REAs: Data Integration & Management

Demonstration Project Training: 27 March 2012

Christy Wolf

Empowered lives.
Resilient nations.

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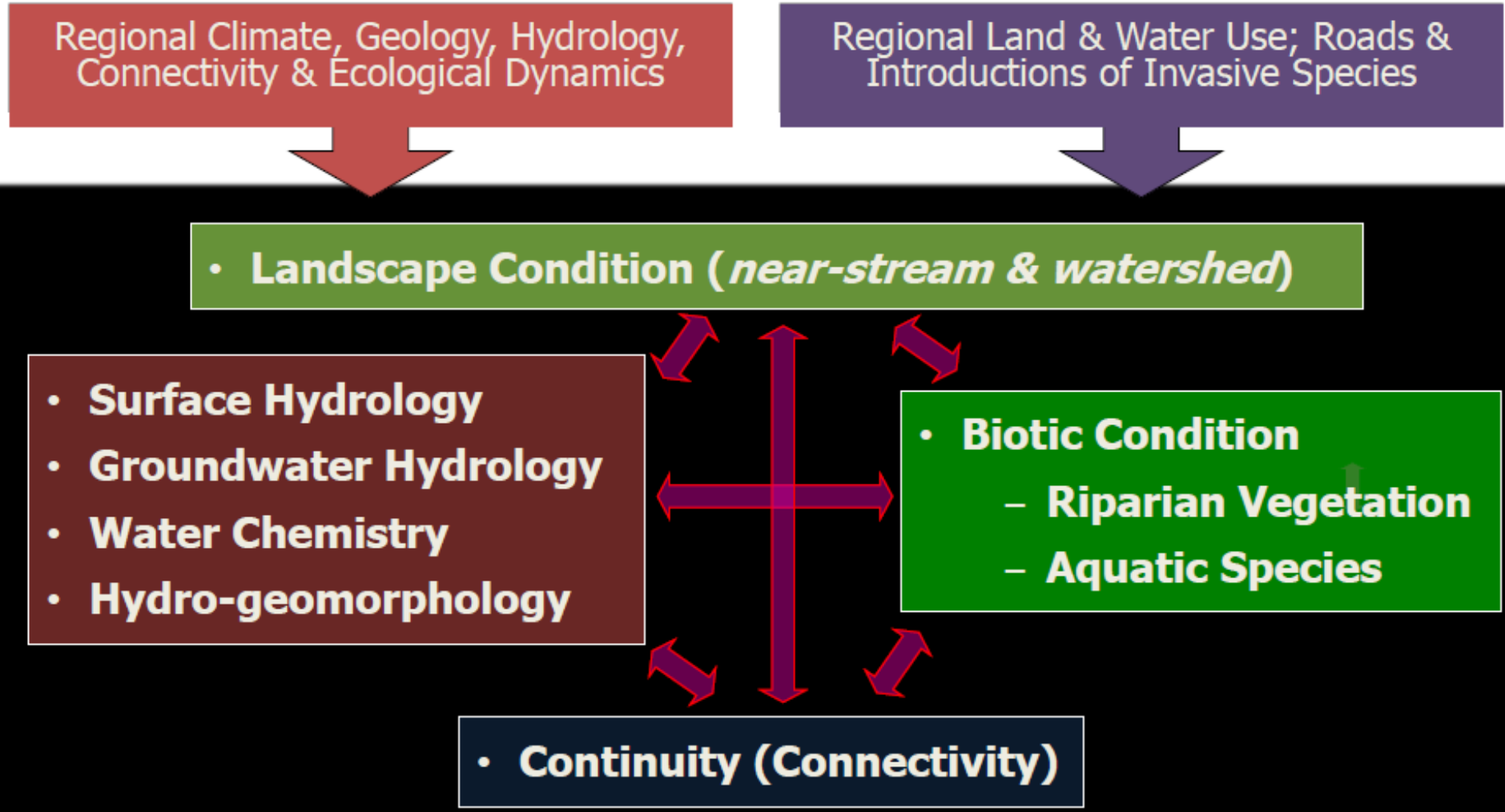
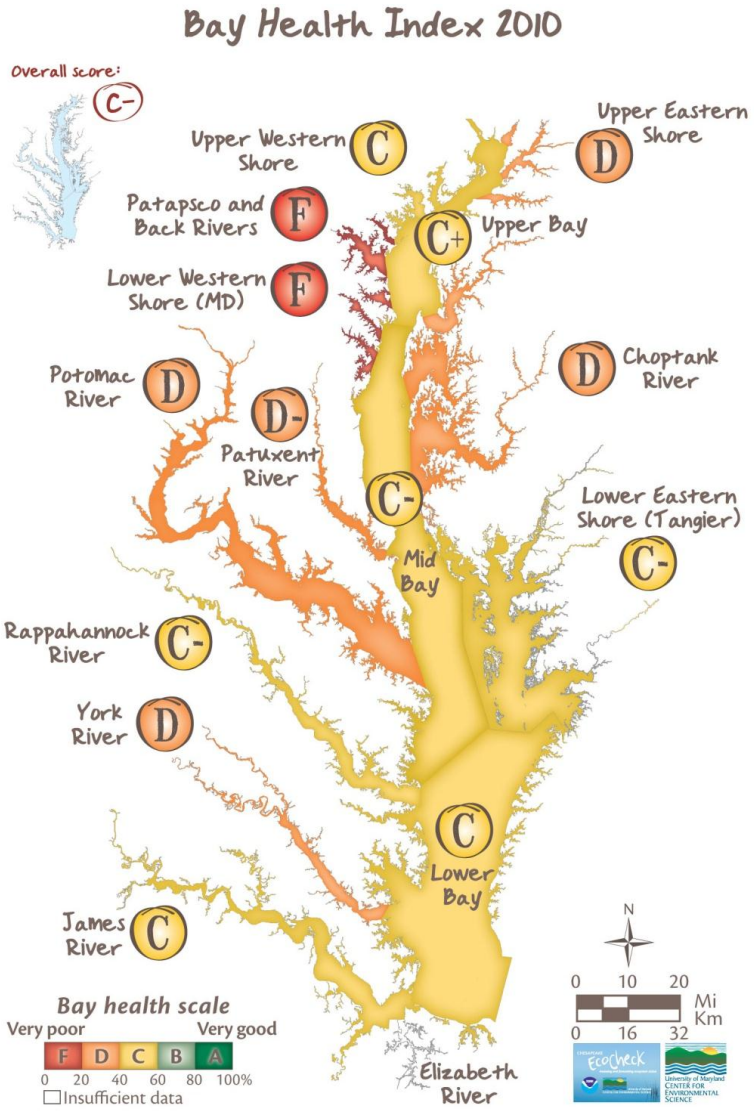
Data Integration:
REAs generate *lots* of information!



(source: PPT from http://www.blm.gov)

Data Integration

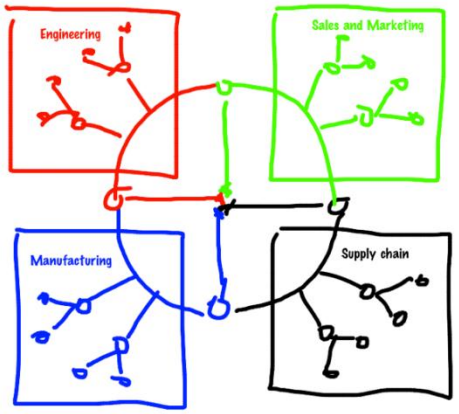
- Data integration helps:
  - Classification of streams, water bodies
  - Identify management priorities
  - Identify areas for more research
  - Provide and early warning



(figure source: http://ian.umces.edu/ecocheck/report-cards/chesapeake-bay/2010)

Data Integration

- Data synthesis = multidisciplinary exercise
- Distill important information from each discipline
- Ranges from simple → sophisticated
  - Threat Matrix
  - Indices ("multimetric" approach)
  - Comparison with standards
  - Basic GIS overlays
  - Statistical GIS models
  - Integration matrix and mapping



(figure source: www.bonkersworld.net)

- Focus on evidence, consider uncertainties
- Not about diagnosing cause, rather interpreting assembled information to develop conclusions and/or recommendations

Threats Matrix Approach

Stresses	Vegetation Types and Species									
	Vegetation Type 1	Vegetation Type 1	Vegetation Type 1	Vegetation Type 1	Vegetation Type 1	Species 1	Species 1	Species 1	Species 1	Species 1
Stress 1										
Stress 2										
Stress 3										
Stress 4										
Stress 5										
Stress 6										
Stress 7										
Stress 8										
Stress 9										
Stress 10										

Stress Rankings	
VH	Very High
H	High
M	Medium (or High Future Concern)
L	Low

Stress-Ranking
Severity (potential impact)
Scope (scale across the site)
Reversibility (restoration potential)
Immediacy (current or potential)
Likelihood (probability)

(source: http://pdf.usaid.gov/pdf_docs/PNACS391.pdf)

Threats	Systems							
	Alpine Meadow	Subalpine Zone	Spruce-fir Forest	Conifer - Beech Forest	Beech Forest	Alpine Lakes	Secondary Streams	Rivers
Exotic Species	VH	H	L	L	M	H	L	L
Illegal Hunting	H	H	M	VH	M	L	L	L
Removal of Species for Sale or Consumption	M	M	L	H	VH	L	M	M
Habitat Destruction	M	M	L	L	L	VH	M	M
Accumulation of Solid Waste	L	L	L	L	L	M	L	M
Tourism	L	L	L	L	L	M	L	M
Contaminants	M	M	M	L	L	H	M	M

Stress Rankings	
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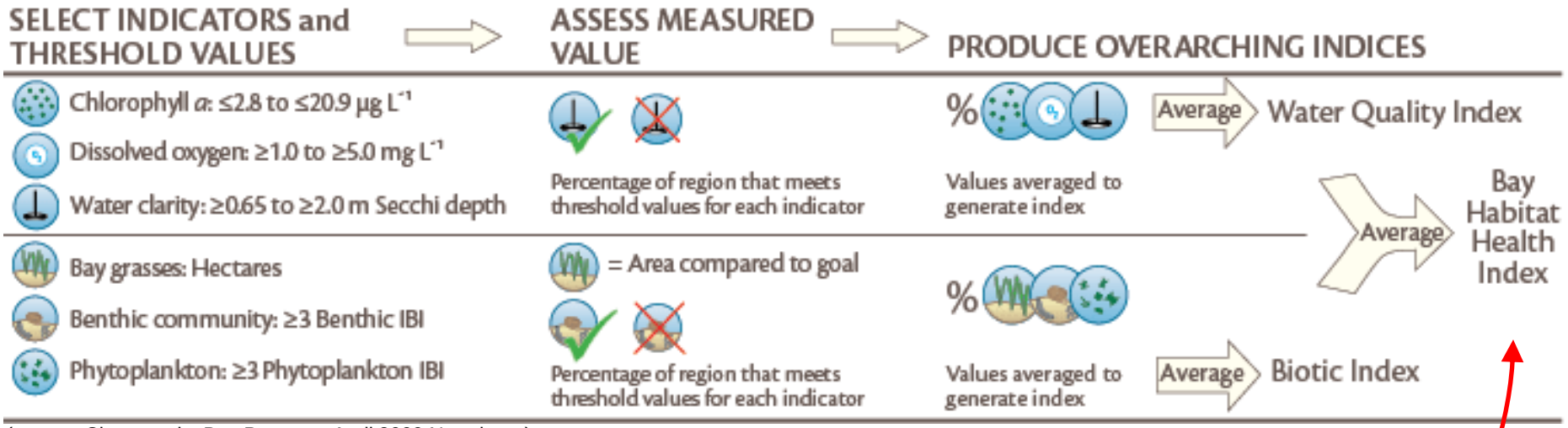
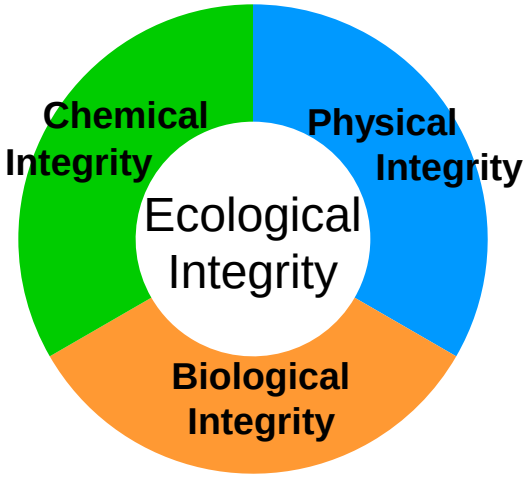
Stress-Ranking
Severity (potential impact)
Scope (scale across the site)
Reversibility (restoration potential)
Immediacy (current or potential)
Likelihood (probability)

A theoretical threats matrix for the Rila Monastery Nature Park.

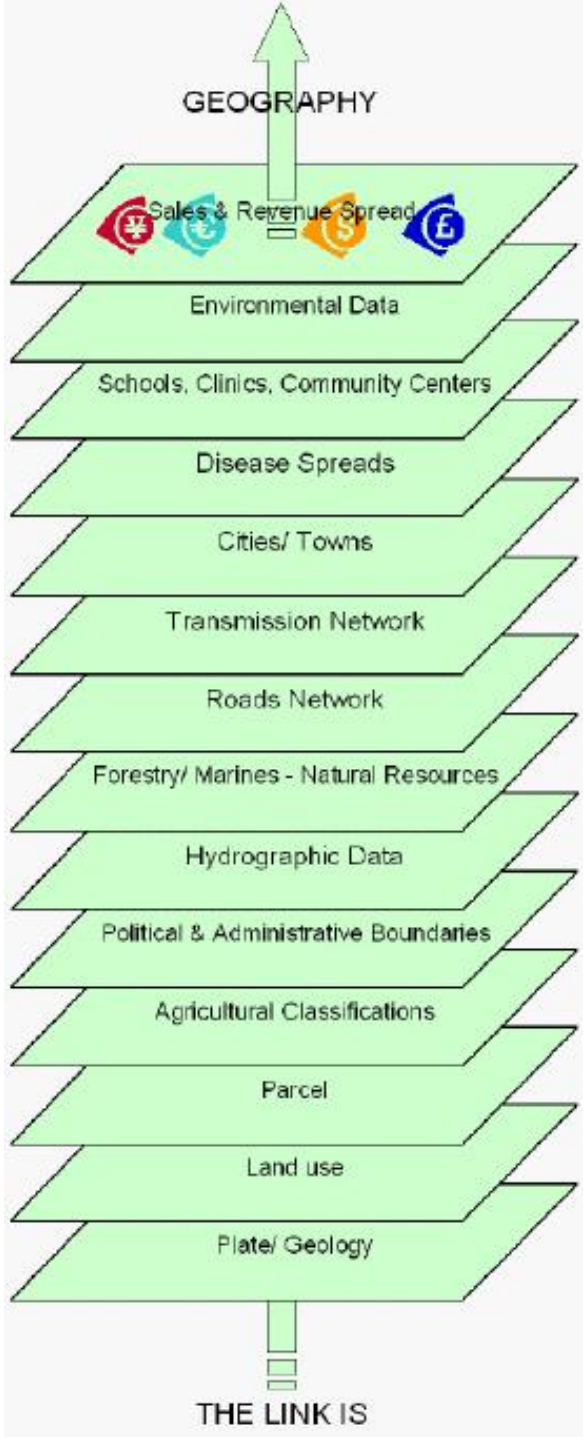
Overall "Health" Index (Ecological Integrity)



(source: Chesapeake Bay Program, April 2009 Newsletter)



Overall Ecological Integrity Index reflects a combination of other indices



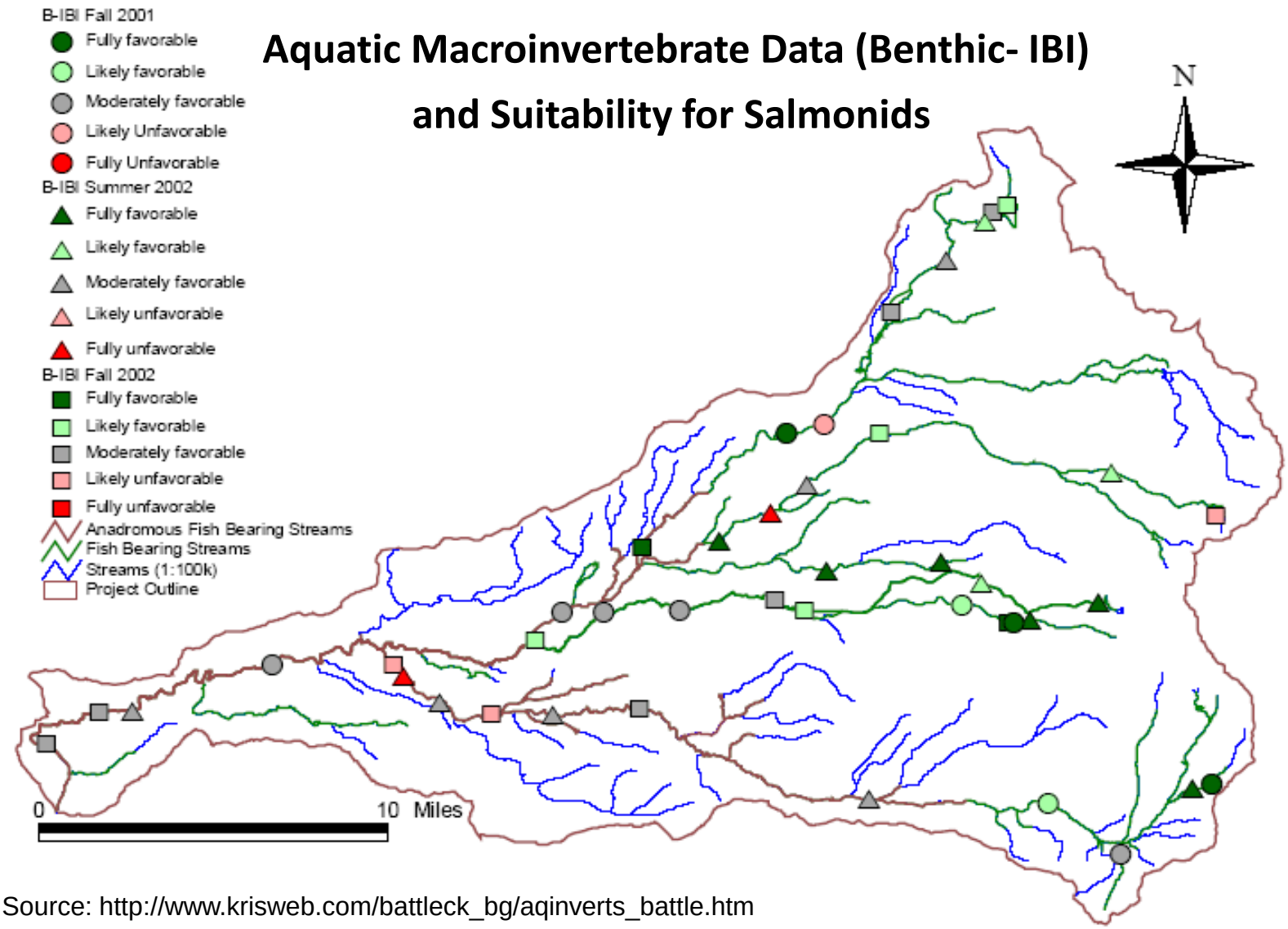
GIS: Ultimate Data Integration Tool

- Vast majority of environmental data has geospatial basis
- Mapping data = fundamental to REAs
- Enhances ability to collect and analyze information
- Facilitates integration of information at different scales
- Produces useful and visually appealing products
- Powerful conservation tool

(figure source: Bokhari 2002. www.directionsmag.com)

Simple Data Integration: Battle Creek (CA) Basin

Aquatic Macroinvertebrate Data (Benthic- IBI) and Suitability for Salmonids



Source: http://www.krisweb.com/battleck_bg/aqinverts_battle.htm

Integration Matrix for Management Prioritization

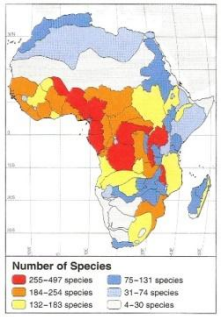
Source: Thieme et al. (2005), Freshwater Ecoregions of Africa and Madagascar

Biological Distinctiveness	**Final Conservation (or Threat) Status**				
	Critical	Endangered	Vulnerable	Relatively Stable	Relatively Intact
Globally Outstanding	**I**	**I**	**I**	**III**	**III**
Continentally Outstanding	**II**	**II**	**II**	**III**	**III**
Bioregionally Outstanding	**IV**	**IV**	**V**	**V**	**V**
Nationally Important	**IV**	**IV**	**V**	**V**	**V**

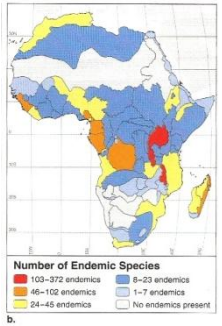
5 Classes (I, II, III, IV, & V) reflect nature and extent of management likely required.

Biological "Distinctiveness" Index

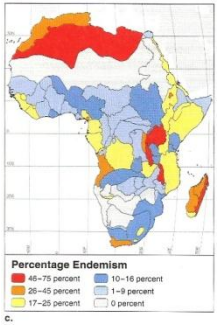
(oversimplified for illustration)



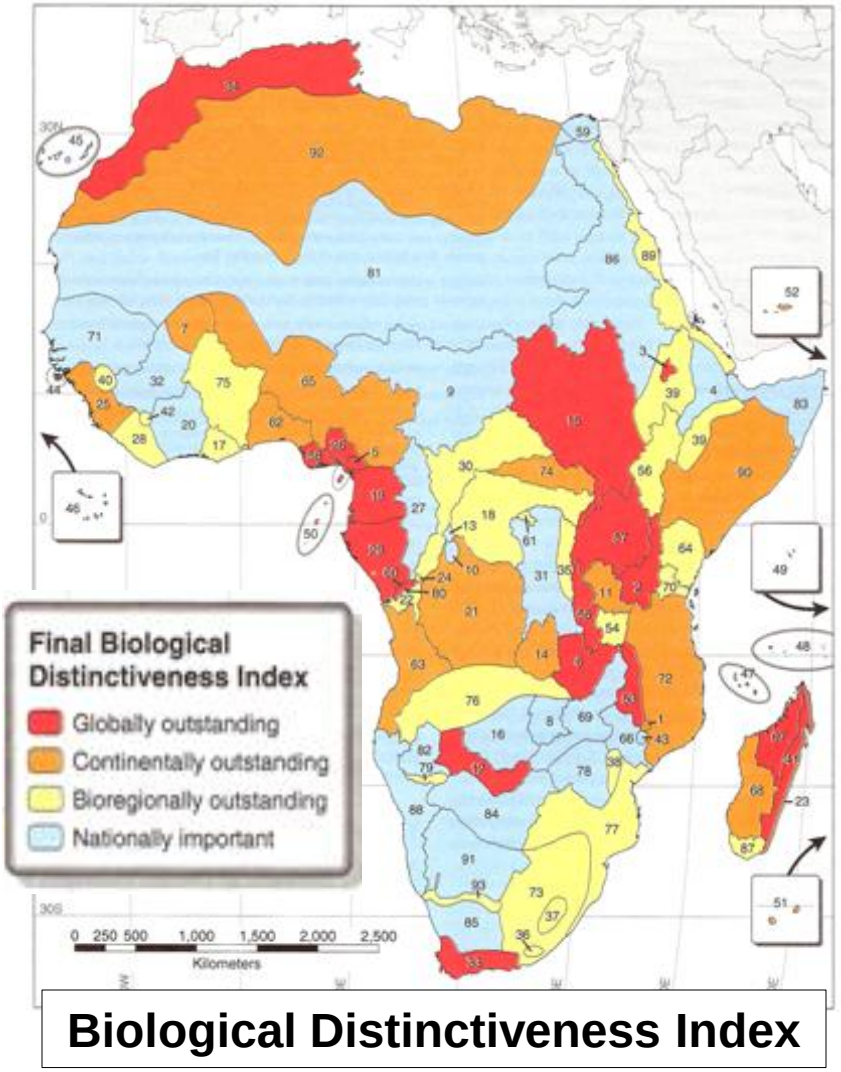
 # Species



 # Endemic Species



% Endemic Species

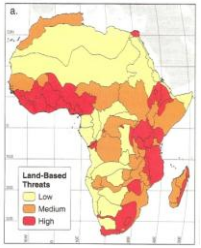


Biological Distinctiveness Index

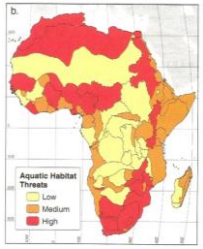
(source: Thieme et al. 2005)

Conservation Status

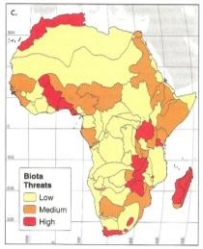
(oversimplified for illustration)



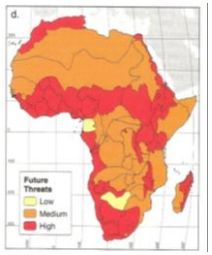
Land-Based Threats



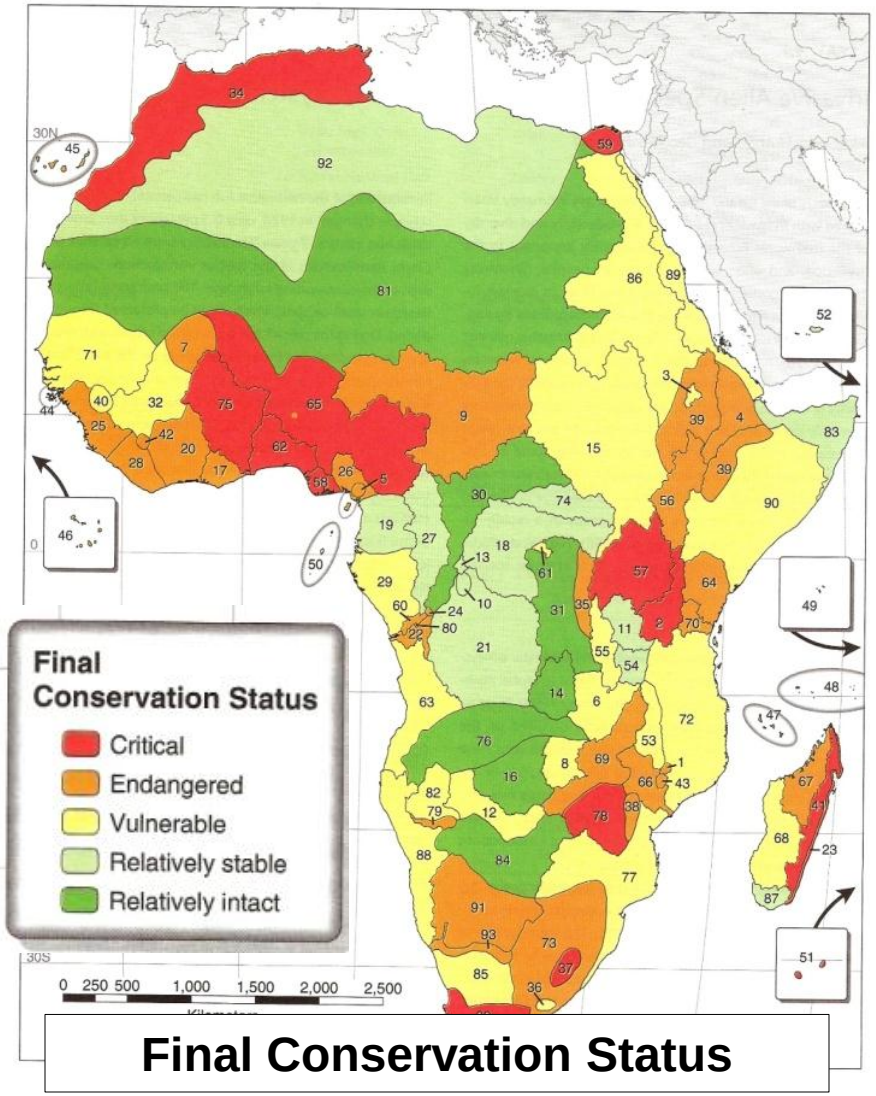
Aquatic Habitat Threats



Biota Threats

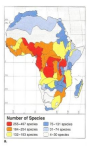


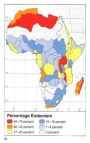
Future Threats

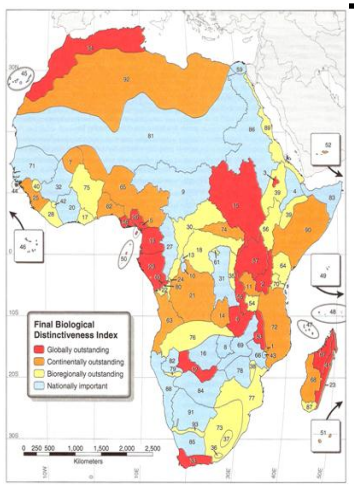


Final Conservation Status

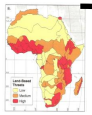
(source: Thieme et al. 2005)

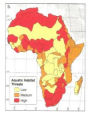


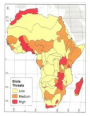


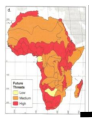


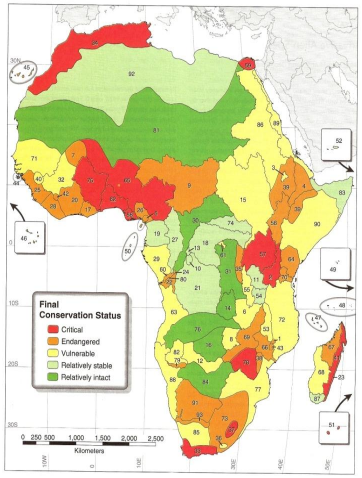
Biological Distinctiveness Index



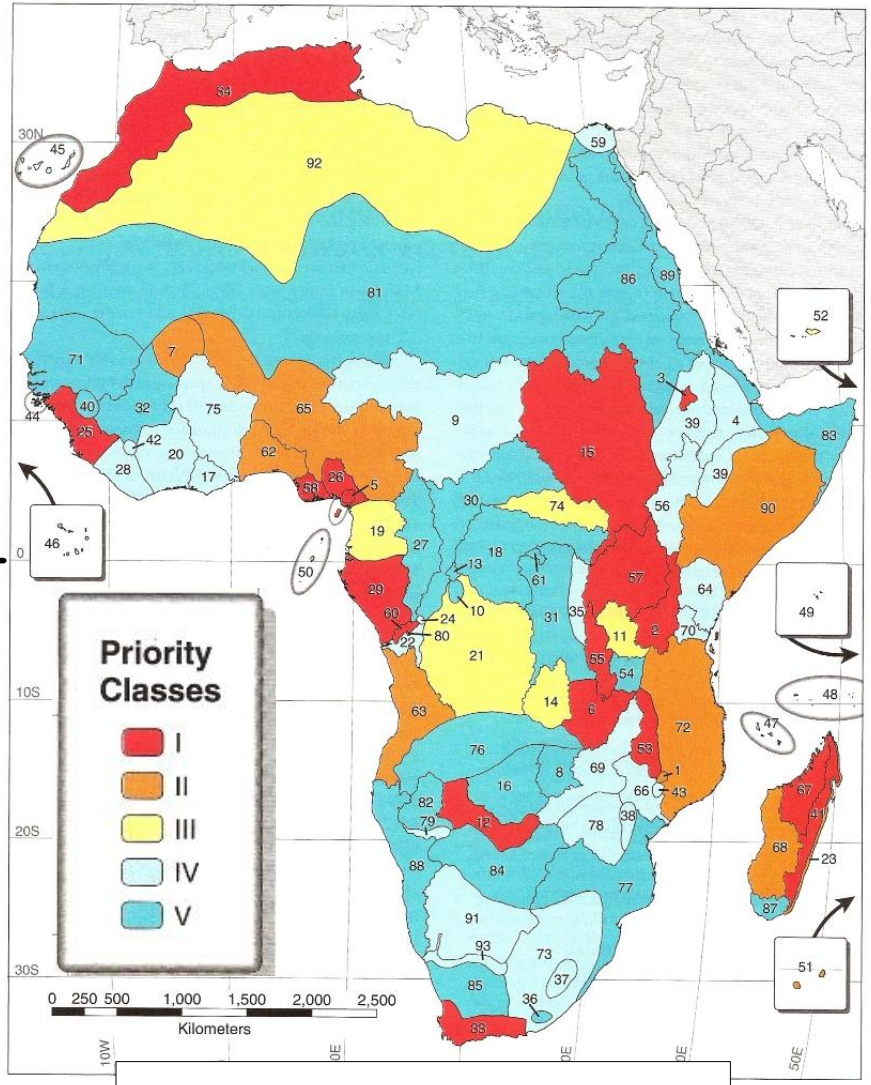








Conservation Status Index



Priority Class

(source: Thieme et al. 2005)

Mapping Integration Matrix
Priority Classes

Source: Thieme et al. (2005), Freshwater Ecoregions of Africa and Madagascar

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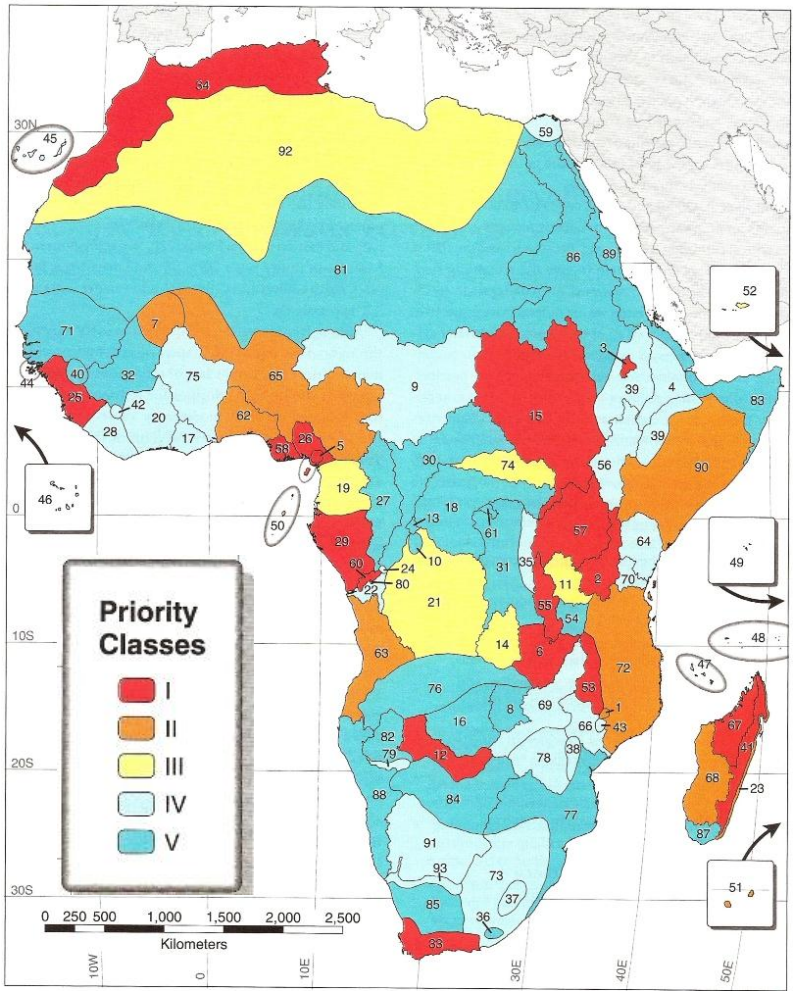
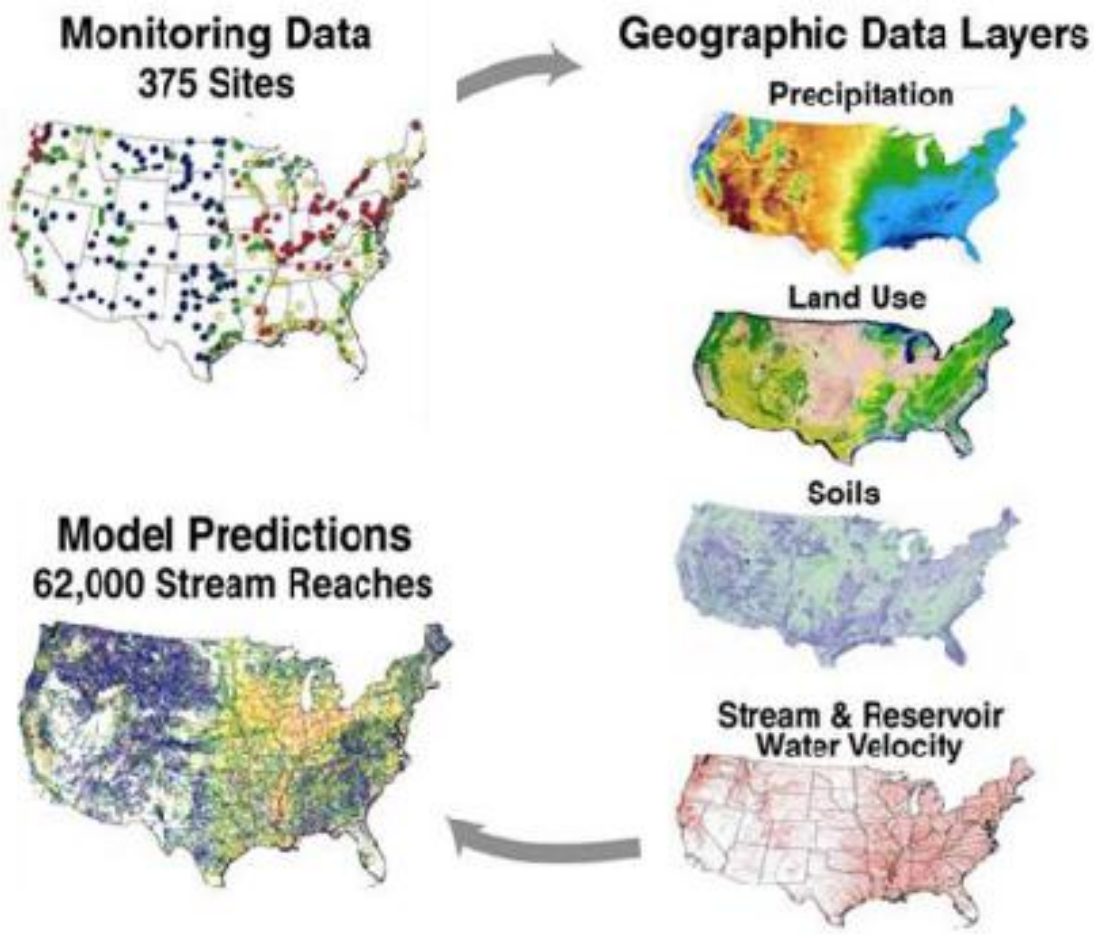
Priority Class



Data Integration with Statistics & Computer Models

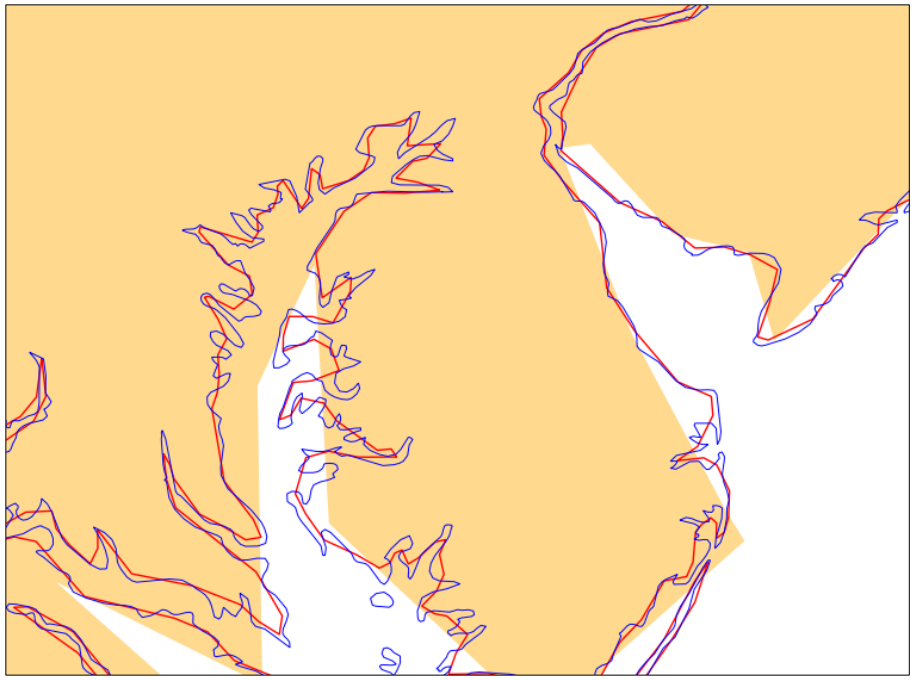
- SPARROW (SPAtially Referenced Regressions On Watershed attributes)
- Relates water quality measurements from monitoring stations to attributes of the watersheds
- Helps explain factors that affect water quality
- Predict stream quality of unmeasured areas



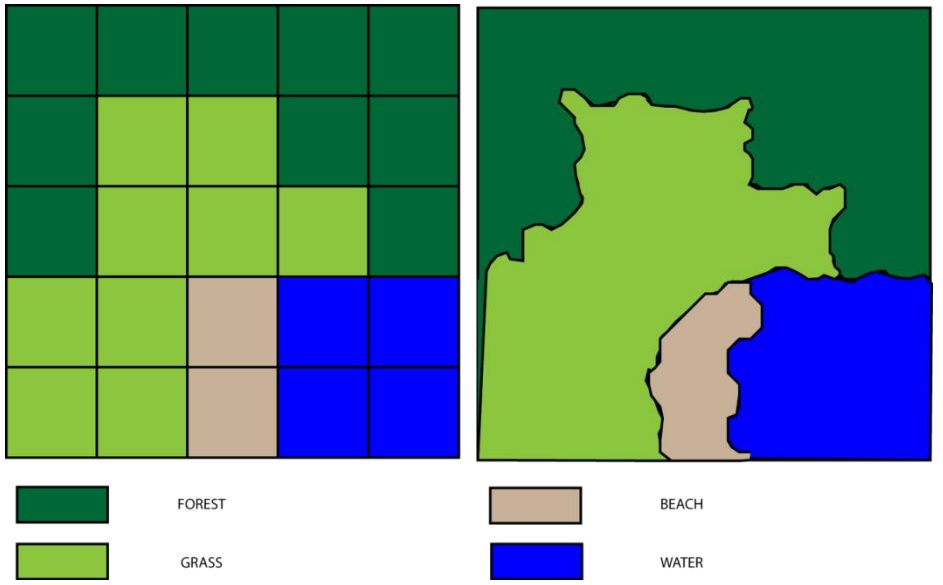
source: http://water.usgs.gov/nawqa/sparrow

Scale & Temporal Considerations

- Data are often at different scales
- Data often represent “snapshot” in time
- Data sources vary (e.g., rastor vs vector data)

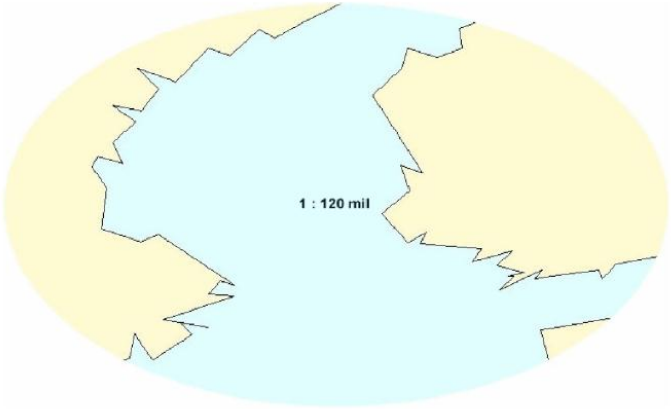


(figure source: http://gothos.info/tag/gis-data)



(figure source: http://outsidetheneatline.blogspot.com)

Illustration of Map Scales



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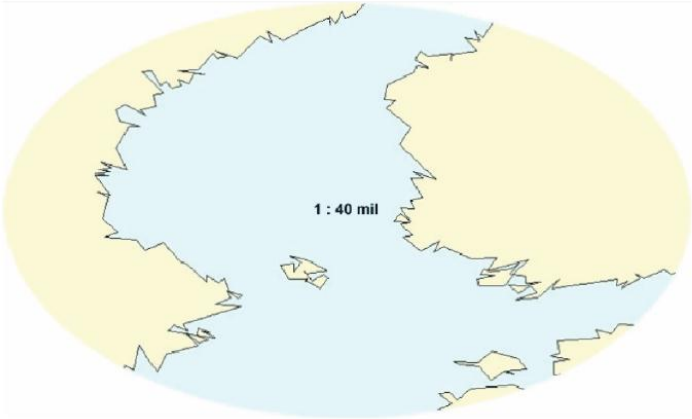

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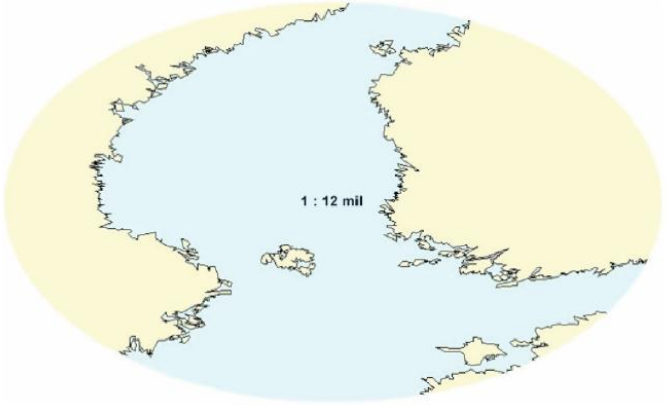

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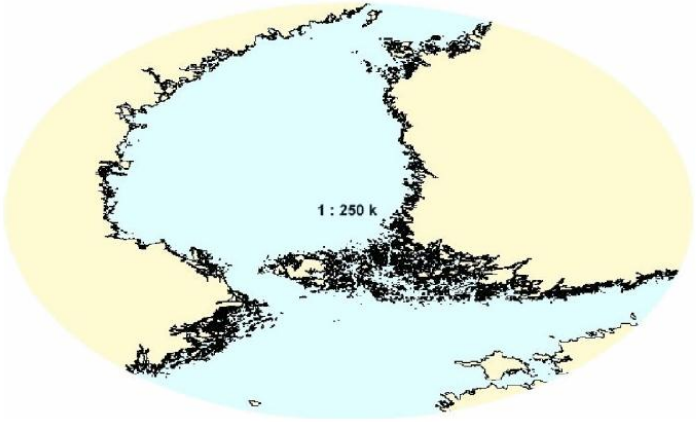

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(figure source: www.maritimeboundaries.com)

Data Quality and Data Gaps

"Anything is Better than Nothing"

"If can't do it right, don't do it at all"

It's true that "No data is better than misleading data", but we must start somewhere!

- Clearly document survey effort
- Factor data quality into assessment (recognize poor data quality can skew findings)
- Be conservative in interpretations
- Identify data gaps & areas for future research
- Share data, foster interagency partnerships; strategic coordination can be instrumental!

A Final Note…

- Focus on solutions, not problems
  - More assessments and more monitoring will likely lead to discoveries of more problems
  - Primary intent of REAs is to assess situation, establish baseline…
  - If problems are discovered, solutions should be developed as collaborative effort
- Think big, landscape level… A body of water will only be as healthy as the watershed surrounding it.