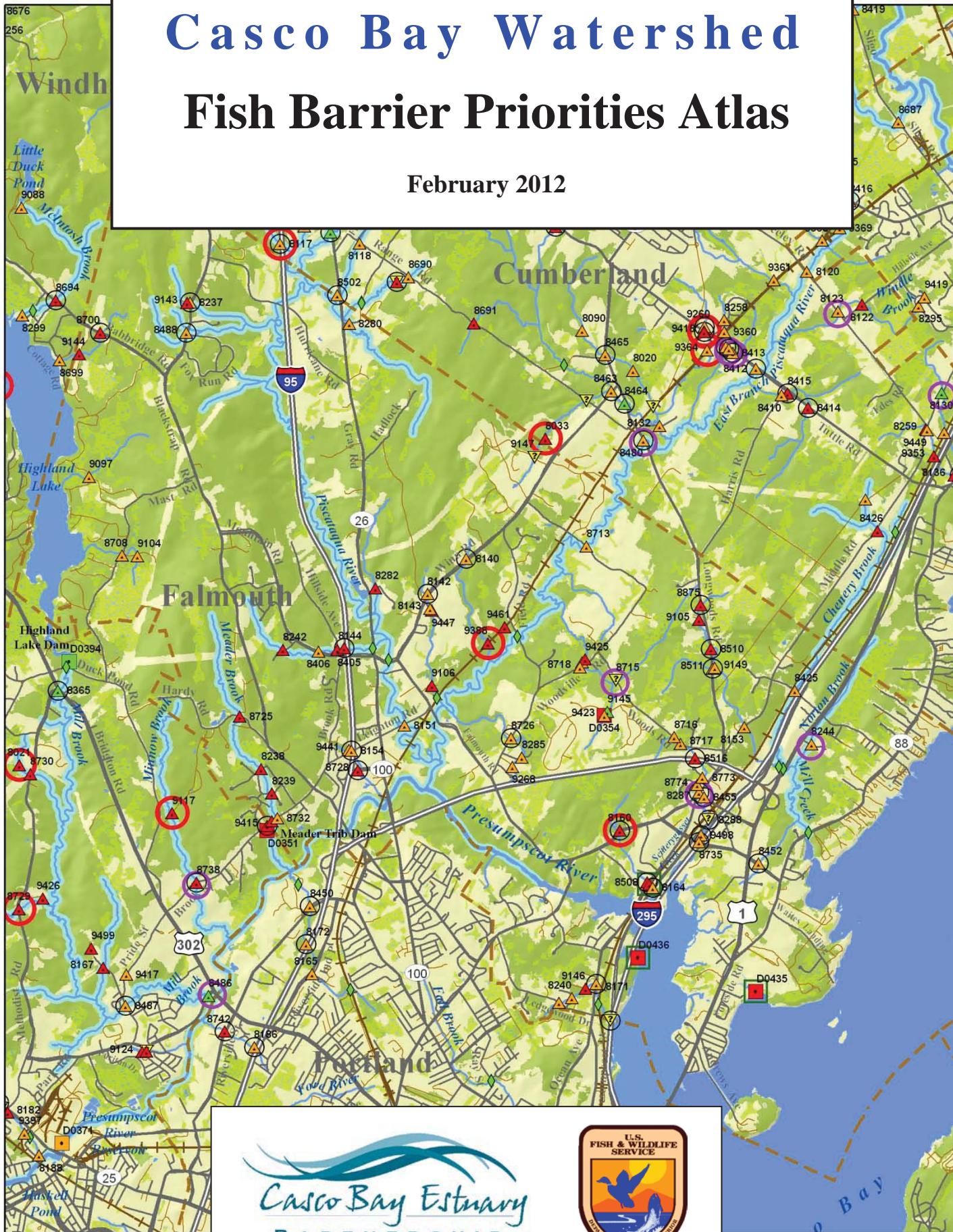


Casco Bay Watershed Fish Barrier Priorities Atlas

February 2012



Casco Bay Watershed

Fish Barrier Priorities Atlas

March 2012

Background

This atlas was created to help guide restoration of streams affected by road-stream crossings and dams acting as barriers to fish passage in the Casco Bay watershed as part of a project coordinated by the Casco Bay Estuary Partnership (CBEP) and U.S. Fish and Wildlife Service Gulf of Maine Coastal Program (USFWS-GOMCP). The 42 individual town maps of the atlas contain crossings, dams and a small number of natural barriers identified during field surveys¹ of perennial streams in 2009 and 2010, and mapped using a geographic information system (GIS). Sites have been classified by the degree of restriction they represent for fish passage, and additional related data such as high priority stream habitat and flood hazards are shown in the maps to help identify priority sites. Data have been compiled into a database for use in analysis and mapping.

Although habitat needs for fish are best understood at the scale of whole streams, which bear little relationship to town boundaries, this atlas was created primarily for use by municipal public works employees and other staff and representatives focusing on local road systems. Therefore, each map page represents a town or city, and is shown at a scale suitable to include the entire community on one page. An index map shows the location of each town within the watershed, and a legend page provides explanation of symbols used on individual maps. Barriers from outside the Casco Bay watershed are shown where data are available, but masked to focus on the towns and portion of towns which are within the watershed.

Fish Barriers

Road-stream crossings are shown with SiteID numbers to help identify them in the barrier database. Dams, in most cases, have labels both of SiteID and the dam's common name, if one is known. *Severe* barriers are defined as those road/stream crossings where fundamental physical barriers exist at either the inlet or outlet of the crossing, including inlets or outlets "perched" above the stream channel, and inlets blocked at least 50%, usually by debris. *Potential* barriers cover a wide spectrum of road-stream crossing situations where fish passage problems are likely to exist at some flows for some species or age groups of fish, and passage of other aquatic organisms such as amphibians and macroinvertebrates is likely also limited. Sites that were inaccessible to survey crews, and therefore not surveyed, are shown as unsurveyed, but are included in our analysis as *Potential* barriers. Dams are classified by whether or not they have effective facilities in place to provide upstream fish passage. Natural barriers, including waterfalls, debris jams (including woody debris or rock and fine sediments), and beaver dams were assessed when in close proximity to surveyed crossings and dams, and are mapped as well.

Priority Streams

USFWS-GOMCP and CBEP staff consulted with state fisheries biologists to identify streams with important fish habitat, primarily for brook trout or Atlantic salmon, or both. These *priority streams* are highlighted on the maps. The scope of the road/stream crossing barrier assessment was limited to perennial streams, those with continuous flow year round. Although intermittent streams were not surveyed, fish using priority streams also rely on connectivity with intermittent tributaries at various times of year. There are likely to be additional barriers on important intermittent streams that have not been assessed.

Flood Hazards

The maps present data from Cumberland County Emergency Management Agency (CCEMA) and CBEP to show where flood hazards are likely to overlap with fish barriers. CCEMA, in cooperation with towns, has identified many road crossings as flood hazards based on past flood events. CCEMA sites are marked by purple circles, and do not always coincide with barrier survey sites because they may be located on intermittent streams or larger rivers crossed by bridges, which are generally passable for fish but may still entail flood hazards.

¹ Field surveys were conducted based on protocols from the *Maine Road-Stream Crossing Survey Manual* (http://www.maine.gov/doc/mfs/fpm/water/docs/stream_crossing_2008/MaineRoad-StreamCrossingSurveyManual2008.pdf).

Where these sites do coincide with barriers, the combination of flood hazard with fish passage problems should place them high on any town's priority list for replacement.

A second set of flood hazard sites was derived from the barrier survey data by CBEP Director Curtis Bohlen. In CBEP's analysis, the capacity of each crossing was compared to the expected flows for that specific crossing during a 25-year flood event. Where sufficient crossing data exists, flows were calculated based on the relationship between drainage area above the crossing, and the proportion of the drainage area occupied by National Wetland Inventory-defined wetlands. CBEP flood hazard sites are shown as red circles, and represent all crossing sites where the capacity of the crossing was less than 50% of the expected 25-year flood value. This is meant as a general indication of flood risk, but may be incorrect in some locations based on site-specific factors. As with CCEMA sites above, where these sites coincide with barrier sites, the combination of flood hazard with fish passage problems should place them high on any town's priority list for review and possible replacement.

Other Data

Land use and wetland data are mapped to provide helpful landscape information, with upland forested areas distinguished from wetland, open, or developed areas. Public and private roads and railroads are included, as are all streams in the watershed, both perennial and intermittent. Relief shading is provided to help make reading the topography of the maps somewhat more intuitive. Tidal crossings, due to the increased complexity involved with crossing designs for two-way flow and maintenance of coastal wetlands, are denoted separately on the maps. Any town or other entity with plans to replace culverts at tidal crossings is invited to contact CBEP to explore partnership and grant funding opportunities. Town-based data summary tables for all barrier sites classified as *Severe* or *Potential* on high priority streams are provided following the maps. Each town has a two-page summary of key attributes from the database to provide information on location, dimensions and site conditions.

Data Sources

The data used to create this atlas came from a variety of sources. CBEP and USFWS-GOMC funded field surveys, with significant volunteer assistance from Trout Unlimited. Many resources were supplied by USFWS-GOMCP, including software, hardware, and data. Most barrier data was developed by USFWS-GOMCP from field survey data, though some was provided by the Kennebec Estuary Land Trust, which conducted surveys in the easternmost portion of the watershed. Flood hazard data is from either CCEMA, or from Curtis Bohlen's CBEP flood hazard analysis. Priority streams data was developed by USFWS-GOMCP, MDIFW, and the Maine Department of Marine Resources based on survey data of fish occurrences and habitat surveys. Basemap data, including relief shading, roads, town boundaries and most watershed polygons were supplied by the Maine Office of Geographic Information Systems. The roads data mapped is primarily from the Maine Department of Transportation dataset. Dam data is modified from original data from the Maine Department of Environmental Protection. Hydrography data came from high resolution National Hydrography Dataset (NHD).

Disclaimer

Please be aware that the data contained in the maps and tables of this atlas may contain errors, and represents the best information available at the time of publication. Note that crossing surveys were conducted in 2009 and 2010, and some sites surveyed may have undergone important changes based on flood events, maintenance or even entire replacement of a crossing. Likewise, flood hazard sites identified by CCEMA may have been modified based on previously planned work to lessen flooding problems.

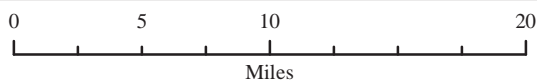
For more information, please contact:

Alex Abbott c/o
Gulf of Maine Coastal Program
U.S. Fish and Wildlife Service
4R Fundy Rd.
Falmouth, ME 04105
Telephone: 207-781-8364, ext. 21
Electronic Mail: alexoabbott@hotmail.com

Matt Craig
Casco Bay Estuary Partnership
PO Box 9300, 34 Bedford Street
Portland, ME 04104-9300
Telephone: 207.228.8359
Electronic Mail: mcraig@usm.maine.edu
Website: www.cascobayestuary.org

Casco Bay Barriers by Town

Index Map



Casco Bay Barriers by Town

Legend

Crossing Barrier Type with SiteID

- 8235 ▲ Severe
 - 8049 ▲ Potential
 - 8731 ▲ Passable
 - 9112 ▼ Unknown
- Dams**
- No Upstream Fish Passage
 - Planned Upstream Fish Passage
 - Upstream Fish Passage
- ◇ Bridge (Passable)
 - Debris/Beaver Dam (Impassable)
 - ⚡ Waterfall (Impassable)
 - MDOT Crossing
 - Tidal Site
 - Flood Hazard - Cumberland County EMA
 - Flood Hazard - CBEP Analysis
 - ~ Priority Stream

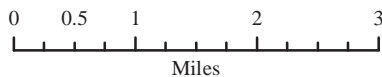
Roads

- Private
- Public
- Highway
- Interstate
- Railroad
- - - Town Boundary
- Wetland
- ~ Perennial Stream
- ~ Intermittent Stream
- Rivers, Ponds & Coastal Waters
- Watershed Boundary
- Forested Lands
- Open or Developed Lands

These maps are created primarily with 1:24,000 scale basemap data, with landcover data added to provide general distinctions between open and forested lands. Areas outside of the Casco Bay watershed are masked to obscure them.

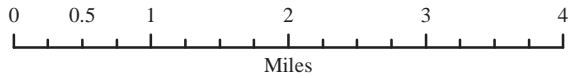


Scale Varies by Town
See scale bar at bottom of each map



Casco Bay Barriers by Town

Windham



Severe and High Priority Potential Barriers by Town

Site ID	Town	Habitat Priority	Basic Structure Type	Barrier Class	Survey Date	Road Name	Road Type & Class	Stream	UTM East	UTM North	Stream Type	Number Of Culverts	Material	Condition
8799	Windham	High	Culvert	Potential	7/22/2009	Albion Rd	Town / Paved	Unnamed	389115	4848815	Perennial	1	Concrete	
9275	Windham		Multiple Culverts	Severe	6/26/2009	Arrowhead Pass	Private / Driveway	Weeks Brook	388677	4842051	Perennial	2	Metal	
8374	Windham		Culvert	Severe	6/23/2009	Barnes Rd	Town / Paved	Unknown	385546	4845415	Perennial	1	Metal	
9276	Windham		Culvert	Severe	6/26/2009	Batchelder Rd	Private / Unpaved	Milliken Brook	388919	4842236	Perennial	1	Metal	
8663	Windham	High	Culvert	Severe	6/18/2009	Brand Rd	Town / Paved	Ollie Brook	387047	4855666	Perennial	1	Concrete	
8138	Windham	High	Culvert	Severe	7/13/2009	Chute Rd	Town / Paved	Colley Wright Brook	387754	4846422	Perennial	1	Metal	
9167	Windham	High	Culvert	Severe	7/14/2009	Colley Brook Ave	Private / Paved	Colley Brook	388688	4850213	Perennial	1	Metal	
8680	Windham	High	Multiple Culverts	Potential	7/14/2009	Falmouth Rd	State / Paved	Baker Brook	388877	4852220	Perennial	2	Metal	
8112	Windham	High	Multiple Culverts	Potential	7/14/2009	Falmouth Rd	State / Paved	Dutton Hills Brook	389270	4851939	Perennial	2	Plastic	
8694	Windham	High	Multiple Culverts	Severe	7/22/2009	Falmouth Rd	State / Paved	McIntosh Brook	390996	4849533	Perennial	2	Metal	
9085	Windham		Multiple Culverts	Severe	8/3/2009	Glendale Rd	Private / Unpaved	Unknown	392727	4852158	Perennial	6	Metal	
8106	Windham	High	Culvert	Potential	7/14/2009	Gray Rd	State / Paved	Pleasant River	388202	4853153	Perennial	1	Metal	
8152	Windham	High	Multiple Culverts	Severe	7/1/2009	Hardy Stream	Town / Paved	Milliken Brook	389835	4843389	Perennial	2	Metal	
8795	Windham	High	Culvert	Severe	7/13/2009	Highland Cliff	Town / Paved	Unknown	388022	4844946	Perennial	1	Metal	
8796	Windham	High	Culvert	Severe	7/13/2009	Highland Cliff Rd	Town / Paved	Unknown	388085	4845416	Perennial	1	Concrete	
9277	Windham	High	Multiple Culverts	Severe	6/26/2009	Inkhorn Brook Road	Private / Unpaved	Milliken Brook	389569	4842865	Perennial	5	Metal	
8864	Windham	High	Culvert	Potential	8/4/2009	Keeps Way	Town / Unpaved	Outlet Brook	383096	4855670	Perennial	1	Concrete	
8970	Windham		Multiple Culverts	Severe	8/3/2009	Lakeside Dr	Town / Unpaved	Unknown	392692	4852061	Perennial	4	Plastic	
8711	Windham	High	Culvert	Potential	7/13/2009	Land Of Nod Rd	Town / Paved	Unknown	388568	4845578	Perennial	1	Plastic	
9088	Windham	High	Multiple Culverts	Potential	7/22/2009	Little Duck Pond Rd	Private / Unpaved	McIntosh Brook	390514	4850835	Perennial	2	Metal	Rust
8299	Windham	High	Multiple Culverts	Potential	8/3/2009	Lower Beach Rd	Town / Unpaved	McIntosh Brook	390526	4849322	Perennial	2	Metal	
8111	Windham	High	Culvert	Severe	7/14/2009	Nash Rd	Town / Paved	Dutton Hills Brook	389410	4852010	Perennial	1	Metal	
8863	Windham	High	Culvert	Potential	7/14/2009	Nash Rd	Town / Paved	Dutton Hills Brook	389004	4851482	Perennial	1	Plastic	
8686	Windham	High	Culvert	Potential	7/14/2009	Partridge Rd	Town / Paved	Barker Brook	388778	4852139	Perennial	1	Plastic	
8706	Windham	High	Culvert	Potential	7/13/2009	Pope Rd	Town / Paved	Colley Wright Brook	387813	4847075	Perennial	1	Metal	
8275	Windham	High	Culvert	Severe	6/18/2009	Pride Lane	Town / Paved	Tarkil Pond	384999	4855666	Perennial	1	Plastic	
9084	Windham	High	Culvert	Severe	7/30/2009	Provost Dr	Private / Paved	Ditch Brook	385446	4852616	Perennial	1	Metal	
8119	Windham	High	Multiple Culverts	Potential	7/30/2009	River Rd	State / Paved	Otter Brook	384149	4850277	Perennial	2	Metal	
8712	Windham	High	Culvert	Severe	6/23/2009	River Rd	State / Paved	Unnamed	384802	4845186	Perennial	1	Metal	
8800	Windham	High	Culvert	Potential	8/12/2009	Route 302	State / Paved	Colley Wright Brook	388217	4848591	Perennial	1	Concrete	
8473	Windham	High	Culvert	Potential	6/18/2009	Rt 114	State / Paved	Glantz Brook	388340	4856078	Perennial	1	Concrete	
8665	Windham	High	Culvert	Severe	7/17/2009	Rt 202	State / Paved	Glantz Brook	388708	4855820	Perennial	1	Concrete	
8271	Windham	High	Culvert	Potential	8/4/2009	Rt 302	State / Paved	Outlet Brook	383691	4855715	Perennial	1	Metal	
8797	Windham	High	Multiple Culverts	Potential	8/3/2009	Rt 302	State / Paved	Pleasant River	386534	4851315	Perennial	2	Metal	
8639	Windham	High	Culvert	Severe	7/21/2010	Rt. 302	State / Paved	Hyde Brook	382316	4859101	Perennial	1	Concrete	
8655	Windham	High	Culvert	Severe	6/18/2009	Sand Bar Rd	Town / Paved	Unknown	384954	4856173	Perennial	1	Plastic	
8860	Windham	High	Culvert	Severe	8/4/2009	Sokokis Point Rd	Town / Paved	Outlet Brook	383004	4855675	Perennial	1	Plastic	
8376	Windham	High	Multiple Culverts	Potential	7/13/2009	Windham Ctr Rd	State / Paved	Colley Wright Brook	388138	4848388	Perennial	2	Metal	
8865	Windham	High	Culvert	Potential	7/21/2010	Woodland Rd	Town / Unpaved	Unnamed	384025	4856438	Perennial	1	Concrete	
D0353	Windham	High	Dam	Severe	7/13/2009		NA	Colley Wright	388129	4847556	Perennial		Concrete	
D0370	Windham	High	Dam	Severe			NA	collins pond	385337	4853675	Perennial			
D0391	Windham	High	Dam	Severe			NA	Ditch brook	385865	4852009	Perennial			
9068	Windham	High	Unknown	Potential	8/4/2009		Private	Glantz Brook	388233	4856162	Perennial			
9069	Windham	High	Unknown	Potential	8/4/2009		Private	Glantz Brook	388125	4856192	Perennial			
D0381	Windham		Dam	Severe			NA	Little Sebago Lake	385454	4855236	Perennial			
D0383	Windham		Dam	Severe			NA	Mill Pond	385576	4854859	Perennial			
8676	Windham	High	Unknown	Potential	7/14/2009		Town	No Data	390089	4853493	Perennial			
8678	Windham	High	Unknown	Potential	7/14/2009		State Reserve	No Data	389973	4853112	Perennial			
9112	Windham	High	Unknown	Potential	6/23/2009		Private	No Data	386295	4843484	Perennial			
9251	Windham	High	Unknown	Potential	8/4/2009		Private	No Data	388252	4856514	Perennial			
9256	Windham	High	Unknown	Potential	7/14/2009		Private	No Data	390069	4853414	Perennial			
9071	Windham	High	Culvert	Potential	8/4/2009		Private	Outlet Brook	383841	4855703	Perennial			
D0382	Windham	High	Dam	Severe			NA	Presumpscot	385627	4842600	Perennial			
D0380	Windham	High	Dam	Severe			NA	Presumpscot River	385239	4843324	Perennial			
D0385	Windham	High	Dam	Severe			NA	Presumpscot River	383368	4850960	Perennial			

Severe and High Priority Potential Barriers by Town

Site ID	Specific Structure Type	Inlet Condition	Inlet Blocked	Primary Inlet Span FT	Crossing Structure Length FT	Outlet Condition	Outlet Drop FT	Crossing Substrate	Fill Height FT	Estimated Stream Width FT	Upstream Miles to Next Barriers	Up-Stream Barriers	Total Upstream Miles	Down-stream Barriers	Dam Name	Hydraulic Height FT
8799	Round Culvert	At Grade	No	2.9	53.5	At Grade		None		2.9	0.239	0	0.239	7		
9275	Round Culvert	At Grade	No	3.0	29.9	Perched	0.6	None		6.5	1.580	0	1.580	0		
8374	Round Culvert	At Grade	No	3.5	48.6	Perched	0.5	None		19.6	0.559	0	0.559	4		
9276	Round Culvert	At Grade	No	2.1	15.9	Cascade		None		14.7	0.622	2	1.483	0		
8663	Round Culvert	At Grade	No	3.0	49.9	Perched	0.4	None		5.1	0.202	0	0.202	10		
8138	Pipe Arch Culvert	At Grade	No	16.1	94.5	Cascade		None		3.2	0.508	6	4.468	2		
9167	Round Culvert	At Grade	No	2.0	24.0	Perched	0.3	None		2.9	0.590	0	0.590	7		
8680	Round Culvert	At Grade	No	4.6	65.0	At Grade		None		3.3	3.028	3	3.447	7		
8112	Round Culvert	At Grade	No	2.1	49.9	At Grade		None		3.2	0.099	1	0.367	9		
8694	Round Culvert	At Grade	25%	3.0	79.1	Perched	0.5	None		9.2	1.733	1	2.296	3		
9085	Round Culvert	At Grade	100%		20.0	At Grade		None		6.5	0.068	1	0.543	6		
8106	Pipe Arch Culvert	At Grade	No	8.9	84.3	At Grade		None		5.5	1.094	8	5.872	6		
8152	Round Culvert	At Grade	No	2.9	60.4	Perched	0.2	None		34.6	0.459	0	0.459	2		
8795	Round Culvert	At Grade	No	2.0	49.9	Perched/Cascade	3.6	None		4.4	0.271	0	0.271	2		
8796	Round Culvert	At Grade	No	3.0	48.6	Perched	0.3	None		14.8	0.348	1	1.188	2		
9277	Round Culvert	At Grade	25%	2.2	33.5	Perched	1.0	None		36.3	0.403	1	0.862	1		
8864	Round Culvert	At Grade	No	3.5	21.3	At Grade		None		6.1	0.450	3	2.345	2		
8970	Round Culvert	At Grade	No	2.0	23.3	Cascade		None		4.2	0.475	0	0.475	7		
8711	Round Culvert	At Grade	No	3.0	40.7	At Grade		None		6.2	0.840	0	0.840	3		
9088	Round Culvert	At Grade	No	1.6	23.6	At Grade		None		1.8	0.563	0	0.563	4		
8299	Round Culvert	At Grade	No	3.8	27.9	At Grade		None		4.8	0.340	2	2.637	2		
8111	Round Culvert	At Grade	No	2.5	36.7	Perched	1.0	None		16.0	0.268	0	0.268	10		
8863	Round Culvert	At Grade	No	2.0	39.7	At Grade		None		1.3	0.456	2	0.823	8		
8686	Round Culvert	At Grade	No	4.2	50.5	At Grade		None		17.8	0.507	3	1.330	7		
8706	Pipe Arch Culvert	At Grade	No	11.6	104.7	At Grade		Contrasting		31.3	0.408	5	3.960	3		
8275	Round Culvert	At Grade	No	1.1	20.0	Perched	0.2	None		10.1	0.456	0	0.456	11		
9084	Pipe Arch Culvert	At Grade	No	9.8	77.1	Perched	0.3	None		29.0	1.015	14	28.986	7		
8119	Round Culvert	At Grade	No	5.0	62.8	At Grade		None		35.9	1.927	0	1.927	6		
8712	Round Culvert	Inlet Drop	No	3.0	91.9	Perched	0.6	None		15.9	0.458	0	0.458	4		
8800	Box Culvert	At Grade	No	11.0	50.5	At Grade		None		24.0	1.828	2	2.657	6		
8473	Box Culvert	At Grade	No	5.9	131.2	At Grade		None		3.2	0.089	7	4.975	7		
8665	Box Culvert	At Grade	No	9.5	85.3	Perched	-324.8	None		8.2	0.348	8	5.323	6		
8271	Round Culvert	At Grade	No	3.4	141.1	At Grade		None		3.3	0.115	2	1.895	3		
8797	Pipe Arch Culvert	At Grade	No	19.7	82.0	At Grade		Unknown		2.9	20.689	46	75.032	5		
8639	Box Culvert	At Grade	No	6.6		Perched	3.2	None	16.4	7.8	3.679	0	3.679	1		
8655	Round Culvert	At Grade	No	3.3	41.4	Perched	0.2	None		1.4	0.749	0	0.749	11		
8860	Round Culvert	At Grade	No	4.6	41.7	Perched	0.2	None		4.6	0.077	4	2.422	1		
8376	Round Culvert	At Grade	No	4.0	50.5	At Grade		None		8.4	0.157	3	2.814	5		
8865	Round Culvert	At Grade	No	2.0		At Grade		None	2.3		1.043	0	1.043	5		
D0353										5.0	0.738	4	3.553	4	Unnamed	1.4
D0370										8.2	0.833	13	27.971	8	Collins Pond Dam	15.0
D0391										4.4	0.608	15	29.594	6	Varney Mill Dam	7.0
9068			No							4.3	0.391	6	4.885	8		
9069			No							4.3	3.163	3	3.914	9		
D0381										3.9	15.075	11	26.820	10	Little Sebago Dam	8.0
D0383										3.4	0.317	12	27.137	9	Mill Pond (1) Dam	8.0
8676			No							4.8	0.051	2	0.419	8		
8678			No							4.1	0.166	0	0.166	10		
9112			No							5.7	0.262	0	0.262	2		
9251			No							5.0	0.429	0	0.429	9		
9256			No							6.4	0.202	1	0.369	9		
9071			No	< 1.5						2.8	0.737	1	1.780	4		
D0382										27.1	0.589	67	112.396	2	Mallison Falls Dam	20.0
D0380										1.7	11.093	66	111.807	3	Little Falls Dam	17.0
D0385										4.1	1.324	5	4.290	6	North Gorham Dam	39.0