one half of the Primary Drinking Water Standards or more than the Secondary Drinking Water Standards. |
| Article 11.15 Stormwater Management | <ul style="list-style-type: none"> • Stormwater best management practices are required |
| Article 11.18 | <ul style="list-style-type: none"> • Subsurface wastewater disposal systems, roads, and dwellings are not permitted within 250 feet of the normal high water mark of any pond in excess of 10,000 square feet, lake, river, or tidal waters |

Additional Protection Measures

Land conservation, discussed in the Land Use and Natural Resources Chapters, is an effective strategy for protecting watersheds. Approximately 30% of the Kennebunk River Watershed is conserved. The KKWWD owns 2,000 acres of land within the watershed.

Public Works implements practices to protect water quality, including storing salt in a covered shed and not dumping snow in the Kennebunk River.

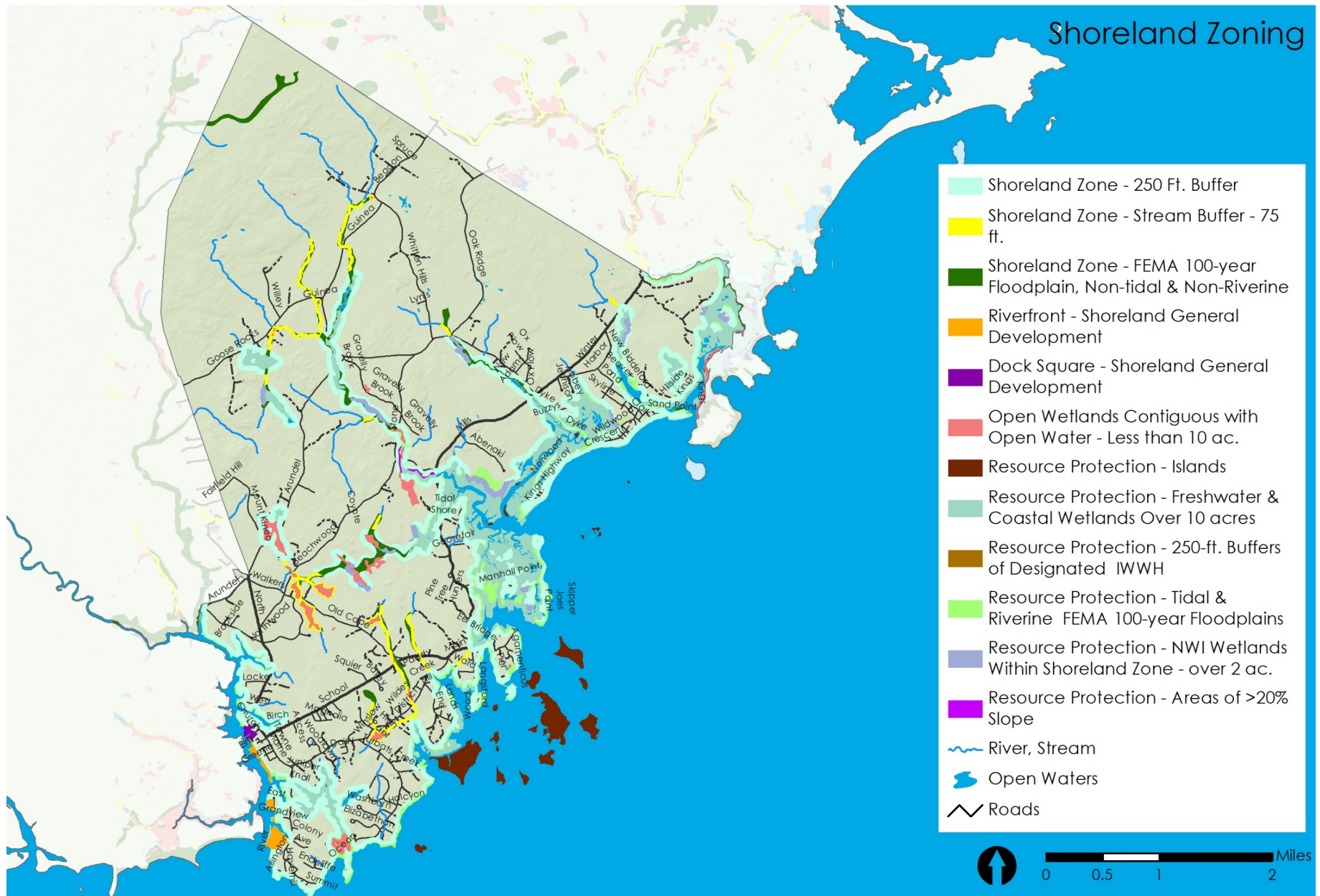


Figure 8-12 Shoreland zoning in Kennebunkport (Source: Planning Department)

- ¹ Böck K., Polt R., Schülting L. (2018) Ecosystem Services in River Landscapes. In: Schmutz S., Sendzimir J. (eds) Riverine Ecosystem Management. Aquatic Ecology Series, vol 8. Springer, Cham. Available at: https://doi.org/10.1007/978-3-319-73250-3_21
- ² Wells Reserve at Laudholm. Kennebunk River. Available at: <https://www.wellsreserve.org/conservation/in-your-community/rivers-and-streams/kennebunk-river>
- ³ Maine Department of Environmental Protection. Water Quality Lake or Pond? Available at: <https://www1.maine.gov/dep/water/lakes/lkepond.html>
- ⁴ Kennebunkport Conservation Trust. Property Gifts. Available at: <https://www.kporttrust.org/kct-property-gifts>
- ⁵ Maine Department of Environmental Protection. Water Quality. Issue Profile Maine's Wetlands: Their Functions and Values. August 2003. Available at: <https://www.maine.gov/dep/land/nrpa/ip-wet-fv.html>
- ⁶ US Forest Service. Classification of Wetlands and Deepwater Habitats of the United States. Palustrine Systems. Available at: <https://www.fws.gov/wetlands/documents/classwet/palustri.htm>
- ⁷ Maine Department of Environmental Protection. 2016 Integrated Water Quality Monitoring and Assessment Report. February 28, 2018. Available at: <https://www.epa.gov/sites/production/files/2018-03/documents/2016-me-integrated-rpt.pdf>
- ⁸ Maine Department of Agriculture, Conservation and Forestry. Municipal Planning Assistance Program. Planning Data. Spring 2018.
- ⁹ Maine Department of Agriculture, Conservation and Forestry. Maine Geological Survey. Significant Sand and Gravel Aquifer Maps Digital Data. Available at: maine.gov/dacf/mgs/pubs/digital/aquifers.htm
- ¹⁰ Town of Kennebunkport. Annual Report 2019. Available at: https://www.kennebunkportme.gov/sites/g/files/vyhlf3306/f/uploads/2019_kennebunkport_annual_report_6-15-2020_good_one_for_website.pdf
- ¹¹ Kennebunk, Kennebunkport and Wells Water District. Available at: <https://kkw.org/>
- ¹² Kennebunk, Kennebunkport and Wells Water District. Available at: <https://kkw.org/>
- ¹³ Kennebunk, Kennebunkport and Wells Water District. Available at: <https://kkw.org/>
- ¹⁴ US Geological Survey. National Water Information System: Web Interface. Water-Year Summary for Site USGS 01069700. Available at: https://waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=63960&wys_water_yr=2019&site_no=01069700&agency_cd=USGS&adr_water_years=2009%2C2010%2C2011%2C2012%2C2013%2C2014%2C2015%2C2016%2C2017%2C2018%2C2019&referred_module=
- ¹⁵ Federal Emergency Management Agency. Chapter 8 Floodplain Natural Resources and Functions. Available at: <https://training.fema.gov/hiedu/docs/fmc/chapter%208%20-%20ofloodplain%20natural%20resources%20and%20ofunctions.pdf>
- ¹⁶ Federal Emergency Management Agency. Chapter 8 Floodplain Natural Resources and Functions. Available at: <https://training.fema.gov/hiedu/docs/fmc/chapter%208%20-%20ofloodplain%20natural%20resources%20and%20ofunctions.pdf>
- ¹⁷ Provided by Sue Baker, NFIP State Coordinator, Maine Floodplain Management Program, via email 10/23/20
- ¹⁸ FEMA, MEGIS
- ¹⁹ Maine Department of Environmental Protection. Water Quality. Classification of Maine Waters. Available at: <https://www.maine.gov/dep/water/monitoring/classification/>
- ²⁰ Maine Department of Environmental Protection. Classification of Maine Waters. Available at: [https://www.maine.gov/dep/water/monitoring/classification/#:~:text=Water%20Quality%20Classes,lakes%20and%20ponds%20\(GPA\).](https://www.maine.gov/dep/water/monitoring/classification/#:~:text=Water%20Quality%20Classes,lakes%20and%20ponds%20(GPA).)
- ²¹ Maine Department of Environmental Protection. 2016 Integrated Water Quality Monitoring and Assessment Report. February 28, 2018. Available at: <https://www.epa.gov/sites/production/files/2018-03/documents/2016-me-integrated-rpt.pdf>
- ²² Maine Comprehensive Plan Review Criteria Rule Chapter 208. Available at: https://www.maine.gov/dacf/municipalplanning/comp_plans/index.shtml
- ²³ Town of Kennebunkport. Annual Report 2019. Available at: https://www.kennebunkportme.gov/sites/g/files/vyhlf3306/f/uploads/2019_kennebunkport_annual_report_6-15-2020_good_one_for_website.pdf

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- ²⁴ Town of Kennebunkport. Annual Report 2019. Available at: https://www.kennebunkportme.gov/sites/g/files/vyhlif3306/f/uploads/2019_kennebunkport_annual_report_6-15-2020_good_one_for_website.pdf
- ²⁵ Maine Department of Environmental Protection. Invasive Aquatic Plants. January 2020. Available at: <https://www.maine.gov/dep/water/invasives/invasivesmap2020.pdf>
- ²⁶ Maine Department of Environmental Protection. Invasive Aquatic Plants-Risk to Maine Lakes. Available at: <https://www.arcgis.com/home/webmap/viewer.html?webmap=54b2a5c513a74af3bdof42148dde34a9&extent=-72.9553,43.2447,-64.8419,46.5092>
- ²⁷ Maine Department of Marine Resources. Maine Stream Habitat Viewer. Available at: <https://www.maine.gov/dmr/mcp/environment/streamviewer/index.htm#about>
- ²⁸ Maine Department of Marine Resources. Maine Stream Habitat Viewer. Available at: <https://www.maine.gov/dmr/mcp/environment/streamviewer/index.htm#about>
- ²⁹ Main Forest Services, GOMC-NOAA, Community Based Habitat Restoration Partnership, and USFWS Gulf of Maine Coastal Program. Maine Stream Crossings. New Designs to Restore Stream Continuity. <https://1hy29k3c8ufqiklsj4fdzo41-wpengine.netdna-ssl.com/wp-content/uploads/2017/09/Maine-Stream-Crossings-New-Designs-to-Restore-Stream-Continuity.pdf>
- ³⁰ US Environmental Protection Agency. Climate Change Indicators: Streamflow. Available at: <https://www.epa.gov/climate-indicators/climate-change-indicators-streamflow>
- ³¹ National Integrated Drought Information Systems. U.S. Drought Portal. Droughts in Maine. Available at: <https://www.drought.gov/drought/states/maine?places=Kennebunkport%2C+ME%2C+USA>
- ³² National Integrated Drought Information Systems. U.S. Drought Portal. Advancing Drought Science and preparedness across the Nation. Available at: https://www.drought.gov/drought/sites/drought.gov.drought/files/media/reports/regional_outlooks/GOM%20Summer%202020.pdf
- ³³ US Environmental Protection Agency. What Climate Change Means for Maine. Available at: <https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-me.pdf>
- ³⁴ US Environmental Protection Agency. Climate Change Indicators: Streamflow. Available at: <https://www.epa.gov/climate-indicators/climate-change-indicators-streamflow>
- ³⁵ Wake, C., Knott, J., Lippmann, T., Stampone, M., Ballester, T., Bjerklie, D., Burakowski, E., Glidden, S., Hosseini-Shakib, I., Jacobs, J. (2019). New Hampshire Coastal Flood Risk Summary – Part I: Science. Prepared for the New Hampshire Coastal Flood Risk Science and Technical Advisory Panel. Report published by the University of New Hampshire, Durham, NH.