GROWING AREA EL

Petit Manan Point to Ripley Neck

Sanitary Survey Report
2007-2019

Final

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MAINE
MARINE RESOURCES

Executive Summary

This is a Sanitary Survey report for Growing Area EL in Washington County written in compliance with the requirements of the 2017 Model Ordinance and the National Shellfish Sanitation Program. One pollution area in Growing Area EL will be reviewed for a possible upgrade in 2020; West Carrying Place Cove (Harrington). In 2019, two classification changes were made in Growing Area EL. A portion of the Prohibited area, 53 (A.2) at the mouth of the Narraguagus River was upgraded to Approved and the Prohibited area near Mitchell Point was upgraded to Restricted, 53 (B.5). One station (EL 45) was deactivated because of a loss of access. This station is in a current prohibited area. Two new investigative stations were activated, (EL 43) and (EL 45.9) to help defend current restricted area boundaries. There were no new actual or potential pollution sources found during this survey. Water quality has remained consistent overall with some improvement in water quality shown in the eastern part of the growing area. Triennial reviews were conducted in 2010, 2013, and 2016 with the last Sanitary Survey done in 2007. The next sanitary survey is due in 2031 and the next triennial in 2022.

Description of Growing Area

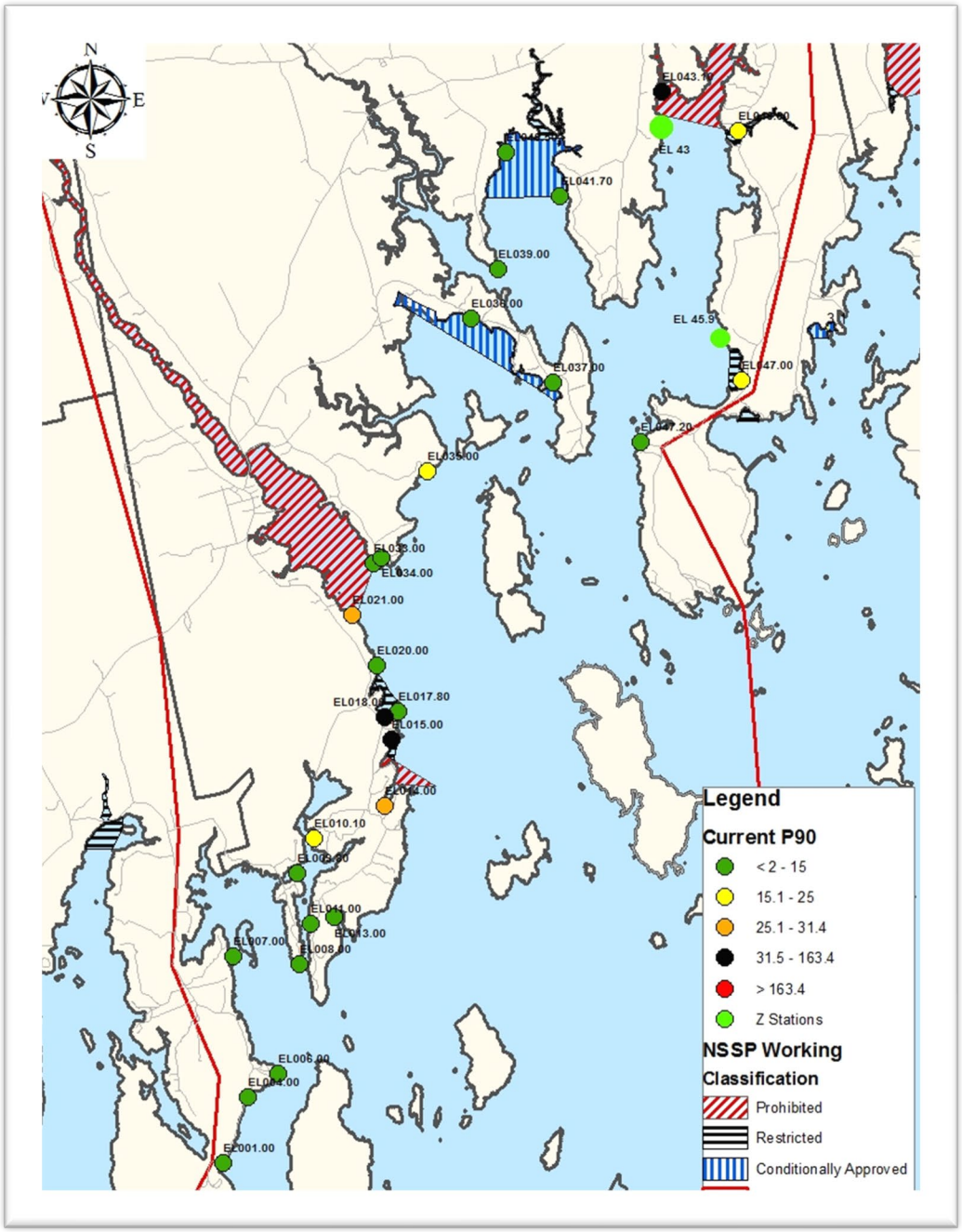
Growing Area EL encompasses approximately 119 square miles and is located in Washington County, Maine. The villages of Millbridge pop- 1,313, Harrington pop-1,004, and Addison pop-1266 have the largest population concentrations (2010 Census data). Development along these shores is spotty with clusters of homes separated by undeveloped land. Heavier development is found at the mouth of the Narraguagus River in Milbridge. All dwellings within 250 feet of the shore, water conduits-ditches, or streams or pollution sources were surveyed. There are 29 licensed overboard discharges (OBD's), one WWTP discharge in the town of Milbridge and three process water discharges from food processing. This growing area also includes one licensed discharge belonging to a one boat repair facility.

The growing area includes the near sub-tidal waters, intertidal flats, and a zone of shore property that extends inland to a definite up-land boundary. The shoreline included in this report extends from the southern tip of Petit Manan Point, Steuben to Willard Point on the southeast side of Ripley Neck in Harrington. This area includes all of Pigeon Hill Bay, Narraguagus River and Bay, Back Bay, Flat Bay, the Harrington River, and numerous small harbors and streams in the towns of Steuben, Milbridge, and Harrington. The upland boundary of this area is described as follows: Easterly of Pigeon Hill Road from Petit Manan Point to the intersection of US Route 1, then south and east of route 1 to the intersection of 1A in the town of Milbridge, then south and east of 1A to the intersection of the Marshville Rd. in Harrington, then west of the Marshville Rd. from Route 1 to its terminus at the southern end of Ripley Neck. This is a rural area with a sparse population. Freshwater influence along these shores is predominately from the Narraguagus and Harrington Rivers along with numerous brooks and small streams throughout the growing area.

There are two shellfish Limited Purpose Aquaculture (LPAs) permits in this growing area for oysters.

Below is the map with Pollution Area boundaries and growing area boundaries. Closures within the growing area can be found in legal notices in DMR central files on the DMR website.

Figure 1. Growing Area EL Overview Map with Active Water Stations



History of Growing Area Classification

Reclassification addendums to the sanitary survey report are in the DMR central files.

Pollution Sources Survey

Summary of Sources and Location

The growing area shoreline is divided into 2-mile segments that are identified using unique Growing Area Shoreline Survey Identification (GASSID) numbers. All properties and potential pollution sources within 250 feet of the shoreline are identified and inspected. The inspection includes a property description, physical address, location of the septic system, and any other relevant potential or actual pollution sources. A GPS point to identify the source location(s) and the data are entered electronically in the field and stored in DMR central files.

Figure 2. Growing Area EL, Pollution Map A

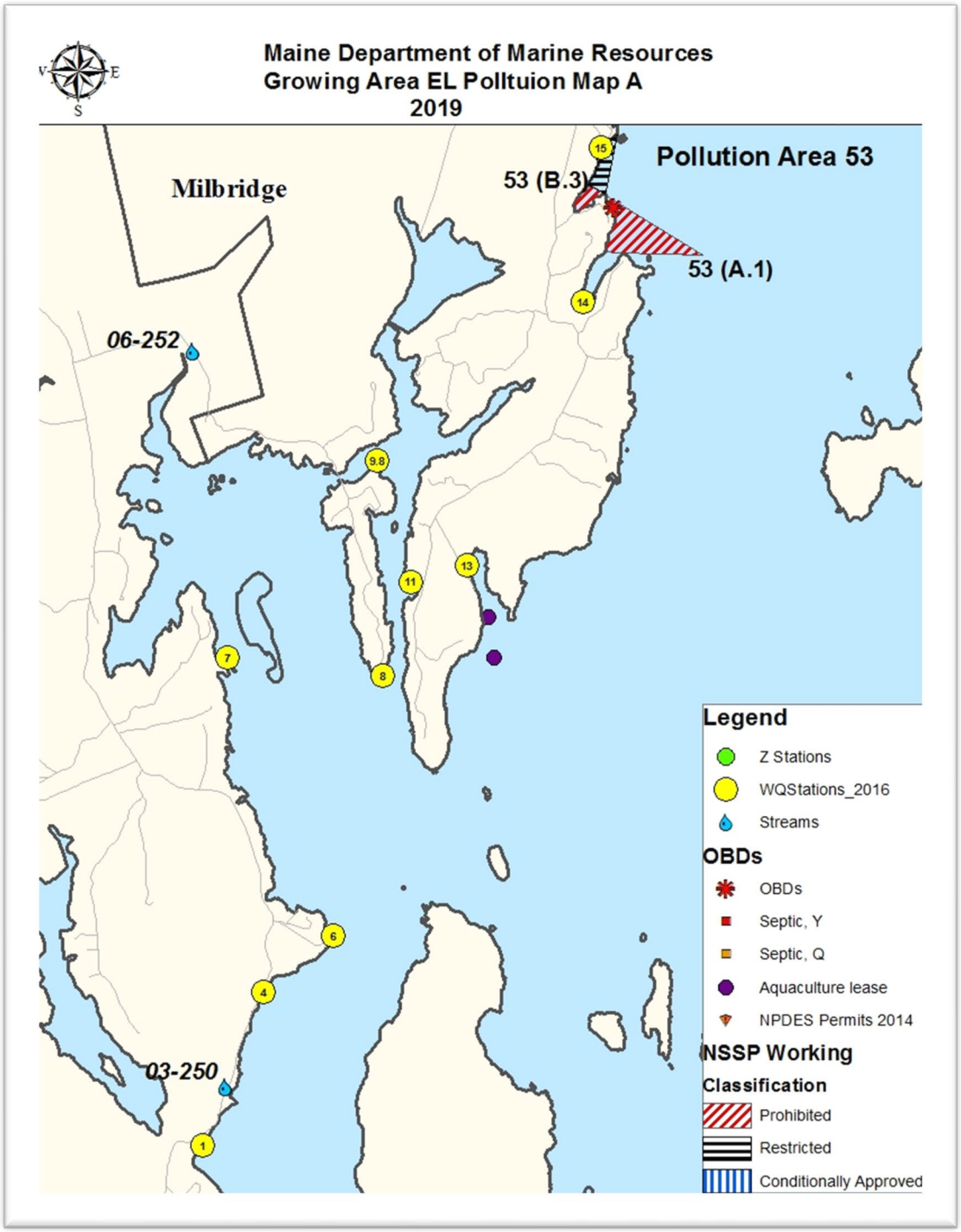


Figure 3. Growing Area EL, Pollution Map B

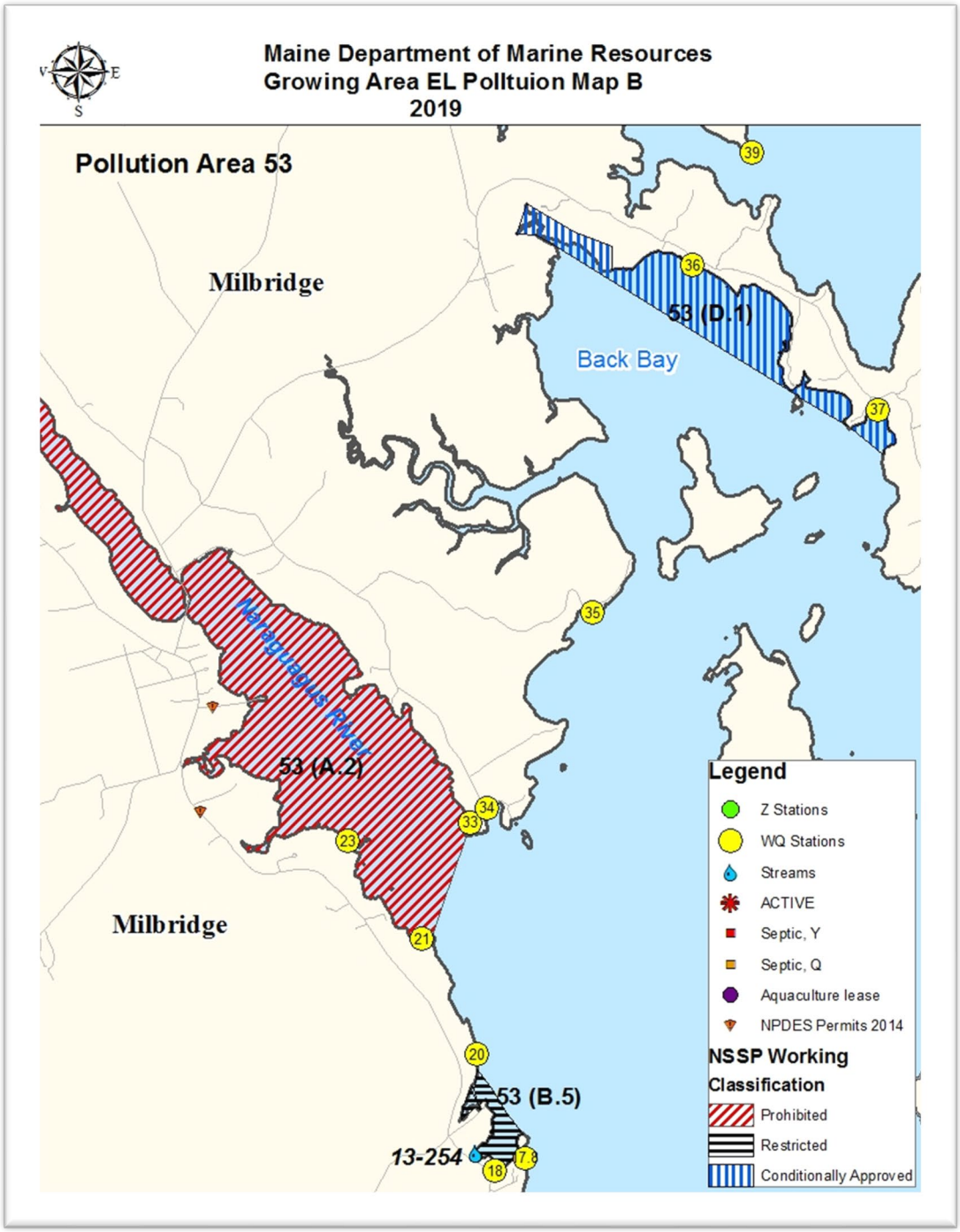


Figure 4. Growing Area EL, Pollution Map C

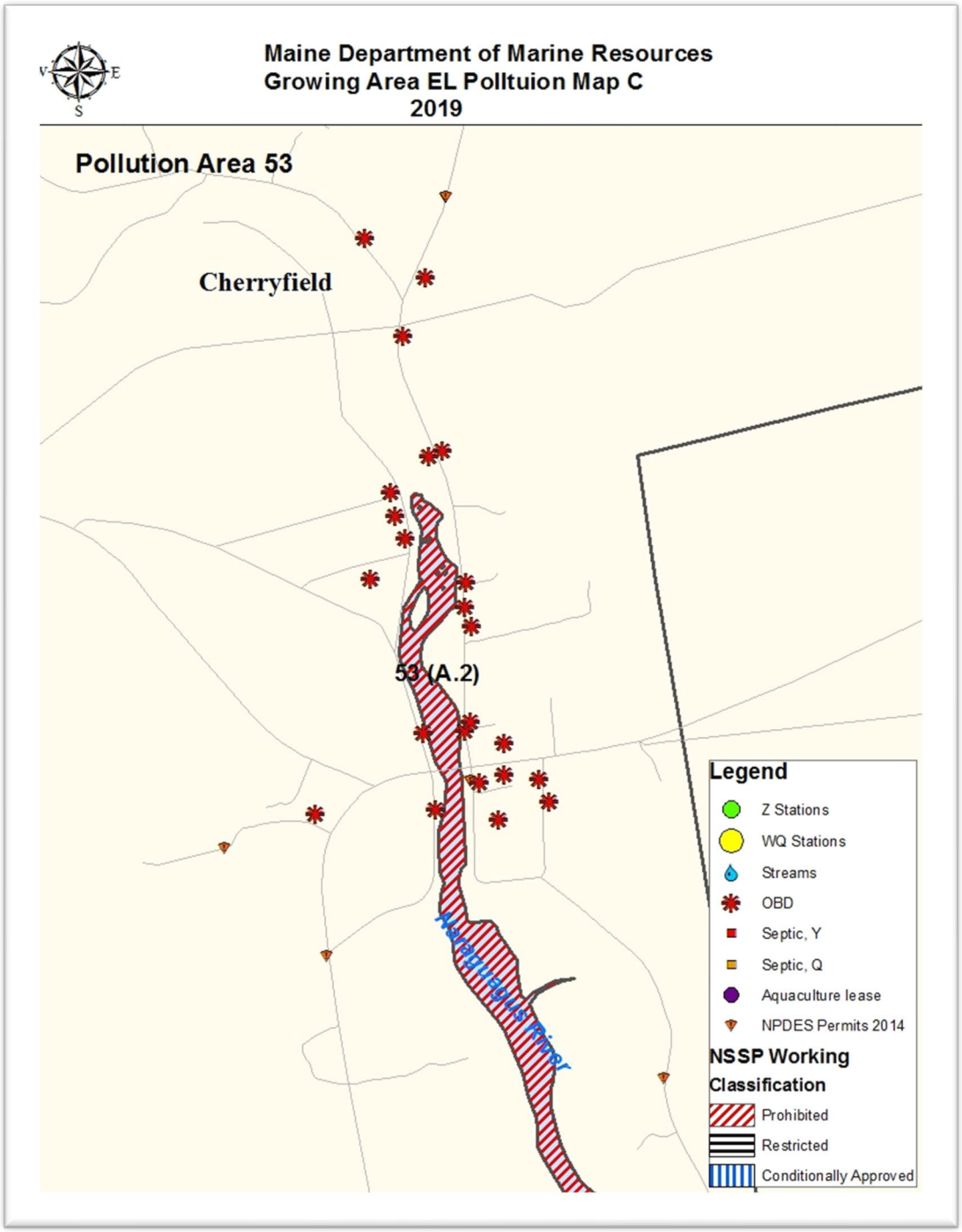


Figure 5. Growing Area EL, Pollution Map D

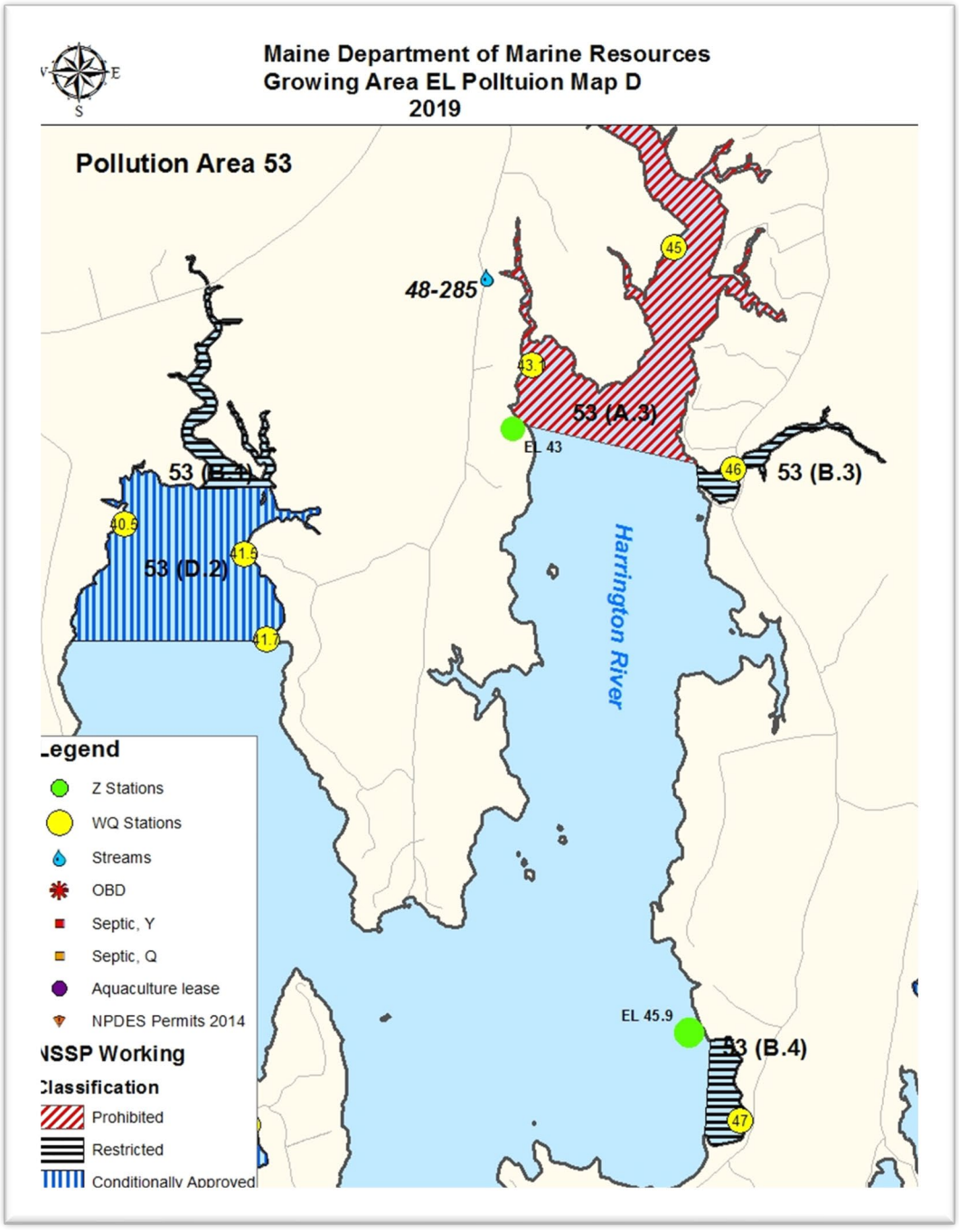
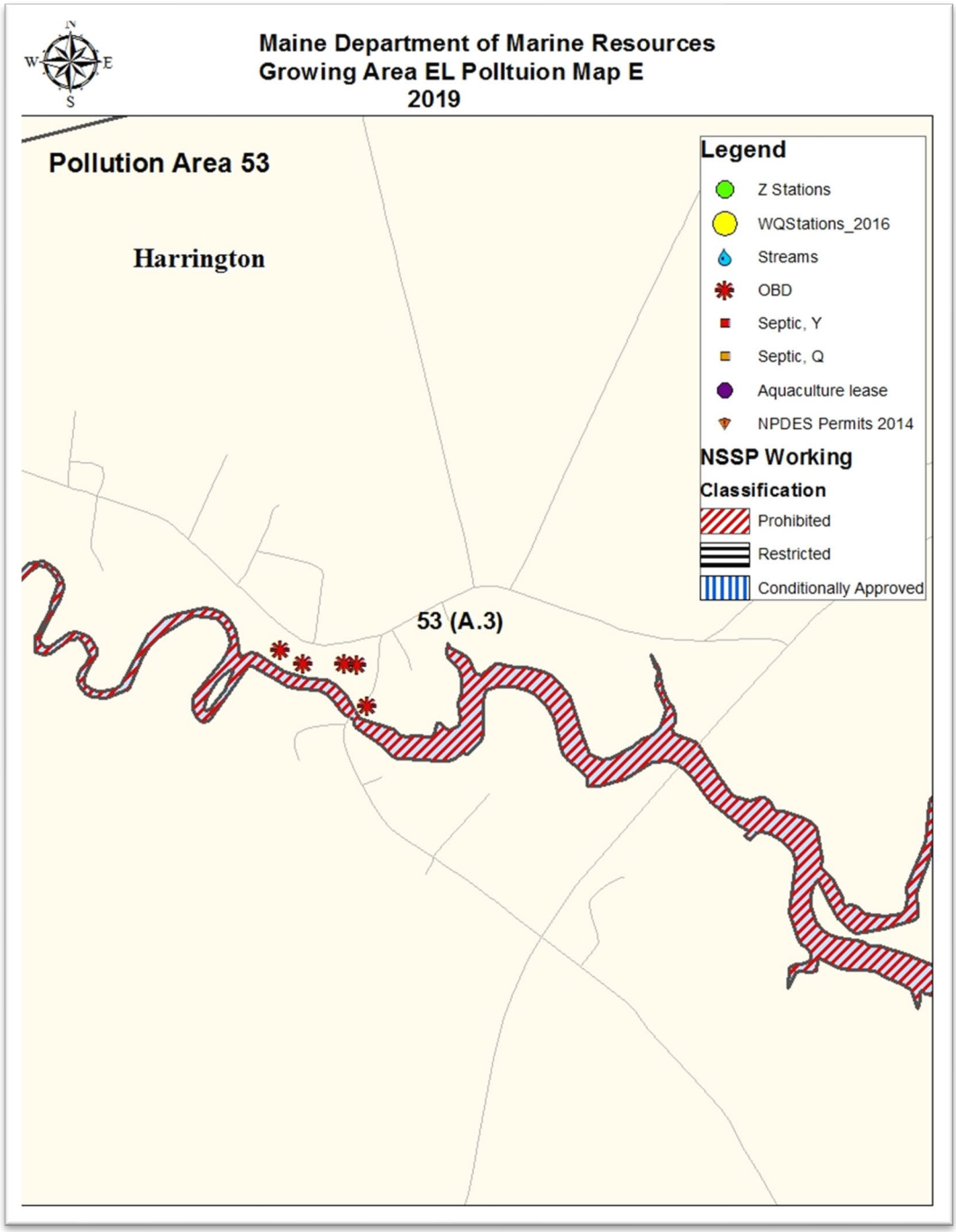


Figure 6. Growing Area EL Pollution Map E



State and Federal Licensed Waste Discharge Permits

Overboard Discharges (OBDs)

There are 29 overboard discharges (OBDs) that discharge their treated effluent into the waters of Growing Area EL. Twenty-three OBDs discharge into the waters of the Narraguagus River in Cherryfield (Figure 4), one OBD discharges into Smith Cove in Milbridge (Figure 2), and five OBDs discharge into the Harrington River in Harrington. (Figure 6). Nine OBD's were removed from the past twelve review years.

An overboard discharge (OBD) is the discharge of wastewater from residential, commercial, and publicly owned facilities to Maine's streams, rivers lakes, and the ocean. Commercial and residential discharges of sanitary waste have been regulated since the mid-1970s when most direct discharges of untreated waste were banned. Between 1974 and 1987 most of the "straight pipes" were connected to publicly-owned treatment works or replaced with standard septic systems. Overboard discharge treatment systems were installed for those facilities that were unable to connect to publicly-owned treatment works or unable to install a septic system because of poor soil conditions or small lot sizes.

All overboard discharge systems include a process to clarify the wastewater and disinfect it before discharge. There are two general types of treatment systems; mechanical package plants and sand filters. Sand filter systems consist of a septic tank and a sand filter. In such systems, the wastewater is first directed to a holding tank where the wastewater solids are settled out and undergo partial microbial digestion. The partially treated wastewater then flows from the tank into a sand filter, consisting of distribution pipes, layers of stone and filter sand, and collection pipes within a plastic liner. The wastewater is biologically treated as it filters down through the sand, and is then collected and discharged to a disinfection unit. Mechanical package plants consist of a tank, where waste is mechanically broken up, mixed and aerated; mechanical systems require electric power and must have an operating alarm on a separate electrical circuit that will activate if the treatment unit malfunctions due to a power failure. The aerated treated wastewater is held in a calm condition for a time, allowing for solids to settle and for the waste to be partially digested by naturally occurring bacteria. The clarified water from the tank is then pumped off the top into a disinfection unit. There are two types of disinfection units, UV and chlorinators (most common). In a chlorinator, the treated water contacts chlorine tablets and remains in a tank for at least 20 minutes where bacteria and other pathogens are killed. The treated and disinfected water is discharged from the disinfection unit to below the low water mark of the receiving waterbody (the ocean, a river, or a stream) via an outfall pipe.

OBDs are licensed and inspected by the Maine Department of Environmental Protection. At each inspection, DEP looks for tags on each treatment unit identifying the service contractor and the last date of service. If an OBD is not properly maintained, or if the OBD malfunctions, it has the potential to directly discharge untreated wastewater to the shore; therefore, preventative closures are implemented surrounding every OBD located in growing area EL (Table 1). The size of each closure is determined based on dilution, using on the permitted flow rate of the OBD (in gallons per day, GPD), and the mid-tide depth of the receiving water that each OBD discharges to; the fecal concentration used for this

dilution calculation is $1.4X10^5$ FC /100 ml. All current closures are of adequate size to protect public health.

Table 1. Overboard Discharges (OBDs).

Pollution Area	OBD #	Location	Receiving Waterbody	Flow (gpd)	Acres Needed	Current Prohibited area
53 (A.2)	1624	Cherryfield	Narraguagus River	600	4.60	837
53 (A.2)	8084	Cherryfield		3000	21.00	
53 (A.2)	1971	Cherryfield		6600	50.63	
53 (A.2)	4610	Cherryfield		300	2.30	
53 (A.2)	4611	Cherryfield		315	2.42	
53 (A.2)	4613	Cherryfield		315	2.42	
53 (A.2)	4614	Cherryfield		315	2.42	
53 (A.2)	4713	Cherryfield		315	2.42	
53 (A.2)	4714	Cherryfield		315	2.42	
53 (A.2)	4715	Cherryfield		210	1.61	
53 (A.2)	5200	Cherryfield		315	2.42	
53 (A.2)	6095	Cherryfield		315	2.42	
53 (A.2)	6099	Cherryfield		760	5.83	
53 (A.2)	6160	Cherryfield		360	2.76	
53 (A.2)	6237	Cherryfield		750	5.75	
53 (A.2)	6238	Cherryfield		360	2.76	
53 (A.2)	6239	Cherryfield		430	3.30	
53 (A.2)	6432	Cherryfield		300	2.30	
53 (A.2)	7401	Cherryfield		360	2.76	
53 (A.2)	7507	Cherryfield		360	2.76	
53 (A.2)	7587	Cherryfield		380	2.92	
53 (A.2)	7637	Cherryfield		3040	23.32	
53 (A.2)	7948	Cherryfield		360	2.76	
53 (A.3)	2058	Harrington	Harrington River	360	2.76	325
53 (A.3)	2810	Harrington		600	4.60	
53 (A.3)	6180	Harrington		360	2.76	

Pollution Area	OBD #	Location	Receiving Waterbody	Flow (gpd)	Acres Needed	Current Prohibited area
53 (A.3)	7110	Harrington		300	2.30	
53 (A.3)	7159	Harrington		300	2.30	
53 (A.1)	4213	Milbridge	Smith Cove	750	3.84	33

National Pollutant Discharge Elimination System (NPDES)

Table 2. NPDES Permitted Discharges

Pollution Area	Permit ID	Type	Facility	Water Body
53 (A.2)	ME0001953	food process	Wyman's	Narraguagus River
53 (A.2)	ME0037265	food process	Wyman's	Narraguagus River
53 (A.2)	ME0037222	food process	Cherryfield foods	Narraguagus River
53 (A.2)	ME0036871*	OBD	Narraguagus Estates	Narraguagus River
53 (A.2)	ME0100404	WWTP	Milbridge	Narraguagus River

- Listed as OBD # 1971 in Table 1.

There is one wastewater treatment plant (WWTP/WWTF) in growing area EL. Since 2017 the WWTP inspection reports have been available in DMR central files. The facility is in Milbridge and discharge into Prohibited Area 53 (A.2). This area is larger than the calculated dilution zone for the effluent (Table 3).

Milbridge-

There is one WWTP within Growing Area EL. This treatment plant services the downtown Milbridge area with 93 customers on the system, each with some type of primary treatment such as a septic tank or large grease traps. These tanks then feed into 65 sand filters located around town and into the piping system under the street which in turn leads to the treatment plant. The treatment plant consists of a 10,000 gal. chlorine contact chamber. A complete review of this plant was conducted in December 2010 with newly hired treatment plant operator Patrick Perry and town manager Lewis Pinkham. Details of this report are in the Growing Area EL file at the Lamoine Lab. The plant is licensed for flows of 0.07 MGD and discharges into 6' of receiving waters at mid-tide, requiring a bacterial dilution zone of 180

acres to dilute a potential 140,000 FC/100ml of effluent down to 14 FC/100ml in the receiving waters. The Prohibited zone (53 (A.2)) which encompasses this dilution zone is approximately 400 acres. The entire closure which includes the OBD's located upstream into Cherryfield is 837 acres.

The regulation Prohibited closure size exceeds the computed effluent dilution zone (dilution calculation=180 acres / closure size= 400 acres).

Table 3, Milbridge WWTP dilution calculation

Milbridge	
FC/100ml	**140,000**
Discharge Rate (gallons per hour)	**2916**
Time of Discharge (hr)	**12**
water depth (ft)	**6**
FC per hour	1.55E+10
FC per **6** hr	1.85E+11
ml to dilute to 14FC/100ml	1.32E+12
ft^3 to dilute to 14FC/100ml	4.68E+07
area needed to dilute to 14 (ft^2)	7797617.5
Acres	180

Residential

All residential pollution sources are reported to the local plumbing inspector (LPI). Once the system has been documented as being fixed, staff members from DMR can re-assess the water quality data and shoreline survey information to determine if the area is safe for shellfish harvest. There are no known residential pollution sources in this growing area.

Industrial Pollution

There are no major industrial pollution sites in growing area EL such as chemical plants, steel mills, shipyards, or refineries. There are three discharges from blueberry processing plants. Two from Jasper Wyman and one from Cherryfield Foods. All these discharges are in current prohibited areas due to

either OBD's or WWTP outfalls. All the shellfish areas adjacent to the businesses meet their present area classifications.

Small individual storage tanks for gasoline and diesel were noted at five locations in the growing area. These tanks are near the shore. Tanks have containment walls and booms in the event of an accidental leak in a tank or spillage when unloading. The oil response team from the Maine DEP contacts Maine Marine Resources when a spill occurs, and a decision will be made whether a shellfish closure is necessary.

Marinas

The marina community in Maine only operates for a portion of the year due to adverse winter weather conditions. The management of marinas in Maine allows for shellfish growing areas to be available to harvesters, for at least a portion of the year, to direct market harvest by utilizing conditional area management plans.

The largest mooring field is in the Narraguagus River, Milbridge. This mooring field contains workboats only (lobster boats, trawling vessels), and is in area 53 (A.2) and is classified as Prohibited. Because these types of workboats are day use, are not lived on, and are unlikely to have marine sanitation devices ("heads") they are not considered a health risk of discharged septic waste nor is a marina closure area necessary.

Stormwater

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). Also, most major stormwater discharges are considered point sources and require coverage under an NPDES permit. In 1990, under the 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, EPA has delegated its authority to the Maine DEP to administer the Phase II Small MS4 General Permit. Under the Small MS4 GP, 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 stormwater runoff control, (5) Post-construction stormwater management, and (6) Pollution prevention/good housekeeping. The permit requires each city or town to develop a draft Storm Water Management Plan that establishes measurable goals for each of the Minimum Control Measures. The City or Town must document the implementation of the Plan, and provide annual reports to the Maine DEP. Currently, the discharge of stormwater from 30 Maine municipalities are regulated under the Phase II Small MS4 General Permit however, no municipalities located within the boundaries of growing area EL fall under these regulations. Additionally, the Maine Storm Water Management Law provides stormwater standards for projects located in organized areas that include one acre or more of disturbed area (Maine DEP 2009).

The only stormwater collection system in Growing Area EL is in the downtown Milbridge area. This collection system was impacted by raw sewage influent from illegal tie ins. Town officials implemented plans to locate sources and the abatement process has made improvements in samples taken from storm drains that empty into the mouth of Sawyer Brook. This area is located within Prohibited Area No. 53 (A.2).

Non-Point Pollution Sources

Non-point source (NPS) pollution is water pollution affecting a water body from diffuse sources, such as polluted runoff from agricultural areas draining into a river, significant rainfall, high river flows, or astronomical high tides. Nonpoint source pollution can be contrasted with point source pollution, where discharges occur to a body of water at a sole location, such as discharges from a chemical factory, urban runoff from a roadway storm drain, or ships at sea. NPS may derive from various sources with no specific solution to rectify the problem, making it difficult to regulate. Freshwater streams, drainage from rainstorm runoff and tidal creeks are the major source of non-point discharge into Growing Area EL. A total of 105 samples were taken from freshwater streams during the review period (Table 4, Figures 7-10).

The mouth of the stream at stream stations EL 14-256, 14-258, 14-260, 15-271, 16-261, 16-276, 22-277, and 22-278 are enclosed in a Prohibited area. The mouth of the stream at stream station EL 13-253, 13-254, 14-255, 14-256, 44-284, 57-288, 58-289, 60-290, 60-291, and 60-292 are enclosed in Restricted areas.

Table 4. Stream Samples in Growing Area EL 2007-2019; Scores > 163 cfu/100ml are highlighted in red.

Pollution area	LOCATION_ID	Sample date	Pollution Type	CFU/100ml
N/A	EL003-250	24-Jun-08	Stream	29
N/A		01-Nov-10	Stream	2

Pollution area	LOCATION_ID	Sample date	Pollution Type	CFU/100ml
N/A		06-Nov-13	Stream	5.5
N/A		07-Oct-19	Stream	48
N/A		24-Jun-08	Stream	60
N/A	EL006-251	01-Nov-10	Stream	20
N/A		06-Nov-13	Stream	>1600
N/A		30-Jun-08	Stream	31
N/A		01-Nov-10	Stream	1.9
N/A		06-Nov-13	Stream	52
N/A	EL006-252	13-May-19	Stream	13
N/A		10-Jun-19	Stream	15
N/A		07-Oct-19	Stream	66
N/A		16-Oct-19	Stream	840
53 (B.3)		24-Jun-08	Stream	16
53 (B.3)		01-Nov-10	Stream	1.9
53 (B.3)	EL013-253	24-Apr-12	Stream	12
53 (B.3)		03-Jun-13	Stream	6
53 (B.3)		13-Nov-13	Stream	1.9
53 (B.3)		29-Jun-15	Stream	480
53 (B.5)		30-Jun-08	Stream	260
53 (B.5)		01-Nov-10	Stream	1.9
53 (B.5)		17-Aug-11	Stream	27
53 (B.5)		22-Aug-11	Stream	142
53 (B.5)	EL013-254	05-Oct-11	Stream	27
53 (B.5)		24-Apr-12	Stream	4
53 (B.5)		17-Apr-18	Stream	18
53 (B.5)		13-May-19	Stream	4
53 (B.5)		07-Oct-19	Stream	122
53 (B.5)		24-Jun-08	Stream	48
53 (B.5)		24-Apr-12	Stream	5.5
53 (B.5)	EL014-255	03-Jun-13	Stream	10
53 (B.5)		06-Nov-13	Stream	2
53 (B.5)		13-Nov-13	Stream	60
53 (B.5)		30-Jun-08	Stream	>1600
53 (B.5)	EL014-256	01-Nov-10	Stream	780
53 (B.5)		14-Jun-11	Stream	380
53 (B.5)		17-Aug-11	Stream	240

Pollution area	LOCATION_ID	Sample date	Pollution Type	CFU/100ml
53 (B.5)		22-Aug-11	Stream	220
53 (B.5)		05-Oct-11	Stream	740
53 (B.5)		24-Apr-12	Stream	920
53 (B.5)		03-Jun-13	Stream	142
53 (B.5)		29-Jun-15	Stream	480
53 (A.2)	EL014-258	05-Jun-08	Stream	38
53 (A.2)		24-Jun-08	Stream	340
53 (A.2)		03-Jun-13	Stream	>1600
53 (A.2)	EL014-260	01-Nov-10	Stream	360
53 (A.2)	EL015-271	30-Jun-08	Stream	88
53 (A.2)		25-Apr-12	Stream	84
53 (A.2)		03-Jun-13	Stream	33
53 (A.2)		06-Nov-13	Stream	16
53 (A.2)	EL016-261	30-Jun-08	Stream	300
53 (A.2)		30-Dec-08	Stream	2
53 (A.2)		30-Dec-08	Stream	9.1
53 (A.2)		24-Apr-12	Stream	88
53 (A.2)		03-Jun-13	Stream	44
53 (A.2)		06-Nov-13	Stream	126
53 (A.2)	EL016-276	30-Jun-08	Stream	124
53 (A.2)		30-Dec-08	Stream	220
53 (A.2)		30-Dec-08	Stream	320
53 (A.2)		25-Apr-12	Stream	66
53 (A.2)	EL022-277	24-Jun-08	Stream	220
53 (A.2)		01-Nov-10	Stream	18
53 (A.2)		24-Apr-12	Stream	54
53 (A.2)		06-Nov-13	Stream	10
53 (A.2)	EL022-278	24-Jun-08	Stream	27
53 (A.2)		01-Nov-10	Stream	9.1
53 (A.2)		24-Apr-12	Stream	380
53 (A.2)		06-Nov-13	Stream	31
N/A	EL027-279	24-Jun-08	Stream	94
N/A		01-Nov-10	Stream	32
N/A		24-Apr-12	Stream	94
N/A		06-Nov-13	Stream	420
N/A	EL037-281	24-Jun-08	Stream	68

Pollution area	LOCATION_ID	Sample date	Pollution Type	CFU/100ml
N/A		01-Nov-10	Stream	25
N/A	EL037-282	24-Jun-08	Stream	25
N/A		01-Nov-10	Stream	7.3
N/A	EL040-283	24-Jun-08	Stream	160
N/A		01-Nov-10	Stream	5.5
N/A		13-Nov-13	Stream	1.9
53 (B.1)	EL044-284	24-Jun-08	Stream	156
54 (B.1)		01-Nov-10	Stream	13
53 (A.3)	EL048-285	24-Jun-08	Stream	220
53 (A.3)		01-Nov-10	Stream	15
53 (A.3)		06-Nov-13	Stream	24
53 (A.3)		13-May-19	Stream	12
53 (A.3)		10-Jun-19	Stream	13
53 (A.3)		07-Oct-19	Stream	104
53 (A.3)		10-Oct-19	Stream	200
53 (A.3)		16-Oct-19	Stream	15
53 (A.3)	EL050-286	24-Jun-08	Stream	60
53 (A.3)	EL054-287	24-Jun-08	Stream	140
53 (B.3)	EL057-288	24-Jun-08	Stream	92
53 (B.3)		01-Nov-10	Stream	2
53 (B.3)		13-Nov-13	Stream	6
53 (B.3)		29-Jun-15	Stream	70
N/A	EL058-289	24-Jun-08	Stream	104
N/A		01-Nov-10	Stream	8
N/A		13-Nov-13	Stream	5.5
53 (B.4)	EL060-290	26-Apr-11	Stream	1.9
53(B.4)		29-Jun-15	Stream	3.6
53(B.4)	EL060-291	26-Apr-11	Stream	1.9
53(B.4)		29-Jun-15	Stream	4
53(B.4)	EL060-292	26-Apr-11	Stream	1.9
53(B.4)		29-Jun-15	Stream	1.9

Figure 7. EL Stream Map 1

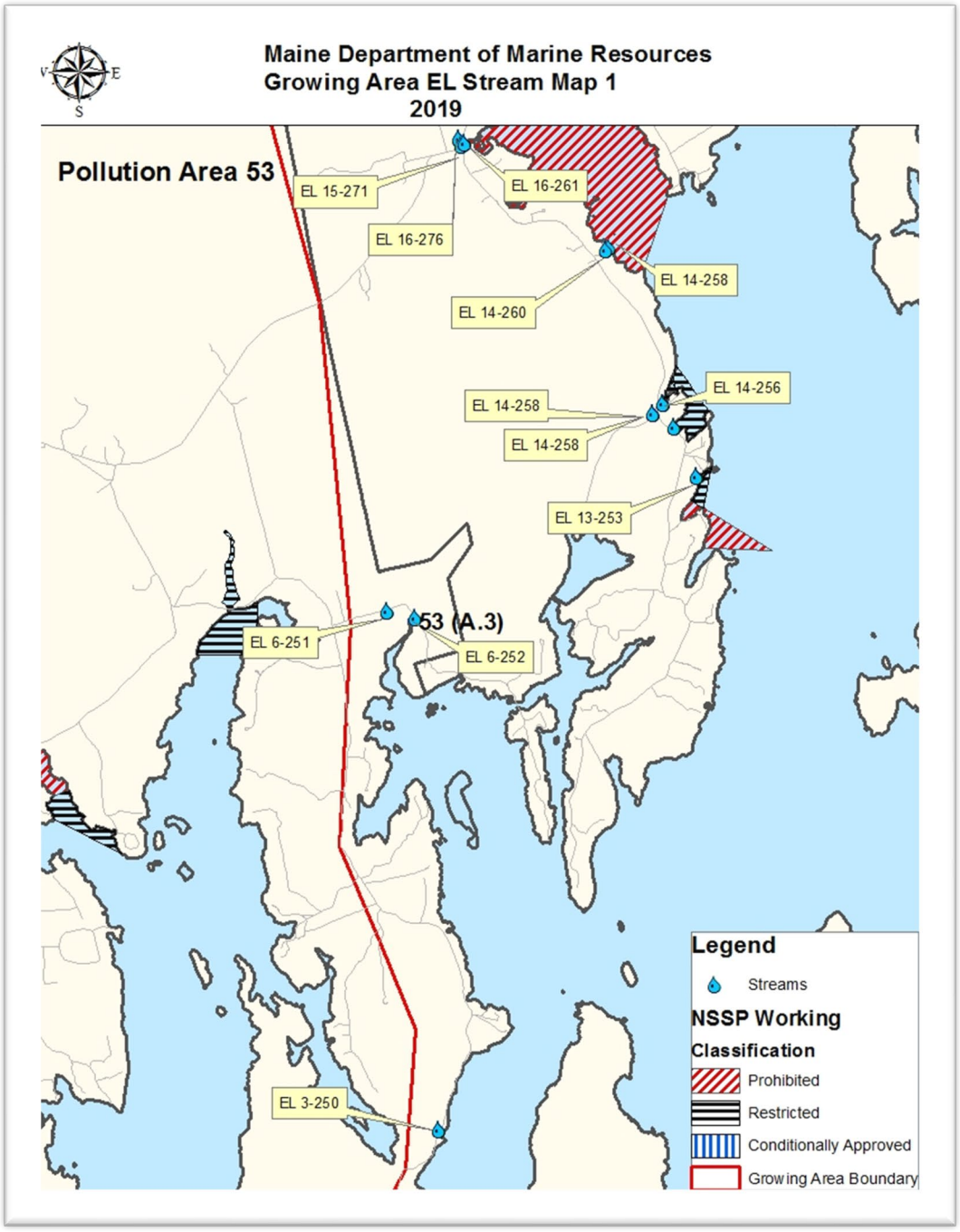


Figure 8. EL Stream Map 2

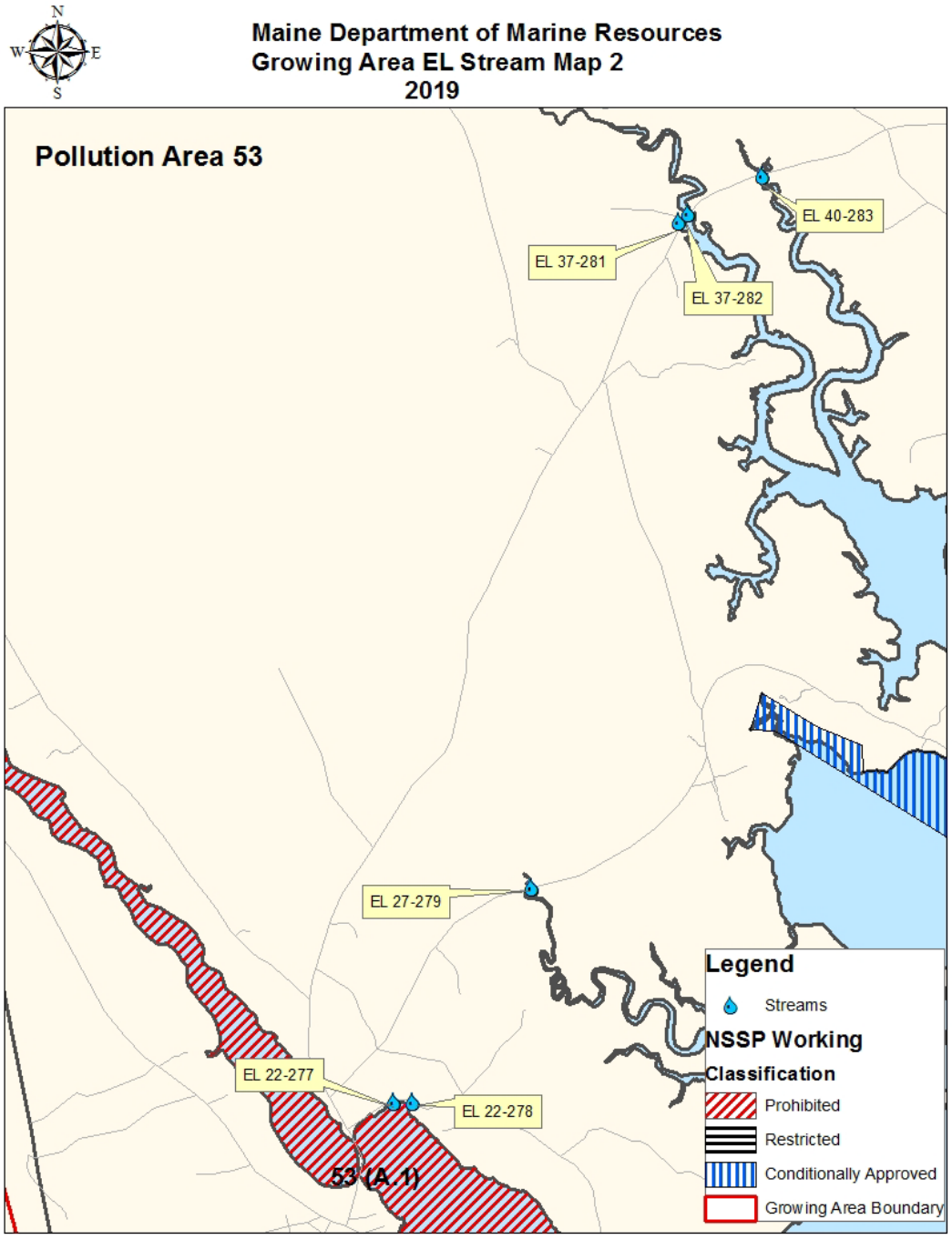


Figure 9. EL Stream Map 3

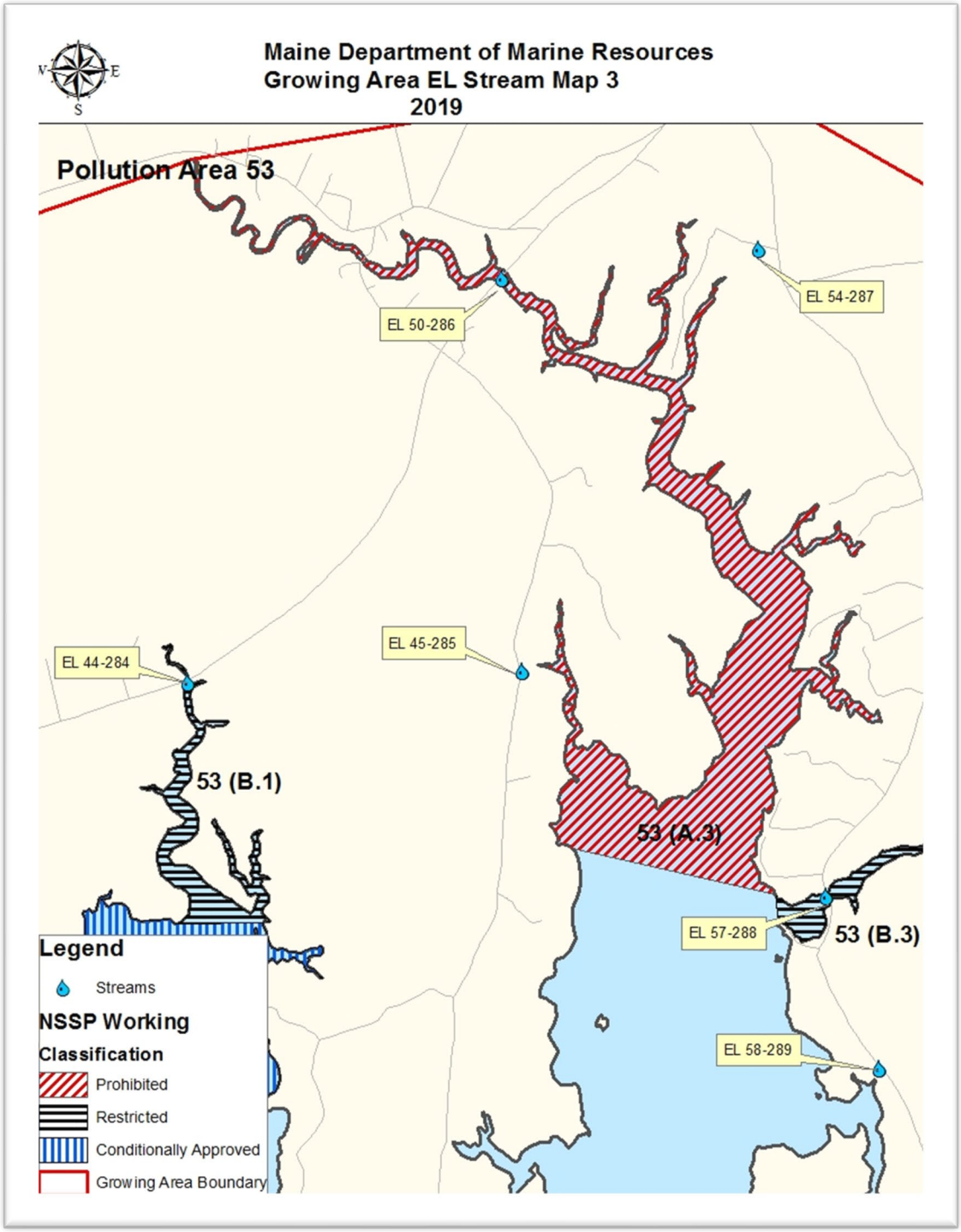
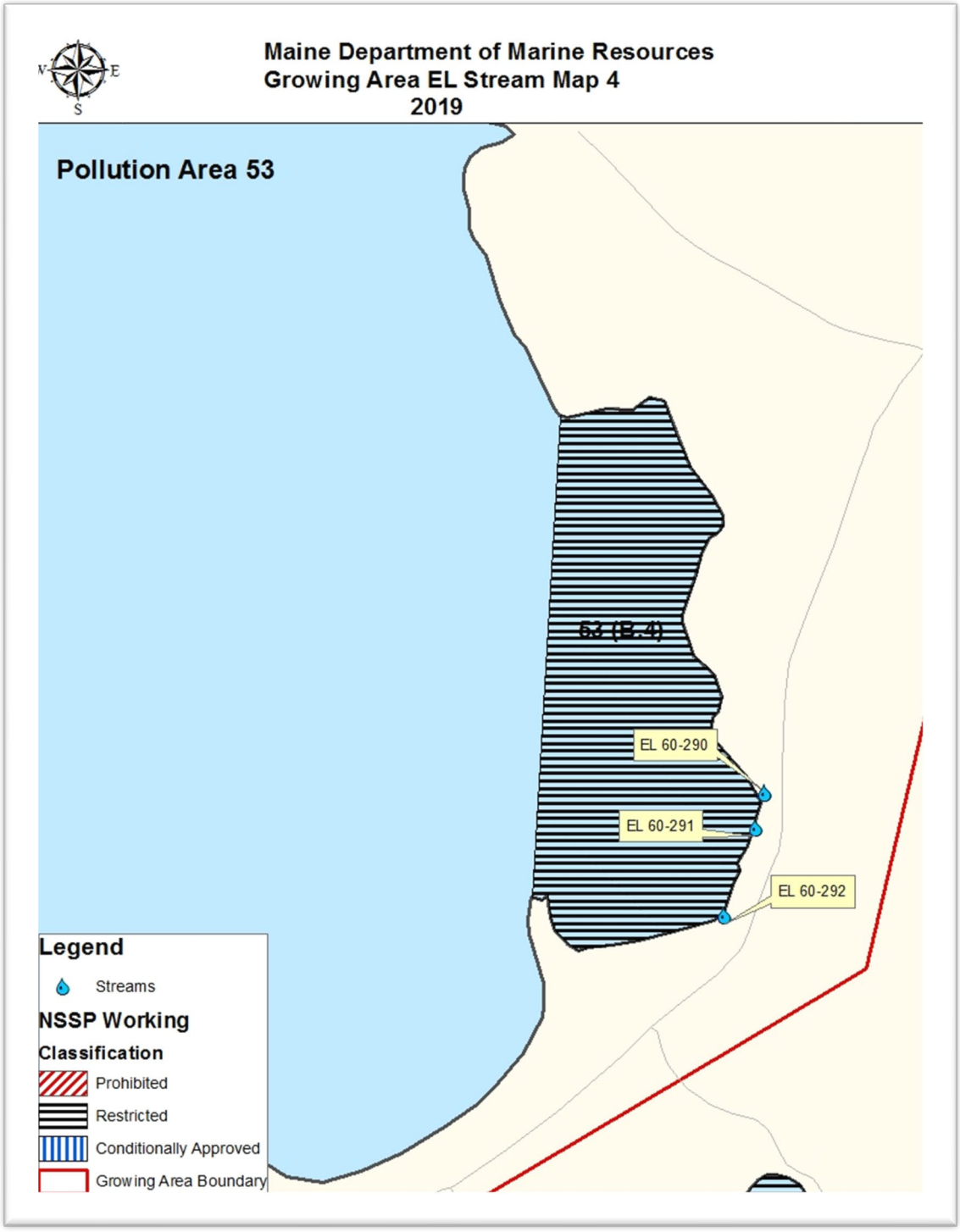


Figure 10. EL Stream Map 4



Agricultural Activities

There are no large-scale agriculture activities in Growing Area EL. Pollution from small agriculture operations can be introduced into the growing area as nonpoint source pollution is transported by runoff from large rainfall or snowmelt events. Smaller farms are encouraged to follow best management practices to help avoid effects animal waste and agricultural pollutants can have on water quality. No small farm activity is impacting shellfish harvest areas in Growing Area EL.

Domestic Animals and Wildlife Activity

The salt marshes and mudflats of the growing area provide valuable habitat to a variety of wildlife. Commonly observed bird species include a variety of gulls, sea and inland ducks, cormorants, geese, great blue herons, egrets, swans, and others. Mammals living within the growing area include dogs, cats, whitetail deer, muskrat, squirrels, chipmunks, rabbits, moles, mice, bats, shrews, weasels, skunks, raccoons, and others. Maine Inland Fish and Wildlife surveys indicate that migratory waterfowl numbers begin to increase in the early autumn months, and typically peak in late fall or early winter. Although large numbers of birds can, in theory, pose a threat to the growing area water quality, such occurrences are very difficult to document.

Recreation Areas (beaches, trails, campgrounds, etc.)

The concern for actual or potential pollution from recreational areas is because many of them allow dogs and some have bathroom facilities. 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.

Growing area EL is primarily a rural area with recreation areas limited to small-town parks with no septic facilities. The Petit Manan Wildlife Refuge is managed by the U.S. Fish and Wildlife Service and encompasses the lower part of the Petit Manan peninsula, below the Pigeon Hill area. The Service's primary focus at Maine Coastal Islands Refuge is restoring and managing colonies of nesting seabirds. 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. Recreation areas in EL are not considered to be impacting shellfish harvest areas.

Hydrographic and Meteorological Assessment

Tides

Coastal Maine experiences a mixed, semi-diurnal tide, with diurnal inequalities that are more pronounced on spring tides. Except for very few isolated areas with extensive saltwater marshes, tides are not considered to be contributors to fecal contamination. The National Oceanic and Atmospheric Administration data for a station at Eastport indicate a mean tidal range of 18.35 ft. The mean tidal range for most of Maine is 9 feet to 13 feet. Unlike areas with small diurnal tides, this extreme volume exchange results in significant bacterial dilutions. Currents in the area are predominantly driven by the tides.

Rainfall

The mean annual precipitation in growing area EL is approximately 44 inches and the precipitation is not evenly distributed throughout the year. The wettest months are generally April and November while 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. Flood closures are implemented when areas receive greater than two inches of rainfall in a twenty-four-hour period. Rainfall is monitored by numerous rain gauges located along the entire Maine coast and reported primarily through the Weather Underground website. Some areas of Maine have documented fecal influences resulting from the rainfall of greater than one inch in a twenty-four-hour period. These areas are considered rainfall conditional areas and are Conditionally Approved based on the one-inch closure trigger. No rainfall areas have been identified in growing are EL.

Maine DMR is working collaboratively with the University of Maine on a statewide coastal project determining how various watershed characteristics influence fecal contamination of marine waters during rainfall events. This research clusters watersheds based on similar characteristics then models how rainfall and associated pollution is distributed. The model is being refined to incorporate margin watershed influences.

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 nor' easter and can reach 125 knots. In Maine, the wind is not a contributor to fecal pollution because marine currents are primarily influenced by the size and duration of the normal tidal cycle.

River Discharge

Streamflow in Maine exhibits seasonal variation, with the highest flows occurring in the spring (due to snowmelt, spring rains, and low evapotranspiration) and the mid-to-late fall (due to fall rains and low evapotranspiration). The Narraguagus River is the major river system in growing area EL and drains 141,838 acres. Many small streams discharge into the growing area and these streams are discussed in the section about nonpoint source pollution.

Hydrographic Influence

Water circulation in this part of Narraguagus Bay is dominated by tides. The tidal range in Narraguagus Bay is thirteen feet. Tides are caused by the gravitational effects of the moon and sun on the ocean; other influences are heavy rainfall, low barometric pressure, and strong onshore winds which will increase tides. Tide levels fluctuate during the month based on the positions of the sun, moon, and earth. These fluctuations and the speed and direction of the tidal currents constantly change during a tidal cycle. Tidal currents have the greatest energy when water is pushed in and out of bays and channels during the highest and lowest tide levels. Growing area EL is subject to a semidiurnal tidal cycle

with two high tides and two low tides per day. The tidal cycle is 12 hours and 25 minutes long so that high and low tides are 50 minutes later each day.

Water Quality Studies

Map of Sampling Stations

Most marine fecal pollution of Maine waters comes from non-point sources. DMR uses Systematic Random Sampling (SRS) to monitor this influence and uses a pre-established schedule at an adequate frequency to capture all meteorological, hydrographic, and/or other pollution events that trigger non-point pollution contribution. Using SRS will detect the intermittent and unfavorable change in water quality and the program accepts the estimated 90th percentile (P90) as the standard to measure the variance of a data set.

There are presently 27 active water sampling sites in Growing Area EL and 2 investigative stations which do not currently have enough data to calculate a P90. It is recognized that access, icing, and safety considerations prevent some stations from being sampled on scheduled dates. Currently, all stations in Growing Area EL meet their current NSSP classification standard. Two water quality stations EL 46 and EL 47 now have water quality that meets the standards for Approved harvest and will be evaluated for an upgrade in 2020. Station EL 14 has shown a decline in water quality and is in danger of exceeding the approved standard. No stations failed to meet their standards at end of the year 2019.

Water Quality Discussion and Classification Determination

P90s for all active stations with a minimum of 30 samples were calculated and all stations meet their classification standards (Tables 6). The percent change in P90 from 2018 to 2019 was calculated and only two stations showed a substantial increase in the P90 score (Table 5). Overall the water quality in growing area EL appears to be remaining consistent. Some stations improved and some stations have declined.

Table 5. P90 calculations for stations with a minimum of 30 samples. Geomeans and P90s not meeting current classifications are highlighted in red. CA P90's are using open period data only

Station	Class	Count	GM	SDV	MAX	P90	Min_Date
EL001.00	A	30	2.2	0.22	16	4.4	3/11/2015
EL004.00	A	30	2.3	0.25	36	5.1	3/11/2015
EL006.00	A	30	2.5	0.33	38	6.9	3/11/2015
EL007.00	A	30	2.8	0.34	44	7.9	5/19/2015
EL008.00	A	30	2.3	0.24	24	4.7	3/11/2015
EL009.80	A	30	2.9	0.42	104	10.4	5/19/2015

Station	Class	Count	GM	SDV	MAX	P90	Min_Date
EL010.10	A	30	3.2	0.52	680	15.4	10/7/2014
EL011.00	A	30	2.7	0.48	520	11.6	3/11/2015
EL013.00	A	30	3.1	0.47	124	12.6	4/28/2015
EL014.00	A	30	4.7	0.62	820	29.6	4/28/2015
EL015.00	R	30	4.3	0.68	1120	32.4	3/11/2015
EL017.80	A	30	2.8	0.4	76	9.3	3/11/2015
EL018.00	P	30	6.7	0.79	840	70.6	4/28/2015
EL020.00	A	30	3.2	0.44	220	12.2	3/11/2015
EL021.00	P	30	4.8	0.63	540	31.4	5/27/2015
EL033.00	P	30	2.8	0.32	33	7.4	3/11/2015
EL034.00	P	30	3.5	0.43	86	12.8	3/11/2015
EL035.00	A	30	3.8	0.49	94	16.5	4/28/2015
EL036.00	CA	30	3.4	0.46	72	13.5	12/1/2015
EL037.00	CA	30	2.7	0.28	13	6.4	12/1/2015
EL039.00	A	30	3.1	0.4	112	10.2	4/28/2015
EL040.50	CA	30	2.5	0.27	26	5.6	5/30/2012
EL041.70	CA	30	2.6	0.29	22	6.4	3/7/2012
EL043.10	P	30	5.2	0.61	280	32.5	7/21/2015
EL046.00	R	30	5.6	0.47	52	22.9	4/22/2015
EL047.00	R	30	4.1	0.5	102	18.7	5/14/2015
EL047.20	A	30	2.6	0.31	30	6.7	9/22/2015

Table 6. Percent change in P90 2018-2019; Positive numbers show improvement negative numbers indicate a decline

Station	2018 P90	2019 P90	% change
EL001.00	4	4.4	-9.09%
EL004.00	4.9	5.1	-3.92%
EL006.00	6.9	6.9	0.00%
EL007.00	5.8	7.9	-26.58%
EL008.00	4.3	4.7	-8.51%
EL009.80	9.8	10.4	-5.77%
EL010.10	14.6	15.4	-5.19%
EL011.00	11	11.6	-5.17%
EL013.00	12.6	12.6	0.00%
EL014.00	23.8	29.6	-19.59%
EL015.00	32.5	32.4	0.31%

Station	2018 P90	2019 P90	% change
EL017.80	7.3	9.3	-21.51%
EL018.00	60.6	70.6	-14.16%
EL020.00	10.6	12.2	-13.11%
EL021.00	25.3	31.4	-19.43%
EL033.00	6.5	7.4	-12.16%
EL034.00	10.7	12.8	-16.41%
EL035.00	15.7	16.5	-4.85%
EL036.00	31	13.5	129.63%
EL037.00	11.1	6.4	73.44%
EL039.00	9.2	10.2	-9.80%
EL040.50	18.6	5.6	232.14%
EL041.70	40.9	6.4	539.06%
EL043.10	26.7	32.5	-17.85%
EL046.00	44.7	22.9	95.20%
EL047.00	32.9	18.7	75.94%
EL047.20	5.5	6.7	-17.91%

Emergency Closures: The reports summarizing emergency closures such as flood and biotoxin closures for the entire state are in the DMR central files.

Reclassifications: Reclassification addendums to the sanitary survey report are in the DMR central files.

CAMP Reviews, Inspection Reports, and Performance Standards

Annual Review of Area 53 (D.1) Back Bay, Milbridge Conditional Area Management Plan

Scope

Effective immediately, because of seasonal non-point pollution, the shores, flats and waters of Back Bay (Milbridge), north and east of a line beginning at a red-painted post located on the east shore of Wallace Cove running northwest to the north point of Little Island, then running northwest in line with the eastern side of Back Bay ledge to a point of land located on the west shore of Back Bay in line with the Milbridge FCC Cell Phone Tower. This area is classified as “Conditionally Approved” and it shall be unlawful to dig, take or possess any clams, quahogs, oysters, or mussels from June 1 through October 31.

The Back Bay, Milbridge portion of growing area EL is Conditionally Approved based on seasonality. Water quality in this area meets approved standards during the open status, from November 1 through May 31. Stations EL 36 and 37 monitor this area.

Compliance with management plan-

The Back-Bay area was sampled monthly while in the open status. The table below shows that the Geomean and P90 calculations meet approved standards during the open period. This conditional closure is enforced by DMR Marine Patrol.

Table 7. 2019 P90 open status

Station	Class	Count	GM	SDV	MAX	P90	Min_Date
EL036.00	CA	30	3.4	0.46	72	13.5	5/27/2015
EL037.00	CA	30	2.8	0.28	13	6.6	5/27/2015

Adequacy of reporting and cooperation of involved persons-

On-going cooperation between marine patrol enforcement activity (Division II, Lamoine) and water testing (Water Quality Laboratory, Lamoine) has provided an adequate system of monitoring and prohibition of harvesting during the closed period.

Compliance with approved growing area criteria-

All stations within the Conditional Area meets approved standards during the open status based on geomean and p90 values and lack of other pollution threats.

Field inspection of critical pollution sources-

Analysis of the samples from the Back Bay (EL 36 and 37) shows geomean and P90 scores that meet approved standards. This calculation is for the most recent thirty samples between November 1st and May 31st. A complete shoreline survey of the Back Bay area indicates no other point sources of pollution.

Water sampling compliance history

Table 8. 2019 Sampling Compliance

		Adverse	Random		Total
Station	Class	Closed	Closed	Open	
EL036.00	CA		4	7	11
EL037.00	CA		4	7	11

This area is open for 7 months and was sampled 7 times in the open status for 2019.

Analysis-recommendations-

This seasonal area continues to meet the Conditionally Approved classification criteria based on water quality scores listed above. The open period start date of November 1st and the closure date of May 31st continue to be valid. No recommendations for changes to the current management plan or conditional area classification open status are needed now.

Annual Review of Area 53 (D.2) Flat Bay, Milbridge Conditional Area Management Plan

Scope

Effective immediately, because of seasonal non-point pollution, the shores, flats and waters of Flat Bay (Harrington), Flat Bay (Harrington) south of a line beginning at a red-painted post at the western point of land at the mouth of Curtis Creek, running east to a red painted post on the opposite shore; AND north of a line beginning at a red-painted post on the tip of a prominent point of land on Keylog Shore and running west to the opposite shore. This area is classified as “Conditionally Approved” and it shall be unlawful to dig, take or possess any clams, quahogs, oysters, or mussels from June 1 through October 31.

The Flat Bay, Harrington portion of growing area EL is Conditionally Approved based on seasonality. Water quality in this area meets approved standards while in the open status, from November 1 through May 31. Stations EL 40.5 and 41.7 monitor this area.

Compliance with management plan-

The Flat Bay area was sampled monthly while in the open status. The table below show that the Geomean and P90 calculations meet approved standards during the open period. This conditional closure is enforced by DMR Marine Patrol.

Table 9. 2019 P90 open status

Station	Class	Count	GM	SDV	MAX	P90	Min_Date
EL040.50	CA	30	2.4	0.27	26	5.4	3/7/2012
EL041.70	CA	30	2.6	0.29	22	6.2	3/9/2011

Adequacy of reporting and cooperation of involved persons-

On-going cooperation between marine patrol enforcement activity (Division II, Lamoine) and water testing (Water Quality Laboratory, Lamoine) has provided an adequate system of monitoring and prohibition of harvesting during the closed period.

Compliance with approved growing area criteria-

All stations within the conditional area meet approved standards during the open status based on geomean and p90 values and lack of other pollution threats.

Field inspection of critical pollution sources-

Analysis of the samples from Flat Bay (EL 40.5 and 41.7) shows geomean and P90 scores meet approved standards. This calculation is for the most recent thirty samples between November 1st and May 31st. A complete shoreline survey of the Flat Bay area indicates no other point sources of pollution.

Water sampling compliance history

Table 10. 2019 Sampling Compliance

		Adverse	Random		Total
Station	Class	Closed	Closed	Open	
EL040.50	CA		4	7	11
EL041.70	CA		4	7	11

This area is open for 7 months and was sampled 7 times in the open status for 2019.

Analysis-recommendations-

This seasonal area continues to meet the Conditionally Approved classification criteria based on water quality scores listed above. The open period start date of November 1st and the closure date of May 31st continue to be valid. No recommendations for changes to the current management plan or conditional area classification open status are needed now.

Recommendation for Future Work

Water quality stations EL 46 and 47 meet the standard for approved harvest and these areas 53 (B.3 and B.4) will be recommended for an upgrade to Approved. No stations in growing area EL required a downgrade due to the end of the year 2019 P90 scores. The addendums for each of these proposed upgrades can be found in the DMR central files.

Table 11. Count table of samples collected in growing area EL during the 2019 season.

Station	Class	C	O	Total	Samples Required	Comments
EL001.00	A	3	6	9	6	flood
EL004.00	A		6	6	6	
EL006.00	A		6	6	6	
EL007.00	A		6	6	6	
EL008.00	A		6	6	6	
EL009.80	A		6	6	6	
EL010.10	A		6	6	6	
EL011.00	A		6	6	6	
EL013.00	A		6	6	6	
EL014.00	A		6	6	6	
EL015.00	R		6	6	6	
EL017.80	A		6	6	6	
EL018.00	P	6		6	0	prohibited
EL020.00	A		6	6	6	
EL021.00	P	6		6	0	prohibited
EL033.00	P	6		6	0	prohibited
EL034.00	P	6		6	0	prohibited
EL035.00	A		6	6	6	
EL036.00	CA	4	7	11	7	CA
EL037.00	CA	4	7	11	7	CA
EL039.00	A	3	6	9	6	flood

Station	Class	C	O	Total	Samples Required	Comments
EL040.50	CA	4	7	11	7	CA
EL041.70	CA	4	7	11	7	CA
EL043.10	P	6		6	0	prohibited
EL046.00	R		6	6	6	
EL047.00	R		6	6	6	
EL047.20	A	4	6	10	6	flood

References

National Shellfish Sanitation Program: Guide for the Control of Molluscan Shellfish, 2017 Revision;

Tide and Wind data, GOMOSS Internet site, West Penobscot Bay Buoy, 2001-2003.

Climatic and hydrographic information, US Coast Guard Coastal Pilot, 2005 edition

U.S. Food and Drug Administration (2001). Applied Concepts in Sanitation Surveys of Shellfish Growing Areas: Course #FD2042 (Training Manual), Volumes I and II.

Town information, 2007-2008 Maine Municipal Directory, Maine Municipal Association, Augusta, Maine 04330

Licensed discharge information, Maine Department of Environmental Protection, Augusta, Maine

Data Layers, Maine Office of GIS, Augusta, Maine

Rainfall data, National Weather Service, Caribou, Maine

Maine Combined Sewer Overflow 2016 Status Report, Maine Department of Environmental Protection, April 2017

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), Approved (A) and Investigative (X).
Count = the number of samples evaluated for classification must be a minimum of 30.
GM = 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, the Approved standard is 31, Restricted standard is 163
Min_Date = oldest date sampled included in the calculations.