Rapid Watershed Assessment

Coastal Drainages East of Small Point
8-Digit HUC 01050003

Prepared for:

Time & Tide Resource Conservation and Development Council

Prepared By:

Kennebec Soil and Water Conservation District

April 2008

This project was funded through the USDA/Natural Resource Conservation Service by a Cooperative Conservation Partnership Initiative (CCPI) Grant

Table of Contents

Introduction……...Page 1

Political Profile……..Page 2-4

Physical Profile…….Page 5-8

Hydrologic Profile……Page 9-12

Resource Concerns…….Page 13-18

Assessment Matrices…… Page 19-25

Introduction - Watershed Area[1] and Location

Coastal Drainages East of Small Point is an 8-Digit Hydrologic Unit Code (HUC) sub-basin covering approximately 672,000 acres, or 1050 square miles, in the Mid-Coast region of Maine. The 8-Digit HUC is further divided into seven 10-digit sub-basins and 28 12-digit sub-basins. It is comprised of 126 Great Ponds and upwards of 2000 smaller waterbodies. These drain to the Gulf of Maine through one of seven major river systems and a network of intermittent and perennial streams that is nearly 1300 miles long.

The watershed area represents 3.1% of the total area of the state. There are five counties and 50 towns with land areas within the watershed. These account for approximately 110,000, or 8.6%, of Maine's 1,275,000 residents*.

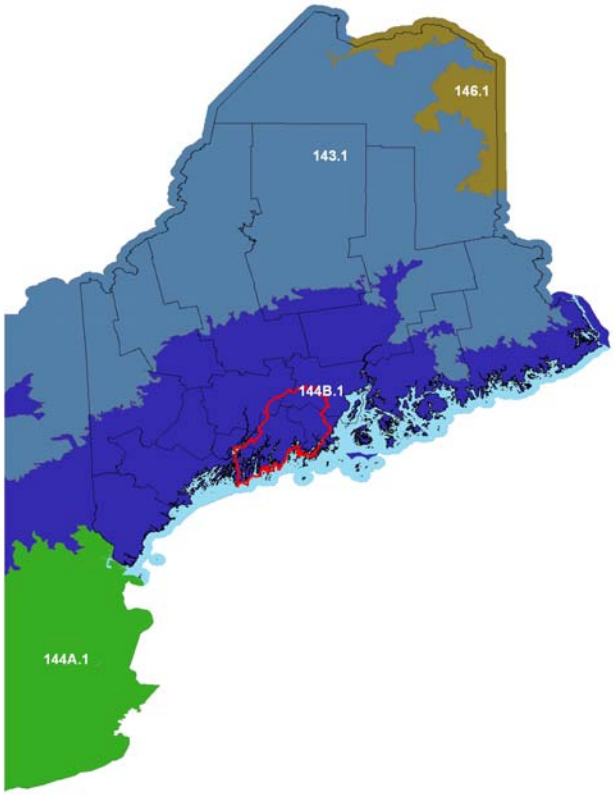
The sub-basin is served by four NRCS service centers, one resource conservation and development office, and four soil and water conservation district.

**Note: Population data is for entire town/census area even if only a portion is contained within the HUC*

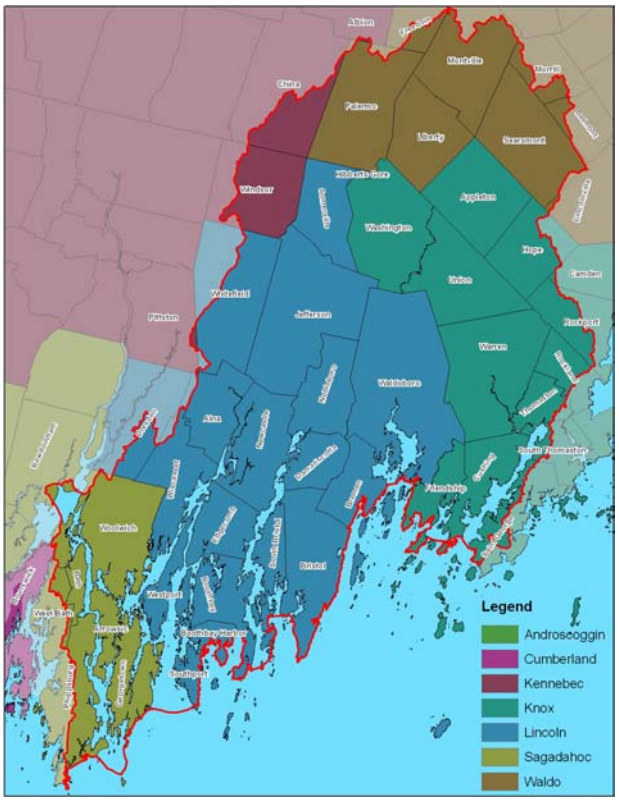
Introduction - Common Resource Area[2]

<u>144 B.1-New England and Eastern New York Upland, Northern Part[3]</u>

Till mantled rolling to hilly uplands with level to sloping valleys terminating in coastal lowlands. About 80 percent of this area is in hardwood and conifer forests. Small acreages are used for forage crops for dairy cattle. Truck crops, small fruits, and apples are grown on some farms. The soils are medium to coarse textured, in a frigid temperature regime and are in an udic moisture regime. The higher hills have thin mantles and on the lower areas the soils are sandy glacial outwash with smaller areas of marine and lacustrine sediments. The soil deposits are derived from Wisconsin Age drift and range from well drained to very poorly drained. There are large areas of muck and peat soils.



Political Profile – Towns[4] and Counties[5] in HUC



Kennebec County 28084 acres 4.1% of HUC

Albion, China, Pittston, Windsor

Knox County 166560 acres 24.8% of HUC

Appleton, Camden, Cushing, Friendship, Hope, Rockland, Rockport, St. George, S.Thomaston, Thomaston, Union, Warren, Washington

Lincoln County 300077 acres 44.6% of HUC

Alna, Boothbay, Boothbay Hbr, Bremen, Bristol, Damariscotta, Dresden, Edgecomb, HibbertsGore, Jefferson, Nobleboro, Somerville, South Bristol, Southport, Waldoboro, Westport, Whitefield, Wiscasset

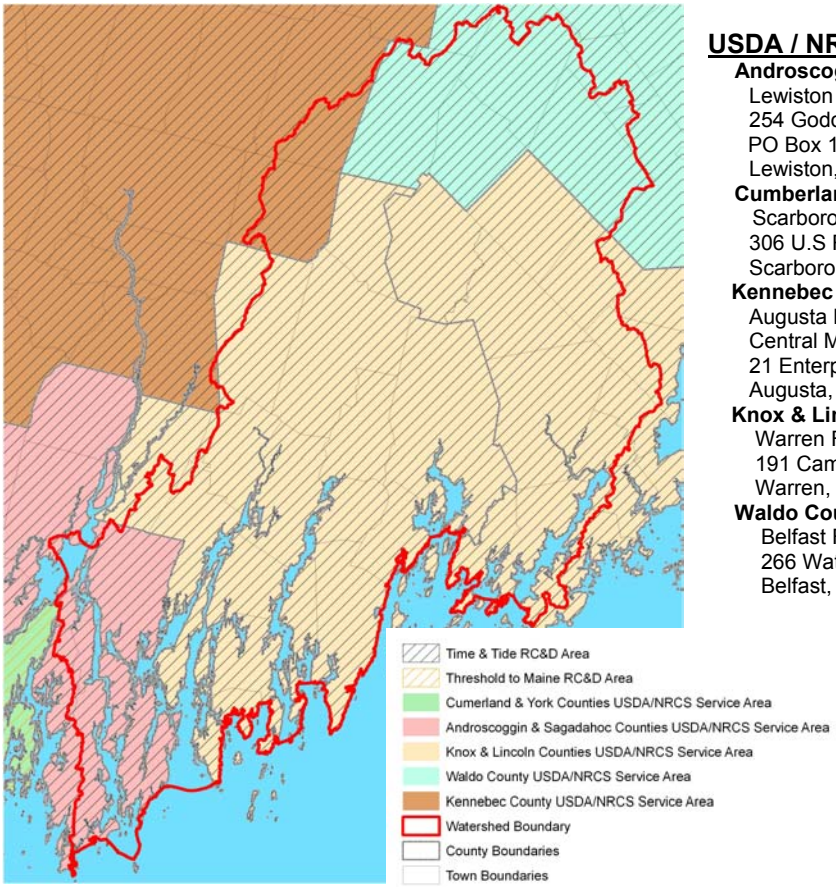
Sagadahoc County 78299 acres 11.6% of HUC

Arrowsic, Bath, Bowdoinham, Georgetown, Phippsburg, West Bath, Woolwich

Waldo County 99079 acres 14.7% of HUC

Belmont, Freedom, Liberty, Lincolnville, Montville, Morrill, Palermo, Searsmont

Political Profile – USDA / Time & Tide / Soil & Water District Service Areas[6]



USDA / NRCS Service Centers

Androscoggin & Sagadahoc Counties
Lewiston Field Office Telephone: 207-783-4101
254 Goddard Road
PO Box 1938
Lewiston, Maine 04241-1938

Cumberland & York Counties
Scarborough Field Office Telephone: 207-883-0159
306 U.S Route 1 Suite 1A
Scarborough, Maine 04074-9774

Kennebec County
Augusta Field Office Telephone: 207-622-7847 Ext.3
Central Maine Commerce Center
21 Enterprise Drive Suite 1
Augusta, Maine 04330

Knox & Lincoln Counties
Warren Field Office Telephone: 207-273-2005
191 Camden Road
Warren, Maine 04864-4207

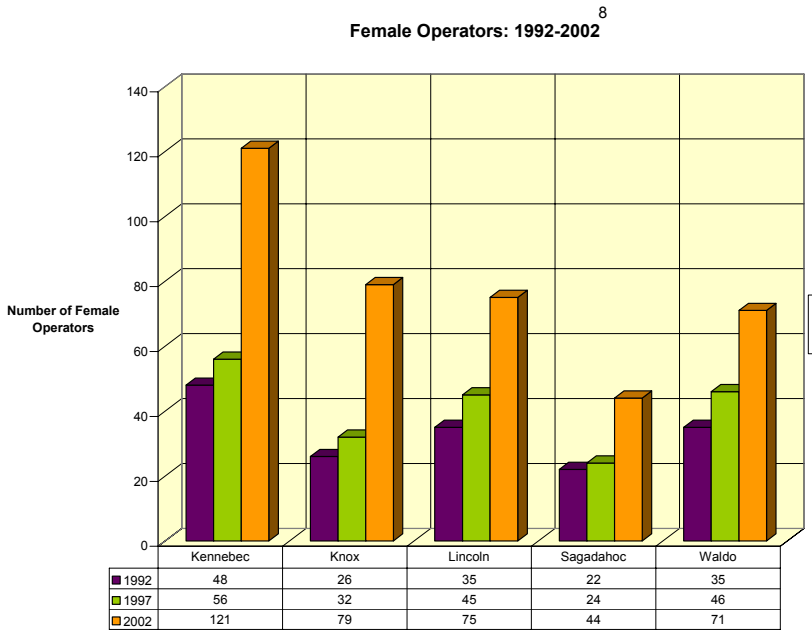
Waldo County
Belfast Field Office Telephone: 207-338-1964
266 Waterville Road
Belfast, Maine 04915-1224

Maine RC&D Areas

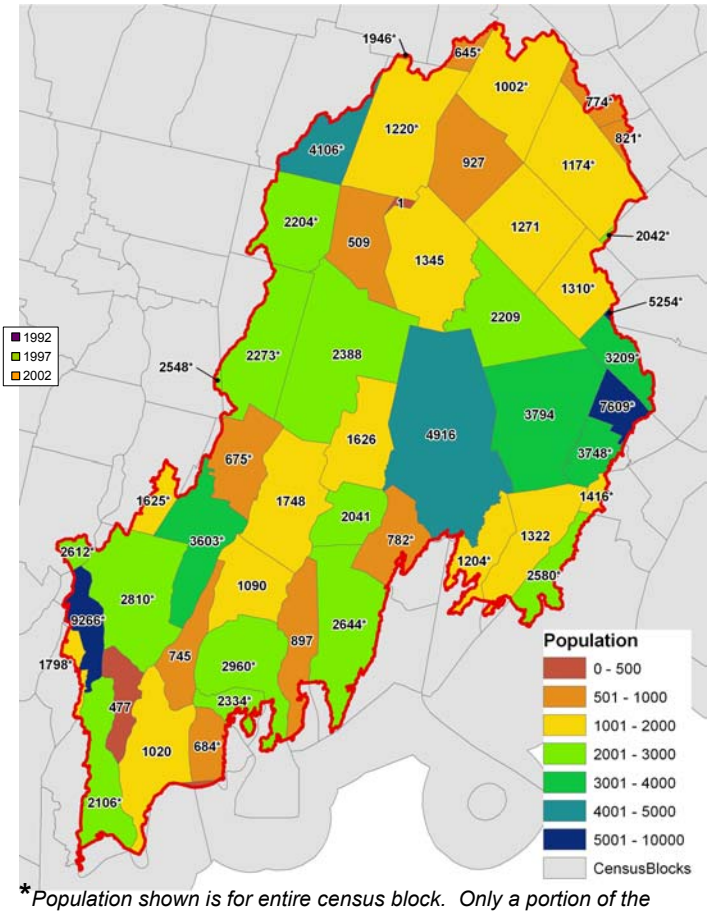
Threshold to Maine RC&D Area Telephone: 207-657-3131
67 Shaker Road Telephone: 207-657-3131
Gray, Maine 04039-9640

Time & Tide RC&D Area Telephone: 207-622-7847 Ext. 4
Central Maine Commerce Center
21 Enterprise Drive Suite 1
Augusta, Maine 04330

Political Profile – Population / Demographics[7]

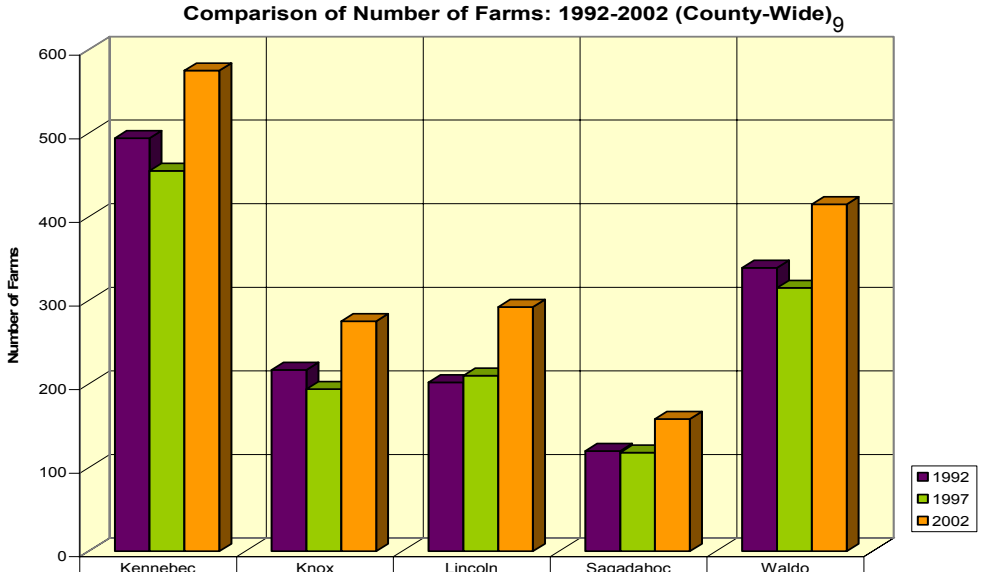


	Kennebec	Knox	Lincoln	Sagadahoc	Waldo
1992	48	26	35	22	35
1997	56	32	45	24	46
2002	121	79	75	44	71



Population shown is for entire census block. Only a portion of the area is contained within the 8-Digit HUC Area.

Total number of farms – 1715 (County Wide 2002)

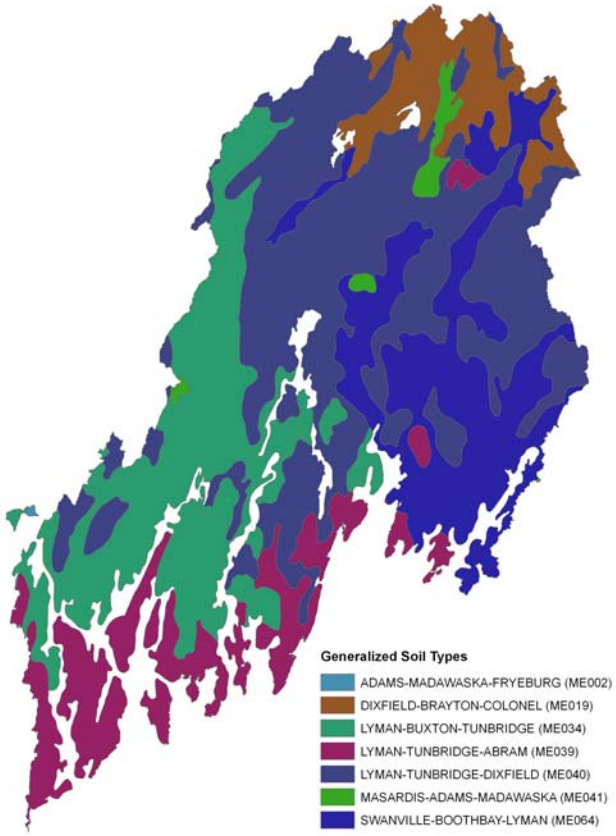


	Kennebec	Knox	Lincoln	Sagadahoc	Waldo
1992	494	217	202	120	339
1997	455	194	210	118	315
2002	575	275	292	158	415

Political Profile – Population / Demographics[10] cont.

County Totals	Town	Population 2000	Change 1990-2000		Pop. Density per Square Mile	Population Density Change 1999-2000
			Number	%		
Kennebec* 10804	Albion*	1946	210	0.121	50	5
	China*	4106	393	0.106	82	8
	Pittston*	2548	104	0.043	80	9
	Windsor*	2204	309	0.163	63	9
Knox* 36271	Appleton	1271	202	0.189	39	6
	Camden*	5254	194	0.038	292	11
	Cushing	1322	334	0.338	70	17
	Friendship*	1204	105	0.096	86	7
	Hope*	1310	293	0.288	60	13
	Rockland*	7609	-363	-0.046	585	-28
	Rockport*	3209	355	0.124	146	16
	South Thomaston*	1416	189	0.154	129	17
	Saint George*	2580	319	0.141	103	13
	Thomaston*	3748	442	0.134	341	40
	Union	2209	220	0.111	69	7
	Warren	3794	602	0.189	82	13
	Washington	1345	160	0.135	35	4
Lincoln* 33541	Alna*	675	104	0.182	32	5
	Boothbay	2960	312	0.118	135	14
	Boothbay Harbor*	2334	-13	-0.006	389	-2
	Bremen*	782	108	0.160	43	6
	Bristol*	2644	318	0.137	78	9
	Damariscotta	2041	230	0.127	170	19
	Dresden*	1625	293	0.220	54	10
	Edgecomb	1090	97	0.098	61	5
	Hibberts Gore	1	0	0	1	0
	Jefferson	2388	277	0.131	45	5
	Newcastle	1748	210	0.137	60	7
	Nobleboro	1626	171	0.118	86	9
	Somerville	509	51	0.111	23	2
	Southport*	684	39	0.060	137	7
	South Bristol*	897	72	0.087	69	5
	Waldoboro	4916	315	0.068	69	4
	Westport	745	82	0.124	83	9
	Whitefield*	2273	342	0.177	48	7
	Wiscasset*	3603	264	0.079	144	11
Sagadahoc*	Arrowsic	477	-21	-0.042	60	-3
	Bath*	9266	-533	-0.054	1030	-58
	Bowdoinham*	2612	420	0.192	77	12
	Georgetown	1020	106	0.116	54	6
	Phippsburg*	2106	291	0.160	73	10
	West Bath*	1798	82	0.048	150	7
	Woolwich*	2810	240	0.093	80	7
Waldo*	Belmont*	821	169	0.259	59	12
	Freedom*	645	52	0.088	29	2
	Liberty	927	137	0.173	36	5
	Lincolnville*	2042	233	0.129	55	6
	Montville*	1002	125	0.143	23	3
	Morrill*	774	130	0.202	46	8
	Palermo*	1220	199	0.195	30	5
	Searsmont*	1174	236	0.252	31	6
			Average increase in population 181		Average Density per Sq. Mile 115	Average Density Change 6.3

Physical Profile - Generalized Soils[11]



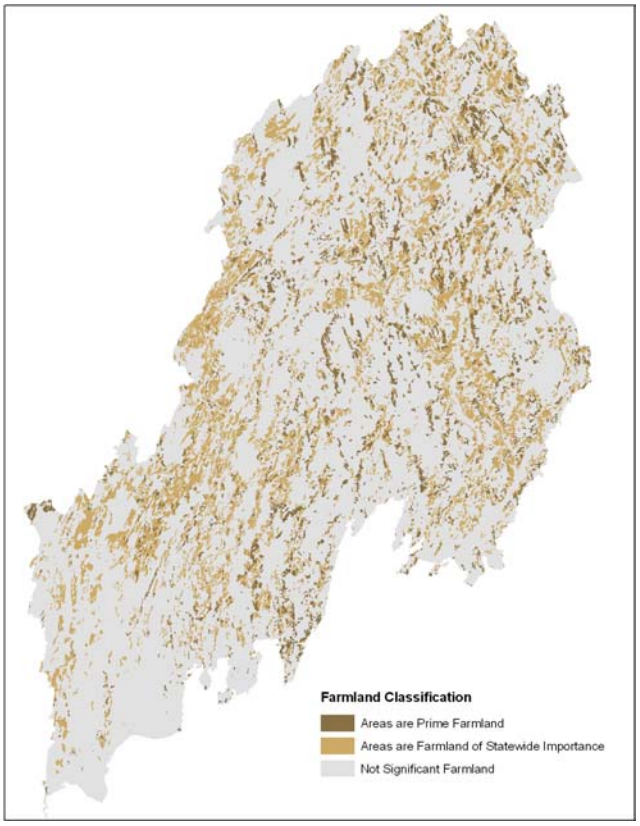
Major soil orders in this HUC are Inceptisols and Spodisols. They are generally loamy or sandy, excessively to poorly drained, and are shallow to very deep. Most soils were formed in glaciomarine, glaciolacustrine, or glaciofluvial deposits.

Dixfield-Brayton-Colonel		Lyman-Tunbridge-Dixfield	
Acres	*%HUC*	*Acres*	*%HUC*
44740	7.2	229616	37.1
Swanville-Boothbay-Lyman		**Lyman-Buxton-Tunbridge-**	
Acres	*%HUC*	*Acres*	*%HUC*
111657	18.1	137886	22.3
Lyman-Tunbridge-Abram		**Masardis-Adams-Madawaska**	
Acres	*%HUC*	*Acres*	*%HUC*
78004	12.6	7980	1.3
Adams-Madawaska-Fryeburg			
Acres	*%HUC*		
254	>0.1		

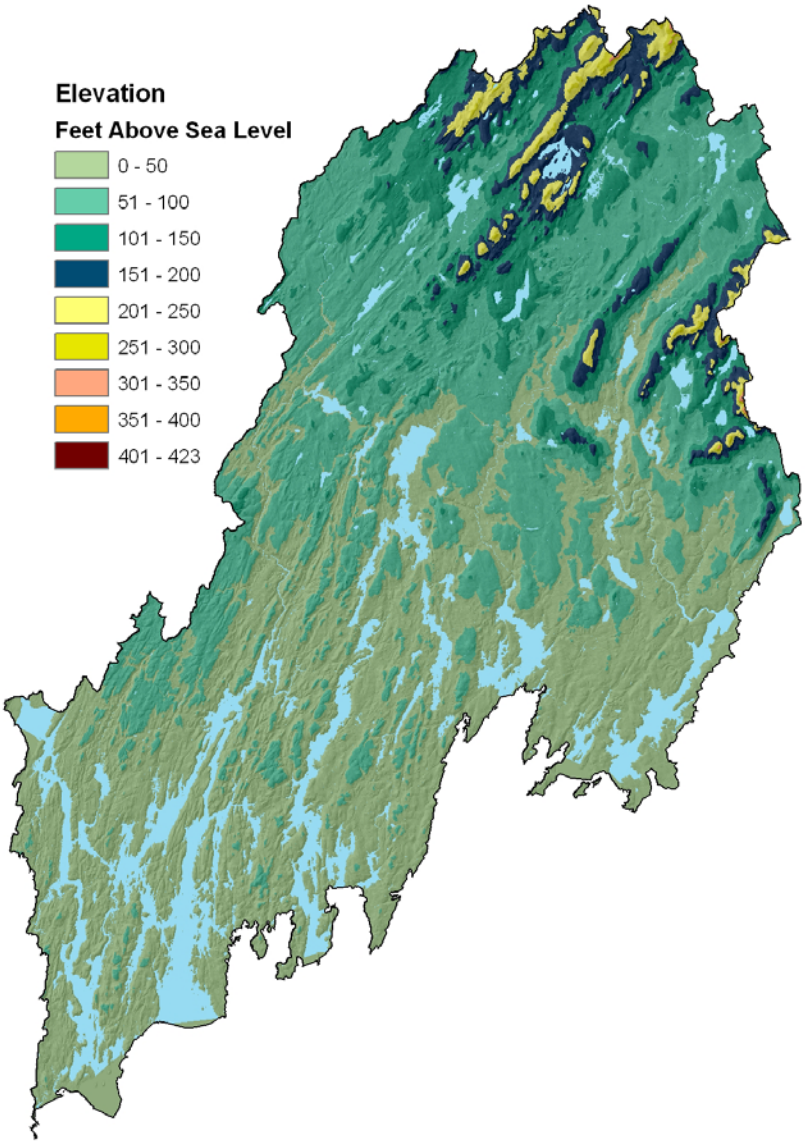
Physical Profile - Farmland Classification[12]

County	Kennebec	Knox/ Lincoln	Sagadahoc	Waldo
Acres of Prime Farmland	1001	35263	1264	9863
Acres of Important Farmland	4656	84869	10023	21301
% of County Area in HUC	20.1%	25.7%	14.4%	31.5%
% of HUC Area	0.8%	17.9%	1.7%	4.6%

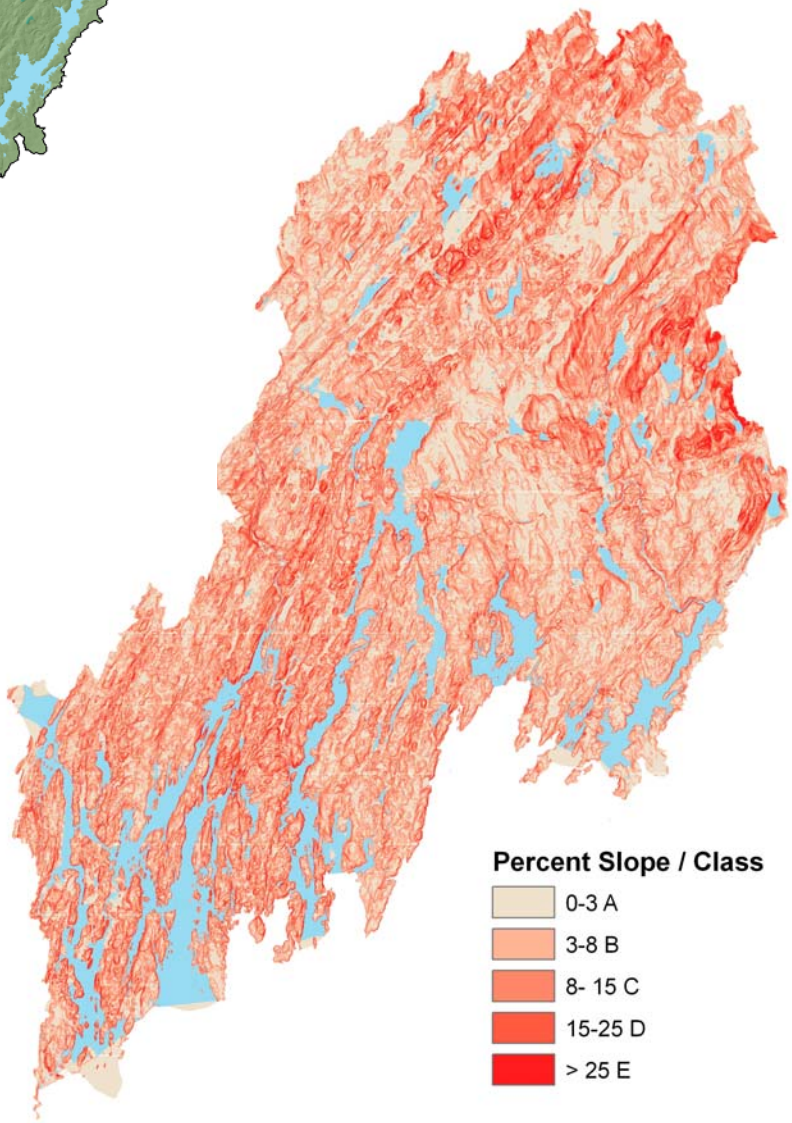
The HUC contains significant acreage of both prime farmland and important farmland. These areas are fairly evenly distributed throughout the watershed area.



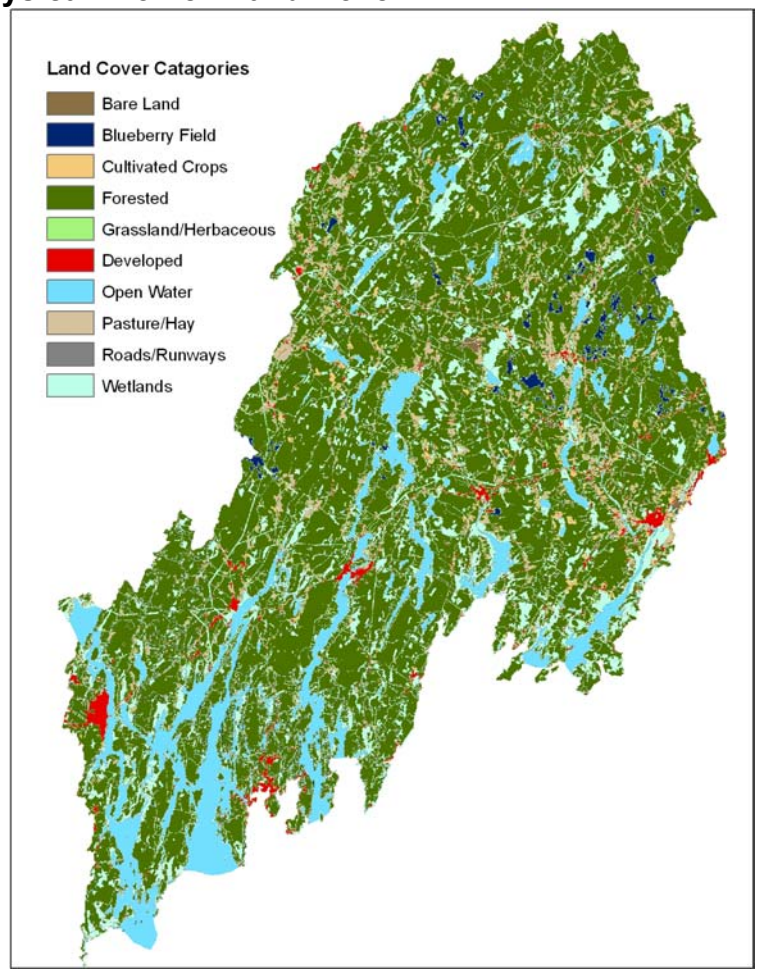
Physical Profile – Slope[13] & Elevation[14]



Elevations within the watershed range from sea level to just over four hundred twenty feet. Most of the higher elevations occur in the in the northern and northeastern sections of the watershed. Only a very small area exceeds four hundred feet, while the majority lies below one hundred fifty feet above sea level.



Physical Profile - Land Cover[15]



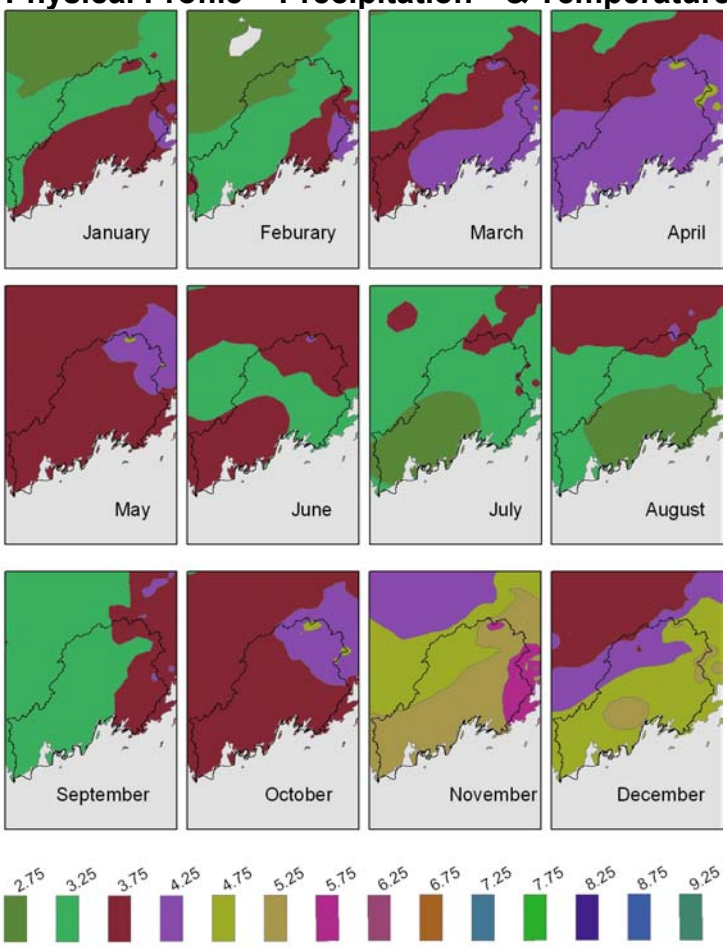
Over 67 percent of the watershed is forested. The majority of this area is mixed forest with both coniferous and deciduous species. Common hardwood species include beech, white birch, yellow birch, and sugar maple. Softwood species include hemlock, white pine, spruce, and balsam fir. Forests in this area are widely used for hunting and recreational purposes. A significant part of the forest lands are used for both residential and leisure home developments.

Much of the cropland is used to produce forage for dairy cattle. Small fruits and apples are also grown here and are often concentrated near population centers. The HUC is also located within the largest blueberry production area in the world. Many farmsteads in the area are also used as rural residences and many earn the living from non-farm occupations. Urban development is increasing within the watershed.

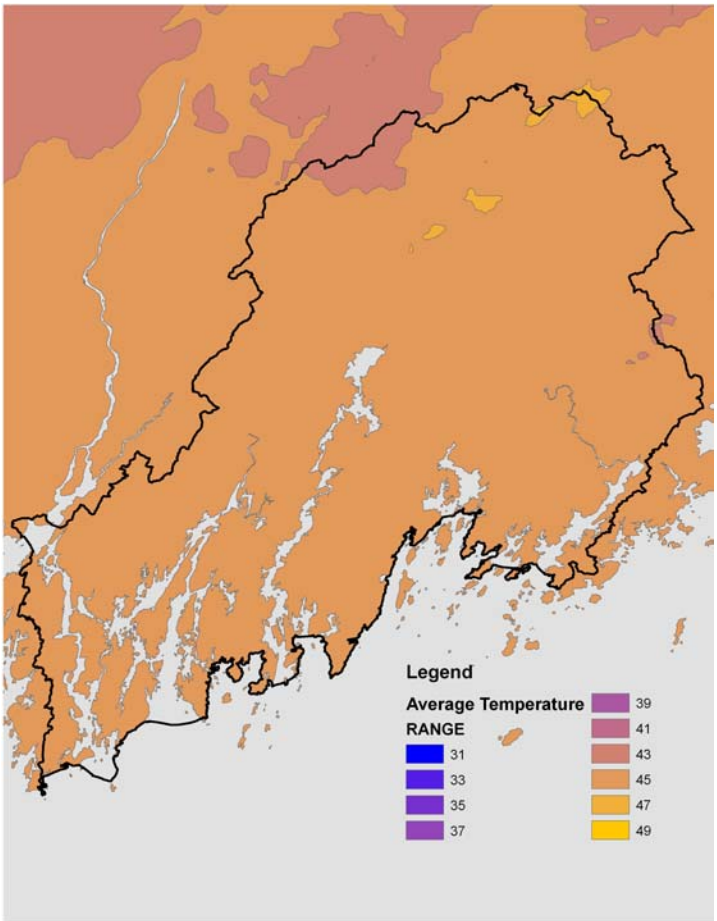
See Land Cover Statistics on Page 8

10-Digit Watersheds	Sheepscot River	St. George River	Medomak River	Damariscotta River	Johns Bay	Kennebec River Estuary	Sheepscot Bay	
Landcover Type								**Landcover Class Totals**
Developed Lands								
High intensity developed	321.19	870.29	288.35	305.58	25.53	406.39	129.42	**2346.73**
Medium intensit developed	536.67	1036.81	476.52	394.33	78.51	293.69	175.39	**2991.93**
Low intensity developed	1207.63	2635.65	1057.36	833.19	195.48	746.58	451.25	**7127.14**
Roads/runways	3360.88	4849.44	2445.76	2007.81	732.77	908.46	1472.75	**15777.88**
Open space developed	378.89	638.32	264.63	1061.46	70.01	905.44	669.80	**3988.54**
Total	**5805.25**	**10030.50**	**4532.62**	**4602.38**	**1102.30**	**3260.56**	**2898.60**	**32232.22**
Agricultural & Grasslands								
Cultivated crop	3348.62	3440.06	1947.00	774.67	265.84	107.05	73.46	**9956.70**
Pasture/hay	8245.22	12558.81	4521.37	3332.24	556.80	1487.54	1131.48	**31833.44**
Blueberry field	1420.78	3476.89	770.25	303.54	0.00	12.41	0.00	**5983.88**
Grassland/herbaceous	189.07	687.39	453.01	37.08	92.66	174.70	192.55	**1826.46**
Total	**13203.70**	**20163.15**	**7691.62**	**4447.53**	**915.30**	**1781.70**	**1397.48**	**49600.48**
Forested Lands								
Deciduous forest	34891.54	55928.57	18734.93	13094.27	6455.89	5679.65	5618.28	**140403.14**
Evergreen forest	20355.56	19627.21	19291.92	12507.51	4316.87	8569.69	14666.00	**99334.76**
Mixed forest	62669.78	38295.22	26916.05	19442.06	10481.14	17335.89	17184.50	**192324.63**
Wetland forest	6413.41	8445.63	6293.63	2238.77	1607.53	1655.08	455.55	**27109.61**
Total	**124330.28**	**122296.63**	**71236.54**	**47282.62**	**22861.43**	**33240.31**	**37924.33**	**459172.14**
Wetlands								
'Scrub/shrub'	2212.10	2666.01	1531.48	796.81	352.75	317.05	685.49	**8561.69**
Wetlands	5167.25	4869.57	3250.64	1511.65	1129.76	3706.80	2399.40	**22035.07**
Unconsolidated shore	727.84	3318.82	3129.15	962.30	428.79	223.13	1917.30	**10707.34**
Total	**8107.19**	**10854.41**	**7911.28**	**3270.76**	**1911.30**	**4246.98**	**5002.20**	**41304.10**
Forestry								
Recent clearcut	30.52	6.00	18.16	1.56	2.91	161.50	0.00	**220.65**
Light partial cut	1408.17	1278.47	745.49	1424.22	314.63	2221.67	2525.45	**9918.10**
Heavy partial cut	802.32	1357.49	260.55	767.06	80.09	377.06	414.85	**4059.42**
Regenerating forest	645.30	702.18	444.76	555.28	462.54	750.93	988.17	**4549.15**
Total	**2886.31**	**3344.14**	**1468.96**	**2748.13**	**860.17**	**3511.15**	**3928.46**	**18747.32**
Other								
Bare land	181.17	646.93	442.79	170.59	4.28	20.87	46.59	**1513.21**
Open water	6057.91	11083.32	4641.48	12583.06	2788.75	11226.54	21225.41	**69606.47**
Total	**6239.08**	**11730.25**	**5084.28**	**12753.65**	**2793.03**	**11247.41**	**21271.99**	**71119.68**
Total Watershed Area	**160571.81**	**178419.08**	**97925.30**	**75105.05**	**30443.52**	**57288.11**	**72423.07**	**672175.94**

Physical Profile – Precipitation[16] & Temperature[17]

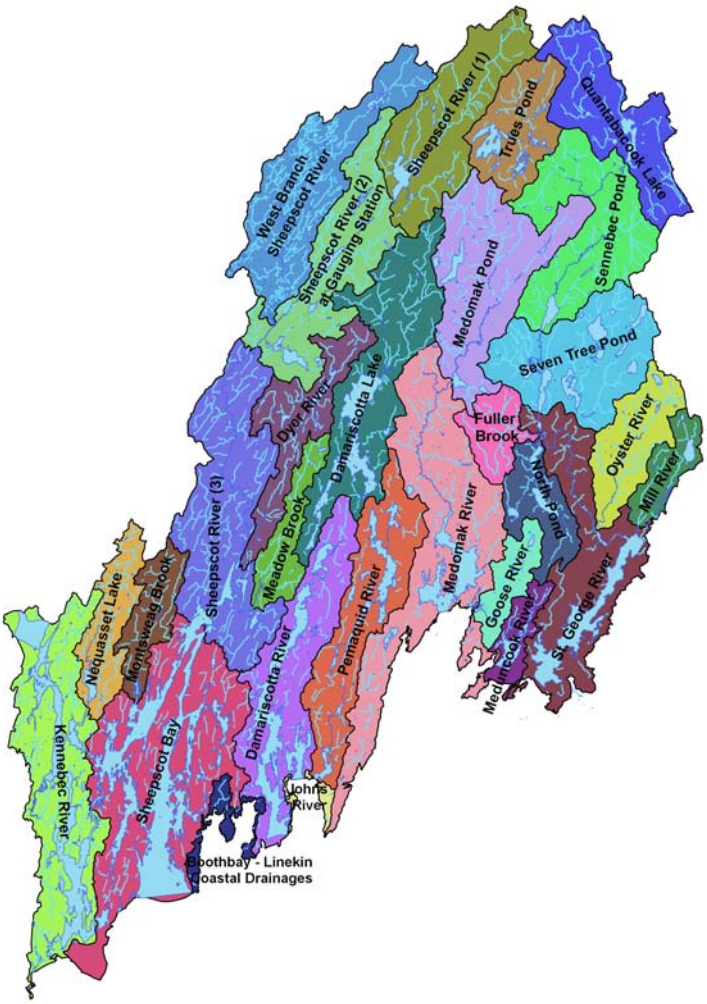


The majority of the HUC area averages between 42 and 48 inches per year with a few isolated areas receiving up to 52 inches per year. In general, precipitation is fairly evenly distributed throughout the year. Much of the summer precipitation falls during high intensity thunderstorm events, while much of the winter precipitation occurs in the form of rain or snow during moderate-intensity northeasters with much of the heavy snow occurring late in winter. The average annual temperature ranges between 43 and 47 degrees with an average freeze-free period of 160 days. This period can range from as little as 120 days to as many as 195 days. These averages increase from north to south and closer to the coast.



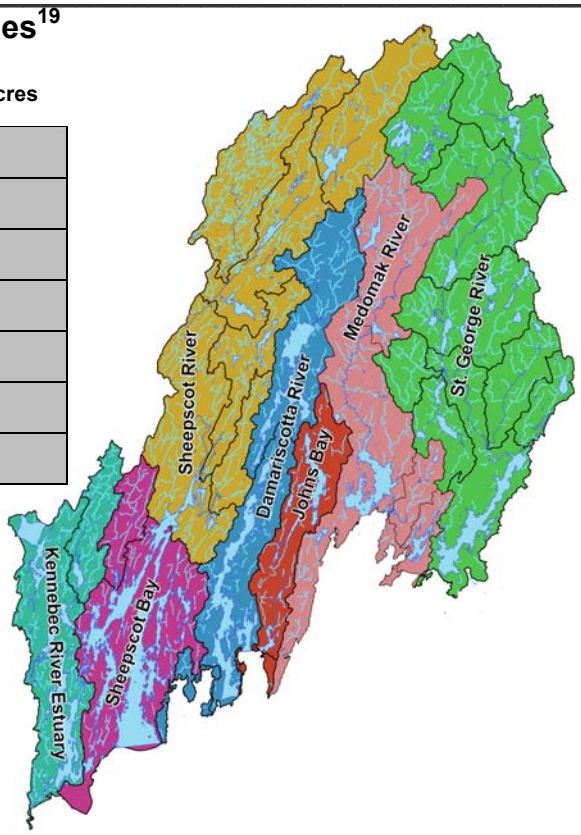
Hydrologic Profile - 12 Digit Watershed Area[18]

12 Digit Watershed	Acres	12 Digit Watershed	Acres
Sheepscot River (1)	29500	Mill River	7773
Quantabacook Lake	24628	Meadow Brook	9840
West Branch Sheepscot River	32615	North Pond	11674
Trues Pond	16953	Pemaquid River	29207
Sheepscot River (2) at Gauging Station	29869	Damariscotta River	33807
Sennebec Pond	31037	Goose River	7795
Medomak Pond	34151	Nequasset Lake	13120
Damariscotta Lake	37588	Montsweag Brook	10494
Seven Tree Pond	29961	Meduncook River	6161
Dyer River	17845	Kennebec River	44409
Sheepscot River (3)	41653	Sheepscot Bay	62248
Medomak River	50308	Boothbay - Linekin Coastal Drainages	4066
Oyster River	15417	Johns River	1382
Fuller Brook	8352		
St. George River	33552		



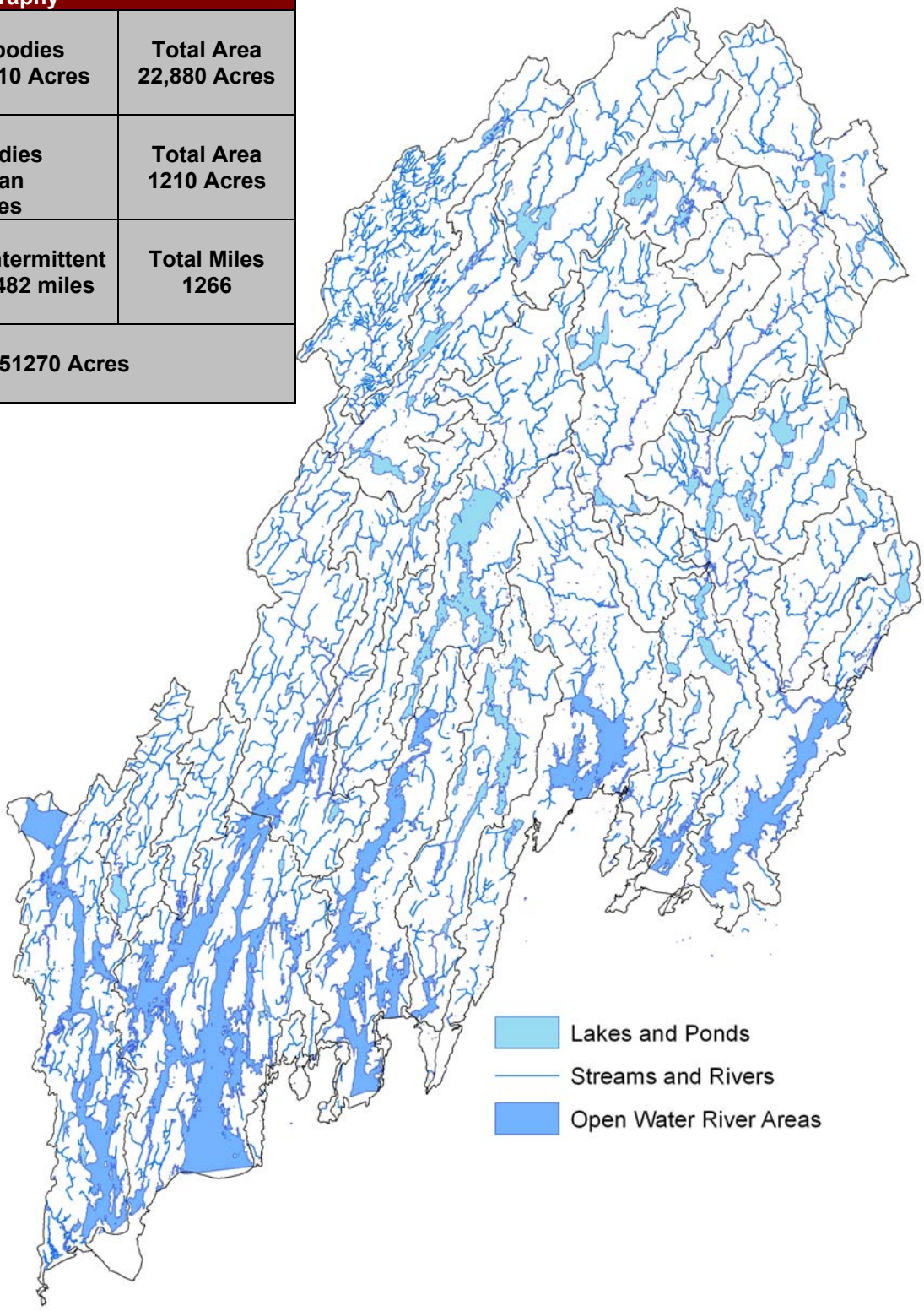
Hydrologic Profile - 10 Digit Watersheds & Waterbodies[19]

10 Digit Watershed	# of Great Ponds	Pond Acres	Watershed Acres
Damariscotta River	9	4882	75461
Johns Bay	10	2820	30589
Kennebec River Estuary	5	760	57529
Medomak River	15	1571	98415
Sheepscot River	32	4510	161322
Sheepscot Bay	9	374	72742
St. George River	46	7961	179347



Hydrologic Profile – Waterbodies[20]

Hydrography			
Major Lakes & Ponds	126 Waterbodies greater than 10 Acres		Total Area 22,880 Acres
Minor Lakes & Ponds	1889 Waterbodies less than 10 Acres		Total Area 1210 Acres
Miles of Streams & Rivers	Perennial 784 miles	Intermittent 482 miles	Total Miles 1266
Open Water River Areas	51270 Acres		

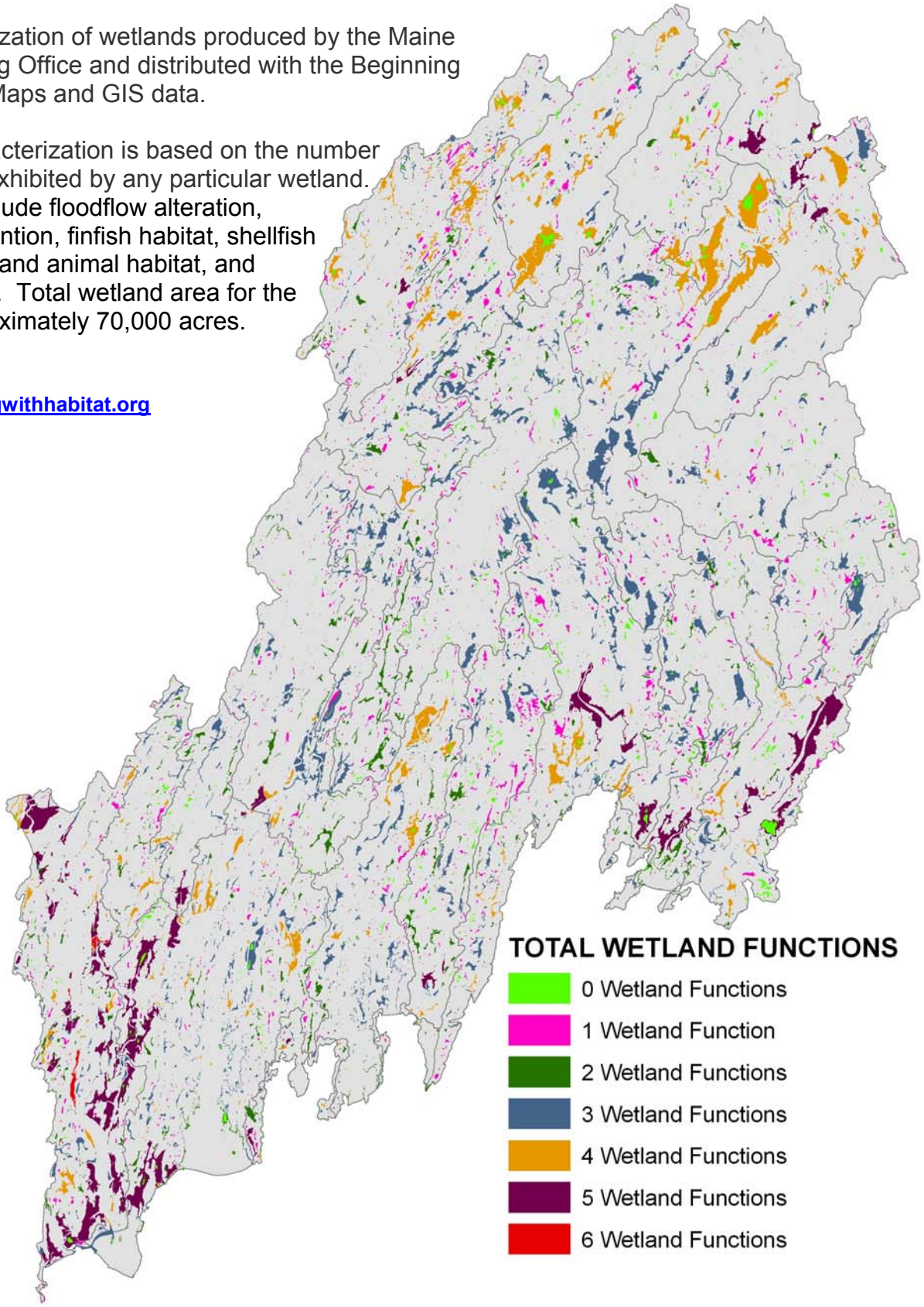


Hydrologic Profile – Wetlands[21]

Characterization of wetlands produced by the Maine State Planning Office and distributed with the Beginning with Habitat Maps and GIS data.

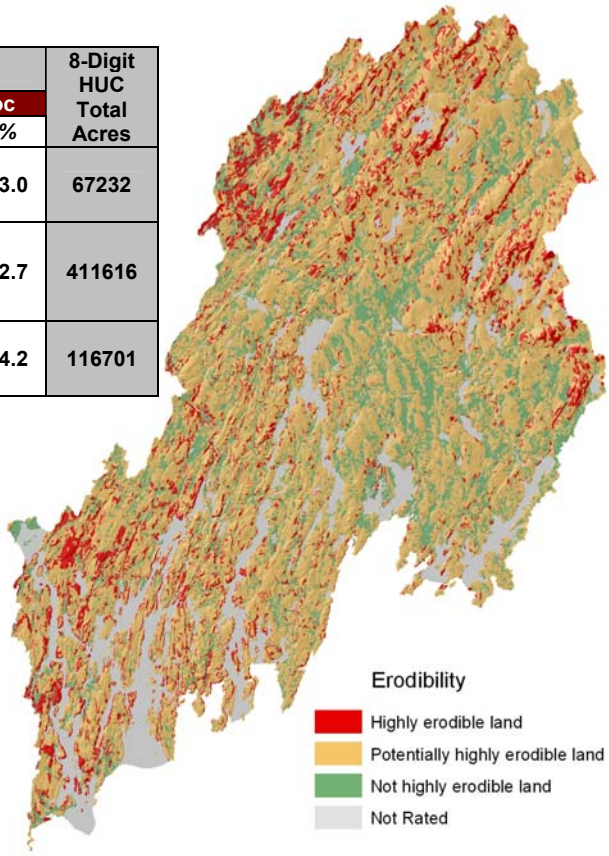
The Characterization is based on the number of functions exhibited by any particular wetland. Functions include floodflow alteration, sediment retention, finfish habitat, shellfish habitat, plant and animal habitat, and cultural value. Total wetland area for the HUC is approximately 70,000 acres.

www.beginningwithhabitat.org

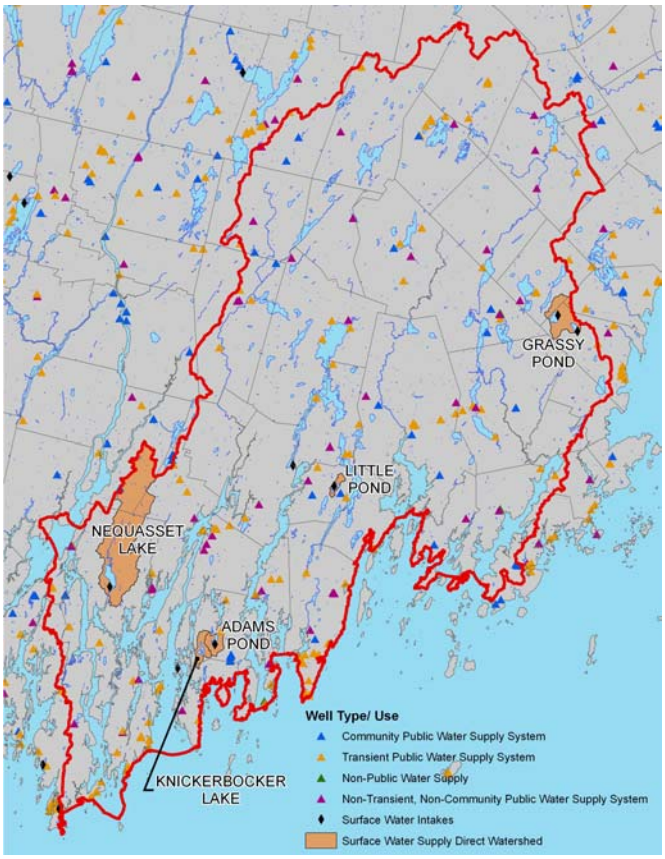


Resource Concerns – Erodibility[22]

Erodibility	County								8-Digit HUC Total Acres
	Kennebec		Knox/Lincoln		Waldo		Sagadahoc		
Classification	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*	
Highly Erodible Land	12519	36.6	38992	9.4	13350	13.9	14890	23.0	67232
Potentially Highly Erodible Land	14825	43.3	286177	69.3	70085	72.7	40529	62.7	411616
Not Highly Erodible Land	6855	20.0	87733	21.2	12909	13.4	9204	14.2	116701



Resource Concerns – Drinking Water Sources & Sole Source Aquifers[23]

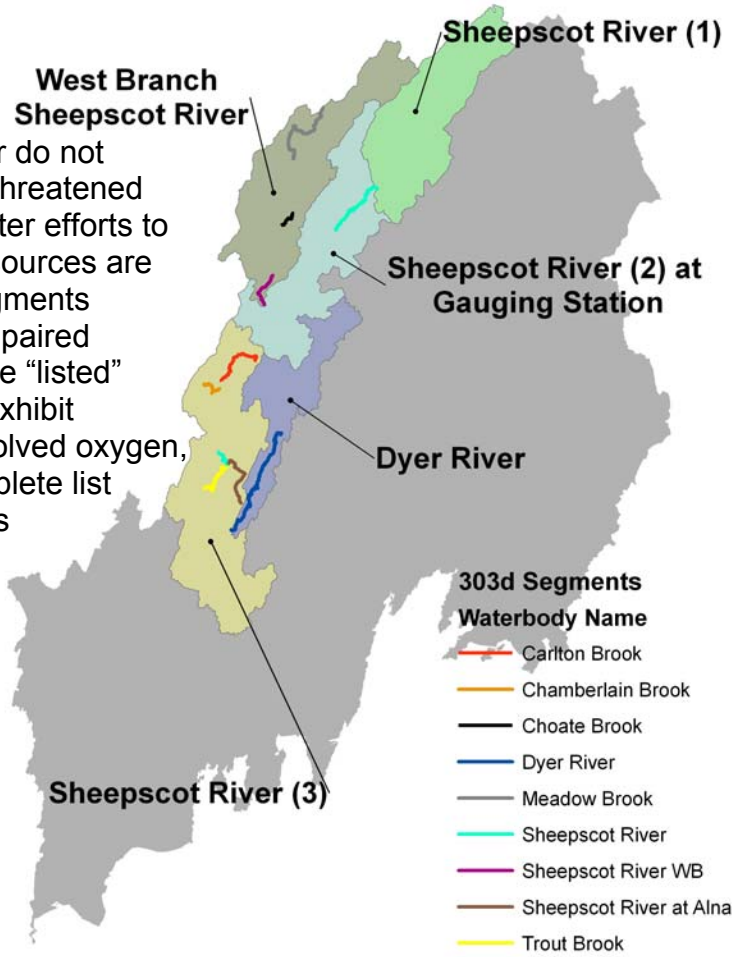


This map depicts watersheds of surface public water supplies and point locations of public wells. No sole source aquifers are contained within the HUC area

Surface Water Source	Watershed Area/Acres	Surface Water Area/Acres
NEQUASSET LAKE	13045	465
GRASSY POND	2684	190
ADAMS POND	947	78
KNICKERBOCKER LAKE	998	109
LITTLE POND	424	83

Resource Concerns - 303d Impaired River & Stream Segments[24]

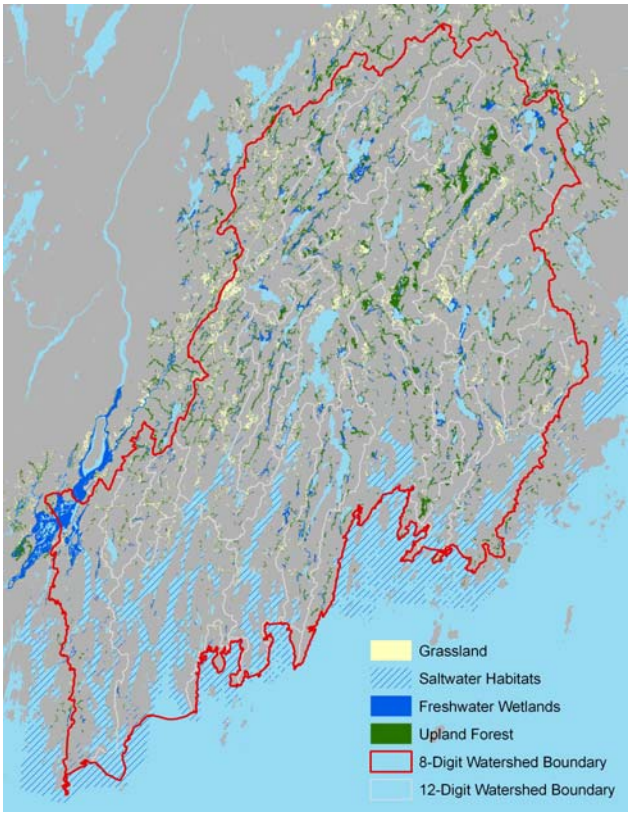
These segments have been identified by the State of Maine under section 303(d) of the Clean Water Act. The identified segments either do not meet water quality standards or are imminently threatened and are not expected to meet standards even after efforts to remediate point and non-point source pollution sources are implemented. It is important to note that the segments shown only include the available GIS data for impaired waters. Currently all fresh and marine waters are "listed" due to fish consumption advisories. Areas that exhibit deficiencies in other attainment areas such dissolved oxygen, NPS pollution, or bacteria are included in a complete list of all streams, rivers, lakes, and estuaries, and is available from the Maine Department of Environmental Protection at the following web address.
http://www.maine.gov/dep/blwq/docmonitoring/305b/



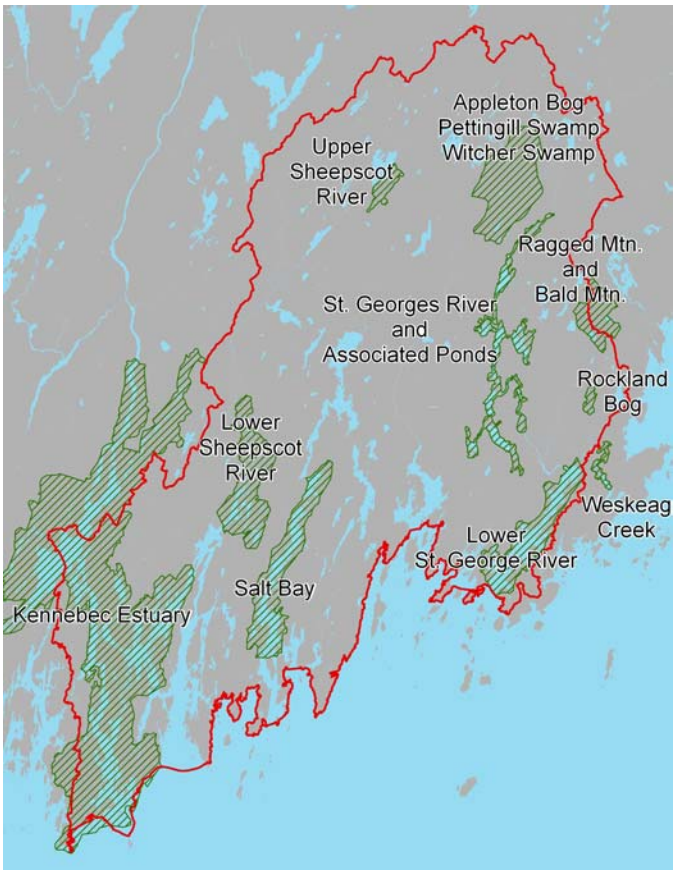
303d 12-Digit Watershed	12-Digit Watershed Area/Acres	303d Stream/River Segment	Length in Miles
Dyer River	17762	Dyer River	9.35
Sheepscot River (2) at Gauging Station	29729	Sheepscot River	6.59
Sheepscot River (3)	41465	Carlton Brook Chamberlain Brook Sheepscot River at Alna Trout Brook Sheepscot River	3.94 1.76 3.48 3.43 0.39
West Branch Sheepscot River	32465	Choate Brook Meadow Brook Sheepscot River WB	1.33 5.94 2.29
Totals:	**121421**	**10 Classified Segments**	**38.50**

Resource Concerns – Gulf of Maine Program Top 25% Rated Habitat Areas[25]

This data was created by the United States Fish and Wildlife Service as part of the Gulf of Maine Program and represents a composite of individual habitat maps for 64 Priority Trust Species. The top 25% of the mapped habitat is considered to be the most important and is broken out into the four basic cover types. This data is also available as part of the Beginning with Habitat program.



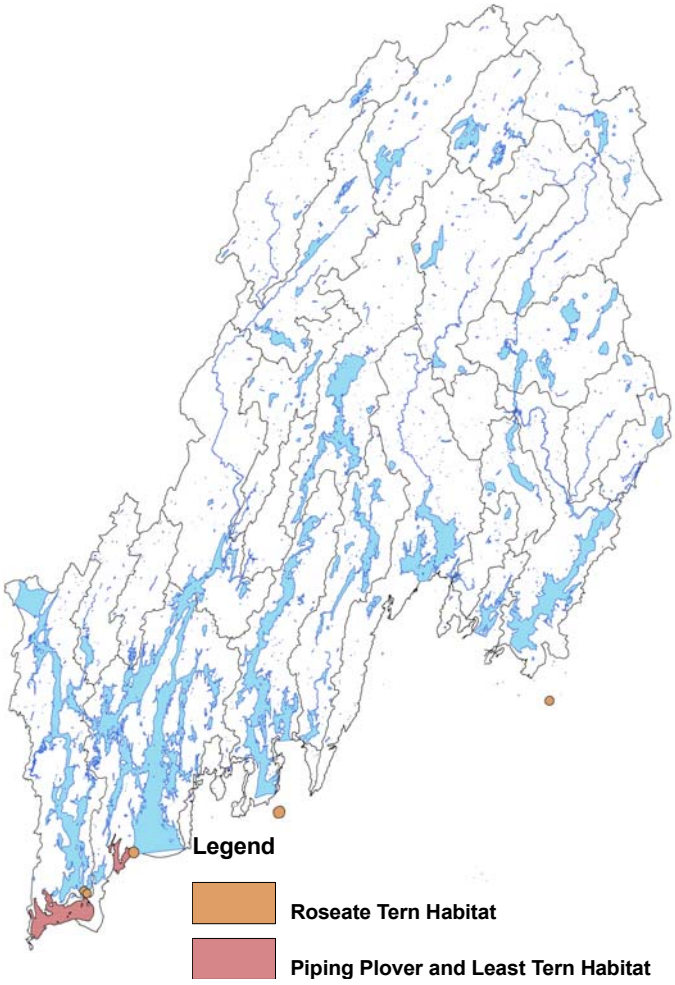
Resource Concerns – Focus Areas of Ecological Significance[26]

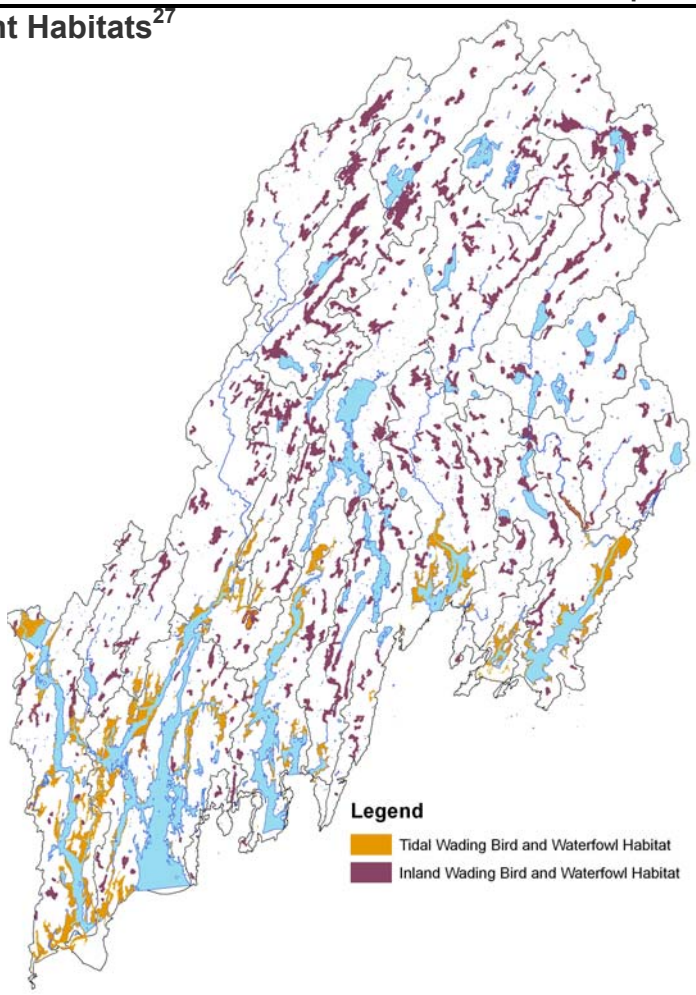


Also available through the Beginning with Habitat program, Focus Areas are identified through a selection process and exhibit at least one, but usually several, of the programs data elements. The areas are designed to bring attention to areas with concentrations of known rare and significant plant and animal habitats. Each area has an accompanying fact sheet that includes a description of the area and associated species occurrence, as well as, other useful tools. They are also available through the program website.

www.beginningwithhabitat.org

Resource Concerns – Essential and Significant Habitats[27]



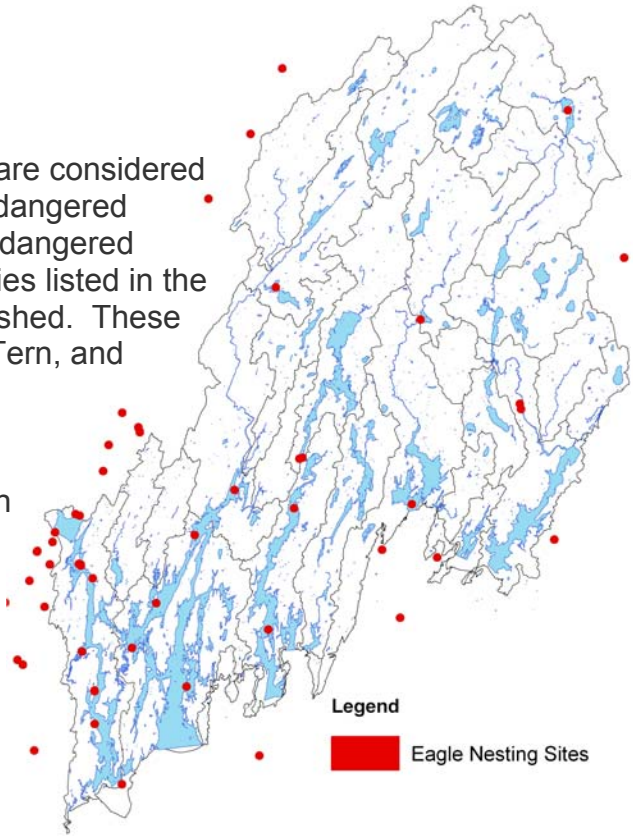


Essential Habitat data represents areas that are considered essential to protect and conserve habitats of Endangered and Threatened species identified in Maine's Endangered Species Protection Act (MESA). Of the 43 species listed in the Act, only four have had Essential Habitat established. These include the Roseate Tern, Piping Plover, Least Tern, and Bald Eagle.

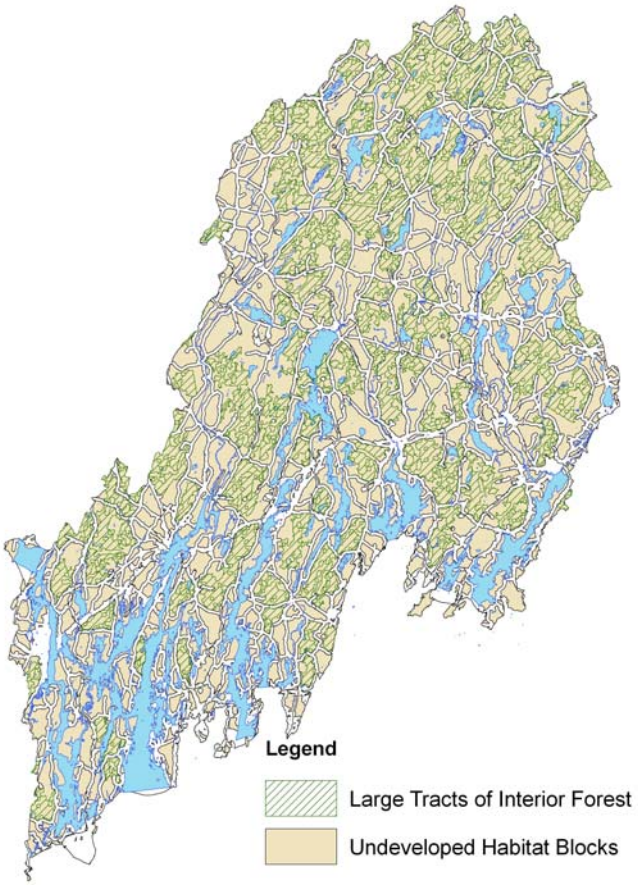
Tidal and Inland Wading Bird and Waterfowl habitats have been mapped to provide protection for the specific habitats under the Natural Resources Protection Act (NRPA).

Much more detailed information for this data can be obtained through the Maine's Beginning with Habitat Program.

www.beginningwithhabitat.org



Resource Concerns – Unfragmented Habitat[28]



Large tracts of interior forests offer habitat that is generally undisturbed and unfragmented by roads, development, and agriculture. There are approximately 130,000 acres currently existing within the HUC boundaries.

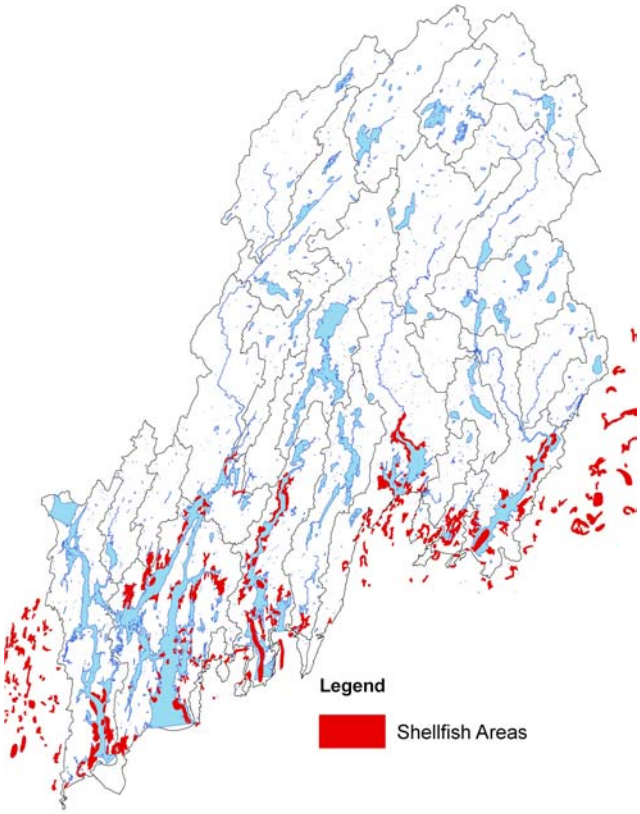
Undeveloped habitat blocks generally represent all areas that are not fragmented by a major road (town and state), or developed area. The data includes forest, grassland/ agricultural land, and wetlands.

www.beginningwithhabitat.org

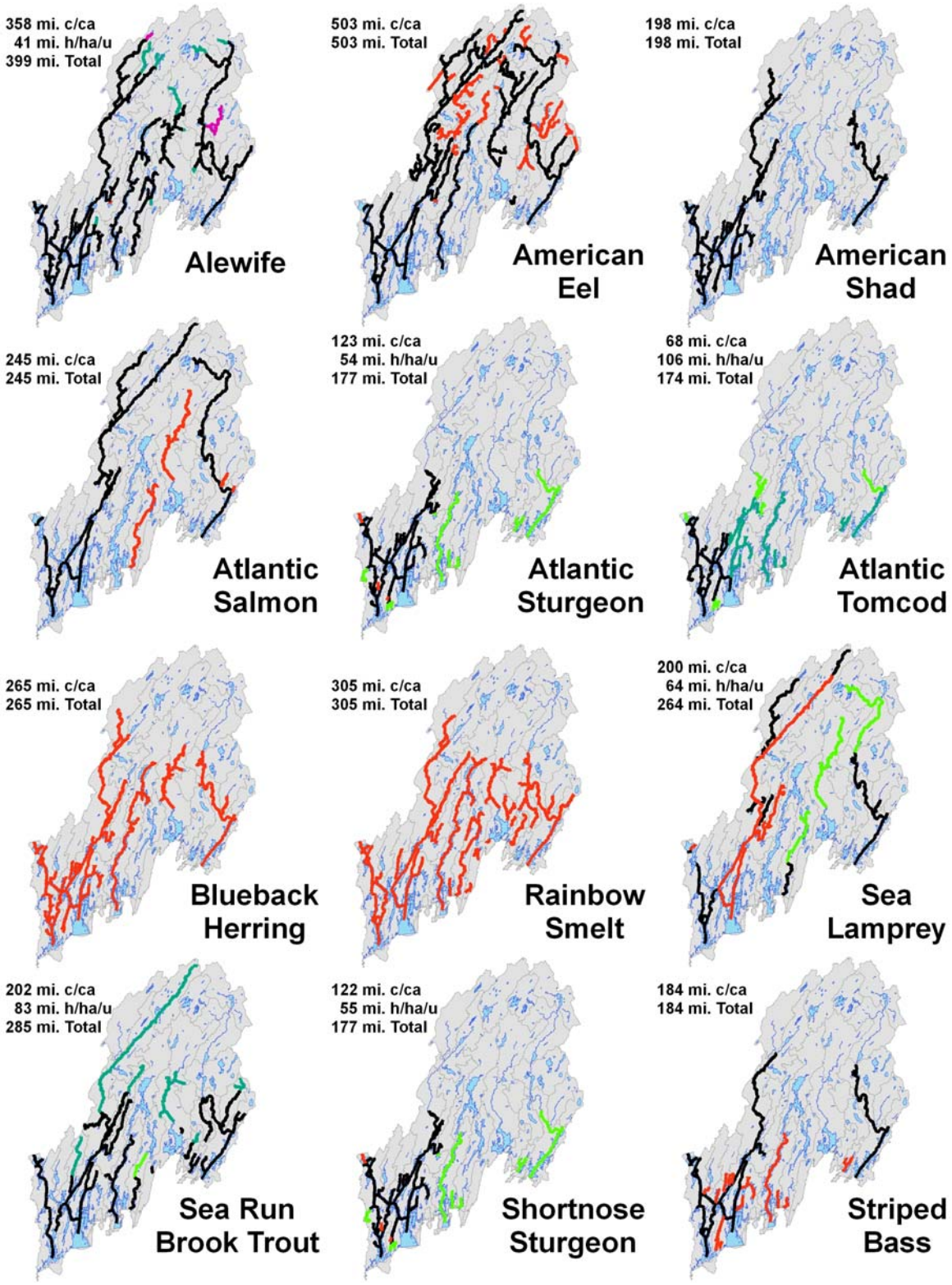
Resource Concerns – Shellfish Areas[29]

There are approximately 10,200 acres of shellfish areas occurring within the watershed. This industry is a significant economic contributor in many of the local coastal communities. These areas often are subject to closures due to bacteria, point source and non-point source pollution, overboard discharges, and toxics. A listing of currently closed shellfish areas requiring TMDLs, as well as, the specific pollutant or source affecting the area, can be obtained from the Maine Department of Environmental Protection website.

http://www.maine.gov/dep/blwq/docmonitoring/305b/



Resource Concerns – US Fish and Wildlife Diadromous Fish Habitat[30]



Diadromous Fish Presence

Current (c) — *Current distribution and / or access of the species in this stream segment based on documentation and / or biologists knowledge.*

Current Assumed (ca) — *Assumed current distribution and / or access of the species in this stream segment based on undocumented sources and / or assumed inferences of the best judgement of fisheries biologists.*

Historic (h) — *Historic distribution and / or access of the species in this stream segment based on documentation and / or biologists' knowledge. Historic distribution refers to the habitat that was utilized prior to anthropogenic changes to the watershed hydrology.*

Historic Assumed (ha) — *Assumed historic distribution and / or access of the species in this stream segment based on undocumented sources and / or assumed inferences of the best judgement of fisheries biologists. Historic distribution refers to the habitat that was utilized prior to anthropogenic changes to the watershed hydrology.*

Uncertain (u) — *Distribution or access (historic or current) in this area is uncertain. Fisheries biologisits are uncertain if the species has (or had) access to this stream segment or if it is currently or historically present. More information is needed to determin species' historic or current presence / access.*

Assessment Matrix – Conservation Practrices

Conservation Practice: Fencing (382)

Fencing: "Enclosing or dividing an area of land with a suitable permanent structure that acts as a barrier to livestock, big game, or people (does not include temporary fences.) Based on a 1000 linear foot project"[i]

Cost Category	Item	Quantity of Inputs	Input Unit Cost	Input Unit	Practice Unit Cost	Total Cost
Materials	Barb Wire (12-1/2GA)	609	60.00	each	0.18	36540.00
Materials	Fence Staples	2030	4.00	lb	0.04	8120.00
Labor	Labor	11774	13.00	hr	0.76	153062.00
Materials	Cedar Posts	12180	3.33	each	0.20	40559.00
Materials	Cedar Rail	2030	4.00	each	0.04	8120.00
Labor	Labor (skidder)	3248	16.25	hr	0.26	52780.00
Labor	Labor (Saw)	3248	16.25	hr	0.26	52780.00
Equipment/Installation	Skidder	3248	44.38	hr	0.71	144146.24
Equipment/Installation	Four Wheeler	3248	26.25	hr	0.42	85260.00
Total					**$2.87**	**$581,367.24**

Note: These numbers are based on GIS data. Actual miles of fencing may vary.
Total miles of fence needed = 38.5 miles

Conservation Practice: Nutrient Management (590)

Nutrient Management: "Managing the amount, source, placement, form and timing of the application of nutrients and soil amendments. Numbers are based on a 100 acre farms. Time involved includes collecting samples, interpreting results, and managing the amount, source, placement, form, and timing of all nutrients and soil amendments."[ii]

Cost Category	Item	Quantity of Inputs/per farm	Input Unit Cost	Input Unit	Number of Farms*	Total Cost
ACQ of Tech Knowledge	Soil Tests (standard)	10 (per farm)	12.00	sample	100	1200.00
ACQ of Tech Knowledge	Manure Test	1	20.00	sample	100	2000.00
Labor	Management Time	80	26.00	hr	100	208,000.00
ACQ of Tech Knowledge	Hired Consultant	10	55.00	hr	100	55,500.00
Total						**$266,200.00**

* Number of farms based on calculations (estimations) of farms without nutrient management plans from Areawide Conservation Plan for HUC 01050003 Coastal Drainages East of Small Point.

Assessment Matrix – Conservation Practices cont.

Conservation Practice: Riparian Forest Buffer (391)

Riparian Forest Buffers in areas of Agricultural Land Use: "An area of predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies. This scenario involves planting 2 types of hardwood trees at a 10X10 spacing and 2 types of shrubs at a 6X6 spacing, with shelters on all trees and mats on all trees and shrubs."[iii]

Streams (Average Buffer is 75')

Cost Category	Item	Quantity of Inputs	Input Unit Cost	Input Unit	Cost Per Acre	Acres needing buffers*	Total Cost
Materials	Trees	242	1.87	each	452.54	1483	671,116.82
Materials	Shrubs	202	1.87	each	377.74	1483	560,188.42
Materials	Tree Shelves w/stakes	242	3.73	each	902.66	1483	1,338,644.78
Materials	Mats and pins	444	1.87	each	830.28	1483	1,231,305.24
Labor	Planting Labor	444	1.87	plant	830.28	1483	1,231,305.24
Equipment/Installation	Light site prep	1	124.44	acre	124.44	1483	184,544.52
Total					**$3517.94**		**$5,217,102.02**

Rivers (Average Buffer is 250')

Cost Category	Item	Quantity of Inputs	Input Unit Cost	Input Unit	Cost Per Acre	Acres needing buffers*	Total Cost
Materials	Trees	242	1.87	each	452.54	586	265,188.44
Materials	Shrubs	202	1.87	each	377.74	586	221,355.64
Materials	Tree Shelves w/stakes	242	3.73	each	902.66	586	528,958.76
Materials	Mats and pins	444	1.87	each	830.28	586	486,544.08
Labor	Planting Labor	444	1.87	plant	830.28	586	486,544.08
Equipment/Installation	Light site prep	1	124.44	acre	124.44	586	72,921.84
Total					**$3517.94**		**$2,061,512.84**

Lakes and Ponds (Average Buffer is 250')

Cost Category	Item	Quantity of Inputs	Input Unit Cost	Input Unit	Cost Per Acre	Acres needing buffers*	Total Cost
Materials	Trees	242	1.87	each	452.54	574	259,757.96
Materials	Shrubs	202	1.87	each	377.74	574	216,822.76
Materials	Tree Shelves w/stakes	242	3.73	each	902.66	574	518,126.84
Materials	Mats and pins	444	1.87	each	830.28	574	476,580.72
Labor	Planting Labor	444	1.87	plant	830.28	574	476,580.72
Equipment/Installation	Light site prep	1	124.44	acre	124.44	574	71,428.56
Total					**$3517.94**		**$2,019,297.56**

Total for Streams, Rivers, Lake and Ponds Combined **$9,298,005.42**
Total Acres of Riparian Buffer (191 ft Average) = 2643 Acres

***Assessment is only in the beginning stages. These numbers are based on GIS data. Actual number of acres may vary.**

Assessment Matrix – Conservation Practices cont.

Conservation Practice: Fish Passage (396)

Fish Passage: "Installation of arched culvert (12' wide x 5' tall), 48 feet long. Removal of existing culvert. Data from cost estimate of actual site in Washington County. Significant site prep (seeding and mulching, erosion and sediment control, dewatering, riprap, and backfill) required during installation."[iv]

Cost Category	Item	Quantity of Inputs	Input Unit Cost	Input Unit	Cost per culvert	Number of culverts*	Total Cost
Materials	Pipe and footings	48	297.50	ft	14,280.00	16	228,480.00
Equipment/Installation	Assembly	48	42.50	ft	2040.00	16	32,640.00
Mobilization	Mobilization	48	42.50	ft	2040.00	16	32,640.00
Equipment/Installation	Dewatering	48	42.50	ft	2040.00	16	32,640.00
Equipment/Installation	Pipe Removal/site prep	48	42.50	ft	2040.00	16	32,640.00
Equipment/Installation	Pipe installation	48	42.50	ft	2040.00	16	32,640.00
Equipment/Installation	Pipe backfill	110	20.00	cy	2200.00	16	35,200.00
Materials	Riprap and bed	40	40.00	cy	1600.00	16	25,600.00
Materials	Road fill	375	14.00	cy	5250.00	16	84,000.00
Equipment/Installation	Channel work	25	25.00	ft	625.00	16	10,000.00
Materials	Seeding and Mulching	48	21.25	ft	1020.00	16	16,320.00
Materials	E&S control	48	10.63	ft	510.24	16	8,163.84
Total			**$640.88**		**$35,685.24**		**$570,963.84**

Fish Ladders (396)

Fish Passage: "Alaskan Steepass. Fish ladder has to cover up to 6 vertical feet. Two gates will be required for the stop log bays for water level control, attraction flow control, and downstream fish passage. Gates will be similar to 60" x 60" sluice gate, heavy duty, self-contained with crank operation gate (cost from RS Means Heavy Construction Cost Data 2007, supplied by Kleinschmidt engineer Matt Bernier)."[v]

Cost Category	Item	Quantity of Inputs	Input Unit Cost	Input Unit	Cost per ladder	Number of ladders*	Total Cost
Materials	Fish ladder construction	6	17,212.25	vf	103,275.00	3	309,825.00
Materials	Gate construction	2	31,824.00	each	63,648.00	3	190,944
Materials	Riprap	100	53.35	cyd	5355.00	3	16,065.00
Total			**$49,089.60**		**$172,278.00**		**$516,834.00**
Total Cost for Arched Culverts and Fish Ladder							**$1,097,797.84**

***The assessment phase is in the beginning stages throughout HUC 01050003. It is anticipated that these number will be higher.**

Assessment Matrix _ Conservation Practices cont.

Conservation Practice: Stream Crossings (578)						
Stream Crossing: "Small culvert for access road or forest trail, 12" to 24" in diameter, ADS N-12 smooth interior PE pipe, 20 foot length. Cost is the average of 12", 15", 18", and 24" diameter pipes."[vi]						
Cost Category	**Item**	**Quantity of Inputs**	**Input Unit Cost**	**Input Unit**	**Number of crossings***	**Total Cost**
Materials	ADS N-12 Smooth Interior Pipe	1	262.50	each	5	1312.50
Equipment/Installation	Installation of Pipe (engineers estimate)	1	262.50	each	5	1312.50
Total			**$525.00**			**$2625.00**
*** The assessment phase is in the beginning stages throughout HUC 01050003. It is anticipated that these number will be higher.**						

[1] NRCS eFOTG. http://efotg.nrcs.usda.gov/references/public/ME/Typical_Conservation_Practice_Cost.pdf
[1] NRCS eFOTG. http://efotg.nrcs.usda.gov/references/public/ME/Typical_Conservation_Practice_Cost.pdf
[1] NRCS eFOTG. http://efotg.nrcs.usda.gov/references/public/ME/Typical_Conservation_Practice_Cost.pdf
[1] NRCS eFOTG. http://efotg.nrcs.usda.gov/references/public/ME/Typical_Conservation_Practice_Cost.pdf
[1] NRCS eFOTG. http://efotg.nrcs.usda.gov/references/public/ME/Typical_Conservation_Practice_Cost.pdf
[1] NRCS eFOTG. http://efotg.nrcs.usda.gov/references/public/ME/Typical_Conservation_Practice_Cost.pdf

Assessment Matrix – Conservation Practices Physical Effects

Conservation Practices Physical Effects (CCPE)[vii]						
Resource Concern Category	Practice	Fencing	Fish Passage	Nutrient Management	Riparian Buffer	Stream Crossing
	Practice Code	382	396	590	391	578
	Resource Concern					
Air Quality	Adverse Air Temperature				2	
	NH^3- Ammonia			2		
	Chemical Drift				2	
	Excessive Greenhouse Gas – CH4					
	Excessive Greenhouse Gas - CO^2				5	
	Excessive Greenhouse Gas - N^2O			1		
	Excessive Ozone					
	Objectionable Odors			2	1	
	Reduced Visibility					
	Undesirable Air Movement				2	
Domestic Animals	Inadequate Quantities and Quality of Feed and Forage	2		4		
	Inadequate Stock Water					
Fish and Wildlife	Imbalance Among & Within Populations		5		5	
	Inadequate Cover/Shelter		4	2	5	-1
	Inadequate Food		4	1	5	
	Inadequate Space	-1	5		5	-1
	Inadequate Water		5			
	T&E F&W Species: F&W Species Listed or Proposed for Listing Under the ESA		5	3	5	2
	Habitat Fragmentation	-1	5		5	-1
	T&E Species: Declining Species, Species of Concern		5	2	5	2
Plant Condition	Forage Quality and Palatability	2		5		
	Noxious and Invasive Plants				2	
	Plants not Adapted or Suited	2		1	4	
	Productivity, Health and Vigor	3		4	5	
	T or E Plant Species: Plant Species Listed or Proposed for Listing Under the ESA				2	
	Wildlife Hazard					
	T or E Plant Species: Declining Species, Species of Concern				2	

Assessment Matrix – Conservation Practices Physical Effects

Conservation Practices Physical Effects (CCPE)						
Resource Concern Category	Practice	Fencing	Fish Passage	Nutrient Management	Riparian Forest Buffer	Stream Crossing
	Practice Code	**382**	**396**	**590**	**391**	**578**
	Resource Concern					
Soil Condition	Compaction				3	
	Contaminants – Residual Pesticides					
	Damage from Sediment Deposition					
	Organic Matter Depletion			1	3	
	Contaminants: Animal Waste and Other Organics - Nitrogen			2		
	Contaminants: Commercial Fertilizer - Nitrogen			3		
Soil Erosion	Classic Gully				1	
	Ephemeral Gully				1	
	Irrigation - induced					
	Road, Road Sides & Construction Sites					
	Sheet and Rill				1	
	Shoreline				3	
	Streambank		2		3	3
Water Quality	Excessive Nutrients & Organics in Groundwater			5	1	
	Excessive Nutrients & Organics in Surface Water			5	4	2
	Excessive Suspended Sediment & Turbidity in Surface Water				5	2
	Harmful Levels of Pathogens in Groundwater			1		2
	Harmful Levels of Pathogens in Surface Water			3	3	
	Harmful Levels of Pesticides in Surface Water				4	
	Harmful Levels of Pesticides in Groundwater				3	
	Harmful Temperatures of Surface Water		2		5	
Water Quantity	Drifted Snow					
	Excessive Runoff, Flooding or Ponding					
	Excessive Seepage					
	Excessive Subsurface Water					
	Inadequate Outlets		1			1
	Inefficient Water Use on Irrigated Land					
	Inefficient Flows in Water Courses					
	Reduced Capacity of Conveyances by Sediment Deposition		2		4	
	Reduced Storage of Water Bodies by Sediment Accumulation				4	

Assessment Matrix

Key to Understanding Ratings	
Rating	***Relation to Resource Concern***
-5	Significant Increase
-4	Moderate to Significant Increase
-3	Moderate Increase
-2	Slight to Moderate Increase
-1	Slight Increase
Blank	Insignificant or Neutral
1	Slight Decrease
2	Slight to Moderate Decrease
3	Moderate Decrease
4	Moderate to Significant Decrease
5	Significant Decrease
An increase, signified by as negative number is indicative of an intensifying of the resource concern; while a decrease, which is a positive number denotes a lessening of the concern.	

[1] NRCS: eFOTG. http://efotg.nrcs.usda.gov/references/public/ME/ME_CPPE_eFOTG_2008.pdf

Citations

1. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). **wbdme6_a** [ESRI .shp]. Edition 2.1: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 2004/03/28.

2. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), National Soil Survey Center (NSSC). **cra_nat_us48** [Arc/Info .e00]. v1.1: Natural Resources Conservation Service (NRCS) National Coordinated Common Resource Area (CRA) Geographic Database. http://soils.usda.gov/survey/geography/cra.html.

3. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), National Coordinated Common Resource Area Geographic Database Legend. v1.2: 1/16/2004. http://soils.usda.gov/survey/geography/cra.html.

4. Maine Office of Geographic Information Systems (MEGIS). **metwp24** [ESRI .shp]. v2: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 2007/07/01.

5. Maine Office of Geographic Information Systems (MEGIS). **cnty24** [ESRI .shp]. v2: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 2005/05/06.

6. Fredenburg, Jeff. "USDA/Time & Tide/Soil & Water District Service Areas". Scale NTS: Kennebec Soil & Water Conservation District, Augusta, ME. 2007/11/21.

7. U.S. Department of Commerce (USDOC), Bureau of the Census (USCB), Maine Office of Geographic Information Systems (MEGIS) (comp., ed.). **mcdccd00** [ESRI .shp]: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 2001/11/01.

   Joined Table
   Maine Census Consortium. **POPMAPS** [.dbf]: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 2001/11/29.
   Analysis of Census 1990-2000 county subdivisions (CCDs) for Maine, developed by the Maine Census Consortium. The file relates to MCDCCD00 and includes populations 00/90, numeric and percent population change, population density 2000 and density change. Publication Date: 11/29/2001.

8. USDA, National Statistics Service. (1997 & 2002). *1997 Census of Agriculture – County Data and 2002 Census of Agriculture County Data.* Retrieved 13 Sep. 2007 from http://www.nass.usda.gov/census/census97/profiles/me/mepb008.pdf and http://www.nass.usda.gov/census/census02/volume1/me/st23_2_001_001.pdf

9. Ibid.

10. Maine Census Consortium. **POPMAPS** [.dbf]: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 2001/11/29.

Analysis of Census 1990-2000 county subdivisions (CCDs) for Maine, developed by the Maine Census Consortium. The file relates to MCDCCD00 and includes populations 00/90, numeric and percent population change, population density 2000 and density change. Publication Date: 11/29/2001.

11. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), National Soil Survey Center (NSSC**). statsgo** [ESRI .shp]: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 1994/12/31.

12. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Maine Office of Geographic Information Systems (MEGIS) (comp.). **ssa_s** [ESRI .shp]: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 2005/03/09.

13. Fredenburg, Jeff. "Elevation". ArcMap v. 9.2. 10m DEM Mosaic. H:\gis\GISData\WatershedProjects\RWA\CoastalDrainagesEast of Small Point\Elevation. Scale NTS: Kennebec Soil & Water Conservation District, Augusta, ME. 2007/09/21.

14. Fredenburg, Jeff. "Slope". ArcMap v. 9.2. 10m DEM Mosaic. H:\gis\GISData\WatershedProjects\RWA\CoastalDrainagesEastofSmallPoint\Slope. Scale NTS: Kennebec Soil & Water Conservation District, Augusta, ME. 2007/09/21.

15. Maine Library of Geographic Information (MLGI), Maine Department of Environmental Protection (MEDEP), Maine Department of Inland Fisheries and Wildlife (MEIFW), Maine Department of Transportation (MEDOT), Maine Department of Health and Human Services, with the Maine GIS Executive Council (GISEC), U.S. Geological Survey (USGS), National Oceanographic and Atmospheric Administration (NOAA), Space Imaging (SI), and Sanborn. **melcd** [ESRI GRID (5m)]: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 2004/11/11.

16. Daly, Chris, and Taylor, George**,** Natural Resources Conservation Service (NRCS) Water and Climate Center, NRCS National Cartography and Geospatial Center (NCGC), PRISM Model, and the Oregon Climate Service at Oregon State University. **me_poly** [ESRI .shp], Maine Average Monthly or Annual Precipitation, 1961-1990: Water and Climate Center of the Natural Resources Conservation Service, Portland, Oregon. 1998/04. http://datagateway.nrcs.usda.gov/GatewayHome.html

17. USDA/NRCS - National Cartography & Geospatial Center. **temp_a_me** [ESRI shp.] Processed Annual Average Temperature 1971-2000: National Cartography and Geospatial Center. Fort Worth, Texas. 2006. http://datagateway.nrcs.usda.gov/GatewayHome.html

18. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). **wbdme6_a** [ESRI .shp]. Edition 2.1: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 2004/03/28.

19. Ibid.

20. NHD 24 [CD-ROM]. United States Geological Survey: Natural Resource Conservation Service State Office. Bangor, ME. 10/2007. http://nhd.usgs.gov/index.html.

21. Habitat Data Layers [CD-ROM]. Augusta, ME: Maine Department of Inland Fisheries and Wildlife / Beginning with Habitat. 8/21/2007. www.beginningwithhabitat.org.

22. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Maine Office of Geographic Information Systems (MEGIS) (comp.). **ssa_s** [ESRI .shp]: Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 2005/03/09.

23. Maine Office of Geographic Information Systems (MEGIS). **dirsheds** [ESRI .shp]: Source Water Protection Area (SWPA). Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/. 4/2004.

24. Maine Department of Environmental Protection (MDEP). **303d_NHDSegments** [ESRI.shp.]. 2006.

25. Gulf of Maine Watershed Habitat Analysis v 3.1 [CD-ROM]. Falmouth, ME: US Fish and Wildlife Service / Beginning with Habitat. 09/10/2003. http://gulfofmaine.fws.gov / www.beginningwithhabitat.org.

26. Habitat Data Layers [CD-ROM]. Augusta, ME: Maine Department of Inland Fisheries and Wildlife / Beginning with Habitat. 8/21/2007. www.beginningwithhabitat.org.

27. Ibid.

28. Ibid.

29. Maine Department of Marine Resources (MEDMR). Augusta, ME. 1/1/1995: **shells** [ESRI .shp]:. Maine Office of Geographic Information Systems (MEGIS) http://megis.maine.gov/catalog/.

30. Houston, R., K. Chadbourne, S. Lary and B. Charry. 2007. Geographic Distribution of Diadromous Fish in Maine [CD-ROM v1.0].U.S. Fish & Wildlife Service and Maine Audubon Society, Falmouth, Maine.

[i] NRCS eFOTG. http://efotg.nrcs.usda.gov/references/public/ME/Typical_Conservation_Practice_Cost.pdf
[ii] NRCS eFOTG. http://efotg.nrcs.usda.gov/references/public/ME/Typical_Conservation_Practice_Cost.pdf
[iii] NRCS eFOTG. http://efotg.nrcs.usda.gov/references/public/ME/Typical_Conservation_Practice_Cost.pdf