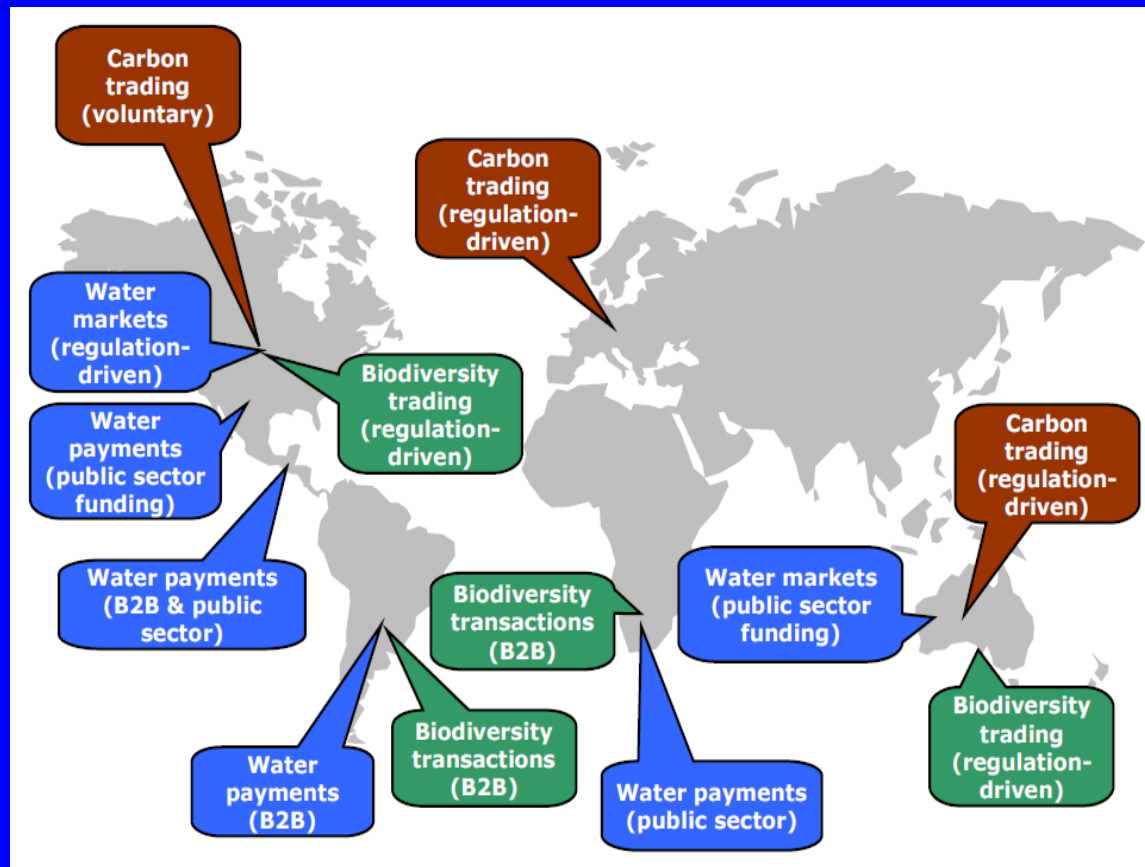


# A Global Assessment of Payments for Ecosystem Services



*James Salzman*

*UCLA Law School*

*UCSB Bren School of the Environment*

# Ecosystem Services

“The conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life”

– Daily 1997



## *Translocation*

**Pollination**

**Seed dispersal**



## *Stabilizing*

**Pest control**

**Climate regulation**

**Mitigating droughts**

**Flood control**

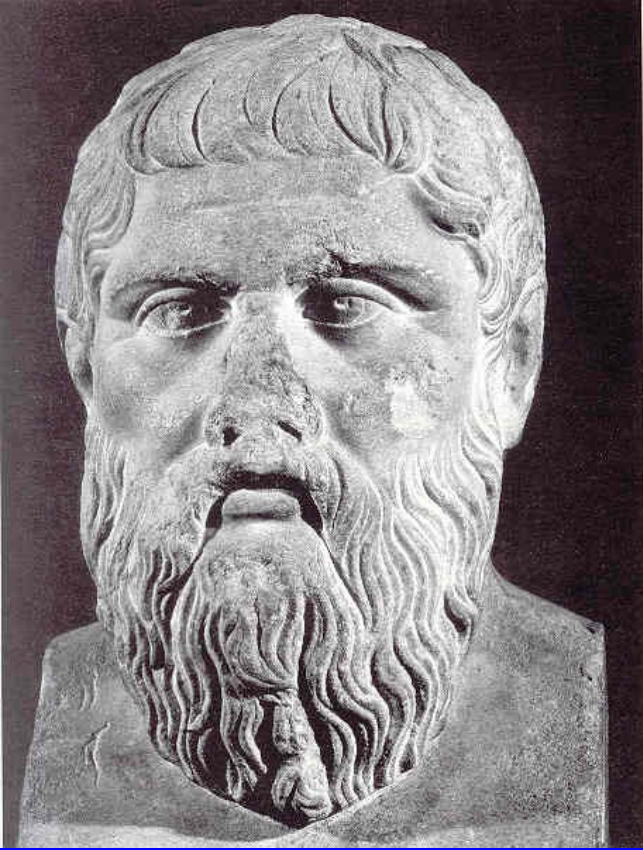


## *Cycling and Filtration*

**Water purification**

**Waste degradation**

**Soil fertility**



What now remains of the formerly rich land is like the skeleton of a sick man with all the fat and soft earth having wasted away and only the bare framework remaining...

The soil [used to be] deep, it absorbed and kept the water..., and the water that soaked into the hills fed springs and running streams everywhere.

**Plato (~400 B.C.)**

# Why Such Poor Protection of Services?

- **Ignorance**

- Services taken for granted
- Biophysical provision poorly understood

# Production of Goods

- Food
- Pharmaceuticals
- Energy
  - e.g., biomass
- Industrial products
  - waxes, oils, fragrances, dyes, latex, rubber, etc.
- Durable materials
  - precursors to many synthetic products
- Genetic resources



# Why Such Poor Protection of Services?

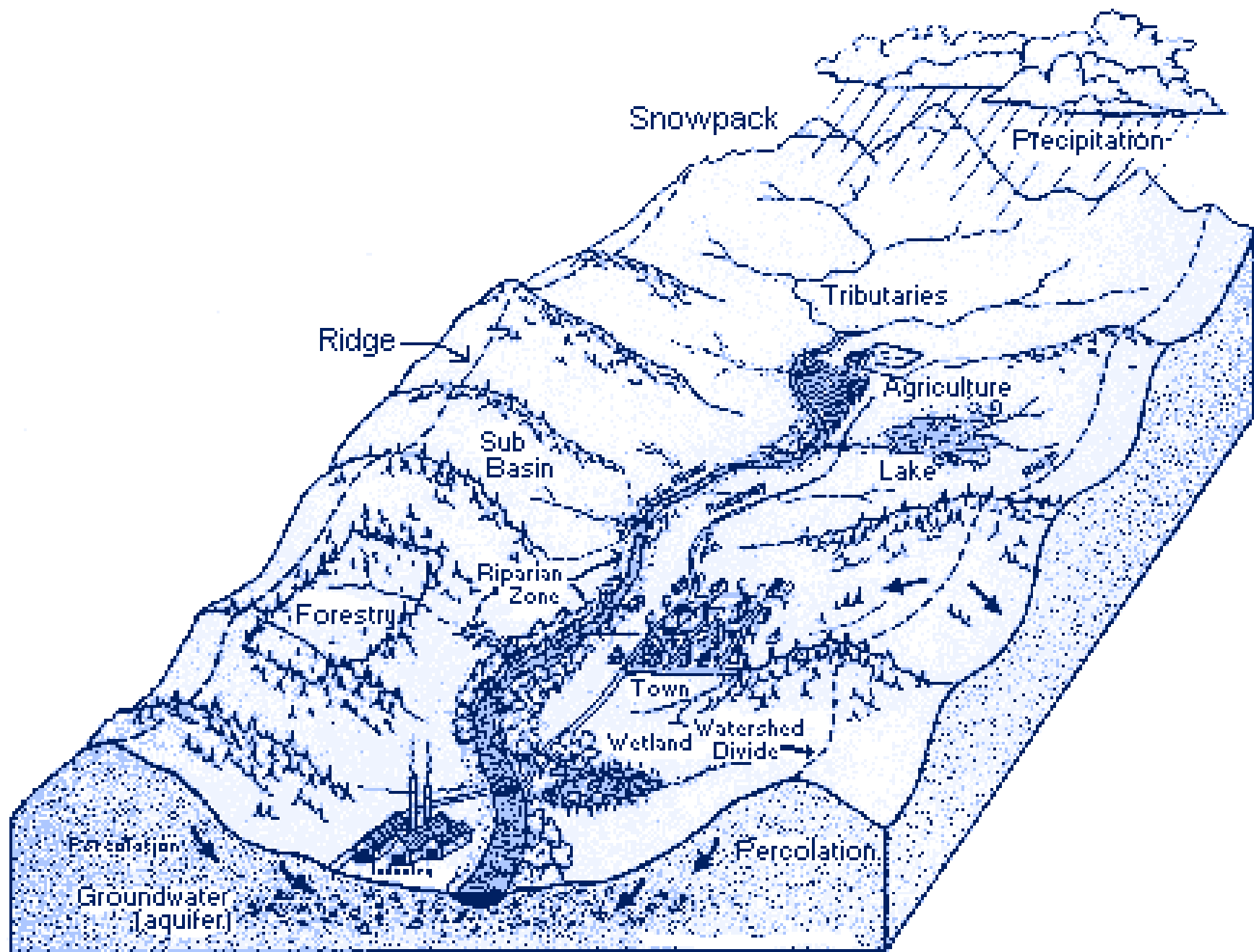
- **Market Failure**

- Few markets for public goods and services
- Current price signals don't indicate sufficient value to encourage protection and provision of services
- Value is landscape-specific
- Scarcity triggers action too late

# Why Such Poor Protection of Services?

- **Institutional Failure**

- Policies and institutions do not encourage or value management of ecosystems for service provision
- Ecological and political boundaries rarely overlap
- Challenge of extending authority beyond traditional institutional boundaries





# The Government Policy Toolkit

## The 5 P's

- **Prescription**
- **Property**
- **Penalties**
- **Persuasion**
- **Payment**

# The Policy Toolkit -- The 5 P's

## Water Quality from Farm

- **Prescription**
  - regulations requiring riparian fencing
- **Penalties**
  - fines per metre of unfenced streambank
- **Property**
  - tradable right to have % unfenced streambank
- **Persuasion**
  - pilot projects with fenced streambanks

# The Policy Toolkit -- The 5 P's

## Water Quality from Farm

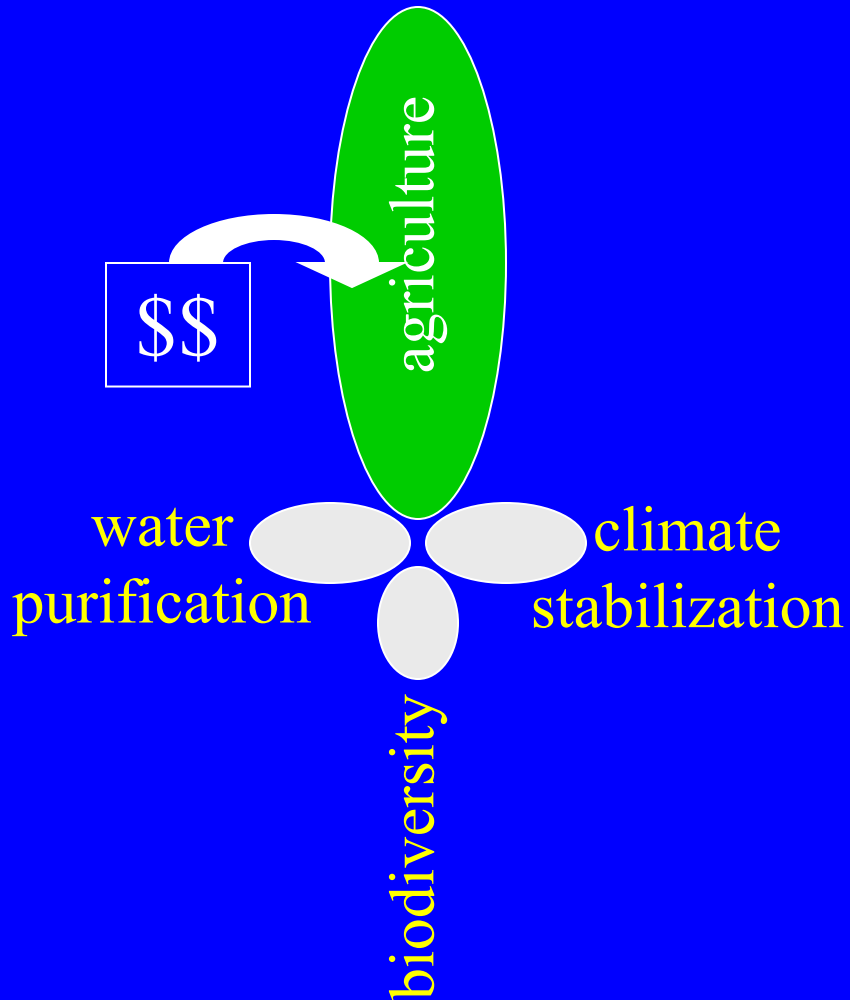
- **Payment for services rendered**
  - treat farmers' provision of ecosystem services as no different than their provision of other marketable goods
- **Why not pay farmer to manage land through riparian buffers and “grow the crop of water quality” much the same as dairy and spud farmers do for their cash crops?**

# **Payments for Ecosystem Services (PES)**

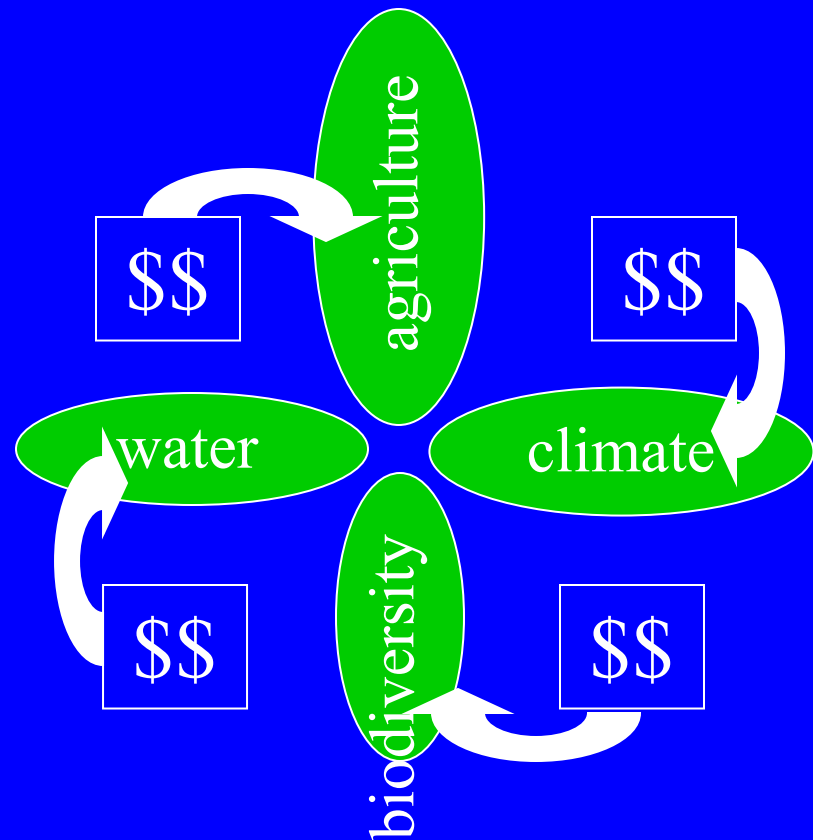
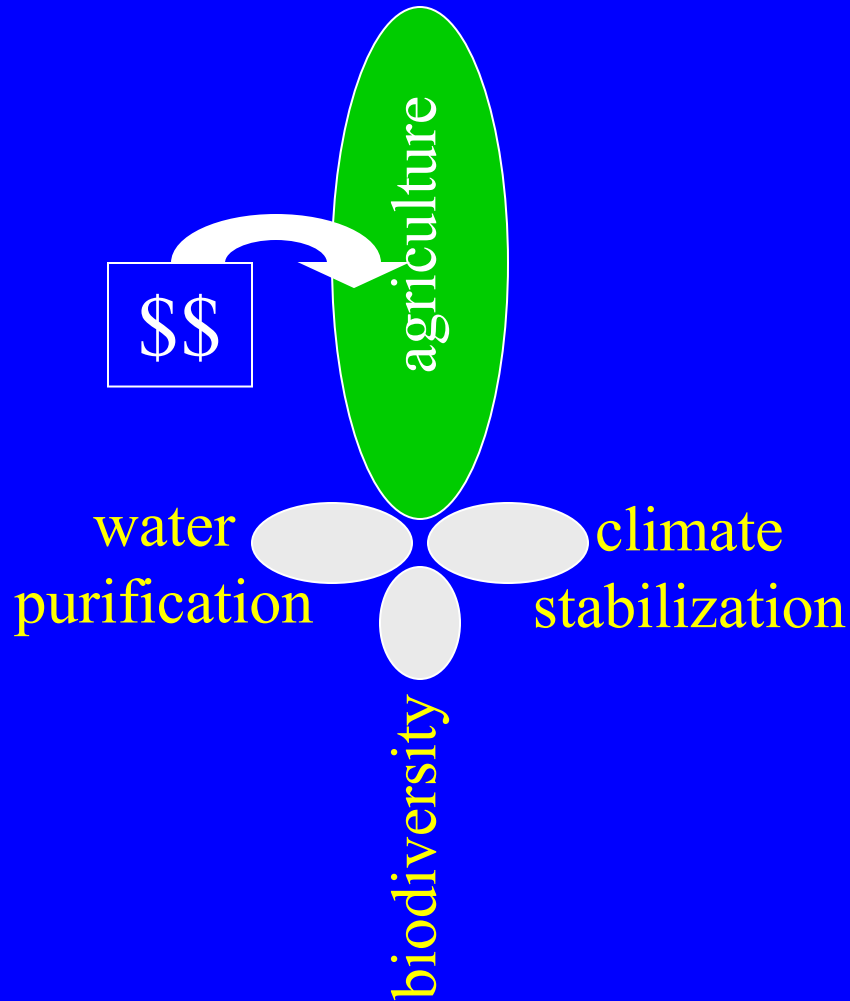
The exchange of value for land management practices intended to provide or ensure ecosystem services



# Joint Products of Ecosystems



# Joint Products of Ecosystems



# PES Categories

## User-financed PES

ES beneficiaries (Individuals NGOs, companies ) pay landholders  
ES protection, enhancement or re-establishment

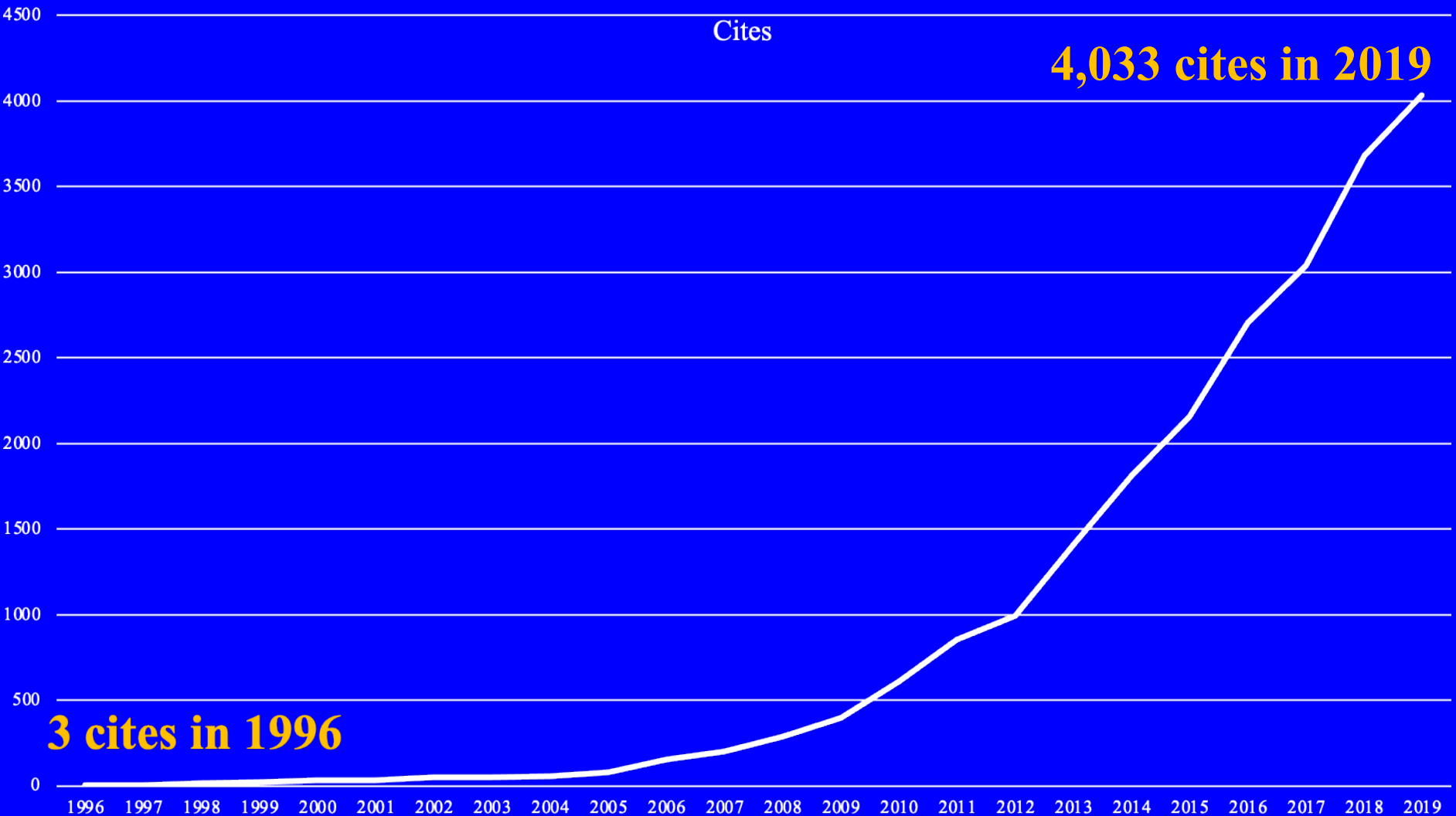
## Government-financed PES

Public payments on behalf of beneficiaries

## Compliance PES

Parties required to compensate other parties for activities that maintain or enhance comparable ES for credit or offset that satisfies their mitigation requirements.

# Rapid Rise of Interest in PES



**The  
Economist**

APRIL 23RD-29TH 2006

[www.economist.com](http://www.economist.com)

Habemus Benedict XVI

PAGE 49

The China question

PAGES 12, 29 AND 41

The stockmarket's April stumble

PAGE 71

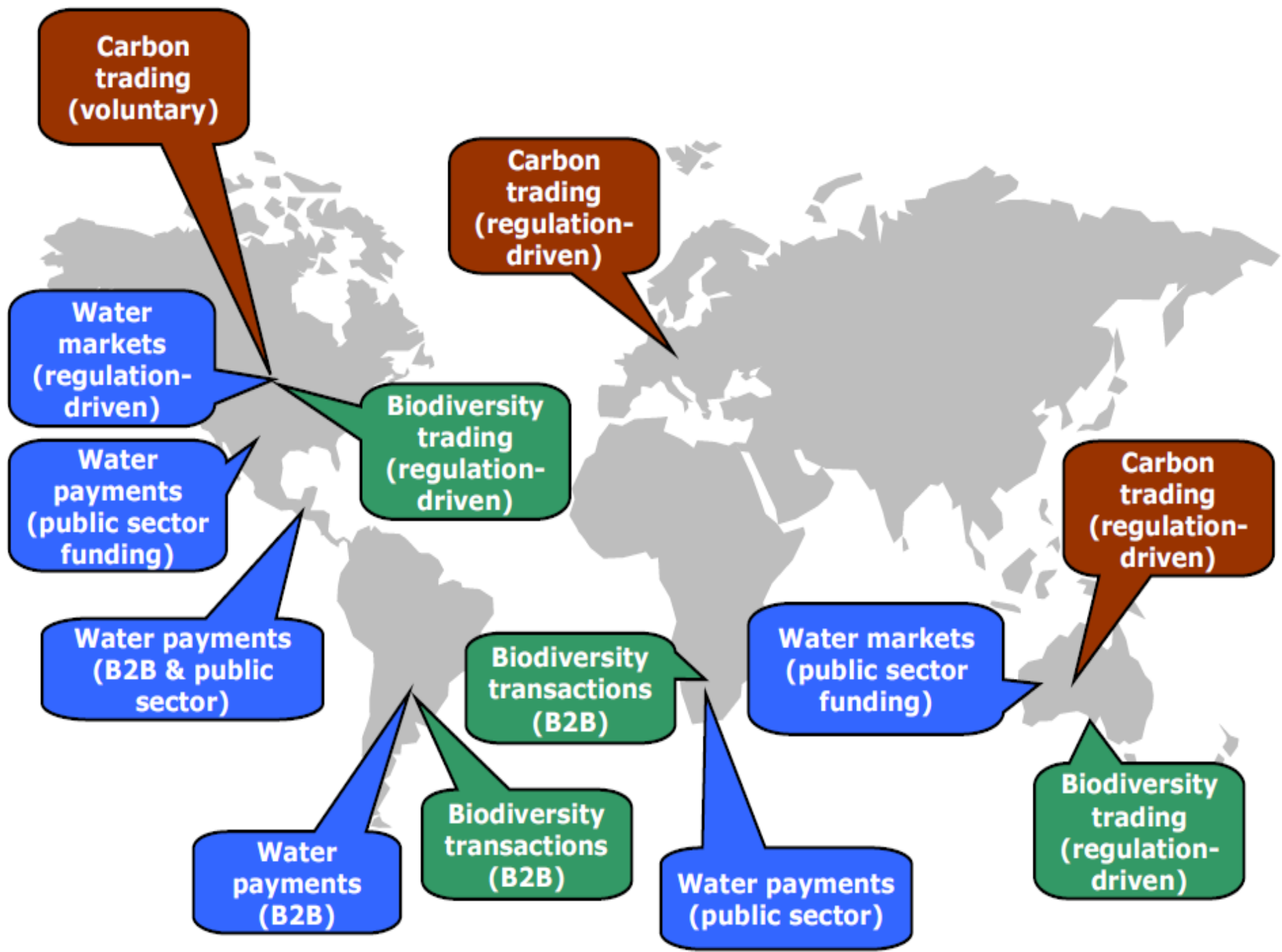
Republicans, Abe and Condi

LEXINGTON, PAGE 16

# Rescuing environmentalism (and the planet)



<b>PES Transaction Type</b>	<b>Sector</b>	<b>Dominant Payment Model</b>
Public payment for water services (PWS)	Water	Public Finance
Instream buybacks	Water	Bilateral Deals
Trading & Offsets	Water	Credit Trading
Bilateral PWS	Water	Bilateral Deals
Wetland Mitigation	Biodiversity	Bilateral Deals Credit Trading
Biodiversity Mitigation	Biodiversity	Bilateral Deals Credit Trading
Voluntary Biodiversity Offsets	Biodiversity	Bilateral Deals
Compliance Forest Carbon	Carbon	Offset Trading
REDD+ Finance	Carbon	Public Finance
Voluntary Forest Carbon	Carbon	Offset Trading
Certified Commodities	All	Certification and Standards



**Carbon trading (voluntary)**

**Carbon trading (regulation-driven)**

**Water markets (regulation-driven)**

**Water payments (public sector funding)**

**Water payments (B2B & public sector)**

**Water payments (B2B)**

**Biodiversity trading (regulation-driven)**

**Biodiversity transactions (B2B)**

**Biodiversity transactions (B2B)**

**Water payments (public sector)**

**Water markets (public sector funding)**

**Carbon trading (regulation-driven)**

**Biodiversity trading (regulation-driven)**

# What has really happened?

- How has PES evolved across the globe and across different sectors?
- How much can we move beyond “anecdotal”?
- What are the likely trajectories for PES sectors?
- Do we know if PES has worked (and how would we know)?





PES

TOP STORY



## Fifteen Years Of Warnings Were Ignored Before Recent Asháninka Assassinations

Last week's assassination of Peruvian indigenous leader Edwin Chota and three other indigenous leaders took much of the world by surprise, but Asháninka leaders and human rights campaigners active along the Peru/Brazil border had been warning of the danger that illegal loggers posed since 1999. [\[ Go To Article \]](#)



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### Charting New Waters

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BIODIVERSITY HOMEPAGE



### State of Biodiversity Markets

[Biodiversity Markets Homepage](#)

INTERVIEW



## Reflections and Experiences from No Net Loss of Biodiversity Conference

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- [▶▶ PES Primer](#)

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  - ▶ S.Korea increases emissions cap in proposed carbon trading scheme
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Analysis | Published: 12 March 2018

# The global status and trends of Payments for Ecosystem Services

James Salzman , Genevieve Bennett, Nathaniel Carroll, Allie Goldstein & Michael Jenkins

*Nature Sustainability* **1**, 136–144(2018) | [Cite this article](#)

**2942** Accesses | **56** Citations | **119** Altmetric | [Metrics](#)

## Abstract

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Recent decades have witnessed a considerable increase in Payments for Ecosystem Services (PES)—programmes that exchange value for land management practices intended to provide or ensure ecosystem services—with over 550 active programmes around the globe and an estimated US\$36–42 billion in annual transactions. PES represent a

PES Mechanism (Category)	Definition	Example	Market Size 2009 → '15	Programs 2005 → '15	Distribution (Countries)
Subsidy PWS (government-financed)	Public finance rewards land managers for enhancing or protecting ecosystem services. The funders do not directly benefit from the management activities.	Chinese government's Sloping Lands Conversion Program pays farmers to stop cultivating on steep slopes. Roughly 53 million farmers receive compensation to improve water quality and flood control.	\$6.3 billion → \$23.7 billion (\$12.98 billion in China).	17 → 139, with 69 in China	39
Collective Action PWS (user and government-financed)	An institution pools resources from multiple water users (private parties, NGOs, government bodies) to pay upstream land owners for management actions that provide water quality and other benefits.	Quito's Water Conservation Fund relies on a 1% surcharge on monthly water bills and monies from local electrical utility and beer company directed to finance projects protecting forests and grasslands in the watershed.	\$402 million → \$564 million	16 → 86	22
Bilateral PWS (user and government-financed)	A single water user compensates one or more parties for activities that deliver hydrologic benefits to the payer or serves to mitigate impacts from their activities.	In the 1990s, New York City raised a bond to pay for land use changes in the Catskills and Delaware watersheds in order to ensure the quality of their drinking water at much cheaper than a treatment plant.	\$13 million → \$93 million	19 → 111	27
Instream Buybacks (user and government-financed)	Water rights are purchased or leased from historic rights holders and retired, which leaves the water in-stream to deliver water quality benefits and ensure healthy ecological flows.	In Australia, the Restoring the Balance program committed over \$3 billion over a ten year period to purchase water entitlements from farmers to ensure instream flows in the Murray-Darling Basin.	\$25 million → \$60.7 million	15 → 20, with 18 in the USA	3
Quality trading and offsets (compliance)	Water service providers comply with regulations by paying landowners for activities that improve a measure of water quality (such as nutrients, salinity, temperature, etc.) in exchange for credits.	In the Hunter River Salinity Trading Scheme, salt credits are traded among mines and power stations based on river conditions to control the salinity.	\$8.3 million → \$22.2 million	10 → 31, with 29 in the USA	3

# Water

- Largest number of programs and transactions
  - Low transaction costs, clear causation
- China Leads the Way
- Collective Action Funds in Latin America Growing
- Instream Water and Quality Trading Require Institutional Capacity and Secure Property Rights

# Biodiversity and Habitat

- Compliance Biodiversity Requires Strong Institutional Infrastructure
- Voluntary Biodiversity Offsets Remain an Emerging Approach
- Access to Capital an Important Factor for Voluntary Offset Uptake
- Mitigation Credit Banks are Growing but only in Developed Countries

# Forest Carbon

- Forest Carbon Markets Have Evolved Rapidly
- Supply Exceeds Demand for Voluntary and Compliance Forest Carbon
- California A Tentative Success Story
- The Trajectory of REDD

# New Horizons: Agricultural Commodities

- Palm Oil, Soy, Cattle, Timber and Pulp
- Forestry Stewardship Council, Roundtable for Responsible Soy, Roundtable for Sustainable Palm Oil
- Commitments from companies with \$4 trillion market capitalization
- 30% of commitments made since 2014



# Effectiveness?

- Number of programs
- Value of transactions
- Geographic scope
- Actions on the ground
  - Trees planted, hectares conserved
- *But has PES made a difference on the ground?*

# How would we know?

- Metrics of effectiveness
  - Biophysical
    - Is the service provided?
  - Economic
    - Is the service efficiently provided?
  - Social welfare
    - Poverty reduction?

# Surprisingly under-studied

- PES reviews since 2002 have consistently reported a lack of data on the effectiveness of PES.
  - Brouwer et al., 2010
- Most evaluations or monitoring studies are case studies written by IWS advocates or project proponents, which also raises the issue or risk of confirmation bias.
  - Forest Trends, 2014
- We do not yet fully understand either the conditions under which PES has positive environmental and socioeconomic impacts or its cost-effectiveness.
  - Pattanayak et al., 2012

# Problems in literature

- Measurement of proxies rather than service provision
- Lack of baseline
- Inability to determine counter-factual
- Reliance on case studies rather than testable hypotheses
- Selection bias

# Effective compared to what?

- Problems of strategic behavior and counterfactuals
- Costa Rica
  - Pfaff et al. (2013)
- Indonesia
  - Heilmayr et al. (2020)

