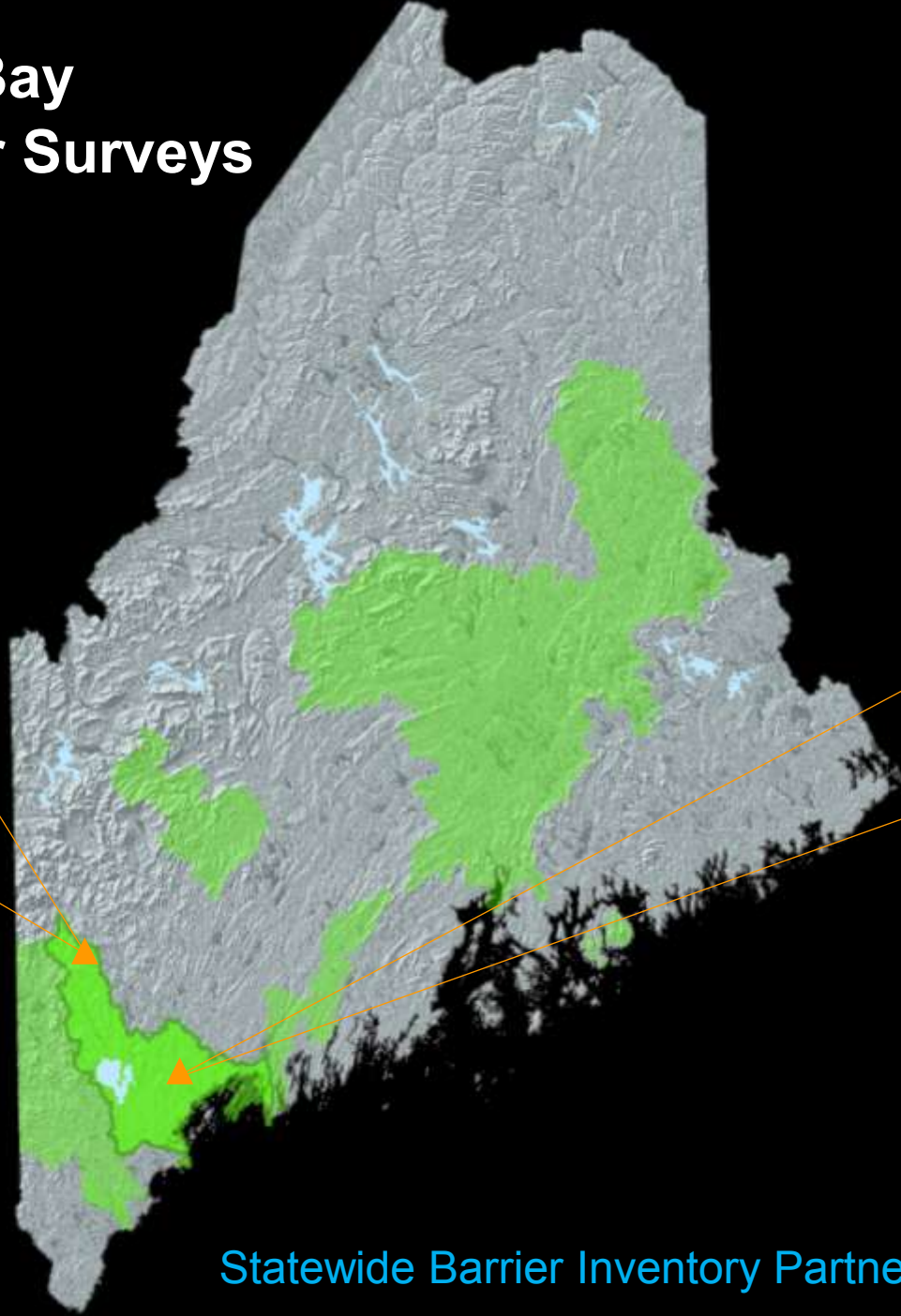


Casco Bay Stream Barrier Surveys

Alex Abbott
U.S. Fish and Wildlife Service
Gulf of Maine Coastal Program



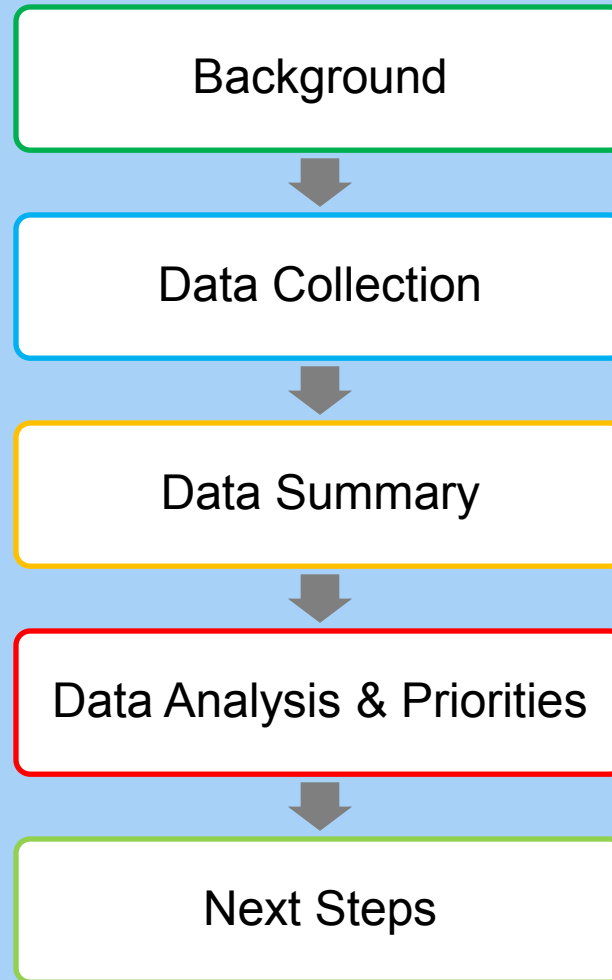
Statewide Barrier Inventory Partnership

Maine Barrier Survey Status Map



More than
25 % of Maine
Road Crossings
Surveyed

Casco Bay Stream Barrier Surveys



Thanks to Maine's Barrier Inventory Partners



Maine Barrier Survey Protocols

Structure Type & Dimensions

1) Select the Specific Structure Type from the diagram below and check its number on the front of this form, and

2) Record on the front of this form in the appropriate blocks: dimensions A, B, and C as shown in the diagram, as well as the total Crossing Structure Length (D) for all. Record structural height (E) only for Type 7 Structures.

1 2

ROAD - STREAM CROSSING SURVEY

Date _____ (month) Time _____ Sequence # _____ Site ID _____

Observer (i) _____ Organization _____

Stream _____ Tributary to _____ Town _____

Event _____ Type ☐ Flood ☐ Upstream ☐ Structural ☐ Road ☐ Downstream

GPS Coordinates (NAD83 UTM Zone 18N) East _____ North _____

DeLorme Atlas Map # _____ Grid Reference _____ Location _____ Description _____

Photo IDs _____

Basic Structure
Material
Specific Structure
Channel Width
Inlet Condition
☐ Open Channel
☐ Flooded
Outlet Condition
Outlet Water
Tributary Source
Tributary Pool
At Outlet Spill
By Crossing Site
Crossing Surface
Structural Details
Water Depth
Range Comparison
Significant Data
Visible Barriers
Comments:

MAINE ROAD-STREAM CROSSING SURVEY MANUAL



Alex Abbott
Gulf of Maine Coastal Program
U.S. Fish and Wildlife Service
Falmouth, Maine

May 2007



Natural Barrier Survey Log

Date _____ (month) Observer (i) _____ Organization _____

Stream _____ Tributary to _____

Flow Condition: ☐ Low Flow ☐ Moderate Flow ☐ High Flow ☐ No Flow

Site Sketch (Downstream Dam Face)

Site ID _____

Dam Survey

Date _____ (month) Time _____ Sequence # _____ Site ID _____

Observer (i) _____ Organization _____

Stream _____ Tributary to _____ Town _____

MAINE DAM & NATURAL BARRIER SURVEY MANUAL

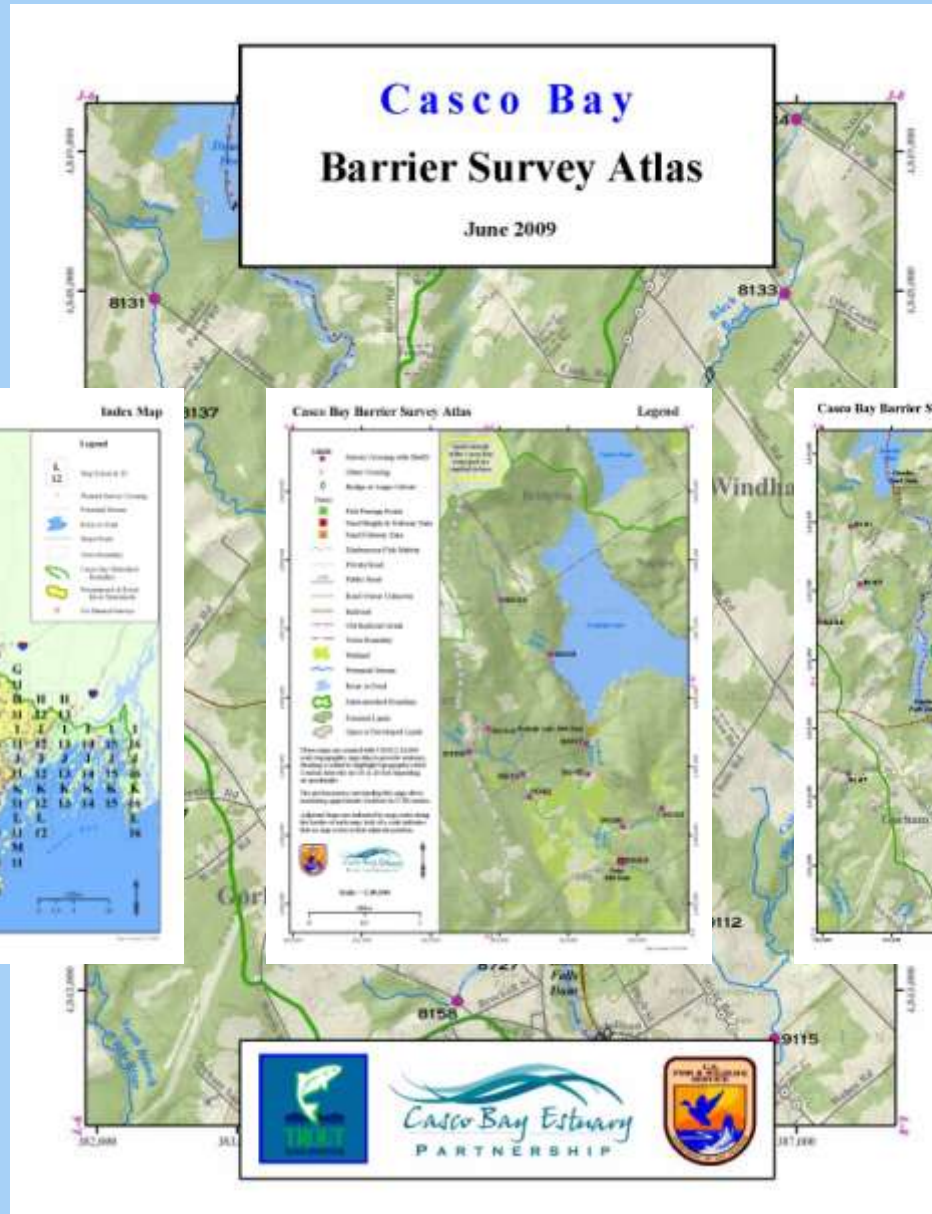


Alex Abbott
Gulf of Maine Coastal Program
U.S. Fish and Wildlife Service
Falmouth, Maine

September 2007



Barrier Survey Atlas



Casco Bay Barrier Surveys

Perennial
Stream Miles
 $\approx 1,200$

Sebago
Lake

Casco Bay

0 1 2 3 4 5
Miles



Casco Bay Barrier Surveys

Road & Railroad
Miles
 $\approx 4,300$

Sebago
Lake

Casco Bay

0 1 2 3 4 5
Miles



Casco Bay Barrier Surveys

Planned Crossing
Sites
1,340

Data Summary

	Lower Presumpscot & Royal		Crooked	
	#	%	#	%
Planned Crossing Sites to Survey	584	44	170	13
(Total Casco Bay = 1,340)				
Unsurveyed Crossings	115	9	85	6
Bridge (no barrier)	60	4	38	3
Inaccessible	28	2	29	2
Crossing Sites Surveyed	488	100	96	100
Blocked Inlets	46	9	18	19
Other Inlet Problems	38	8	9	9
Perched Outlets	147	30	35	36
Severe Crossing Barriers	152	31	44	46
Dam Sites Surveyed	37	-	11	-
Severe Dam Barriers	34	-	11	-
Total Severe Barriers	186	-	55	-

0 1 2 3 4 5
Miles



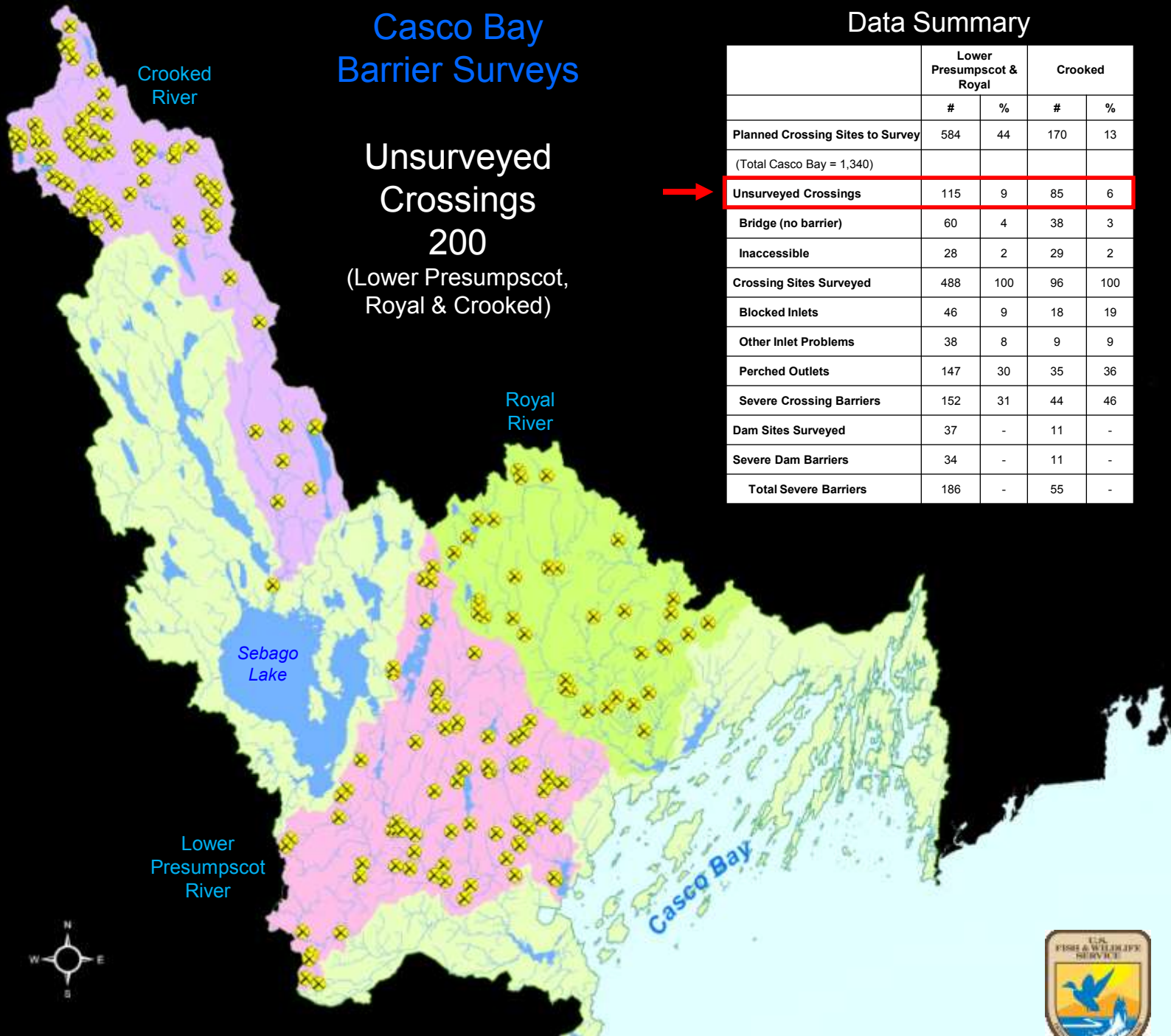
Casco Bay Barrier Surveys

Unsurveyed
Crossings
200
(Lower Presumpscot,
Royal & Crooked)

Data Summary

	Lower Presumpscot & Royal		Crooked	
	#	%	#	%
Planned Crossing Sites to Survey	584	44	170	13
(Total Casco Bay = 1,340)				
Unsurveyed Crossings	115	9	85	6
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0 1 2 3 4 5
Miles



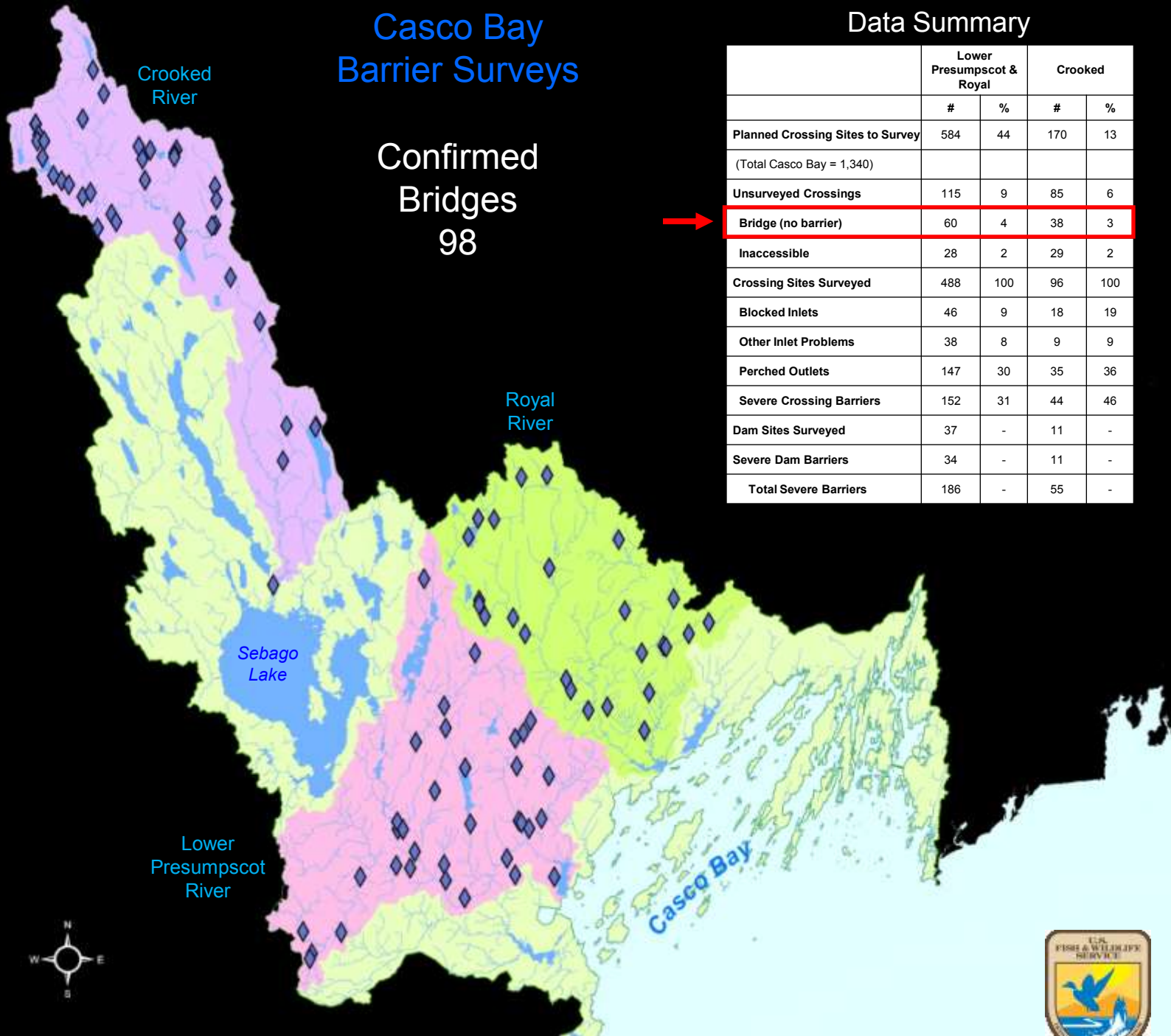
Casco Bay Barrier Surveys

Confirmed
Bridges
98

Data Summary

	Lower Presumpscot & Royal		Crooked	
	#	%	#	%
Planned Crossing Sites to Survey	584	44	170	13
(Total Casco Bay = 1,340)				
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0 1 2 3 4 5
Miles



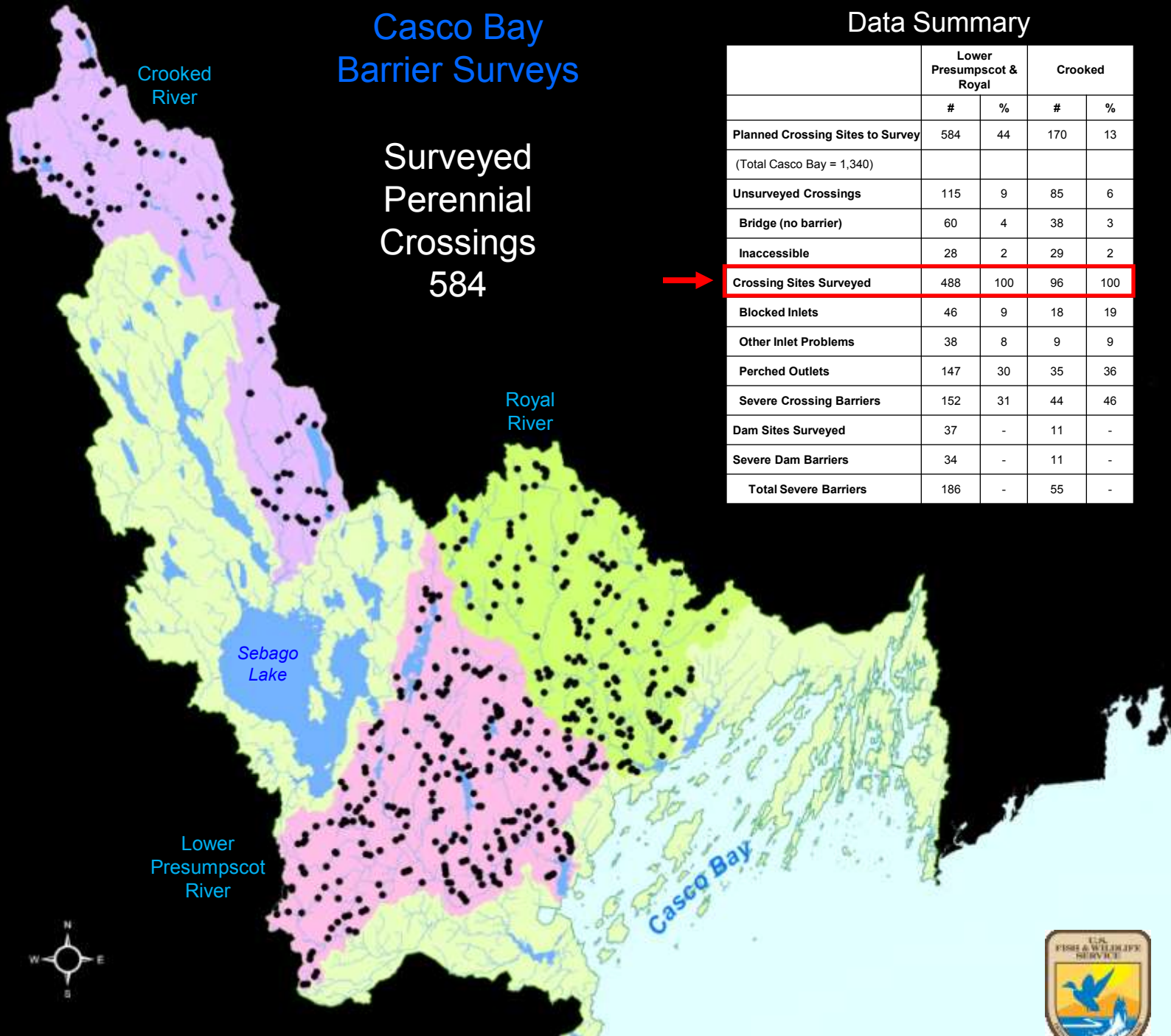
Casco Bay Barrier Surveys

Surveyed
Perennial
Crossings
584

Data Summary

	Lower Presumpscot & Royal		Crooked	
	#	%	#	%
Planned Crossing Sites to Survey	584	44	170	13
(Total Casco Bay = 1,340)				
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0 1 2 3 4 5
Miles

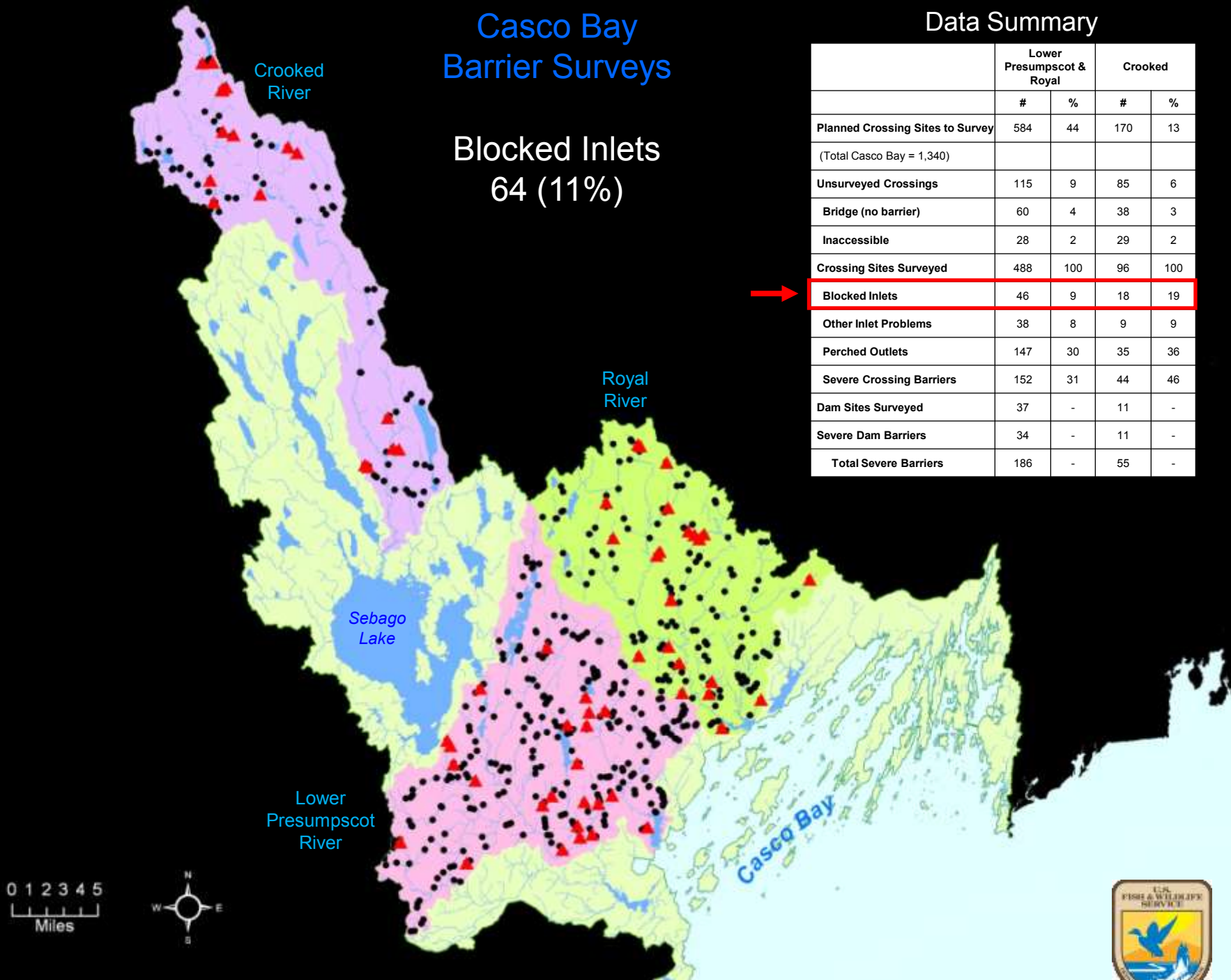


Casco Bay Barrier Surveys

Blocked Inlets
64 (11%)

Data Summary

	Lower Presumpscot & Royal		Crooked	
	#	%	#	%
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Total Severe Barriers	186	-	55	-



64 Blocked Inlets



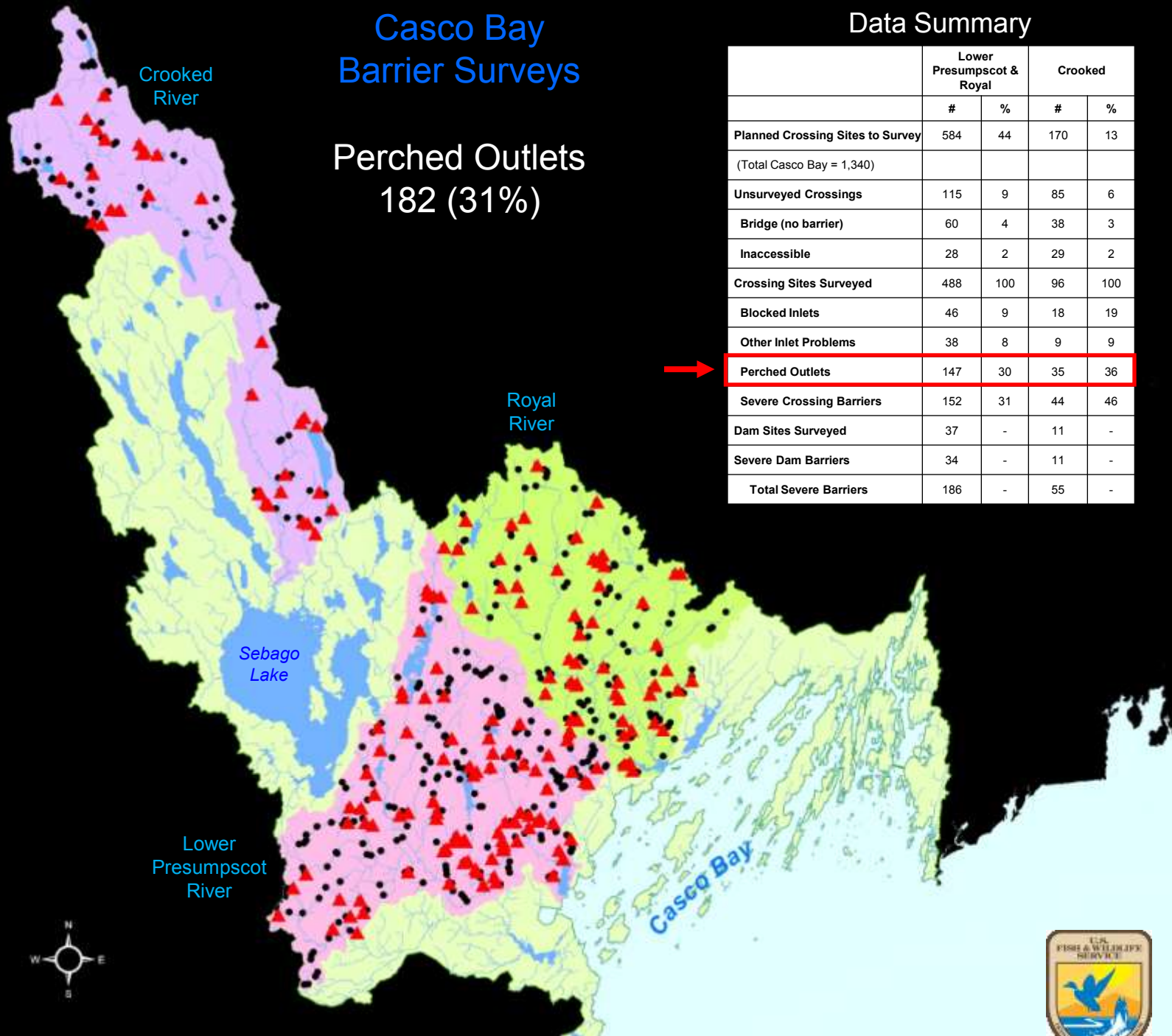
Casco Bay Barrier Surveys

Perched Outlets
182 (31%)

Data Summary

	Lower Presumpscot & Royal		Crooked	
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Dam Sites Surveyed	37	-	11	-
Severe Dam Barriers	34	-	11	-
Total Severe Barriers	186	-	55	-

0 1 2 3 4 5
Miles



182 Perched Outlets



Casco Bay Barrier Surveys

Severe Crossing
Barriers
196 (34%)

Data Summary

	Lower Presumpscot & Royal		Crooked	
	#	%	#	%
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Dam Sites Surveyed	37	-	11	-
Severe Dam Barriers	34	-	11	-
Total Severe Barriers	186	-	55	-

BarrierClass

- Severe
- Potential
- No Barrier
- Unknown

Severe Crossing
Barriers =
Blocked >= 50%,
Severe Inlet Problem,
or
Perched Outlet

0 1 2 3 4 5
Miles



Lower Presumpscot River

Sebago Lake

Royal River

Crooked River

Casco Bay



Casco Bay Barrier Surveys

Surveyed Dams
48
Severe Dam
Barriers
45

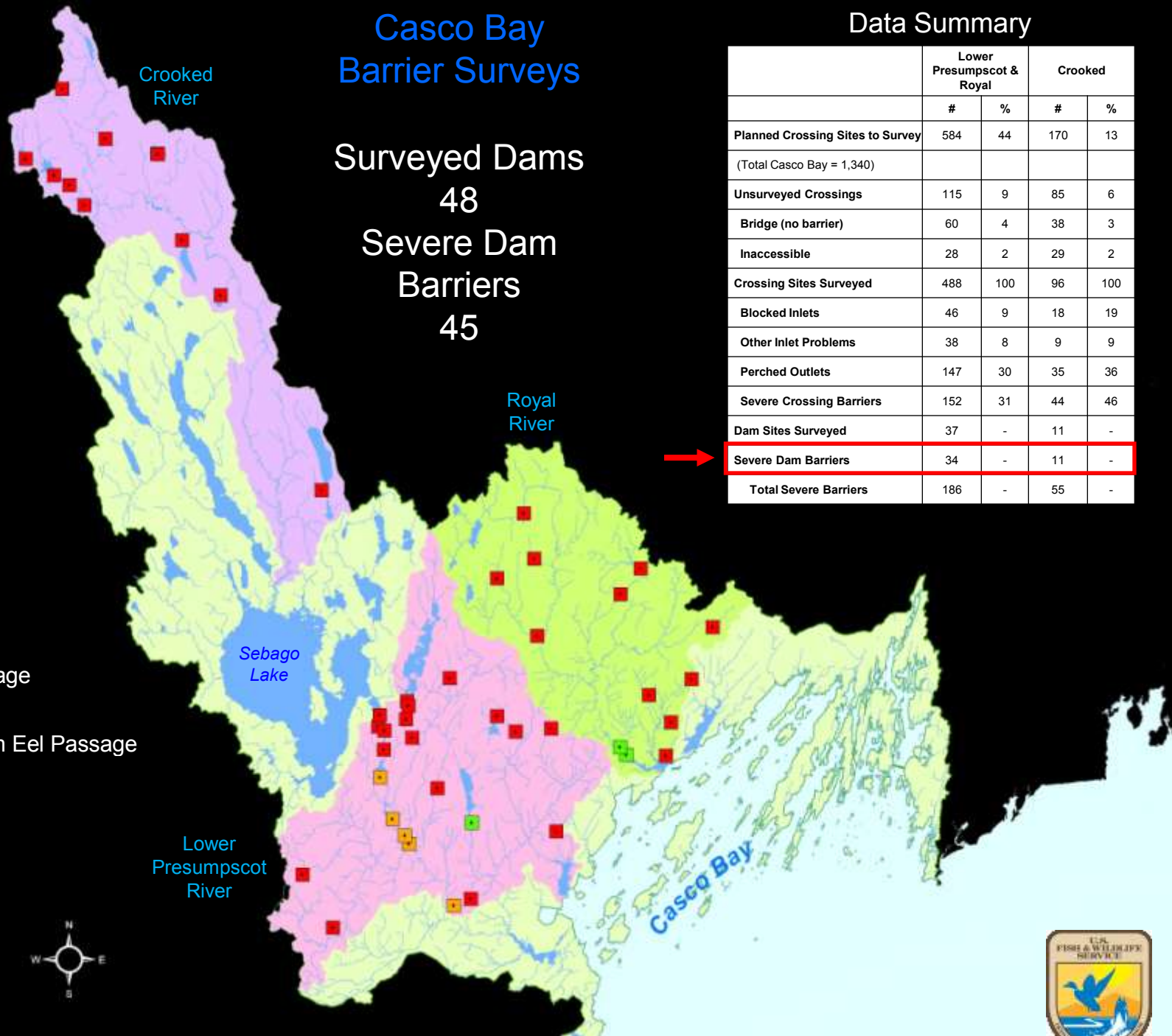
Data Summary

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Severe Crossing Barriers	152	31	44	46
Dam Sites Surveyed	37	-	11	-
Severe Dam Barriers	34	-	11	-
Total Severe Barriers	186	-	55	-

Dams

- No Passage
- Passage
- Upstream Eel Passage

0 1 2 3 4 5
Miles



45 Severe Dam Barriers



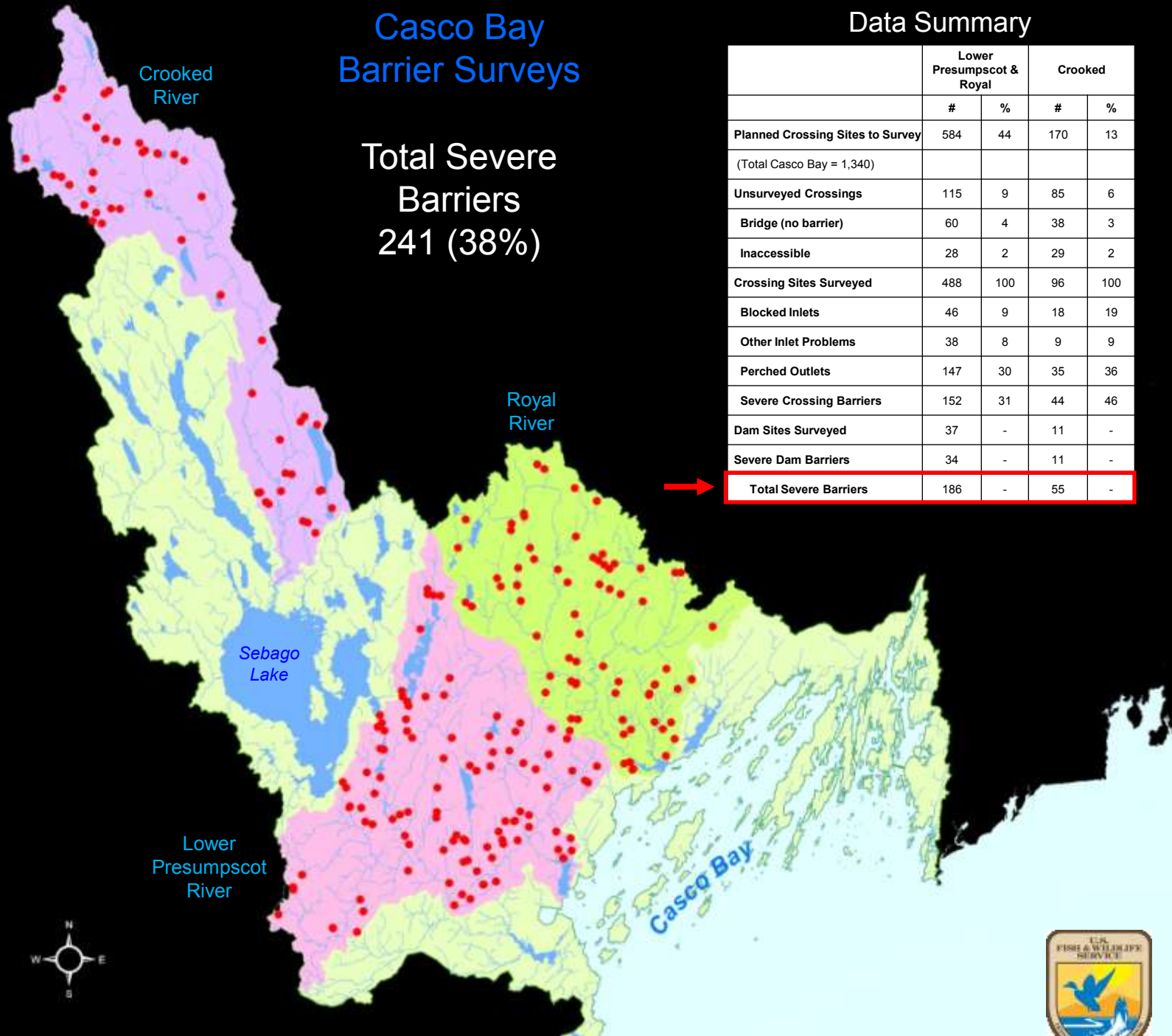
Casco Bay Barrier Surveys

Total Severe
Barriers
241 (38%)

Data Summary

	Lower Presumpscot & Royal		Crooked	
	#	%	#	%
Planned Crossing Sites to Survey	584	44	170	13
(Total Casco Bay = 1,340)				
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Bridge (no barrier)	60	4	38	3
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Dam Sites Surveyed	37	-	11	-
Severe Dam Barriers	34	-	11	-
Total Severe Barriers	186	-	55	-

0 1 2 3 4 5
Miles



Prioritization



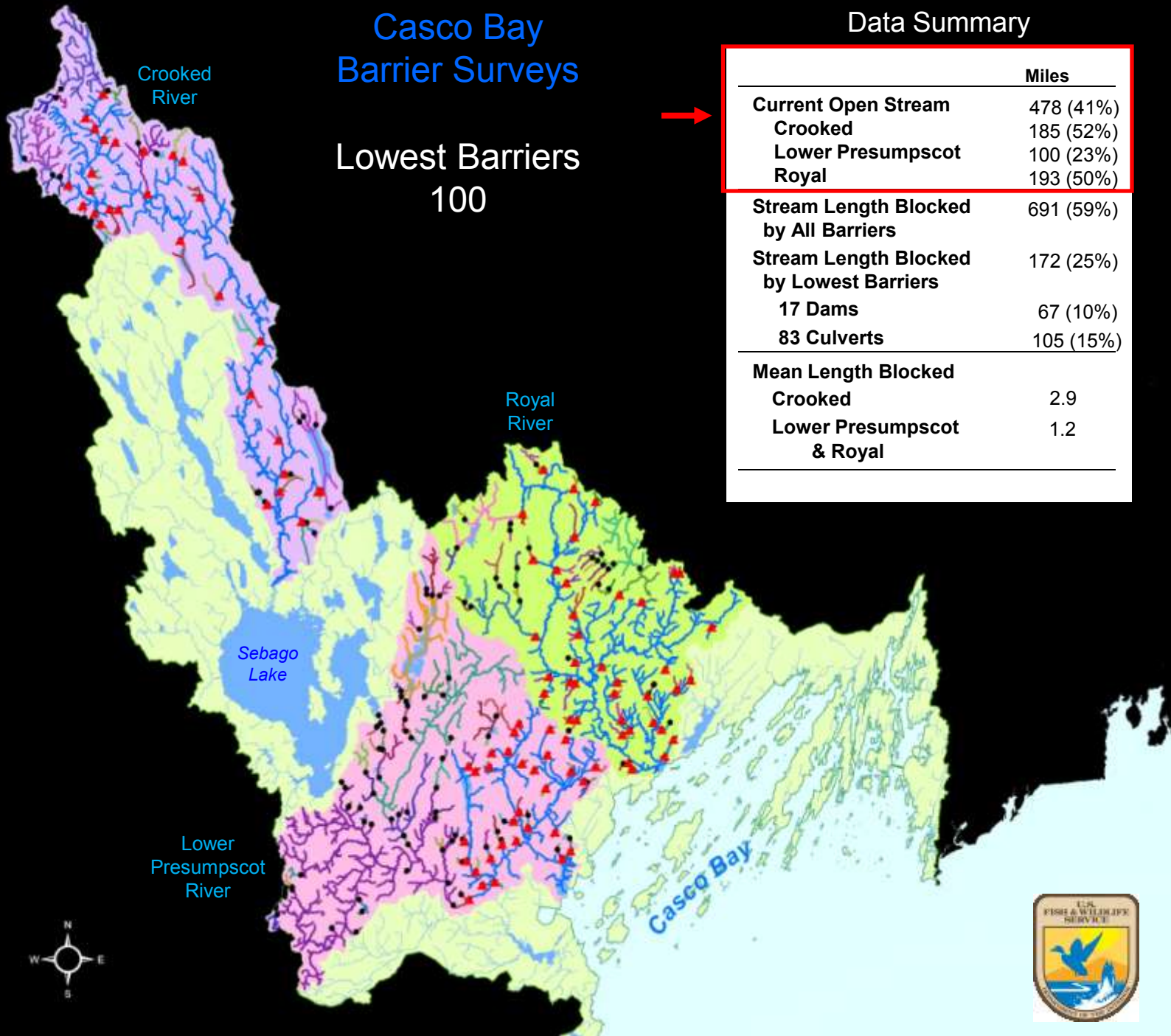
Casco Bay Barrier Surveys

Lowest Barriers
100

Data Summary

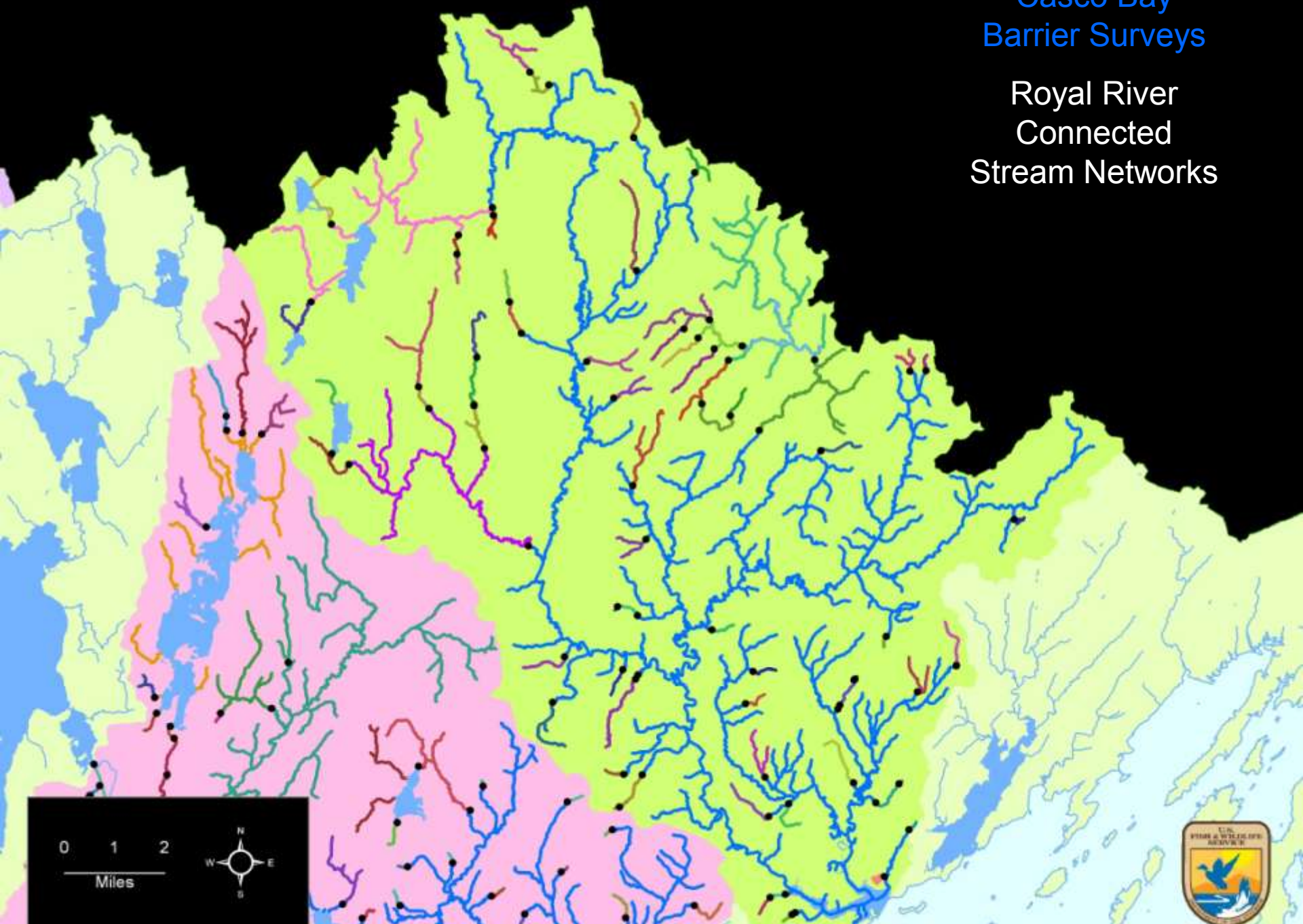
	Miles
Current Open Stream	478 (41%)
Crooked	185 (52%)
Lower Presumpscot	100 (23%)
Royal	193 (50%)
Stream Length Blocked by All Barriers	691 (59%)
Stream Length Blocked by Lowest Barriers	172 (25%)
17 Dams	67 (10%)
83 Culverts	105 (15%)
Mean Length Blocked	
Crooked	2.9
Lower Presumpscot & Royal	1.2

0 1 2 3 4 5
Miles



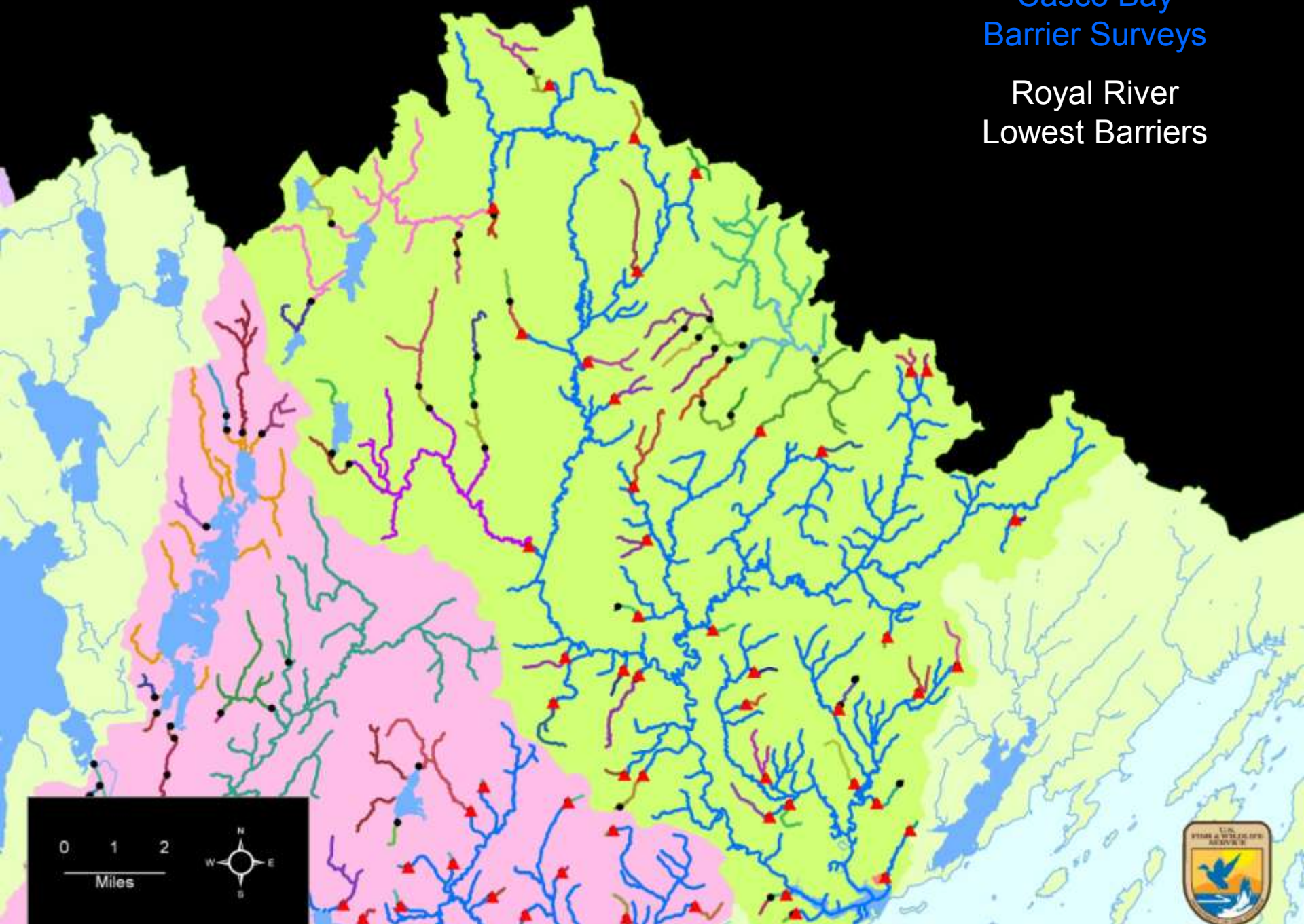
Casco Bay
Barrier Surveys

Royal River
Connected
Stream Networks



Casco Bay
Barrier Surveys

Royal River
Lowest Barriers

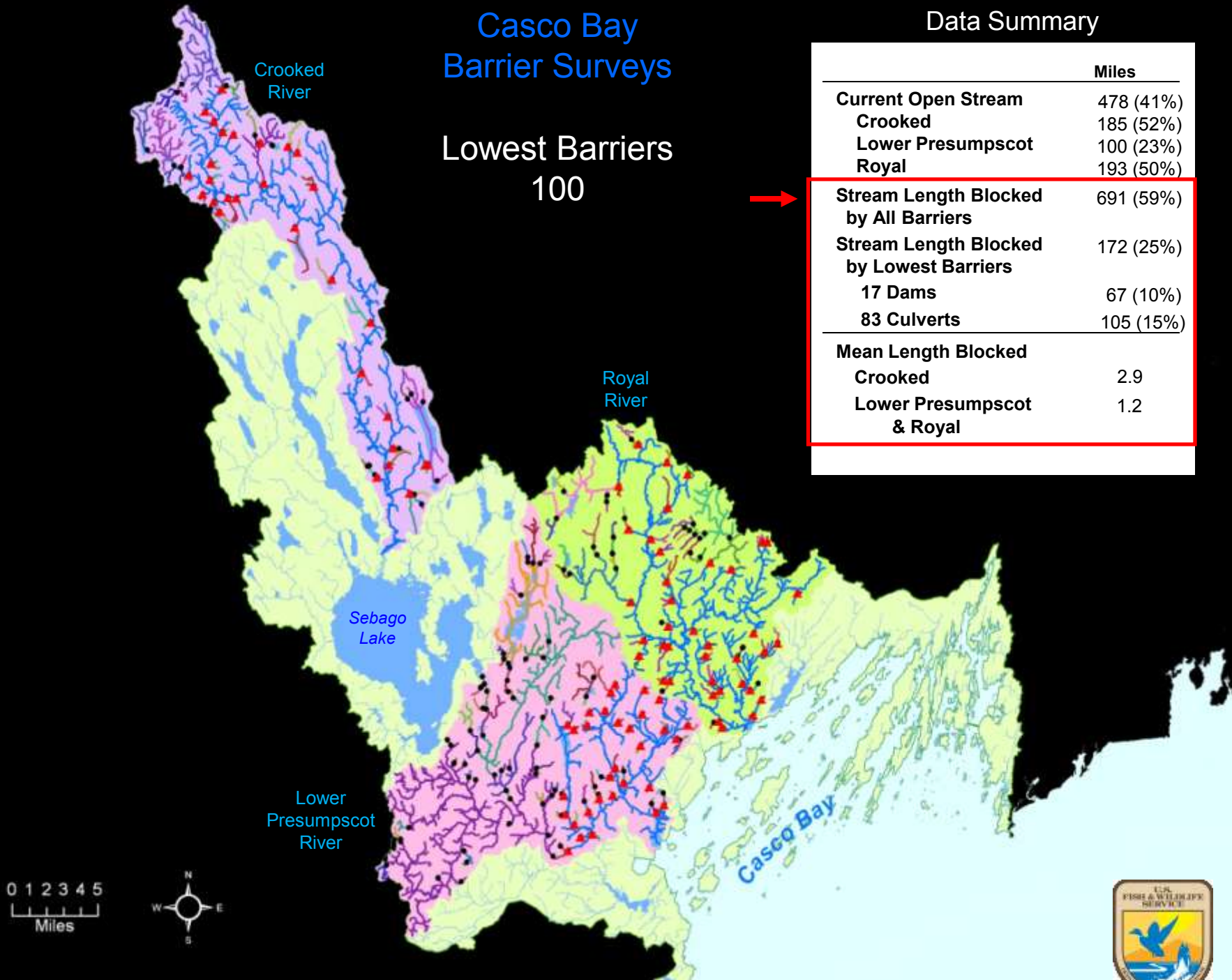


Casco Bay Barrier Surveys

Lowest Barriers
100

Data Summary

	Miles
Current Open Stream	478 (41%)
Crooked	185 (52%)
Lower Presumpscot	100 (23%)
Royal	193 (50%)
Stream Length Blocked by All Barriers	691 (59%)
Stream Length Blocked by Lowest Barriers	172 (25%)
17 Dams	67 (10%)
83 Culverts	105 (15%)
Mean Length Blocked	
Crooked	2.9
Lower Presumpscot & Royal	1.2



Casco Bay Barrier Surveys

High Priority Barriers

Data Summary

Site 1

26 stream miles

Site 2

11 stream miles

Site 3

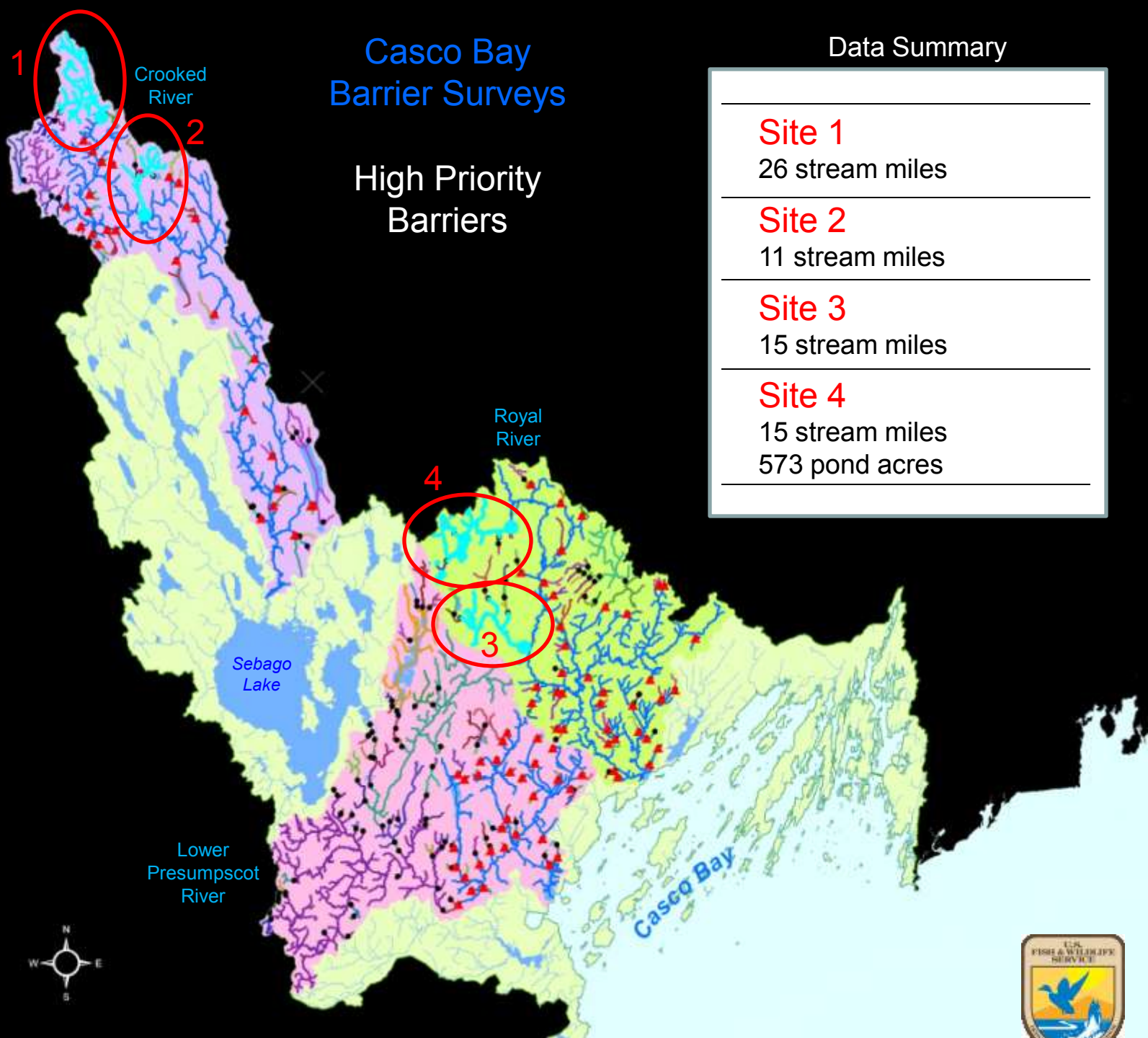
15 stream miles

Site 4

15 stream miles

573 pond acres

0 1 2 3 4 5
Miles

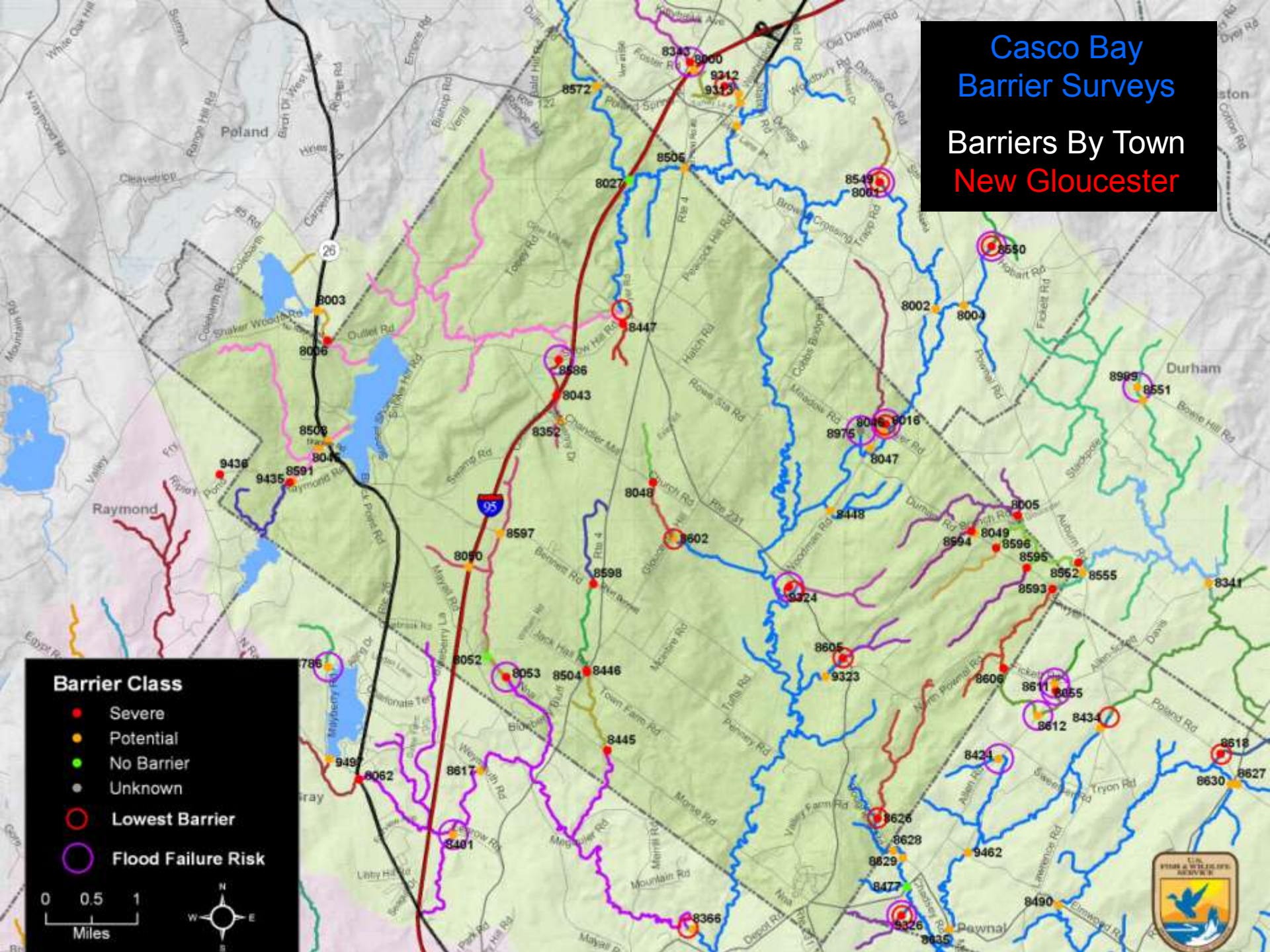


Potential Priority Projects

Site	Structure	RoadType	Span/ Height	Issues	Stream Miles Opened	Cost
1	4 Culverts	Unpaved	6.4 ft	Perched Outlet, Blocked Inlet	26	??
2	Box Culvert/ Bridge	Paved	19.3 ft	Perched Outlet	11	??
3	Dam	NA	9.8 ft	No Passage	15	??
4	Dam	NA	10 ft	No Passage	15 miles & 573 pond acres	??



Casco Bay Barrier Surveys Barriers By Town New Gloucester



MAINE stream crossings

new designs to restore stream continuity

Stream continuity is critical to all creatures that depend on streams, including invertebrates, fish, amphibians, reptiles, and mammals. The design and condition of stream crossings determine whether a stream behaves naturally and whether wildlife can migrate freely. Through the effects of dams and poorly designed stream crossings, we have fragmented streams and hindered wildlife dispersal throughout our watersheds. In many cases, even crossings that were once effective are now barriers because of erosion or mechanical breakdown.

Safe and stable stream crossings can accommodate wildlife and protect stream health while reducing expensive erosion and structural damage. By adhering to the standards in the *Maine Department of Transportation Fish Passage Policy and Design Guide*, town officials, highway departments, and private landowners can help protect and restore stream continuity in Maine.



KEY FEATURES OF WELL-DESIGNED CROSSINGS (fish friendly)



BRIDGE



OPEN-ARCH

- Large sizes suitable to handling flood flows and debris
- Bridges and open-arch designs considered optimum under most conditions
- Crossings are wide and high relative to their length
- Greater than 1.2x stream width maintains dry banks for wildlife passage
- Water depth and velocity match conditions upstream and downstream
- Natural substrates create good conditions for stream wildlife
- Long life span with significant cost savings over time

EFFECTIVE CROSSINGS INCLUDE...

- Bridges and open-bottom arches
- Culverts that span and are sunk into the streambed

STREAM CROSSING PROBLEMS



UNDERSIZED CROSSINGS restrict natural stream flow, causing several problems, including scouring and erosion, high flow velocity, clogging, and ponding. Crossings should be large enough to retain natural substrates and to pass fish, wildlife, floods, and debris.



SHALLOW CROSSINGS have water depths too low for many organisms to move through them and may lack appropriate bed material. Crossings should have an open bottom or should be sunk into the streambed to allow for natural substrate and water depths.



PERCHED CROSSINGS are above the level of the stream bottom at the downstream end. Perching can result from either improper installation or from years of downstream bed erosion. Crossings should be open-bottomed or sunk in the bed to prevent perching.

SLIPLINING is NOT the answer!

Slip lining, inserting a smooth plastic liner to an older culvert, may save money in the short run, but it nearly always decreases fish passage. Liners raise crossing elevations and increase flow velocities, removing crossing bed material and increasing downstream scour.

For more information on stream crossing surveys in Maine, visit the Maine Forest Service online at:

www.maine.gov/dec/info/hpn/water/stream_crossing.html

The *Maine Department of Transportation Fish Passage Policy and Design Guide* can be found online at:

www.maine.gov/ndot/environmental-office/homepage/other_environmental.php

Maine's stream barrier removal efforts are supported by a broad coalition of state and federal agencies and nongovernment organizations:

Maine Forest Service
Maine Department of Marine Resources
Maine Department of Transportation
Maine Department of Inland Fisheries and Wildlife
Maine Department of Environmental Protection
National Oceanic and Atmospheric Administration
University of Southern Maine Aquatic Systems Group
Penobscot Valley Council of Governments
Natural Resources Conservation Service
U.S. Fish and Wildlife Service
Atlantic Salmon Federation
The Nature Conservancy
Project SHARE
Trout Unlimited
Maine Rivers

Design and Illustration: Kellen O'Brien
www.kellenobrien.com



Next Steps

Complete Surveys & Analyze All Data



Identify Potential Restoration Sites



Assess Feasibility of Restoration Sites



Apply for Funding Restoration



Restoration!

