



# The Natural Capital Approach

Building nature's benefits into decisions

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NatCap Lead Scientists  
Annual Meeting and Training, March 2014





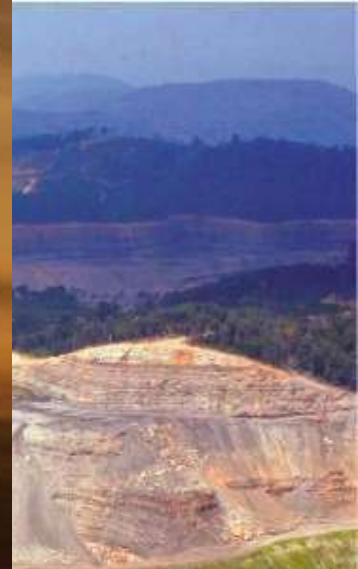




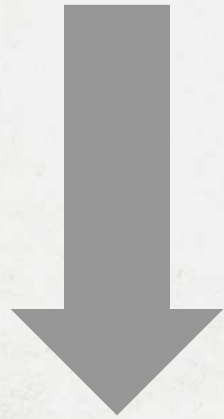




© Reuters



**people**



**nature**





Food, fuel,  
fiber



Pollination



Coastal  
protection



Clean  
water



Recreation



**people**

**nature**





improve outcomes

**FOR NATURE AND  
PEOPLE**



# THEORY OF CHANGE

Advance science of  
ecosystem services

Create user-friendly  
approaches & tools

Build and tell  
success stories



Get information about natural  
capital into decisions



Make decisions with better  
outcomes for people and nature

5

5



# THE NATCAP APPROACH

1. Be relevant, co-produce information
2. Explore multiple benefits, trade-offs, change
3. People matter
4. Where matters
5. Include dynamics, uncertainty



STORYTIME





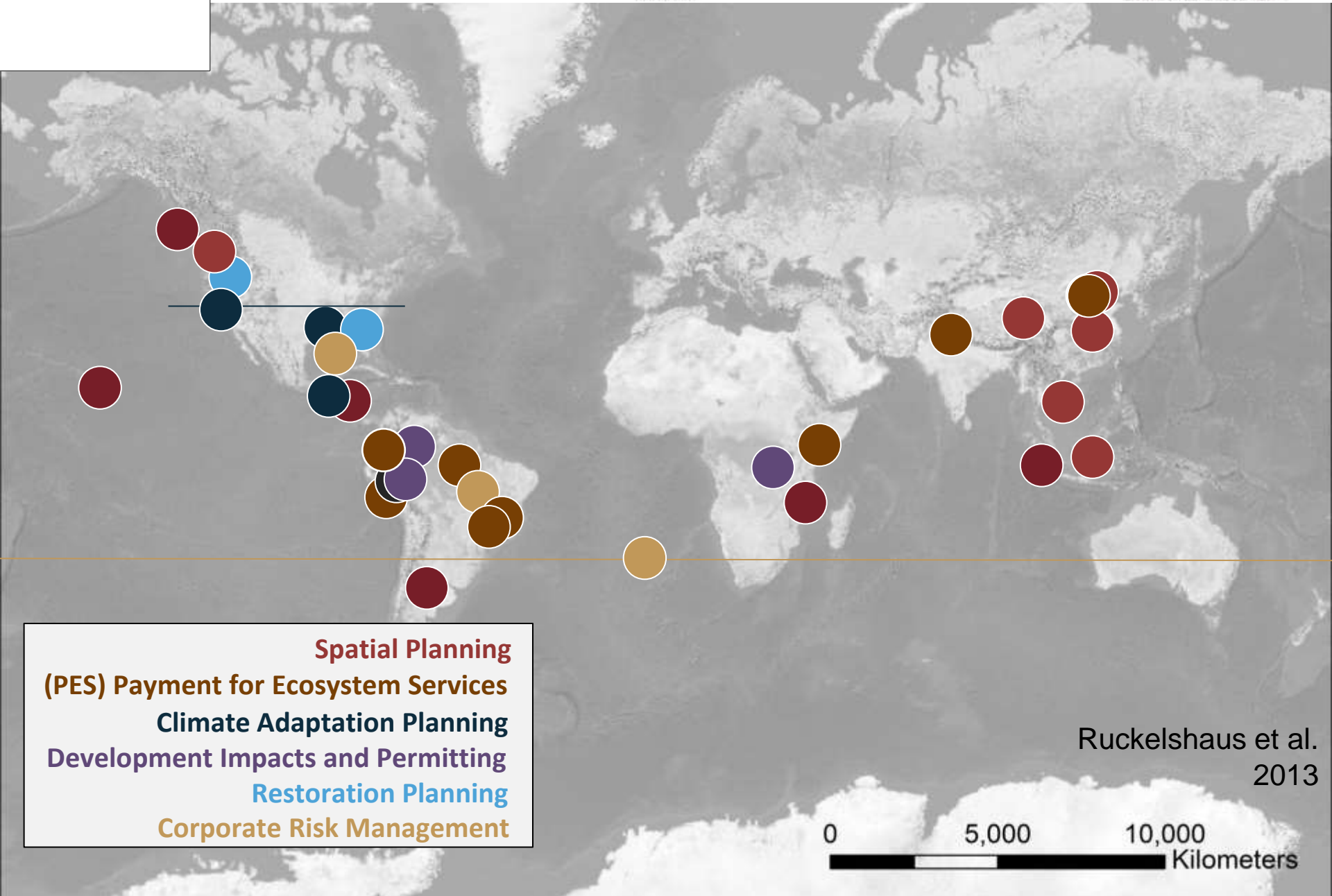
**How can we use resources more efficiently through better spatial planning?**





**How do we reward or incentivize producers of public goods?**







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The Nature  
Conservancy



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**Spatial Planning**  
**(PES) Payment for Ecosystem Services**  
**Climate Adaptation Planning**  
**Development Impacts and Permitting**  
**Restoration Planning**  
**Corporate Risk Management**

Ruckelshaus et al.  
2013

0 5,000 10,000  
Kilometers



**Be relevant, co-produce  
information**



**Explore multiple benefits, trade-  
offs, change**



How can competing uses for marine resources be balanced?

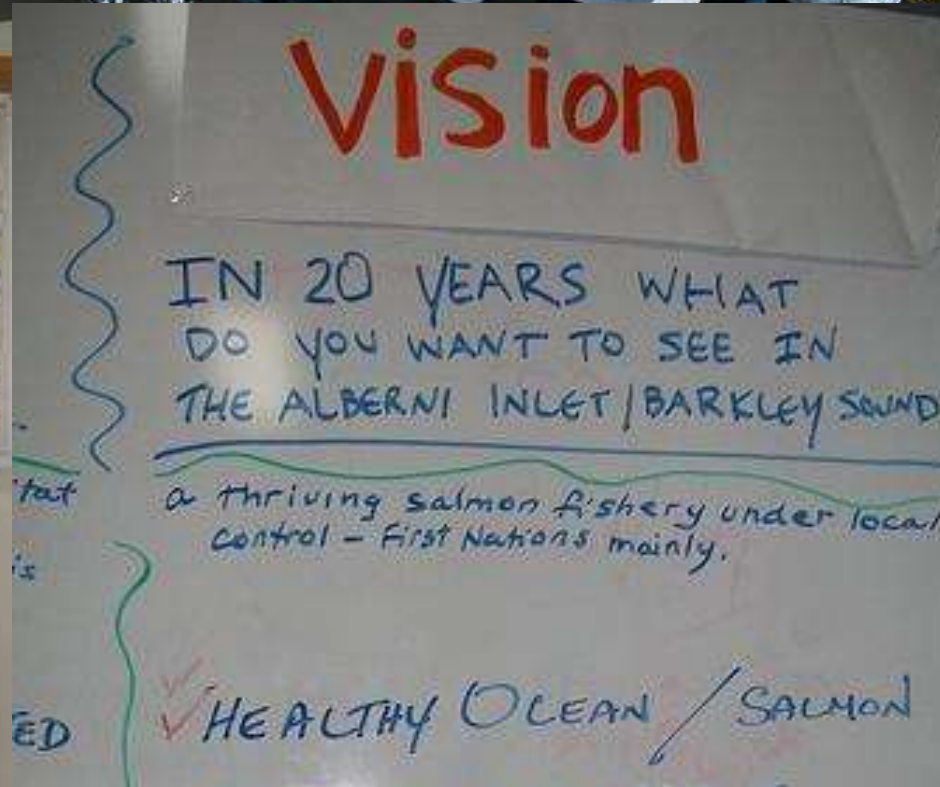
Where should different uses be zoned to maximize benefits from all resources and uses?

How much will different benefits change under different future scenarios of marine use?












- 
- Healthy environment
  - Access to local seafood
  - Sustainable local jobs
  - Safe waterways
  - Vibrant communities and culture
  - Adaptive management

changes in ecosystem → changes in  
ecosystem services



**InVEST**

integrated valuation of  
environmental services  
and tradeoffs



# Forcing Conditions

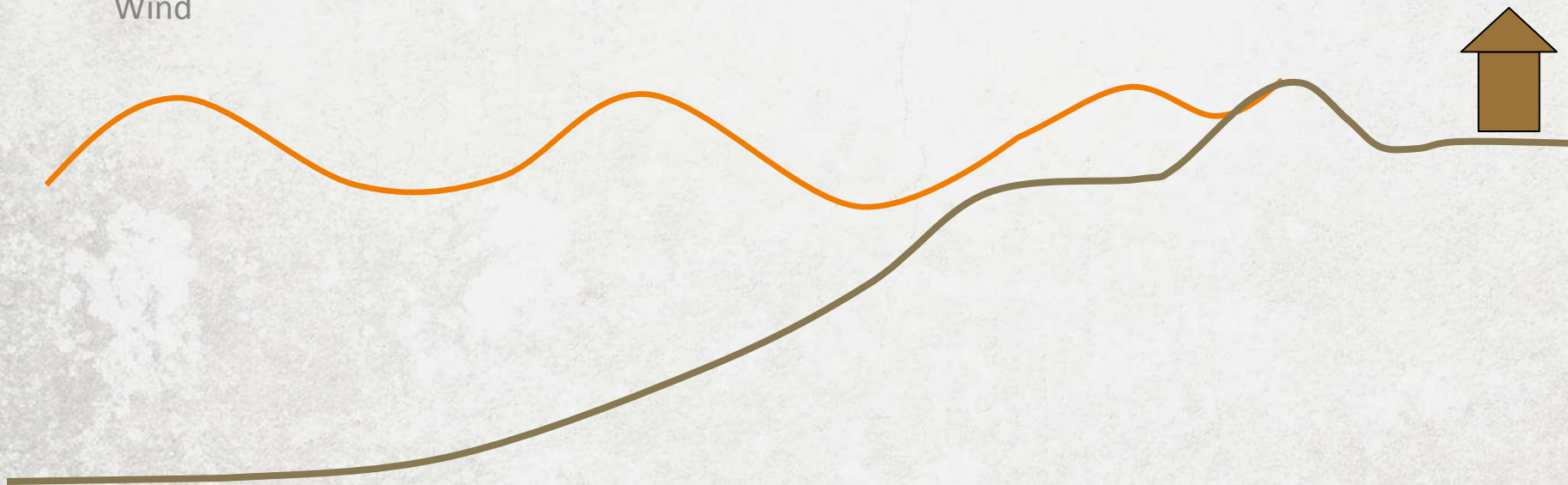
Waves

Baseline tide

Long-term sea-level rise

Currents

Wind

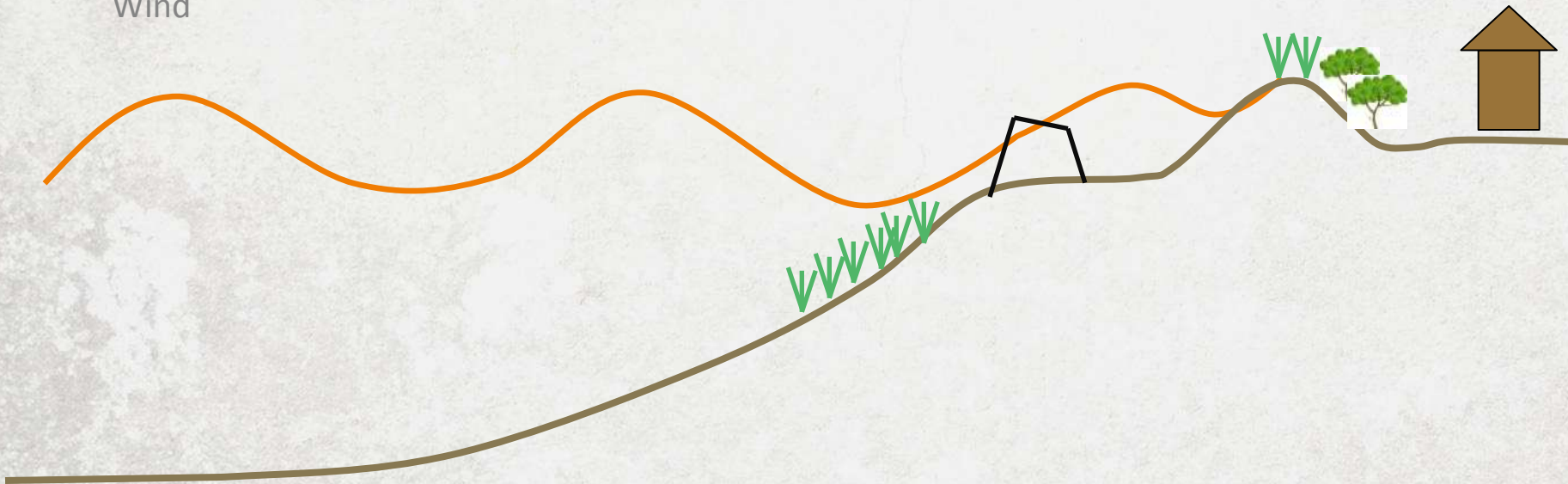


## Forcing Conditions

Waves  
Baseline tide  
Long-term sea-level rise  
Currents  
Wind

## Attenuation

n  
Biogenic habitat  
Abiotic morphology  
'Hard' structures





## Forcing Conditions

Waves  
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Long-term sea-level rise  
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## Hydrodynamic Output

Wave height  
Mean water level  
Runup  
Storm surge



## Forcing Conditions

Waves  
Baseline tide  
Long-term sea-level rise  
Currents  
Wind

## Attenuation

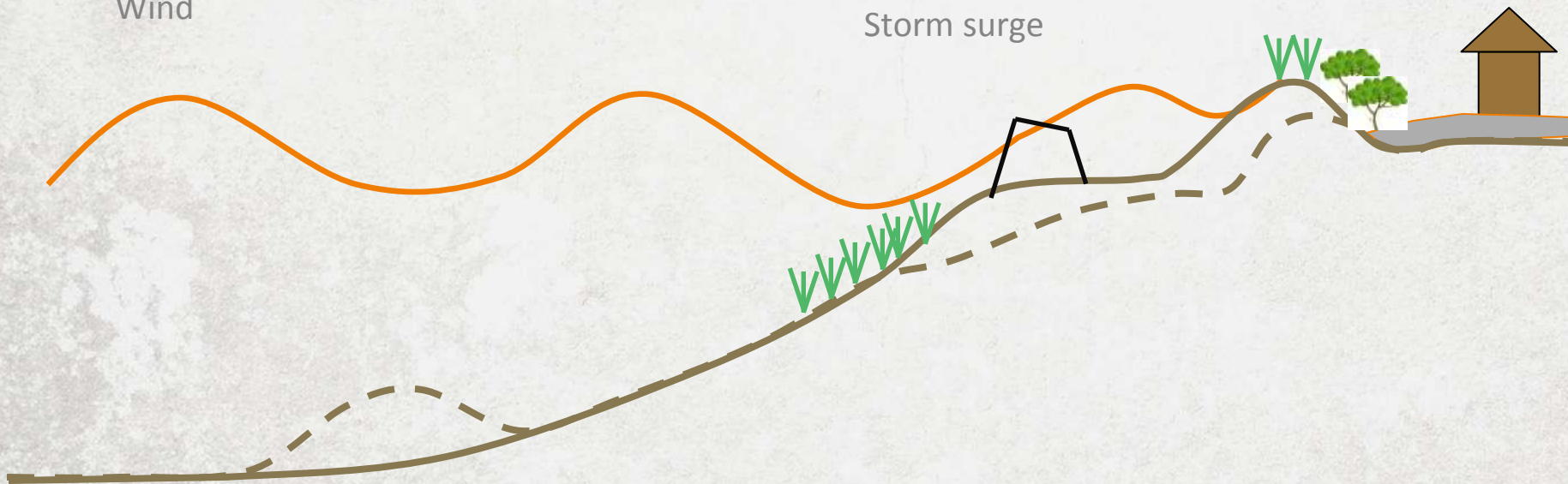
Biogenic habitat  
Abiotic morphology  
'Hard' structures

## Hydrodynamic Output

Wave height  
Mean water level  
Runup  
Storm surge

## Erosion Flooding

Near property and people





NOT TO SCALE

- Avoided re-nourishment cost
- Avoided property damages
- Avoided people displaced

Absence of Vegetation

Presence of Vegetation





**Carbon  
Storage &  
Sequestration**



**Blue Carbon  
Storage &  
Sequestration\***



**Wave Energy**



**Crop Pollination**



**Finfish  
Aquacultural  
Production**

**InVEST**

integrated valuation of  
environmental services  
and tradeoffs



**Managed  
Timber  
Production**



**Fisheries  
Production\***



**Offshore  
Wind Energy**



A wide-angle photograph of a beach at sunset. The sky is filled with soft, white clouds, and the sun is low on the horizon, casting a warm, golden glow over the scene. The water is calm, reflecting the light from the sky.

**Coastal  
Protection**

A landscape photograph of a mountain lake. The lake is surrounded by lush green forests and mountains in the background. The water is a deep blue, reflecting the surrounding landscape.

**Nutrient  
Retention**

A close-up photograph of a small, light-colored bird perched on a thin, brown branch. The bird is facing away from the camera, and its wings are slightly spread. The background is a dense, green forest.

**Habitat quality**

A photograph of a mountain lake seen through a dense forest. The lake is surrounded by steep, forested mountains. The water is calm, reflecting the surrounding landscape.

**Scenic Views**

A photograph of a lake surrounded by trees with vibrant autumn foliage in shades of orange, yellow, and red. The water is calm, reflecting the colorful trees and the sky above.

**Sediment  
Retention**

A photograph of a coral reef underwater. The coral is in various colors, including red, orange, and green. The water is clear, and the lighting is bright, highlighting the intricate structures of the coral.

**Habitat Risk  
Assessment**

A silhouette of a person standing on a rocky outcrop, looking out over a vast landscape. The person's arms are raised in a gesture of triumph or joy. The background shows a bright sun and a blue sky with scattered clouds.

**Recreation**

A photograph of a large concrete dam with a series of spillways. The dam is situated in a valley, and the water behind it is a deep blue. The sky is clear and blue.

**Hydropower  
Production**

A photograph of a calm body of water, likely a lake or a bay, under a clear blue sky. The water is a deep blue, and the horizon is visible in the distance.

**Marine Water  
Quality**



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Invest

Habitat Risk

Water Quality

Renewable Energy

Coastal Erosion


Aquaculture

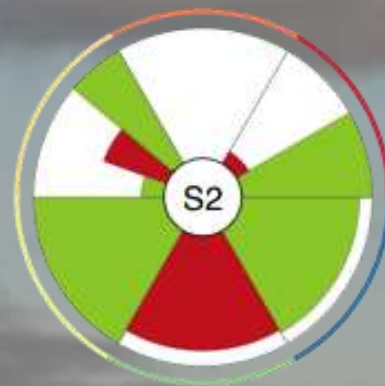
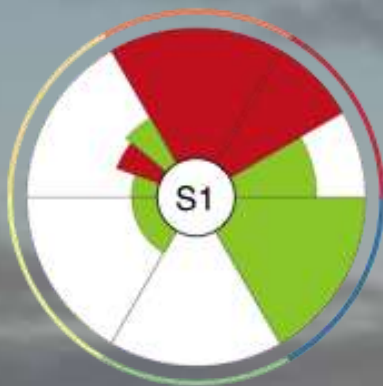
Production

Scenic Views

Fisheries



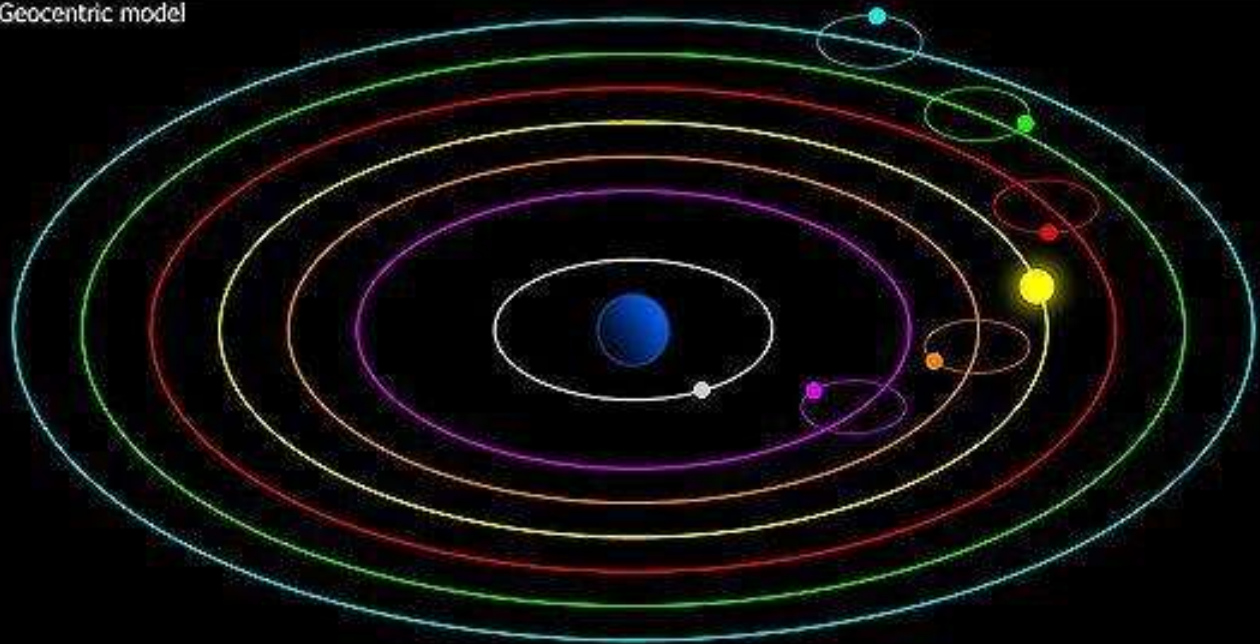
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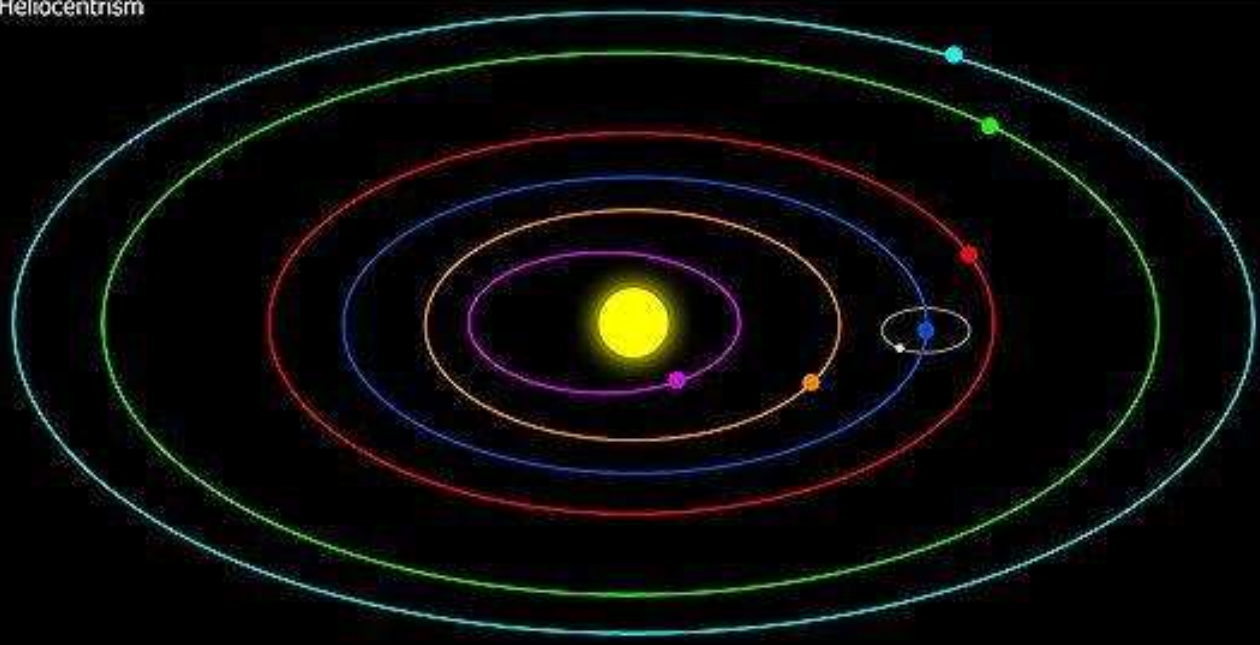


Geocentric model

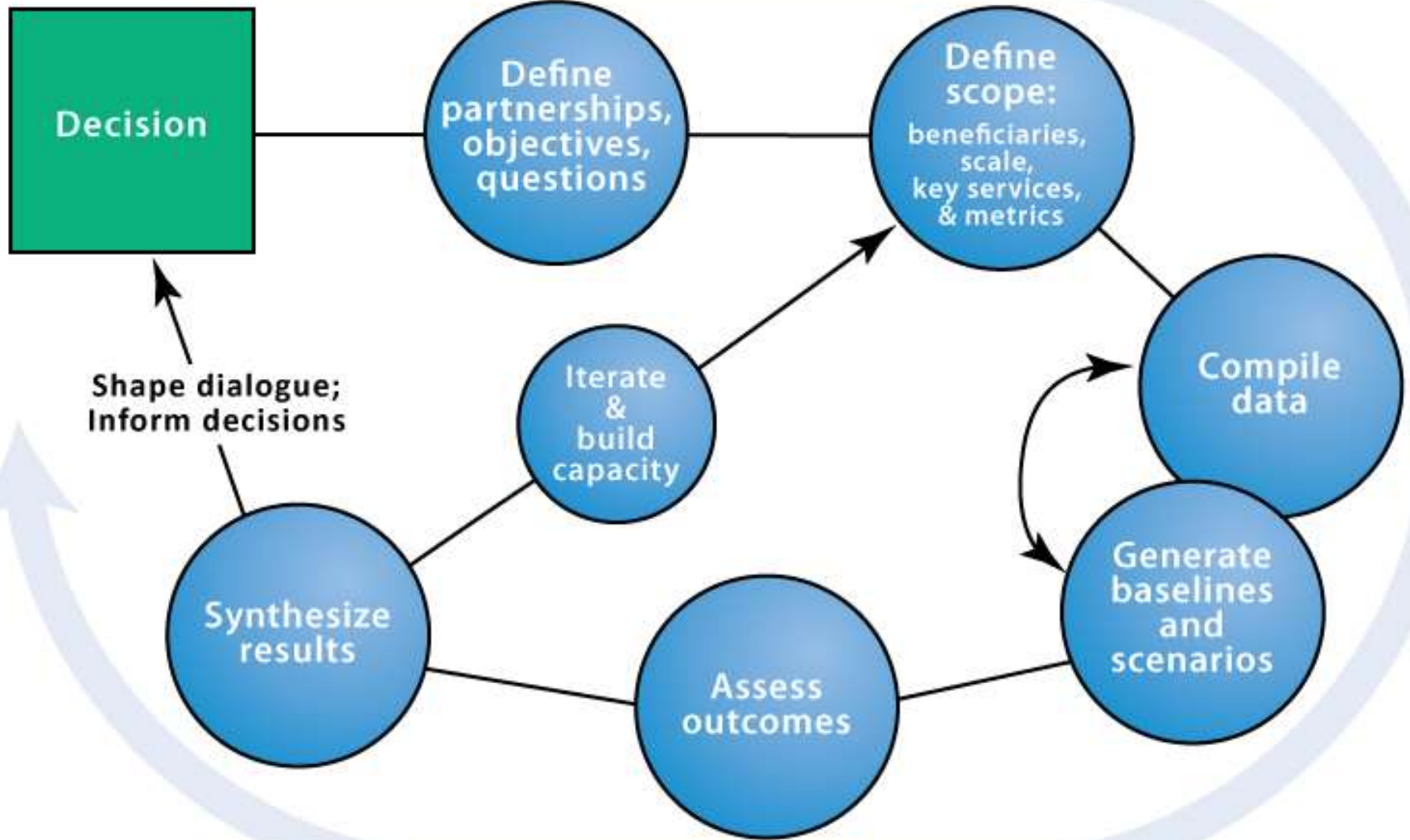


Earth  
Moon  
Mercury  
Venus  
Sun  
Mars  
Jupiter  
Saturn

Heliocentrism



Engage stakeholders





**Be relevant, co-produce  
information**



**Explore multiple benefits, trade-  
offs, change**

**People matter.**





# Social-Ecological System

Biophysical

Human



Ecosystem  
Structure



Supply



Human locations &  
Activities



Social  
preferences

Production  
Function

Service

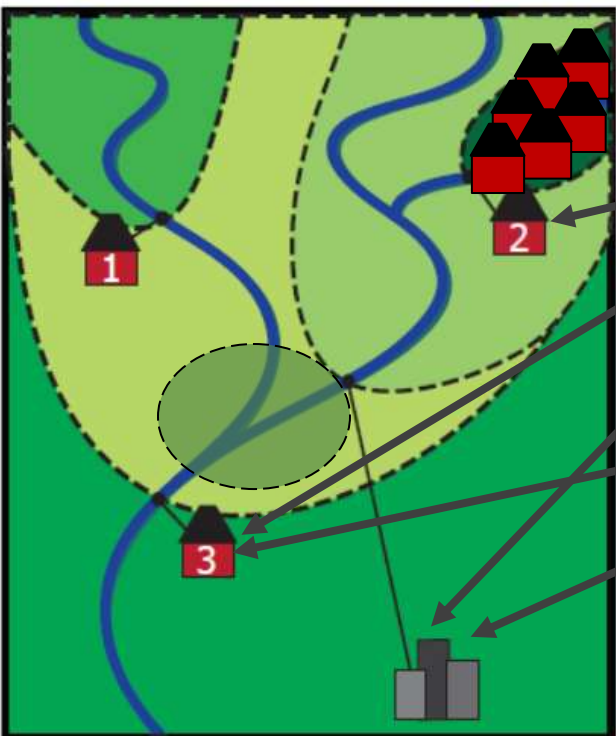
Benefit

## InVEST

integrated valuation of  
environmental services  
and tradeoffs

Tallis et al BioScience 2012



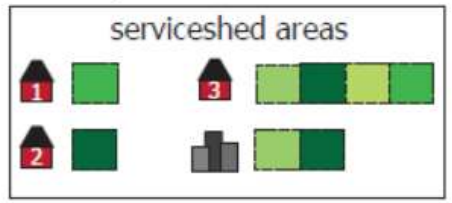


↓ water quality

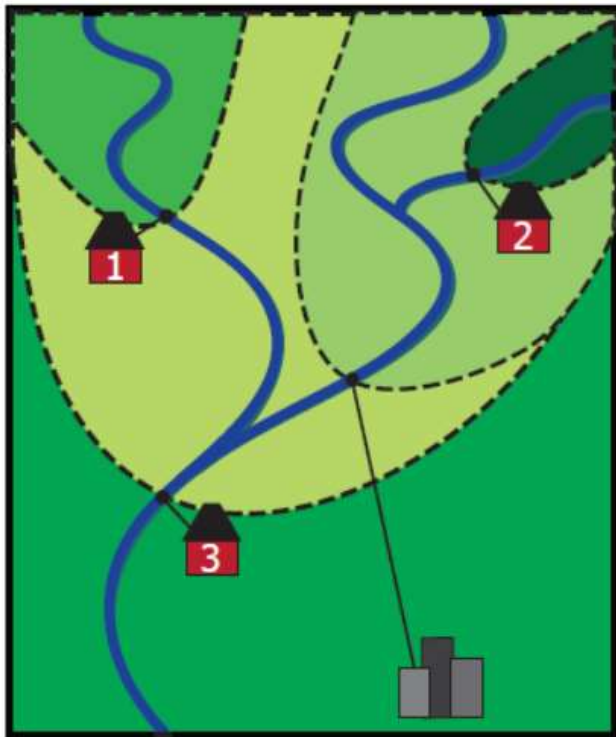
↑ water quality

---- serviced boundary

●— point of water access



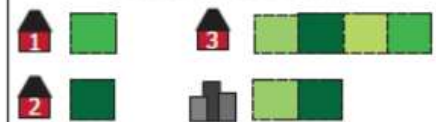
# Water



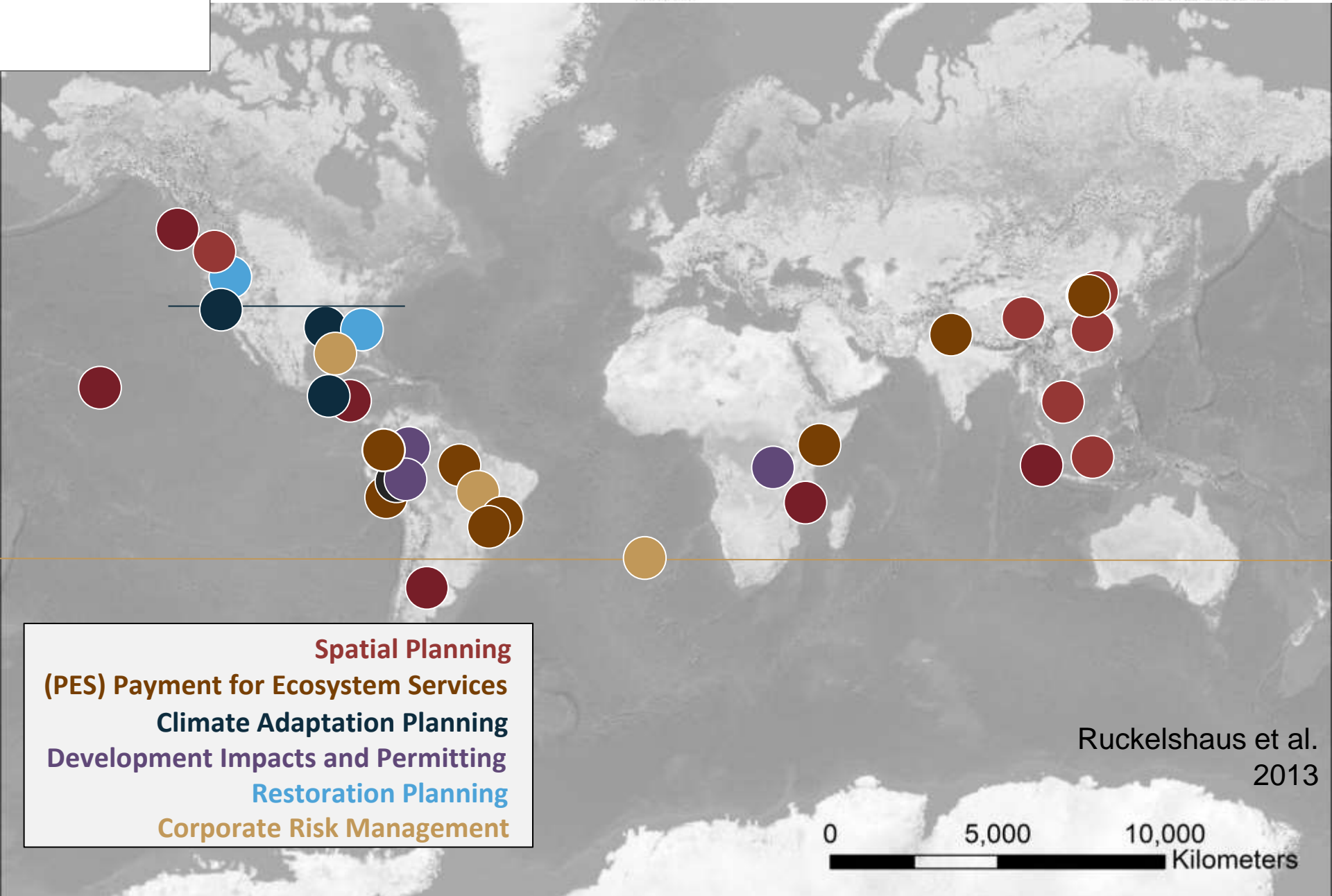
----- serviced boundary

●— point of water access

serviced areas









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Ruckelshaus et al.  
2013

0 5,000 10,000  
Kilometers





Who will be impacted by development?

Where will offsets restore benefits to the same people who lost them? How much of the lost benefits can be restored?

How can risks to development be mitigated by natural capital?

## inputs

climate  
erosivity

soil  
erodibility

mgmt  
factors

retention  
efficiency

slope



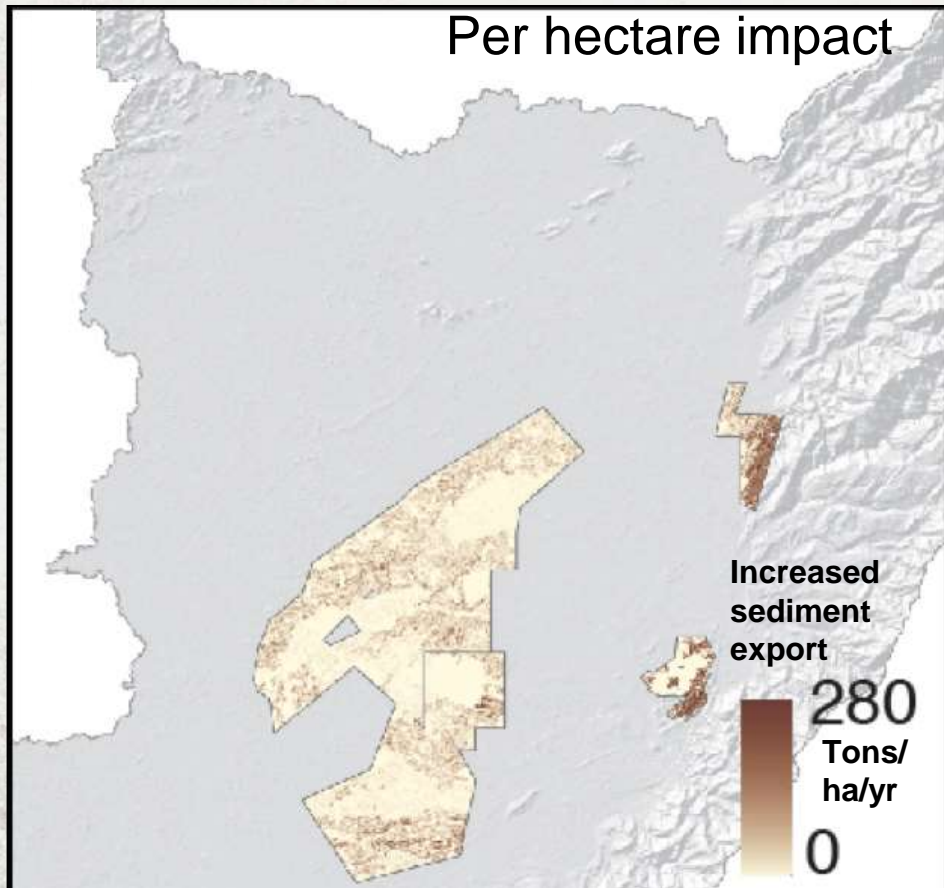
## biophysical supply

sediment export to the stream  
(mitigated by natural capital)

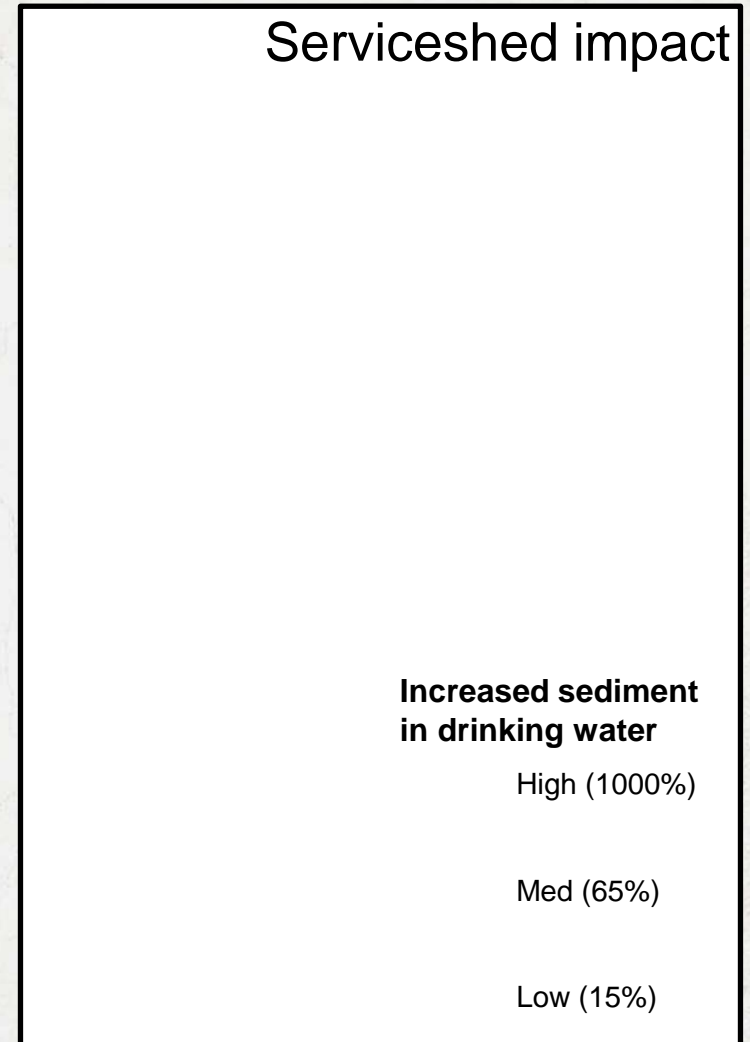
## benefit to people

(avoided) sediment in drinking  
water, irrigation canals, hydropower



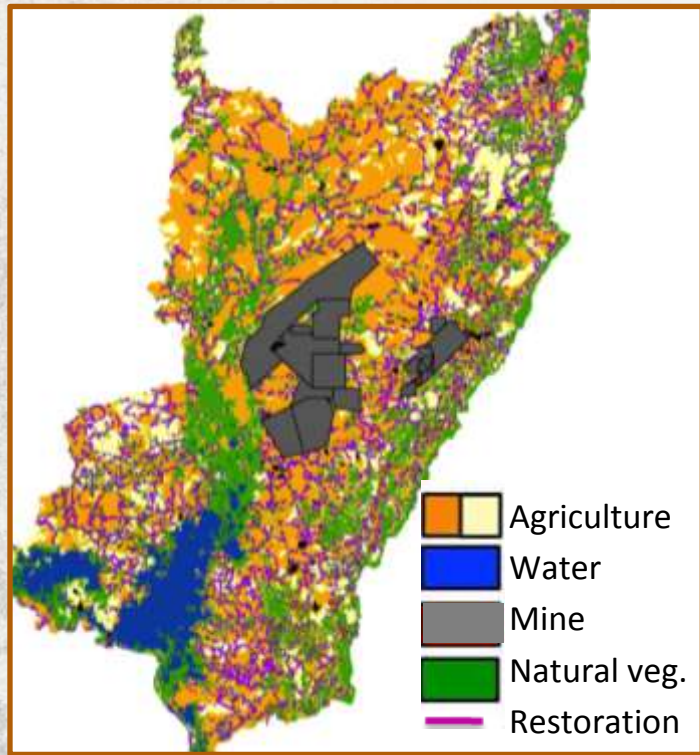


Δ supply



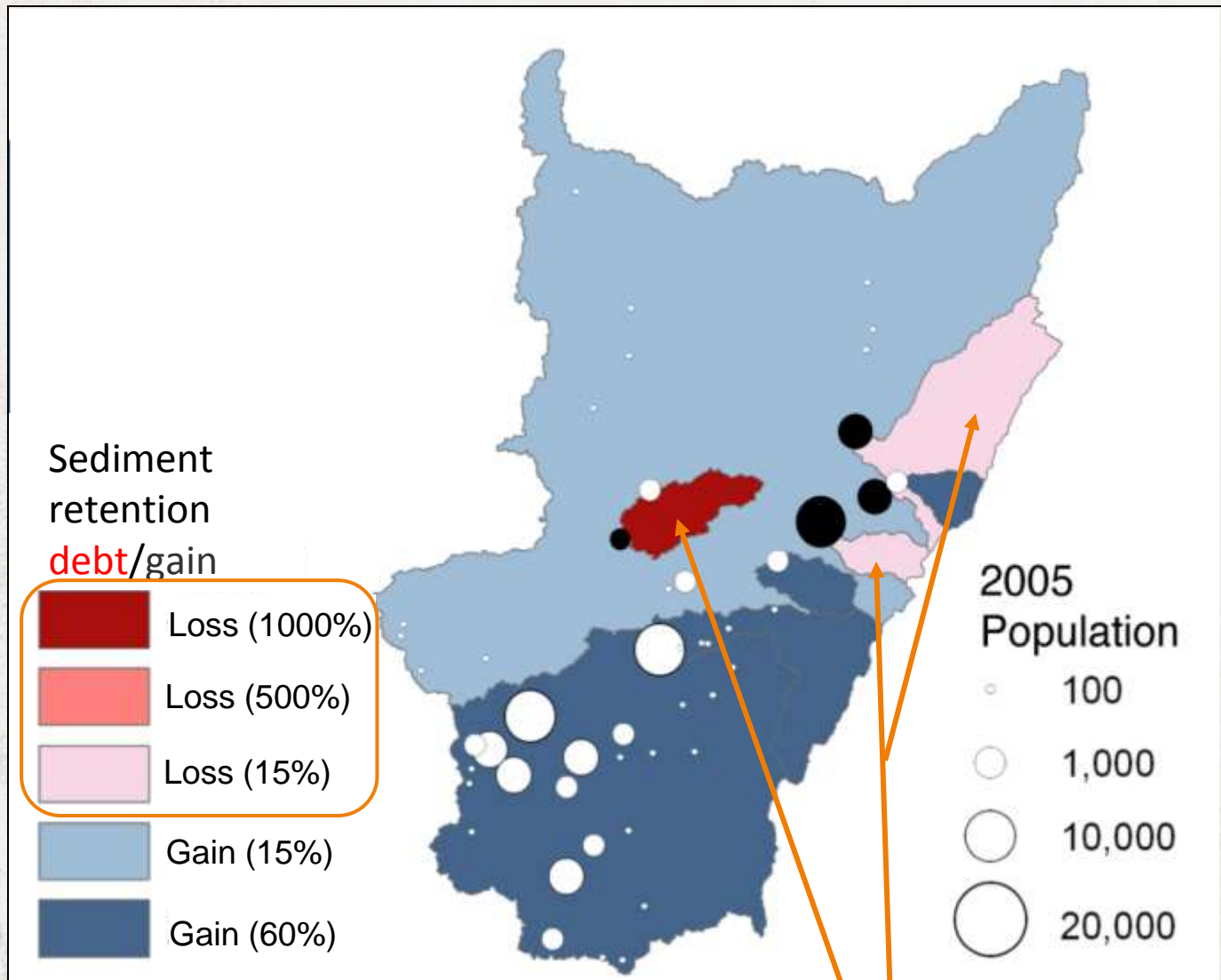
Δ service

# Can lost services be restored

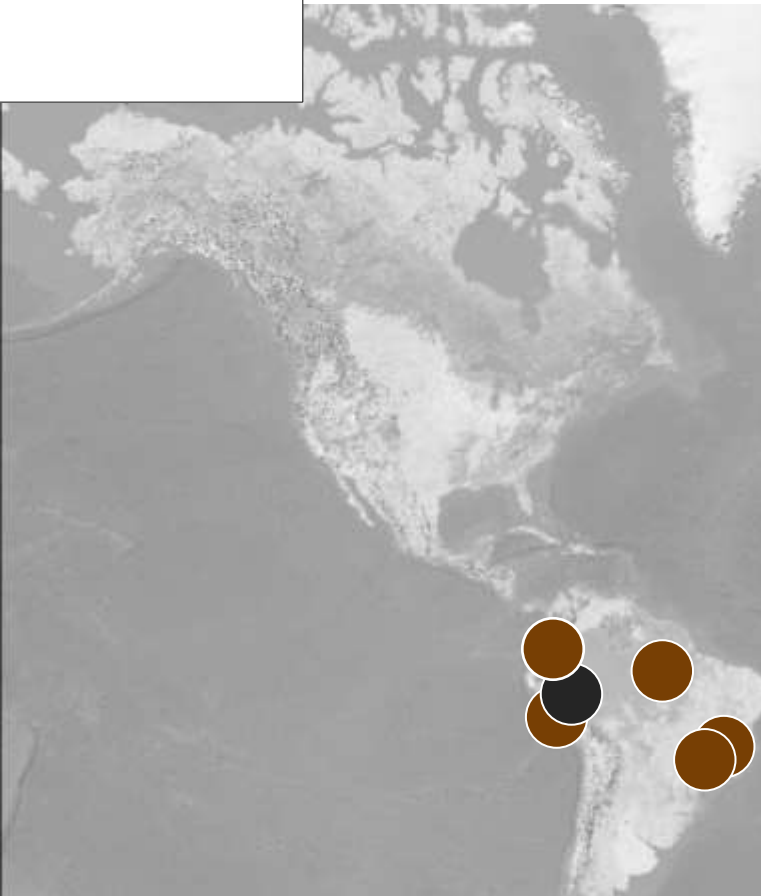


to the same people?





**lose service even AFTER mitigation**



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Ruckelshaus et al.  
2013

0 5,000 10,000  
Kilometers

A horizontal scale bar with a black and white alternating pattern, used to indicate distances in kilometers.



A photograph of a steep, densely forested hillside. The trees are a vibrant green, suggesting a healthy ecosystem. The sky at the top is blue with some white clouds. The text is overlaid on the left side of the image.

Where should watershed management investments be made to secure water supply and mitigate risks?

What improvements in ecosystem services such as water provisioning or purification can be expected?

Do targeted investments do better than what we do now?







**Where matters.**

# Where are the most cost-effective investments for natural capital?

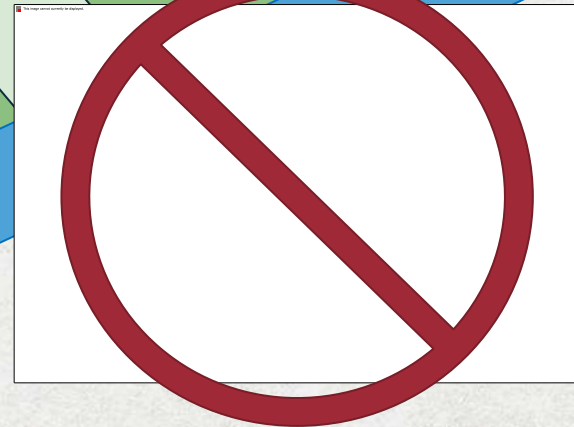
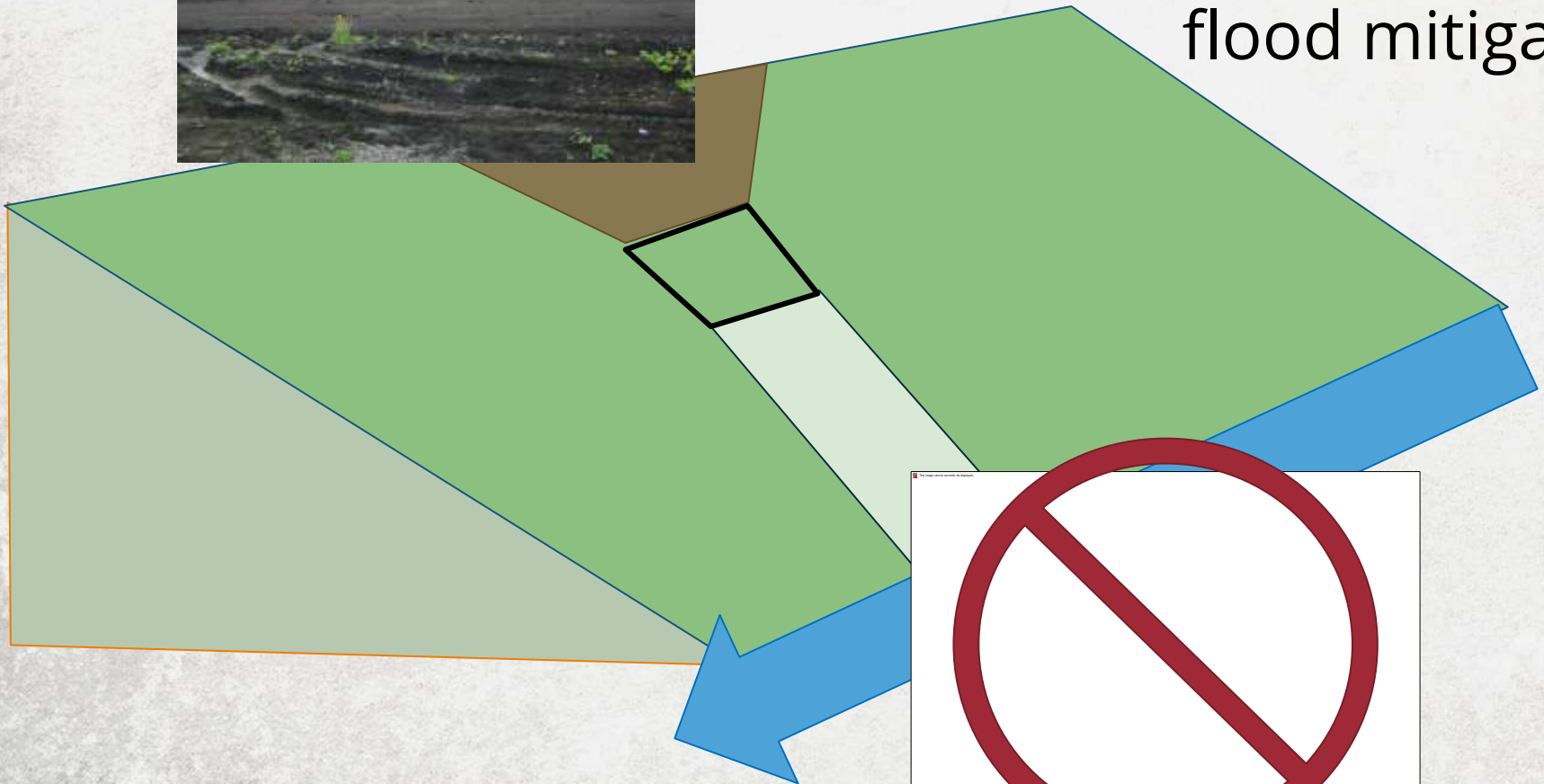
Which activities?

Where in the watershed?





sediment retention  
nutrient retention  
dry season baseflow  
groundwater  
infiltration  
flood mitigation



Biophysical  
rankings



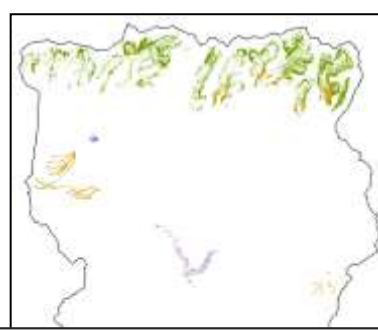
Feasibility;  
Preference



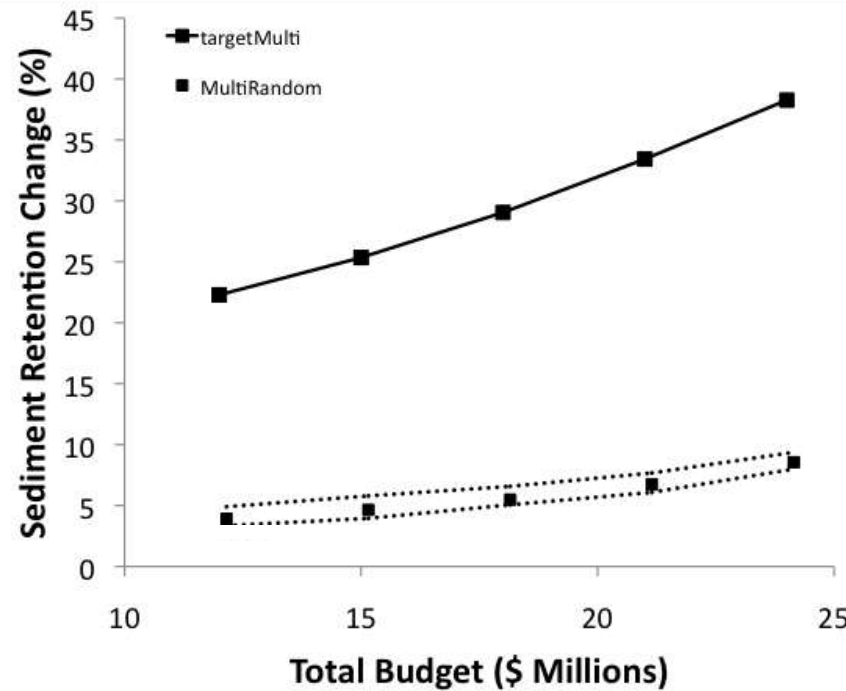
Cost data;  
budget



Portfolio land  
cover



Investment  
Portfolio



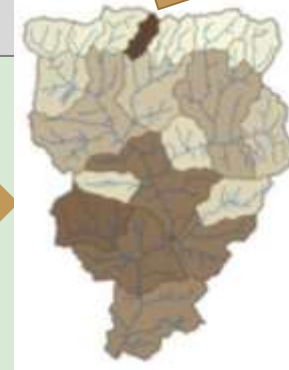
Base land  
cover



Models



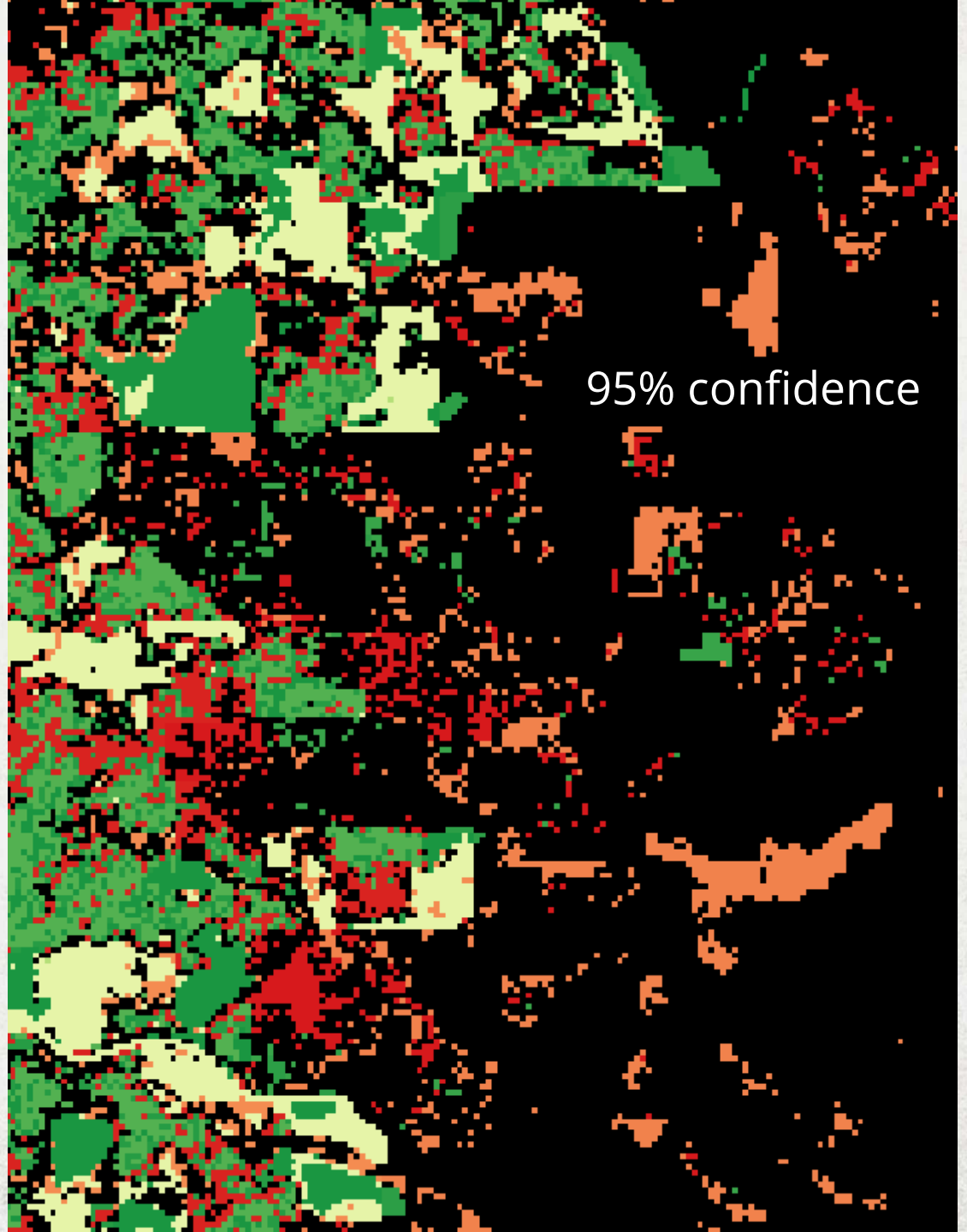
DIFFERENCE





**Include uncertainty, dynamics**

carbon  
sequestration  
with uncertainty





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