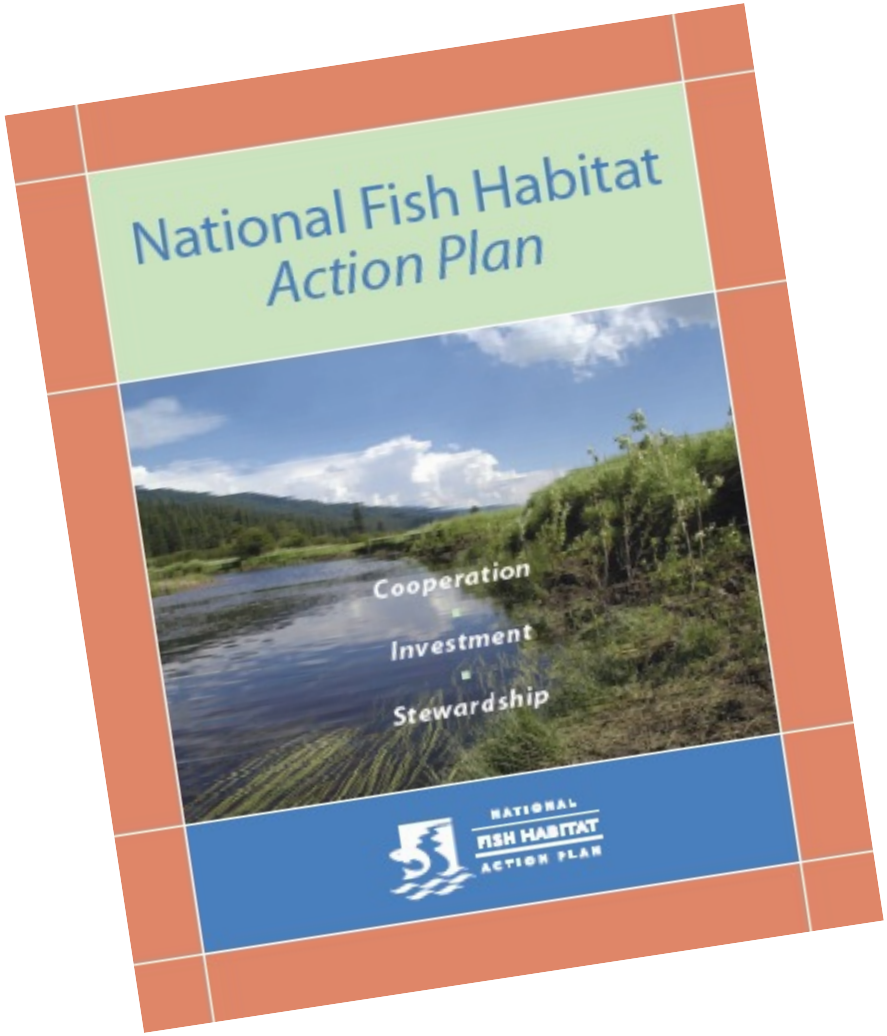


National Fish Habitat Action Plan Science and Data Components

The Science and Data Engine Behind the Action

Gary Whelan
USGS Water Census Ad Hoc Committee Call

July 1, 2010

NATIONAL FISH HABITAT ACTION PLAN






Mission of the National Fish Habitat Action Plan

- Protect
- Restore
- Enhance

NATIONAL FISH HABITAT ACTION PLAN

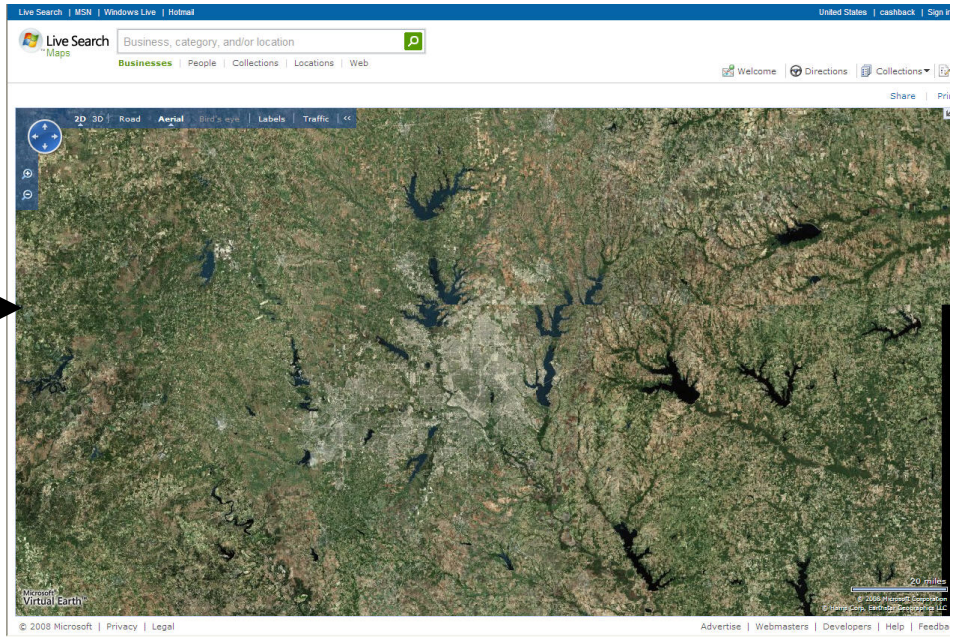
Plan Background

- Non-regulatory
- Multi-Agency and NGO Effort
- Science and Data Based
  - National Fish Habitat Assessment
  - Data Support Systems
- Partnership Focus and Action Unit

NATIONAL FISH HABITAT ACTION PLAN





The Real World

Historic View of “Habitat”

NATIONAL FISH HABITAT ACTION PLAN






Key Plan Tenets

- Must address the problems underlying habitat issues, not the symptoms
  - Must address system process level issues
- Must consider scale and science
- Must show real progress in improving aquatic habitat that leads to improved fish populations
- Must make strategic investments in habitat
  - Protect intact healthy systems
  - Rehabilitate degraded systems
  - Improve engineered systems

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Key Science Products

- Science Products
  - National Fish Habitat Science and Data Framework Document
  - Interim 2010 Conservation Targets and Strategies
  - National Fish Habitat Assessment
  - Decision Support System

NATIONAL FISH HABITAT ACTION PLAN






Key Data Products

- Data Products
  - Data Delivery System
  - Science and Data Public Interface
  - NFHAP and Conservation Project Tracking Database
  - Conservation Priorities Database

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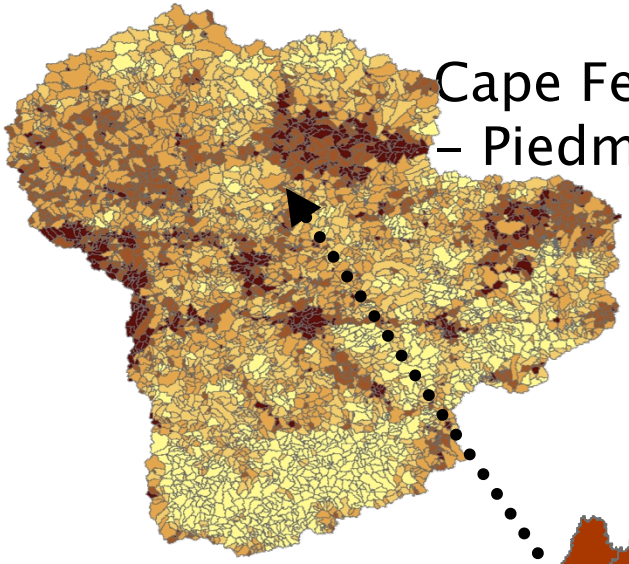
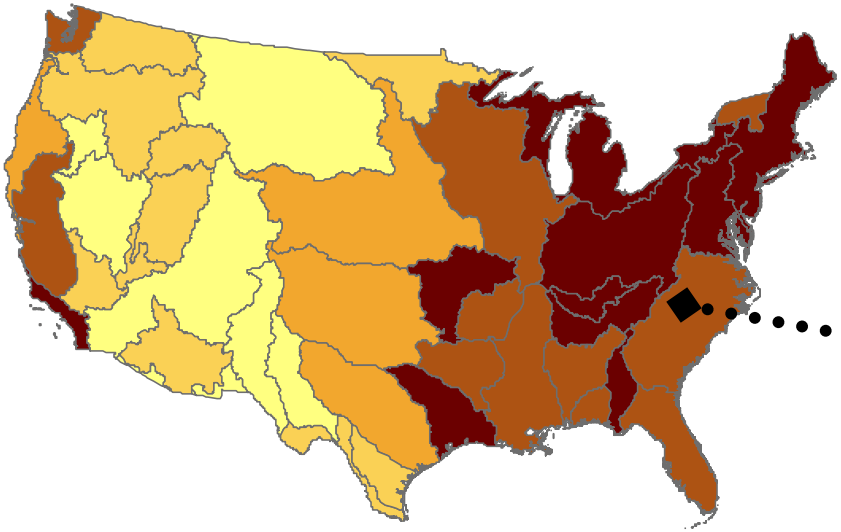
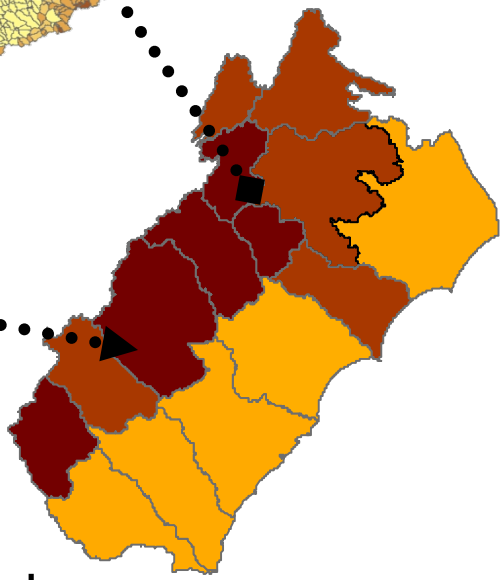
National Fish Habitat Assessment



Cape Fear River – Piedmont



WWF Ecoregions



Appalachian Piedmont

NATIONAL FISH HABITAT ACTION PLAN






Assessment Purpose and Background

- Help Board and Partnerships with prioritization decisions and determining success
- Measure process condition not symptoms
- National Scale
  - Data sets – National, Consistently Measured, Biologically Meaningful
  - Stressor Index
- Base system infinitely flexible
  - Analysis – Any geo-referenced possibility
  - Include detailed partnership data
- Allow for learning

NATIONAL FISH HABITAT ACTION PLAN






Assessment Foundation

- Systems are nested and hierarchical
- Systems can be classified
  - Organize and summarize information
  - Comparisons
- Processes and their key component/ impairments
  - Can be classified
  - Nested and hierarchical
- Inland and coastal systems must be connected

NATIONAL FISH HABITAT ACTION PLAN






Condition Focus on Key Processes (Emergent Properties)

- Connectivity
- Hydrology
- Channel and Bottom Form
- Material Recruitment
- Water Quality
- Energy Flow in Aquatic Communities






Condition Analysis

- All impairment variables
  - Percentage of the natural variation
    - Scaleless
    - Related to the expected values of the system
    - Provides appropriate comparisons between different systems
  - Example – Percentage area of classified unit that has sedimentation rates > 25% above expected natural variation in sedimentat

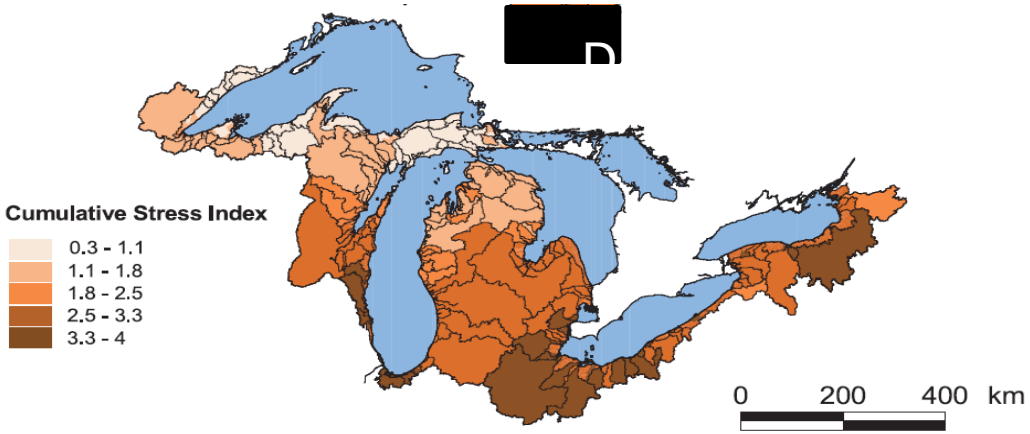
NATIONAL FISH HABITAT ACTION PLAN

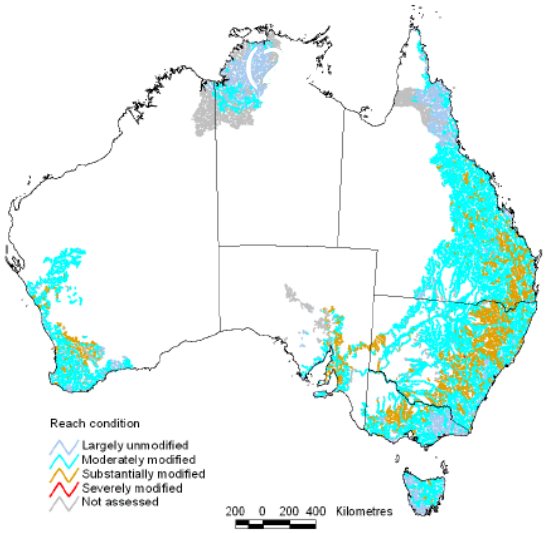





A landscape assessment approach

- Landscape measures of human activities in catchments are useful predictors of in-stream water chemistry, physical habitat, and biotic integrity (Gergel et al. 2002; Allan 2





The intensity of anthropogenic activities in catchments will influence the degree of local habitat degradation.

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Condition Analysis

- **Initial assessment**
  - **Surrogates from existing databases that are national in scope with consistent measurement**
    - **22+ databases will be used for 2010 Assessment**
    - **Transfer functions will be developed**
- **By 2015, fill in with real and modeled data**

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Ecologically Sound Spatial Framework

- **Highest Level**
  - WWF Freshwater Ecoregions and Coastal Ecological Regions
- **Mid Level**
  - TNC Ecological Drainage Units (EDUs)
  - Coastal Assessment Framework (EDAs and CDAs)
- **Lowest Level**
  - Drainages
  - Individual Waters
  - Estuaries
- **Glue**
  - National Hydrography Dataset plus (NHD+) and Coastal Assessment Framework

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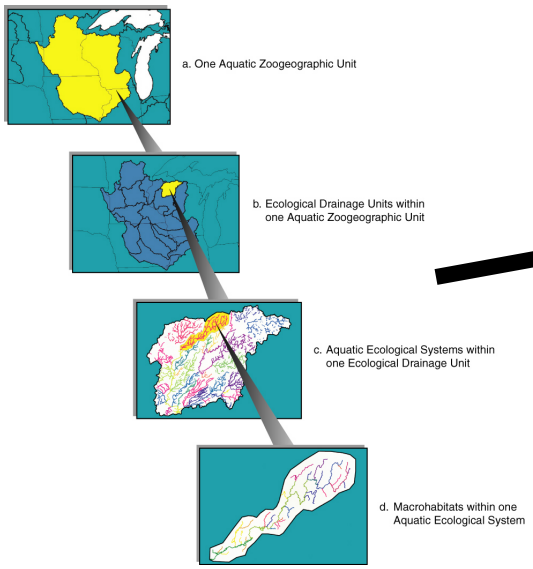
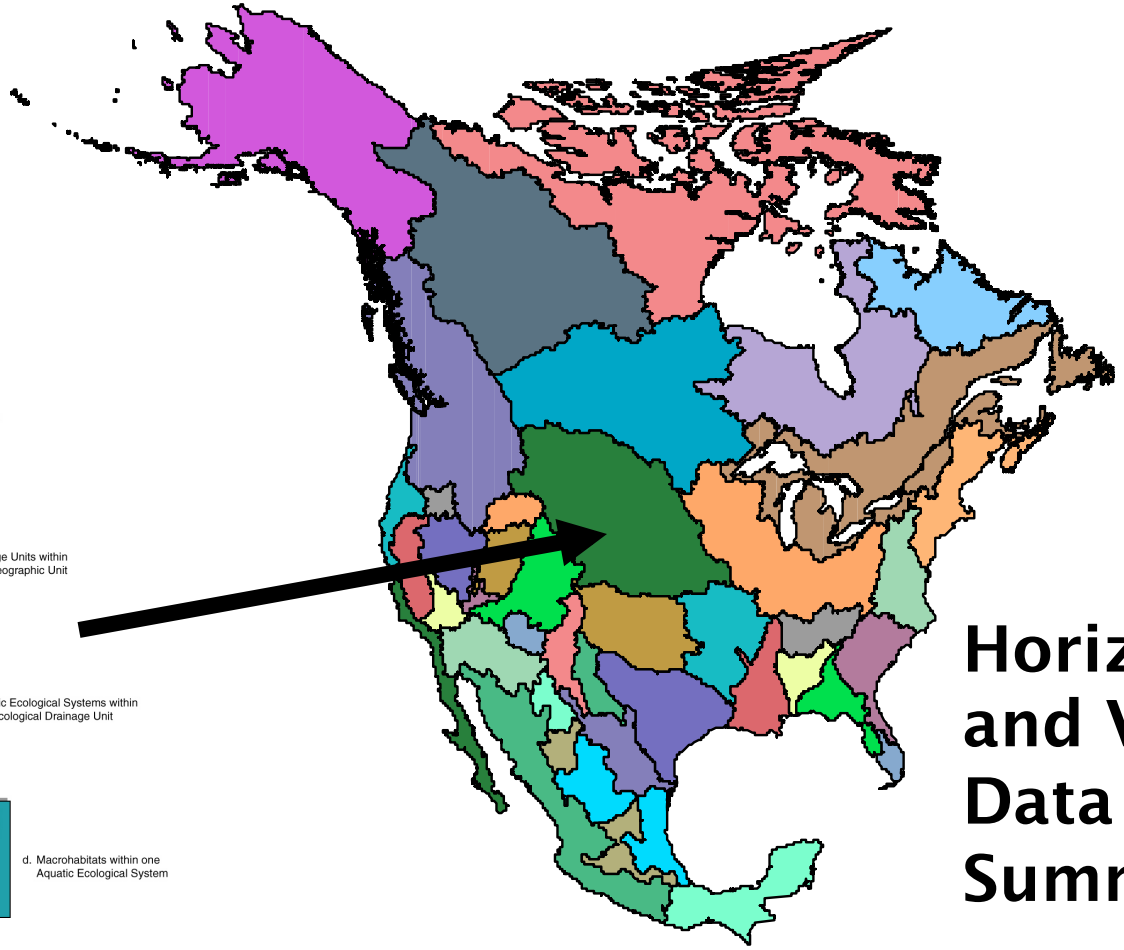
Inland Assessment





Horizontal and Vertical Data Summaries

NATIONAL FISH HABITAT ACTION PLAN






Selection and attribution of GIS data

- Criteria used to select databases for processing:
  1. Meaningful for assessing fish habitat
  2. Covers entire conterminous United States *(considering use of regional data sets in refinement)*
  3. Consistently developed for the lower 48 States
- Two types of parameters that influence habitats:
  1. Natural factors
  2. Anthropogenic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Natural factors (partial list) –72 Total

Source	Year	Scale/ Resolution	Variable
NHDPlus	2005	1:100 k	•Sequence # •Catchment area •Link, Dlink •Reach length •Reach elevation •Strahler order •Size stratum
Nat'l Elevation Data	2004	30 m	•Slope •Elevation
STATSGO	1995	1:250 k	•Soil type •Soil permeability
National Land Cover Data 2001	2001	30 m	•11 cover types
National Land Cover Data 1992	1992	30 m	•8 cover types
			•Mean annual

Anthropogenic factors (partial list) – 29

Source	Year	Scale/ Resolution	Variable
US Census 2000	2000	1:100 k	•Road crossings •Road length
EPA	2007	Point	•CERC, NEPT, PCS, TRI
USDA	2002	1:2,000 k	•Cattle
NOAA	2000	1000 m	•Population density
USGS Minerals Information Team	2003	Point	•Mines & processing plants
USGS	2000	County	•Ground/surface water use
USGS	2001	County	•N and P applications from fertilizer &manure
National Land Cover Dataset	1992	30 m	•10 land cover classes
USACE Nat'l Inventory of Dams	2004	Point	•Dams
USFWS Fish Passage Decision Support System	2002	Point	•Barriers
National Atmospheric	2006	1000 m	•Precipitation chemistry

Initial Inland Stressor Variables

Developed open space (%)
Low intensity urban (%)
Medium intensity urban (%)
High intensity urban (%)
Impervious surfaces (%)
Pasture/hay (%)
Cultivated crops (%)
Ground water use (MGD/km^2)
Surface water use (MGD/km^2)
Cattle density (#/acre farmland)
Population density (#/km^2)
Road crossings (#/km^2)
Road length (m/km^2)
Dams (#/km)
Mines or mineral processing plants (#/km^2)
Toxics Release Inventory sites (#/km^2)
National Pollution Discharge Elimination System sites (#/km^2)
Superfund National Priorities sites (#/km^2)

- ***17 variables selected based on:***
  - ***interpretability***
  - ***utility for nationwide analysis***
  - ***literature review***
  - ***relationships to other variables***






Analytical Approach

Step 1: Develop Stressor Axes
Principal Components Analysis

Step 2: Weight Axes and Portion Stressor to Scale
Multivariate Analysis
(e.g. Multiple Linear Regression, Pathway Model, Neural Network, etc.)

Habitat Indicator Data

Stressor Analysis

Habitat Assessment

Biological Response Data

Fish Abundance and Diversity

Product 2

Fish Habitat Condition Index

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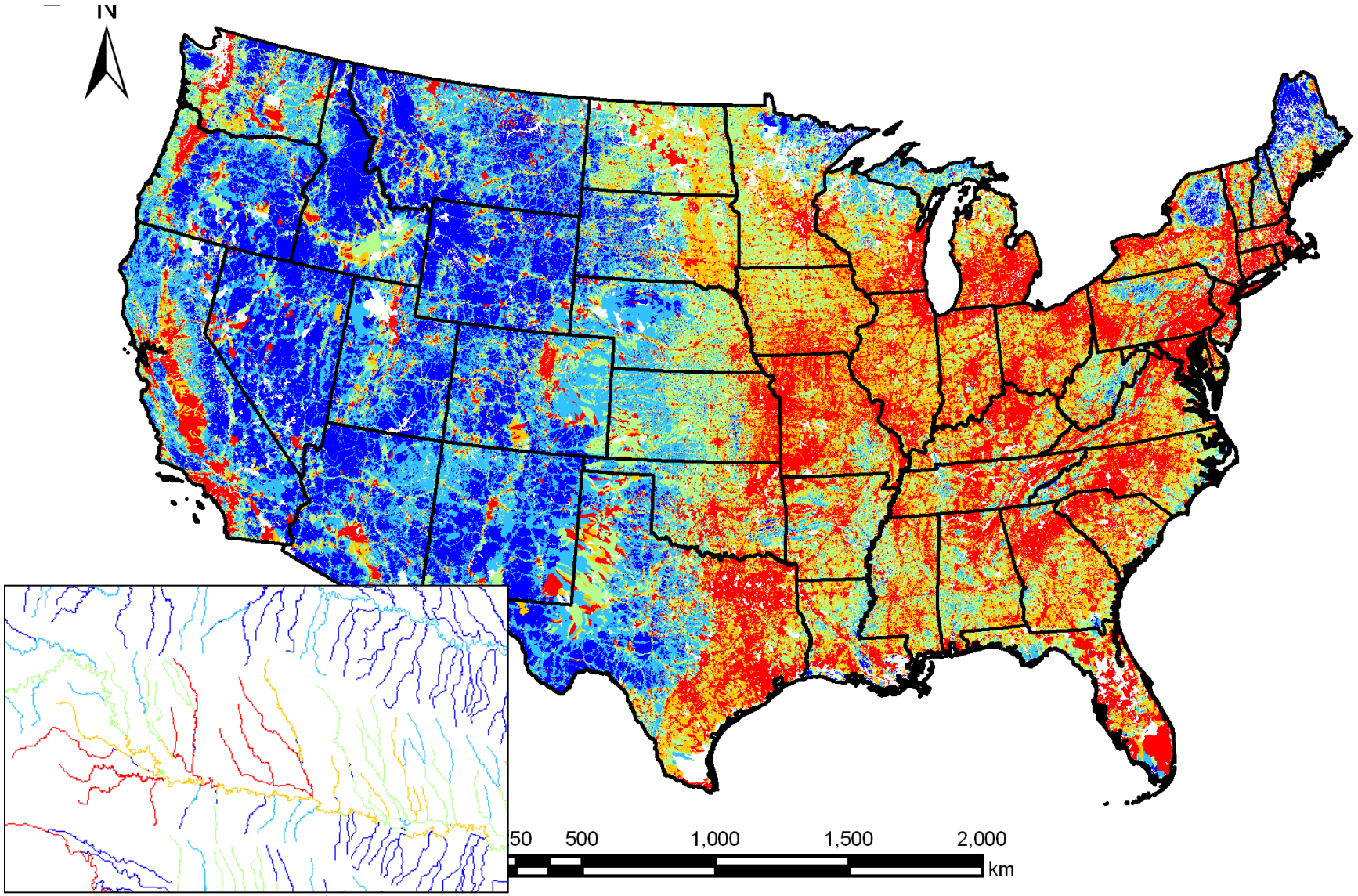
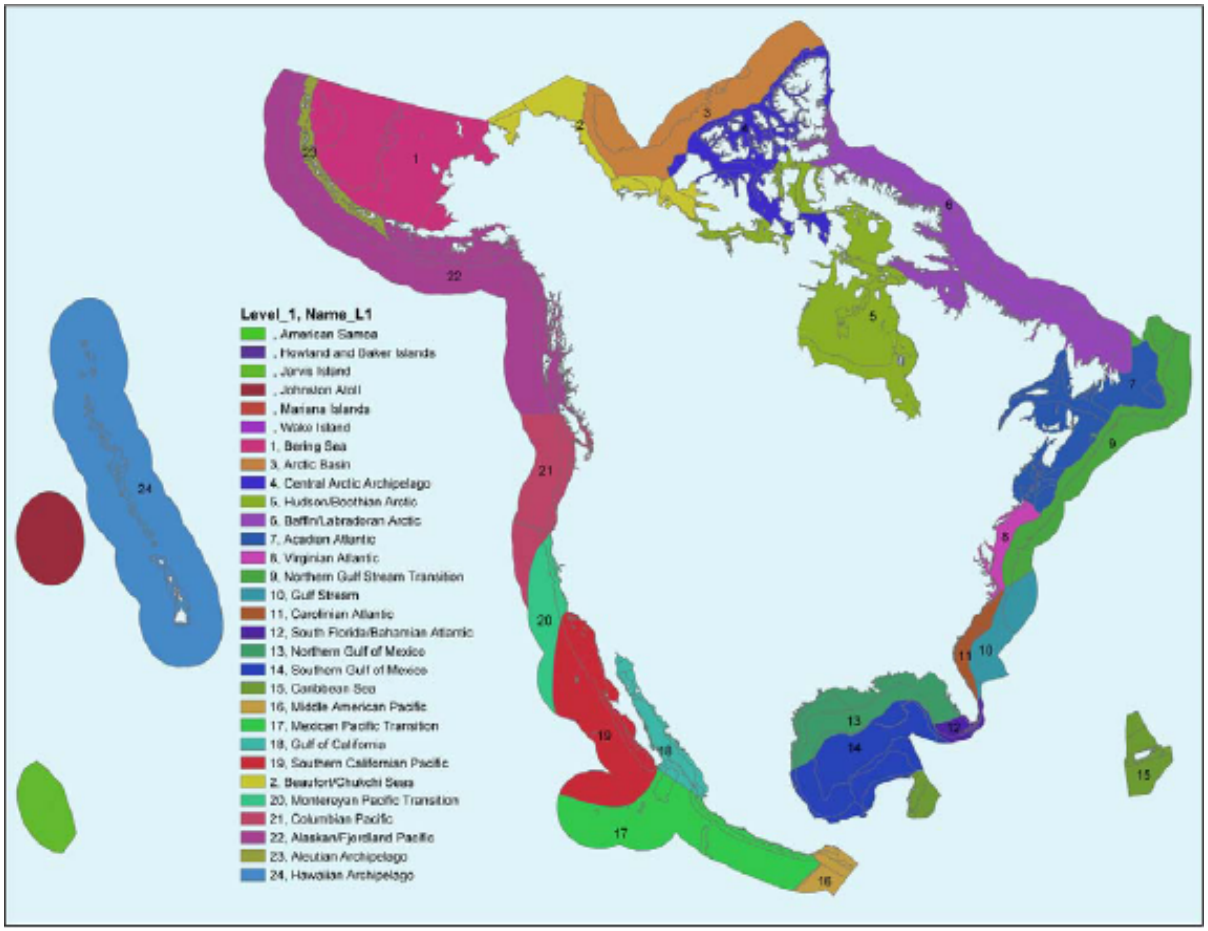
Cumulative Landscape Disturbance Index








Coastal Ecological Region Layer



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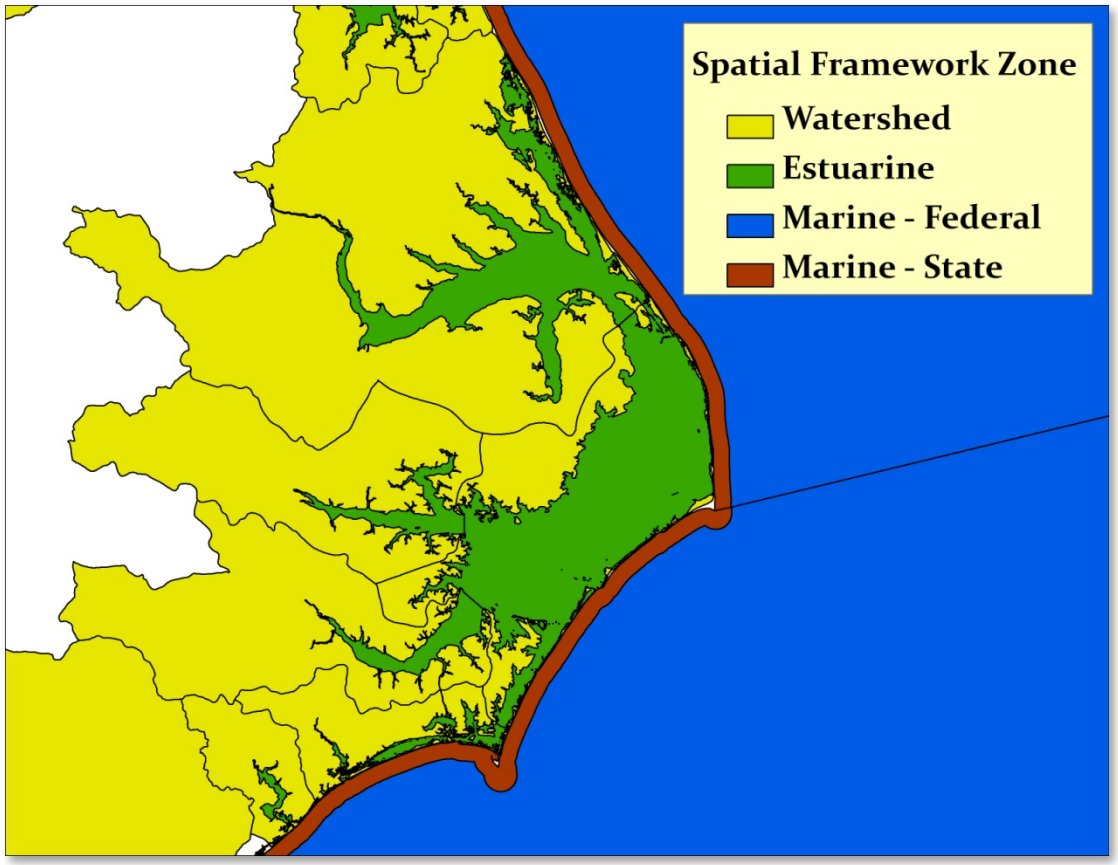
Data Framework

Four units of analysis

- Watersheds (347)
- EDAs (124) and CDAs (194)
- Inshore State Marine Waters
- Offshore Waters



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Coastal Stress indicators - 50

Category	Threat / stressor	Indicator (Comprehends single-or groups of descriptive variables)
Connectivity	Coastal construction: Dams, dikes, roads (stormwater), Dredging	Area accessible to fish
Hydrology / Oceanography		Freshwater inflow
		Tidal flow
		Degree of estuarine channelization
		Extent of shoreline armoring
		Land use / cover
		Percent change in impervious surfaces in watershed
Water Quality	Eutrophication	Nutrient input
		Harmful algal blooms (HABs)
Geomorphology	Dredging, Sedimentation, Erosion	Status of soft bottom habitat
		Status of hard bottom habitats
Biotic Habitats	Habitat loss	Status of coastal wetlands
		Status of submerged aquatic vegetation (SAV)
		Status of habitat forming invertebrates
Environmental Contamination	Pollution	Chemical contamination of sediments
		Chemical contamination in fish and mollusks
Biodiversity	Food web alteration	Non-indigenous and invasive species
		Plankton density
		Benthos community

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Analytical Approach

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Habitat Indicator Data

Stressor Analysis

Habitat Assessment

Biological Response Data

Fish Abundance and Diversity

Product 2

Fish Habitat Condition Index

NATIONAL FISH HABITAT ACTION PLAN

Assessment Status

- Overall hierarchal spatial system in place and functioning
  - Inland – NHD+ and “lakeshed”
  - Coastal
- Inland (Lower 48 States)
  - Rivers and Streams – Complete and in refinement
  - Lakes – Lakesheds nearing completion and planning in progress
  - Reservoirs and Impoundments – Underway by RFHP
- Inland (AK)
  - Refined assessment at HUC 12 in review
- Inland (HI)
  - Initial analysis complete and refinement in progress

NATIONAL FISH HABITAT ACTION PLAN

Assessment Status

- Coastal
  - Spatial system in place – Lower 48
    - AK and HI – In progress
  - Datasets and stressor variables selected and attribution ongoing
  - Great Lakes – In planning
  - Interaction between Inland and Coastal – In development

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Assessment Status

- Climate Change Module
  - National scale with detailed regional projects (i.e. Northern Midwestern lakes, Lower Colorado River)
  - Downscaling climate data nearly complete
  - Development of likely land use changes in progress
    - Stressor analysis in response beginning

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Data System Components and Status

- Data Delivery System
  - Initial system developed and refinement underway
- Science and Data Public Interface
  - System design and prototype complete
- NFHAP and Conservation Project Tracking Database
  - System design and planning in progress
- Conservation Priorities Database
  - For future development

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Decision Support System – Future

- Combined Habitat Assessment and Socioeconomic Index
  - Refined assessment variables and scores
  - Socioeconomic variables
    - Which ones?
      - Examples – Probability of success, proximity to population centers, number of interested parties

NATIONAL FISH HABITAT ACTION PLAN






Thank You!

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Visit www.fishhabitat.org for more information

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