Jun 27th, 10:40 AM - 11:00 AM

Session A1- Basinwide approaches to prioritizing stream connectivity projects

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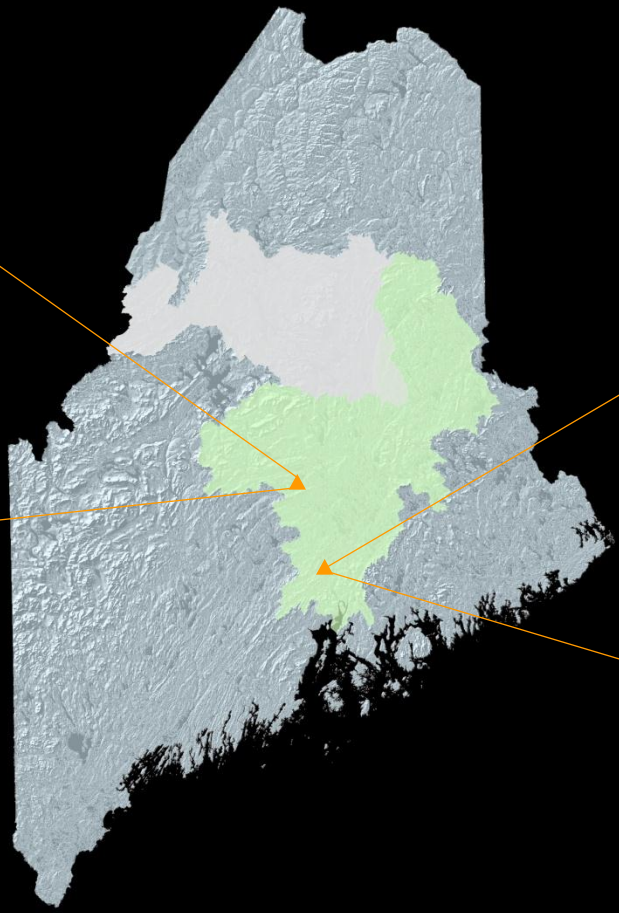
Basinwide approaches to prioritizing stream connectivity projects



Jed Wright & Alex Abbott - USFWS
Tara Trinko Lake & Dan Kircheis – NMFS
Jesse O'Hanley – University of Kent

Background

Barrier inventory approach

Data summary

Basinwide connectivity approaches

Strengths and limitations

Next steps

Background

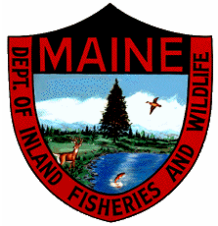
Where are they?

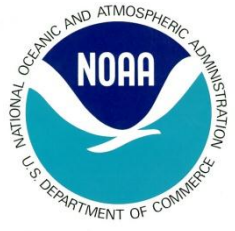
What's their impact?

How do we assess them?

How do we fix them?

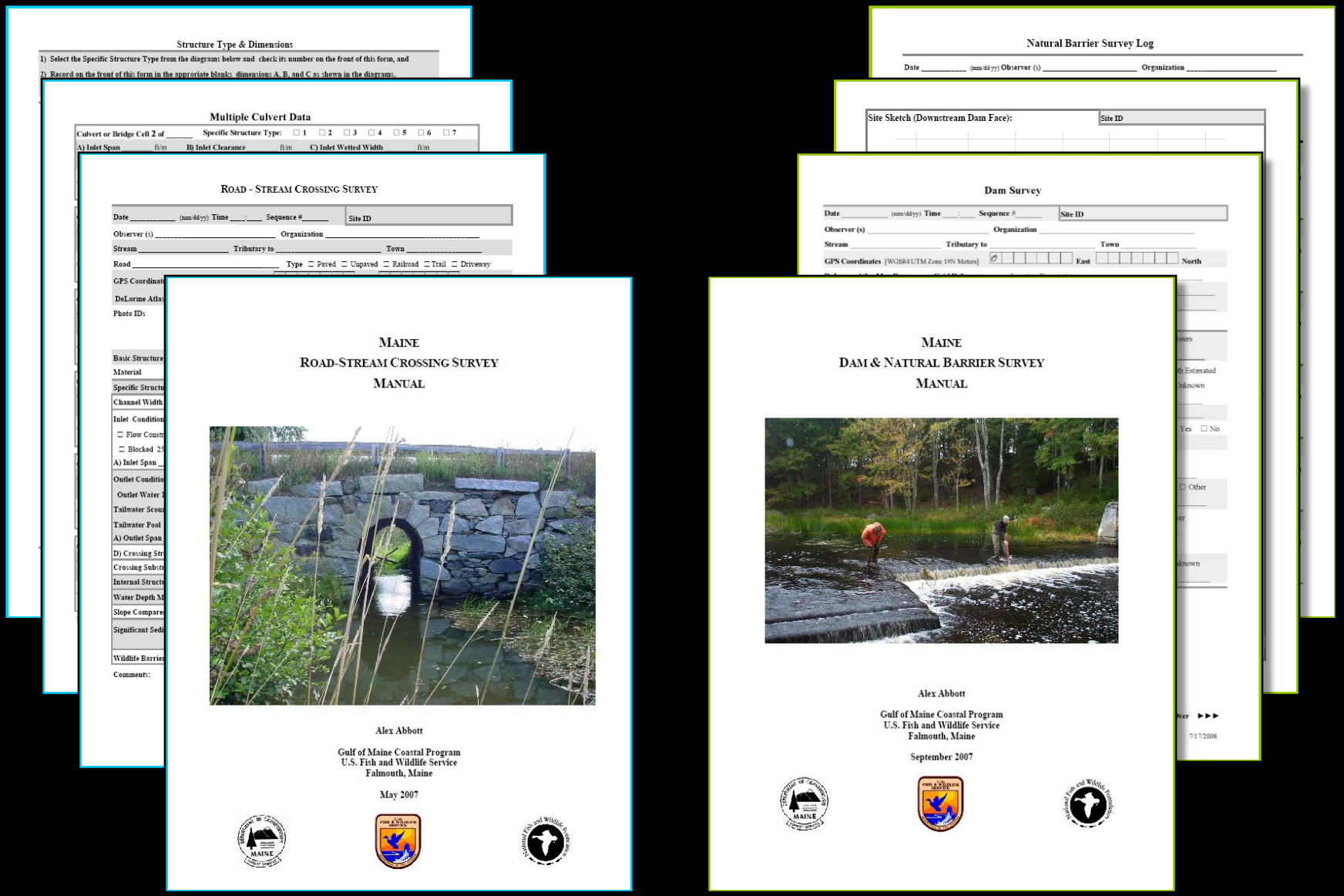
Maine Barrier Inventory Partners





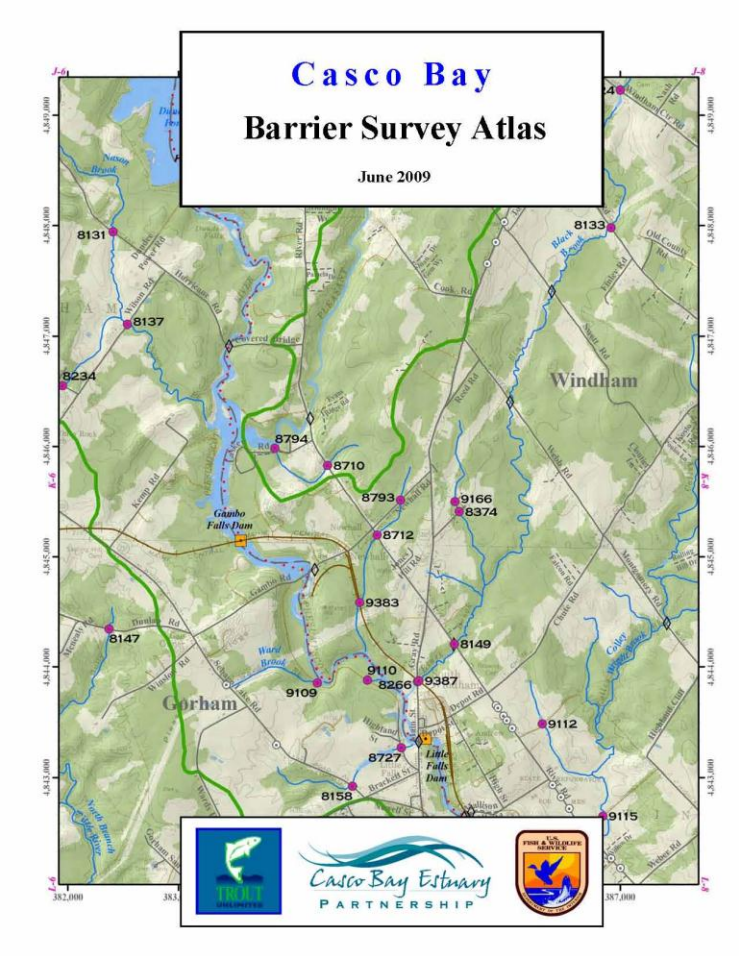
Barrier Inventories

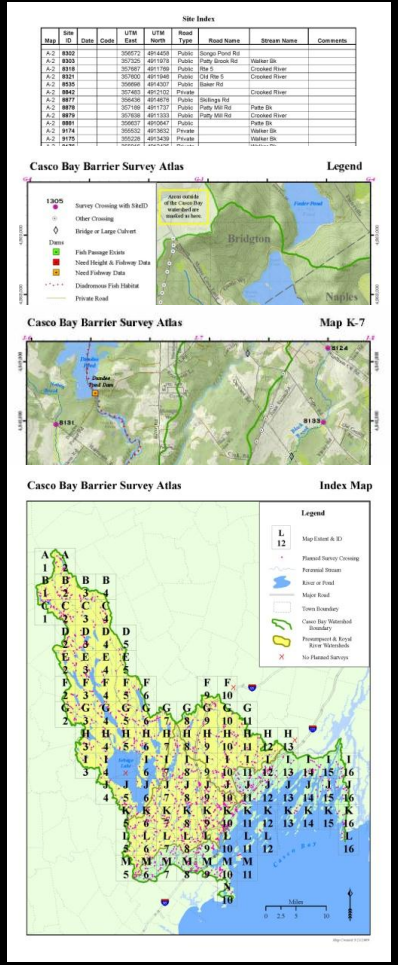
Maine Barrier Survey Manuals



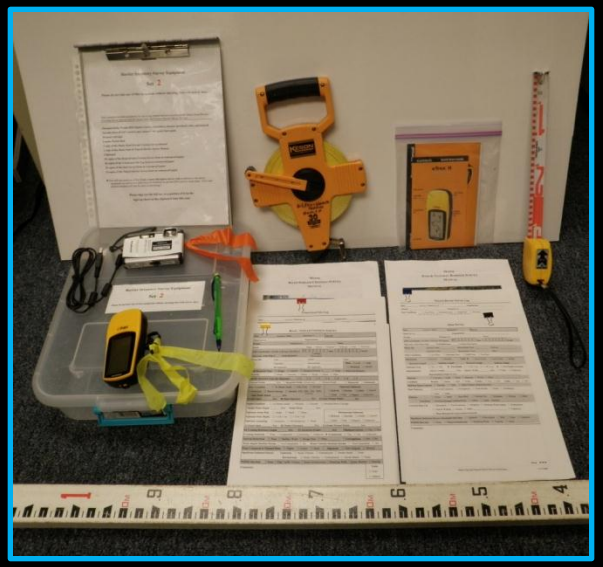
Barrier Inventories

Barrier Survey Atlas





Equipment Kits



GPS Receiver

Digital Camera

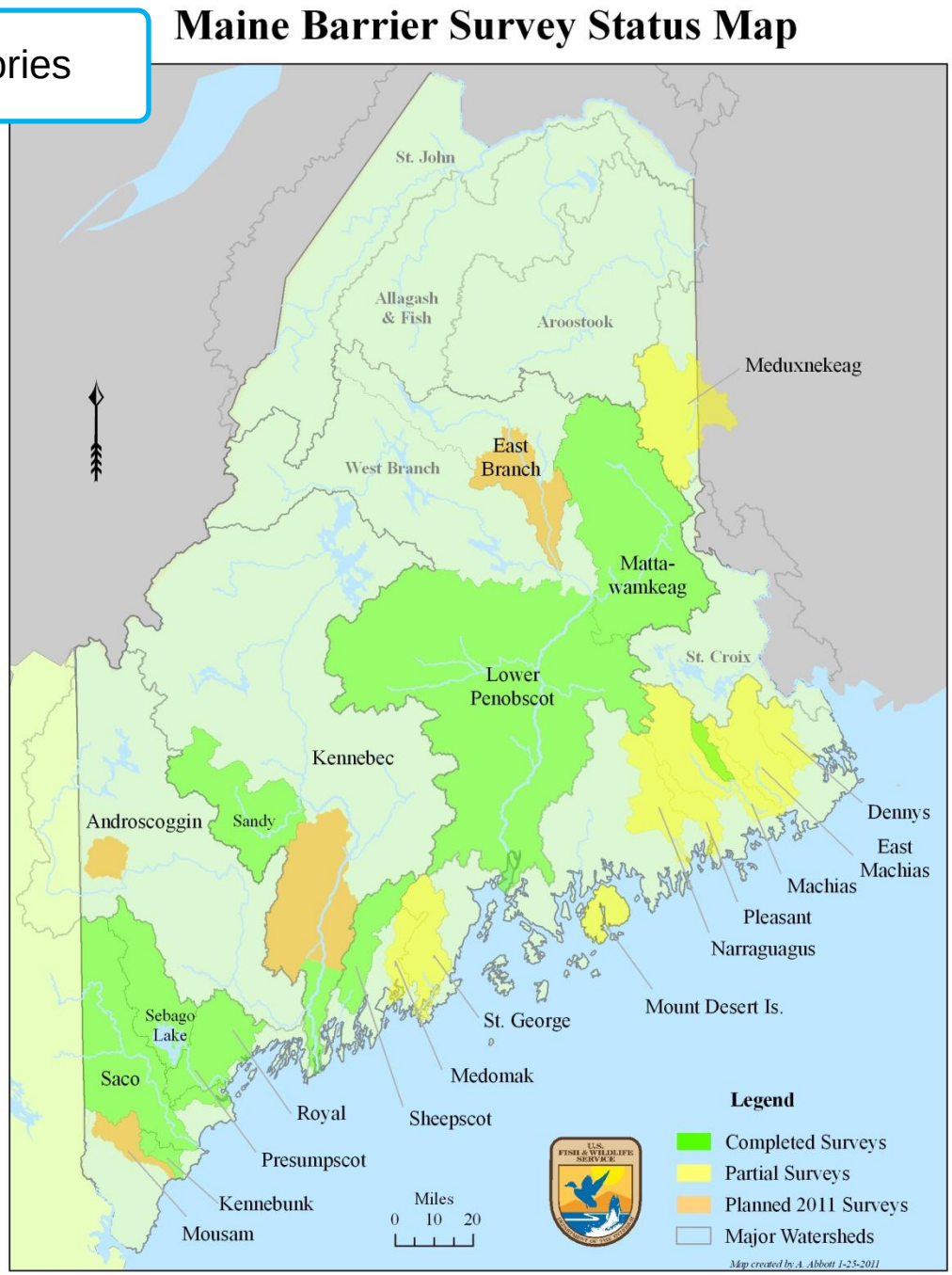
Measuring Tools

Clipboard

Forms & Manuals

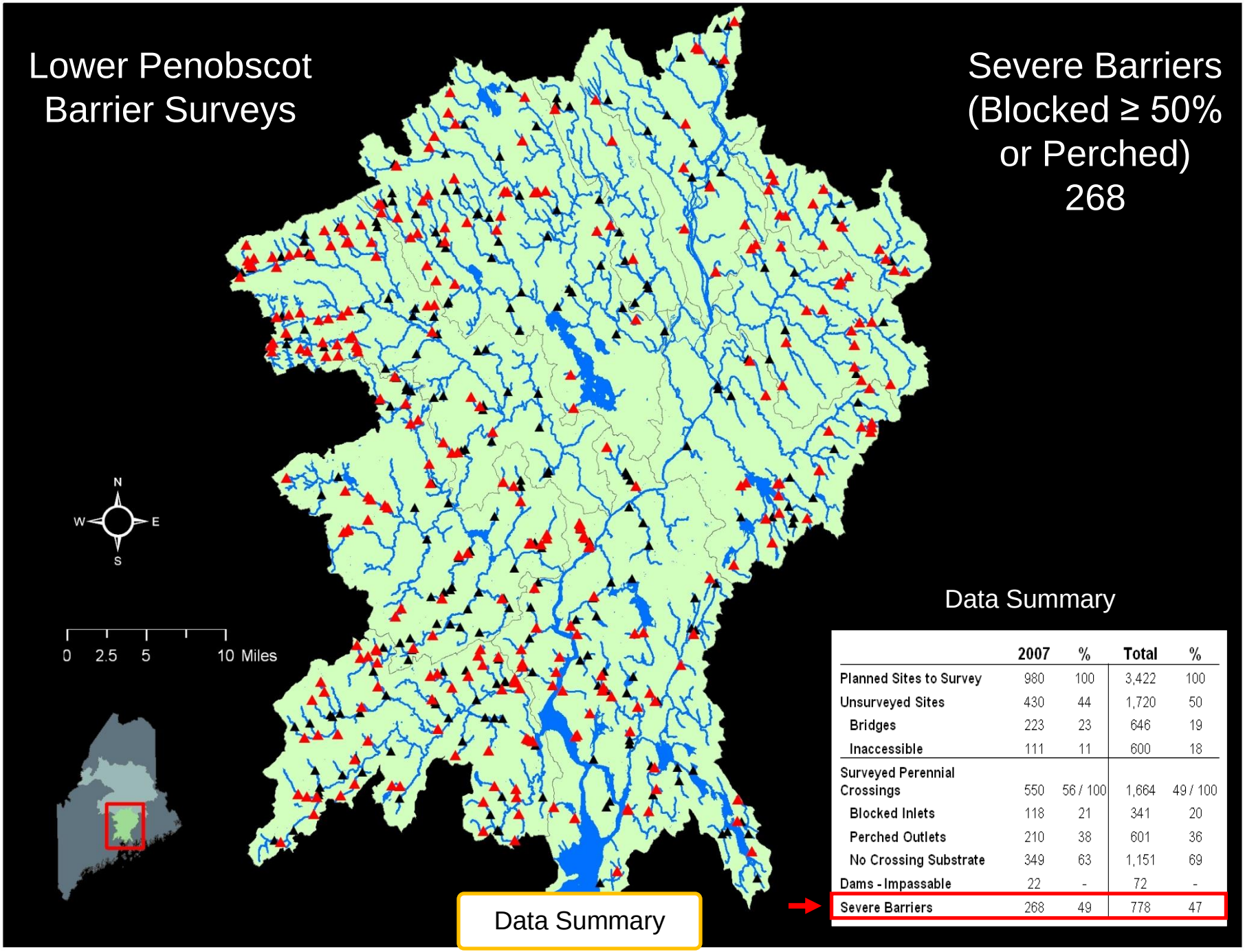
Essential for Navigation and Planning

Barrier Inventories



More than 25 % of Maine Road Crossings Surveyed

Lower Penobscot Barrier Surveys

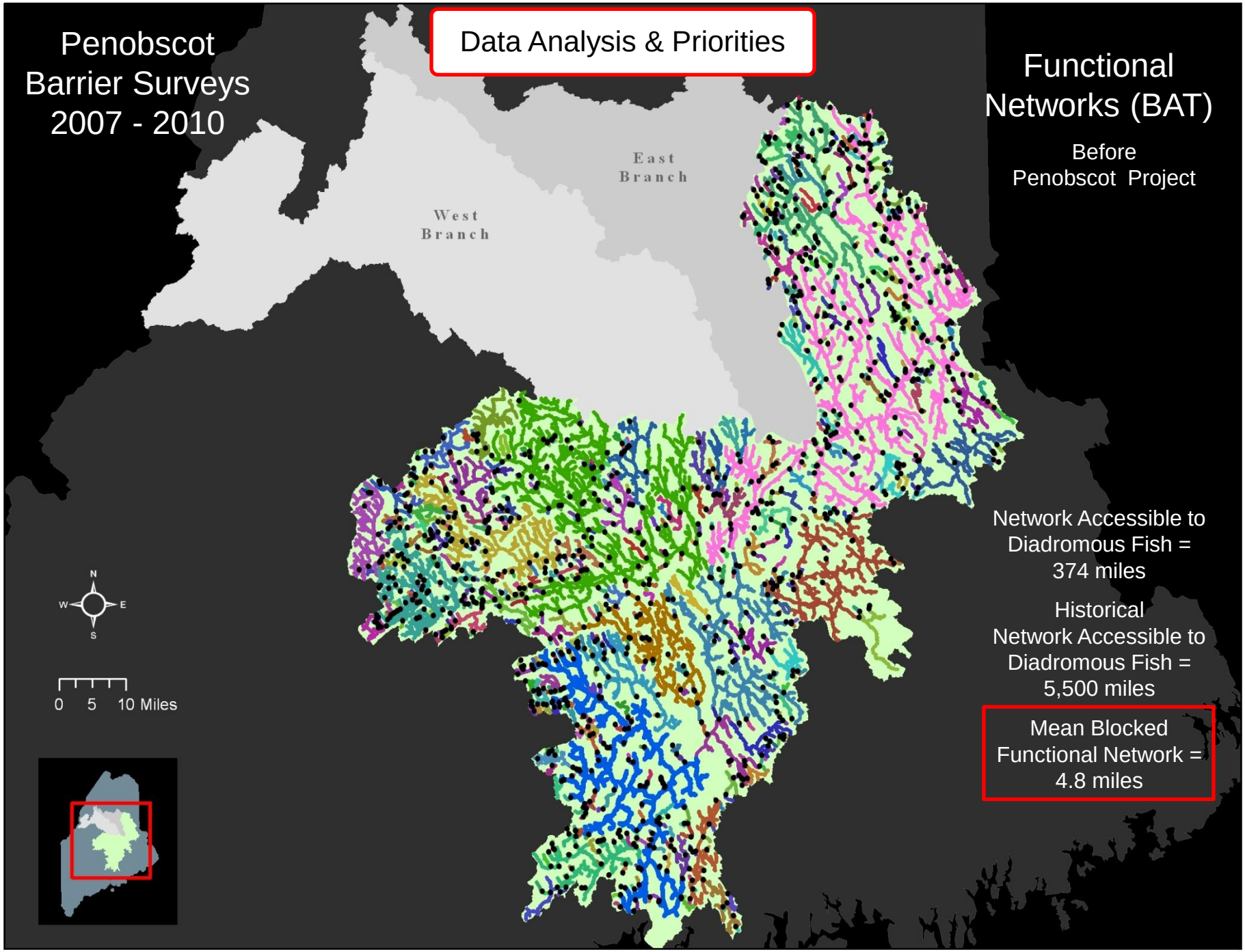


Severe Barriers (Blocked ≥ 50% or Perched) 268

Data Summary

	2007	%	Total	%
Planned Sites to Survey	980	100	3,422	100
Unsurveyed Sites	430	44	1,720	50
Bridges	223	23	646	19
Inaccessible	111	11	600	18
Surveyed Perennial Crossings	550	56 / 100	1,664	49 / 100
Blocked Inlets	118	21	341	20
Perched Outlets	210	38	601	36
No Crossing Substrate	349	63	1,151	69
Dams - Impassable	22	-	72	-
Severe Barriers	268	49	778	47

Data Summary


Penobscot
Barrier Surveys
2007 - 2010
Data Analysis & Priorities
Functional
Networks (BAT)
Before
Penobscot Project
East
Branch
West
Branch
Network Accessible to
Diadromous Fish =
374 miles
Historical
Network Accessible to
Diadromous Fish =
5,500 miles
Mean Blocked
Functional Network =
4.8 miles
N
W
E
S
0 5 10 Miles

Mid-Penobscot Fish Passage Barriers

Legend

- 3394 — Severe Barriers (SiteID labeled)
- 2669 — Moderate Barriers
- 1625 — Open Bottom Arch Crossings
- 3357 — Adequate Crossings
- 1253 — Bridges (Not Barriers)
- 2242 — Unsurveyed Site
- No Crossing Structure
- MDOT Crossing

Dams

- D0054 — Fish Passage
- D0028 — No Fish Passage
- D0075 — No Data on Fish Passage

- Diadromous Fish Habitat
- Streams
- Rivers, Ponds & Coastal Waters
- Wetlands
- Forested Lands
- Open or Developed Lands
- Watershed Boundaries
- Town Boundaries
- Railroa
- Private

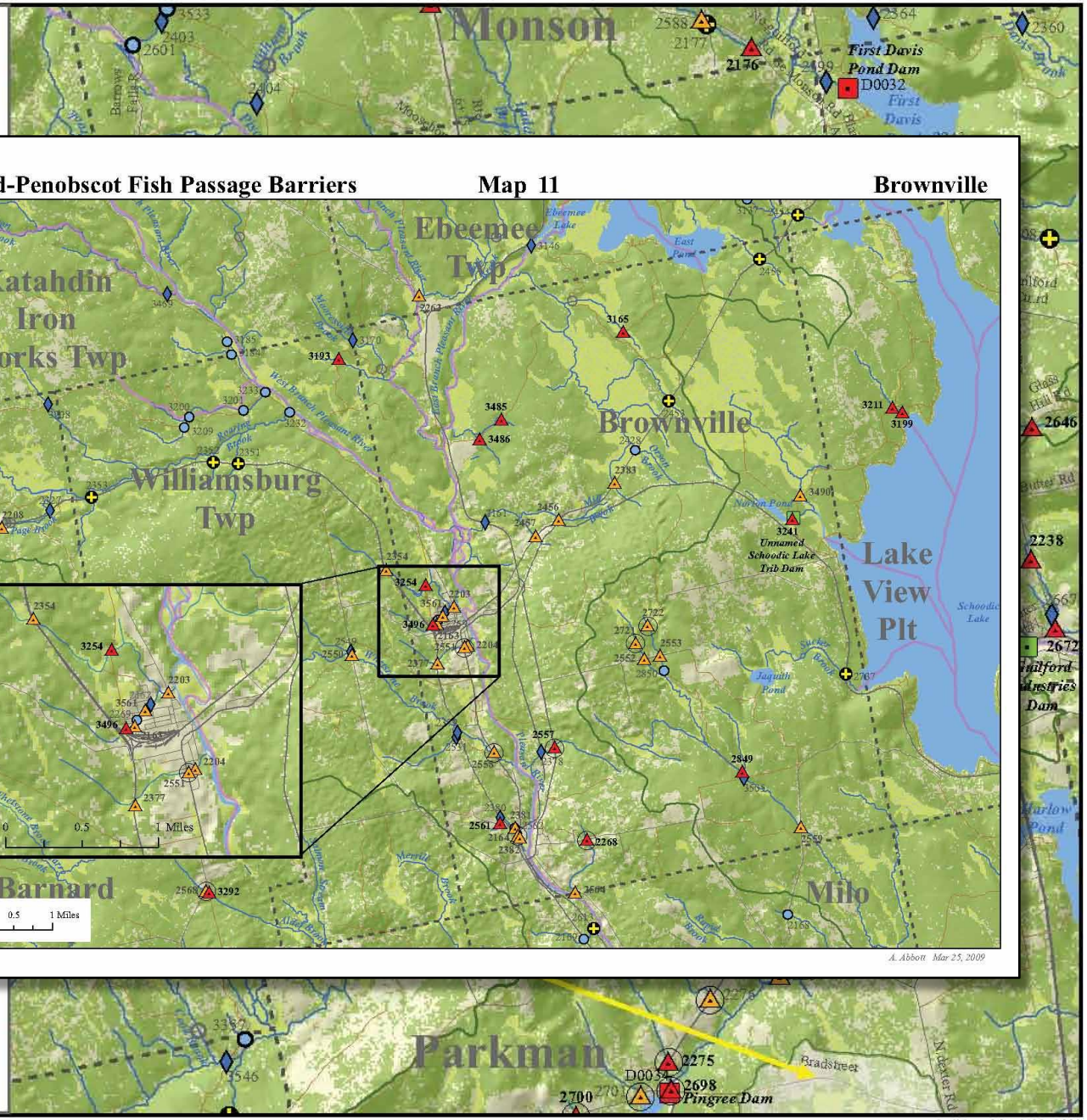
Public Roads

- Intersta
- Primary
- Second
- Local

Note: Scale varies for each map.

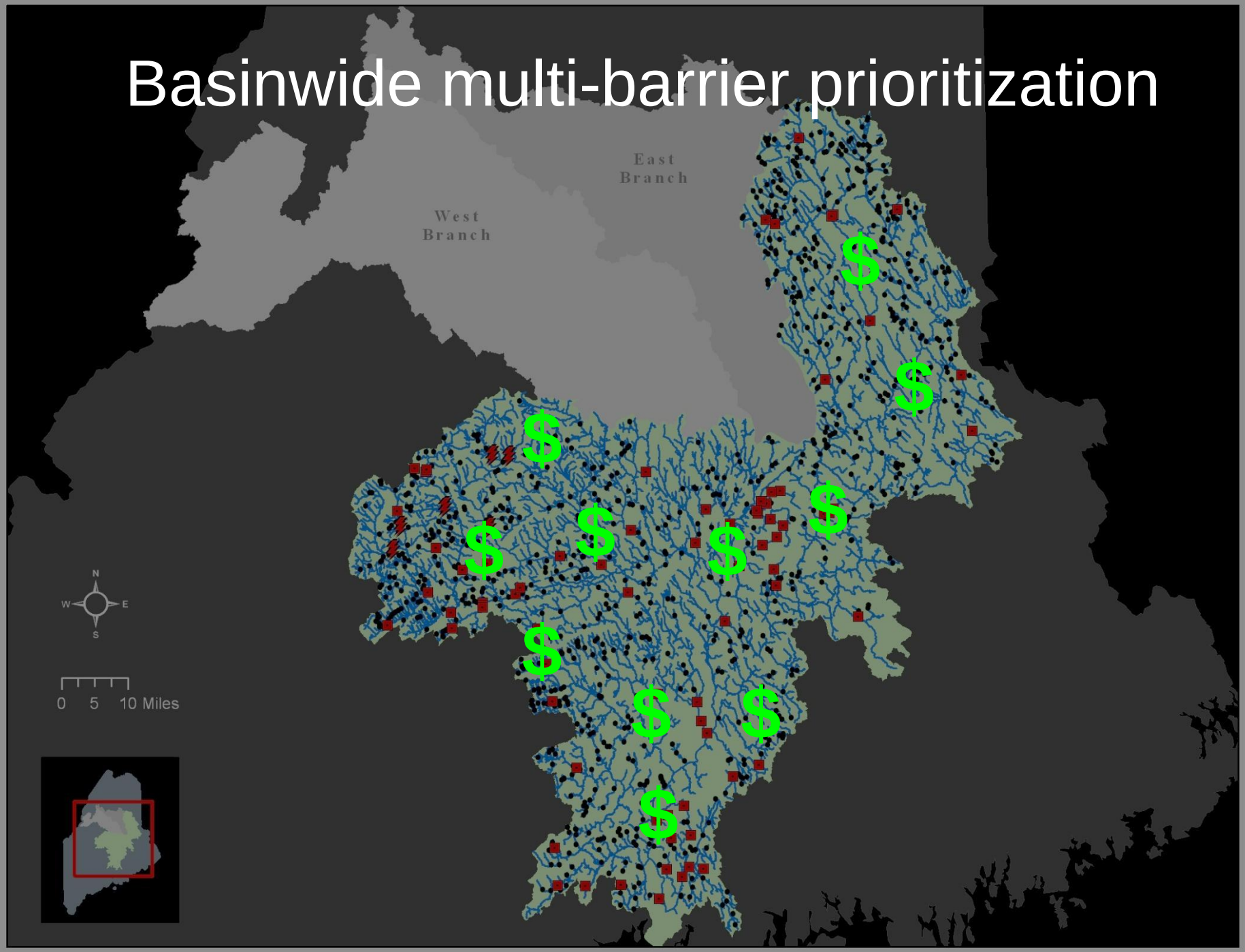
Lightly shaded areas without crossings lie outside t mid and lower Penobscot drainages.

Data provided by U.S. Fish and Wildlife Service Gulf of Maine Coastal Program and Maine Office



A. Abbott March 25, 2009

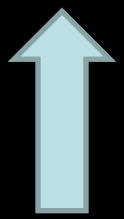
Basinwide multi-barrier prioritization



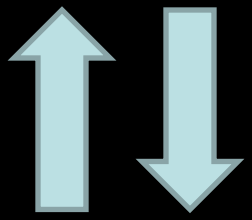
Watershed connectivity assessment

Objective: Maximize habitat connectivity (habitat units, quality, type, length) while minimizing cost

Diadromous species: Upstream access

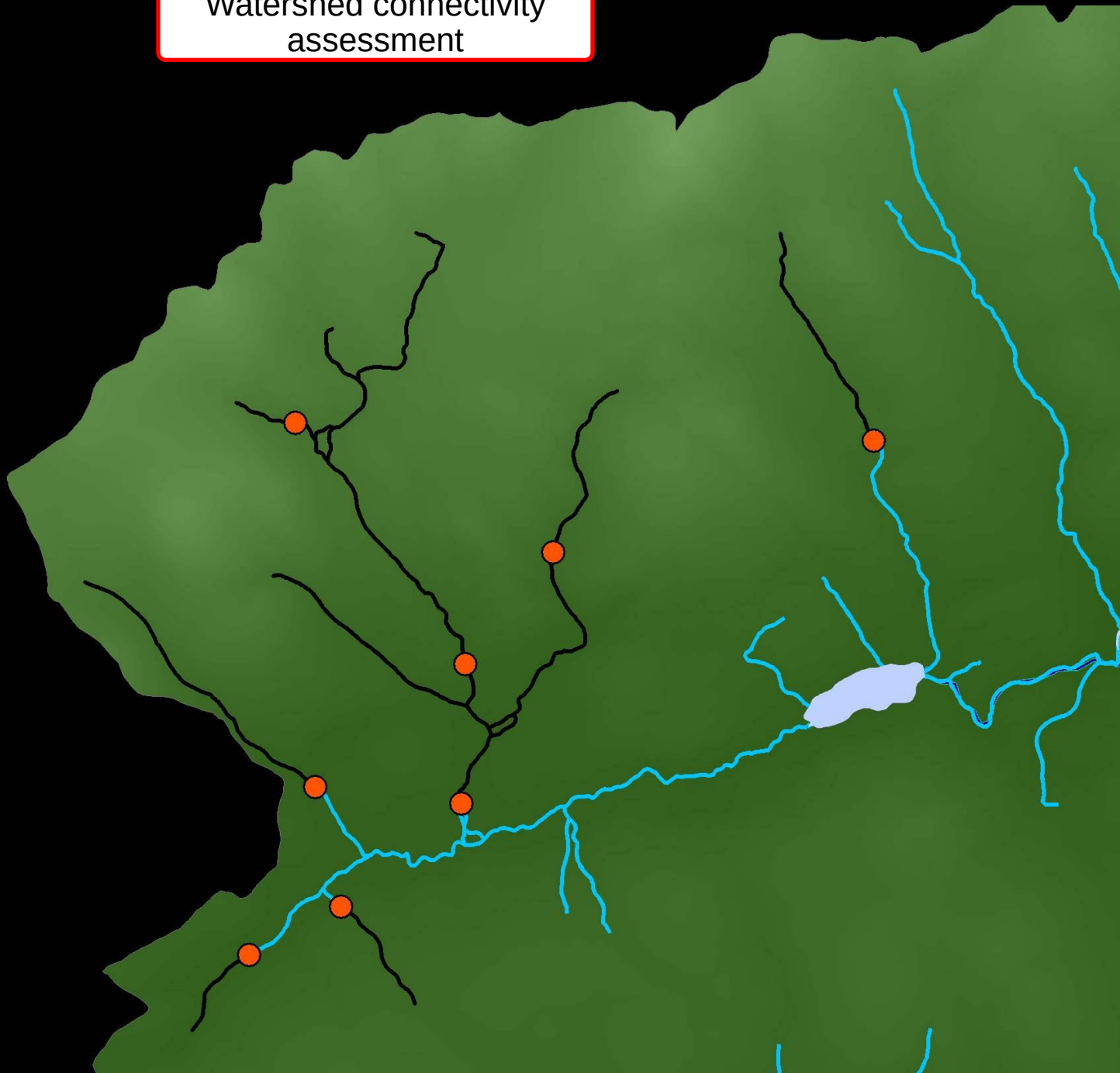


Resident species: Bi-directional connectivity



Watershed connectivity assessment

Jesse Rush O'Hanley and David Tomberlin (2005)



Watershed connectivity assessment

$150,000

3.8 km

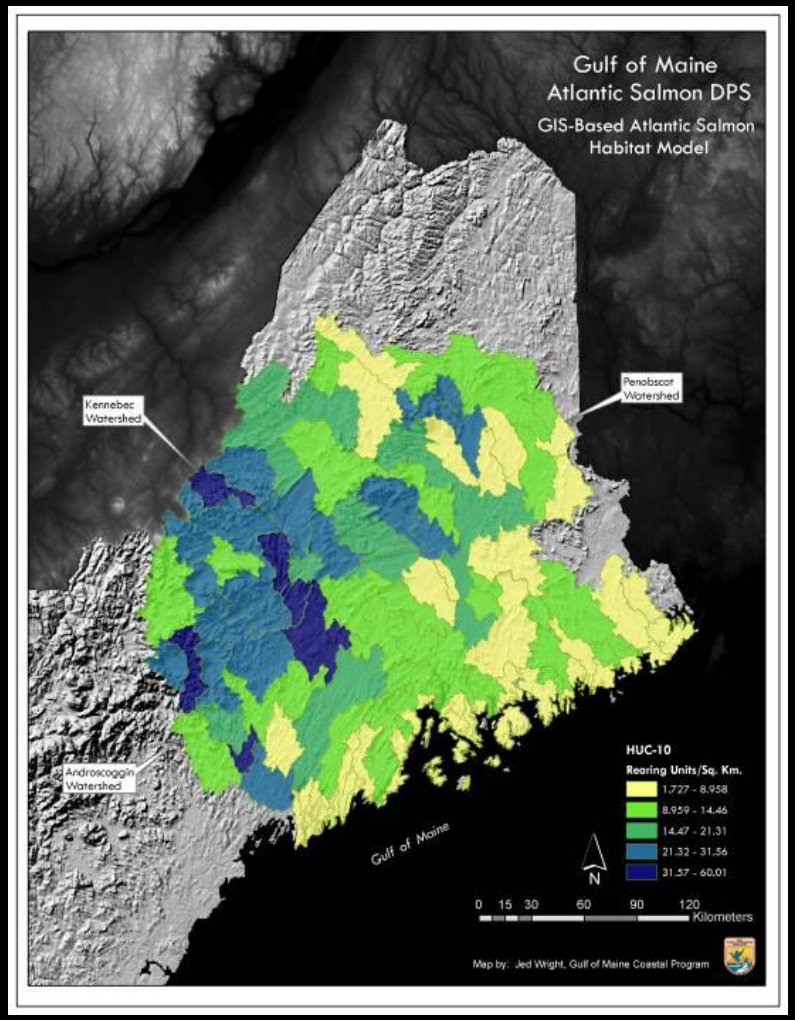
$26,316 / km

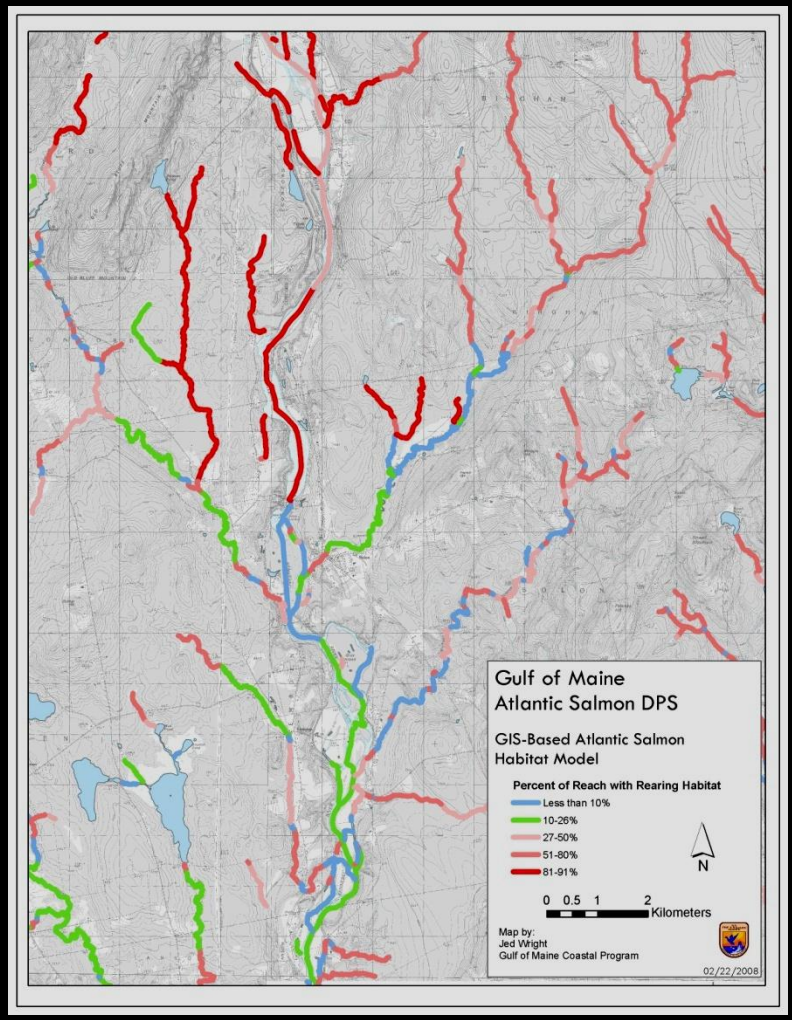
Watershed connectivity assessment

Model Inputs

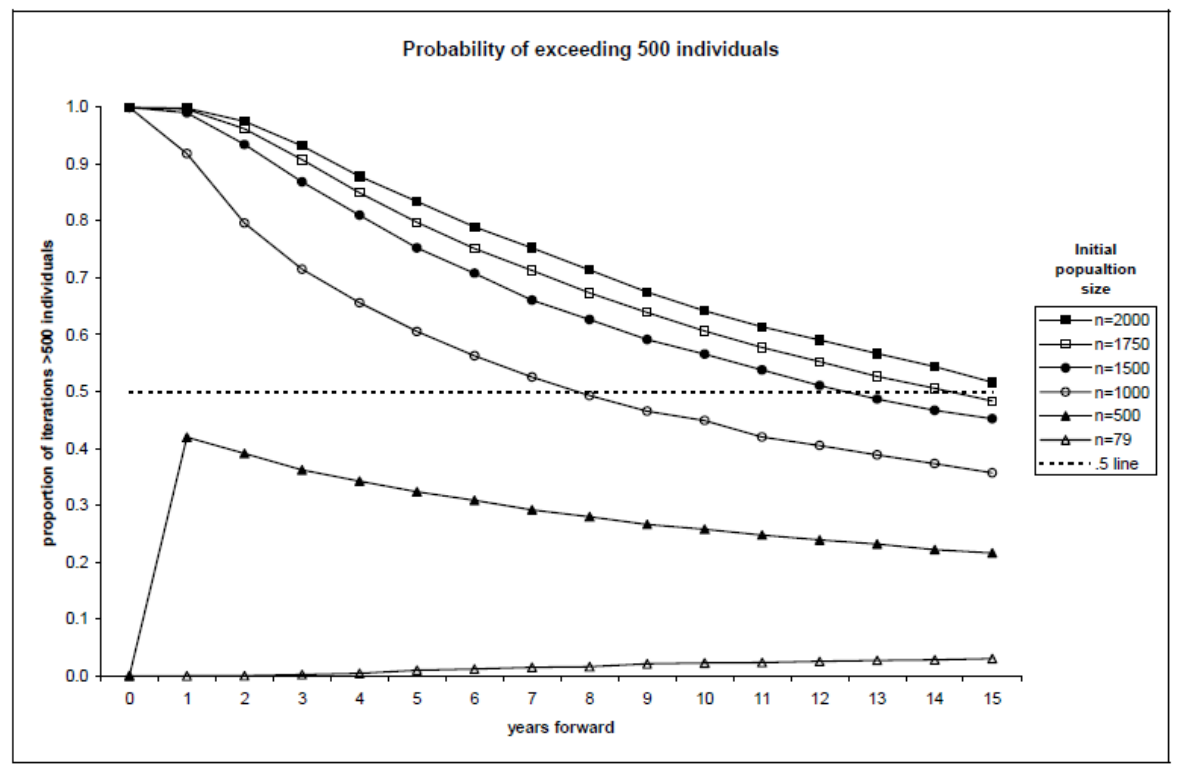
- Site ID
- Cost to fully repair or remove a barrier
- Current upstream passability of a barrier
- Habitat/stream length upstream
- Number of downstream barriers and IDs
- Number of upstream barriers and IDs

GIS Based Atlantic Salmon Habitat Model





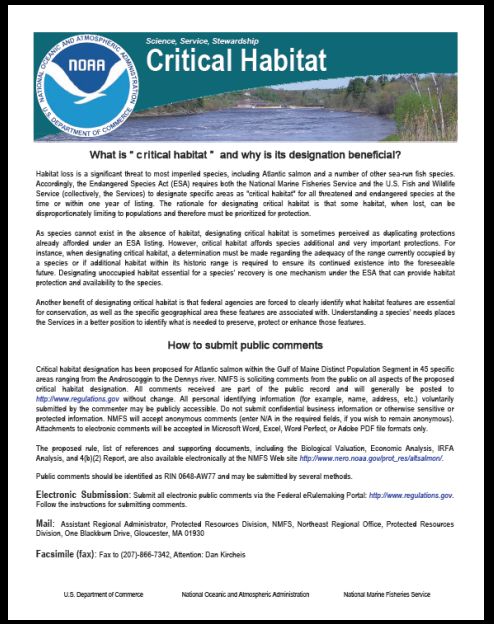
Watershed connectivity assessment



Population objectives

Identify threats

Habitat models


Science, Service, Stewardship
Critical Habitat

What is " critical habitat " and why is its designation beneficial?

Habitat loss is a significant threat to most imperiled species, including Atlantic salmon and a number of other sea-run fish species. Accordingly, the Endangered Species Act (ESA) requires both the National Marine Fisheries Service and the U.S. Fish and Wildlife Service (collectively, the Services) to designate specific areas as "critical habitat" for all threatened and endangered species at the time or within one year of listing. The rationale for designating critical habitat is that some habitat, when lost, can be disproportionately limiting to populations and therefore must be prioritized for protection.

As species cannot exist in the absence of habitat, designating critical habitat is sometimes perceived as duplicating protections already afforded under an ESA listing. However, critical habitat affords species additional and very important protections. For instance, when designating critical habitat, a determination must be made regarding the adequacy of the range currently occupied by a species or if additional habitat within its historic range is required to ensure its continued existence into the foreseeable future. Designating unoccupied habitat essential for a species' recovery is one mechanism under the ESA that can provide habitat protection and availability to the species.

Another benefit of designating critical habitat is that federal agencies are forced to clearly identify what habitat features are essential for conservation, as well as the specific geographical area these features are associated with. Understanding a species' needs places the Services in a better position to identify what is needed to preserve, protect or enhance those features.

How to submit public comments

Critical habitat designation has been proposed for Atlantic salmon within the Gulf of Maine Distinct Population Segment in 45 specific areas ranging from the Androscoggin to the Dennys river. NMFS is soliciting comments from the public on all aspects of the proposed critical habitat designation. All comments received are part of the public record and will generally be posted to http://www.regulations.gov without change. All personal identifying information (for example, name, address, etc.) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information. NMFS will accept anonymous comments (enter N/A in the required fields, if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, Word Perfect, or Adobe PDF file formats only.

The proposed rule, list of references and supporting documents, including the Biological Valuation, Economic Analysis, IRFA Analysis, and 4(b)(2) Report, are also available electronically at the NMFS Web site http://www.nero.noaa.gov/prot_res/altsalmon/.

Public comments should be identified as RIN 0648-AW77 and may be submitted by several methods.

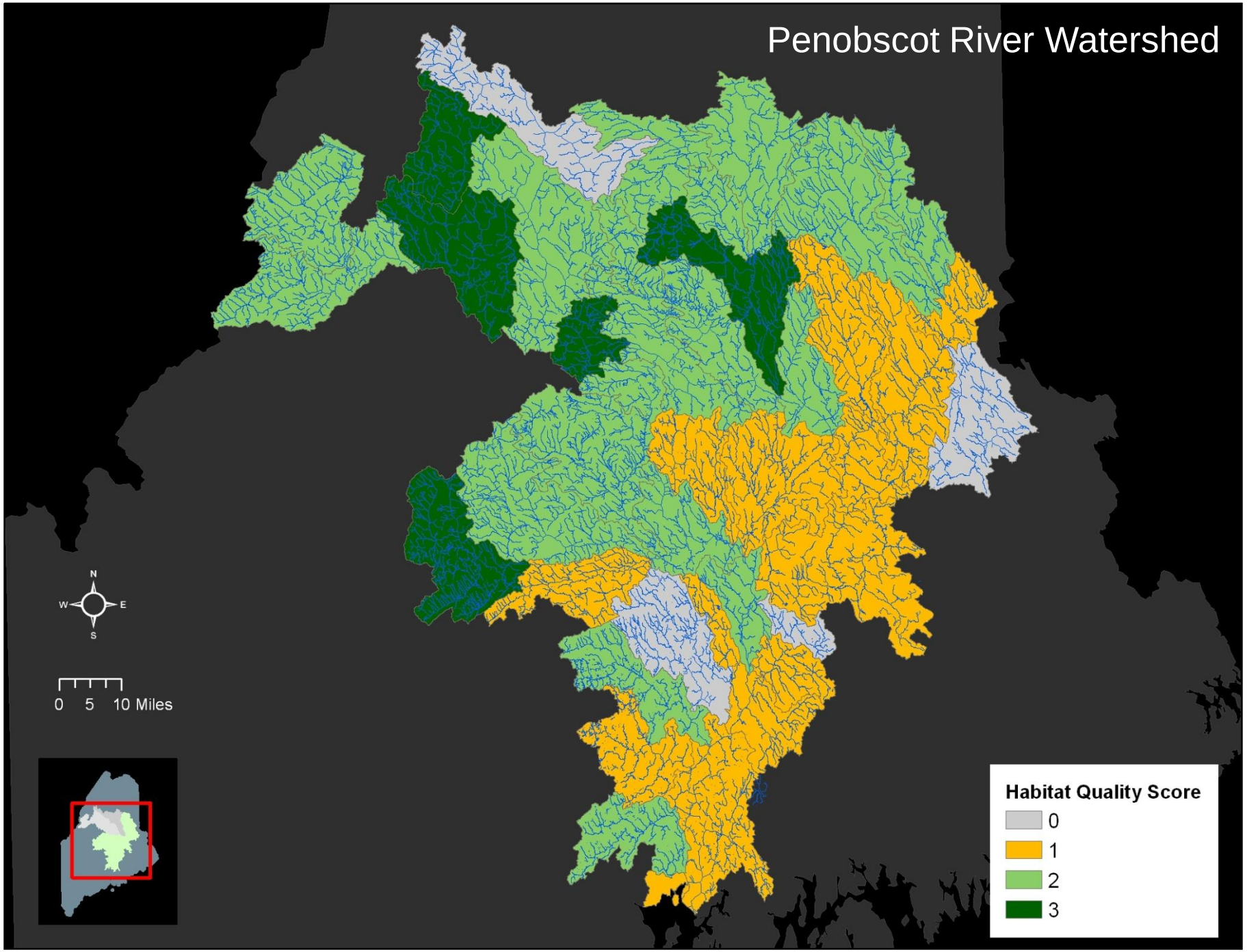
Electronic Submission: Submit all electronic public comments via the Federal eRulemaking Portal: http://www.regulations.gov. Follow the instructions for submitting comments.

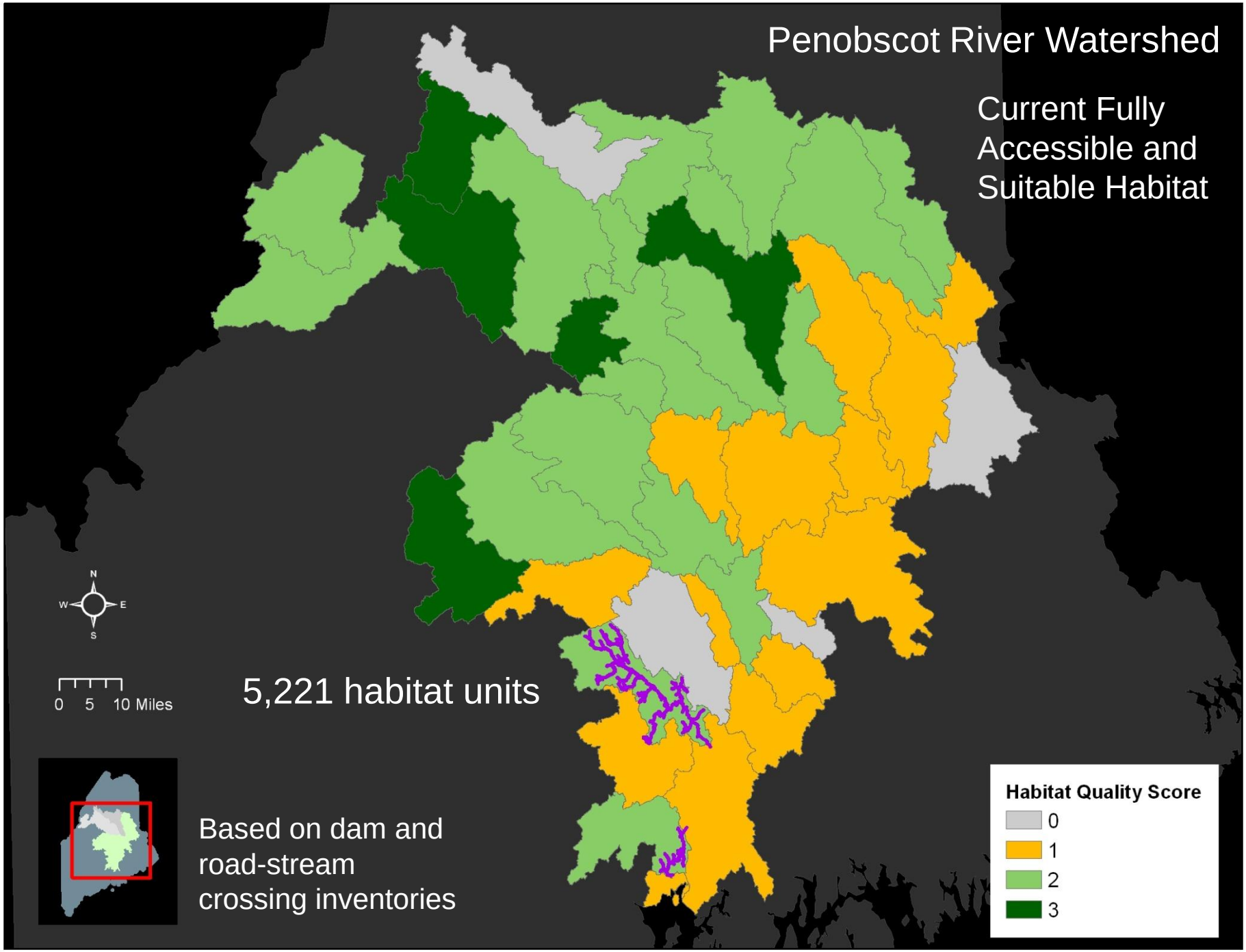
Mail: Assistant Regional Administrator, Protected Resources Division, NMFS, Northeast Regional Office, Protected Resources Division, One Blackburn Drive, Gloucester, MA 01930

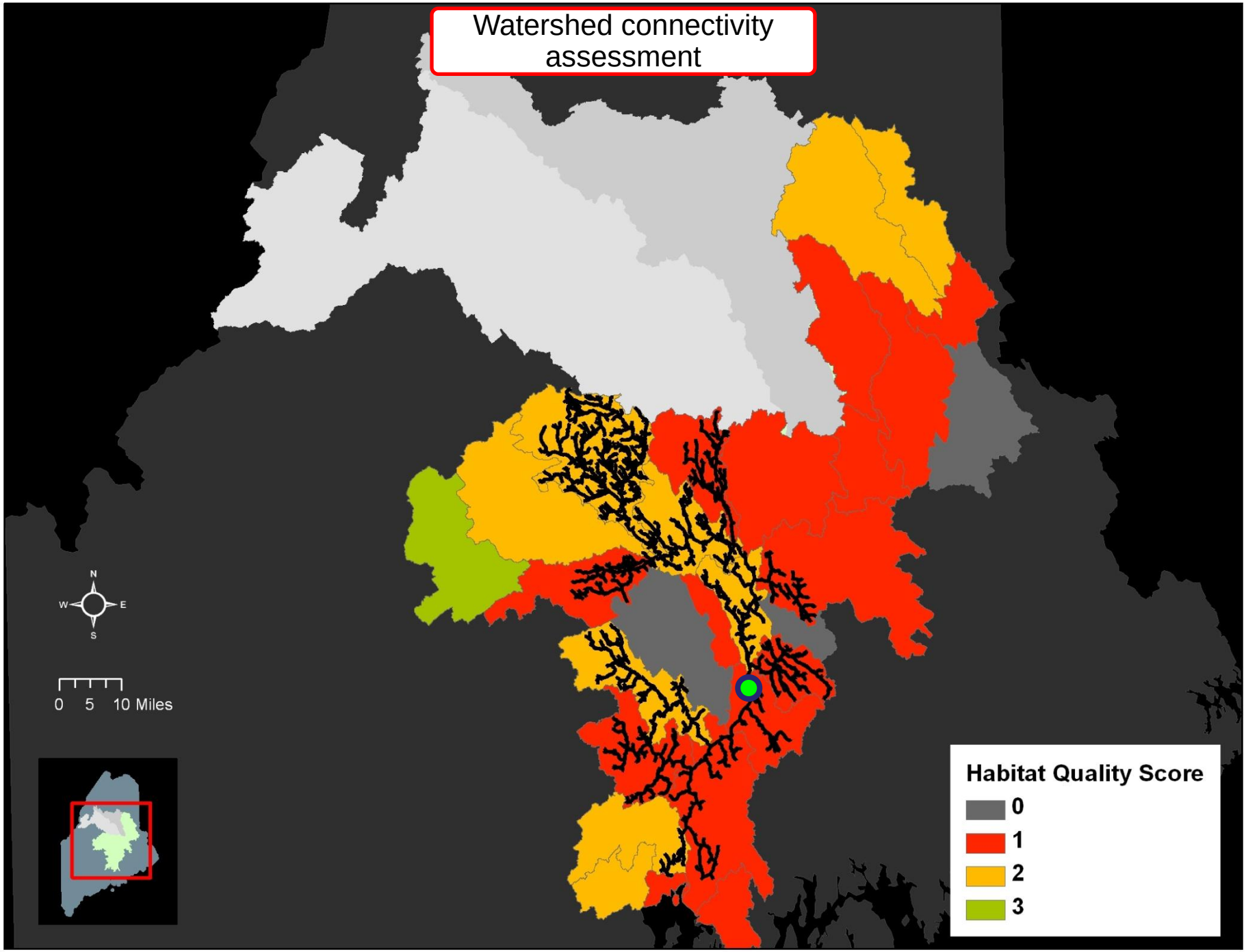
Facsimile (fax): Fax to (207)-866-7342, Attention: Dan Kircheis

U.S. Department of Commerce | National Oceanic and Atmospheric Administration | National Marine Fisheries Service

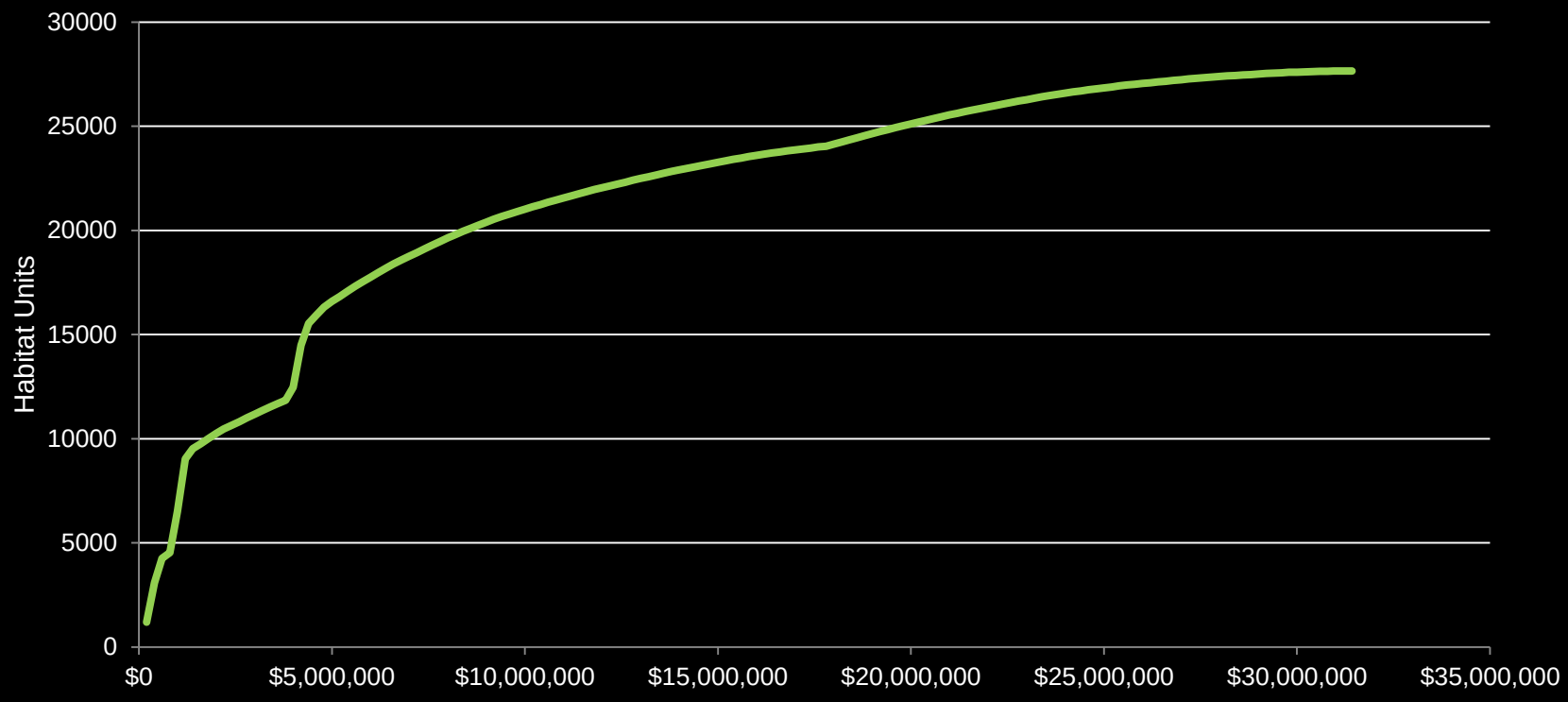
Legault, C.M. 2004. Salmon PVA: a population viability analysis model for Atlantic salmon in the Maine Distinct Population Segment. Ref. Doc. 04-02. Woods Hole, MA.

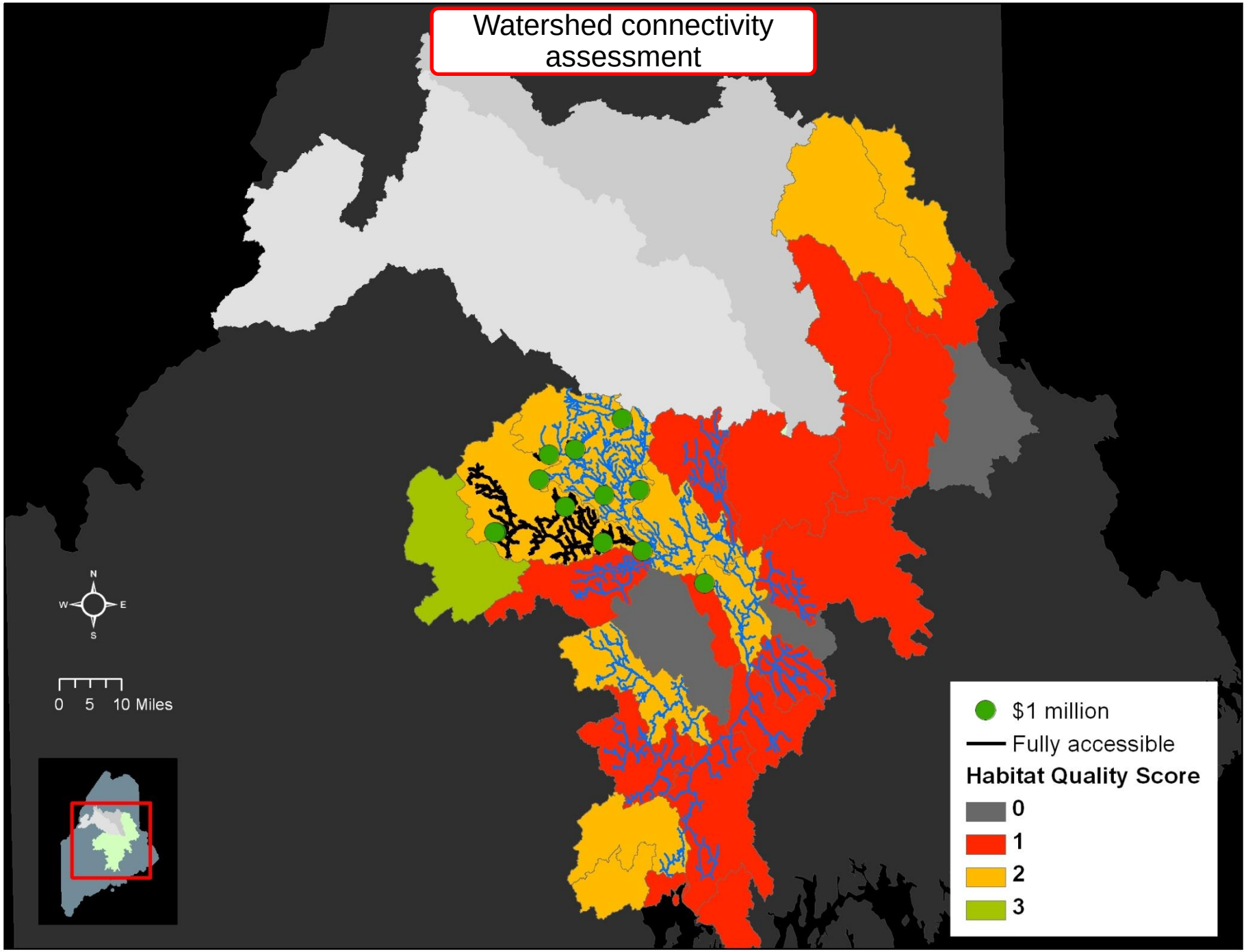

Penobscot River Watershed
N
W
E
S
0 5 10 Miles
Habitat Quality Score
0
1
2
3

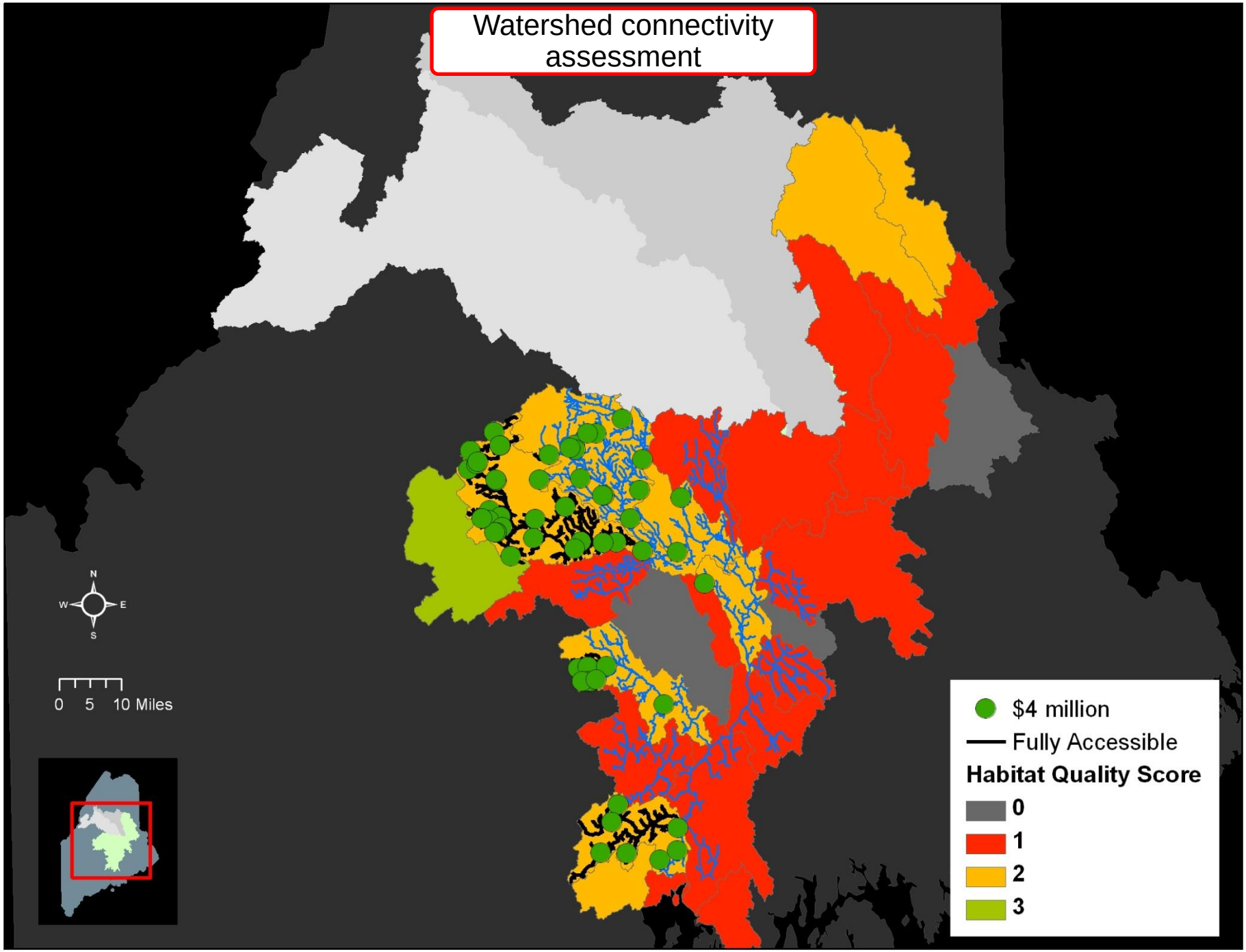

Penobscot River Watershed
Current Fully Accessible and Suitable Habitat
N
W
E
S
0 5 10 Miles
5,221 habitat units
Based on dam and road-stream crossing inventories
Habitat Quality Score
0
1
2
3


Watershed connectivity assessment
N
W
E
S
0 5 10 Miles
Habitat Quality Score
0
1
2
3

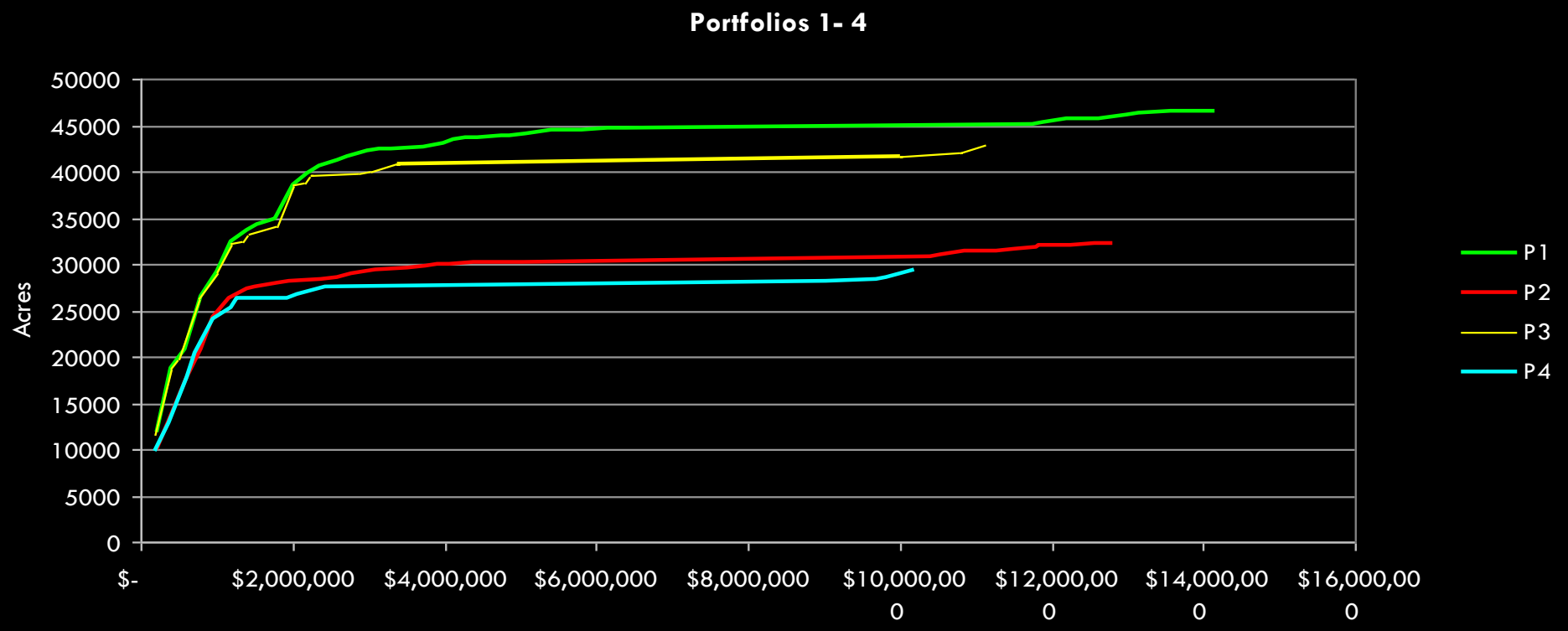
Watershed connectivity assessment



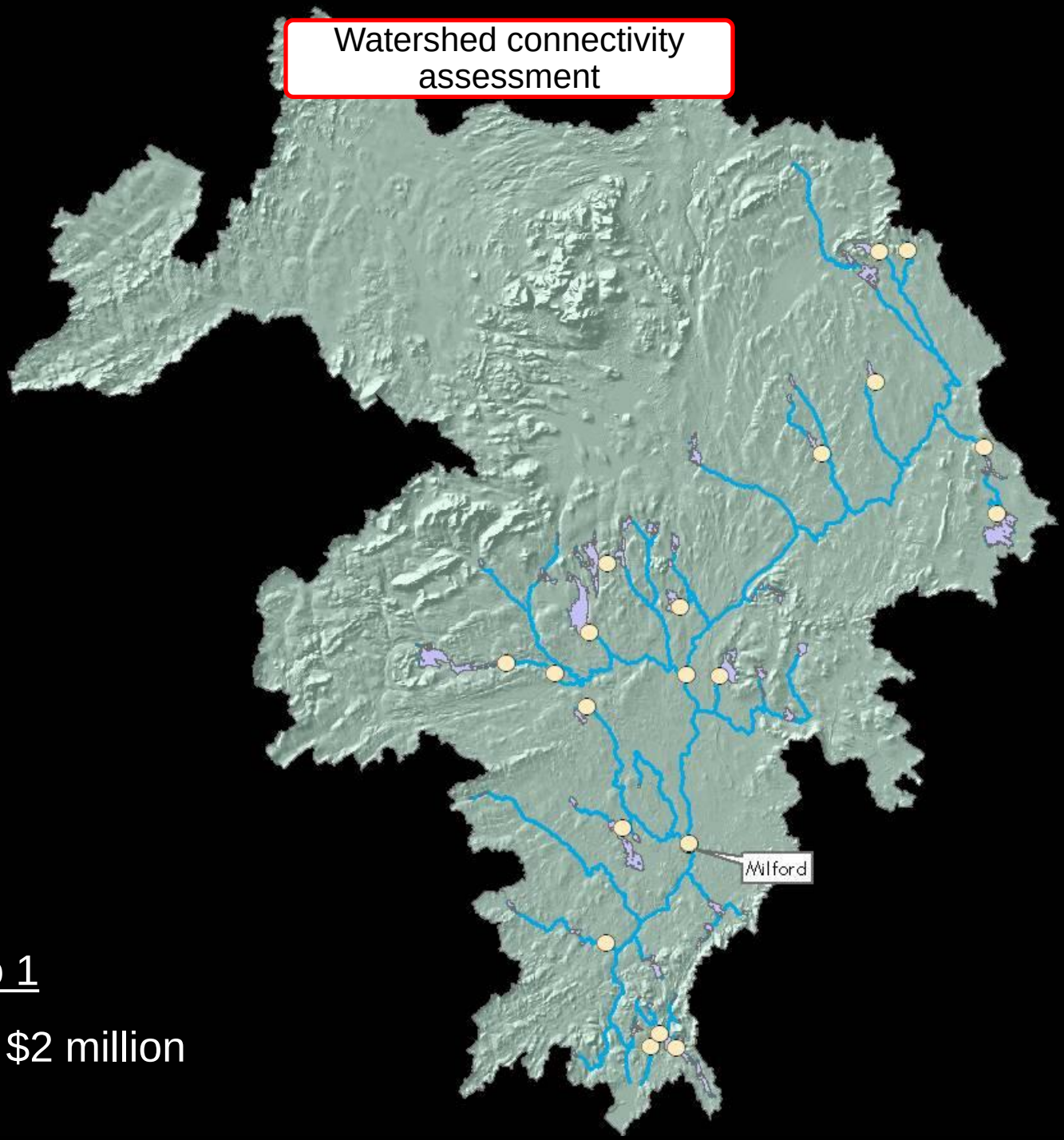

Watershed connectivity assessment
N
W
E
S
0 5 10 Miles
$1 million
Fully accessible
Habitat Quality Score
0
1
2
3


Watershed connectivity assessment
N
W
E
S
0 5 10 Miles
$4 million
Fully Accessible
Habitat Quality Score
0
1
2
3

Watershed connectivity assessment

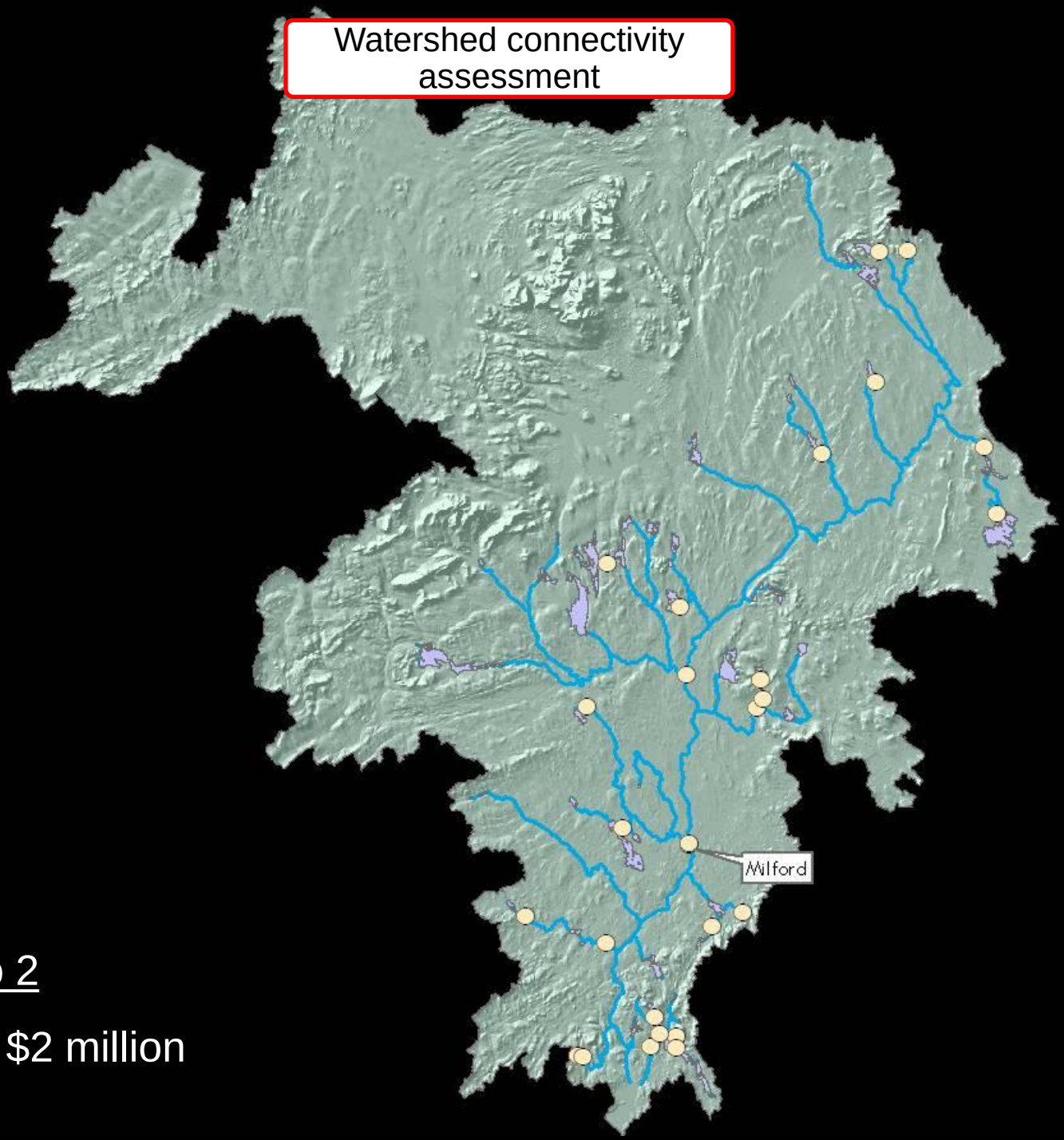


Watershed connectivity assessment



Portfolio 1

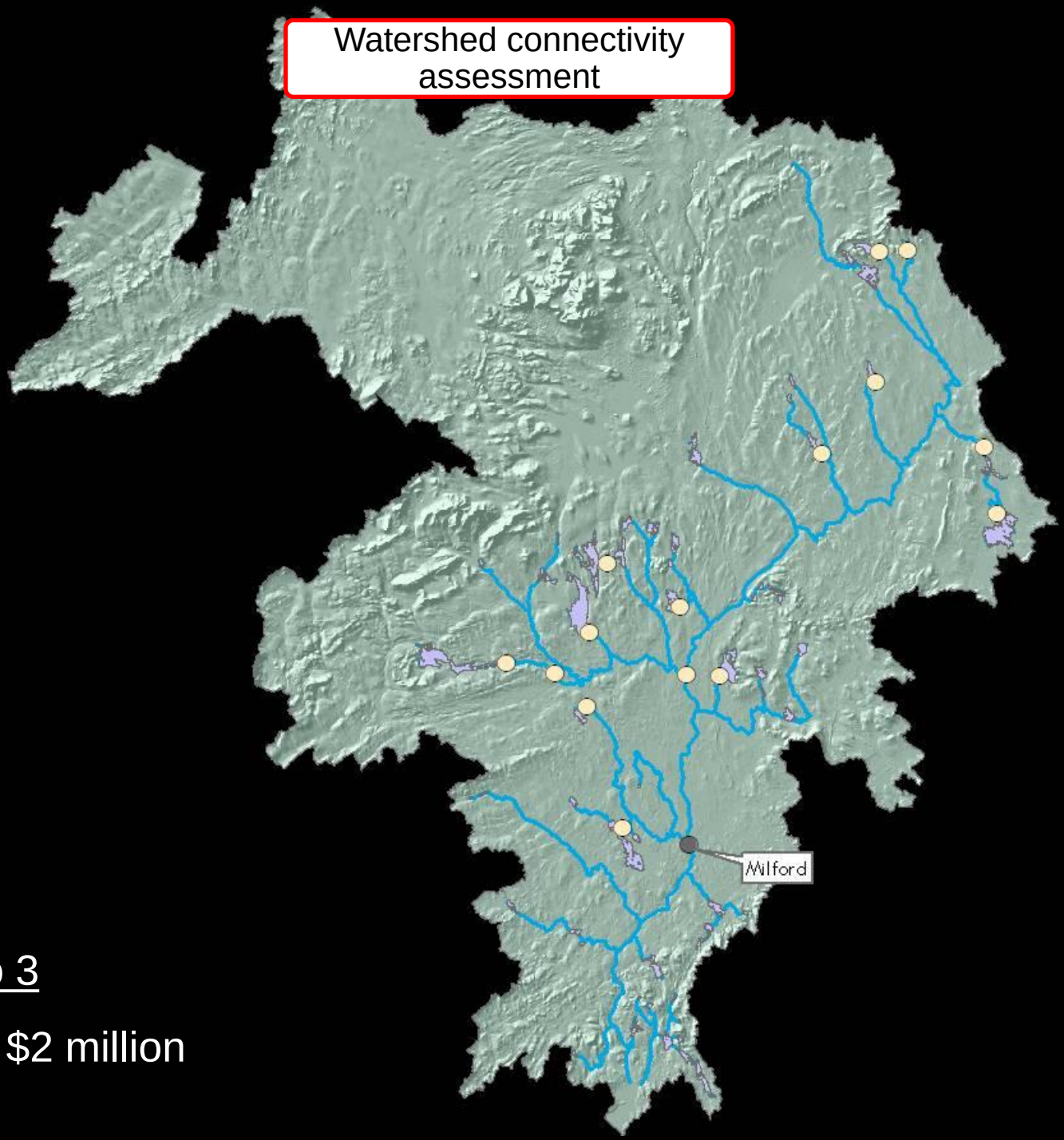
Budget: $2 million



Portfolio 2

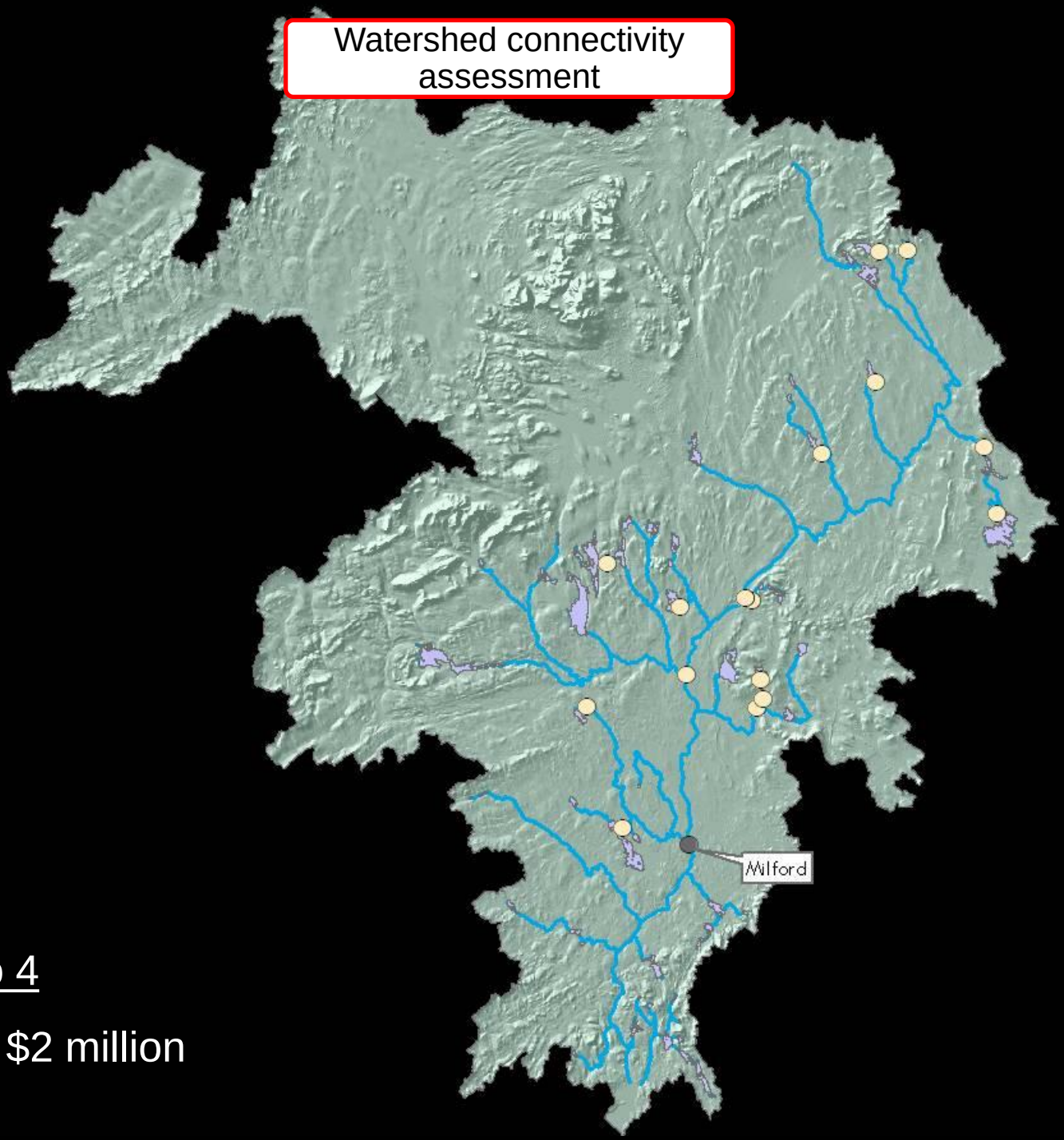
Budget: $2 million

Watershed connectivity assessment



Portfolio 3

Budget: $2 million

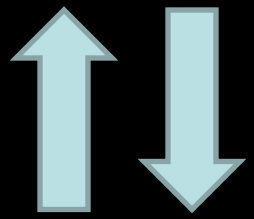


Portfolio 4

Budget: $2 million

Watershed connectivity assessment

Bi-directional connectivity



Connectivity status (Deibel et al. 2009)

Measure of the access to and from the range of seasonal or developmental habitat types that a fish uses (baseline, 1 is a system with no barriers).

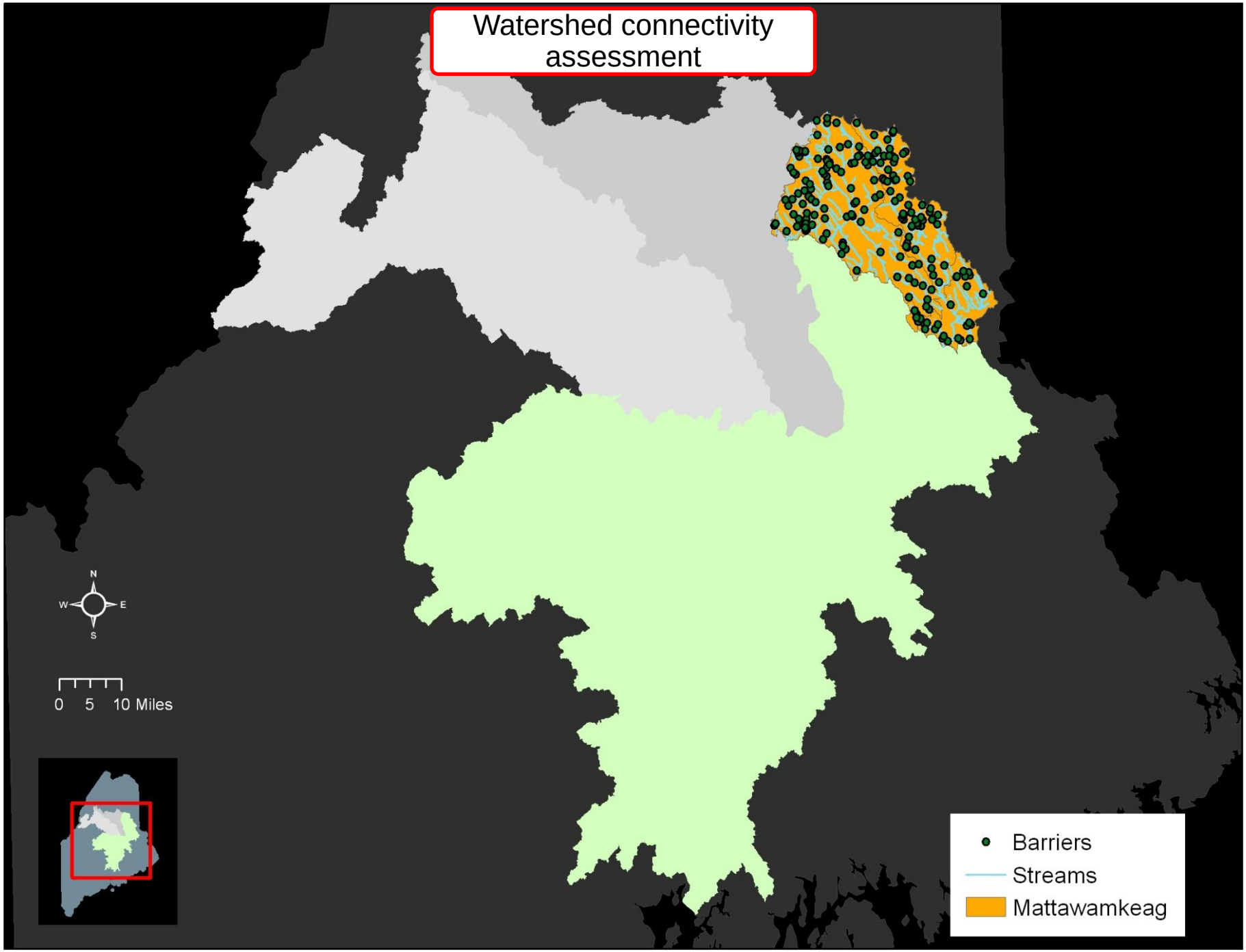
Takes into account the quality, distance and level of connectivity to different stream habitat types.

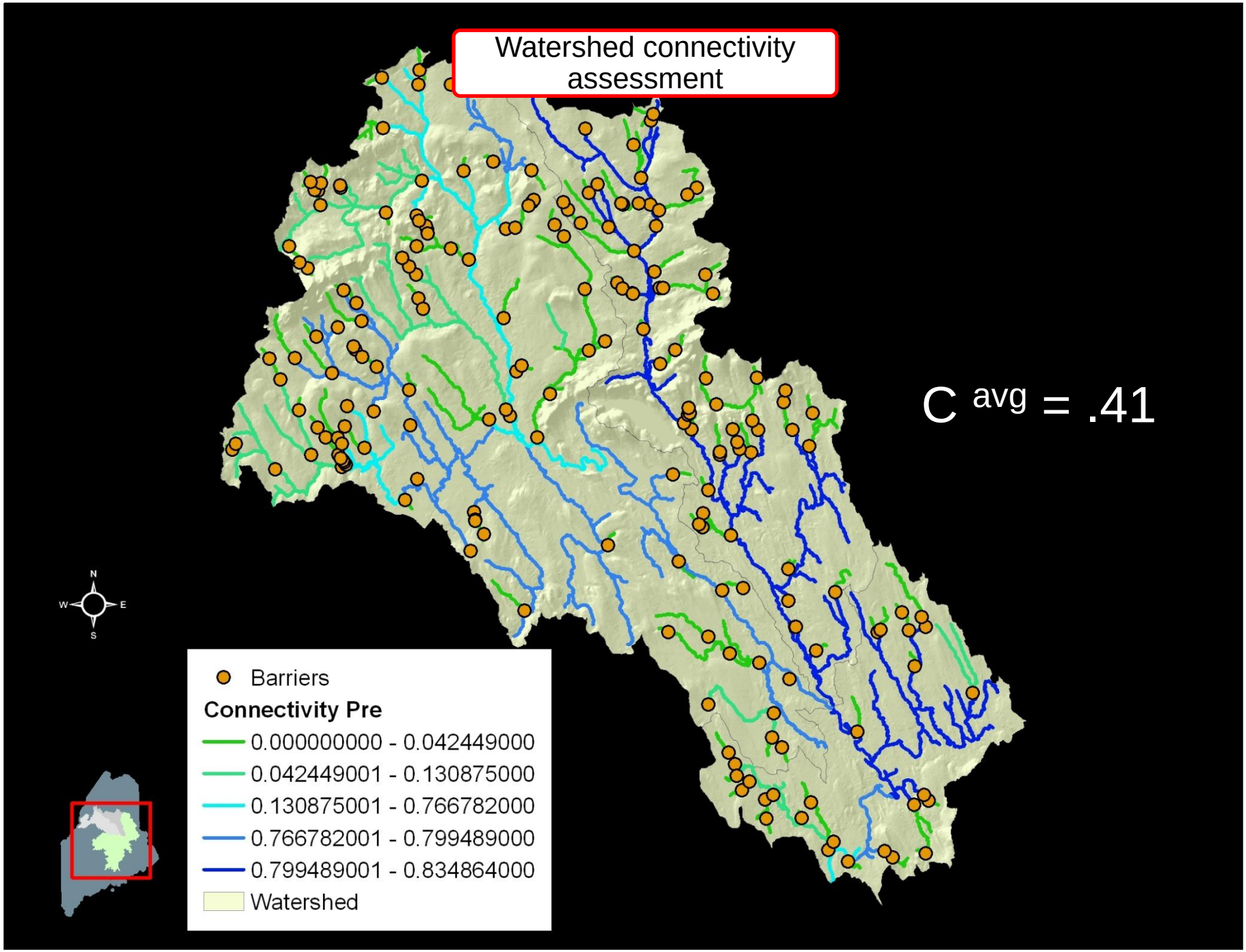
Connectivity weighted habitat status (O'Hanley et al. 2010)

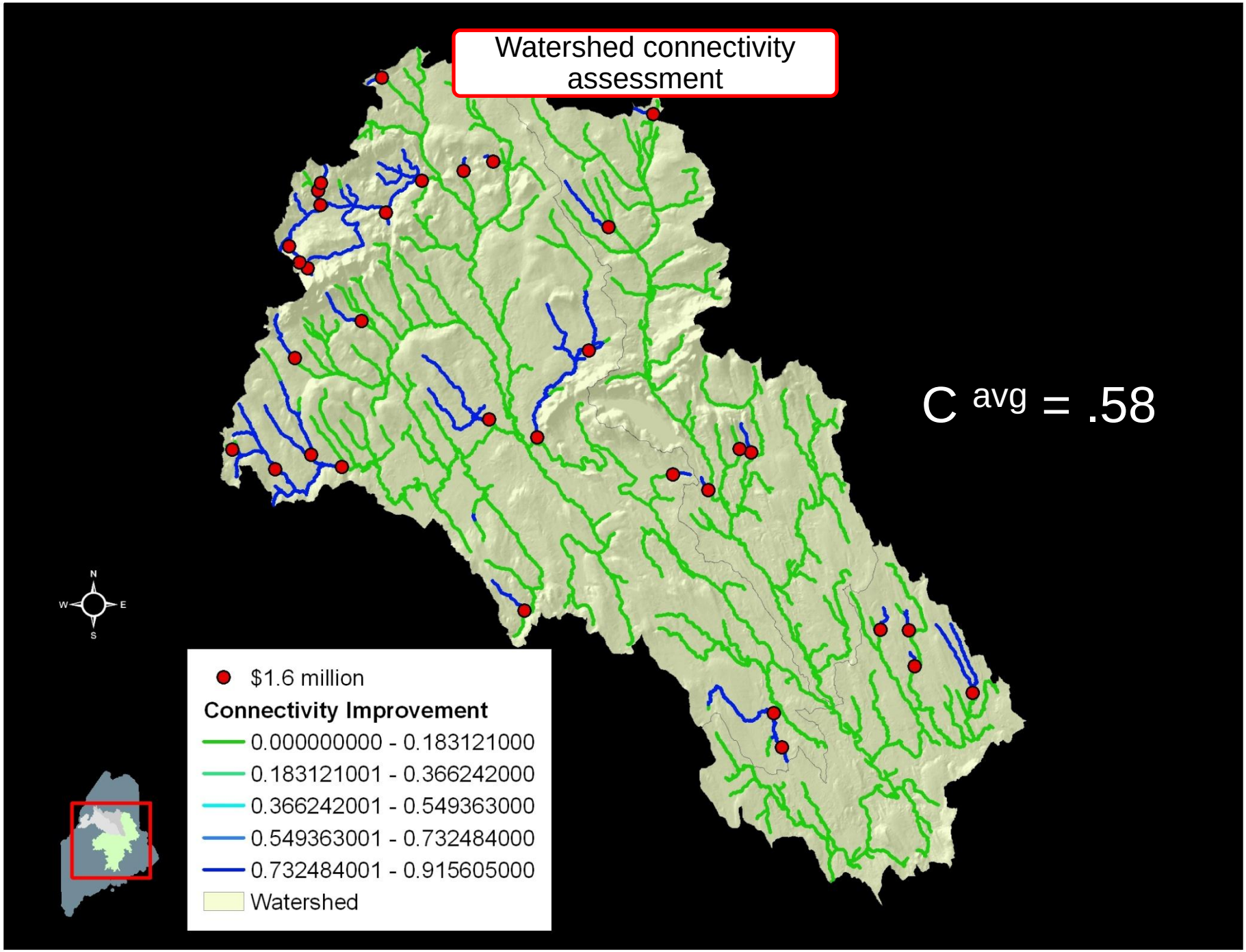
Watershed connectivity assessment

Model Inputs

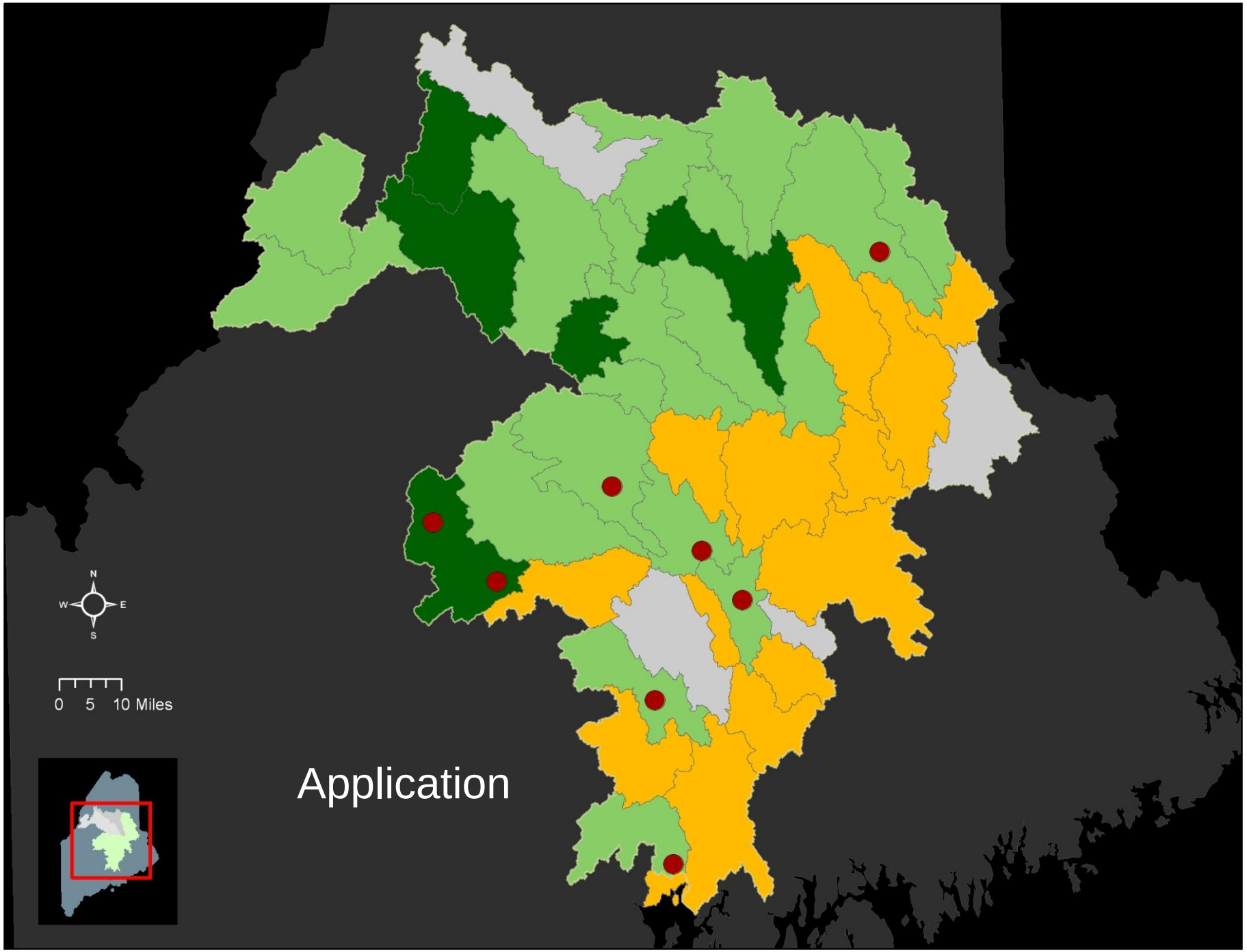
- Cost to fully repair or remove a barrier
- Current upstream passability of a barrier
- Current downstream passability of a barrier
- Strahler stream order
- Habitat quality
- Segment length
- Distance along the stream network between each beginning of a segment to the end of every other segment
- List of barriers that are found between the beginning of a segment to the end of every other segment
- Typical seasonal dispersal distance

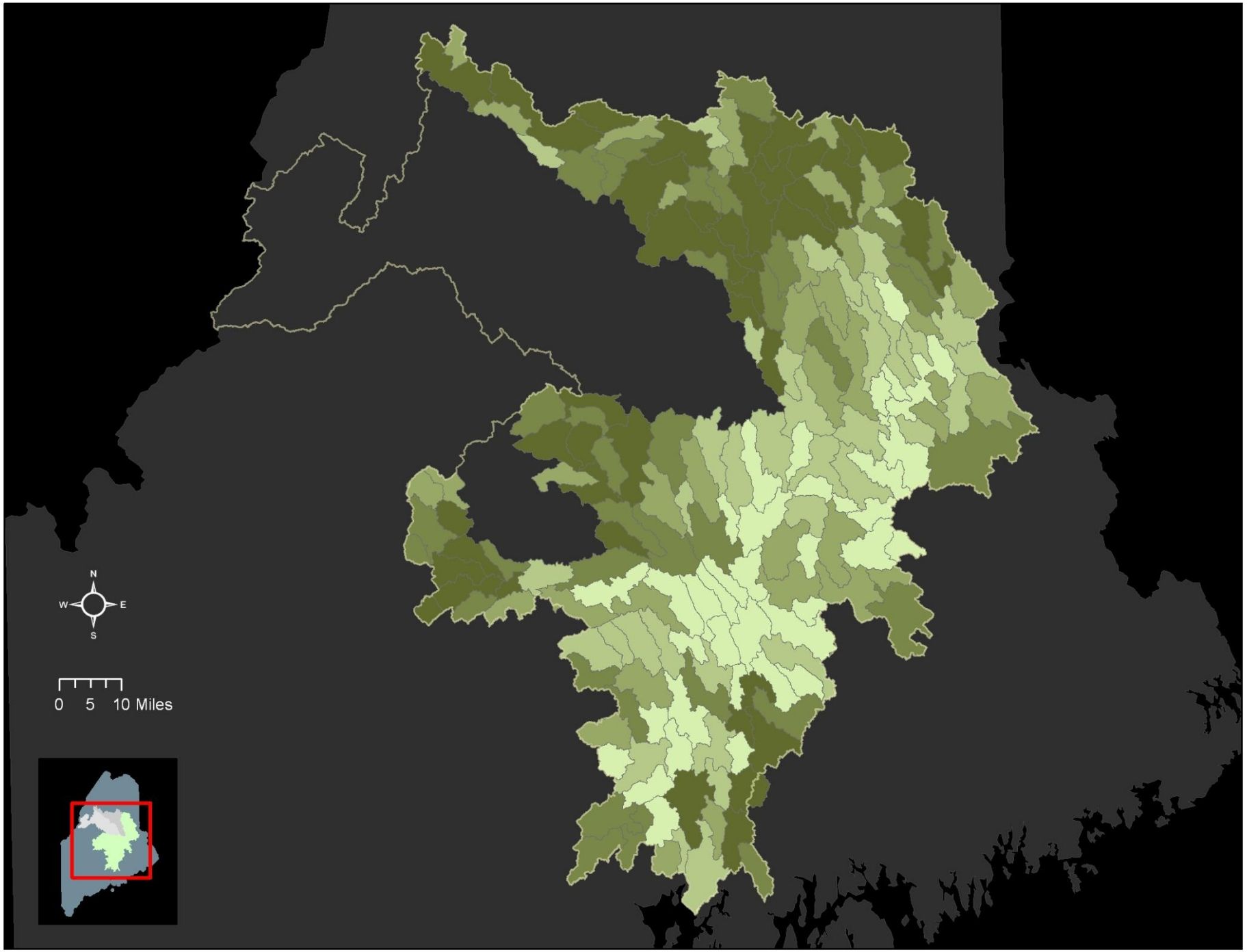

Watershed connectivity assessment
N
W
E
S
0 5 10 Miles
Barriers
Streams
Mattawamkeag

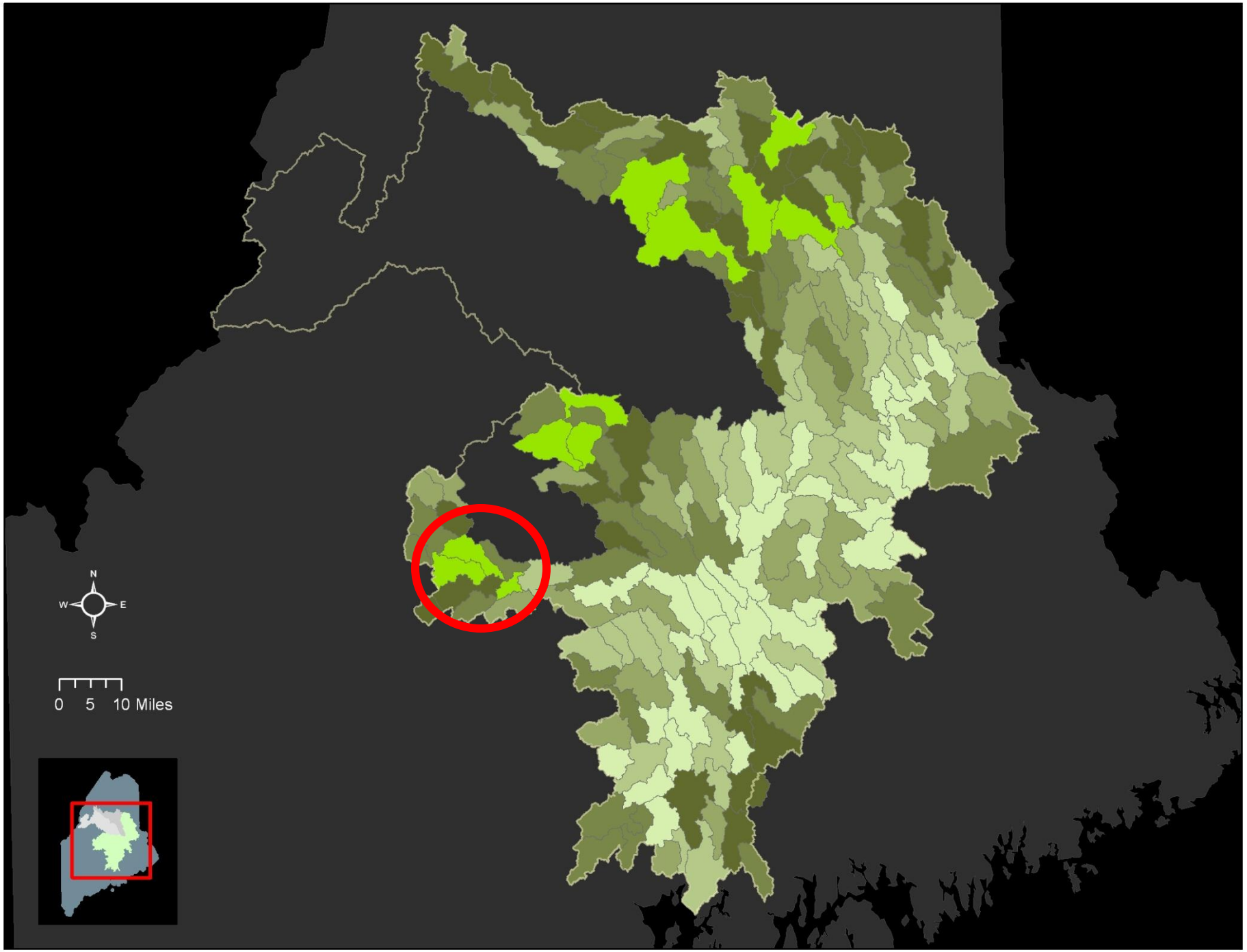

Watershed connectivity assessment
C avg = .41
N
W
E
S
Barriers
Connectivity Pre
0.000000000 - 0.042449000
0.042449001 - 0.130875000
0.130875001 - 0.766782000
0.766782001 - 0.799489000
0.799489001 - 0.834864000
Watershed

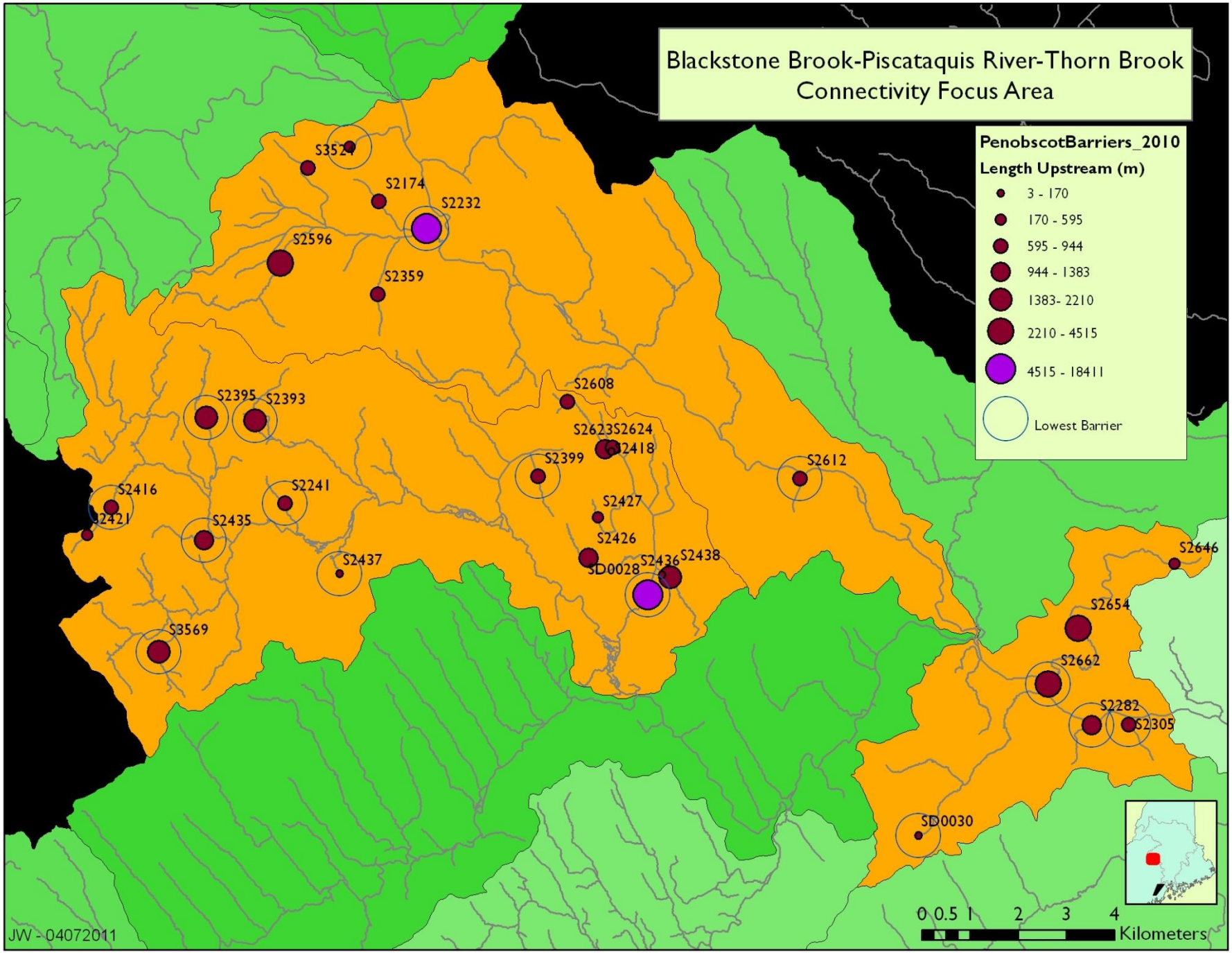

Watershed connectivity assessment
C avg = .58
N
W
E
S
$1.6 million
Connectivity Improvement
0.000000000 - 0.183121000
0.183121001 - 0.366242000
0.366242001 - 0.549363000
0.549363001 - 0.732484000
0.732484001 - 0.915605000
Watershed

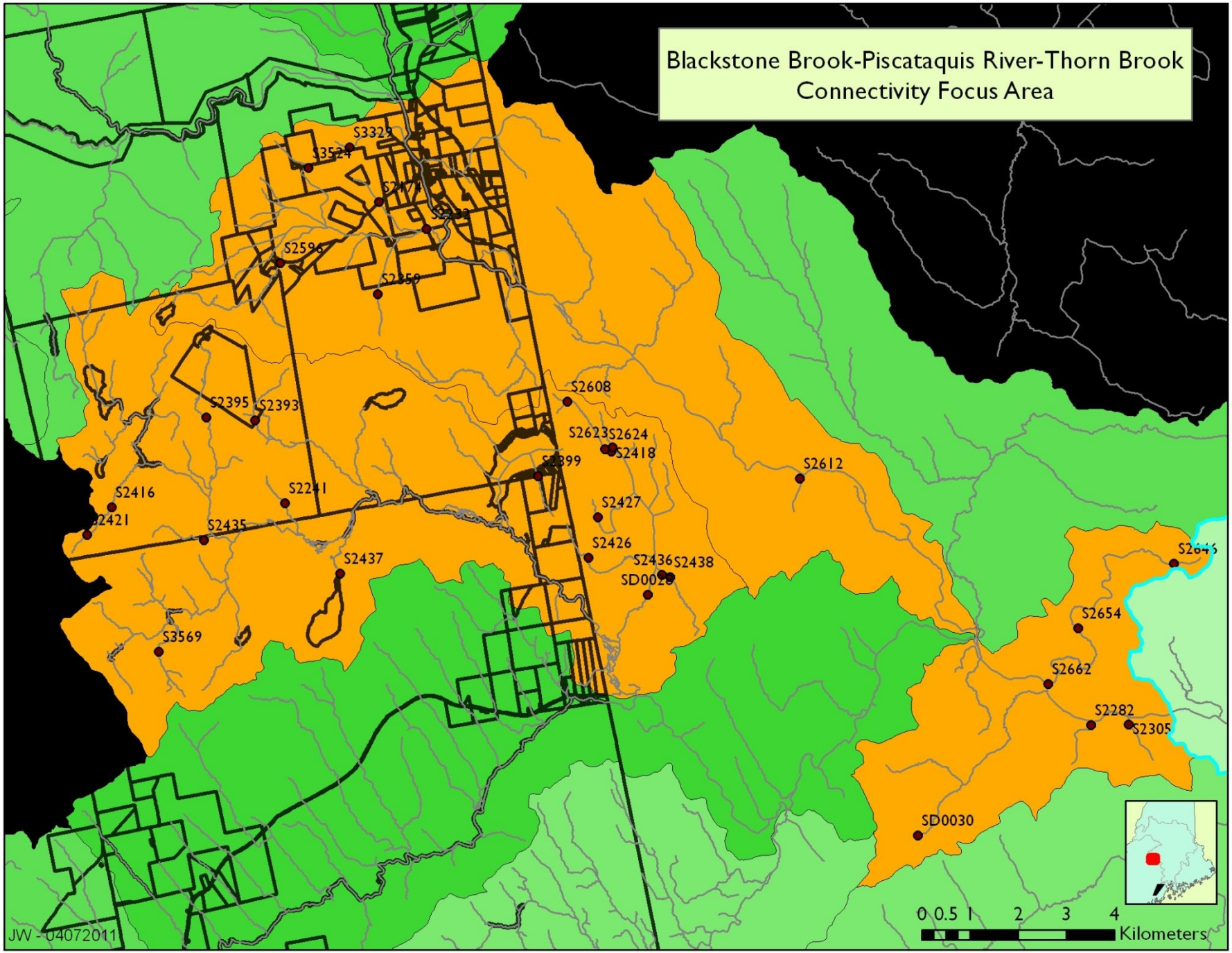
Optimization vs. prioritization/ranking


N
W
E
S
0 5 10 Miles
Application


N
W
E
S
0 5 10 Miles


N
W
E
S
0 5 10 Miles


Blackstone Brook-Piscataquis River-Thorn Brook
Connectivity Focus Area
PenobscotBarriers_2010
Length Upstream (m)
3 - 170
170 - 595
595 - 944
944 - 1383
1383- 2210
2210 - 4515
4515 - 18411
Lowest Barrier
S3524
S2174
S2232
S2596
S2359
S2608
S2395
S2393
S2623S2624
S2418
S2399
S2612
S2416
S2241
S2421
S2435
S2427
S2426
S2437
SD0028
S2436
S2438
S2646
S2654
S3569
S2662
S2282
S2305
SD0030
0 0.5 1 2 3 4
Kilometers
JW - 04072011


Blackstone Brook-Piscataquis River-Thorn Brook
Connectivity Focus Area
S3329
S3524
S2596
S2359
S2395
S2393
S2608
S2623
S2624
S2418
S2399
S2612
S2416
S2241
S2421
S2435
S2427
S2426
S2436
S2438
SD0028
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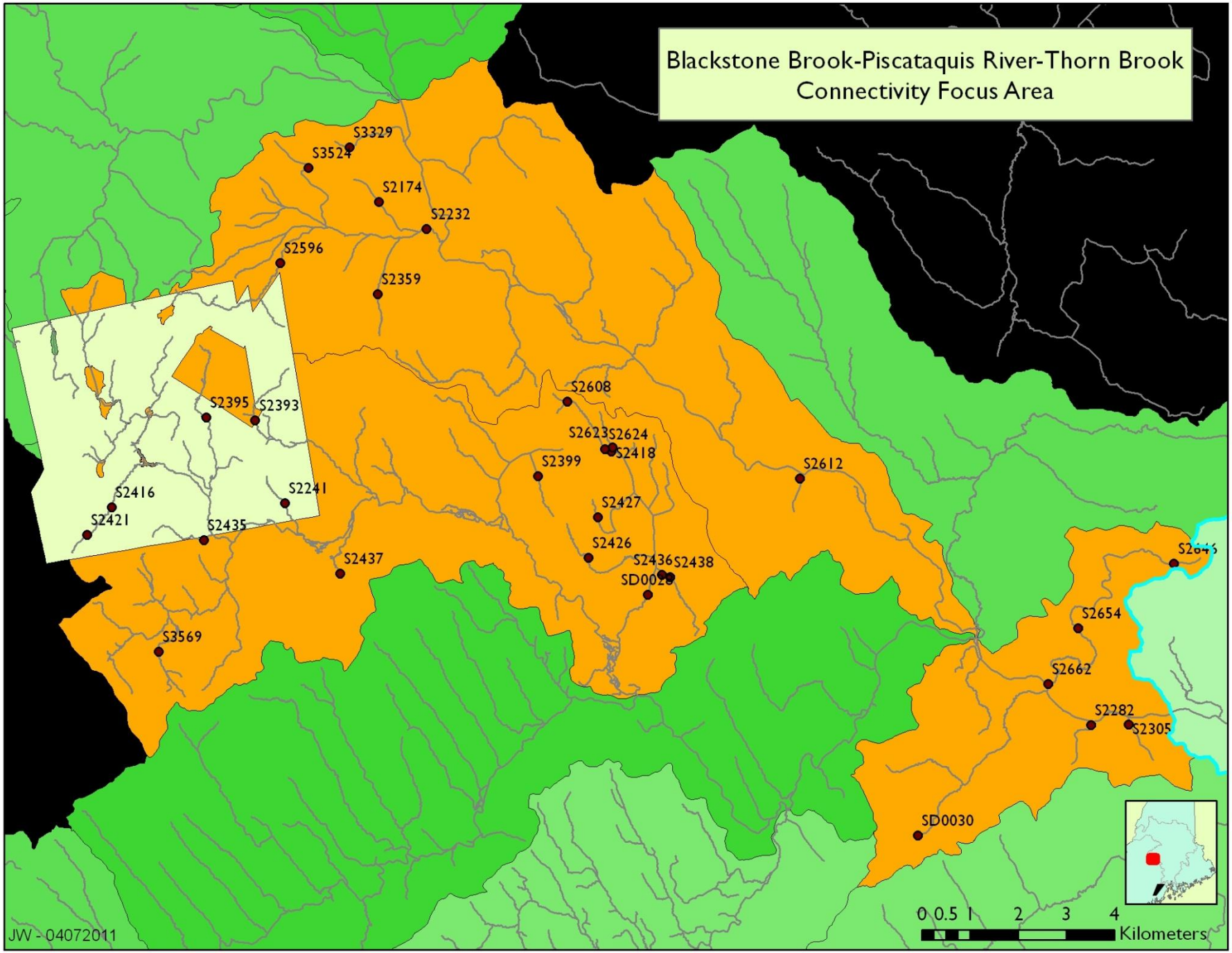
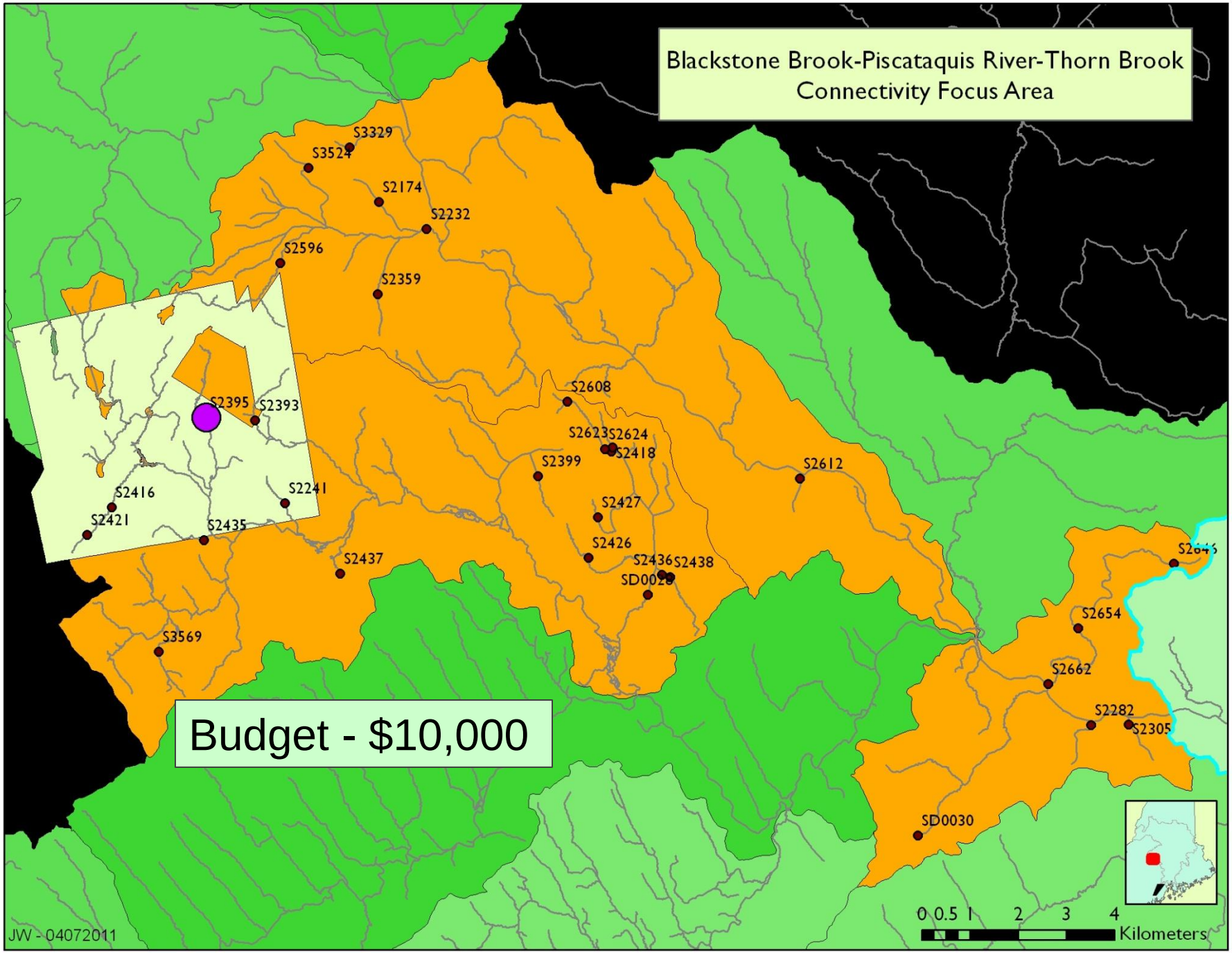
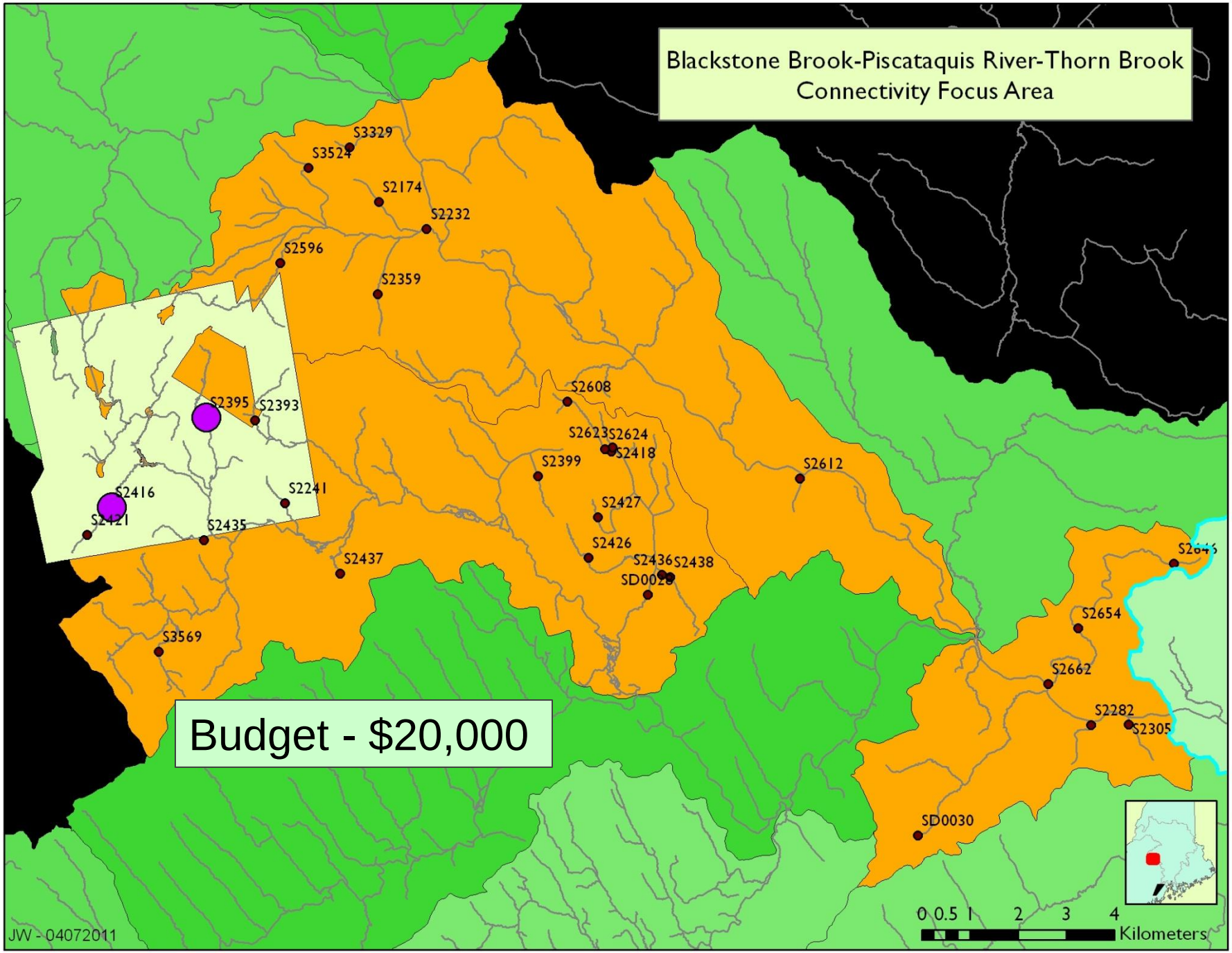
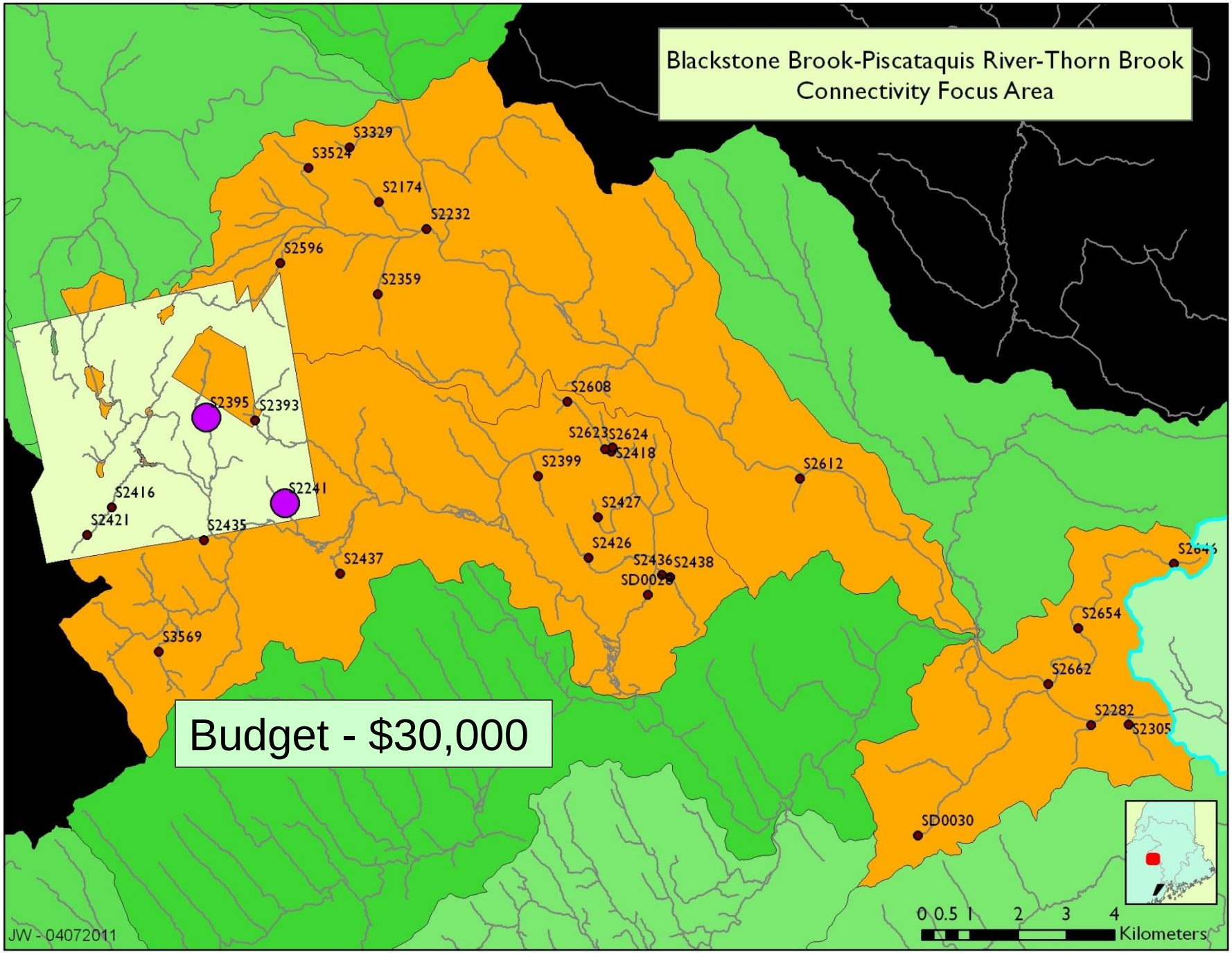
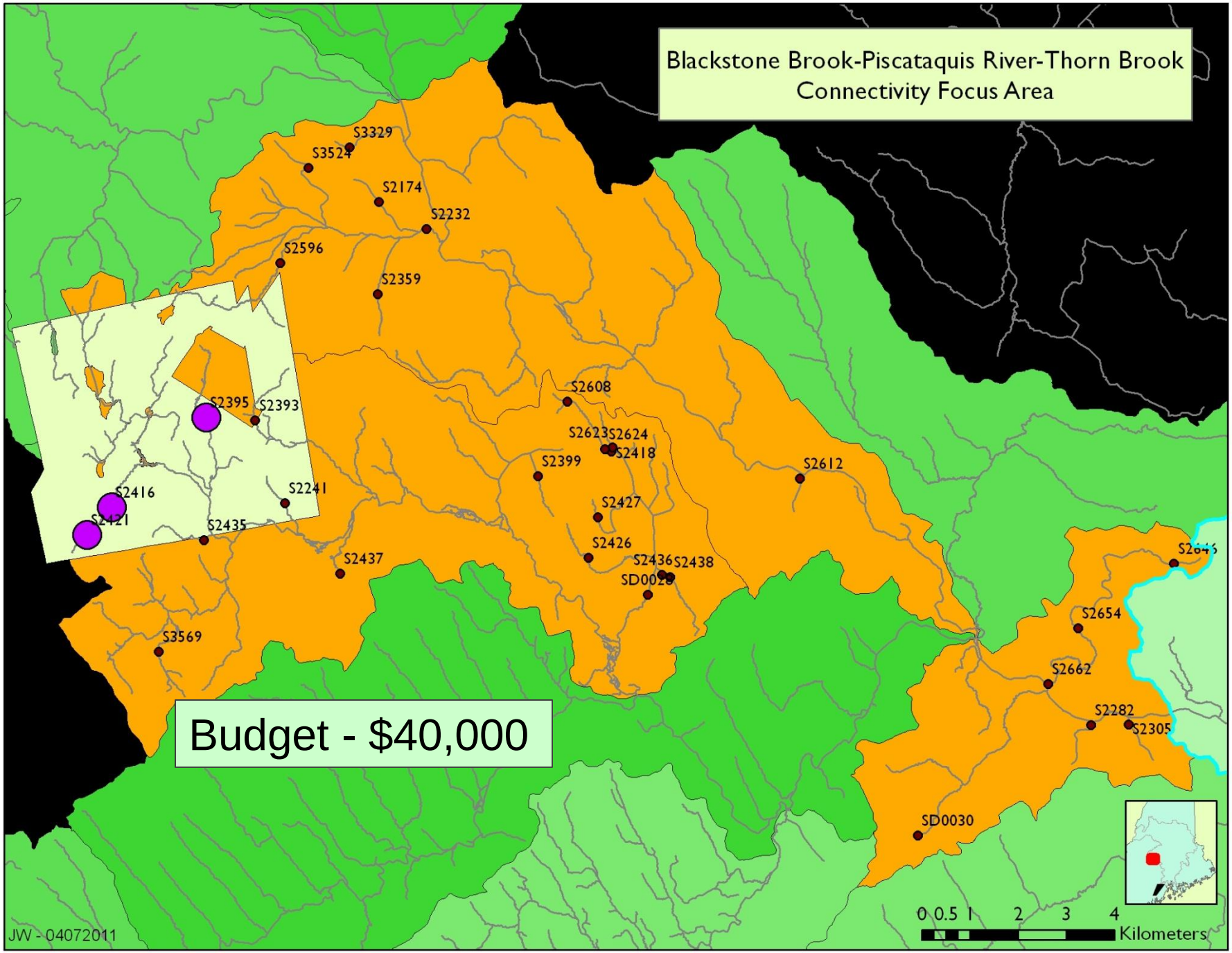
S2662
S2282
S2305
SD0030
0 0.5 1 2 3 4
Kilometers
JW - 04072011


Blackstone Brook-Piscataquis River-Thorn Brook
Connectivity Focus Area
S3329
S3524
S2174
S2232
S2596
S2359
S2608
S2623
S2624
S2418
S2399
S2612
S2427
S2426
S2436
S2438
SD0028
S2437
S2241
S2435
S2421
S2416
S2395
S2393
S3569
S2654
S2662
S2282
S2305
SD0030
0 0.5 1 2 3 4
Kilometers
JW - 04072011


Blackstone Brook-Piscataquis River-Thorn Brook
Connectivity Focus Area
S3329
S3524
S2174
S2232
S2596
S2359
S2608
S2623
S2624
S2418
S2399
S2612
S2427
S2426
S2436
S2438
SD0028
S2437
S2395
S2393
S2416
S2421
S2435
S2241
S3569
S2654
S2662
S2282
S2305
SD0030
Budget - $10,000
JW - 04072011
0 0.5 1 2 3 4
Kilometers


Blackstone Brook-Piscataquis River-Thorn Brook
Connectivity Focus Area
S3329
S3524
S2174
S2232
S2596
S2359
S2608
S2623
S2624
S2418
S2399
S2612
S2427
S2426
S2436
S2438
SD0028
S2437
S2435
S2241
S2416
S2421
S2395
S2393
S3569
S2654
S2662
S2282
S2305
SD0030
Budget - $20,000
JW - 04072011
0 0.5 1 2 3 4
Kilometers


Blackstone Brook-Piscataquis River-Thorn Brook
Connectivity Focus Area
S3329
S3524
S2174
S2232
S2596
S2359
S2608
S2623
S2624
S2418
S2399
S2612
S2427
S2426
S2436
S2438
SD0028
S2437
S2654
S2662
S2282
S2305
SD0030
S3569
S2395
S2393
S2241
S2416
S2421
S2435
Budget - $30,000
0 0.5 1 2 3 4
Kilometers
JW - 04072011


Blackstone Brook-Piscataquis River-Thorn Brook
Connectivity Focus Area
S3329
S3524
S2174
S2232
S2596
S2359
S2608
S2623
S2624
S2418
S2399
S2612
S2395
S2393
S2416
S2241
S2421
S2435
S2427
S2426
S2436
S2438
SD0028
S2437
S3569
S2654
S2662
S2282
S2305
SD0030
Budget - $40,000
JW - 04072011
0 0.5 1 2 3 4
Kilometers

Cost data

- Sensitivity analysis

Scenario testing

- Integrate optimization within GIS

Data currency

- Institutionalize surveys and databases

Prioritization within optimization

Watershed connectivity assessment

Budget	FIXIDS								
$200K	'S3072'	'SD0077'							
$400K	'S3072'	'SD0069'	'SD0085'						
$600K	'S3062'	'S3072'	'SD0069'	'SD0077'	'SD0085'				
$800K	'S1453'	'S1739'	'S1849'	'S1932'	'S2351'	'S2453'	'S2519'	'S2988'	'S3062'
		'S3072'	'S3089'	'S3158'	'SD0069'	'SD0077'	'S3064'	'SD0085'	'SD0049'
$1m	'S1739'	'S2351'	'S2453'	'S2988'	'S3062'	'S3072'	'S3158'	'SD0077'	'SD0080'
		'S3257'	'S3299'	'S3300'					

Budget									
$200K	0.992	0.995							
$400K	0.992	0.989	0.986						
$600K	0.984	0.992	0.989	0.995	0.986				
$800K	0.970	0.975	0.959	0.937	0.964	0.970	0.934	0.975	0.984
		0.992	0.959	0.975	0.989	0.995	0.948	0.986	0.973
$1m	0.975	0.964	0.970	0.975	0.984	0.992	0.975	0.995	0.986
		0.975	0.970	0.970					

Criteria for Connectivity
Spatial Decision Support Tools

- Dynamic
- Accessible/Interactive
- Expert input
- Transparent
- Multi-objective
- Scalable

Common needs – components exist
Pool resources?

Thanks to the following individuals

USFWS: John Sweka, Scott Craig, Charles Soucy

NOAA-Fisheries: Rory Saunders

Boston College: Noah Snyder

Maine Department of Marine Resources: Joan Trial, Gail Whipplehauser

Maine Forest Service: Keith Kanoti

Project SHARE: Steve Koenig

USFS: Keith Nislow, Mark Fedora, Matt Diebel

Datanostics Inc.: Jim Wallace

Colorado State University: John Norman

GeoData Institute (UK): Duncan Hornby

The Nature Conservancy: Josh Royte, Erik Martin