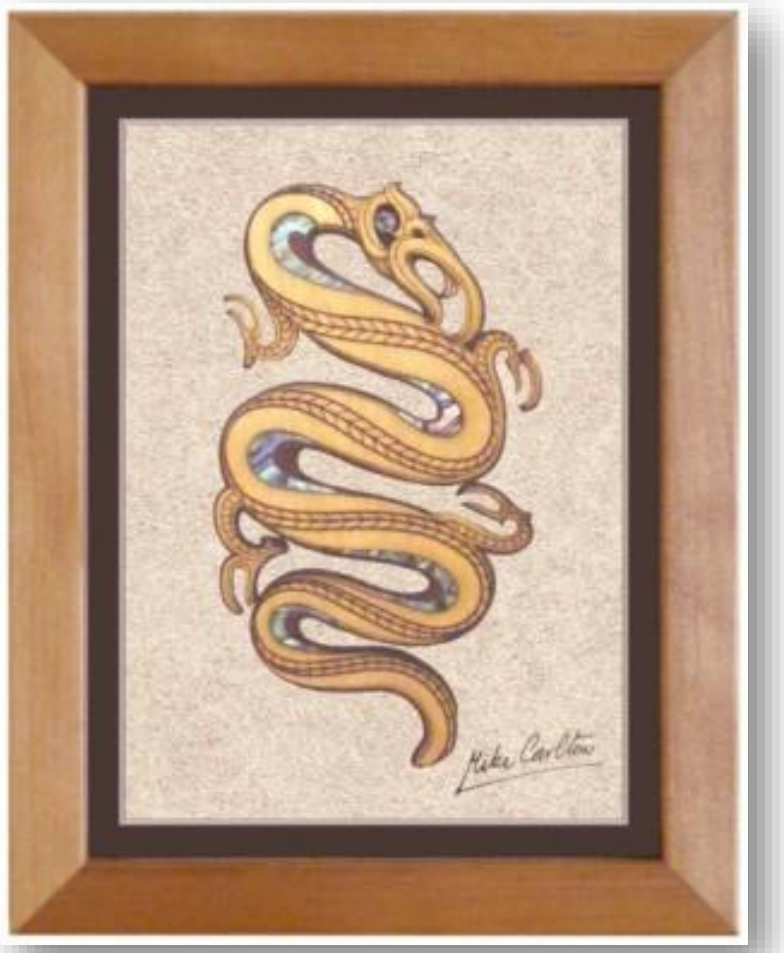# Fish Habitat Prioritization for American eel (*Anguilla rostrata*) in Virginia and Maryland tributaries of the Chesapeake Bay Watershed

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Introduction

The American eel *Anguilla rostrata* was once one of the most abundant fish in Atlantic coastal streams but is now at less than 1% of historic levels. No specific cause is responsible; however, overfishing, parasites, habitat degradation, pollution, barriers to migration, and global environmental change have contributed to the decline. The Atlantic States Marine Fisheries Council (ASMFC) considers this species as depleted. The objective of this work is to determine the current distribution, density and relative abundance of American eel throughout the Chesapeake Bay watershed.

Metric	Values	Description	Weight
Population	0	None documented	3
	1	Historical presence	3
	2	Current presence (2010-present, <10,000)	3
	3	Current presence (2010-present, >10,000)	3
Flow connectivity	0	dams/barriers with no known eel passage	2
	1	dams/barriers w/ fish ladders, eel passage unconfirmed	2
	2	dams/barriers w/ fish ladders, eel passage confirmed	2
	3	no barriers	2
Impervious surface	0	>75% impervious surfaces	1
	1	50-75% impervious surfaces	1
	2	25-49% impervious surfaces	1
	3	<25% impervious surfaces	1

Sample metrics used to estimate the best areas for prioritization of eel habitat conservation efforts.

Materials & Methods

We use weighted metrics representing habitat factors and GIS mapping in our analysis of eels Chesapeake Bay watershed. These data include presence, density, relative abundance, distribution, length, life stage and gender overlaid with environmental factors including temperature, salinity, contaminant type and load, parasite and disease infection, presence and type of riparian buffers, barrier type, and fishing pressure. The effects of environmental factors across temporal and spatial scales will be evaluated using metrics based on the Fish Habitat Decision Support Tool (Erik Martin, The Nature Conservancy).

Preliminary Results

Using a variety of sources, we have obtained data on over 1.8 million American eels from tributaries of the Chesapeake Bay in Maryland and Virginia. These data include elvers, yellow and silver eels. We have also compiled data on some environmental factors, including dams and the level of riparian buffer zones within 30 m of each stream.

	Date (combined)	Site Name	Stream Name	Basin	Lat	Lon	total eels	Life Stage
8810	10/10/2007	Augusta Forestry Center		South River	38.17303889	-78.86004444	946	Silver
8811	10/10/2007	Augusta Forestry Center		South River	38.17303889	-78.86004444	870	Silver
8812	10/10/2007	Augusta Forestry Center		South River	38.17303889	-78.86004444	774	Yellow
8813	10/12/2007	Augusta Forestry Center		South River	38.17381111	-78.85642222	738	Yellow
8814	10/12/2007	Augusta Forestry Center		South River	38.17381111	-78.85642222	670	Yellow
8815	10/12/2007	Augusta Forestry Center		South River	38.17381111	-78.85642222	582	Yellow
8816	10/12/2007	Augusta Forestry Center		South River	38.17381111	-78.85642222	535	Yellow
8817	10/12/2007	Augusta Forestry Center		South River	38.17381111	-78.85642222	463	Yellow
8818	10/12/2007	Augusta Forestry Center		South River	38.17381111	-78.85642222	396	Yellow
8819	10/19/2007	Gravel Run MD - Chester River Area, 1st order stream to Corsica River, (39° 4'42.19"N	76° 7'10.89"W			0	
8820	10/22/2007	Gravel Run MD - Chester River Area, 1st order stream to Corsica River, (39° 4'42.19"N	76° 7'10.89"W			0	
8821	10/24/2007	Gravel Run MD - Chester River Area, 1st order stream to Corsica River, (39° 4'42.19"N	76° 7'10.89"W			0	
8822	10/26/2007	Gravel Run MD - Chester River Area, 1st order stream to Corsica River, (39° 4'42.19"N	76° 7'10.89"W			1	silver
8823	10/29/2007	Luray Impoundment		South Fork Shenandoah	38.67635833	-78.51742778	943	Silver
8824	10/29/2007	Luray Impoundment		South Fork Shenandoah	38.67635833	-78.51742778	871	Silver
8825	10/29/2007	Luray Impoundment		South Fork Shenandoah	38.67635833	-78.51742778	837	Silver
8826	10/29/2007	Luray Impoundment		South Fork Shenandoah	38.67635833	-78.51742778	832	Silver
8827	10/29/2007	Luray Impoundment		South Fork Shenandoah	38.67635833	-78.51742778	810	Silver
8828	10/29/2007	Luray Impoundment		South Fork Shenandoah	38.67635833	-78.51742778	793	Silver
8829	10/29/2007	Luray Impoundment		South Fork Shenandoah	38.67635833	-78.51742778	755	Yellow
8830	10/29/2007	Gravel Run MD - Chester River Area, 1st order stream to Corsica River, (39° 4'42.19"N	76° 7'10.89"W			14	silver
8831	10/30/2007	Shenandoah Impoundment		South Fork Shenandoah	38.47957222	-78.62408889	968	Silver
8832	10/30/2007	Shenandoah Impoundment		South Fork Shenandoah	38.47957222	-78.62408889	926	Silver
8833	10/30/2007	Shenandoah Impoundment		South Fork Shenandoah	38.47957222	-78.62408889	898	Intermediate
8834	10/30/2007	Shenandoah Impoundment		South Fork Shenandoah	38.47957222	-78.62408889	855	Yellow
8835	10/30/2007	Shenandoah Impoundment		South Fork Shenandoah	38.47957222	-78.62408889	855	Intermediate

A selection of eel data containing variables such as date sampled, site name, basin, GPS coordinates, total number of eels and life stage.
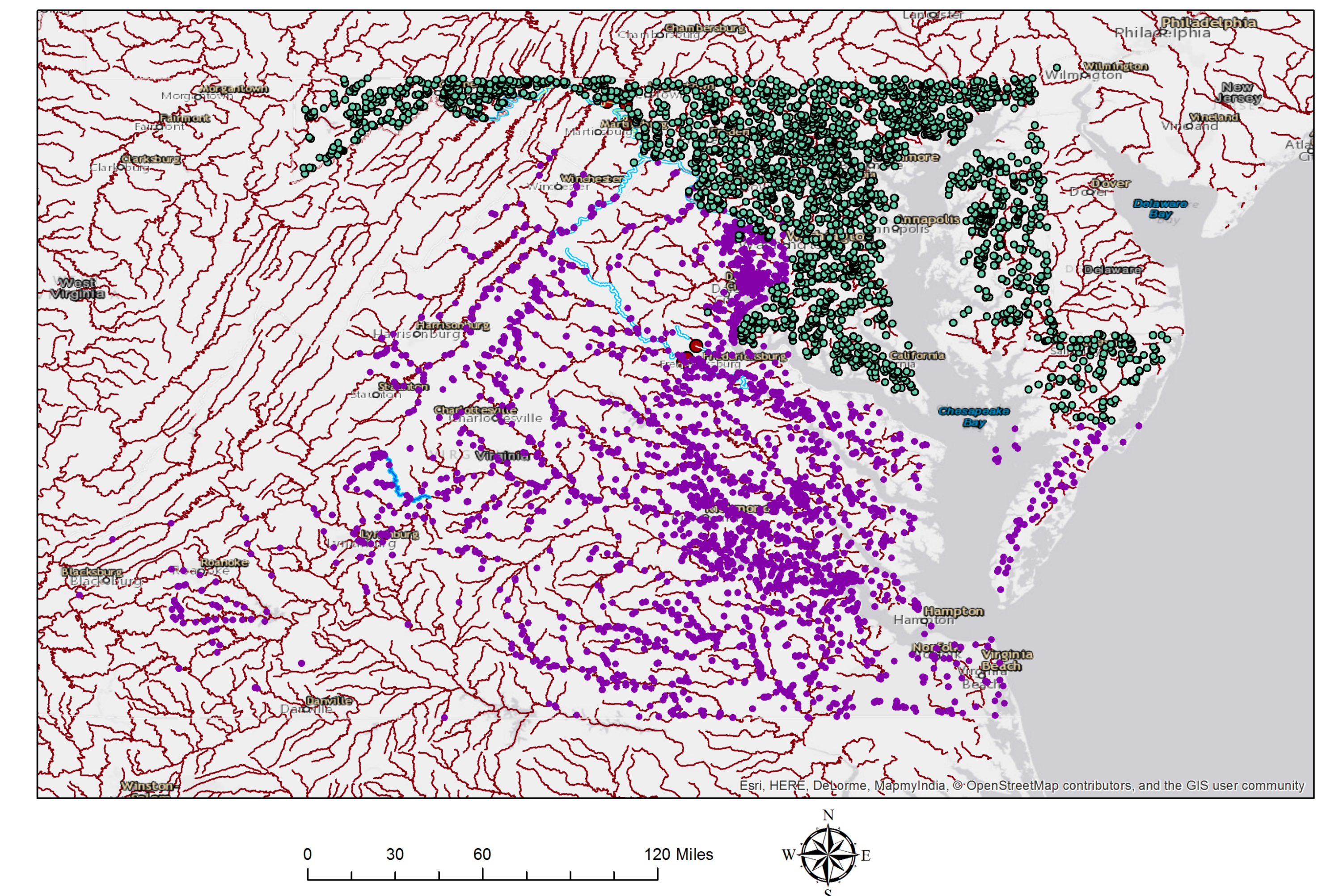
Green dots indicate the presence of eels in Maryland; Purple dots indicate eels in Virginia. Red dots show the presence of dams.

Further discussion

Hypotheses about American eel distribution and abundance will be evaluated based on specific metrics and combinations of metrics. We also will develop a null model using environmental factors known to be associated with suitable habitat for American eel. Model outputs will be used to create maps (using ArcGIS 10.4 and Python) of potential American eel habitat. These results will be used to inform policy proposals and suggest conservation management actions.