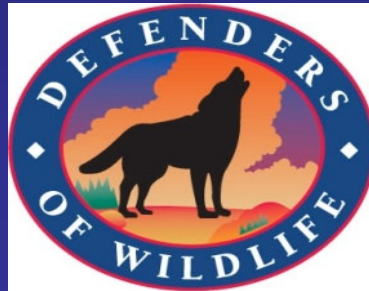


Markets for Ecosystem Services on Agricultural Lands: Experience and Outlook in the United States

Frank Casey

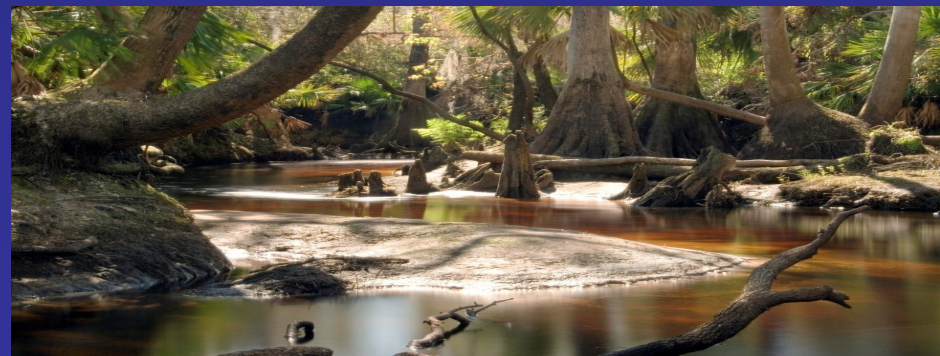
Conservation Economics and Finance Program
Defenders of Wildlife



Presented at the Biodiversity Forum, Cascais Natura
Estoril, Portugal, September 13, 2010

Topics

- Ecosystem services defined
- “Market”-based approaches to ecosystem service provision
- Designing ecosystem service “markets”
- Examples of ecosystem service markets
- Characteristics of Functioning Ecosystem Service Markets
- Some Conclusions



What Are Ecosystem Services?

1) Millennium Ecosystem Assessment:



ECOSYSTEM SERVICES

Provisioning

- FOOD
- FRESH WATER
- WOOD AND FIBER
- FUEL
- ...

Regulating

- CLIMATE REGULATION
- FLOOD REGULATION
- DISEASE REGULATION
- WATER PURIFICATION
- ...

Cultural

- AESTHETIC
- SPIRITUAL
- EDUCATIONAL
- RECREATIONAL
- ...

Supporting

- NUTRIENT CYCLING
- SOIL FORMATION
- PRIMARY PRODUCTION
- —

Ecosystem functions vs. ecosystem services vs. ecosystem service values

- *Ecosystem Functions:*
Biophysical processes in an ecosystem
- *Ecosystem services:*
Outputs of ecosystem functions that directly or indirectly benefit humans
- *Ecosystem service values:* the benefits humans receive from ecosystem services

Examples:

<u>Ecosystem function</u>	<u>Ecosystem service</u>	<u>Ecosystem service value</u>
Habitat provision to pollinators	Pollination of crops	Value of harvested crops (or avoided cost of artificial pollination)
Absorption of wave energy	Buffering of tidal surges	Avoided/reduced damage to humans, human structures, crops, livestock



Service values are context-specific!

2) Boyd and Banzhaf (2006): Natural or Engineered Setting

Ecosystem services are end products of nature, that is, “components of nature that are directly enjoyed, consumed, or used to yield human well-being.”

Ecosystem Services	Benefits
Pollinator populations, soil quality, shade & shelter, water availability	Harvests
Aquifer availability, surface water quality	Drinking water provision
Air quality, drinking water quality, land uses or predator populations hostile to disease transmission, wetlands, forests, natural land cover	Damage avoidance
Surface & groundwater, open land	Waste assimilation
Relevant species populations, natural land cover, vistas, surface waters	Recreation
Natural land cover in viewsheds, wilderness, biodiversity, relevant species populations	Amenities & fulfillment

U.S. Federal initiatives to promote ecosystem service provisioning

U.S. Office of Environmental Markets

A Community of Ecosystem Services

National Ecosystem Services Partnership

United States Forestry Service Ecosystem Services

United States Department of Agriculture:
Conservation Innovation Grants

- **Lack of protection of ecosystem services via markets (market failure) or regulation**

Market Failure

- Many ES are public goods
- **Their value cannot be captured by providers in free markets**
- Few created markets for public goods (e.g., wetlands and endangered species)

Institutional Failure

- **Policies and institutions do not (sufficiently) encourage land management for ES provision**
- Ecological boundaries don't match political boundaries
- Extending institutional boundaries beyond traditional reach is politically difficult

- Large and growing number of ecosystem service payment schemes around the world

- In 2002, a survey analyzed 287 cases worldwide of ecosystem service payments for forest services alone



Market-based approaches to ecosystem service provision

The Idea:

“The marketing of ecosystem goods and services is basically an effort to turn such recipients [who benefit for free] ... into buyers, thereby providing market signals that serve to help protect valuable services.”

(Brown *et al.*, 2006:1)

So why is designing ES markets a challenge?

Need to determine:

- *Who* pays *whom*?
- *When*?
- *For what*? What exactly is the product or output
- *How is the output measured (standards)*, and
- *How much is it worth*?



Who pays whom?

- **Individual to individual**



Driven by **self interest**, not regulation:

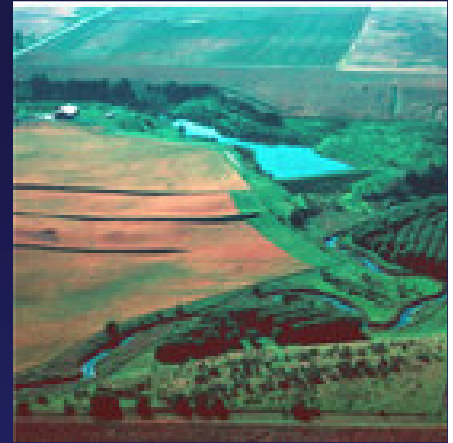
- Perrier-Vittel pays farmers to use less intensive dairy farming techniques to reduce pollution of its springs (France)
- Costa Rica hydropower plant pays upstream farmers to implement land management practices to reduce soil erosion
- Payment for Ecosystem Services

- **Mitigation markets – government initiated, regulation driven**



- Clean Water Services pays farmers to plant shade trees along Tualatin River to reduce water temperature and comply with U.S. Clean Water Act
- U.S. Wetland Mitigation Banking – developers must offset filled wetlands to comply with Clean Water Act, (but...are functions the same?)
- U.S. Endangered Species Act: Conservation Banking for endangered species

- **Payment programs for resource conservation and/or ecosystem services: PES**



- Australia's Bushtender Program
- NY City pays landowners in upstream watersheds for agricultural easements and new water quality initiatives on small farms
- US Agricultural Resource Conservation Programs



Most ecosystem service payments to date are based on government created markets or government payment programs

- Reason: many ecosystem services are **public goods** - property rights are need to be defined to attract private investment, and economic value cannot be captured by land owners



Designing Ecosystem Service “Markets”

- Never lose sight of the main objective - **The protection of ecosystem service values**
- High exchange volume and low transaction costs for buyers and sellers are desirable, but are not the primary goal of conservation markets – conservation is.

Therefore, the primary objectives are:

- The definition of service units (i.e. “currency”)
- The setting of exchange rules (trading areas, trading ratios)

Challenges in market design:

- Identification of services of concern
- Measurement of service flows
- Valuation of service flows
- Pricing of services and setting of exchange rules
- Securitization of service contracts
- Stacking and Bundling of services
- *What are outcome indicators to be measured*

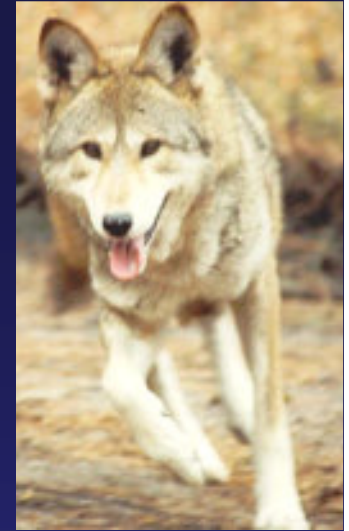


Measurement of Ecosystem Service Flows

- **Assessment methodologies must be robust:**
 - reasonably accurate
 - reasonably inexpensive
- **Applicable by the land owner, not only trained ES technicians/ scientists**
- **Technology and understanding of service provision by ecosystems are improving**



Example - Biodiversity Conservation and Ecosystem Services: Red Wolf



Reduced populations of raccoons and invasive nutria

- **Fewer raccoons:**

- more quail → more hunting/income for land owners from quail hunting

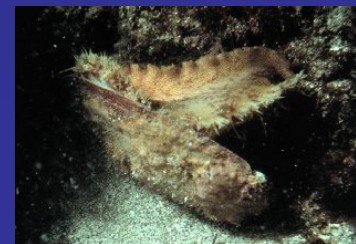
- **Fewer nutria:**

- less damage to dikes and irrigation channels → lower costs for farmers

- less damage to wetland vegetation → more migratory waterfowl

- reduced public management costs for control of invasive species

Sea Otters - Ecosystem services



- Protection of kelp forests
- Beach erosion control, carbon sequestration, fish & mollusk populations

Pricing of Ecosystem Services

- Very few, if any, ecosystem service payments are based on actual full economic values. This reduces the competitiveness of service production with competing land uses.



Securitization of Services

- Insurance/bonds to guarantee fulfillment of service provision contract

Example: The Environmental Trust (CA)

What happens when an entity with responsibility for long-term stewardship of conservation banks files for bankruptcy?

- Need to establish guidelines for financial security and clear chain of liability



JUN 9 2006

Bundling of ecosystem services

- Potential solution for protection of services that suffer from market failure, such as biodiversity:

- Identify marketable services that are co-products of non-marketable (public good) services



Southwestern Willow Flycatcher

- Many empirical examples of biodiversity bundling with:
 - **Carbon sequestration**
 - **Water quality preservation**
 - **Landscape beauty preservation**

Bundling of ecosystem services

- Challenges:
 - **Overlap between protection of biodiversity and many other services is far from perfect (Chan et al., 2006)**
 - **Protection of ecosystem services vs. protection of ecosystems (e.g., C sequestration: plantation vs. forest)**



Examples of Ecosystem Service Market Projects

Farmers and Ranchers Participation in ES Markets

Sage Brush Ecosystem Metric Design

Gopher Tortoise Habitat Trading Rules

Water Quality Markets in Florida



Strengths of Ecosystem Markets

- Attract more financing and increase private incentives for protection of ecosystem and their services
- Make conservation more competitive with alternative land uses
- One more tool in the tool box for conservation



Primary Messages

- Viable ES markets require standardized units of trade, low-cost measurement and valuation of service flows
selection of user friendly indicators
- Markets require adequate currencies that account for all services across space, time, and type
- Role for the public sector in guiding market development and conduct (monitoring and enforcement)
- Think about market premiums attained through certification



Resources

- Ecosystem services benefits valuation toolkit/models
http://www.defenders.org/programs_and_policy/science_and_economics/conservation_economics/index.php
- Florida Ranchlands Environmental Services Project:
<http://www.worldwildlife.org/what/globalmarkets/agriculture/FRESP.html>
- Willamette Partnership: <http://www.willamettepartnership.org/tools-templates>. Countingontheenvironment.pdwiki.com
- National Working Group on Ecosystem Services Valuation: atodd@fs.fed.us
- Parametrix, Inc. EcoMetrix: Environmental Services Accounting:
dhess@parametrix.com
- Pinchot Institute: http://pinchot.org/current_projects/baybank

OBRIGADO!!!



Questions



An Ecosystem Services Model: Conservation and Mitigation Banks in the US

Wayne White

Director of Business Development- Wildlands, Inc
Retired US Fish and Wildlife Service

Forum Biodiversidade 2010
Green Economy



Overview

What is a mitigation/conservation bank?

Regulations driven

Benefits of banks-

- Ecological, private sector, regional planning

Agency requirements for bank approval

Banker due diligence

Credits system

Factors to consider to develop program



What is a Conservation Bank?

Definition: An land account approved by agencies that is drawn on to compensate for adverse environmental impacts elsewhere but within a defined service area.

Sites are chosen and managed for their natural resource values and special-status species or sensitive habitats.

Sites may be natural (preservation) and/or include restoration, and/or creation of habitat.



Regulatory Driven Market

Federal Government

Clean Water Act- Sec 404
(Mitigation banks)

Endangered Species Act- Sec 7
(Conservation banks)

State and local Governments

Varies- water, protected species
and natural resources



Benefits of Banking

Ecological
Private Sector Market
Regional Planning



Ecological Advantages

Large preserve size-

ecosystem functionality

better manageable unit

Species connectivity

Biological performance standards

Diversity of habitat types



Ecological Advantages

Land stewardship

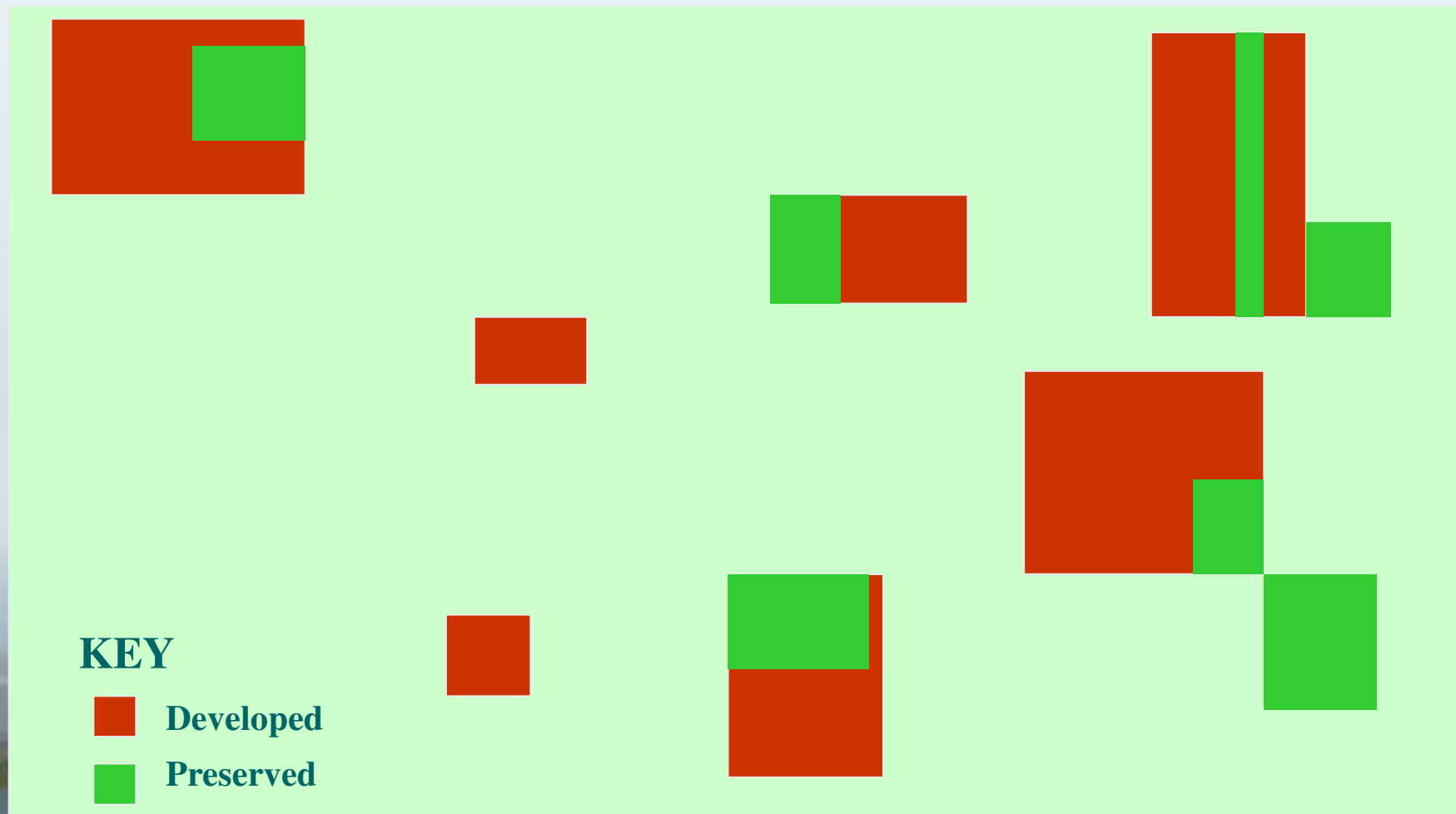
Species protection/ recovery



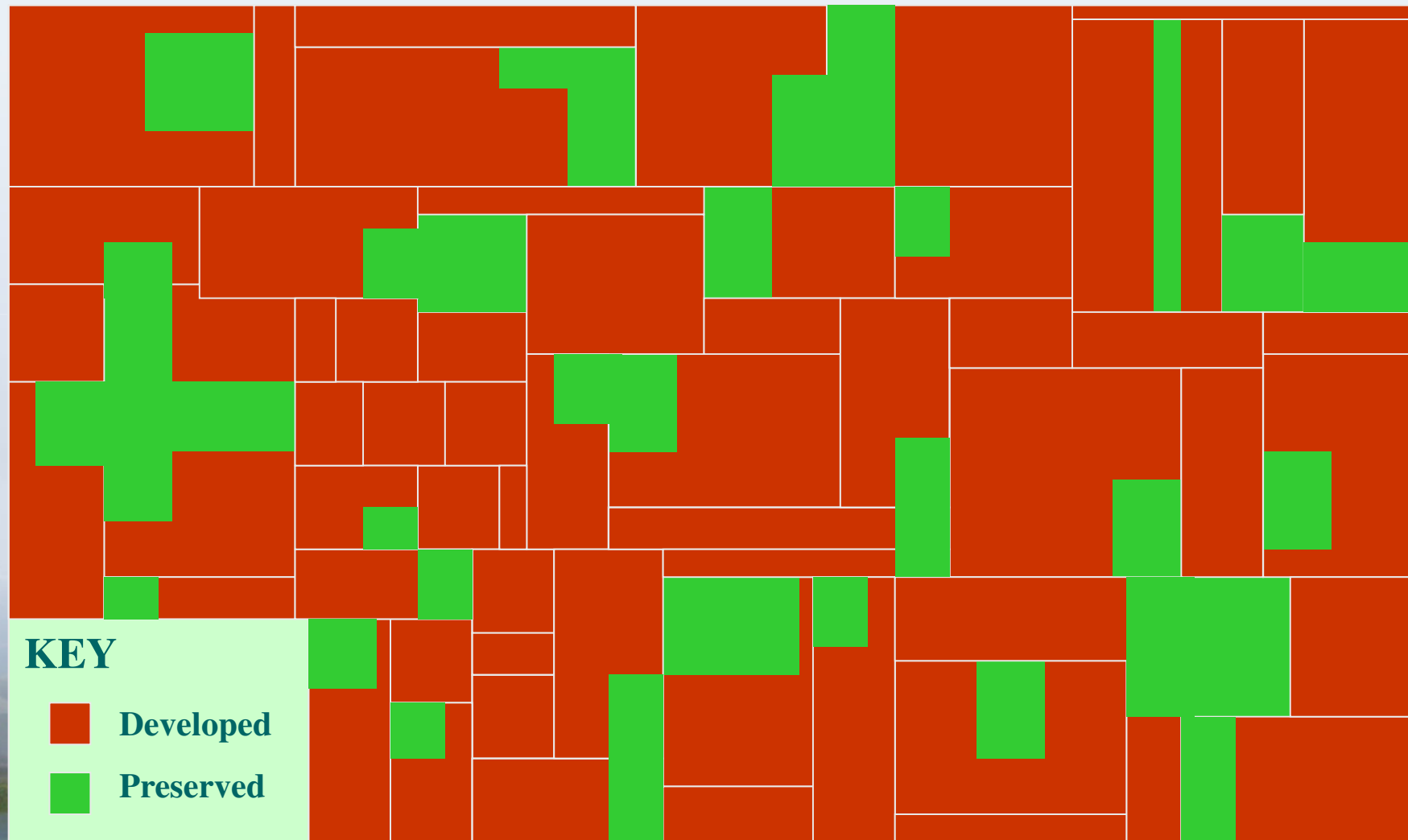
Shaded River Aquatic Habitat
for Salmonids



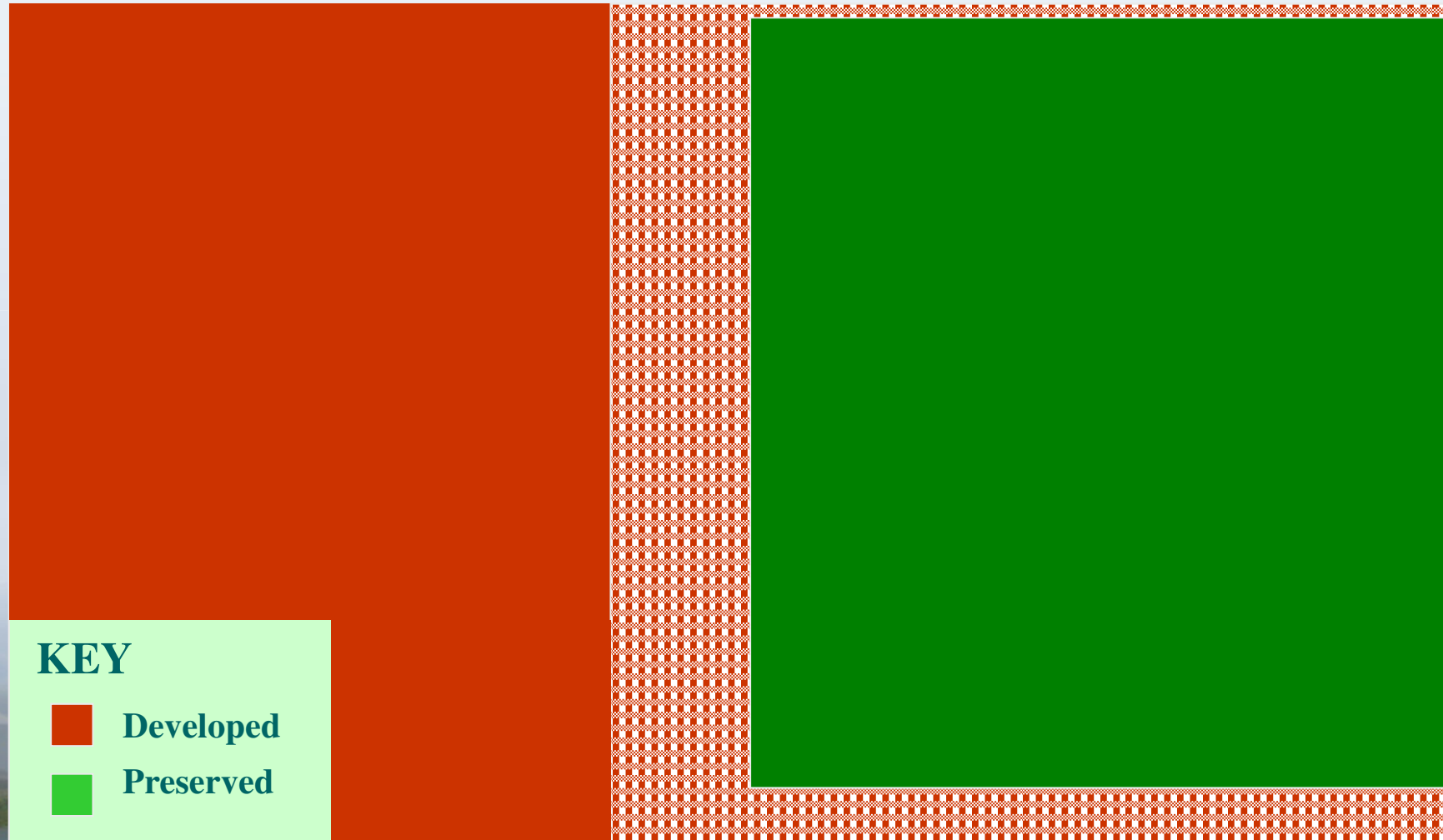
Unplanned Development *Early Stages*...



Unplanned Development *Over Time*



Planned Development *With a Bank*



Diverse Habitats Protected by Banks

Vernal pools

Riparian

Tidal marsh

Oak woodlands

Chaparral

Freshwater marsh

Estuary

Coastal scrub



Vernal Pool Wildflowers



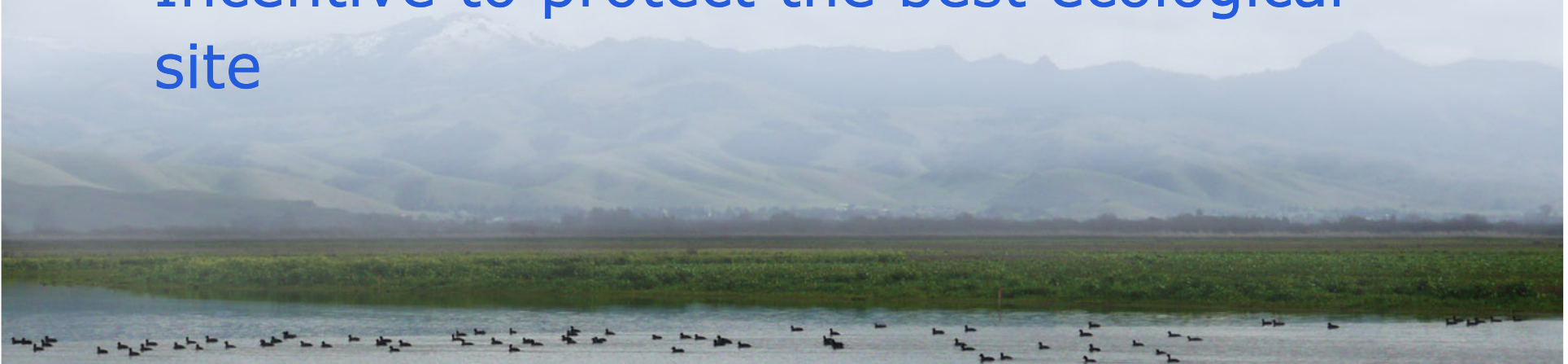
Private Sector Market/Business

Investors looking for 'Green' investments

Providing ecosystem services

Best habitat may provide best profit-

Incentive to protect the best ecological
site



Private Sector Market/Business

For profit- conserving not consuming

Turn landowners into conservators

Banks provide a “carrot” for landowners
looking to maintain life style



Regional Planning

Provides for better planning – Blends mitigation and development

Provides better assurance for local plans to proceed as developed

Consolidates mitigation away from development

Assists implementing species conservation plans



Requirement to Establish a Successful Conservation Bank

Provisions necessary for approval
by US agencies



Requirements

Solid control of property

Conservation easement- Protective constraints recorded on the property

Approved operation and maintenance plan

Adequate funding-

- Non-wasting endowment for long term management and monitoring

- Security for construction or restoration

- Contingency fund



Requirements

Approved operation and maintenance plan

Approved science-based management plan for species and habitats

Approved credits and release schedule

Monitoring conservation easement



Banker Due Diligence

Biological assessment -- Does a site qualify?

Market survey to assess demand

Economic considerations must make sense or profit



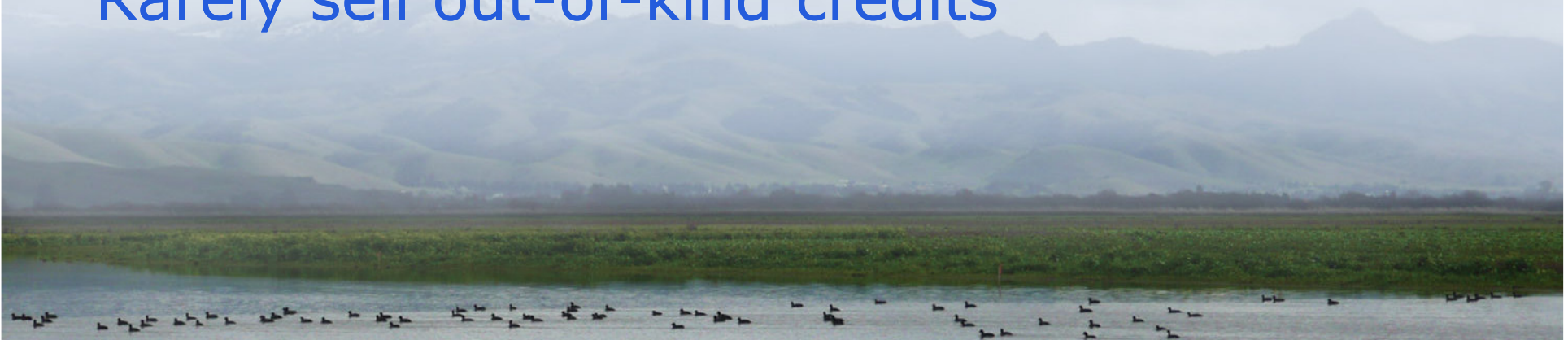
Credit System

Bank sponsor sets the price of credits –
Usually acre for acre and market driven

Management endowments should be funded
through portion of each credit sale

In-kind or like-for-like offsets

Rarely sell out-of-kind credits



Considerations to Establish a Banking Program

Review existing regulatory framework

Policy and regulatory foundation

Integrating with existing permitting processes

Creating demand for credits

Capacity to develop banks and crediting system



US Model is an Outstanding Approach to Provide Environmental Protection

Mitigates Environmental Loss in a
Responsible Way

Consolidates Mitigation Into Larger,
Better Preserve Areas



US Model is an Outstanding Approach to Provide Environmental Protection

Provides Economic Incentives For
Landowners To Protect Property for its
Natural Resources

Establishes Long Term Structure For
Management, Monitoring & Funding

