Overview: Approaches to Quantifying Biodiversity and Ecosystem Services in the Urban Context

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The Nature Conservancy | WORLD BANK GROUP — Social, Urban, Rural & Resilience | IUCN | gef
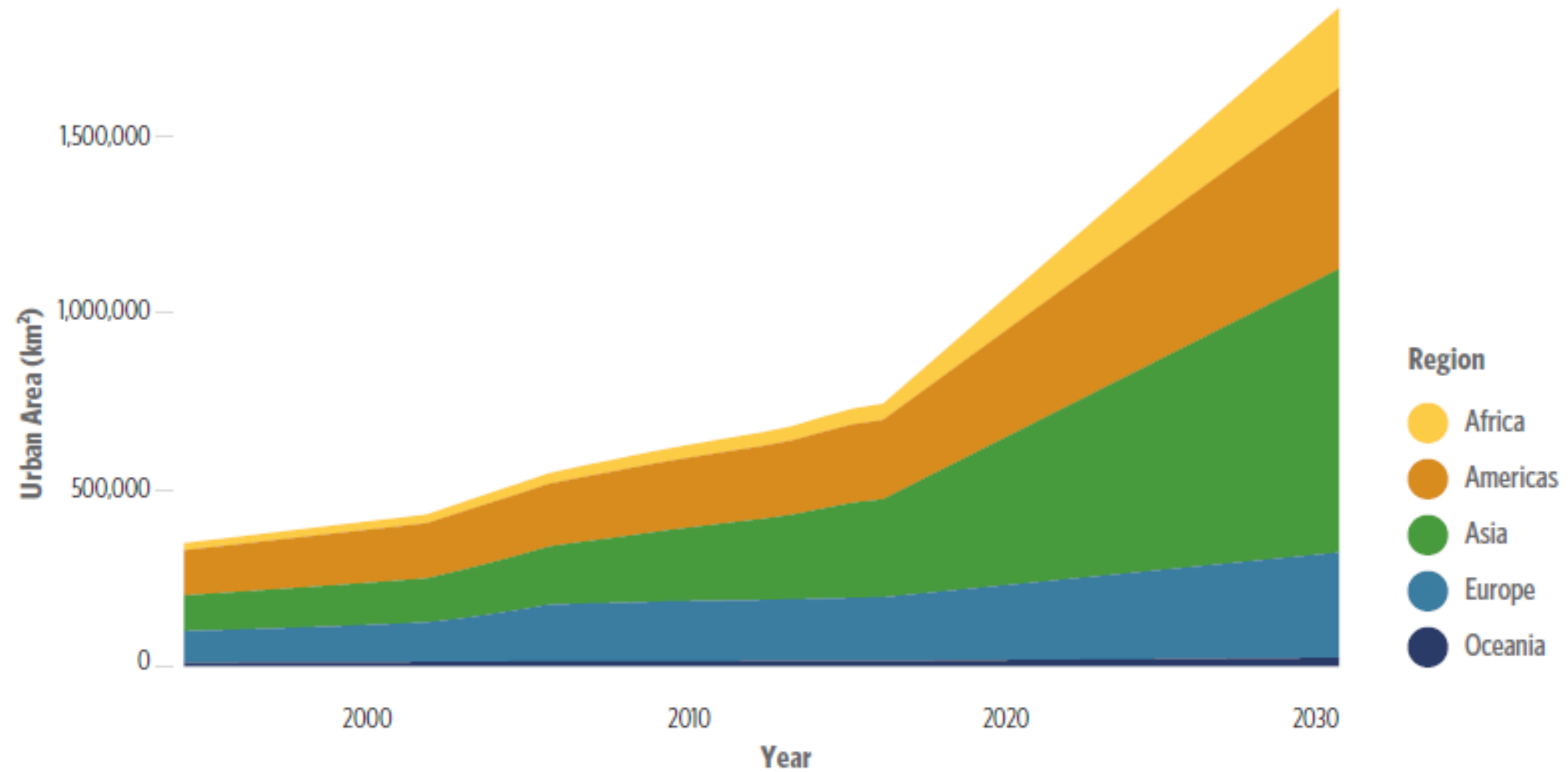
Conservation for cities

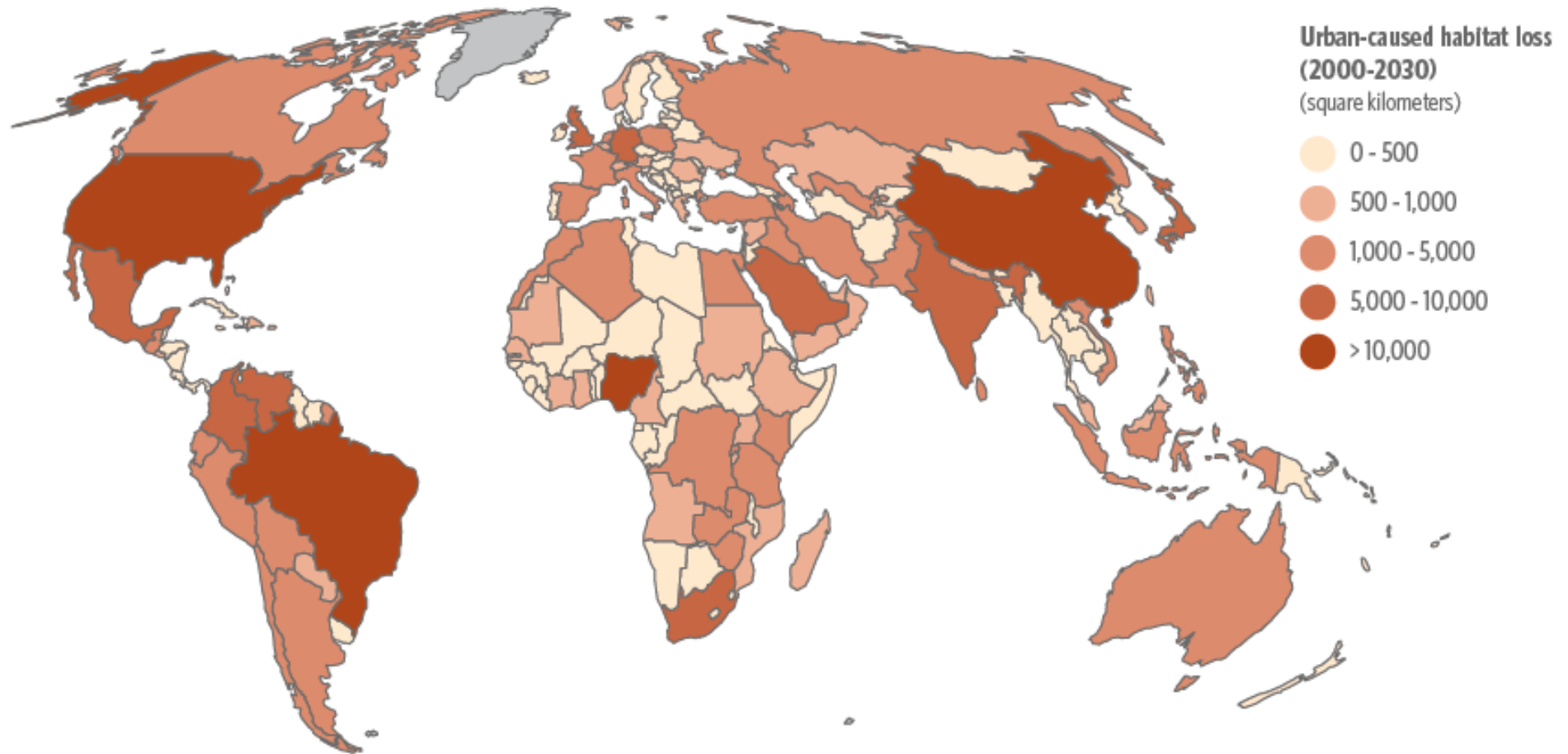How to plan and build natural infrastructure

Agenda

- Context: The Urban Century
- Ecological spatial planning
  - Key concepts
  - Process
  - Ecosystem service valuation
  - Biodiversity and corridors
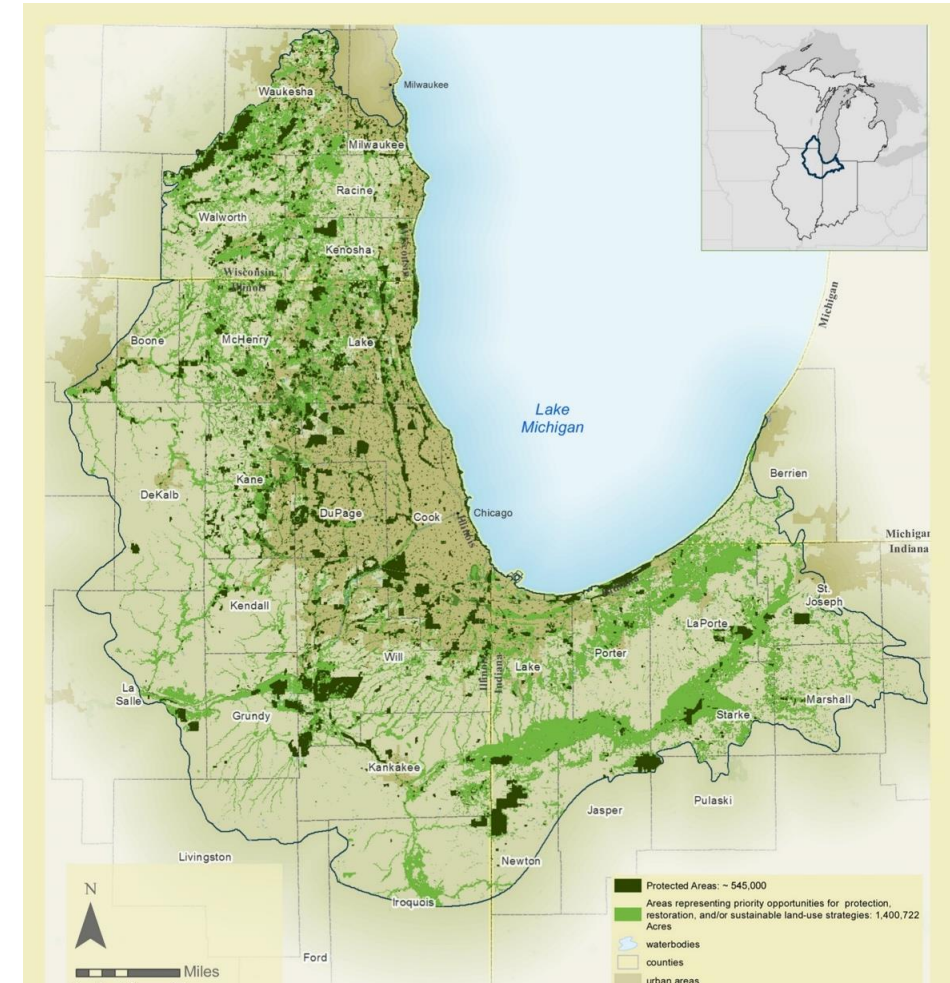 - Best practices

Urban Area Growth

Habitat loss, by country

Urban-caused habitat loss
(2000-2030)
(square kilometers)

- 0 - 500
- 500 - 1,000
- 1,000 - 5,000
- 5,000 - 10,000
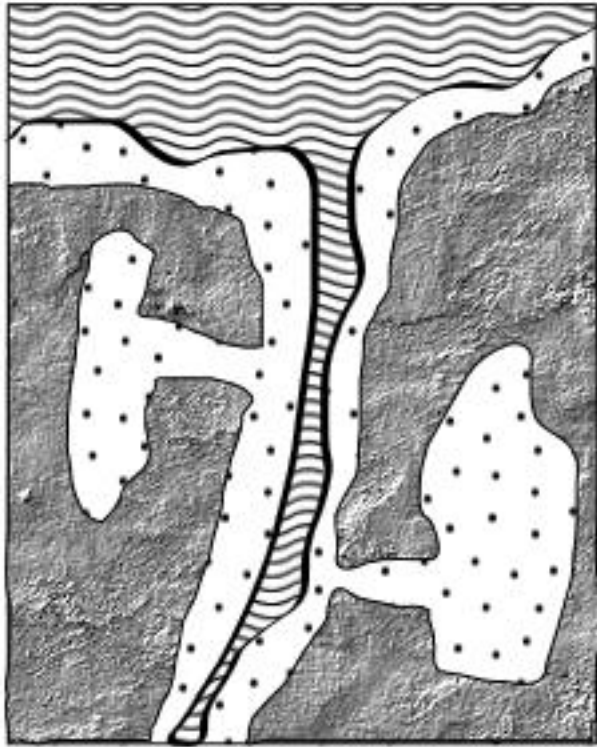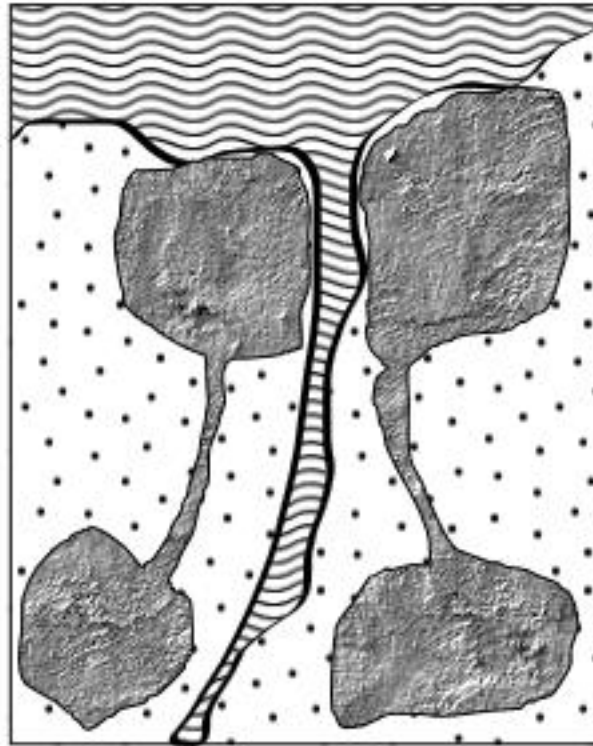- >10,000

www.urbannature100.org

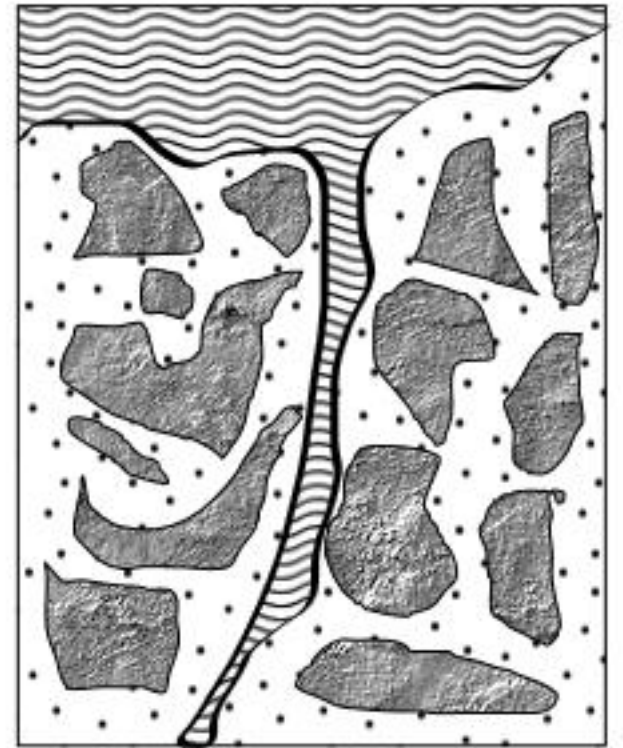# Planning for biodiversity and human well-being: key concepts

Resource use focused   Biodiversity focused   Ecosystem service focused

Ecosystem services of relevance to cities

Ecosystem service	Spatial scale
Provisioning services:	
Agriculture	Regional to global
Water (quantity)	100's km- upstream source watershed
Cultural services:	
Aesthetic Benefits	10's km- area of daily travel
Recreation and tourism	10's km- area of daily travel
Physical Health	10's km- area of daily travel
Mental Health	10's km- area of daily travel
Spiritual value	Varies- Often local
Biodiversity	Varies
Regulating services:	
Drinking water protection (water quality)	100's km- upstream source watershed
Stormwater mitigation	100's m- downstream stormwater system
Mitigating flood risk	100's km- downstream flood-prone areas
Coastal protection	10's km- coastal zone
Air purification	100's km- regional airshed
Heat mitigation	< 100 m- varies with solar angle

Ecological spatial planning: process

A process for Conservation for Cities:

1. Define the problem or policy issue
2. Take inventory: What ecosystem services matter?
3. What natural infrastructure provides those services?
4. Identify options for actions
5. Assess options and implement
6. Monitoring and adaptive management

1. Define the problem or policy issue

- An existing planning process
  - Comprehensive plans (e.g., PlaNYC)
  - Transportation plan
  - Zoning plan
  - Sectoral plans (e.g., stormwater, urban forestry)
- Resiliency analysis
  - 100RC and their City Resiliency Framework
- Climate change analysis

2. Take inventory: What ecosystem services matter?

Type of information	Key questions to ask stakeholders
Relevant to problem definition	Does the ecosystem service seem likely to help in answering the key problem or issue?
Number of people	How many people in the city rely on the service?
Beneficiaries	What specific neighborhoods or groups of people rely most on this service?
Importance	For those relying on the service, how important is it to their lives?
Critical places	What places are crucial for the provision of this service?
Threats	Which threats are most likely to degrade ecosystem service provision over time?

2. Take inventory: What ecosystem services matter?

Type of threat
Residential and commercial development
Transportation and service corridor development
Logging and wood harvesting
Human intrusion and disturbance
Fire and fire suppression
Dams and water management/use
Invasive and other problematic species
Pollution
Climate change and severe weather

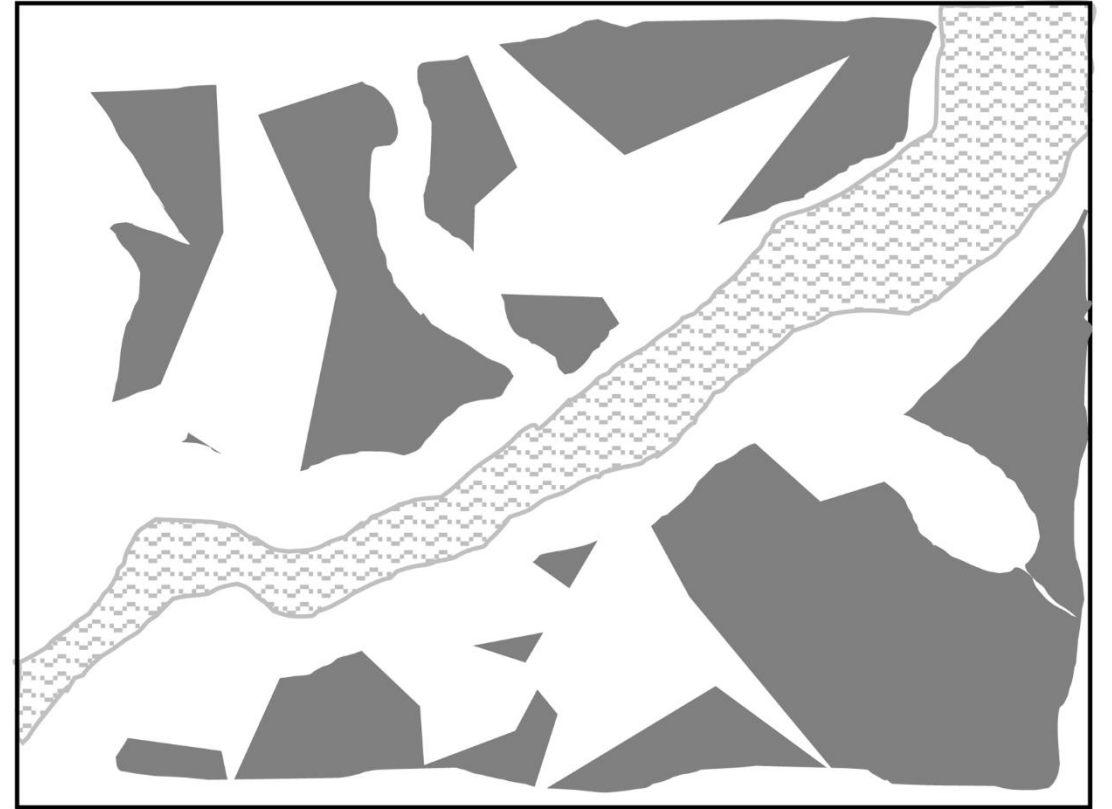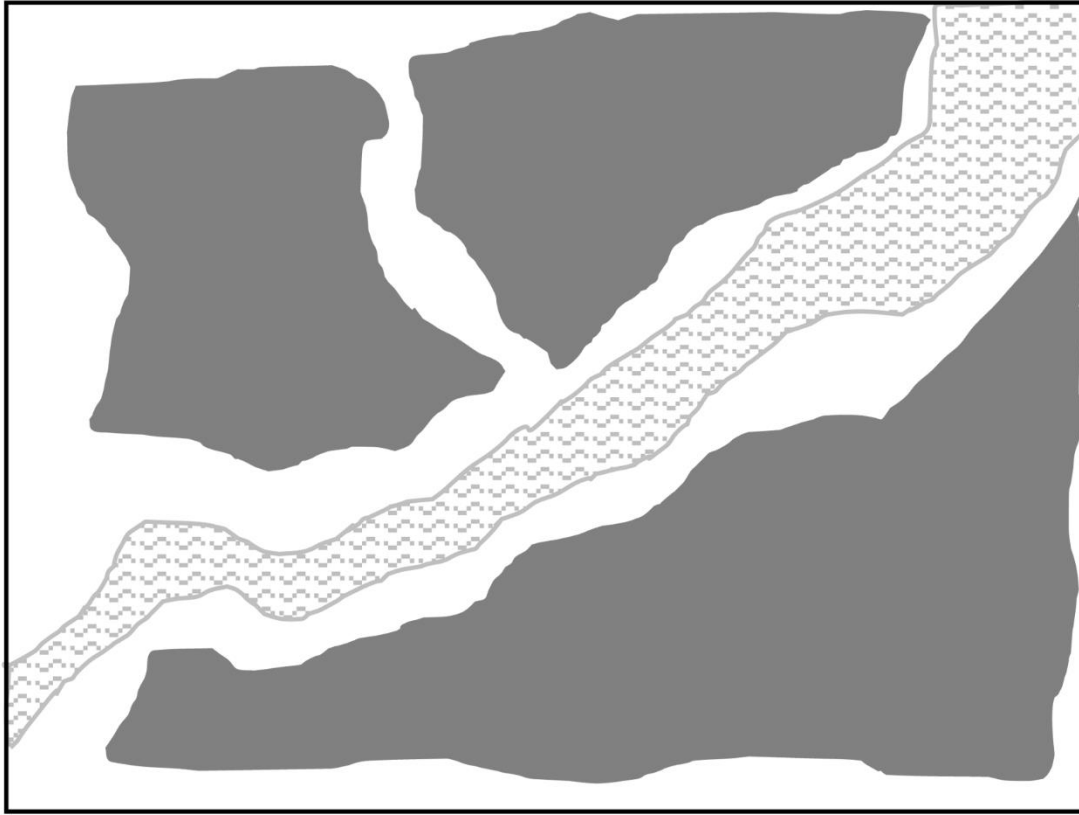# Ecological spatial planning: Ecosystem service valuation

- Ecosystem service value is a function of:
  - Supply of service (ecosystem function and health)
  - Demand for service (number of people and economic value)
- How much information is enough?
  - Index
  - Physical units (e.g., tons of carbon)
  - Economic value (e.g., $)
- What is the purpose of the information?
  - Non-spatial decision-making
  - Spatial decision-making

Stormwater mitigation models

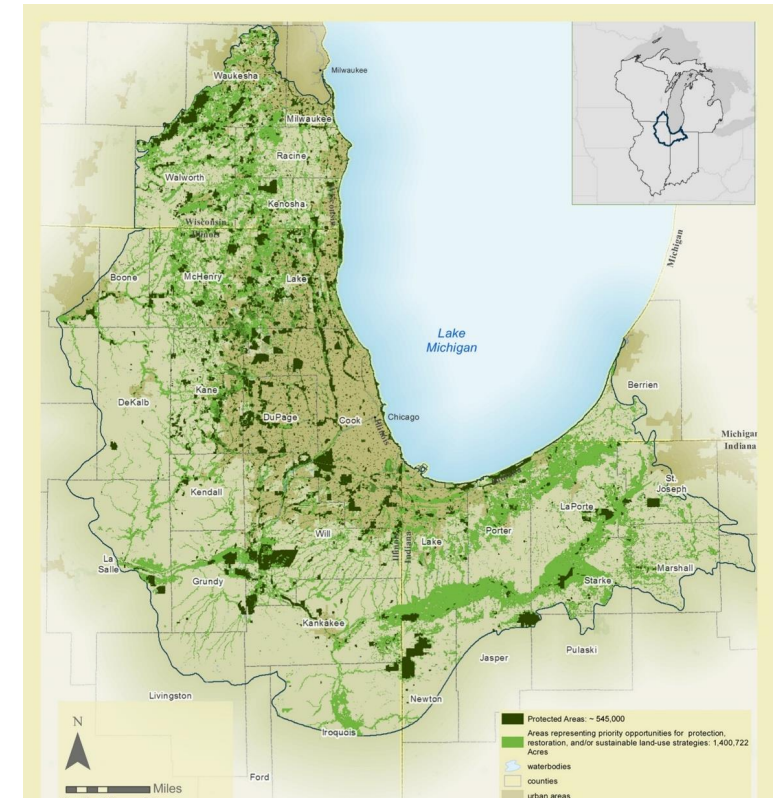|	Green Long Term Control EZ Template	WERF BMP SELECT	National Stormwater Calculator	SUSTAIN (SWMM)
Key outputs:				
Watershed-level estimate:				
Water storage	Yes	Yes	Yes	Yes
Natural filtration	No	Yes	No	Yes
Spatial maps of benefits:				
Water storage	No	No	No	Yes
Nature filtration	No	No	No	Yes
Optimization of placement of sites for natural infrastructure	No	No	No	Yes

Ecological spatial planning: Biodiversity and corridors

Biodiversity models

	Fragstats	Connectivity models	Metapopulation models (e.g., RAMAS)	Conservation planning software
Key outputs:				
Landscape metrics of fragmentation	Yes	Varies	Varies	Varies
Connectivity metrics	Some simple metrics	Yes	Yes	No
Demographic information	No	No	Yes	No
Optimal conservation plans	No	No	No	Yes
Existence value	No	No	No	No

Ecological spatial planning: Best practices

- Process:
  - Engage diverse stakeholders
  - Use accessible language in presentations
  - Define leadership roles early
  - Be transparent in methods
- Spatial analysis
  - Complement existing plans and efforts
  - Provide regional context
- Implementation
  - Design the plan to support decisions that key stakeholders will take.

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Thank You