Ecosystem Services

Putting land and people into water management

Kate A Brauman, Ph.D.

Global Water Initiative

INSTITUTE ON THE
ENVIRONMENT

UNIVERSITY OF MINNESOTA
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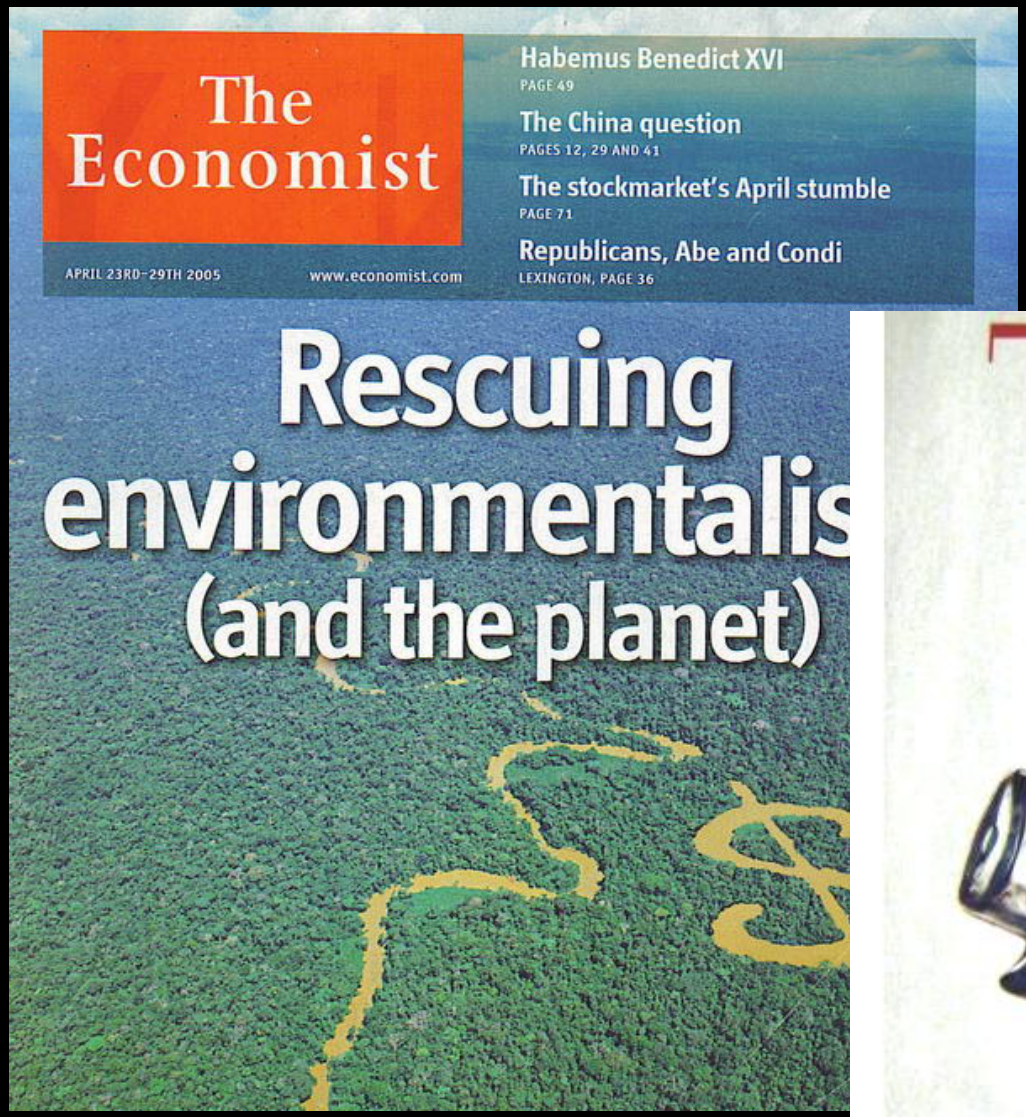
Global Water Initiative

natural capital

PROJECT

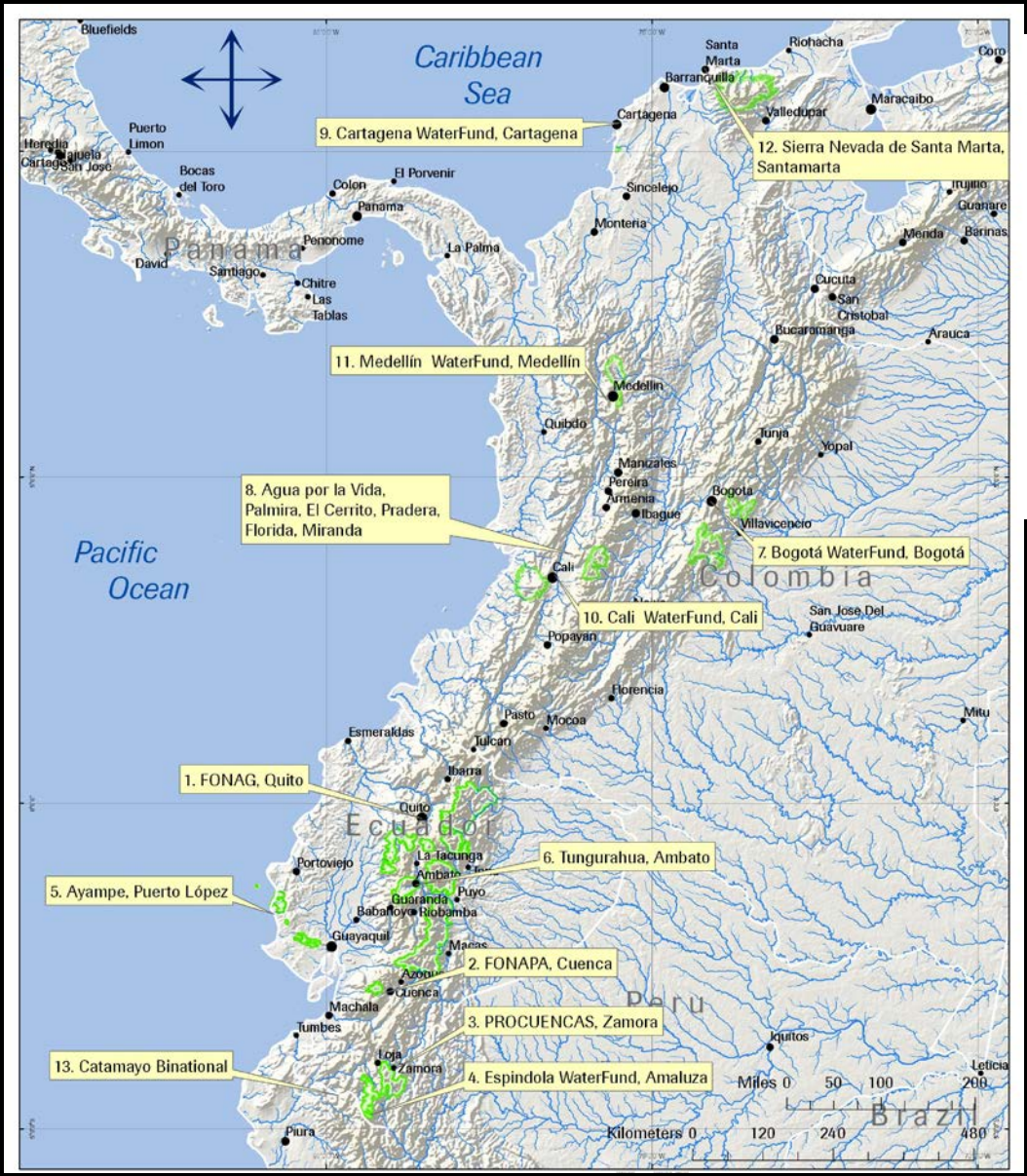
Ecosystem Services

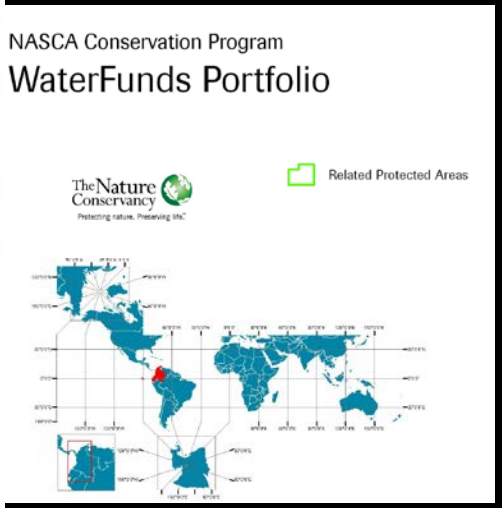
- Why ecosystem services?
- What are ecosystem services?
- What are they good for?


The Economist
Habemus Benedict XVI
PAGE 49
The China question
PAGES 12, 29 AND 41
The stockmarket's April stumble
PAGE 71
Republicans, Abe and Condi
LEXINGTON, PAGE 36
APRIL 23RD-29TH 2005
www.economist.com
Rescuing environmentalis
(and the planet)

TIME
Banking on Trees

Water Funds are Proliferating

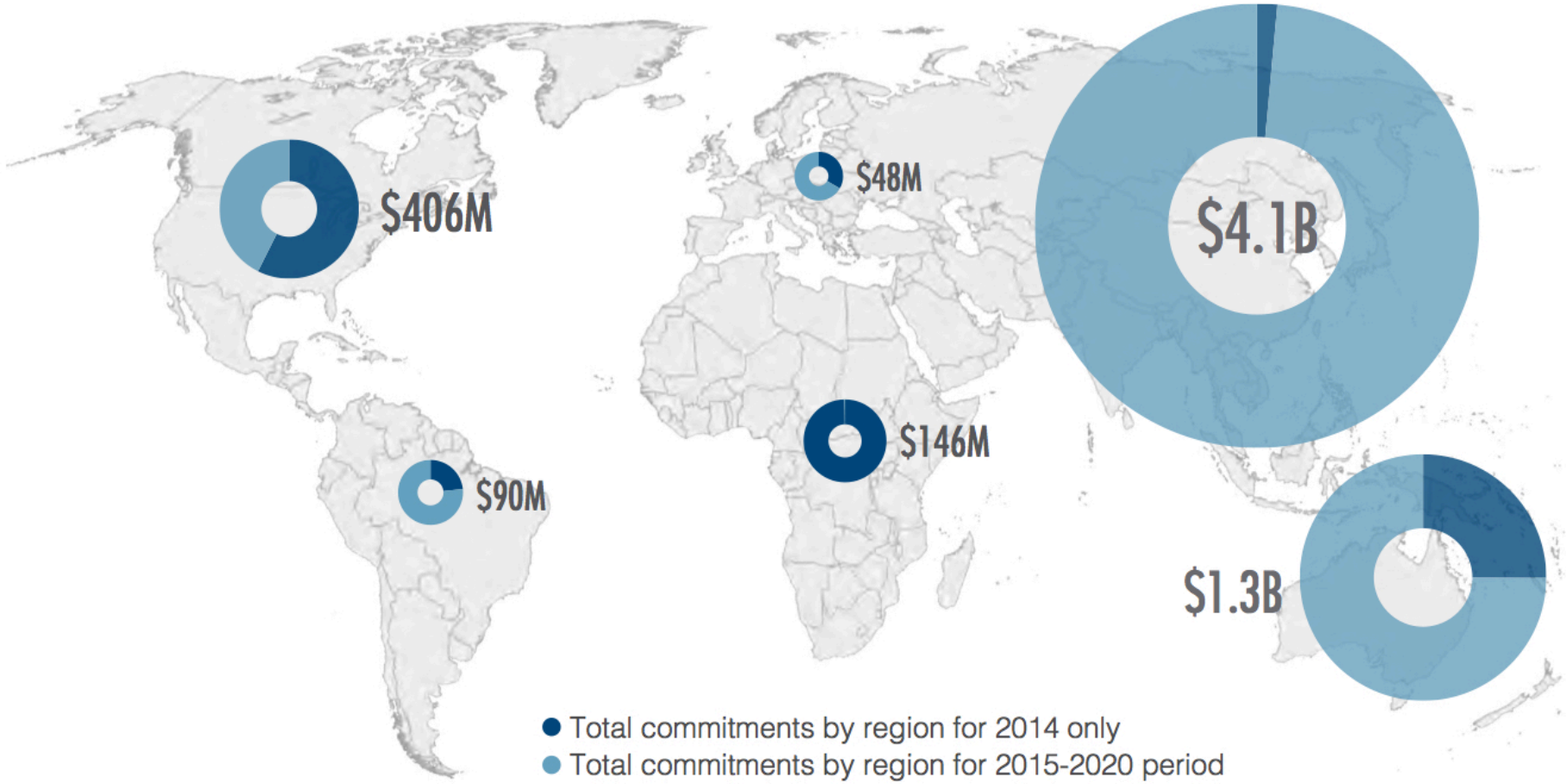




Goldman *et al.*, 2010

Water Funds are Proliferating

Figure 9: Funding Commitments 2014 and 2015-2020 by Region



Source: Forest Trends' Ecosystem Marketplace. *State of Watershed Investment 2014.*

October 7, 2015

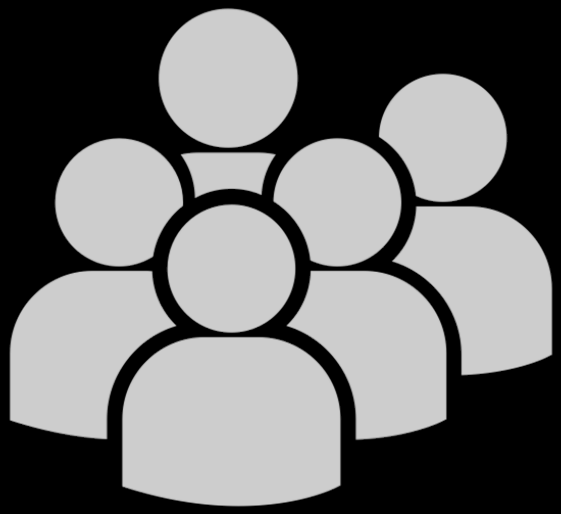
M-16-01

MEMORANDUM FOR EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: Shaun Donovan, Director
Office of Management and Budget

Christine Goldfarb, Managing Director

Connect to People



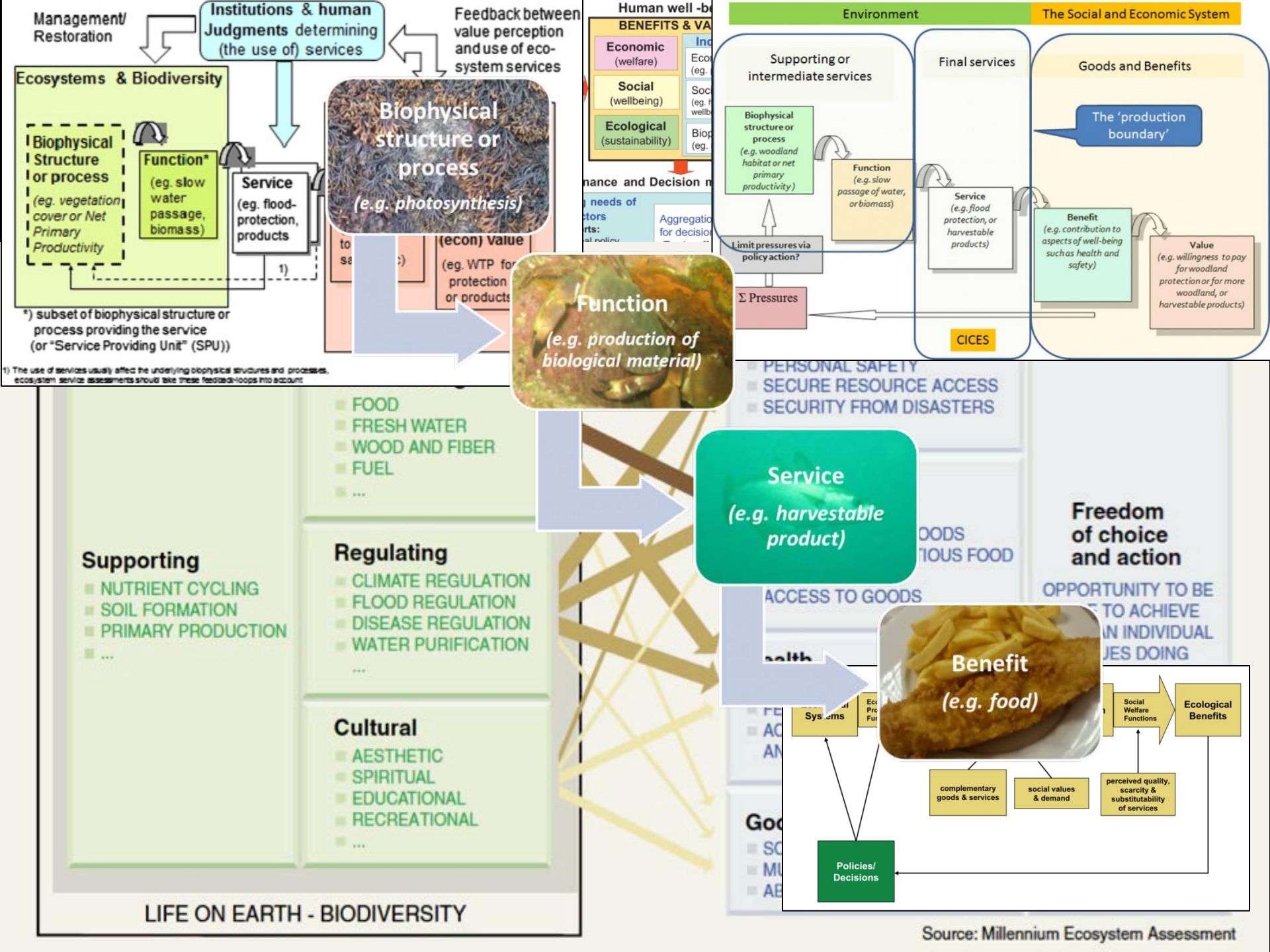
Ecosystem Services

- Why ecosystem services?
- What are ecosystem services?
- What are they good for?

Ecosystem Services

Ecosystem Services

Ecosystem Services are the benefits people receive from the environment



Source: Millennium Ecosystem Assessment

PLOS | BIOLOGY

COMMUNITY PAGE

A Rosetta Stone for Nature's Benefits to People

Sandra Díaz[1]*, Sebsebe Demissew[2], Carlos Joly[3], W. Mark Lonsdale[4], Anne Larigauderie[5]

1 Instituto Multidisciplinario de Biología Vegetal (IMBIV- CONICET) and FCEFyN, Universidad Nacional de Córdoba, Córdoba, Argentina, **2** National Herbarium, Department of Plant Biology and Biodiversity Management, College of Natural Sciences, Addis Ababa University, Addis Ababa, Ethiopia, **3** Departamento de Biologia Vegetal, Instituto de Biologia, Universidade Estadual de Campinas, UNICAMP, Campinas, Brazil, **4** Commonwealth Scientific and Industrial Research Organization, Canberra, Australia, **5** Intergovernmental Platform on Biodiversity and Ecosystem Services Secretariat, UN Campus, Bonn, Germany

ipbes

Science and Policy for People and Nature

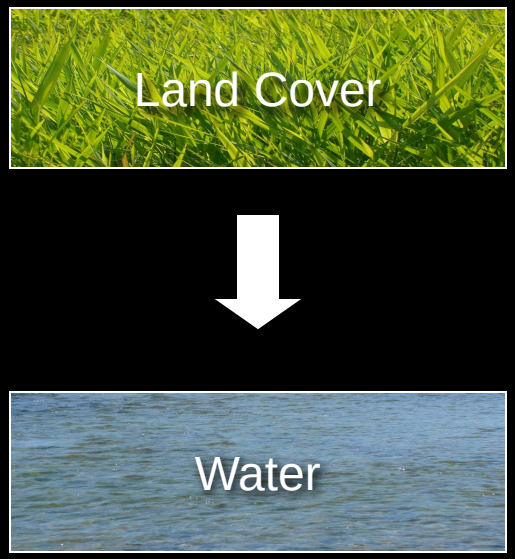
Ecosystems

Ecosystem services

People

Ecohydrologic Processes

Reduce runoff /sediment /nutrients



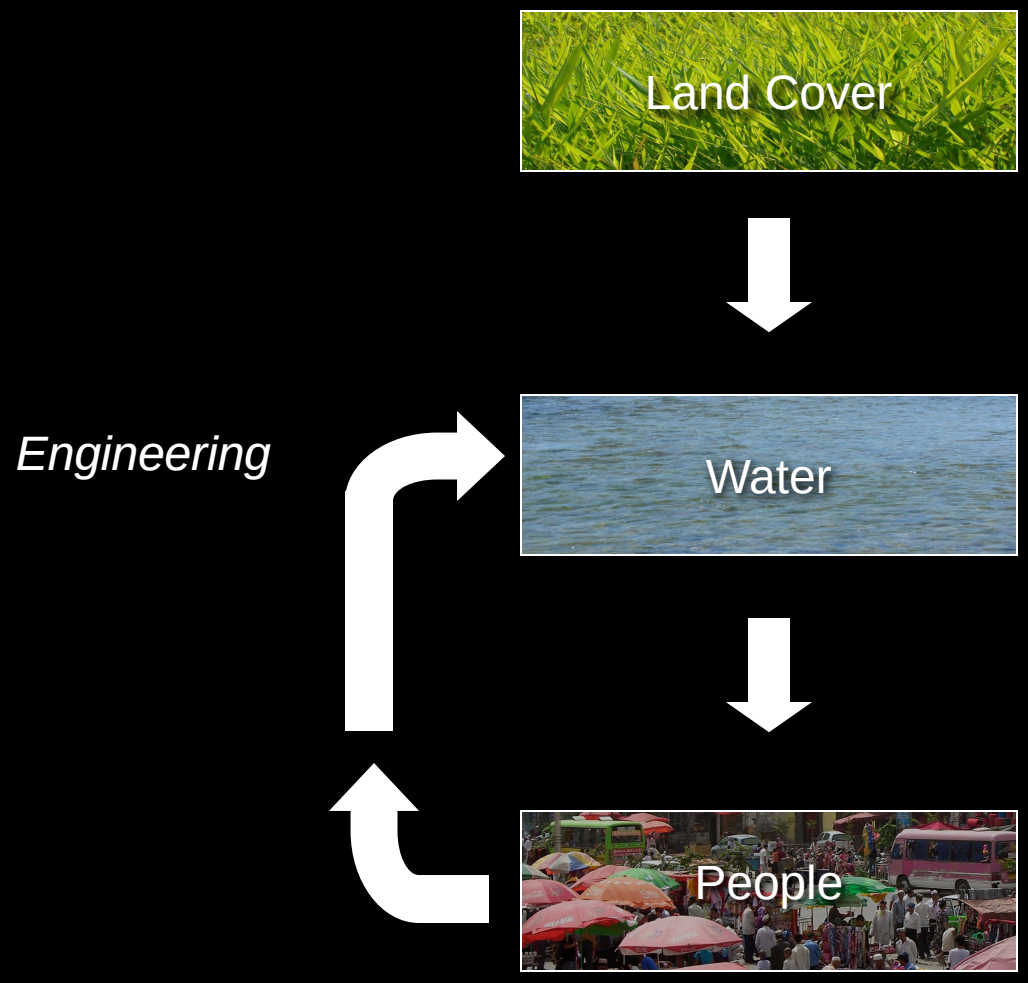
Adapted from Brauman (2015) WIREs Water

Ecohydrologic Processes ⟷ Hydrologic Services

Clean drinking water /
fish to catch /
clear water to swim in

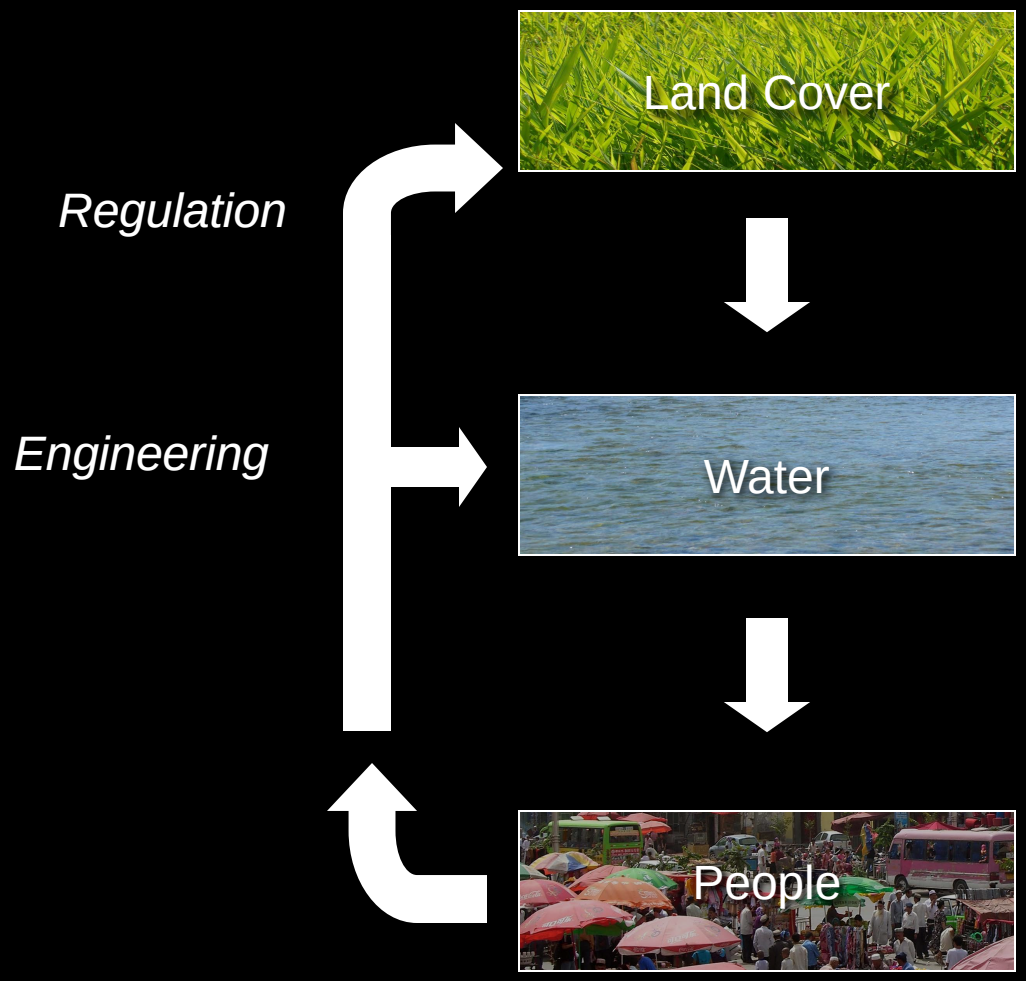
Adapted from Brauman (2015) WIREs Water

Direct Interventions: Fix the Water



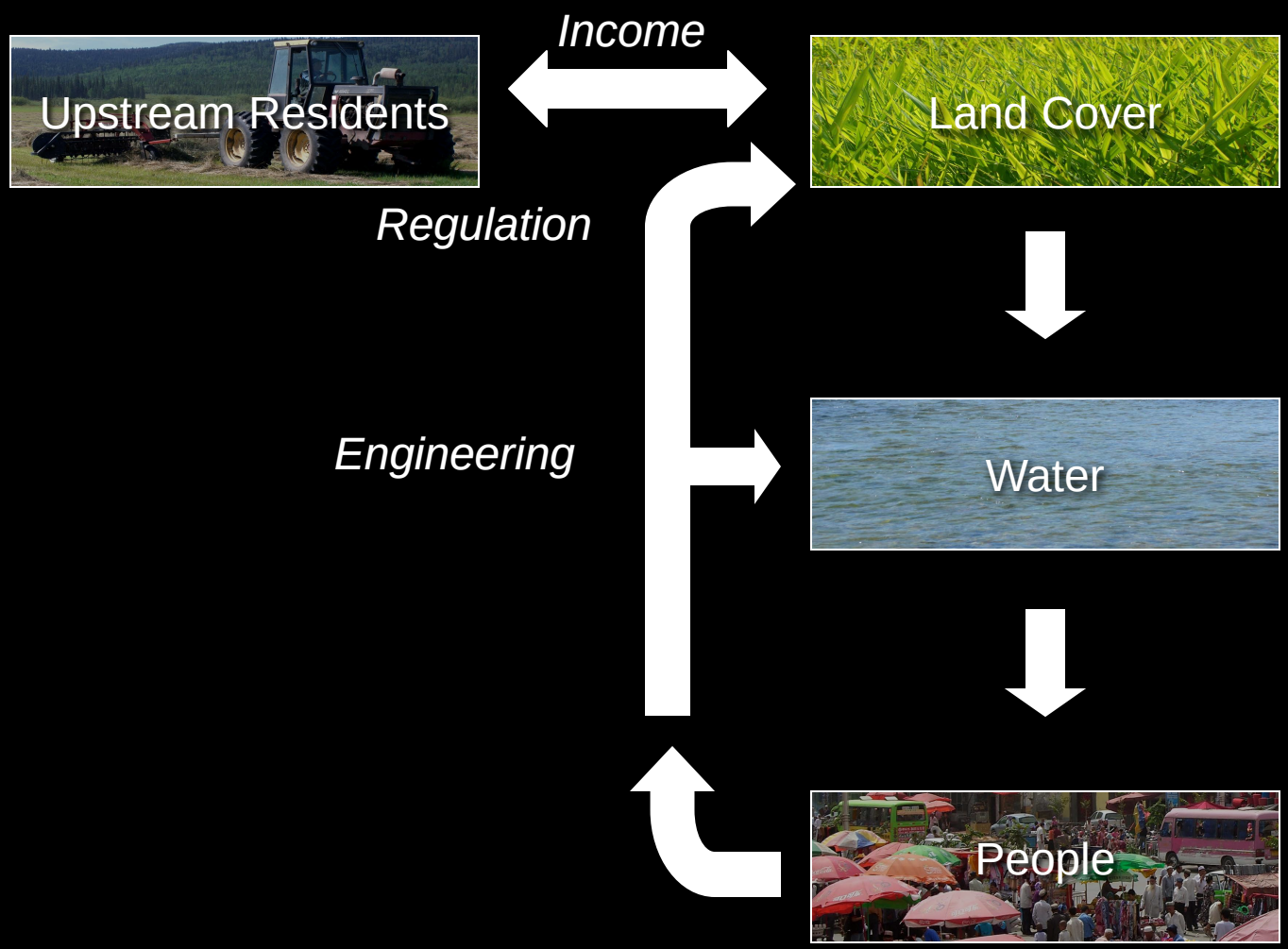
Adapted from Brauman (2015) WIREs Water

Direct Interventions: Stop the problem



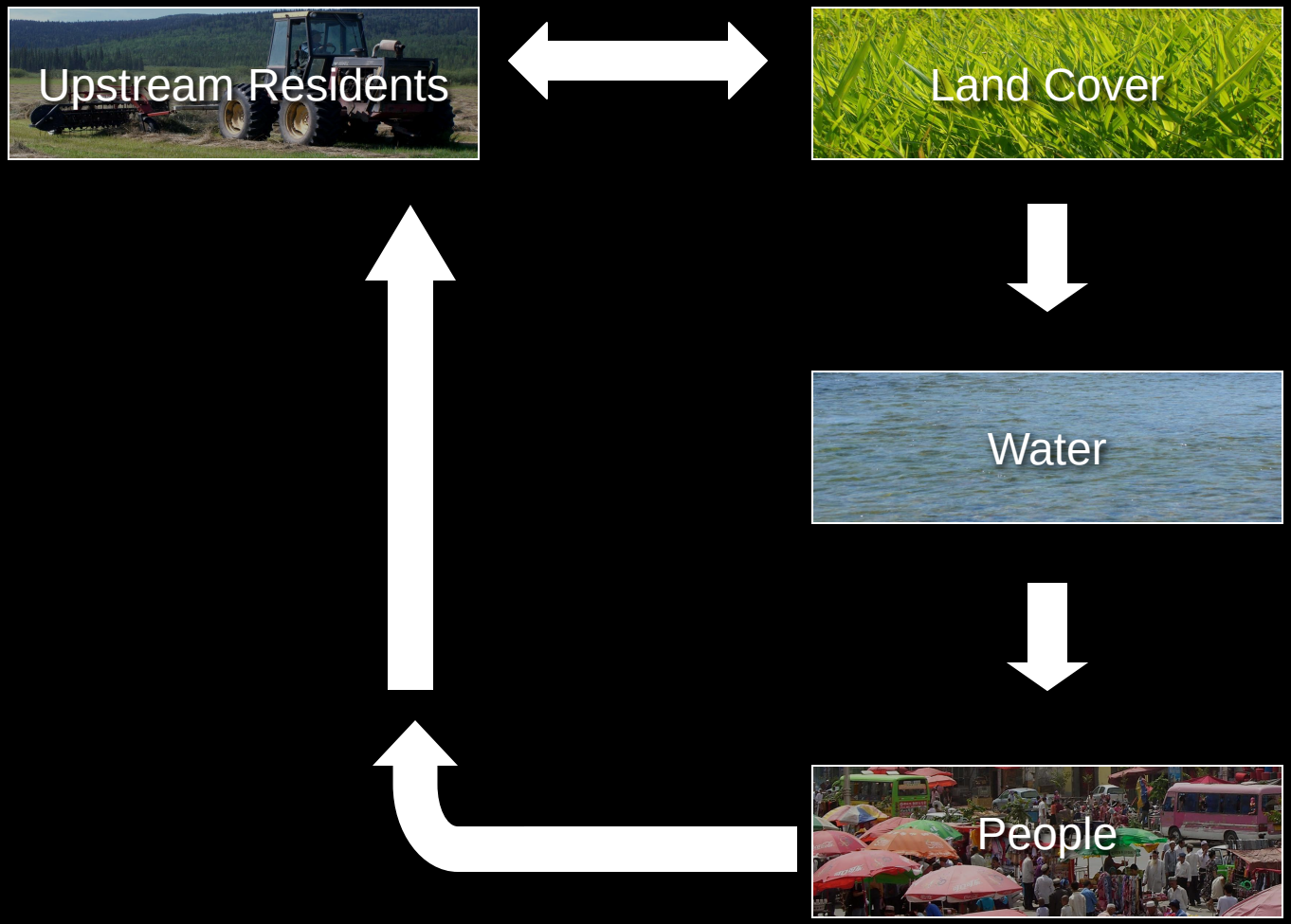
Adapted from Brauman (2015) WIREs Water

Decision Making



Adapted from Brauman (2015) WIREs Water

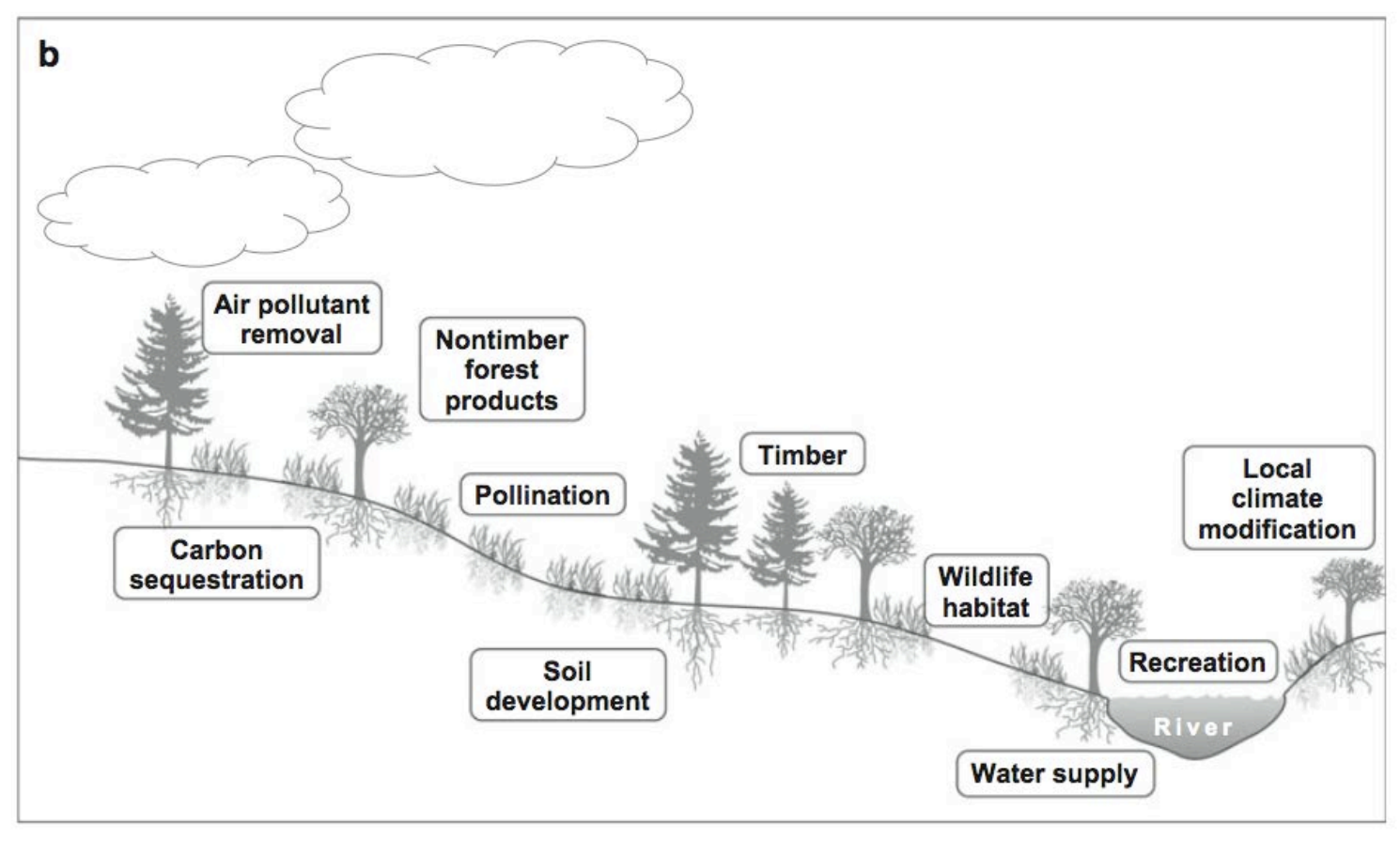
Hydrologic Services Connect Producers and Beneficiaries



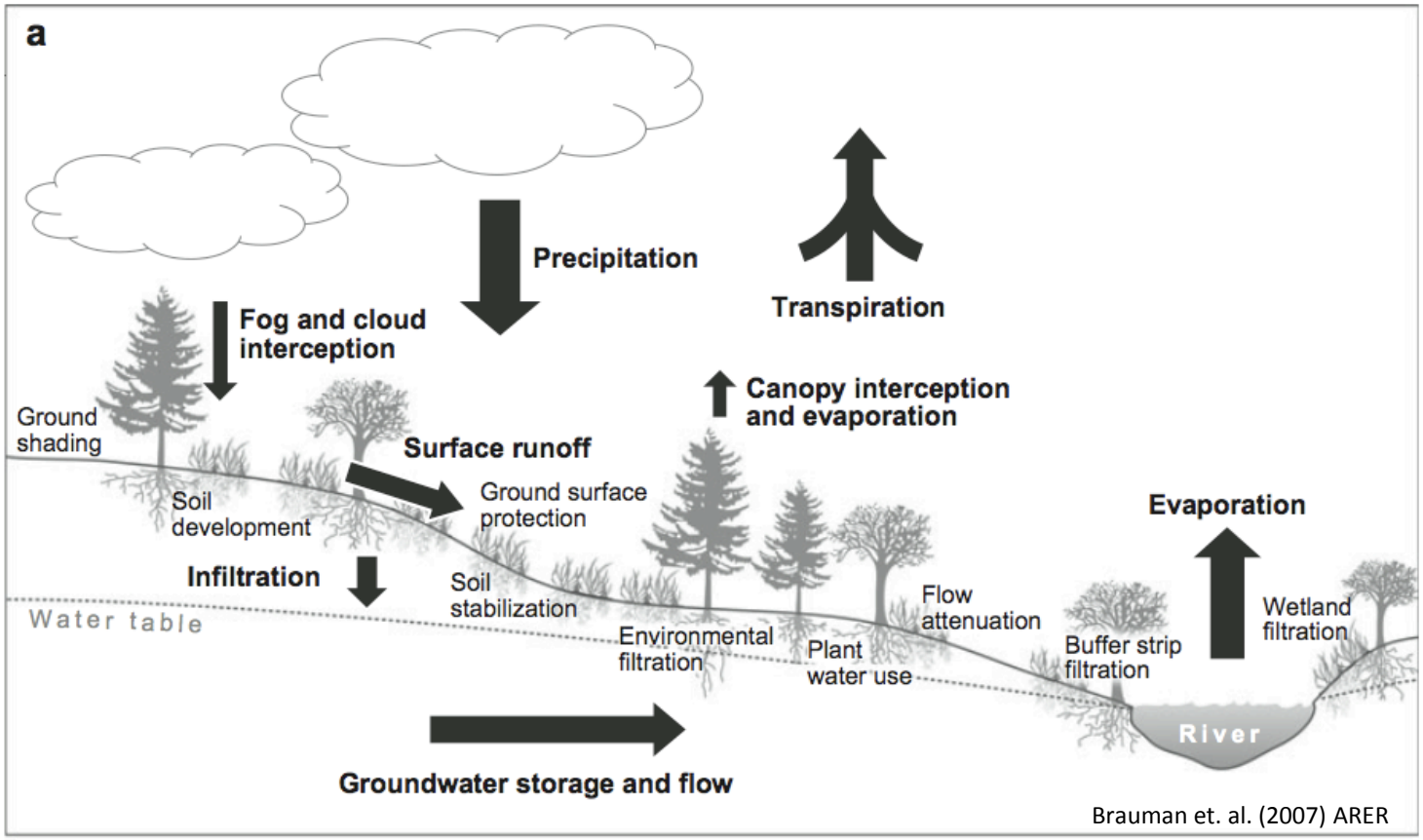
Adapted from Brauman (2015) WIREs Water

Desired Outcomes

Watershed Ecosystem Services



Ecohydrologic Processes



Brauman et. al. (2007) ARER

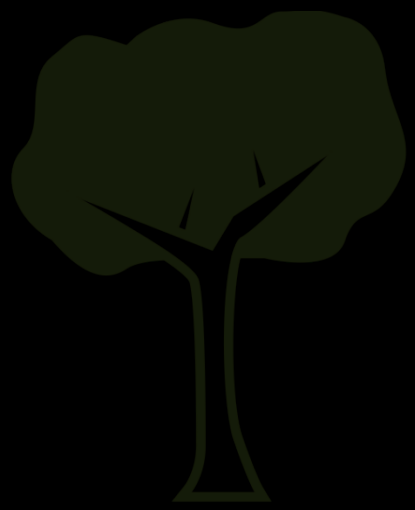
Ecosystem Services

- Why ecosystem services?
- What are ecosystem services?
- What are they good for?

Evaluate Change

$$\Delta$$

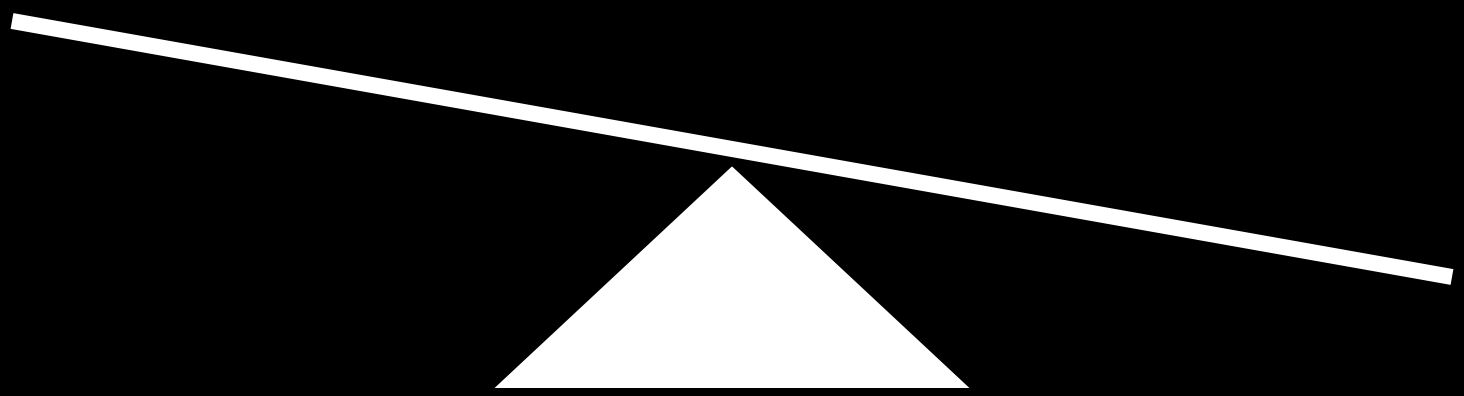
vs.



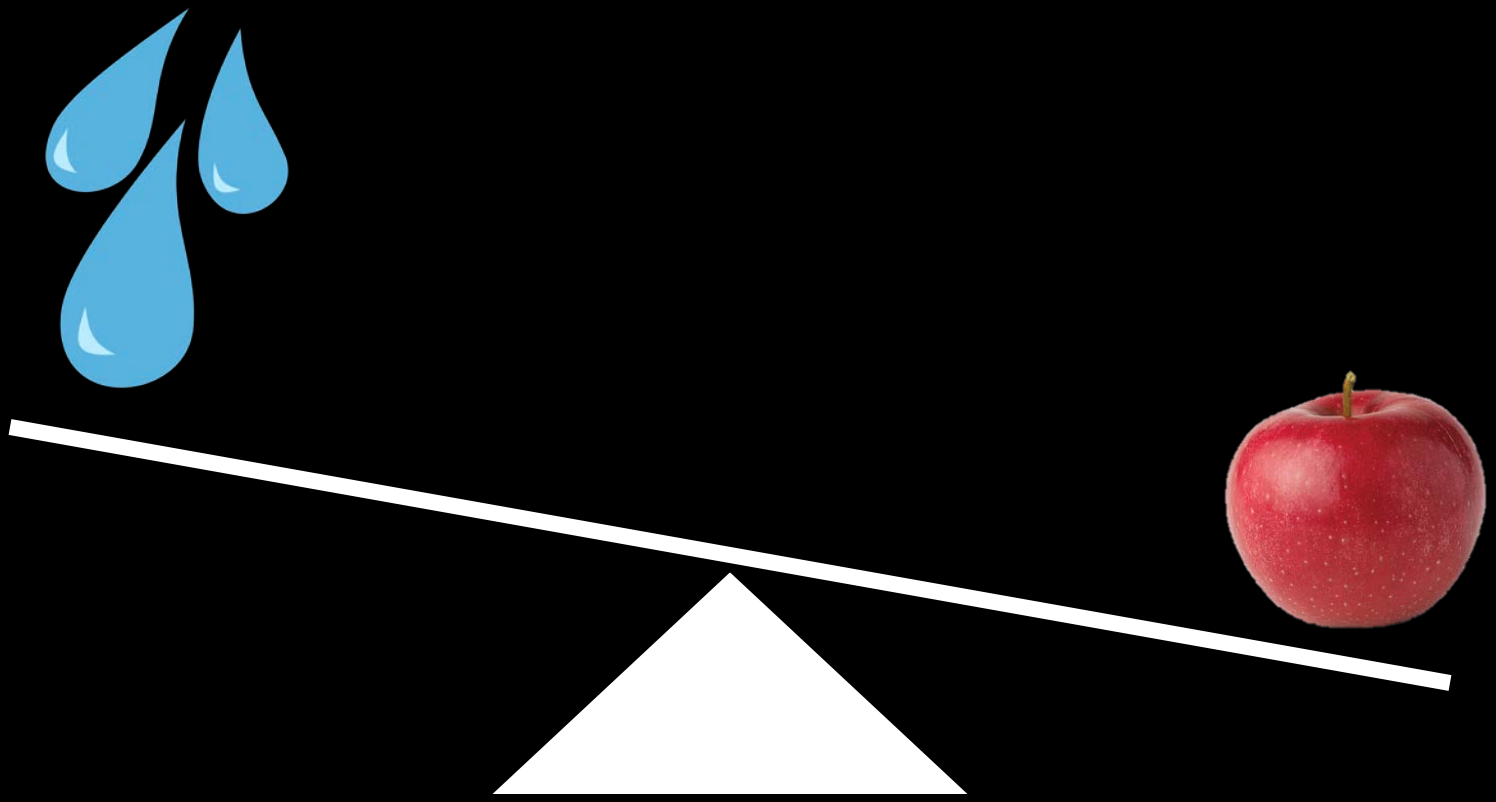
VS.

VS.

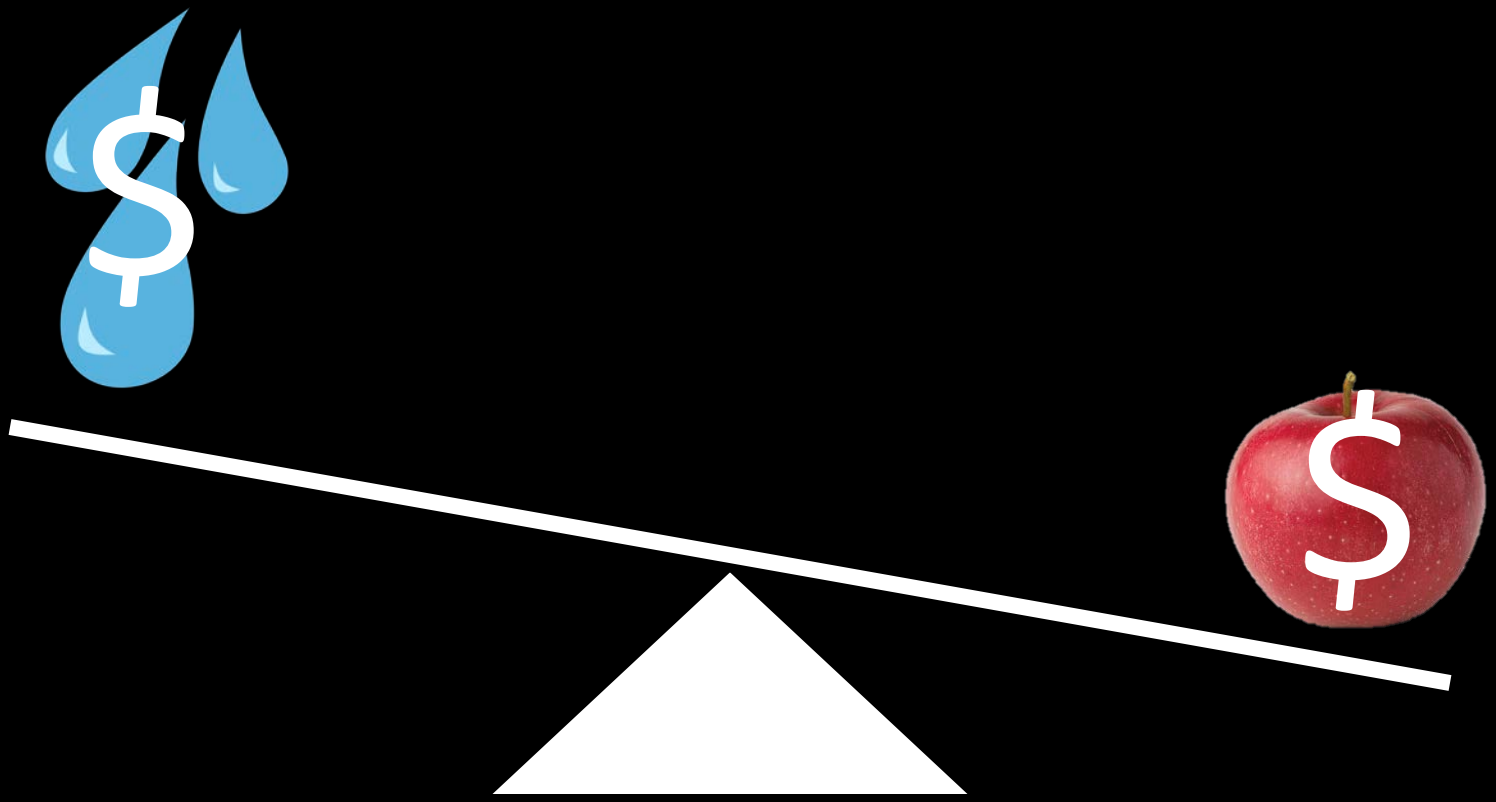
Assess Tradeoffs



Assess Tradeoffs



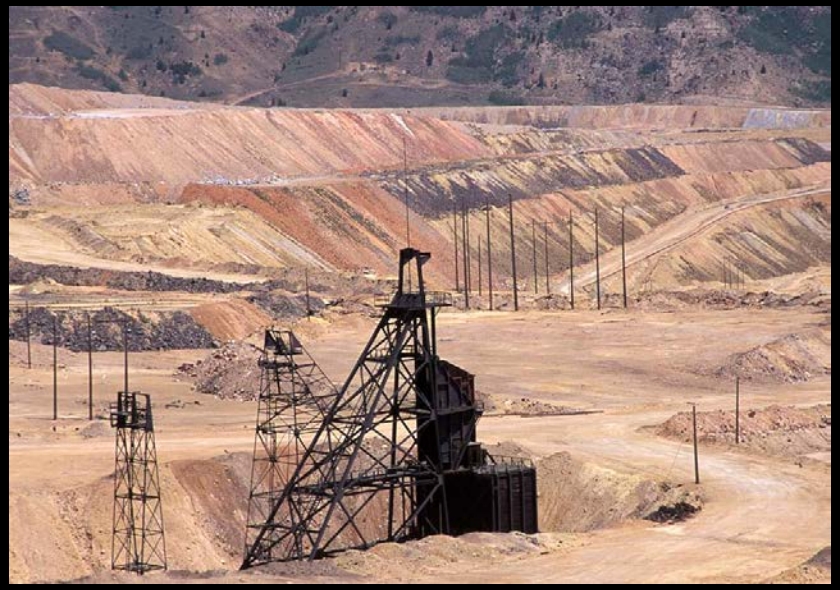
Assess Tradeoffs



Why monetary valuation?

Monetary valuation for:

- Cost benefit assessments
- Evaluating policies and regulations
- Strategic use
- Prioritizing protection or restoration



natural capital PROJECT

InVEST

integrated valuation of environmental services and tradeoffs

Are we making smart investments in clean water?

Valuing Conservation and Agricultural BMPs

Costs of Well Contamination

MPRnews Sections Members More

Crop switch could cost millions in water contamination

Mark Steil · Worthington, Minn. · Jul 10, 2014 Environment

The number of southeastern Minnesota household wells that are contaminated with potentially dangerous nitrates could increase by nearly 50 percent in coming years, a University of Minnesota study shows.

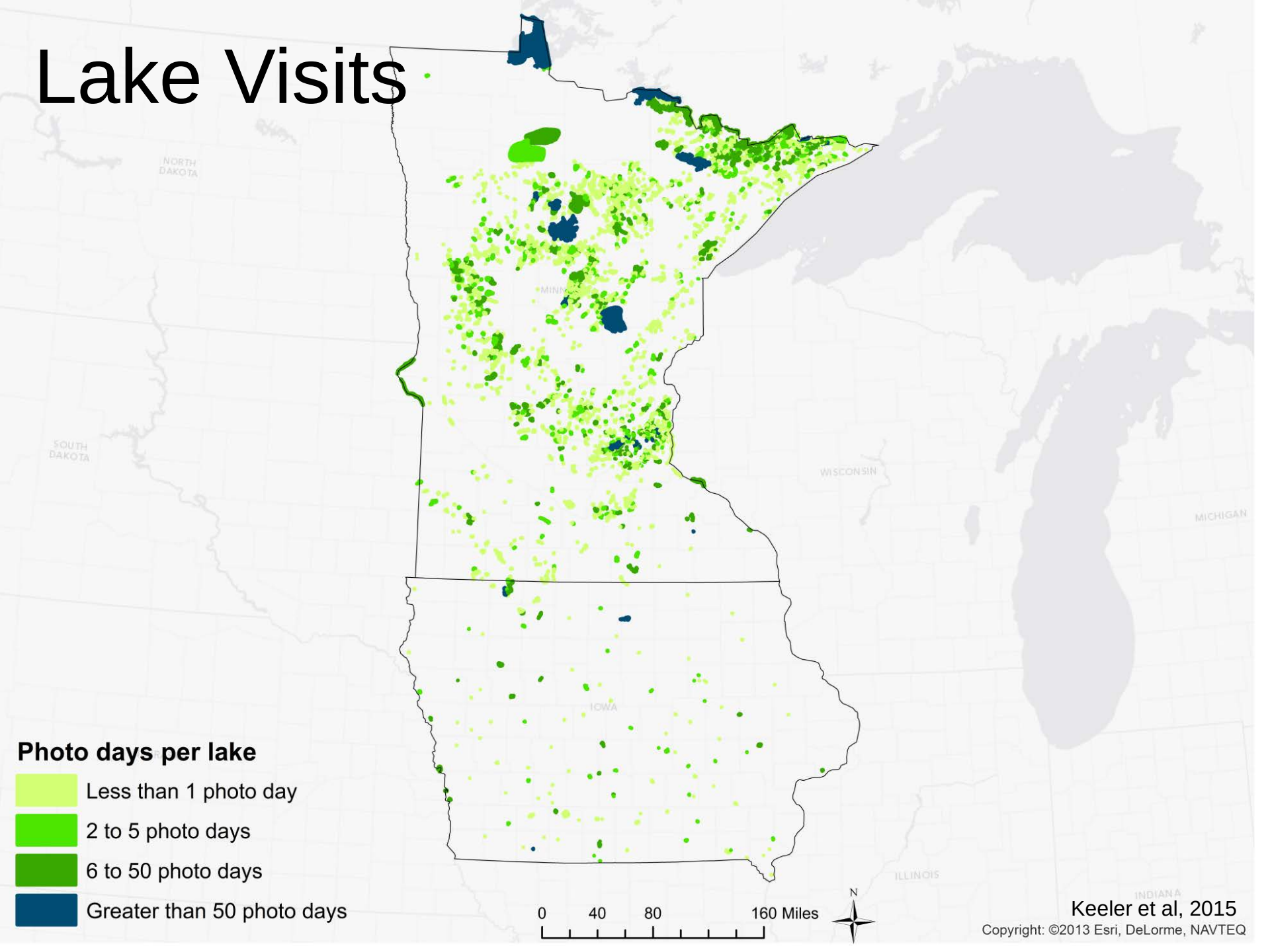
Plowing *MPR Photo/Mark Steil*

The potential problem stems from high grain prices in recent years that led farmers to convert grasslands to plowed fields, said researcher Bonnie Keeler, lead scientist at the university's Institute on the Environment. It could force homeowners and local governments to spend millions of dollars to treat their water, the report said.

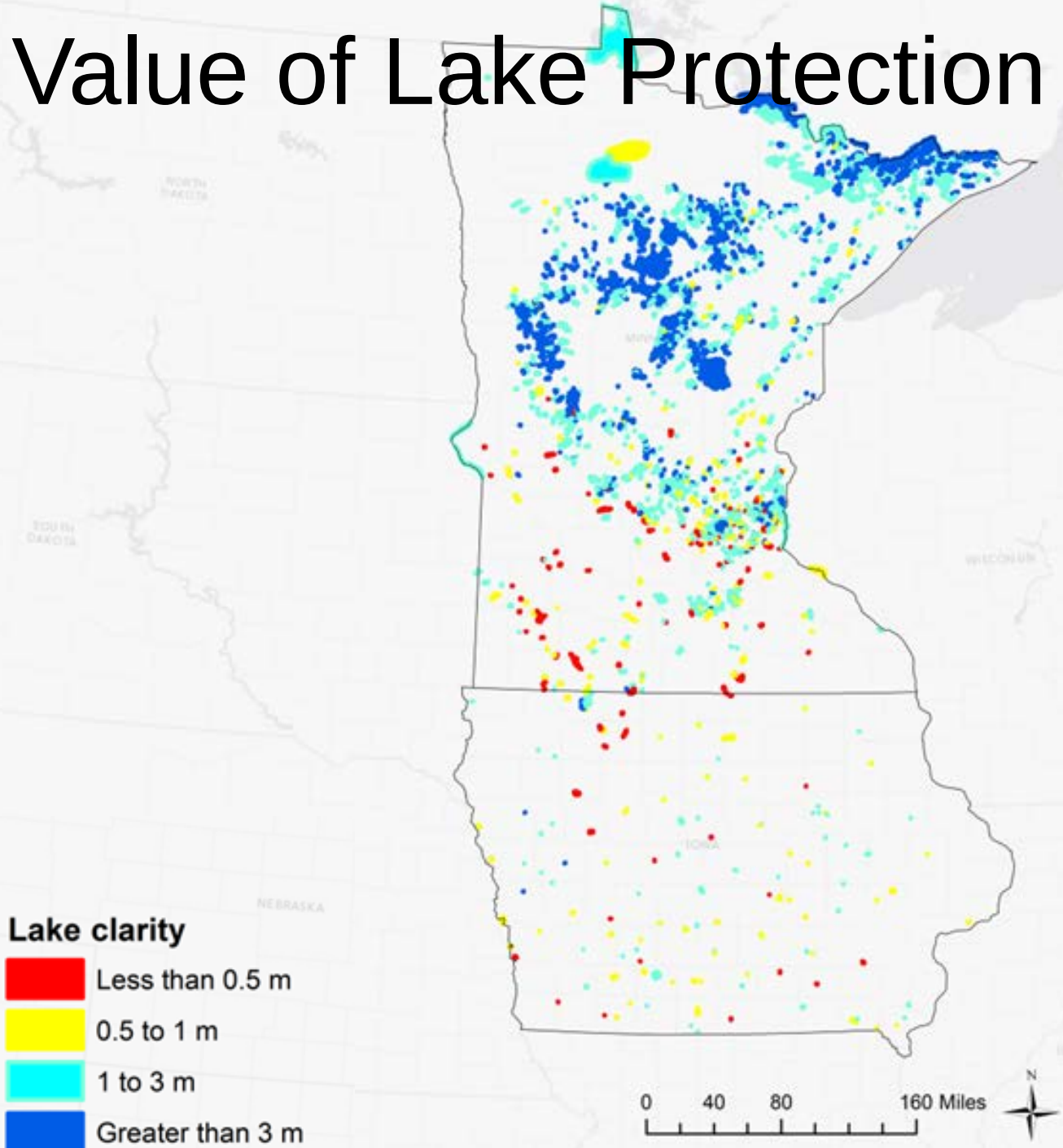
- **Beneath the Surface, a special Ground Level report**

Keeler and Polasky ERL 2014

Lake Visits


NORTH DAKOTA
SOUTH DAKOTA
WISCONSIN
MICHIGAN
IOWA
ILLINOIS
INDIANA
Photo days per lake
Less than 1 photo day
2 to 5 photo days
6 to 50 photo days
Greater than 50 photo days
0
40
80
160 Miles
N
Keeler et al, 2015
Copyright: ©2013 Esri, DeLorme, NAVTEQ

Value of Lake Protection



Keeler et al, 2015

Valuing Conservation and BMPs

Water Quality

- recreation
- drinking water
  - private wells
  - public water supply

Greenhouse Gases

- social cost of carbon

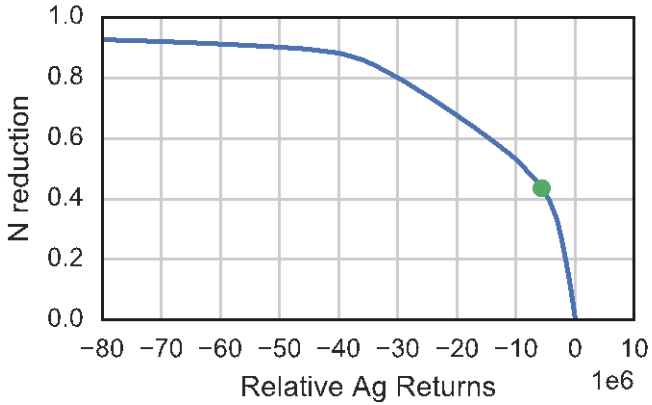
Air Quality

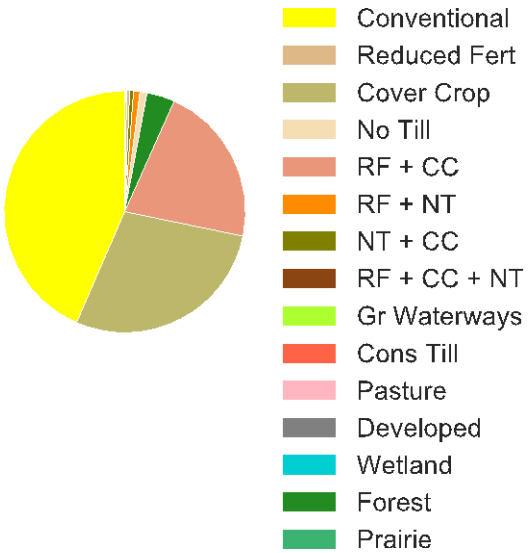
- public health costs

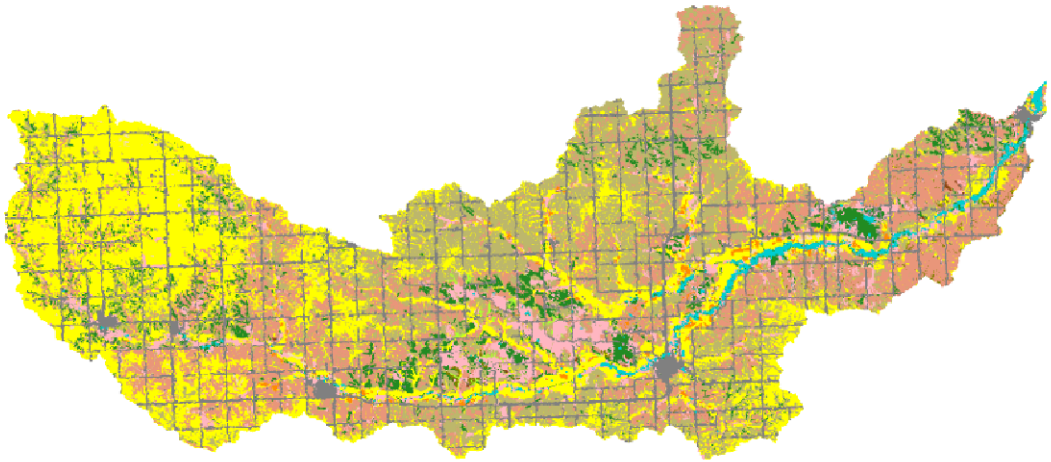
A land conservation payment of $1,300 yields public benefits of $1,700 to $6,400

Johnson et al. 2016

Private costs of conservation are high



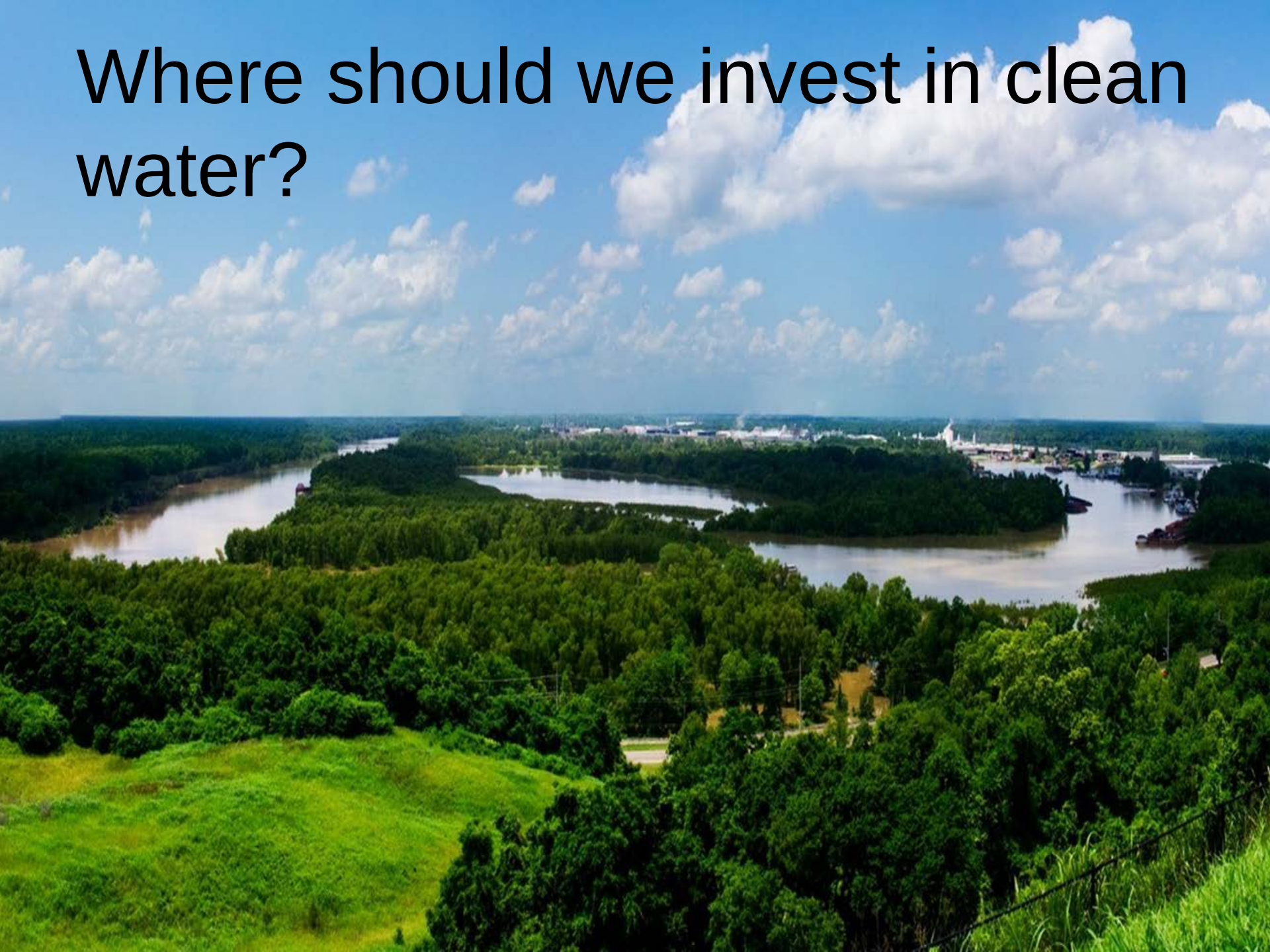




41% N Reduction = ~$4.8 million Annually

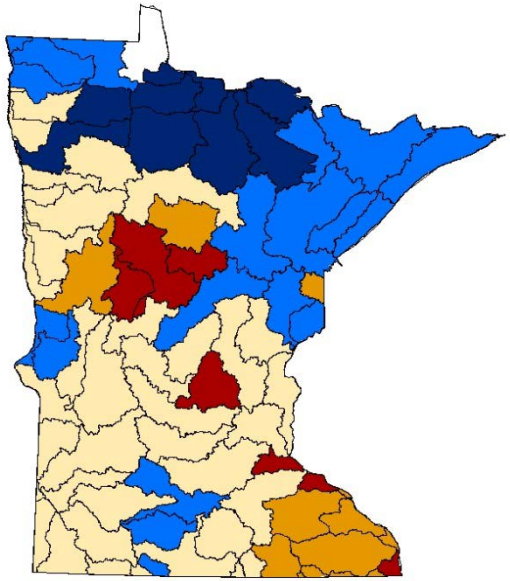
Johnson et al. 2016

Where should we invest in clean water?



That depends on what we value

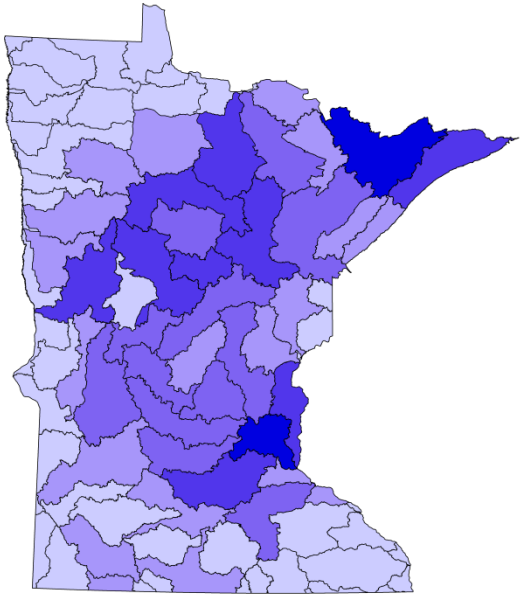
Drinking water



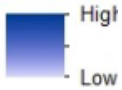
Level of Susceptibility to Groundwater Contamination

- Insufficient Data to Rank
- Lowest Susceptibility
- Low Susceptibility
- Medium Susceptibility
- High Susceptibility
- Highest Susceptibility

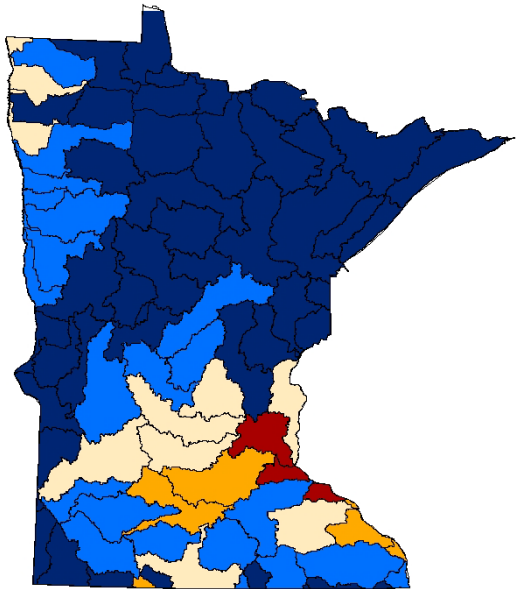
Recreational use value



Lake visitation by major watershed



Gulf hypoxia



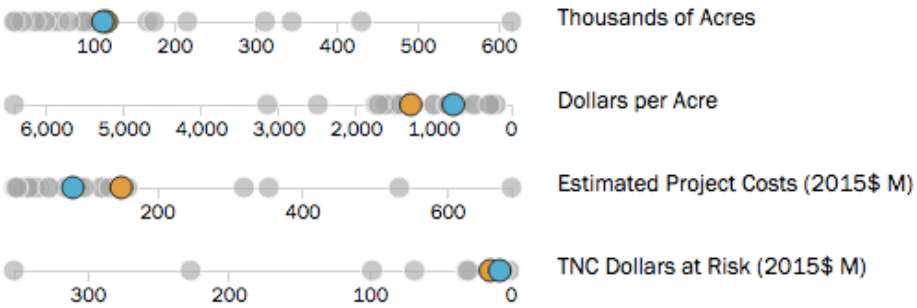
Level of Nutrient Delivery to Basin Outlet

- Lowest delivered load
- Low delivered load
- Medium delivered load
- High delivered load
- Highest delivered load

TNC Conservation ROI Dashboard

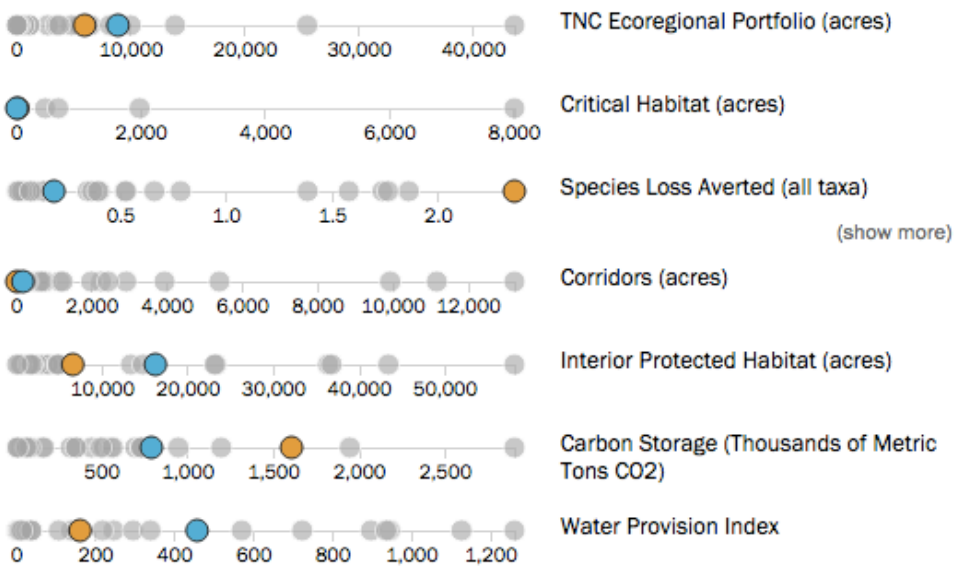
Conservation ROI Dashboard Project P

BUCKS & ACRES

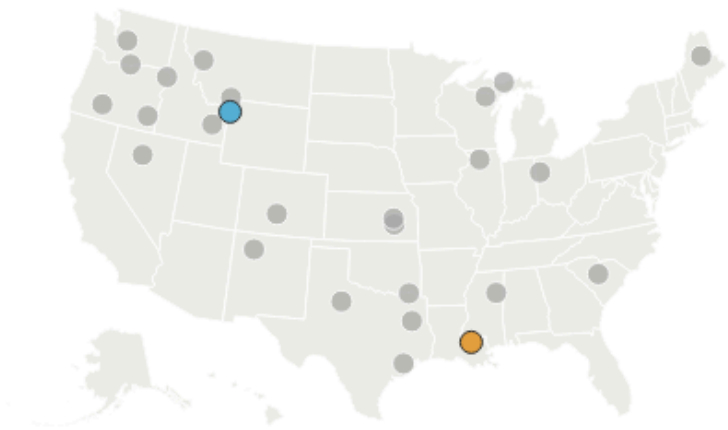


CONSERVATION ROI — PER TNC $ (M)

Per TNC $ (M)

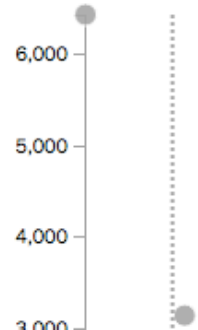


PROJECT LOCATION



EXPLORE BENEFITS & THREATS

Select variables using dropdowns below to plot projects. Dotted lines represent median values for each variable.



Engaging new audiences

KOHL'S
expect great things

StarTribune

New fund aims to protect Mississippi headwaters while they're still clean

The Minnesota Nature Conservancy is launching the $10 million fund.

By **Josephine Marcotty** Star Tribune | SEPTEMBER 11, 2015 — 9:33PM

BRIAN PETERSON

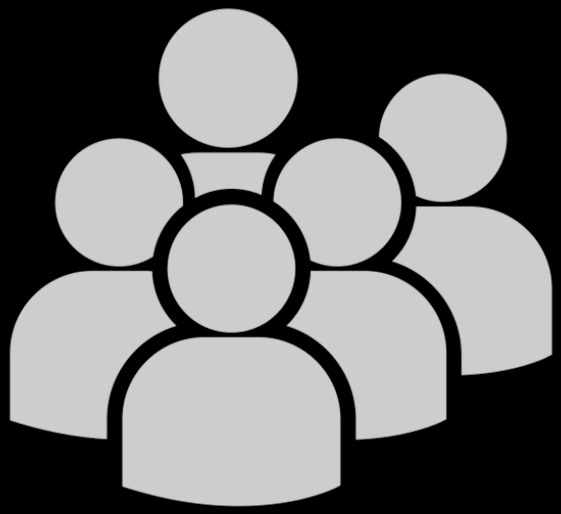
The Nature Conservancy is launching an effort to maintain water quality in rivers like the Mississippi, here as dawn breaks at its headwaters in Itasca State Park.

The Minnesota Nature Conservancy is launching a $10 million fund dedicated to showing that the best way to protect the Mississippi River and the Twin Cities' drinking water is to use nature itself.

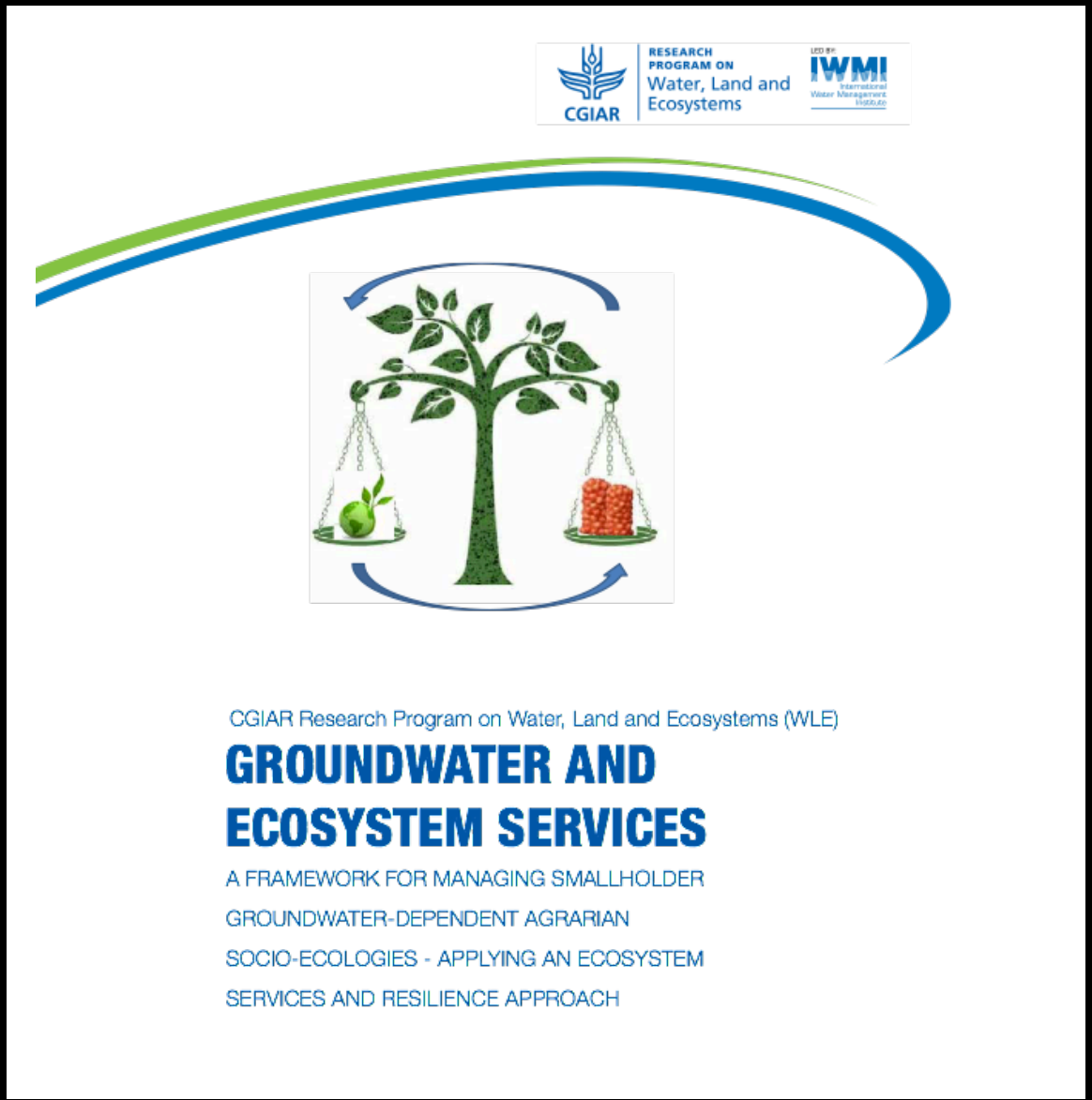
The Upper Midwest chapter of the international conservation organization on Friday announced the creation of the private Minnesota Headwaters Fund. Over the next three years it will raise money to pay for targeted protections, such as conservation easements and streambank protections, around the four rivers that are the Mississippi's primary tributaries: the Crow Wing, the Pine, the Sauk and the Rum.

Ecolab Inc., a Minnesota-based water technology company, was the first to donate, with a contribution of $500,000. The money will be used to keep forested land in its natural state, restore wetlands and flood plains, and protect stream banks.

Accounting for people

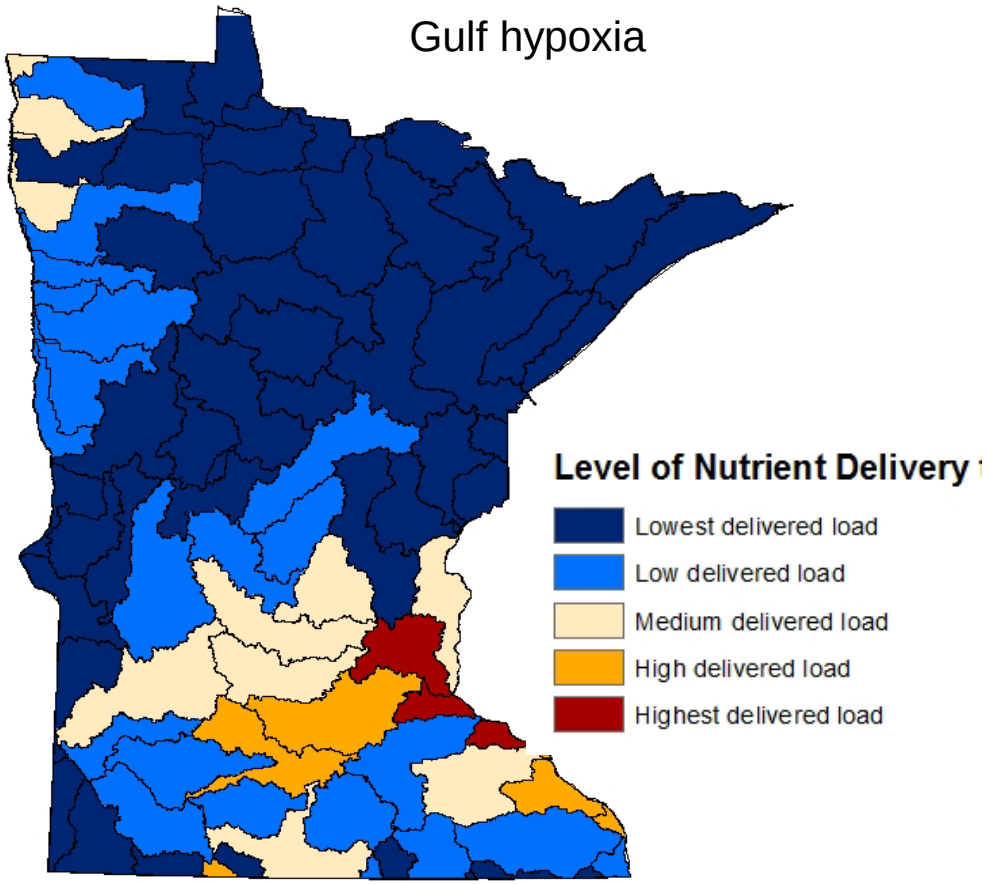


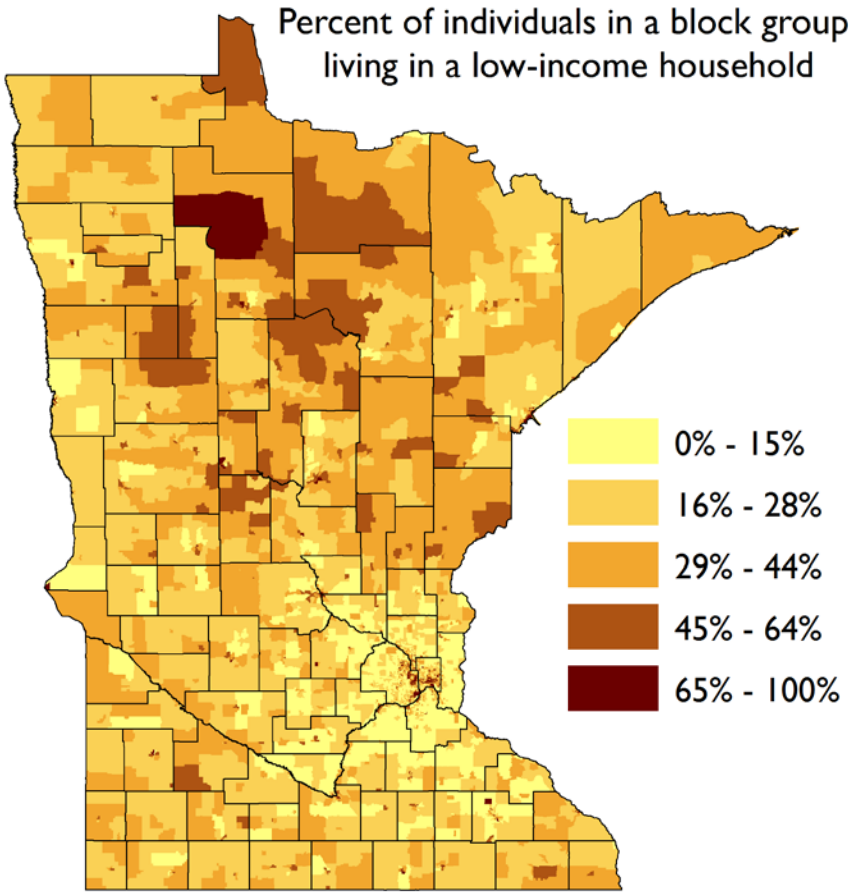
People affected in unaccounted for ways



People affected in ways hard to quantify monetarily

People affected by impacts and interventions





Ecosystem Services

- Why ecosystem services?
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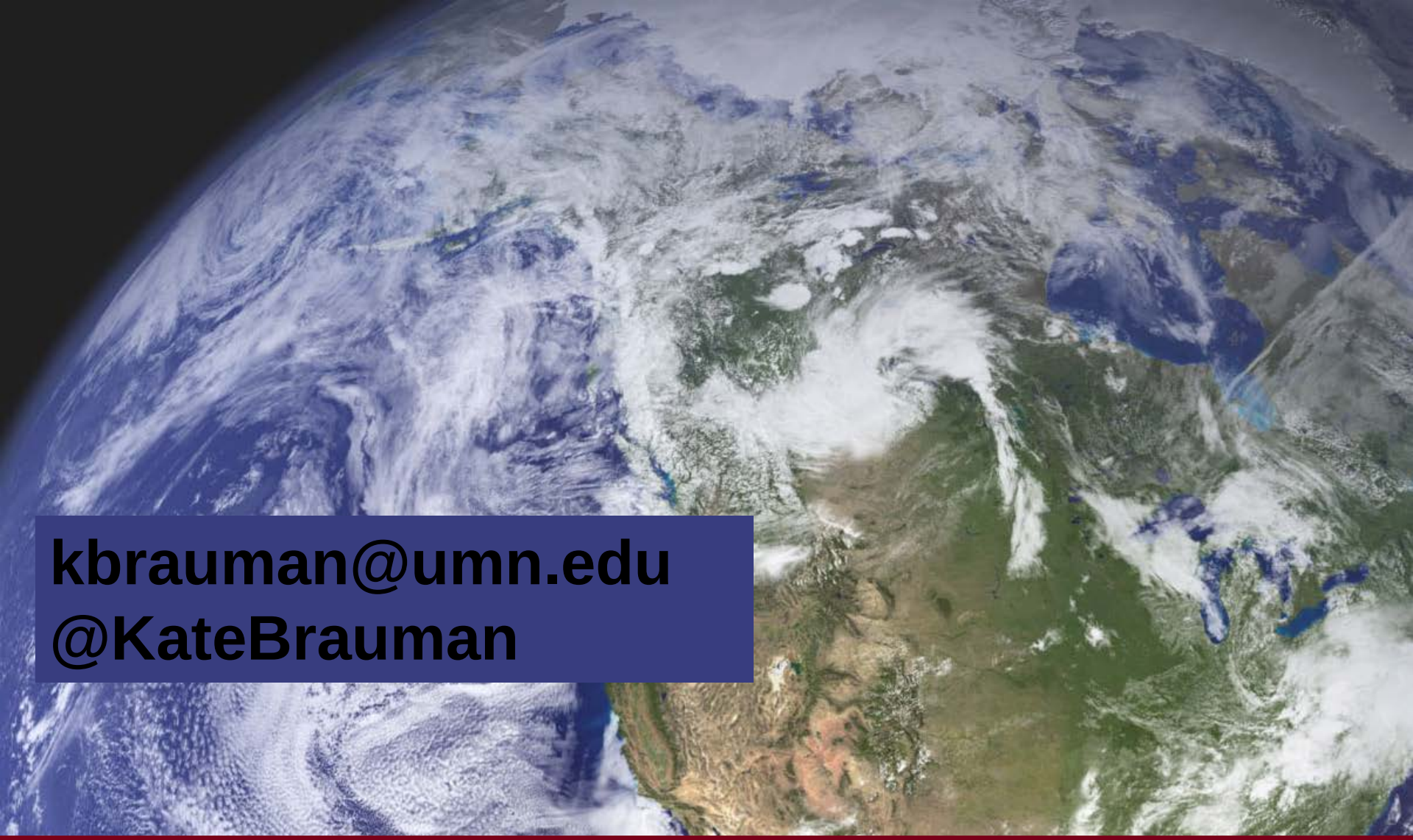
Ecosystem Services

- Motivate and explain our work
- Systematic and transparent accounting
- Impact evaluation and strategic siting
  - That takes everyone into account



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