Costs of Controlling Water Pollution

Catherine L. Kling
President's Chair of Environmental Economics

Integrated Assessment Models and the Social Costs of Water Pollution

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Department of Economics and
the Center for Agricultural and Rural Development
Iowa State University

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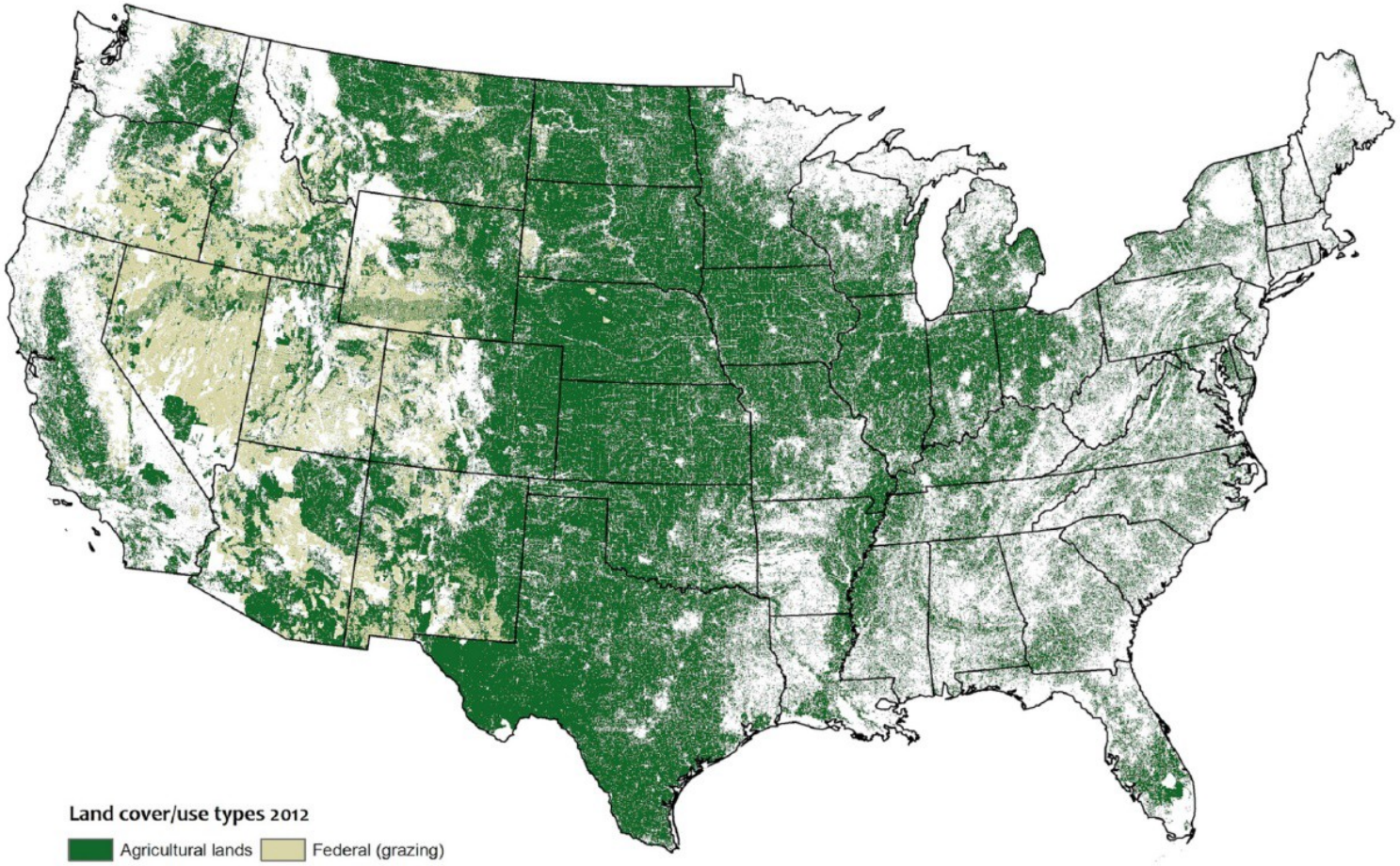
Kling is a University Fellow, Resources for the Future.

Farmer and Rancher Managed Land in the Continental US

Farming and ranching account for just over half of 2.3 billion acres of land



Source: https://www.farmland.org/initiatives/

Fundamental Challenges for Estimating Abatement Costs

1. Available data often does not match economic cost concepts

Economic costs = Least amount that an individual or firm will accept to reduce emissions (WTA to abate)

- What do we often have:
  - Engineering costs (scrubbers, technology costs, N removal in water quality systems)
  - Cost share (NRCS programs)
  - Rental rates (land values)

- What is missing:
  - Value of risk
  - Lumpiness in technology
  - Management costs/preferences
  - Idiosyncratic costs (variability over locations, firms, farms)
  - How important????

Fundamental Challenges for Estimating Abatement Costs

2. Environmental Economics literature documents many cases where ex ante costs over estimated ex post costs

- Reasons:
  - Didn't anticipate other abatement options (SO2 CAAA)
  - Didn't anticipate other market changes
  - Innovation (Ozone)
  - Other?

Fundamental Challenges for Estimating Abatement Costs

3. Costs associated with alternative policies/implementation methods can differ

- Target different sectors or types within sector
- Transaction costs of policy implementation
- Policies that themselves induce innovation will be lost costly in long run
- Market responses can differ
- Leakage can differ
- Some policies will change costs of other abatement

Fundamental Challenges for Estimating Abatement Costs

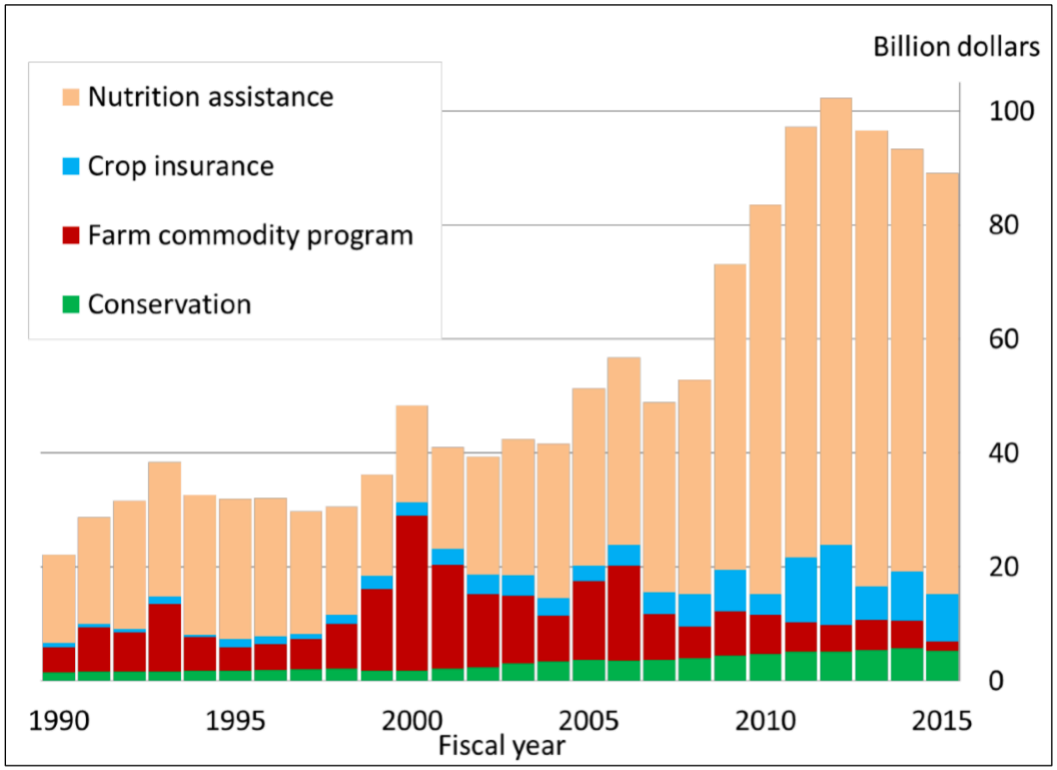
Example: Approaches for agricultural pollution control

- Private Action
  - Voluntary adoption (no compensation)
  - Certification programs
- Government cost-share and payment policies
  - Conservation Reserve Program
  - Environmental Quality Incentives Program
  - State programs
- Government Regulatory/Incentive Programs
  - Conservation Compliance via Farm Bill
  - Water Quality Trading Markets
  - Direct regulation

Many Thanks

Government payment programs: Overview

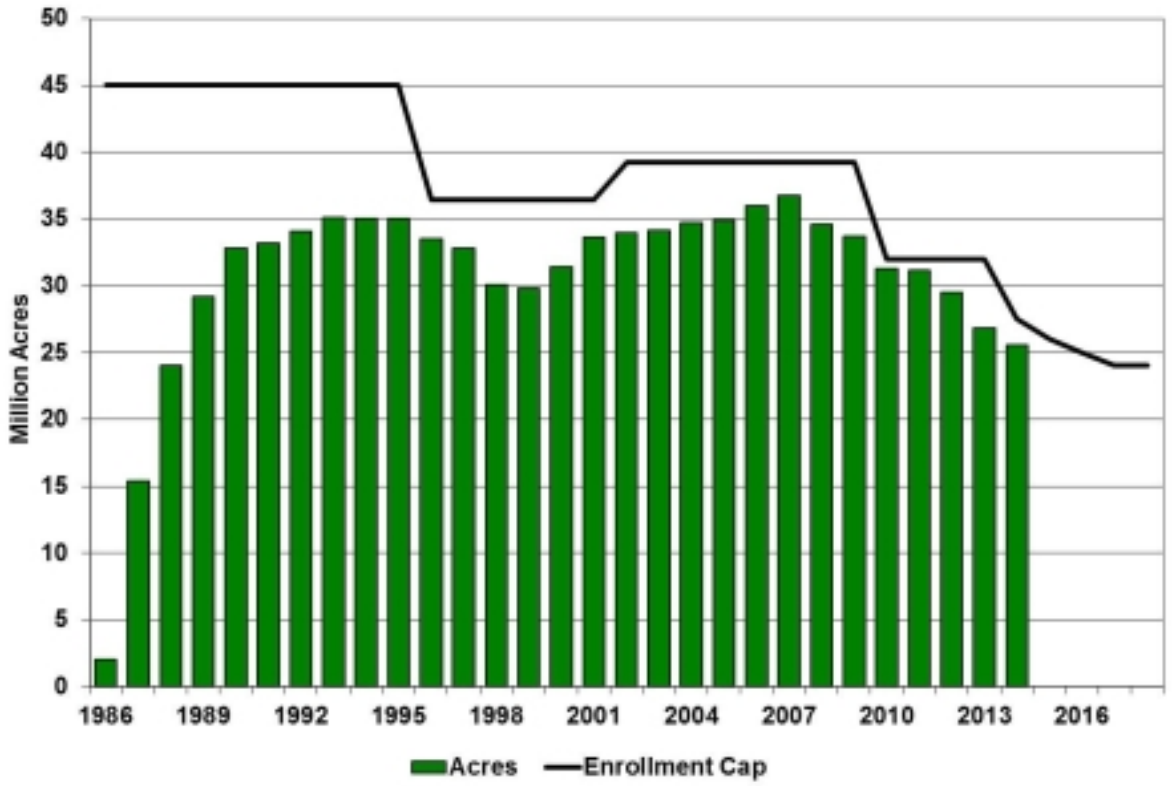
Farm Bill Spending by Major Mandatory Programs



Source: CRS, using USDA data, including USDA Farm Service Agency, "Table 35," *Agricultural Outlook;* USDA Risk Management Agency, "Program Costs and Outlays by Fiscal Year;" J. Glauber, "Crop Insurance Reconsidered," *American Journal of Agricultural Economics*, 2004; USDA Farm Service Agency, "Output 3," *Commodity Estimates Book;* USDA Natural Resources Conservation Service, "Soil and Water Conservation Expenditures, 1935-2010," 2011; and USDA Food and Nutrition Service, "National Level Annual Summary, Participation and Costs."

Government programs: Conservation Reserve Program

Conservation Reserve Program Acres and Enrollment Cap by Program Year



Source: USDA Farm Service Agency and U.S. Congress
Note: Enrollment data by program year. Acres for 2014 are preliminary as of the beginning of 2014

Government programs: Conservation Reserve Program

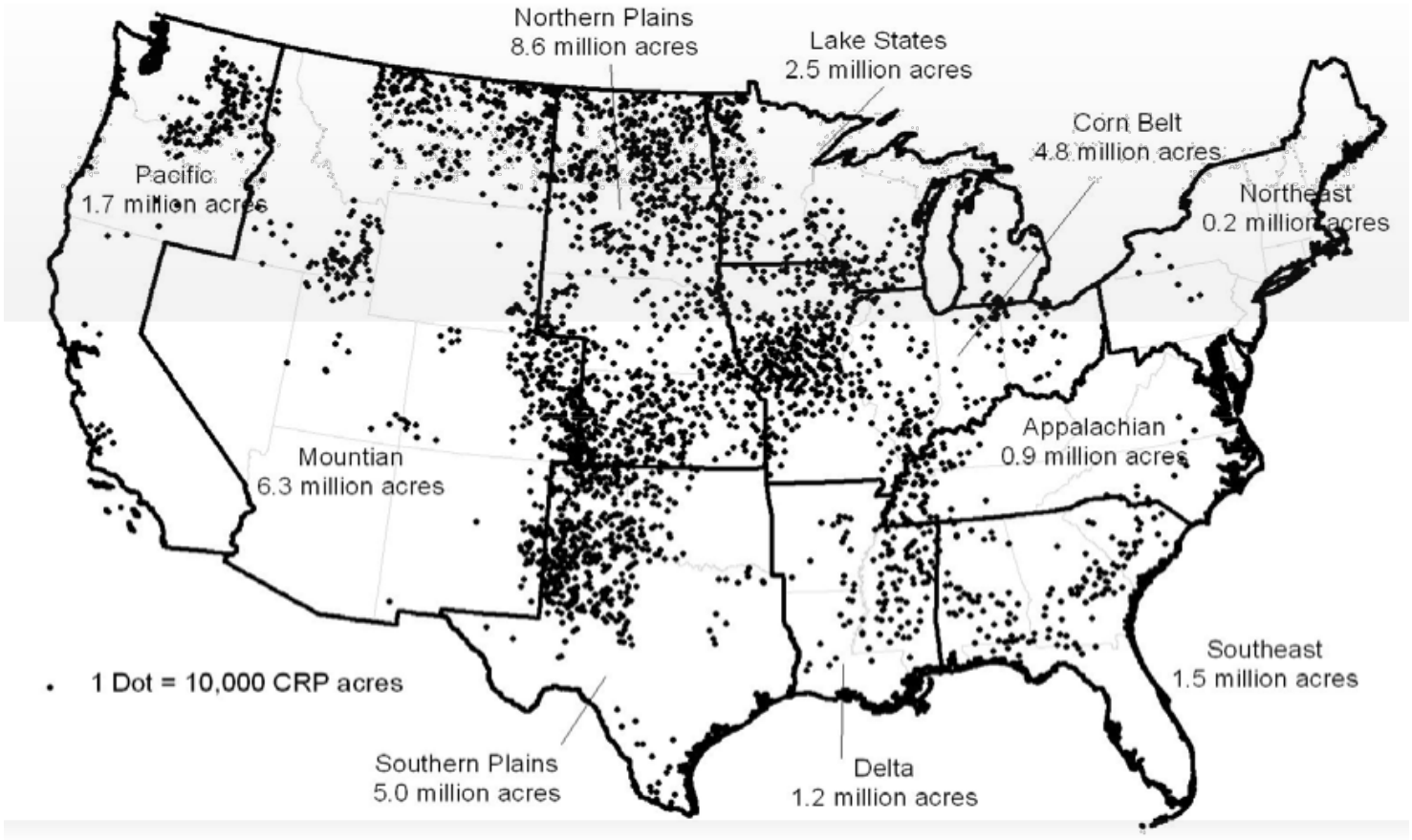


Figure 4. Distribution of CRP Acres in 1997
Source: CRP contracts file.

Hansen, L. (2007) Conservation Reserve Program: Environmental Benefits Update. *Agricultural and Resource Economics Review* 36(2): 1-14.

Conservation Reserve Program: Effectiveness

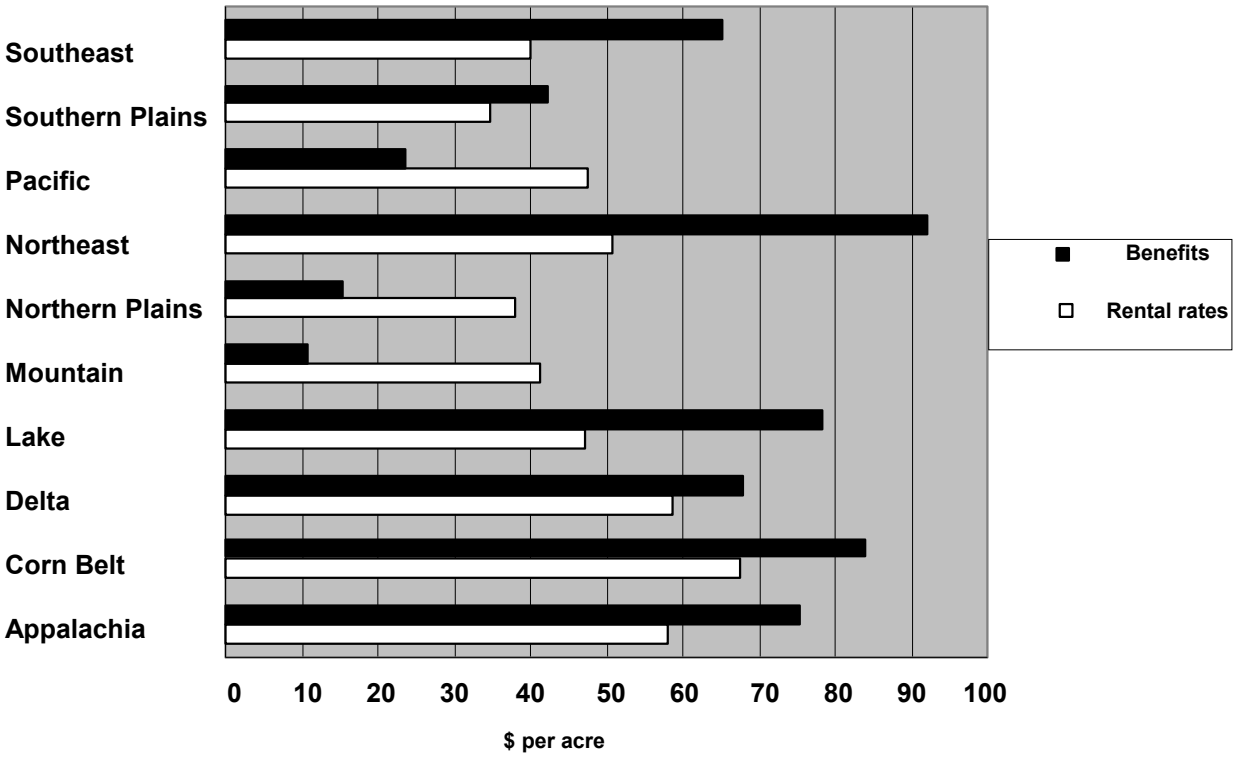
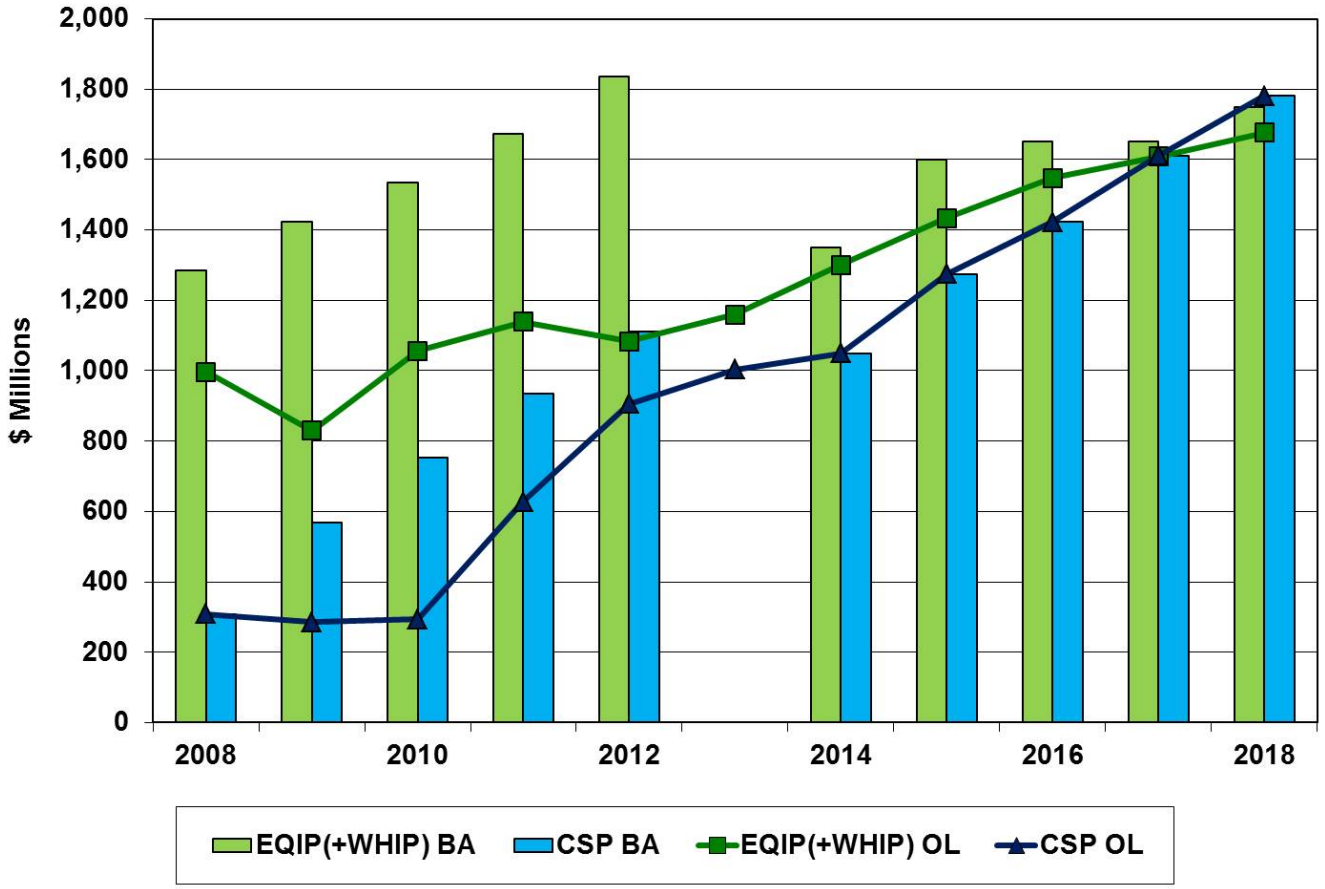


Figure 5. Average Annual Per-Acre CRP Rental Rates and Estimated Benefits
Note: Benefit estimates are derived from this analysis. The rental rates are from the August 2006 CRP summary data (U.S. Department of Agriculture 2006).

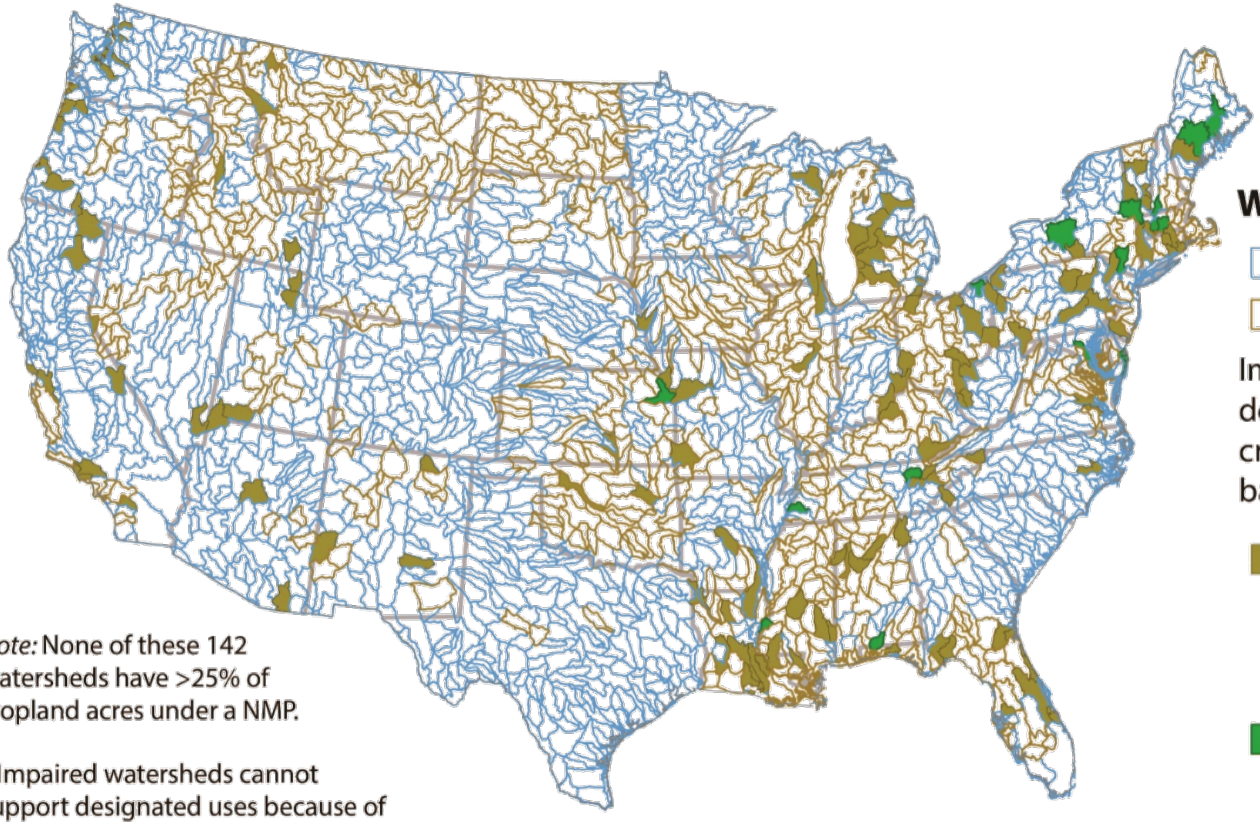
Working Land Programs

Working Lands Programs Budget Authorization (BA) and Outlays (OL) by Fiscal Year



Approaches to Control:

Water Quality Trading Markets: Potential for Expansion



Watershed status

- Watersheds not impaired
- Impaired watersheds*

Impaired watersheds where demand and supply of nitrogen credits are most likely to be in balance (142 watersheds:

- Greatest availability of low-cost credits (<5% of cropland acres under a Nutrient Management Plan (NMP)
- Somewhat lower availability of low-cost credits (5-25% of cropland acres under a NMP)

Note: None of these 142 watersheds have >25% of cropland acres under a NMP.

* Impaired watersheds cannot support designated uses because of pollutants, such as nutrients, produced by both agriculture and regulated sources.

Source: USDA, Economic Research Service analysis of EPA, Geological Survey, and USDA, Natural Resources Conservation Service data.

Regulation: Examples from Several States

State	Description	Year Regulation Was (or Will Be) Implemented
Florida[a]	• Permits certifying the use of appropriate BMPs required for farming in Everglades Agricultural Area	1995
Maine[b]	• Winter ban on manure spreading	2001
Maryland[c]	• Organic nutrients must be incorporated within 48 hours • Cover crops required when applying organic nutrients to fallow ground in fall • 10'–35' "no fertilizer application zone" • Nutrient applications prohibited November - March	2013–2016
Minnesota[d]	• Vegetative buffer requirements 50' from streams in shoreland districts	2007
North Carolina[e]	• Mandatory BMPs or inclusion in local strategy in Neuse River Basin Nutrient Sensitive Waters	1998
Pennsylvania[f]	• 100' setback from environmentally sensitive areas • Winter application of manure banned on high-slope fields, fields without adequate residue or cover crops	2011
Vermont[g]	• Winter ban on manure spreading	1995
Wisconsin[h]	• Meet tolerable soil loss on cropped fields and pastures • Develop and follow a Nutrient Management plan • Use the Phosphorus Index • Avoid tilling within 5 feet of bank surfaces	2011

Kling, C.L. 2013. "State Level Efforts to Regulate Agricultural Sources of Water Quality Impairment". Choices. Quarter 3.

Florida South Coast Agricultural Management District

- Reverse of property rights:
  - Everglades Forever Act 1996;
  - Required farms to adopt of conservation practices for phosphorus
- Different practices were assigned different points
- More than 55% reductions in phosphorus pollution