Payments for Watershed Services from Forests:
Do They Represent Willingness to Pay?

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Resources for the Future

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Overview

Outline of talk:

- Ecosystem functions, services, values
- PES/PWS concept
- Utility theory, willingness to pay, and market prices
- Forest PWS programs
  - Brief summary of some U.S. programs
  - How prices are set
- What do prices reflect?
- Concluding thoughts

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Ecosystem Functions & Services

- Natural lands perform a variety of ecosystem functions
    - e.g., carbon sequestration, provision of habitat, water purification, floodwater storage, storm surge attenuation
- Forests provide important hydrological functions
    - Protection of sourcewater for drinking water supplies

    Reduction of pollutants in streams and other water bodies

    Floodwater retention
    - Reduction of fire risks

Payments for Ecosystem Services

- The PES concept
  - Core idea: beneficiaries of environmental services directly pay the providers of those services
  - Definition (Wunder 2005): *voluntary transactions for a well-defined environmental service (or land use that provides the service) bought by at least one seller and sold by at least one service provider, occurring if and only if the service is actually provided (conditionality)*
  - Beauty of it:
    - "invisible hand" of the market
    - ideally, prices reflect values
    - no public $$ needed

"I'm terrified I might bite the invisible hand of the market."

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PES Challenges

- Transactions costs between buyers and sellers
- Nonexcludable nature of the (quasi-public) good/service
  - e.g., textbook lighthouse example
  - free-riding is likely
- If one buyer, monopsony power?
  - Vittel water case study
- Difficulty writing complex contracts
  - Meet this year's Nobel prize winners in economics
  - Essentially, it's the monitoring & enforcement problem

The Prize in Economic Sciences 2016

Oliver Hart
Harvard University,
Cambridge, MA, USA

Bengt Holmström,
Massachusetts Institute of Technology
Cambridge, MA, USA

Prominent Federal PES Programs

- Wetlands mitigation program
  - "No net loss" of wetlands provision
    - permittees have to offset or
    - buy other preserved or restored wetlands from wetlands mitigation bank
  - Active *private* voluntary market
  - But targeting not based on ecosystem services
    - Replacing acres but maybe not wetland function (no "conditionality")
- Conservation Reserve Program (CRP)
  - USDA program pays farmers to retire land from production
  - Targeting based on ecosystem services (conditionality)
  - But not a *market* program; govt payment

Agents in PES/PWS Programs

- In lots of programs, an agent represents buyers
    - Many government programs (e.g. CRP)
    - For PWS programs
        - local govts
        - And increasingly, utilities

- Do the agents' demands represent true end user WTP?

- Do these programs have the desirable features of a textbook PES/PWS program?

- What will it take or is second-best good enough?

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Some Program Examples

Bennett et al. (2014) identified 37 PWS programs

Gartner et al. (2014): 5 detailed case studies

Ozment et al. (2016): 13 case studies

Bennett et al.:

- 5 main types of programs:
  - Sourcewater protection – driven either by filtration avoidance (SDWA reqts) or (forward-looking) watershed protection
  - Fire risk management
  - Point source pollution (NPDES) offsets
  - Voluntary customer offsets, i.e., "check boxes" (elec utilities)
  - Hydropower mitigation offsets (endangered species)

Some Program Examples (cont.)

	Purpose	Funding mechanism	Revenue raised	Results
Upper Neuse Clean Water Initiative (NC)	Protect forested riparian areas upstream of reservoirs	Nutrient impact fee = $0.0748/ccf	$1.8M/year	6170 acres acq'd along 63 stream miles
Forests to Faucets (Denver)	Fire risk reduction	$0.04/ccf charge on water bill	$16.5 M over 5 years	38,000 acres of national forest treated
Lake Whatcom Watershed Land Acquisition & Preservation Program (Bellingham, WA)	Protect drinking water source	$5/month + $0.64/ccf on water bill	$28.5M since 2001	1,787 acres purchased + 164 easements
San Antonio Source Water Protection Program	Protection of Edwards Aquifer drinking water source	Voter-approved 1/8-cent sales tax adder for 5 years	$90M	226,000 acres protected (mostly easements, some acquisitions)
Clean Water Services (Washington Co. OR)	Reduce temperatures in Tualatin River (for TMDL) by planting trees	In water bills (not separated)	??	100+ miles of stream corridors restored; 1M trees planted in 1 year

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Notice "results" are not really measures of ecosystem services provided

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Evaluating Funding/Financing Schemes

Do prices reflect WTP – i.e., the benefits that the downstream users get from the ecosystem services?

- Water utility fees: probably not -- more likely to reflect what utility can get away with (or approved) and/or avoided cost of treatment plant

- Sales tax: if voter-approved, might be closer

- Water bill seems more like "user pays" but price mechanism's main function is to ration use; not the purpose here.

- Both sales tax and water surcharge have broad bases; generally, small deadweight losses
  - but regressive

- Regulatory requirements (e.g. filtration avoidance programs under Safe Drinking Water Act; offsets used under NPDES) do not necessarily reflect WTP

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Evaluating Funding/Financing Schemes

Supply side issues…

- Targeting of lands to protect often based on development threats or willingness of seller to sell
  - May not be getting ecosystem benefits (if based on development or other threats)
  - May be getting ecosystem benefits you would have gotten anyway – "additionality" concerns (if based on willingness of seller)
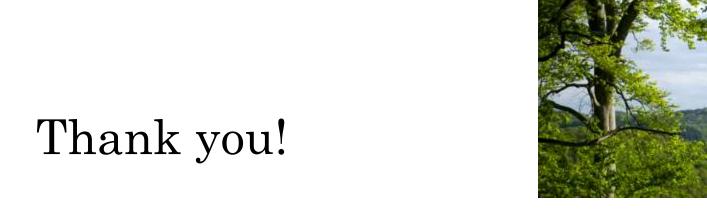
Evaluating Funding/Financing Schemes

- Because of the public good problem (i.e., nonexcludable characteristic of the good/service), unlikely to have a PWS scheme that represents end-user WTP perfectly
- Moreover, transaction costs too high
- *Second-best is good enough!*

Most important...

- Try to base fees on some measure of value, not avoided cost
- Pay for what you want – i.e., clean water is important (conditionality)
- Measure, monitor and evaluate ex post
  - Performance
  - *And prices/payments* (collect and analyze the transaction data)... not sure this is happening

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Thank you!

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