

Background and History: Ecosystem Services

Speaker

Barton H. "Buzz" Thompson, Jr.

2011 ECOSYSTEM SERVICES SEMINAR SERIES



Ecosystem Services Seminar 1: Background and History: Ecosystem Services Presentation

Presentation and Discussion Notes from Speaker Barton "Buzz" Thompson Jr.

Seminar Series and Seminar 1 Goals:

The goal of the multi-session seminar is to educate funders and the broader conservation community on many different aspects of ecosystem services — such as how to account for ecosystem services and to effectively measure, manage, and communicate them.

Seminar 1 focused on the following goals:

- Introduce Ecosystem Services and explore the history of ecosystem services as an approach to conservation
- Trace the development of the concept and provide perspectives on what distinguishes ecosystem services from traditional conservation interventions
- Give an overview of the economic, ecological, and policy rationales for ecosystem services

This document is a product of the Gordon and Betty Moore Foundation's Ecosystem Services Seminar Series that took place between March and November 2011. For more information please visit www.moore.org or request "ES Course Info" from Heather Wright at info@moore.org.

Disclaimer:

This document is a summary that includes PowerPoint slides from the speaker, Mr. Barton "Buzz" Thompson Jr., and notes of his talking points. In addition, we provide a synthesis of important questions discussed during Seminar 1. Please keep in the mind that the following document is only a recap of Buzz's presentation and Blue Earth Consultants' notetakers have, to the best of their ability, captured the speaker's presentation. We hope that the following presentation and discussion notes will be used as resource to advance further discussions about ecosystem services.









Presentation Goal:

This presentation will cover a great deal of territory to set up and prepare the audience for the seminars.



This presentation addresses the following four topics:

- Why do we need environmental regulation?
 - We use it to address market failures.
- How do we currently approach problems?
 - We use regulatory approaches.
- What do ecosystem services add to our traditional toolbox or change?
- We will touch on some challenges to the use of ecosystem services, but this is something that will be addressed in later sessions.



Why does the environment not protect itself?

There are three different frameworks to justify why we step in to protect the environment.

Environmental debates stem from people approaching these issues by using different frameworks.



Framework 1 – Market Failures

The market fails. In the case of the environment, the market cannot help determine where development should be; when you talk about the environment and ecosystems, the market fails.

Why does this happen? Market fails for 4 reasons.

Reason 1

- Environmental Goods are Public They are nonexclusive and non-rivalrous.
 - Ex: The Amazon and carbon sequestration; to the degree the Amazon is absorbing carbon, we all benefit. The market does not exclude anyone so THE MARKET DOES NOT PRICE PUBLIC GOODS. No one will protect the good because the thinking is that there will always be someone else who will protect the good.
 - Ex: wildlife area rich in biodiversity few people protect it because other people will. The idea is again that someone else will do it.



Reason 2

• Tragedy of the Commons – resources are open for everyone to use
This is cultural issue. In most cultures, but not all, resources tend to be overused i.e. open-access fisheries and groundwater (over pumping of ground water)



Reason 3

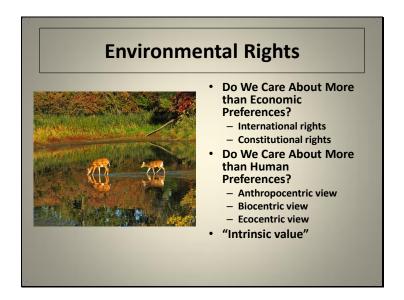
• Negative Externalities – the previous two reasons are both negative externalities. Ex: If I am pumping ground water out for my agricultural use, I am also causing harm by lowering the water table or leading to subsidence or shortages, but I only suffer a portion of that cost. I get all of the benefits and only a disproportionate amount of the cost. This leads to overconsumption because I do take on all of the costs. Ex: Similar scenario exists in the Amazon – If I cut down the trees, I get all the benefits and the harm is put on others, not myself.



Reason 4

• Collective Action Problem – If we come together as a group and develop regulations, it will be more beneficial for all, but it is time consuming and difficult; the temptation to let other people solve the problem is strong: FREE RIDER PROBLEM - This is the traditional economic explanation of why we need regulations. The Market does not work well in this situation.

Ecosystem services fight nicely into neoclassical framework, if you can value them and show people how they will benefit.



<u>Framework 2</u> – Environmental Rights

We value environmental protection. This is the belief that we need to step in and protect it whether the market does or does not works.

Even if we are not willing to pay for it, a lot of us still think environmental protection is important. There is an ethical/human right component.

We see this is a lot of international instruments and in national and state constitutions

Ex: In US, the state with the strongest environmental right is Montana. In the 1970s, they revised their state constitution. In the revisions, they provide that everyone has a right to a healthy environment and that the state must manage its resources on a sustainable basis.

Note that this was NOT ABOUT ECONOMIC FAILURE.

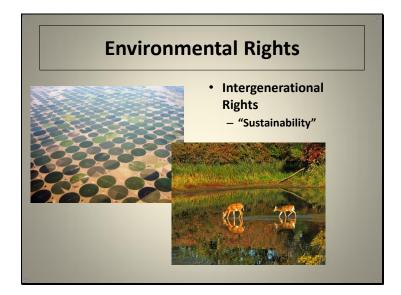
Environmental rights not only reject economic reasoning, they move beyond human preferences, i.e. other living creatures have rights; this is a bio-centric view!

What about the rights of the environment, beyond humans and animals? This is an eco-centric view!

This framework argues that when we look at the environment, we do not and should not value it based on monetary/economic values, but on INTRINSIC values.

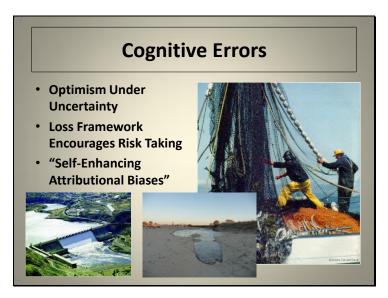
It has value beyond what I say it does...the values go beyond one person.

Members of this framework are troubled by ecosystem services because comes out of an economic framework and not intrinsic environmental rights theory.



This framework is not just about protecting the environment for today, but also about protecting it for future generations.

This theory may be more coherent as a theory in the future generation context than in the economic sustainability sense.



Framework 3- Cognitive Errors

Even if we think rationally, we engage in a variety of cognitive errors that make it difficult to address issues relating to the environment.

Let's use the fishing context to illustrate this...

Cognitive Error 1:

Optimism Under Uncertainty

In conditions of uncertainty, we tend to be overly optimistic.

Ex: If you tell fishermen we are running out of fish and give them an estimate rage A-B, the fishermen will think the stock is at the top of the range at B. They think the situation is better than it really is.

Psychologically, people tend to be optimistic when they hear about catastrophe.

Cognitive Error 2:

Loss Framework

People can be placed in 2 categories depending on the loss framework: risk-taking and risk adverse

Ask them to give something up they become more willing to task risks than they normally would

• Ex: Two best situations

- I will give you \$50, or alternatively, I'll give you the following bet: We will flip a coin. If it lands on heads, you get \$100. If it lands on tails, you get nothing at all. Would you rather have \$50 certain or risk for \$100? Most people tend to be risk adverse and take the \$50 certainty.
- In this situation, you either have to give me \$50 or you have to take the same bet described above. In this situation, more people will take the bet. To avoid a loss, people will take a risk.

This is what is happening in the fishing context. i.e. you have to give up some of your quota today to get something later that is uncertain. Instead of giving up their quota now, fishermen are taking the chance in the future so they don't have to give up anything now.

Cognitive Error 3:

Self-Enhancing Attributional Biases

This is the rationalization that if there is a problem, it's not my fault; it is the fault of something else. I.e. the decrease in fish is not because of fishing, it's due to the dams, and/or lack of water....Anything really, as long as it's NOT MY FAULT



Cognitive Error 4:

Short-Sightedness

As humans, we are short-sighted. We want results right now. People focus on immediately price rather than future savings.

Ex: We will be the fridge with the cheapest price right now. It doesn't matter if the Return on Investment (ROI) is large; people think about the short-term savings instead of the long-term savings.



• **Prescriptive Regulation:** Traditional regulatory approach has been prescriptive regulation with a "command and control" type of process.

Ex: The Supreme Court reducing emissions in Massachusetts.

Property Rights

Traditional neoclassical solution; response to tragedy of the commons scenario. The belief here is that property rights will solve problems.

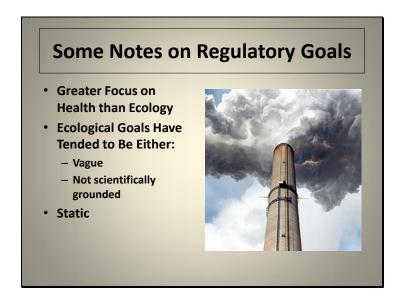
- Financial Incentives
- **Direct Protection-** incentive Such as the Nature Conservancy's work.
- Persuasion

Our traditional regulatory approaches with taxes and penalties etc...



There are a variety of ways we regulate the environment:

- We Set Substantive Goals; sometimes they are performance goals
 - o Kyoto protocol countries have performance standard that they are supposed to meet.
 - Under Federal Land Management Act, we are supposed to manage federal lands for multiple sustained yields.

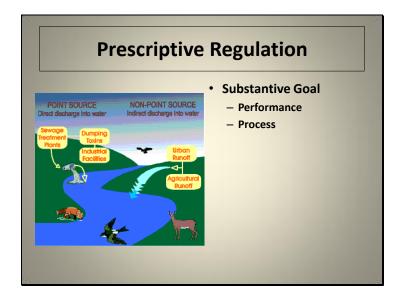


Greater Focus on Health than Ecology:

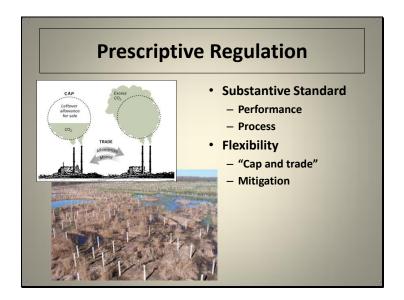
A lot of our environmental laws have been more focused on human health than they have been on ecology or ecological health. The reasoning has been that it's hard to tell people what our ecological goals should be. It is not as easy as telling people what our public health goals should/will be. We have more knowledge about human health than we do about ecology.

• Ecological Goals Have Tended to Be Either:

- Because of this, our ecological goals are vague and not as scientifically grounded as human health goals.
- Ex: "Multiple Sustained Use" is vague compared to health standards.
- Goals are Static we set them and don't revise them
- All of these are failures in terms of long-term sustainability of our environment.



- Substantive Goal: We regulate process rather than a substantive performance goal.
- In picture, we don't regulate agricultural runoff, probably for political reasons, we use process regulation - Best Management Practices (BMPs)
 These too are still fairly vague goals.



Flexibility:

We have tried to find ways to introduce flexibility.

Business and property owners complained that regulation was too costly, so we attempt to be more flexible.

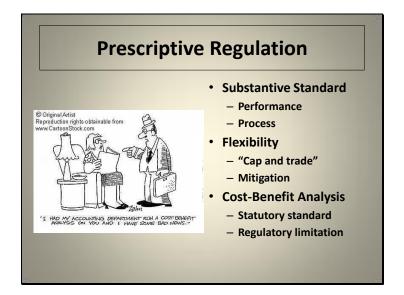
"Cap and trade" Cap is our performance standard, this is not an alternative to prescriptive regulation, it is simply a means to make it more flexible!

We permit trades for flexibility.

Mitigation is another to we use to increase flexibility.

Section 404 Clean Water Act – we permit people to destroy wetland if they have compensatory wetland protection elsewhere. More later...

THIS IS FLEXIBILITY!



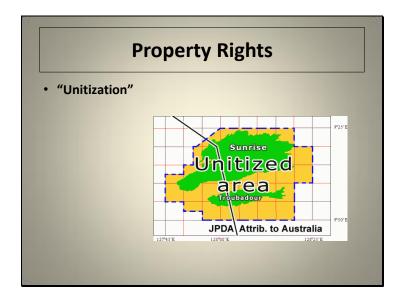
• Cost-Benefit Analysis.

It terms of statutory standard – prescriptive regulation in US and elsewhere use Cost-Benefit (C-B) analysis; improve environment to a point where benefit outweighs the cost

In US, we require our agencies to engage in cost benefit analysis to regulations they wish to impose.

Congress says that we should not impose regulation unless the benefit outweighs the cost.

Again, this is an economic mindset for thinking about environment.

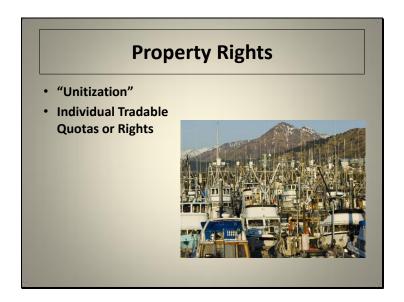


Unitization

We use property rights and unitization to try and protect environment and improve its use.

Ex: Oil and Gas

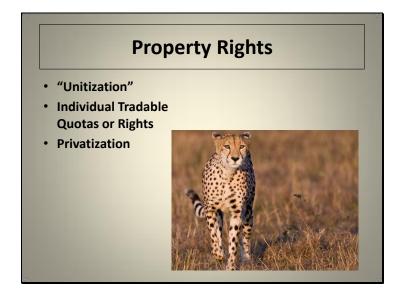
Oil is a common good in the sense that anyone overlying the ground can pump it out. In the picture, this is an international commons issue; both countries want to pump out oil and gas. Solution – unitize the resource; let one person manage it so they don't treat it as a common



• Individual Tradable Quotas and Rights.

This is another was of using property rights.

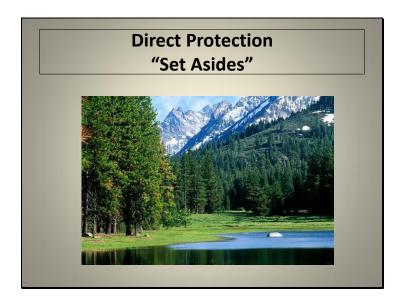
Ex: Fishing quotas



Privatization

Use privatization of the environment in order to promote protection.

Ex: private game reserves



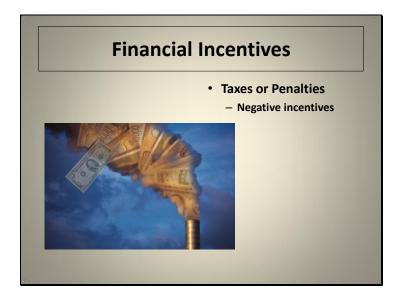
• Direct Protection

In ecological area, rather than give reasons and rules to protect land, buy it and exclude humans.

i.e. Government can acquire land and set it aside as a way to protect it OR can use tax credits to encourage conservation organizations to do it.

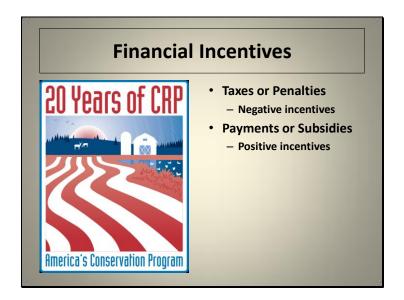
Ex: conservation easements

Ex: wilderness areas.



• Taxes or Penalties is another tool we frequently use in environmental area.

We tax things which are bad for the environment. i.e. global carbon tax is an example of tax/penalty



• Financial Incentives

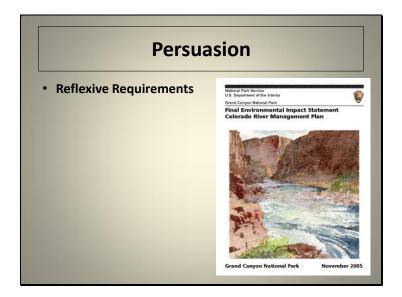
Flip side of taxation is that we will pay people to do what we what them to do. Ex: Federal Farm Bill. In theory, we pay people to do things that benefit environment. Conservation reserve program is an early example.



Combinations

We also combine penalties and rewards.

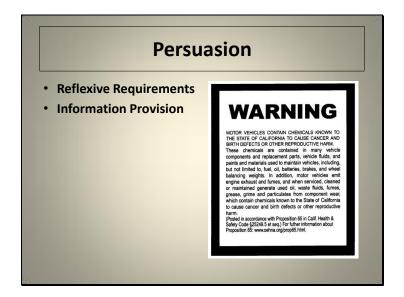
Ex: Bottle bills: we charge people when they buy and pay them back if they bring it in.



• Reflexive Requirements

One type of persuasion is a reflexive requirement

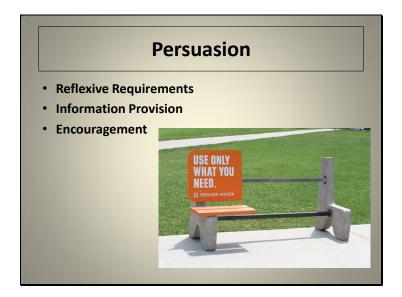
Ex: Environmental Impact Assessment (EIA) – we force people to think about something before they do it. Assumption is that if they think about it, they may not do something that will be harmful.



• Informative Provision

We provide people with information they would not otherwise have. Ex: Prop 65 in California

ASSUMPTION: with information people will do that right thing.



Encouragement

Ex: water conservation campaigns to do the right thing
This example is from Denver, cleaver education mechanisms to conserve water.



Social Norms

The most important thing we can do to change environmental behavior is to **change social norms**.

We have been very successful with recycling in this regard. Now, there is a norm that we recycle.

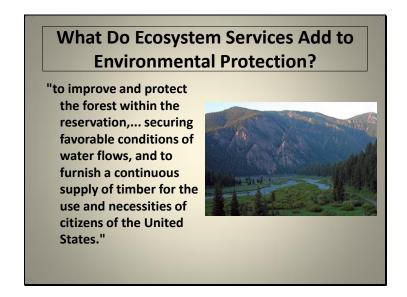
HOW DO WE CHANGE SOCIAL NORMS?

Most valuable way, show people that other people are doing something.

Ex: With recycling, the container in front of someone's house shows which neighbors are doing it. Very visible so people do it so they are not left out.

Ex: Message on sign to not wash towels in hotel

Message is very important: ask people to *join in* with other guests not to wash towels. You do it because other people are. You buy into social norm.



Ecosystem services (ES) are not new! In 1898, we created national forest in US to conserve ES, (see above quote)!

- continuous flow of water
- Timber

What Do Ecosystem Services Add to Environmental Protection? Conceptual or Political Shift Improved Goals or Standards Payments for ecosystem services (PES) Improved Implementation Markets for Ecosystem Services (MES)

Though the concept isn't new, we now have a new way of thinking about ES. Now:

We think HOLISTICALLY!

This means we are less likely to forget one service because we look at a more comprehensive picture.

- ES play a critical role in economy and our lives.
- Because of these new emphases, we are doing more scientific research and we can now value some of these ES.
- With this new, broader emphasis, we can do more.
- ES may be able to do several things:
 - o Conceptual or Political Shift-maybe can convince more people
 - Improved Goals or Standards
 - Payments for ecosystem services (PES)
 - Improved Implementation
 - Markets for Ecosystem Services (MES)-may provide a focus, and people may be willing to pay.



Many people working in the ES area think we can change how people think and convince politicians who have not been engaged in environmental participation.

Now we can talk about the environment in economic terms – which we, as a country, value and people are familiar with its jargon.

Frequently, people who aren't environmentally inclined get this way of talking about them.

ES places us in the environment. It tells us not to take ourselves out of the environment. It tells us this is what we get out of the environment.

If we think ES can provide this, how can we best communicate about ES? Come back to in discussion



Refined/ Added Goals

ES can also help us to improve our standards by helping to refine/add to our goals. i.e. superfund sites

Historically they were managed for health.

Now, they are managed for ecological and health goals. Managers seek to answer this question: HOW CAN WE CLEAN UP THIS SITE IN A WAY THAT IS SAFE AND BENFITS THE ENVIRONMENT?

People in the Department of the Interior are thinking about how they can take the multiple sustained yield idea and bring in the ES notions. They want to answer this question: WHAT ES DO WE GET OUT OF THIS LAND?



Mitigation Comparison

Section 404 Clean Water Act

How do we know if restoration one site is worth destruction of another? ES can provide the currency with scientific validity to do this.

2 years ago Army Corps of Engineers decided they could do this by looking at ES of 2 sites. Compensatory sites should be located where benefits will be most compensatory to damages done elsewhere and where similar ES are maintained or developed.



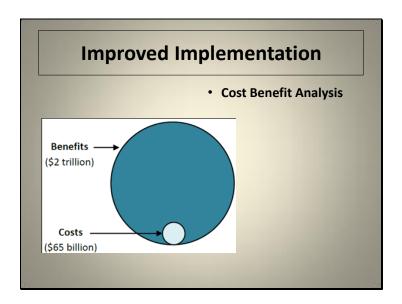
• Incentive Payments

ES helps our refine what we want to achieve through incentive payments. We won't be blindly encouraging activity. We can pay people to protect based on the services coming from a particular land.

Ex: Costa Rica: 1st country to setup Payment for Ecosystem Services (PES). They contracted with land owners to manage lands for 4 services

- scenic beauty
- water conservation
- o carbon sequestration
- biodiversity

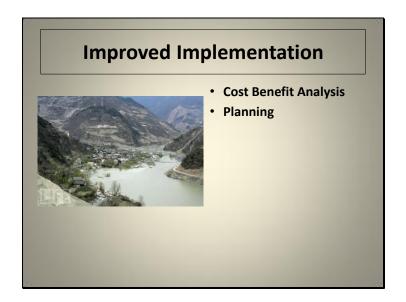
Payments are more specific because have an environmental benefit that we can measure.



ES can help us improve implementation

EPA has to engage in Cost Benefit analysis.
 Historically EPA had a problem could tell cost but not benefits to the environment.
 Had a methodology for measuring health benefits, but no way of doing ecological benefits.

Buzz was part of a committee to inform the EPA on how to do this; now they have a valuation mechanism similar to health evaluation.



ES can improve planning implementation.

Picture: county in China.

China has tried to improve the rigor of their planning by increase conservation areas (20% of land area). They determined what areas we important for ES. Now they plan in those areas according to what isn't damaging to those ES. This linked up to people and gave them a rigorous tool for planning a region in order to protect environmental biodiversity, soil conservation, sand storm mitigation and flood mitigation.

ES really helped motivate this planning. It gave them a reason: increase water yield, decrease floods.

Gave them a rigorous concept by which they would determine where to have development and where not to have it.



We might actually have markets for ES.

People who benefit might be willing to pay for ES.

We should separate out markets.

• People hoped we would get Voluntary Markets:

Although there are some examples (Empressa Electrica: hydro-electric plant around Quito Ecuador; they pay into water fund to protect watersheds; Perrier Vitell, purchase land around water to ensure water quality and pay farmers to use more sustainable less nitrate intensive methods) they are few.

Regulatory Markets

Instead, what tends to drive markets, are REGULATIONS! New York City Water Protection – often told as a voluntary market.

They looked at 2 options

- 1 Building a filtration plant or
- 2 Protecting the Delaware Catskills

What drove them to do this was the Federal Safe Drinking Water Act – it requires filtration of water or protect the upstream watershed; therefore, NY is an example of a regulatory driver.

Virtually all examples are regulatory.

Water markets; carbon market (driven by climate legislation)

Significant markets are arising and they are **driven by regulation**.



Commodity Markets

A market where ES can be reduced to something that looks like a commodity (stock or pork bellies) once you set up a market, it will work smoothly.

Ex: Carbon emissions markets – lots of businesses are involved because it looks like something they are familiar with a traditional situation.

However, most ES markets are Heterogeneous

Local ES, which are hard to measure, are localized and very different rules will apply than those that apply to commodity markets.

There is e a lot of potential for heterogeneous markets, if we have regulation that drives them!

Potential Values of An Ecosystem Service Approach Conceptual or Political Shift Improved Goals or Standards Payments for ecosystem services (PES) Improved Implementation Markets for Ecosystem Services (MES)

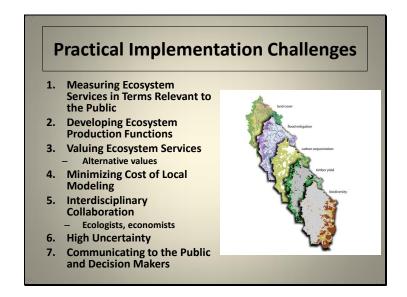
Potential values of ES approach:

Drive more regulation; convince more people need to do it. Improve regulatory
Drive markets



Challenges of Utilizing These Markets:

Taking ES and using them in the ways we have discussed is difficult. People have concerns over use.



Practical Challenges

There are more than just the 7 listed on slide.

- How do you make it relevant to people? Historically, ecologists stopped examination before getting to ES (clean water, flood avoidance, etc.).
- We need to know how a change in land use in one area will impact services in another area. We need ecosystem production functions. We need to understand policy/management alternative.
- We need to be able to value ES. How can you do it in "untraditional" ways? When Buzz sat on the EPA ES committee, thought about community level values. Different values at community level than on the personal.

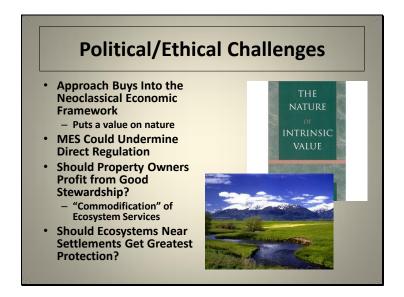
Should we look to community values as opposed to individual values?

- How do you do it at the local level with little cost? this is difficult because
- Little collaboration exists right now
- With high uncertainty, people tend to take more risks.
- It's too hard to explain right now -

The Natural Capital Project at Stanford is trying to address these challenges



- **Examples where ES market problems exist:** (numbers in parentheses refer to numbers in slide above)
 - (1) Do you have the property rights in place? In Hawaii, how ranchers manage land in Kona might impact their ground water recharge. Maybe they can manage their land in a way to benefit biodiversity and THEIR own water recharge.
 - (2) Could we get local water to pay farmers? NO! There are no property rights over water, so free rider problem.
 - (4) Thin markets; few players involved
 - (5)We need more than 1 service for people to get motivated. Services need to be bundled to increase the value. This type of collaboration makes things more complicated.
 - (8) Why do we play people to do this? Shouldn't they do it any way, it is the right thing? Response: we think it is the right way, but not everyone does, so we need to pay them.



Variety of concerns:

Political and Ethical Challenges

ES seems to buy into neoclassic economic framework, should we put a value on nature. Doesn't this go against intrinsic value framework?

Could it undermine direct regulation: notion here is if you can convince policy maker, then the policy maker may ask "why regulate, we can just have markets?"

 Under the 2008 farm bill. ES were included as a creation provision; seem to hope that then people would talk less about regulating agriculture.

Should property owners profit from increased stewardship? Is this a commoditization of ES or will it just be another?

Should ecosystems close by benefit more than Ecosystems far away?

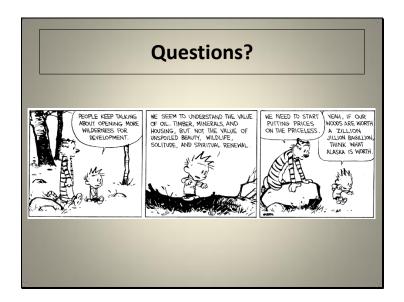


Adverse depends on who you are.

They way you manage it doesn't always increase all ES. THERE ARE CONFLICTS!

- Are there any unnecessary parts? Should we not protect those? Unnecessary for whom?
- What about engineered ecosystems: technological services at a cheaper rate? Should we go there?
- Some services are more easily valued than others. Some are more marketable. Does this drive the direction of ES?

WE NEED TO THINK ABOUT ALL OF THIS IN OUR DISCUSSION OF ES.





Seminar 1 Discussion Synthesis

March 11, 2011

This document is a synthesis of important topics and questions discussed during the question and answer period immediately following Mr. Barton "Buzz" Thompson Jr.'s presentation. Please keep in the mind that the following is only a recap and speaker identities have been removed, except for Mr. Thompson Jr. We hope that the following notes and discussion questions will be used as resource to advance further discussions about ecosystem services.

Below you will find a summary of specific key questions and topics that were covered during the Seminar discussion.

Question 1

What would be the one thing to accelerate the right kind of regulation in the U.S.? What is the one thing that can drive ecosystem services markets?

MR. THOMPSON JR.

- All comes back to politics. Really, we would have to totally revolutionize our political system- but would say there are various steps
 we could take in our science processes; this is where ecosystem services become valuable. We can use ecosystem services to show
 people that the environment is relevant to them and not driving for harder standards hurts them.
- Hear a lot about cost in environmental regulation. It is easy to put a cost on regulation, i.e. how many jobs are lost etc. There is a need to make an equally good scientific case for what the benefits are for making environmental protection. That is an important aspect of ecosystem services; it allows us to do this. It does raise concerns from slide 42, but better.
- <u>Proofiness</u>, by Charles Seif, a book I finished recently. In short, the book says, that if you put a number on anything, then it seems more convincing. We need to do the "proofiness" for the environmental side; do the "proofiness" of environmental rights and ecosystem services. Have to put numbers on the economic values of these environmental regulations.

Question 2

How would we use climate cap and trade at the federal level? Two years ago, it looked like we were heading for a mandate that supported cap and trade. Can you explain some key issues and how we can re-approach this? What are the key things to communicate most effectively to support an overall cap and trade system in the U.S.?

MR. THOMPSON JR.

- U.S. public is more supportive of doing something in the climate sector than has been suggested. John Krosnick in Humanities and
 Social Sciences at Stanford has been doing surveys on climate change for 15 years. He is the best pollster around. His findings show
 that there has not been a "drop-off" of public acceptance in the climate area. The drop off from a year ago was largely from
 weather.
 - People know climate change exists, but not for the reasons scientists say. They think they know why, so they support
 it. They know that scientists are split but think they see it themselves. For example, if they experience a cold winter,
 then they start to doubt the validity of climate change.
 - People get confused about cap and trade. They think it sounds like the market, and Americans like markets, but they do not trust the market. Americans are peculiar: they live in a market economy, they like values, but do not trust the market itself. If we tell people markets are used in other contexts such as in the Clean Water Act, then their support skyrockets after that. If people understand the market basis, John Krosnick has found that there is strong support for markets.
 - o Interesting fact: The state with some of the highest public support for climate change work is Oklahoma.
 - John Krosnick is doing state surveys to see if there are differences across states.
 - In addition, the Public needs to understand Cap and Trade.



Question 3

Many international organizations are thinking of ecosystem services. Even the oil industry is establishing an ecosystem services function in their companies. Why is there this push? If more and more big businesses are thinking like this will this likely push regulatory effort?

MR. THOMPSON JR.

- Why big business? Big oil companies have focused on the ecosystem services because they have lots of land and they need to manage those lands. When people have talked to oil companies asking why they are doing this, many of them say that they do not think ecosystem services markets will be big enough to bring in enough money. Instead, they chose to manage land in a way that resonates well with local community. They are looking to improve their image in terms the community understands. They can then say here is what we are doing: we are lowering flood risk, increasing water lever, etc. for you.
- Ecosystem services may be more valuable and understandable at local level because there are better connections. Water dependent companies do it to protect their interests, i.e. their water source.

Question 4

What do you think is the biggest transformative impact ecosystem services can have? Is it the creation of markets, driving investment, changing perception, companies? Government?

MR. THOMPSON JR.

- All of the various areas bet on a combination. Bet on the combination of large government intergovernmental organizations such as, the World Bank (global level), Department of Agriculture or Department of the Interior.
- They have variety of programs right now and are looking for way to shape programs and show how they benefit the public. They all want a way to explain program that resonate with public more.

Question 5

Is there a way to keep the existing framework and redefine it to use ecosystem services?

MR. THOMPSON JR.

- Ecosystem services could is valuable at local/regional level. Example where ecosystem services is relatively effective: Chicago wilderness area.
 - Effort in that area to protect land was organized from the bottom up and talked to the public about what they thought was important and what they wanted to protect. This framed what the benefits of the land were for the community. It drove community support AND told them what was most important. Ensure that services that are most important are protected.
- Maybe we need regional or local ecosystem services plans rather than national. Generally, people benefit at local level.

Question 6

There is lots of management at a local level – very context specific but policy is at a higher scale. How do you link the local to the policy decisions at a larger scale?

MR. THOMPSON JR.

• You want a nested system. Maybe a national and state level directive to set overall goals for the local level to act and feed back up the scale. European countries have done a good job with nested government.



Question 7

Are their aspects of ecosystem services that allow us to force people to think in the long-term?

MR. THOMPSON JR.

Actually, ecosystem services permit people to understand the value of services. I am not sure it does a lot of in the way of cognitive
errors that leads us to this short-term issue. The cognitive errors mentioned in the presentation are always there. Changing social
norm will be the most helpful. Ecosystem services let people know why the environment is important.

Question 8

On the Perrier-Vittel example: At scale of watershed, it looks great, but look at the Green House Gas (GHG) emissions at the larger scale, it does not look so good. Can you talk about that?

MR. THOMPSON JR.

- Here is how would talk about Perrier-Vittel: may be the worst thing imaginable for the environment, but they are not going to go out of business even if they do not protect their ecosystem.
- What is important about this example is that the business had an input (clean water) to protect. Here, natural protection was more valuable than technological protection. I would emphasize that portion of the story. Not about bottled water, but talk about business recognition of protection.
- Maybe use other examples, many of which are regulatory driven. San Francisco Example: City needed to protect its watershed and it protected area around highway 280.

Question 9:

If you think of challenges in your list (slide 41), where is more research needed to address those challenges?

MR. THOMPSON JR.

- The Natural Capital Project (at Stanford) is addressing challenges 1-5.
- I think there is an interesting question regarding alternative values. We think we need to measure in monetary terms, but what about other values? Are there other ways to measure that will be more concrete to people?
- Challenge #7 how do you communicate in a way that is real to people and increases their support? I think visual tools are important here.
 - o Example: Outside of ecosystem services- works in water issues. I have gone out to the Central Valley to discuss water issues. Now we use visualization tools that show water going down and how it is leading to subsidence and how it creates flood risk. With these new visual tools, people understand it more; it makes it more real to people than just a number
 - Many of these challenges will take care of themselves, i.e. enforcement, market issues...
- Slide 43. Someone should look into whether or not ecosystem services do undermine intrinsic value. I think you can talk to people in both terms. Does not make it seem like less valuable on economic side.

Question 10:

In South America, I have seen people get excited about valuation and they try to use it in policy, but it seems to get in the way because cost is high and it is very uncertain. What is the role of valuation in policy?

MR. THOMPSON JR.

- Do not need to be able to determine all values for all purposes. Many times not worth the cost. We need different levels of scientific
 tools.
 - o General planning Cost-benefit analysis may be sufficient
 - o Planning tools
 - Water supply/protection have multiple levels of tools then have better sense of when need the tool.
- Important to know that it some settings, certain tools may not make sense



Question 11:

I work in South America where there are few market economy societies. How do you use valuation?

MR. THOMPSON JR.

- It may be hard to put monetary values on ecosystem services because people do not tend to think that way. So this goes back to slide 41, when thinking of valuing ecosystem services, we should think of alternative valuation schemes. The value needs to reflect the people and community; need to speak in cultural terms of that community. If we were to testify in front of Congress, we would need to talk in economic terms because that is what we value. Other communities may not want to talk that way. They might want to talk in physical terms about the ecosystem services, i.e. water quality, water flows etc...
 - There might be different level of values—Say "these are the various ecosystem services you receive. How valuable are they? This is a 10 this is a 0." This way, the community puts it in their own terms.

Question 12:

Who is pushing ecosystem services use? Environmentalists or economists? Is not the environmental movement pushing this as a cause?

MR. THOMPSON JR.

- I think it is coming from a variety of quarters. Initially from the ecologists as a way to make ecology relevant to people in its current form.
- Actually, find now that many economists are interested in this. Next two session speakers are examples: Steve Polasky and Jim Boyd are focused on this. They are taking economic tools and merging them with ecology.
- We are hearing more and more about this from governmental agencies. They are looking for a value and a way to justify what they
 are doing and to see how it is benefiting people.

Question 13:

What role can ecosystem services have in connecting public health to ecological health?

MR. THOMPSON JR.

- My guess is that ecosystem services research should go where ecologists and economists have focused but where it will make the
 most sense for the public good if in the health sector and for health reasons. How do you do a better job at connecting the benefits
 of health with protecting areas?
- A few years ago, Stanford hired Eric Lambin. Link global to on ground studies. He works to link land-use with disease factors and determine the interplay between both. There are two reasons why we have been focused on health: 1) we did not have the ecological tools to connect to health and 2) psychological: people care about personal health and is it something that they talk about so we can connect to it. Making the link between ecology, economists, and public health would be great.

Question 14:

Is there an ecosystem services "deniers" camp?

MR. THOMPSON JR.

- Most criticism I have heard is from environmental side rather than business side. They are not really "deniers" but they are
 doubters. The thought goes like this: "is this another environmental organization method to come up with argument? How
 important are these ecosystem services when get down to it?" Used to think bio-prospecting was going to save the forest it did not
 get us there.
- We need to use what is most likely to resonate.
 - o Example: Pollination services does not sound substantive, it will not get us there



Question 15

How do you appeal to people's values if they are an ecosystem services denier? Some want job values, some want economic values, some want other values. There may be a difference between local decision and national priorities. Pitfall may be that a group values destruction of an area. Do we need to have some national standard to push back?

MR. THOMPSON JR.

• True to the degree if you have an area where focus is just on ecosystem services and people do not worry about future generations. If you make inter-generational, people will value it differently. Do not focus exclusively on ecosystem services. Ecosystem services are not in conflict with environment rights, so you can emphasize both.

Question 16

I am trying to make the connection about cognitive errors. I work on climate change and cognitive errors are a real issue. Why do we not have comprehensive legislation? How do you link up and work in concert and address cognitive errors and political pieces in parallel?

MR. THOMPSON JR.

• I have not really thought about that question. I do not think ecosystem services by themselves get us over cognitive errors. There are other tools to help us with that. Self-enhancing attributional biases can help: gather people together and they see they are part of the community are involved.

Question 17

In CA, we have a compliance market – is the carbon market an anomaly?

MR. THOMPSON JR.

The carbon market is anomalous in that it is a commodity market and that it is a global market. However, there are other options;
 commodity markets are just one possibility. Hydro markets are probably the next ones to have a lot of money and potential.

On Transparency

- Level of transparency will create readiness impacts.
 - British Petroleum spills oil and the impact is seen on the London stock exchange immediately.
 - Some day when consumers care about product differences it will become apparent. Consumer understanding will
 increase as transparency increases and externalities are included.
- If can set production functions that are transparent and easy to understand then you can get to something and people will make tradeoffs. Here, the data needs to be fast.
 - Example: When companies needed to disclose toxins released to community, they dropped 60%. This disclosure had the biggest impact of any regulatory decisions. Power and information moved it quickly.
- My dream is that when a shopper goes into a Wal-Mart in 20 years, the lowest cost shirt will be the one with the lowest impact rather than being the one with the most harm.
- We have to explain to community what money is for; need to explain use and reason.

On Reporting

- Could use Ecosystem services to track and report gains such as what taxpayers are receiving from farm bill at a watershed or regional scale. Then can make a united way style campaign of preservation. Switch from reporting and staying below a threshold, to a positive reporting mechanism. Conservation planning can start by pulling planning docs off the shelf to meet goals.
- When went to community in Sonoma County and talked about recreation, public health, and flood control, etc. there is a high level of interest, people get it. We need to quantify level to date and ask for more funding and do more of this. Show that the water agency and parks district are working together in integrated fashion and ask that they support us and avoid large capital projects and send fund to small-scale protection with less impact.



On Biodiversity

- Define shifting perspectives. In some situations, you might maximize Ecosystem services spatially, but not biodiversity. What does
 that mean for biodiversity? Spatial targeting will be key in how conservation projects are done.
- We realized Santa Cruz County is one of the most environmentally lenient. However, they have a constituency that has been very successful in water and land conservation but they are in silos. Overall, it appears to have high success, but also have 18 impaired watersheds that are under the radar of water control board, and have many issues. Through a project I worked on, this was the first time that people had thought about it in this way or that way; it was the first time people questioned the normal way of work. When we stopped only looking at biodiversity, we found there were other holistic reasons for protection.

On Making Changes

- One challenge in thinking of investments is that we are at a key decision point. 1) There is a lot of opportunity to move language and conceptual approach into use and 2) to develop tools to do the measurements. Problem is that, in oceans, you are lucky if you get data every three years let alone yearly or on a smaller scale.
- I tis important that we do not hang ourselves by waiting on the science. Linkages and three above things will not move at the same pace. We need more tools today to help make decisions without the full data.
- Why was this not operationalized in multi-use? Groups value things differently. Those with more power get their views imbedded into the system and society than those with less.
- Why is agricultural runoff not regulated the same way? Because they have the power.
 - Some people do not care about what happens in the Gulf. They know it is happening but they want high agricultural production. You can go on valuing how you want but you have to make a decision about whether you want or need to make a behavior change. May get a "no" answer.
- Talk about it all you want but it is a political process and the political process will be governed by concentrated political groups and change that process.
- Wal-Mart buys most agriculture products. To change paradigm among farmers, get them to stop being able to sell everything through Wal-Mart.
- The key point is that a Lee Scott is one of a handful of leaders at Wal-Mart. There are social norms among CEO and companies; they pay attention to each other and want to match what others are doing.
- Perhaps matter of changing the marketplace.

On Being an "Environmental Movement"

- Before. The philanthropic world worked on Colorado River in desert South West. Not willing to make change until showed that
 tamarisk was pulling too much water. Only then could we get backing to do Ecosystem services analysis. Then started working with
 irrigation, and semiconductor people would get involved as long as not articulated as having an environmental goal. Will not get
 adoption and uptake from others even if we demonstrated the financial return just would not get there from the environmental
 side.
- After Millennium Ecosystem Assessment, spoke with people from the Hoover Institute who would be willing to work with them on this as long as it did not mean talking about the environment; make it about human well-being and not the environment.
- Ecosystem services will require a huge philosophical shift.

On Catastrophe as a Catalyst

- In South America, after having the largest flood in Columbia's history, they are thinking of land zoning and deforestation. The warning is that, are going to wait until we suffer that large-scale damage to make a change? Answer is yes.
- Catastrophes have an amazing way of motivating reform. How do you get change without the disaster?
- Most change happens out of catastrophe or some big lever. Can ecosystem services overcome other kinds of leverage like catastrophe and other motivations of change? Where can we put leverage on the system?
- If you do not wait for the catastrophe but if you show where else it has happened, it helps people relate at a visceral level and make changes.
- I am curious about Columbia's response with ecosystem services; are they in one country or transboundary?
 - Last week there was an agreement in Brazil and Columbia to make regulation of watersheds. Brazil wants more hydro.
 Their motivation is based on energy; Brazil will export energy back. What is relevant to public? When we look at Brazil, all headwaters in Andes.



On Integration

- How do you develop framework that allows you to integrate? How do you show value of ecosystem services when the ecosystem services are not valued? How do we actually take frameworks to the folks who need it?
- One thing you emphasize is the problem of scale. Who generate the ecosystem services and who is using them? Particularly when there is an international division of this.
- The people I interact with are in developing communities and what you put in your presentation is that there is a language that brings people together and allows them to discus. Maybe devised terms can be put on the sideline. The interest is there; it is in the readings. The interest is there but something productive needs to come out of it to keep that interest.