GROWING AREA EQ

Seawall Point, Roque Bluffs to Starboard Island, Machiasport
Washington County, Maine

SANITARY SURVEY REPORT

FINAL REPORT DATE: 2015

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APPROVAL

Division Director:

_____ _____ Date: _____
Print name signature

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Executive Summary

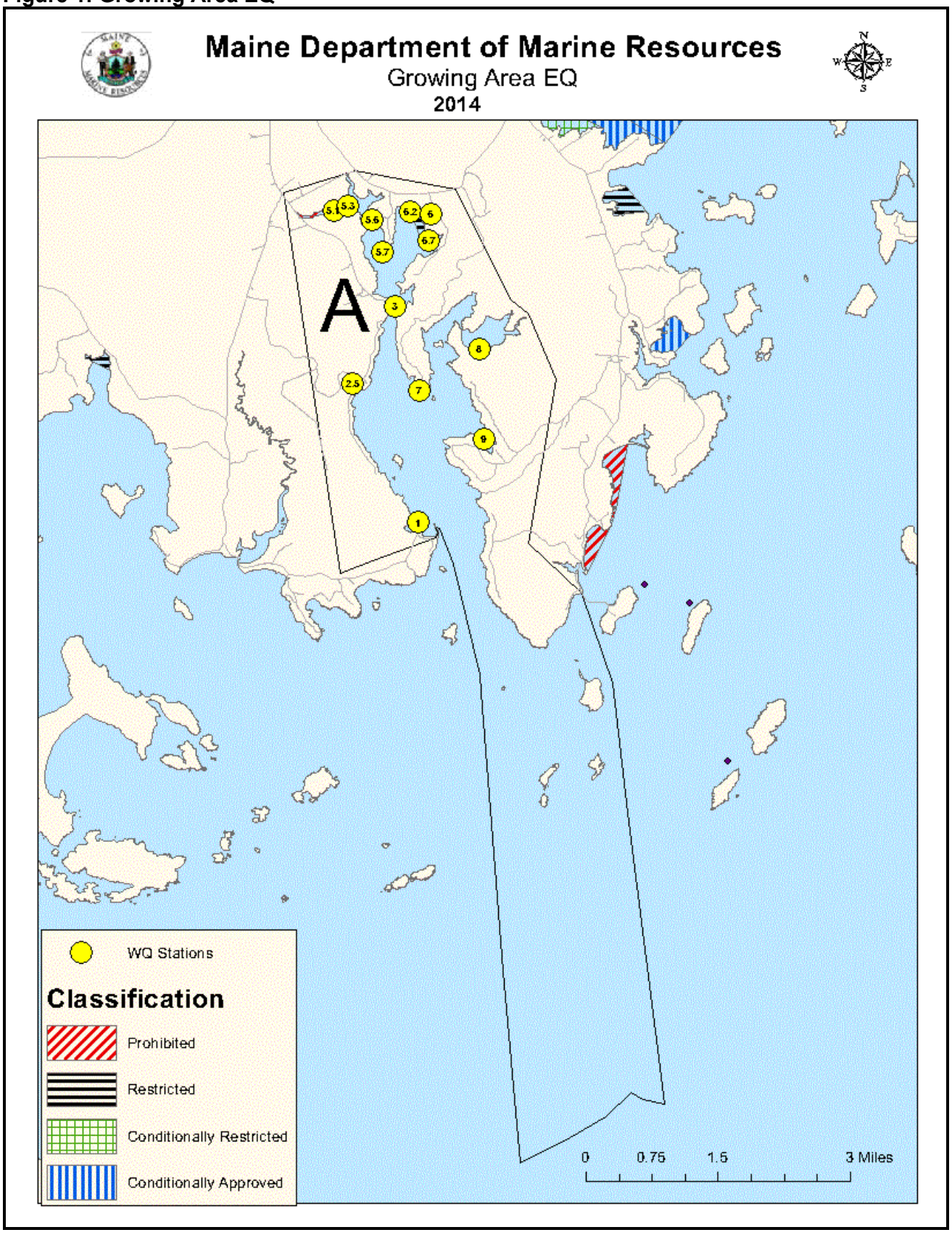
This is a Sanitary Survey report for growing area EQ written in compliance with the requirements of the 2011 Model Ordinance and the National Shellfish Sanitation Program. No changes in classification are needed at this time. Two new stations were added and one station was deactivated. During the last triennial review period closed area 54 D was expanded in 2011. There were no changes in 2012 or 2013. In 2014 the area was reduced and a new restricted area was put in place near the mouth of Marsh stream. The next sanitary survey is due in 2026 and the next Triennial in 2017.

The area is very rural with no villages. Development along these shores is spotty with clusters of homes separated by undeveloped land. All dwellings within 500 feet of the shore, ditches or streams, agricultural operations or other notable issues were surveyed and detailed on field survey work sheets. In this manner, locations of any pollution problems were identified. Descriptions of all properties and their septic situations are included in the shoreline survey MARVIN central database file.

The growing area includes the near sub-tidal waters, inter-tidal flats and at zone of shore property that extends inland to a definite up-land boundary. The shoreline included in this report stretches from Seawall Point, Roque Bluffs to Starboard Island, Machiasport. The shoreline is typical to the convoluted shoreline of this section of Maine, with a series of shallow harbors with muddy and gravel bottoms separated by rock-bound points of land and bold shoreline. The up-land boundary of the growing area is enclosed by a line beginning at the tip of Seawall Point; then west to Johnson Mountain; then north to the intersection of the Roque Bluffs-West Kennebec Roads; then east to the East Kennebec-Cross Roads intersection; then east to Meadow Brook; then southeast to Shagadee Mountain, Machiasport; and then south to Point of Maine.

The Little Kennebec watershed drains primarily undeveloped land. The fresh water influence from the streams feeding the Little Kennebec is relatively small and will be evaluated later in this report. There are only a few small streams entering this growing area. They have been evaluated microbiologically as part of this survey. The Little Kennebec is a huge resource area and currently has one prohibited area at the very head of the river based on historically poor water quality at station EQ 5. There is also one small restricted area that was just put in place in 2014 based on year end 2013 data for station EQ 6 no longer meeting the standard for direct harvest. No pollution sources were found in the rest of the growing area and it is classified as open and approved.

Figure 1: Growing Area EQ



History of Growing Area Classification

2009: No changes.

2010: The prohibited zone (Area No. 54D) in the northwest head of Little Kennebec Bay was expanded by 52 acres because water quality at the boundary station no longer met the "Approved" (DMR Chapter 95.09(W), Area No. 54-D, West Branch of Little Kennebec Bay (Machias).

2011: Area 54D was again expanded.

2012: No changes.

2013: No changes.

Current Classification(s)

Please visit the DMR website to view Legal Notices:
http://www.maine.gov/dmr/rm/public_health/closures/closedarea.htm

Approved: All shores and waters of the growing area not specifically described below.

Restricted: Area 54D, part b, Meadow Brook Cove (Machias) (February 2014); failing water quality EQ 6

Prohibited: Area No. 54-D, West Branch of Little Kennebec Bay (Machias) (February, 2014); failing water quality; Sample stations EQ 5.

Activity during Review Period

2009: Growing area EQ has had increases in bacterial scores at two stations during the review period. DMR shoreline survey activity was through drive through observations during random water sampling runs and flood sampling (Table 3). A complete sanitary survey required for the 12 year sanitary survey was completed in 2008 (Goodwin 2009). No DEP violations affecting Area EQ waters were reported for 2009 (Maine DEP MER 2010). No DEP permit issuances were reported for area EQ during this period (EPA NPDES 2010). No significant changes in the watershed development were noted during the drive through surveys. Active pasture land extending near to high water mark was observed in proximity of station EQ 6.

2010: Stream surveys at Marsh Stream, Little Kennebec Stream in 2010.

2011: Drive through survey conducted during random scheduled runs. No new pollution sources found.

2012: A drive through survey was conducted on May 22, July 16, August 13, September 17and November 5, 2012. No issues were found.

2013: Drive through surveys were completed on 4/22/2013, 9/09/2013, 10/23/2013 and 11/04/2013.

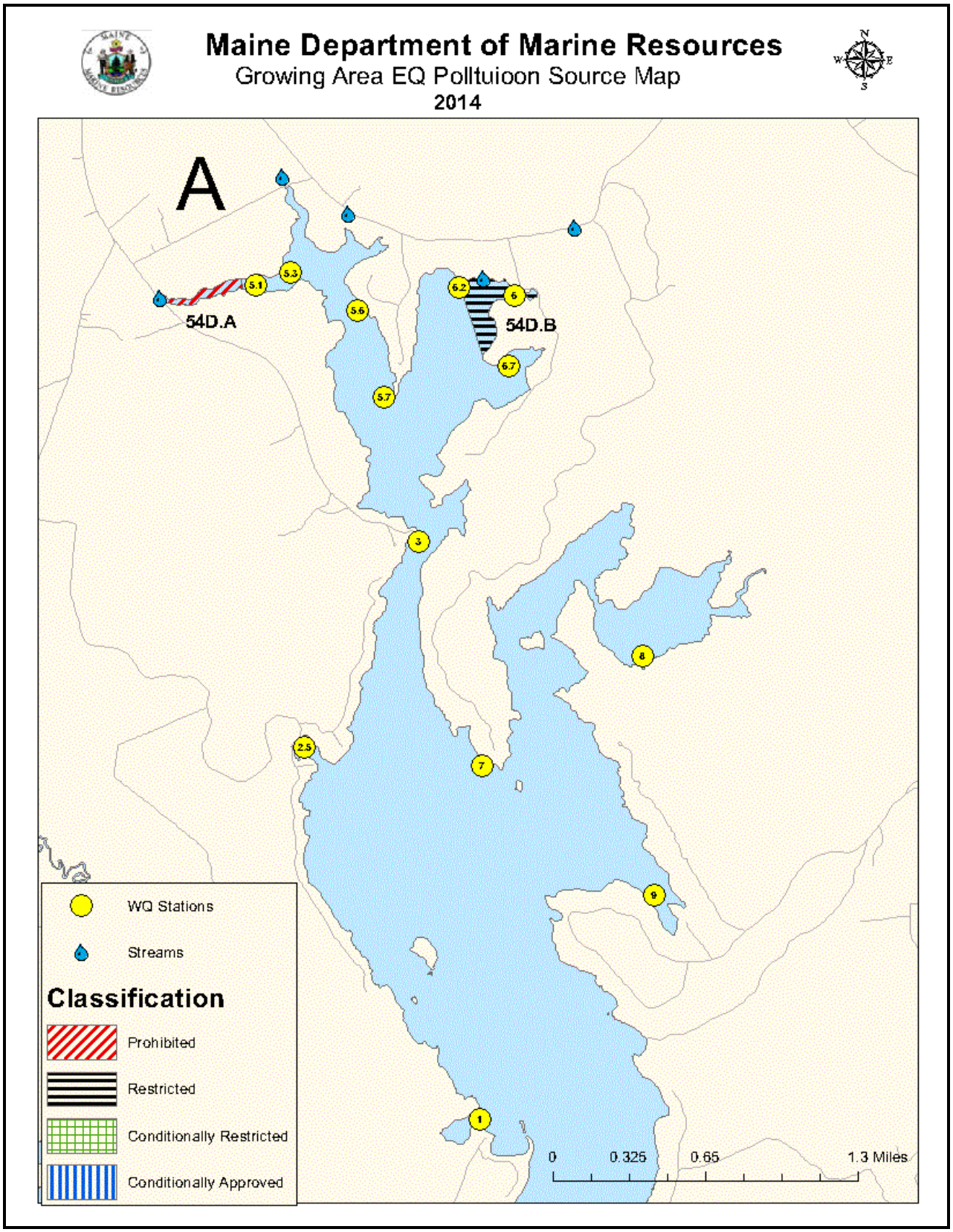
Pollution Source Survey

The following sections include information on pollution sources which do or may impact water quality in growing area EQ. Pollution sources that are reviewed in this section include domestic waste, including both private inground systems and over board discharges (OBDs), marinas and mooring fields, stormwater and pollution from non-point sources (streams), farms and other agricultural activities, domestic animals and wildlife areas, and recreational areas.

Table 1 Area EQ Pollution Source Table

Town	GASS ID	Pollution Area	Major PS	PS type	Problem	Impact	Description
Machias	EQ 5	54D A	Stream	ST	Y	PD	Kennebec Creek
Machias	EQ 5	open	Stream	ST	Y	PD	Small tidal brook at NE end of "cross road"
Machias	EQ 6	open	Stream	ST	Y	PD	Small brook drains farm pond
Machiasport	EQ 7	54D part B	Stream	ST	Y	PD	Drains fire pond
Machiasport	EQ 7	54D part B	Stream	ST	Y	PD	Meadow Brook drains upland sheep pasture

Figure 2 Growing Area EQ Pollution Source Map


Maine Department of Marine Resources
Growing Area EQ Polltuioon Source Map
2014
A
54D.A
54D.B
5.1
5.3
5.6
5.7
6.2
6
6.7
3
8
2.5
7
9
1
WQ Stations
Streams
Classification
Prohibited
Restricted
Conditionally Restricted
Conditionally Approved
0
0.325
0.65
1.3 Miles

Domestic Waste (IG Systems and OBDs)

Growing area EQ consists of 14 two mile segments all within the towns of Roque Bluffs, Machias and Machiasport. The LPI for Machias is Betsy Fitzgerald and for Machiasport it is James Bradley. The growing area consists of 94 residential in ground systems. All domestic waste systems were last visited in 2014 during the sanitary survey. There are no known issues with residential septic systems. Seven outhouses were identified. All were 100 feet or greater from the shore. No problem forms were filed with the towns in this growing area.

Municipal Wastewater Treatment Facilities

There are no wastewater treatment facilities in Growing Area EQ.

Residential Licensed Overboard Discharges

There are no residential licensed overboard discharges in Growing Area EQ.

Marinas and Mooring Fields

Several locations with 4-6 moorings are scattered throughout the growing area with the largest number of boats at Seawall Point (Roque Bluffs), Marston Point (Machias) and Yoho Head (Machiasport). All of these mooring clusters are in approved areas with only work boats (lobster boats, trawling vessels). There are small boat launching facilities at Seawall Point and Yoho Head. These ramps are crude gravel beach ramps used as launching sites for shell fishermen, duck hunters and skiffs for larger boats. We have sample sights at all these locations and they do not impact water quality.

Storm Water Discharges

Stormwater runoff is generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground. As the runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the runoff is discharged untreated (US EPA 2009). Thus, stormwater pollution is caused by the daily activities of people within the watershed. Currently, polluted stormwater is the largest source of water quality problems in the United States.

The primary method to control stormwater discharges is the use of best management practices (BMPs). In addition, most major stormwater discharges are considered point sources and require coverage under an NPDES permit. In 1990, under authority of the Clean Water Act, the U.S. EPA promulgated Phase I of its stormwater management program, requiring permitting through the National Pollution Discharge Elimination System (NPDES). The Phase I program covered three categories of discharges: (1) “medium” and “large” Municipal Separate Storm Sewer Systems (MS4s) generally serving populations over 100,000, (2) construction activity disturbing 5 acres of land or greater, and (3) ten categories of industrial activity. In 1999, US EPA issued Phase II of the stormwater management program, expanding the Phase I program to include all urbanized areas and smaller construction sites.

Although it is a federal program, in the state of Maine, the Phase II Stormwater permit is issued and regulated by the Maine DEP (Chapter 500 and 502). Under the MS4 regulations, each municipality must implement the following six Minimum Control Measures: (1) Public education and outreach, (2) Public participation, (3) Illicit discharge detection and elimination, (4) Construction site storm water runoff

control, (5) Post-construction stormwater management, and (6) Pollution prevention/good housekeeping. The permit required each city or town to develop a draft Stormwater Management Plan by September 3, 2003 that will establish measurable goals for each of the Minimum Control Measures. The Town must document the implementation of the Plan, and provide annual reports to the Maine DEP. Currently the discharge of stormwater from 28 Maine municipalities is regulated under the Phase II permit requirements, however, no municipalities located within the boundaries of growing area EA fall under these regulations. Additionally, the Maine Stormwater Management Law provides stormwater standards for projects located in organized areas that include one acre of more of disturbed area (Maine DEP 2009).

None of the towns in EQ have storm water systems.

Tidal Creeks, Streams, and Wetland Discharges

Many of the bays have freshwater streams draining to the saltwater from upland areas. Sampling of freshwater sources was conducted during low to medium runoff conditions. Streams are considered to be actual or potential, direct pollution sources impacting the growing area. Table 2 lists all the streams in the area that have been sampled during the last triennial period..

Table 2: Streams Sampled in Growing Area EQ

Town	Stream Name	ID	Pollution Area	Date	Flow GPM	Fecal
Machiasport	no name	EQ007-362	54D	6/25/14	4	68
Machiasport	Kennebec Creek	EQ005-347	54D	6/25/14	6	106
Machias	no name	EQ004-346	54D	6/25/14	7.5	10
Machias	no name	EQ003-345	54D	6/25/14	7.5	10
Machias	no name	EQ002-344	54D	5/7/14	4	1.9
Machias	no name	EQ003-345	54D	5/7/14	15	1.9
Machias	no name	EQ004-346	54D	5/7/14	65	22
Machiasport	no name	EQ007-362	54D	5/7/14	3	1.9
Machiasport	Kennebec Creek	EQ005-347	54D	5/7/14	5	13
Machias	no name	EQ002-344	54D	10/1/2014	1	1.9
Machias	no name	EQ003-345	54D	10/1/2014	6	2
Machias	no name	EQ004-346	54D	10/1/2014	20	6
Machiasport	no name	EQ007-362	54D	10/1/2014	142	16
Machiasport	Kennebec Creek	EQ005-347	54D	10/1/2014	573	31

None of the sampled streams listed in Table 2 are used for dilution calculations. Sampling and surveying of all the streams in the growing area will continue in the future.

Agricultural Sources

No significant sources of agricultural pollution were identified in the survey area. Two properties have <5 animals (cows, horses, sheep, domestic pets) in small enclosures and < 30 sheep are summer pastured near Meadow Brook. None have been identified impacting the shellfish harvesting areas. Water sampling

sites EQ005.70 and EQ006.00 monitor these areas. The area around the mouth of Meadow Brook (EQ 6) is now classified as restricted. It is unknown rather the sheep pastured in the upland area are impacting this area. There are no identified slaughter houses, large scale manure spreading operations or garden centers in the area.

Wildlife Areas

The salt marshes and mudflats of the growing area do provide valuable habitat to a variety of wildlife. Mammals living within the growing area include dogs, cats, whitetail deer, muskrat, squirrels, chipmunks, rabbits, moles, mice, bats, shrews, weasels, skunks and raccoons. Commonly observed bird species include a variety of gulls, sea and inland ducks, cormorants, geese, great blue herons, egrets, swans, and others. Maine Inland Fish and Wildlife surveys indicate that migratory waterfowl numbers begin to increase in the early summer months, and typically peak in late fall or early winter. Staging shorebirds need feeding areas with high concentrations of inter-tidal invertebrates. Although large numbers of birds can, in theory, pose a threat the growing area water quality, such occurrences are very difficult to document. No such significant water quality impacts have been documented from wildlife to date.

Recreation, Conservation

The concern for actual or potential pollution from recreational areas is because many of them allow dogs and some having bathroom facilities. In and of themselves, they aren't a pollution source but activities at the recreational areas may contribute to water quality problems by placing added pressure on the watershed. For instance, they may contribute to erosion (trails, building footbridges, etc.), dog waste not picked up may accumulate and wash off after rainfall, new trails may be put into areas that didn't have human activity before and they may put added pressure on wildlife to congregate in other places where we may see water quality decline, etc. The mere presence of humans/dogs doesn't necessarily mean there is an actual pollution source, but it is a potential pollution source.

There are no day use beaches and picnic areas in the area. There are no commercial or public campgrounds in growing area EQ. Although there are a few gravel beaches in the area, swimming in the ocean in this area is relatively rare, as the water temperatures rarely exceed 65°F. There is a newly established wildlife sanctuary with walking trails on Johnson Point. The area is remote without any septic facilities.

Industrial Wastes

There is no heavy industrial activity such as chemical plants, ship building, oil refineries or manufacturing plants in the growing area.

Dredging

There has been no dredging activity in Growing Area EQ since the last survey in 2008.

Fishing Wharves and Aquaculture Sites

Wharves in the review area are small privately owned piers for the loading or unloading of equipment, bait or catch and most are for lobster fishermen. There are no landings with >500 gallon fuel tanks identified during this survey. There are no shellfish aquaculture sites in the area.

Land Based Chemicals

(Information from the Pesticides Board of Maine in Augusta) “Inland blueberry fields close to the marine environment use several chemicals that may have some effect temporarily on fish or shellfish. *Guthion* is sprayed on blueberry fields in July and August to control the fruit fly larva. The half-life is variable around 21 days in aerobic soils and about 62 days in anaerobic soils. The soils in our area are generally considered to be aerobic. *Guthion* is short lived in water, however heavy rain after application causes high runoff of the chemical. *Guthion* is not very persistent in the environment. The chemical is degraded to many other compounds by microorganisms found in soil and water, by sunlight and by reacting with water. *Guthion* does not evaporate very quickly from soil and water. It attaches strongly to soil surfaces and does not easily move into groundwater below the soil surface. *Valpar* (Hexazinone) is a chemical used for the control of weeds and grasses. Hexazinone has a half-life of one month in blueberry soils. Breakdown varies depending on temperature and moisture with the main reason for degradation by soil microorganisms. Other factors affecting half-life include soil leaching, uptake by plants and breakdown by sunlight. Hexazinone has a low acute toxicity. It has an acute oral LD50 for mice (dose to kill 50 percent of test animals) of 1,690 mg/kg (or 0.026 oz/lb of body weight). Aspirin has the same toxicity level. Hexazinone is a class D compound - not classifiable as to human carcinogenicity. Hexazinone has been detected at low levels, in the parts per billion (ppb), range in ground-water in Maine that is under or near to blueberry fields that have been treated with *Velpar*. All detections were well below the maximum exposure guides of 210 ppb set by the Maine Department of Health and Human Services. The EPA "believes that water containing Hexazinone at or below the *Health Advisory Level* of 400 ppb is acceptable for drinking over the course of one's life, and does not pose any health risk. *Round-Up* is used for weeds resistant to *Valpar*. There are large blueberry fields directly adjacent to the western arm of Little Kennebec and north of Mill Pond. Published data and use regulations support minimize health risk from the use of these pest sprays. This information supports a minimal health risk for consumers of shellfish from chemicals used on blueberry fields outside of the immediate “footprint” of the field.

Marine Biotoxins

The Marine Biotoxin Monitoring Program is administered by the Maine Marine Resource’s Public Health Division. It uses the standards outlined in the National Shellfish Sanitation Program (NSSP) to monitor levels of PSP (“Red Tide”) and other marine biotoxins in the shellfish of the State of Maine. When toxin is found at levels near or above where human illness may occur, closures to the harvest of shellfish areas are implemented. Maine has historically had high levels of Paralytic Shellfish Poison (PSP), more commonly known as “Red Tide” during the warmer periods of the year. Shellfish samples are collected statewide between March and October and evaluated at the PSP laboratory Boothbay Harbor, in the western portion of the state. Data is then transmitted to the director of the biotoxin programs at the Boothbay and Lamoine facilities for interpretation and appropriate closures are made when necessary. This area is frequently included in larger near shore biotoxin closures in eastern Maine during summer months.

Hydrographic and Meteorological Characteristics

Tides and Currents

Coastal Maine experiences a mixed, semi-diurnal tide, with diurnal inequalities that are more pronounced on spring tides. National Oceanic and Atmospheric Administration data for a station at Jonesport indicate a mean tidal range of 12.4 ft, a spring tidal range of 14.1 ft.

Currents in the area are predominantly driven by the tides. All along the coast of eastern Maine, the tide generally floods to the north and east and ebbs to the south and west. Along the coast and in the wider bays, the current seldom exceeds 2 knots. Weather conditions affect tidal ranges and current speeds, sometimes very strongly. Strong winds may reverse the direction of currents.

This area is sampled by boat and the upper end of the growing area has no water at the lower tides. To examine the effects that tidal stage might have on fecal coliform concentrations, data collected under the Systematic Random sampling strategy (all months, all samples) were queried for all active sample sites (2002-2014). Then the average score for each station was calculated based on the following tide groupings; Ebb; Flood; H. HF, HE; and L. LF, LE. This can be seen in table 4.

Table 3 Tide Stage Breakdown

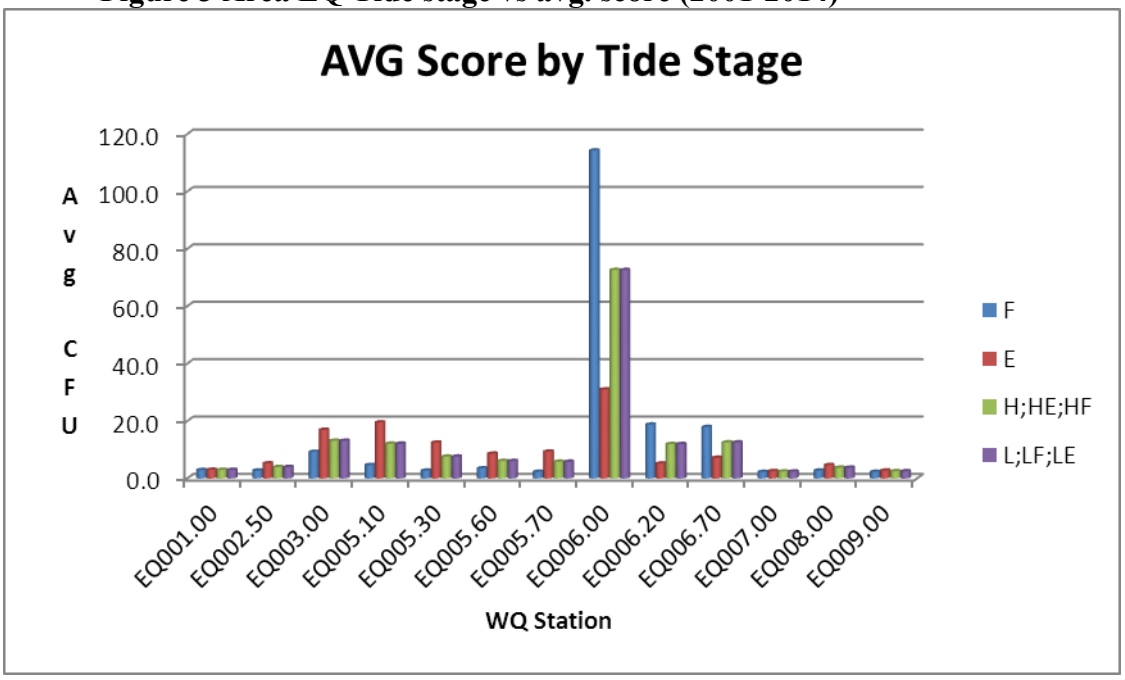
Tide stage	Minutes from Low tide
Low	(+-) 30 minutes
LF	30-90
Flood	91-270
HF	271-329
High	(+-) 30 minutes
HE	(-270) - (-330)
Ebb	(-90) - (-270)
LE	(-30) - (-90)

Table 4: Growing Area EQ Average Fecal Score by Tide 2001 - 2014

Station	F	E	H;HE;HF	L;LF;LE
EQ001.00	2.9	3.0	3.0	3.0
EQ002.50	2.8	5.3	4.0	4.0
EQ003.00	9.3	16.9	13.1	13.1
EQ005.10	4.7	19.5	12.1	12.1
EQ005.30	2.7	12.5	7.6	7.6
EQ005.60	3.6	8.6	6.1	6.1
EQ005.70	2.3	9.4	5.8	5.8
EQ006.00	114.3	31.0	72.6	72.6
EQ006.20	18.8	5.2	12.0	12.0
EQ006.70	17.9	7.2	12.6	12.6
EQ007.00	2.3	2.5	2.4	2.4
EQ008.00	2.8	4.7	3.7	3.7
EQ009.00	2.3	2.8	2.5	2.5

Station 6 shows high average score on all tide stages. This indicates a chronic issue somewhere in the immediate area. Stations 5.7 and 6.2 are located on either side of station 6 and do not show the same high average scores. This area is currently restricted and no problems were found during the 2014 survey. A culvert adjacent to station 6 washed out in 2012 and this changed the exchange of freshwater into the area. With the culvert gone there is no longer a restriction on flow and water exchange between the area and the surrounding upland. This along with the high numbers of geese that use this particular cove to raft up at night is believed to be the cause of the elevated scores in this area.

Figure 3 Area EQ Tide stage vs avg. score (2001-2014)



Rainfall

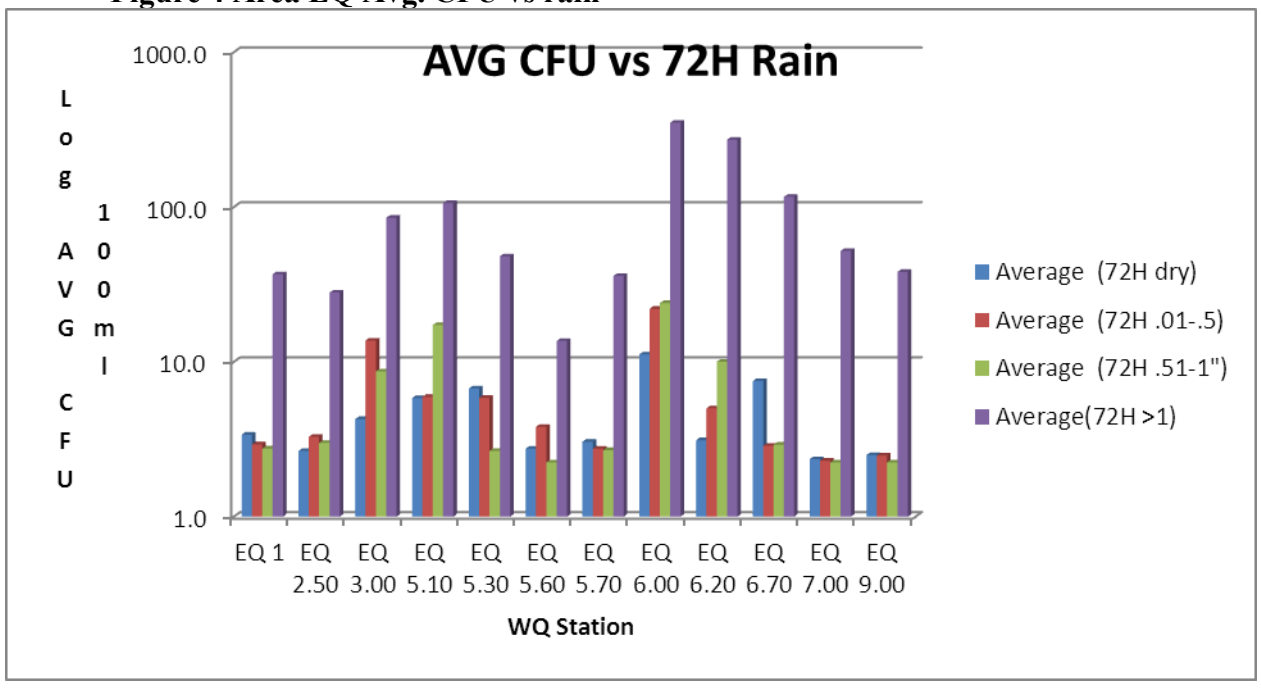
The mean annual precipitation in growing area EQ is approximately 44 inches. The precipitation is not evenly distributed throughout the year. The wettest months are November and April. August is typically the driest month. Much of the precipitation in the winter comes as snow and may affect runoff rates in spring upon melting. It is likely that after prolonged periods of dry weather, significant rainfall (>1" over 24 hours) will cause some pollution from non-point runoff. It is unclear how much of an effect major rainfall events have on water quality due to variability of ground water saturation, history of recent significant rainfall that may have washed non-point pollution sources away, hard ground or ledge or wildlife or agriculture activity. Rainfall is monitored locally at the Machias Wastewater Treatment Plant.

To analyze rain and its effects on the growing area 48 hour rain data for each station from 2001-2014 was binned into dry data; rain between .01-.5”; .51-1”; and .1”. The average fecal score for each binned rain amount can be found in table5.

Table 5 AVG CFU vs rain amount (2001-2014)

Station	Average (72H dry)	Count Dry	Average (72H .01-.5)	Count .01-.5	Average (72H .51-1")	Count .51-1	Average(72H >1)	Count >1
EQ 1	3.4	33	2.9	49	2.8	16	36.8	14
EQ 2.50	2.7	27	3.3	39	3.0	12	28.0	7
EQ 3.00	4.3	46	13.7	78	8.7	26	85.2	30
EQ 5.10	5.8	16	5.9	26	17.3	10	106.0	4
EQ 5.30	6.7	11	5.9	20	2.7	5	48.0	3
EQ 5.60	2.8	12	3.8	20	2.2	5	13.6	3
EQ 5.70	3.0	27	2.7	38	2.7	12	35.8	7
EQ 6.00	11.2	40	22.0	64	24.0	24	350.5	17
EQ 6.20	3.1	10	5.0	21	10.0	6	272.0	4
EQ 6.70	7.5	27	2.9	36	2.9	13	116.3	8
EQ 7.00	2.3	27	2.3	38	2.2	12	52.0	7
EQ 9.00	2.5	27	2.5	38	2.2	12	38.1	7

Figure 4 Area EQ Avg. CFU vs rain



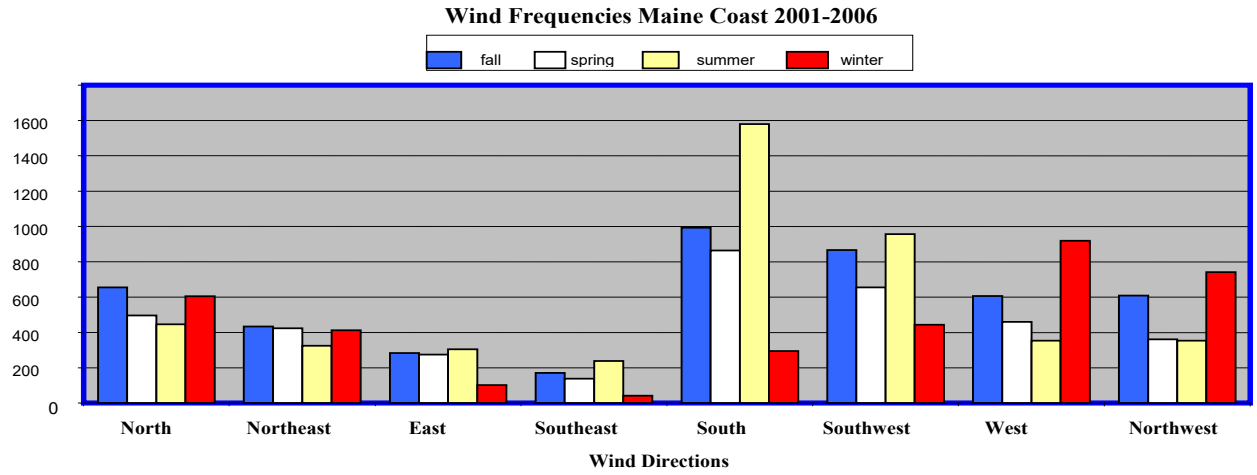
Looking at the graph all stations show elevated average scores for rain greater than 1". No station shows an average score of over 31 CFU/100ml for rain amounts less than 1".

Winds

Migratory weather systems cause winds that frequently change in strength and direction. Gulf of Maine winds are generally westerly, but often take on a northerly component in winter and a southerly one in summer. Strongest winds are generated by lows and cold fronts in fall and winter and by fronts and thunderstorms during spring and summer. Extreme winds are usually associated with a hurricane or severe northeaster and can reach 125 knots. Sustained winds of 100 knots occur about every 50 years on average; gusts are usually about 30 percent higher.

Coastal winds are complex since they are influenced by the topography. Over land speeds are reduced. However, channels and headlands can redirect the wind and even increase the speed by funneling the wind. In general, winds have southerly components in summer and northerly ones in winter. In sheltered waters near Rockland, Portland, and Brunswick, there are a large percentage of calms, particularly during the morning hours. When the existing circulation is weak and there is a difference between land and water temperatures, a land-sea breeze circulation may be set up. As the land heats faster than the water, a sea breeze is established during the day; this onshore flow may reach 15 knots or more. At night, the land cools more rapidly, often resulting in a weak breeze off the land. In many locations, the sea breeze serves to reinforce the prevailing summer wind. Analysis of GOMOOS data (2001-2006) show winter winds along coastal Maine are typically from the west-northwest during clear periods and from the northeast during storms. In the spring, summer and fall, predominant winds are from the south-southwest. West, northwest and north winds are common during fall and winter. Although less frequent, winds from the northeast, north and northwest directions are typically stronger than winds from the south. In the summer, winds tend to be on shore due to heated, rising air over land and cooler ocean air flowing into the void.

Figure 5: Wind Direction Frequencies Maine Coast 2001-2006



River Discharges

This area is not impacted by any river discharges, only creeks and streams. Stream flow in downeast Maine exhibits seasonal variation, with the highest flows occurring in the spring (due to snowmelt, spring rains, and low evapo-transpiration) and the mid-to late fall (due to fall rains and low evapo-transpiration).

Salinity

Salinity generally tends to be lowest in the spring, due to spring rains and snowmelt/runoff and in late fall from rainfall. Summer and early autumn show the highest values of salinity, due to the relatively low stream flows at this time of year. Salinity data, taken from routine (random/prescheduled) ambient monitoring data from sites near the mouths of rivers or streams approximate the stream flow patterns and influence of fresh water inputs on the growing area. However, partial salinity stratification can occur during times of heavy rainfall and runoff. It is well recognized that freshwater influence from runoff can contribute to elevated bacterial loading near shore. Queries of the sample data in Area EQ for average salinity by month (2001-2014) shows sample sites with their average salinities broken down by month. The lowest average salinity was 24 ppt for station EQ 5.1 in December. Low salinities do not impact this growing area.

Table 6: AVG Salinity by Month

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
EQ001.00		30	30	30	30	26	30	30	31	31	31	28
EQ002.50				27	29	29	30	31	31	31	26	
EQ003.00	25		30	28	30	28	29	31	31	29	31	28
EQ005.10				25	25	29	29	28	31	29	26	24
EQ005.30				30	30	29	30	32	32	30	29	
EQ005.60				30	30	30	30	31	32	30	31	
EQ005.70				30	30	30	30	31	31	31	31	
EQ006.00			29	26	26	29	30	30	27	30	27	30
EQ006.20				30	29	30	27	31	31	25	32	
EQ006.70				29	30	26	30	31	31	30	30	26
EQ007.00				30	30	30	30	31	31	31	31	
EQ009.00				30	30	29	30	31	31	31	30	

Seasonal Effects on FC Concentrations

To examine the effects that seasons may have on fecal coliform levels in Growing Area EQ, the historical fecal coliform data of the ambient sites were grouped according to season:

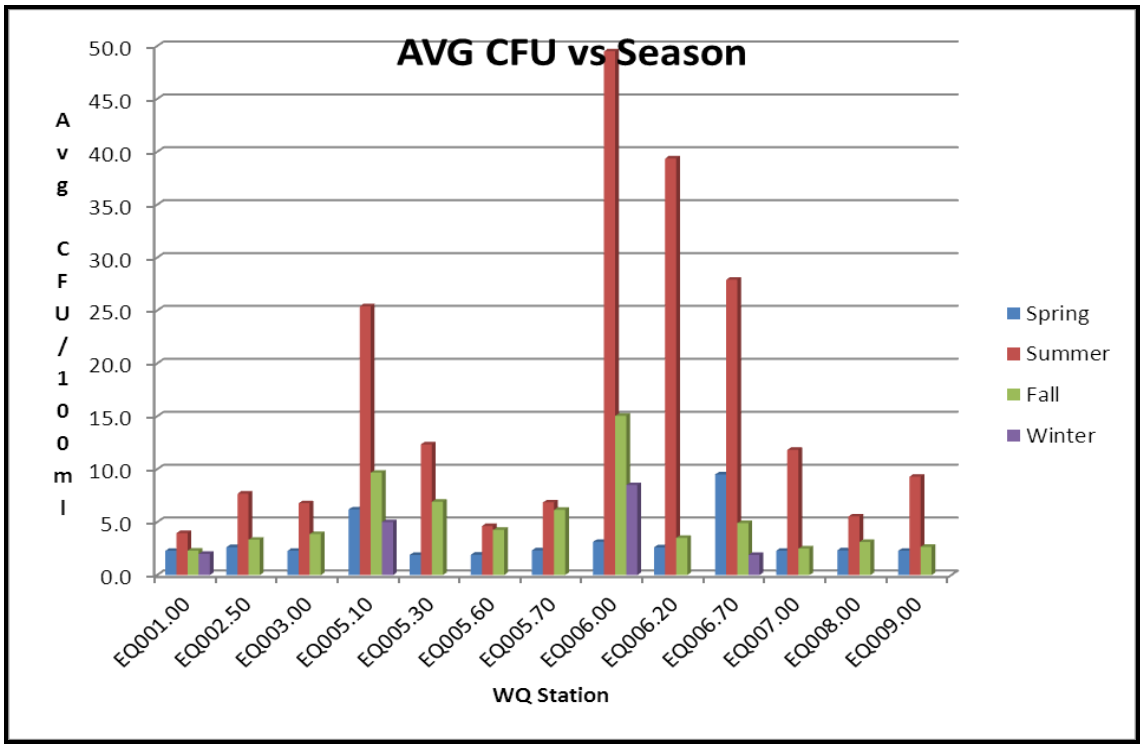
Winter was defined as December, January, and February
Spring was defined as March, April, and May
Summer was defined as June, July, and August
Fall was defined as September, October, and November

To focus the analysis on relatively current data, this analysis presented in Table 10, included fecal coliform results collected from 2001 to 2014. The collection dates were queried to conform to the seasonal groupings discussed above. Any adverse flood data was excluded. Next the average fecal score for each station per season was calculated and then graphed.

Table 7: Seasonal FC Impacted Sample Sites (2001-2014)

Station	Spring	Spring Count	Summer	Summer Count	Fall	Fall Count	Winter
EQ001.00	2.3	18	4.0	37	2.3	29	2
EQ002.50	2.6	18	7.7	37	3.3	29	
EQ003.00	2.3	18	6.8	37	3.9	29	
EQ005.10	6.2	12	25.4	23	9.7	18	5
EQ005.30	1.9	6	12.3	20	6.9	13	
EQ005.60	1.9	7	4.6	19	4.3	14	
EQ005.70	2.3	18	6.9	36	6.2	29	
EQ006.00	3.1	19	49.5	36	15.0	29	8.5
EQ006.20	2.6	6	39.4	17	3.5	11	
EQ006.70	9.5	18	27.9	34	4.9	31	1.9
EQ007.00	2.3	18	11.8	36	2.5	29	
EQ008.00	2.3	18	5.5	34	3.1	28	
EQ009.00	2.3	18	9.3	36	2.7	29	

Figure 6 Area EQ AVG CFU by Season



As evidenced by the graph each station in EQ showed an increase in average score during the summer months. Fall was the second time period that showed increased average scores. This fits with an

increase in human habitation during the summer months as well as increased waterfowl activity during the late summer and fall period. Even though the average was higher during the summer months only two stations EQ 6 and 6.2 had an average score that exceeded 31 CFU/100ml. The area around station EQ 6 is currently restricted. No stations exceeded 31 during the fall or spring. As this area is sampled by boat we have very limited winter data and cannot make any statements about this time period.

Discussion of Hydrographic and Meteorological Characteristics

The most important aspects of hydrographic and meteorology and its influence on pollutant transport in Growing area EQ is the impact of rainfall events >1.0" in 72 hours with resultant upland runoff from both point and non-point sources. Rainfall is heaviest in February-June and September-November and snowmelt in the late spring adds to the runoff, releasing any frozen feces from wild and domestic animals or failing septic systems. Streams and ditches funnel this runoff to the saltwater. Even during low salinity and higher tides the unacceptable fecal scores begin in June and go into December. There is no data between Jan and mid April, but data in April and May does not have high fecal scores. Sample stations near significant fresh water inflow sources are many times in Prohibited areas due to the stream impacts.

High salinities at sample stations near freshwater inflows show that there is not a significant contribution of fresh water into the estuaries. Lower tide stages have less ocean water to dilute the impact from the runoff. Station EQ 6 shows elevated scores during all tide stages and during the summer and fall months..

Tides along the coast are significant enough in the volume of water moving between ebbing and flooding that pollution dispersion is rapid. Any elevated fecal testing results are more likely a localized pollution source.

Water Quality Review

There are presently eleven (12) active water sampling sites in Growing Area EQ. They are collected by boat from near-shore sites in Random Boat Run 04B. Sample sites are established to monitor known or potential pollution sources and on the margins of established closures. It is recognized that access, icing and safety considerations prevent some stations being sampled on scheduled dates. Currently all station in Growing Area EQ meet their current NSSP classification standard. Station EQ 6 is currently below the standard for approved classification and is currently classified as restricted. Based on the seasonal as well as rainfall impact this station will remain restricted.

Water Quality Discussion and Classification Determination

P90 trending shows specific stations with marked increases in values in 2011-2013 and some stations with a marked decrease. Those stations that have shown an increase in P90 are highlighted yellow in Table 11 those that show a decrease are highlighted green. Those stations that showed an increase are all still well below the approved standard of 31 cfu/100ml. Overall Growing Area EQ has shown steady to improving water quality.

Table 8 Area EQ P90 trend

Station	Class	2014 P90	2013 P90	2012 P90
EQ001.00	A	1.9	2.3	4.8
EQ002.50	A	4.5	4.7	6.8
EQ003.00	A	3.8	4.9	4.9
EQ005.10	A	16.3	25.2	32.4
EQ005.30	A	16.7	15.5	11.6
EQ005.60	A	7.3	8.3	6.7
EQ005.70	A	4.8	8.7	8.5
EQ006.00	A	22	41.5	25
EQ006.20	A	17.6	15.1	6
EQ006.70	A	6.6	9	9.1
EQ007.00	A	1.9	2.8	6.1
EQ009.00	A	2.5	2.6	3.6

Conclusions

Growing Area EQ has environmental and human impacts similar to the remainder of the Maine coast east of Penobscot Bay. Coastal community development is rapidly expanding with homes and businesses near the mainland shores and on islands. This development increases the potential pollution risks to the traditional shellfish harvesting areas and the newly emerging shellfish aquaculture business. Pollution sources have adequate prohibited zones large enough to dilute the fecal loading to < 14 CFU/100 ml. of the receiving waters. Pollution loading is most likely originating on the near shore land and impacting the harvesting areas and ocean waters by non-point wide-spread runoff from streams and ditches. Environmental factors and seasonal periods have the greatest pollution impacts on the growing area. There are no present plans to change surveying and sampling schedules in the future. This area is properly classified. There are no changes to classification required in Growing Area EQ at this time.

Recommendation for Future Work

1. Add stations EQ 6 to our adverse rain sampling runs.

2. Continue sampling of streams draining to this growing area 2015 season.

References

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Tax map data, Town of Machias
Tax map data, Town of Machiasport

APPENDIX A - Key to water quality table headers.

STATION = water quality monitoring station
CLASS = classification assigned to the station; prohibited (P), restricted (R), conditionally restricted (CR), conditionally approved (CA) and approved (A).
COUNT = the number of samples evaluated for classification, must be a minimum of 30.
MFCNT = the number of samples evaluated with the MTec method (included in the total Count column)
GEO_MEAN = means the antilog (base 10) of the arithmetic mean of the sample result logarithm (base 10).
SDV = standard deviation
MAX = maximum score of the 30 data points in the count column
P90 = 90th percentile
APPD_STD = the 90th percentile, at or below which the station would meet approved criteria in the absence of pollution sources or poisonous and deleterious substances.
RESTR_STD = the 90th percentile, at or below which the station would meet restricted criteria.