

# Incorporating environmental concerns in programme allocation: The case of the US

**172 EAAE Seminar - Agricultural policy for the environment or environmental policy for agriculture?**

Brussels, 28-29 May 2019

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The findings and conclusions in this presentation are those of the author(s) and should not be construed to represent any official USDA or U.S. Government determination or policy. This presentation was supported by the U.S. Department of Agriculture, Economic Research Service.





# *The assignment ....*

... This presentation will showcase the experience of integrating environmental performance, in particular output-based approaches, into actual policy design. Contrary to the policy session, here we will see economic analysis of how the longest living conservation program for agricultural lands in the US (CRP and EQIP) has evolved over time and which lessons the CAP could take on board. The presentation will also highlight issues like how much data is needed, how the data can be obtained, any additional administrative burden, whether the program actually delivers value for money, and its post-policy long-term impacts on farmers' behaviour.



# Policy Instruments for Protecting Environmental Quality

- Education and technical assistance
- Government labeling standards for private goods
- Environmental credit trading and mitigation banking (*created markets*)
- Compliance mechanisms (*eligibility conditions for other payments*)
- Long-term contracts and easements ... *land retirement*
- Cost-share and incentive payments ... *payments for practice*
- Payments for environmental outcomes ... *payment for performance*
- Regulation



## *Policy Instruments for Protecting Environmental Quality – Today's Focus*

- **Long-term contracts and easements ... *land retirement***
- Cost-share and incentive payments ... *payments for practice*
- Payments for environmental outcomes ... *payment for performance*

*Important point:*

For almost all USDA conservation programs, participation is voluntary!





## *Targeting to achieve improved outcomes*

*For most federal conservation programs, more farmers are willing to participate than budget and acreage limits allow*

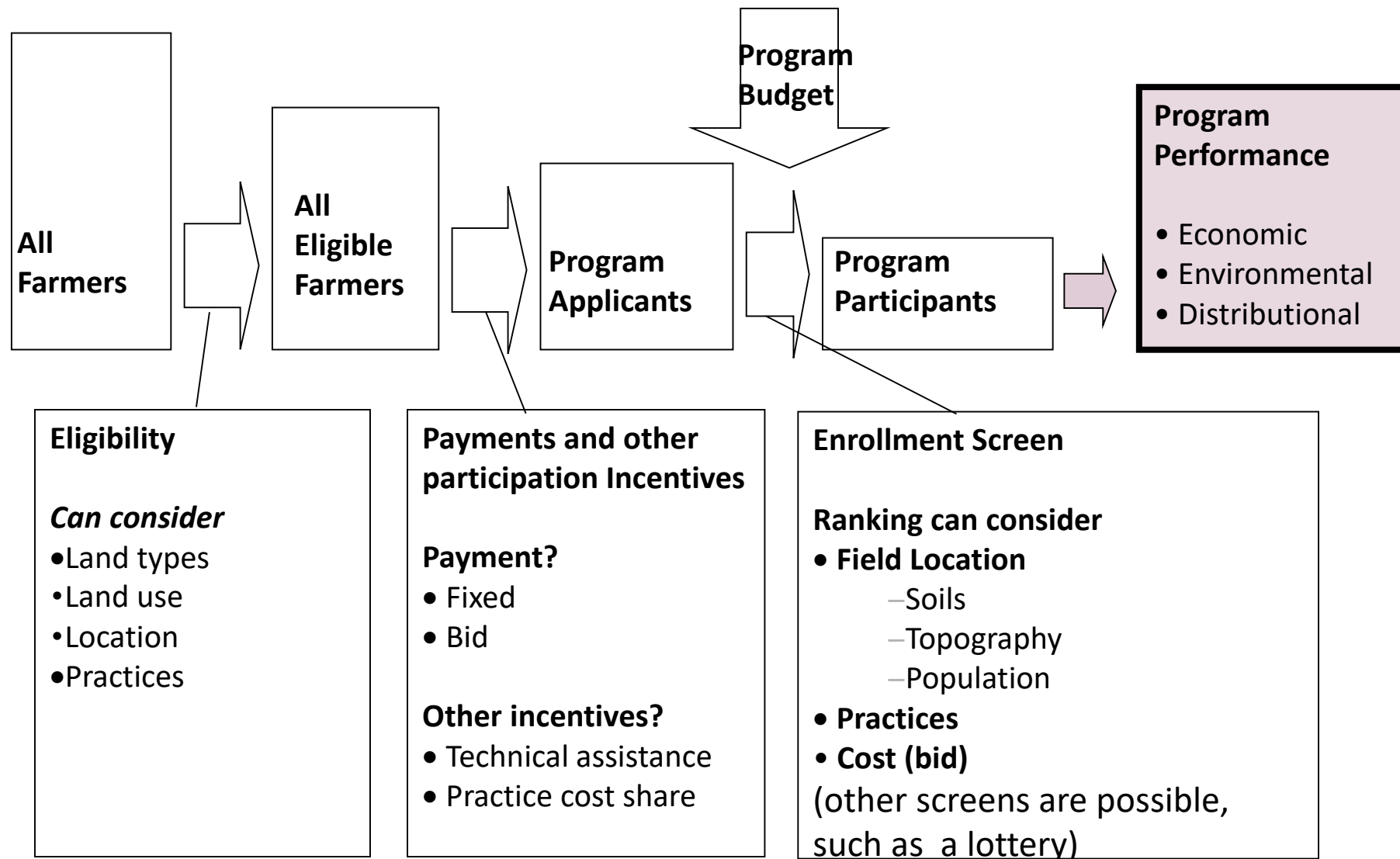
**∴ Targeting can be used to obtain better outcomes!**

Targeting can be achieved using

- ✓ Eligibility : who can apply to the program
- ✓ Payment & incentives : who gets compensated for what
- ✓ Ranking : what applications are preferred



# A multitude of program design decisions affect program outcomes







# *A land retirement example: The Conservation Reserve Program (CRP)*

Now over 30 years old, the CRP continues to be USDA's largest conservation program (~\$2 billion out of \$6 billion)

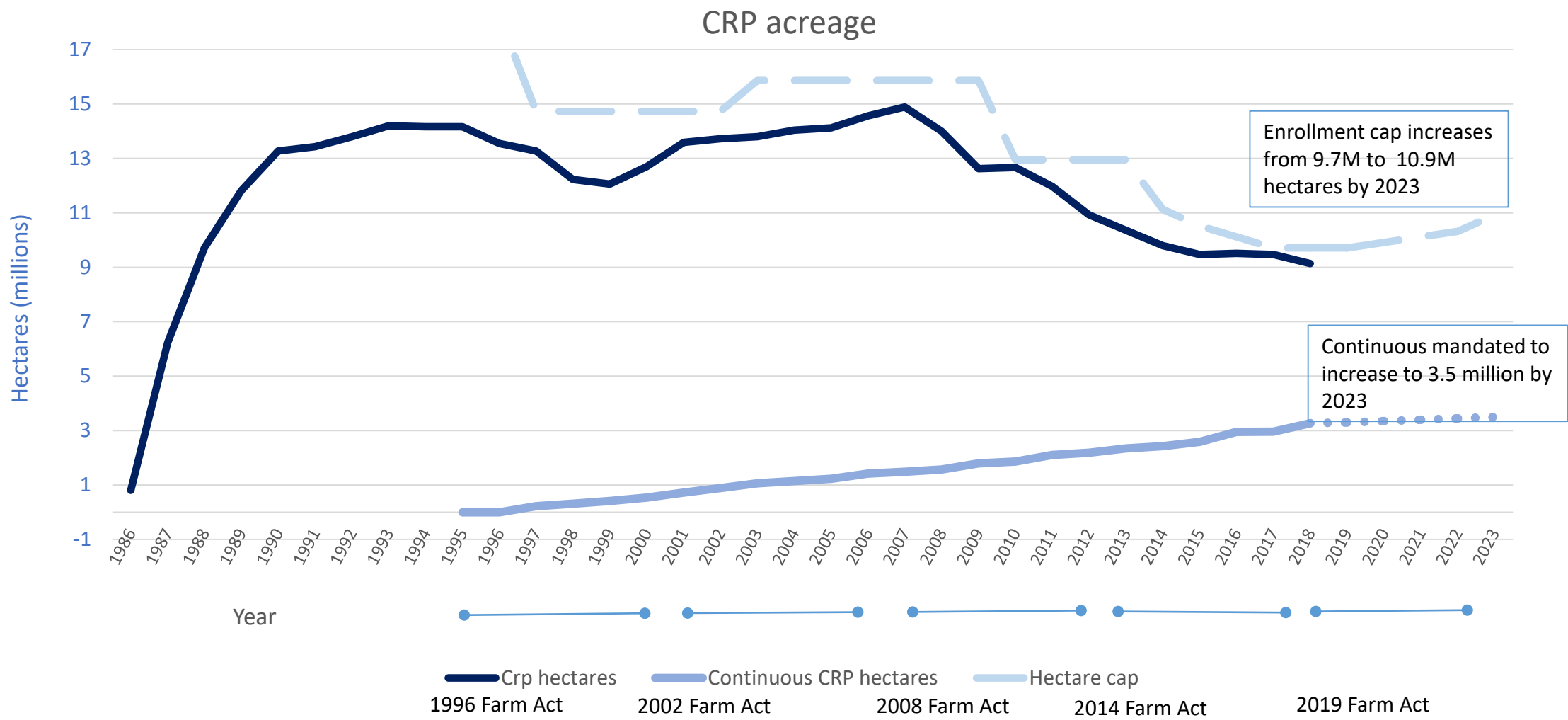
*Enrolled parcels cease crop production, and a “conservation practice” is installed and maintained for 10-15 years*

There are two kinds of CRP -- **General** signup and **continuous** signup. They differ in how they use eligibility, ranking, and payments





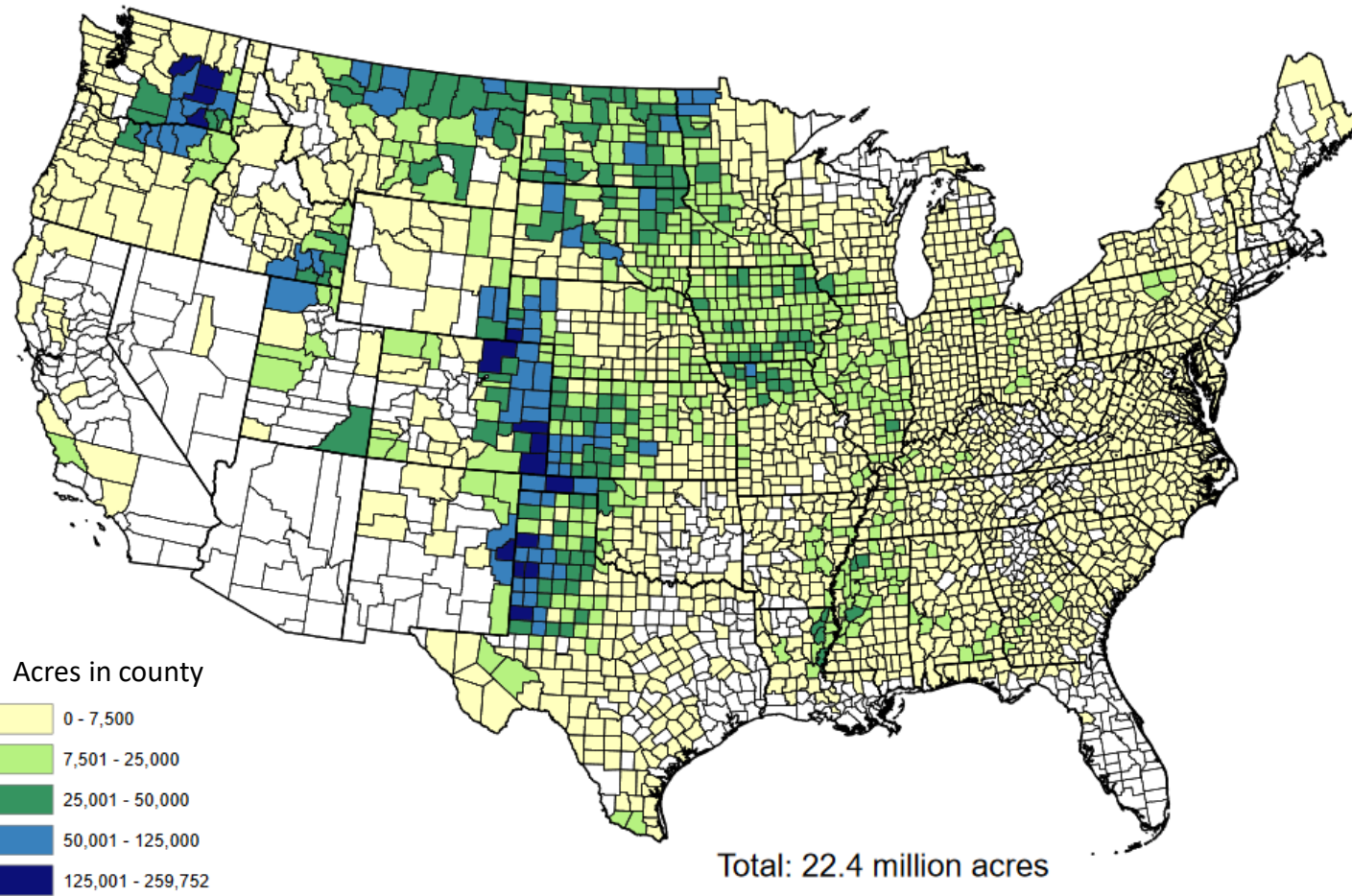
# As of Feb 2019 enrollment: 9.06 million hectares with \$1.8 billion annual rental payments



Source: ERS analysis of CRP contract data from USDA Farm Services Agency



## CRP Enrollment - February 28, 2019



Prepared by FSA/EPAS/NRA



## General signups occur every year or two

Landowners specify a parcel to enroll, a conservation practice to install, and a rental rate.

### Eligibility:

- cropland history, *and*
- either erodibility or location (in a Conservation Priority Area)

Ranking: all offers are ranked using a national Environmental Benefits Index (EBI)

Landowners know their EBI score *before* submitting a bid

EBI cutoff scores for past signups is public knowledge

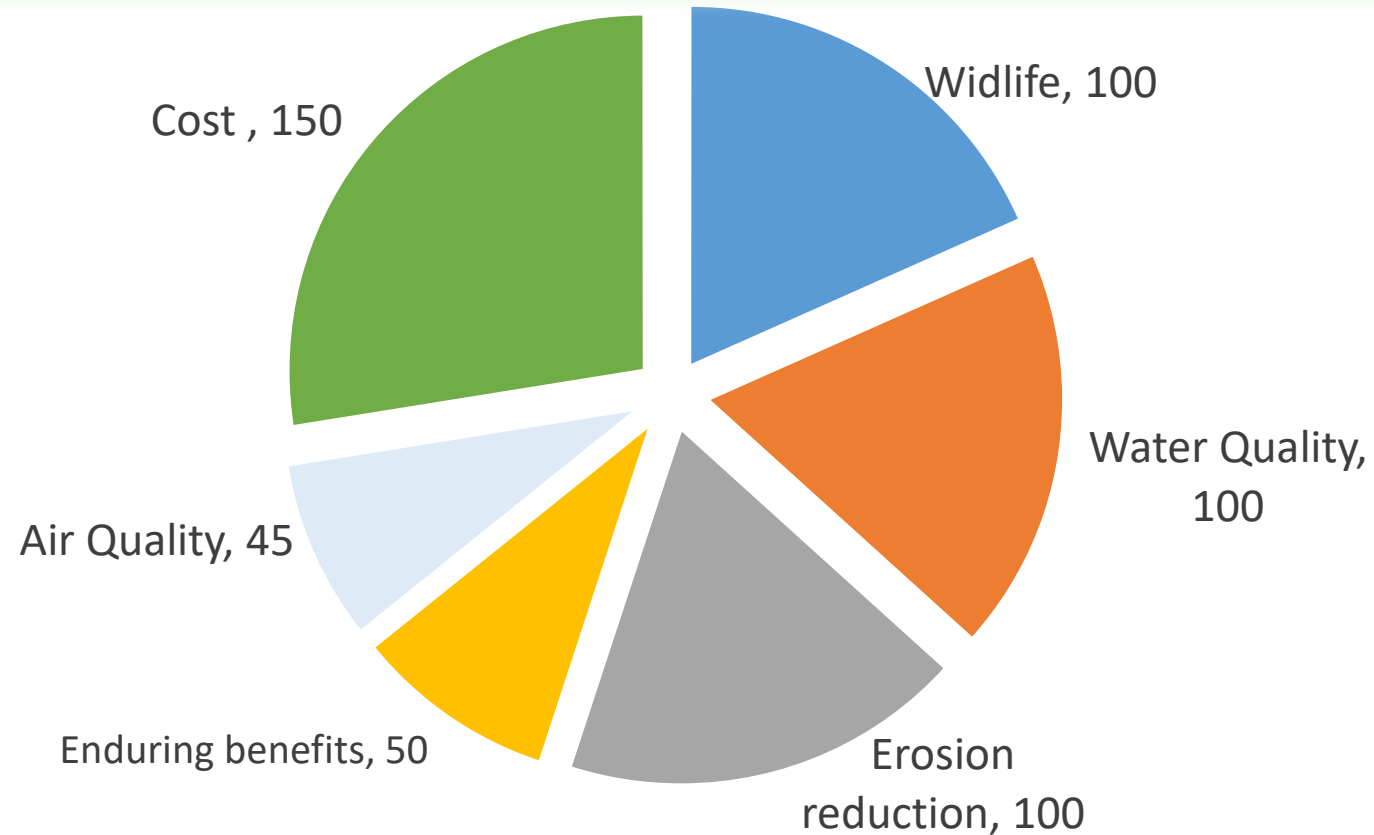
Payment: if accepted, offers receive their requested rental rate

- Requested rent can **not** exceed a parcel specific bid cap
- Hence, a parcel is offered only if the willingness to accept is  $\leq$  the parcel's bid cap





# The Environmental Benefits Index (EBI): a quality weighted auction ...



Cost *enters* additively – higher requested rental rates reduce the EBI score.

*The EBI is not a benefit/cost ratio*

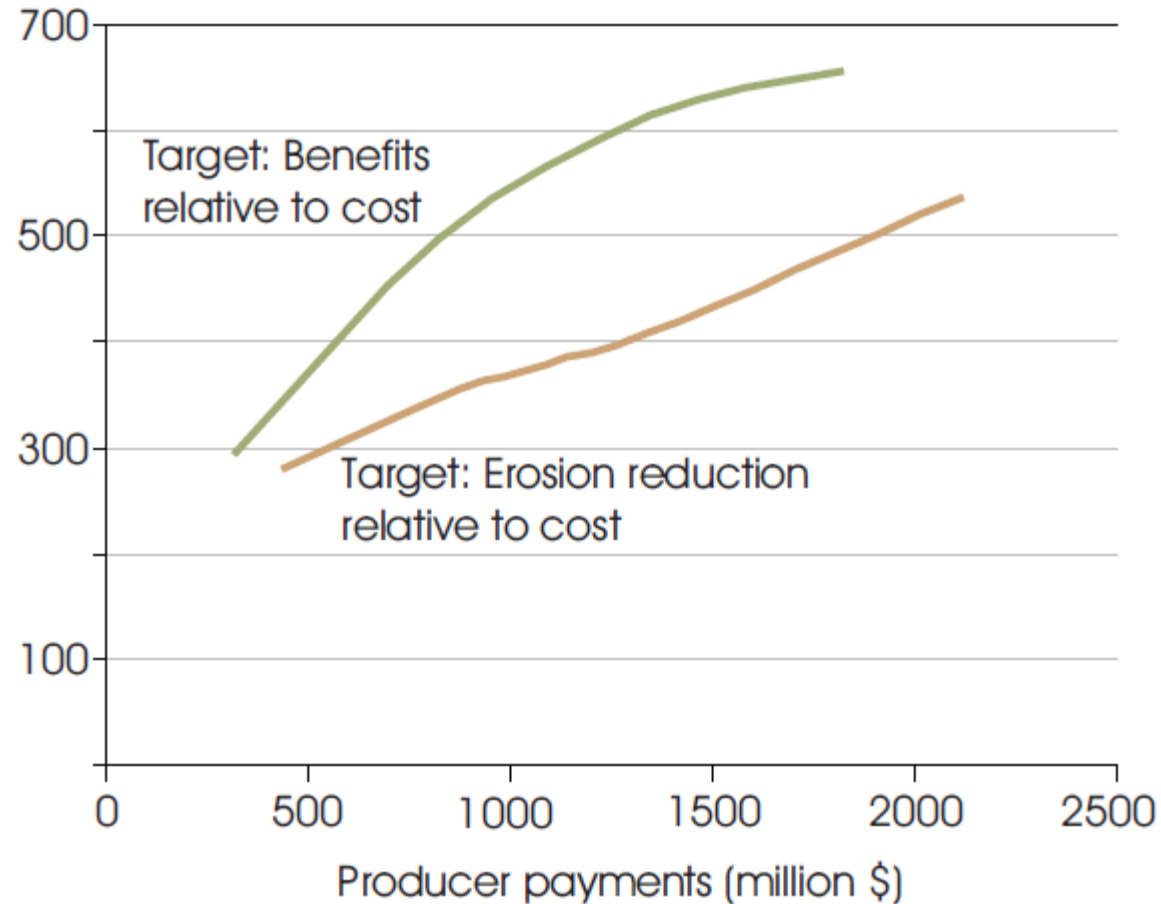
Landowner chooses a conservation practice: some of which provide more points than others

Requested rental rates can not exceed a parcel-specific bid cap

Roughly equal weight to the water quality, erosion, and wildlife habitat ('the major long-term goals of the program')

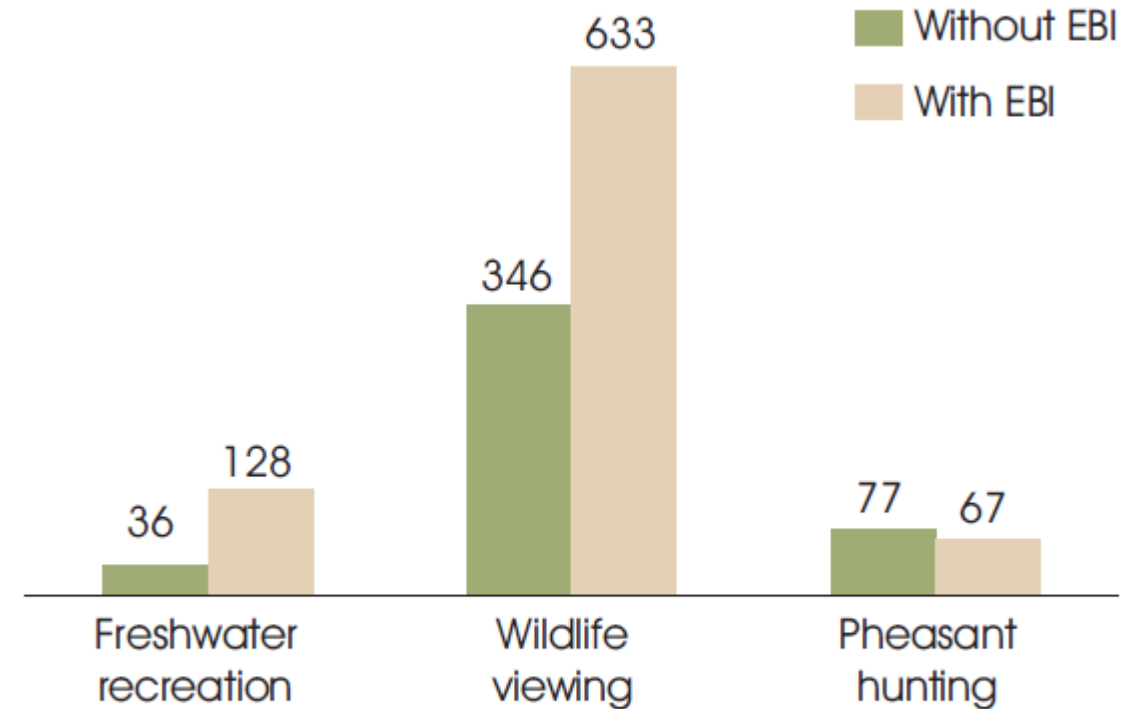
# Impacts of the EBI

Water quality benefits (million dollars)



Source: *Agri-Environmental Policy at the Crossroads: Guideposts on a Changing Landscape*, ERS, AER-794, January 2001.

Million dollars



Source: *Economic Valuation of Environmental Benefits and the Targeting of Conservation Programs: The Case of the CRP*, ERS AER-778, April 1999.

# How do landowners respond to the EBI

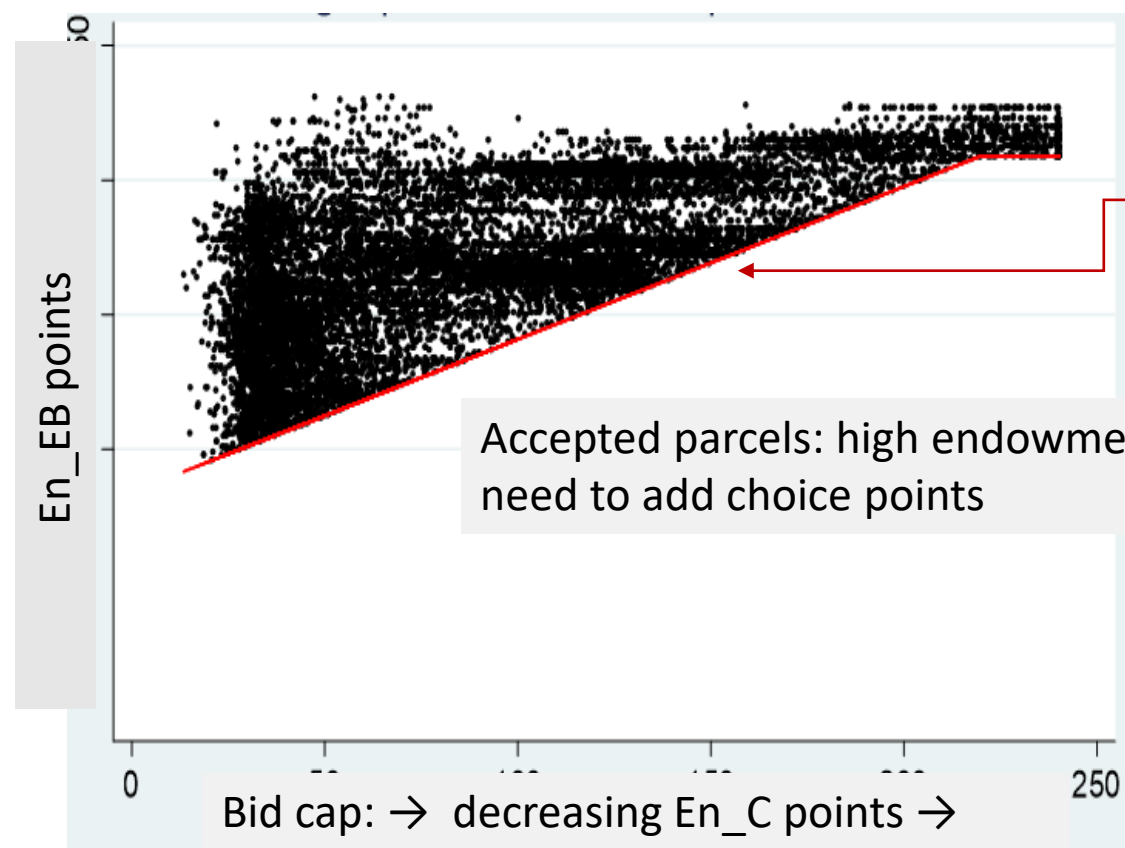
*The EBI points can be divided into four components:*

	Environmental benefits (EB)	Cost (C)
<b>Endowment points (attributes of the parcel)</b>	<i>En_EB</i> : Soil erodibility, water quality zone, wind erosion impacts, ...	<i>En_C</i> : Points due to a low bid cap
<b>Choice points (conservation practice &amp; payment)</b>	<i>Ch_EB</i> : Wildlife impacts, enduring benefit, etc., differ across conservation practices	<i>Ch_C</i> : Points from requesting less than bid cap

*Some parcels will have a large number of endowed points, other will not. How do landowners respond to these endowments, and the ability to make choices?*

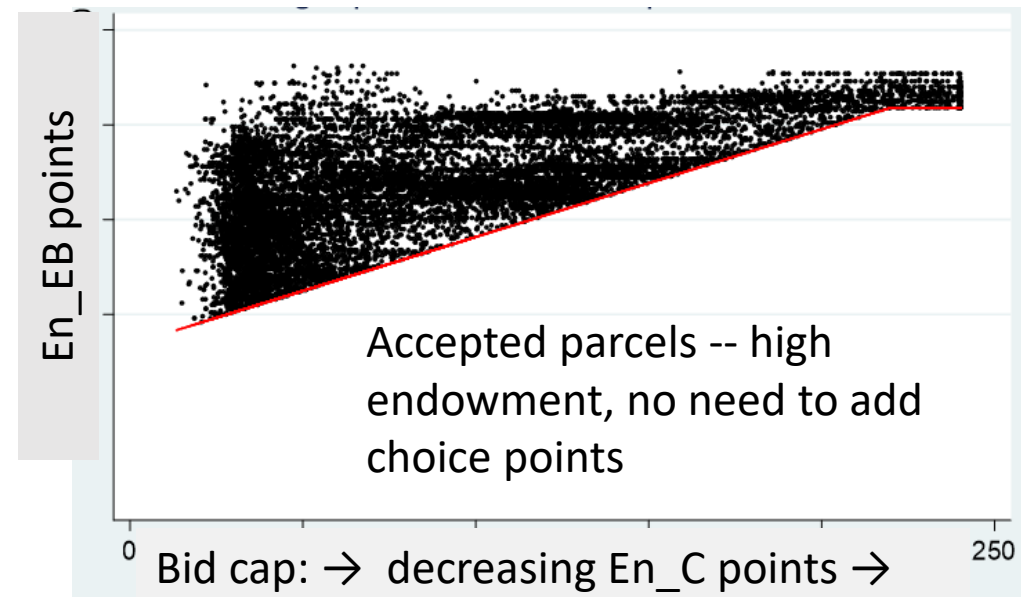


## Landowner responses – an examination of the 45<sup>th</sup> General Signup (2013)

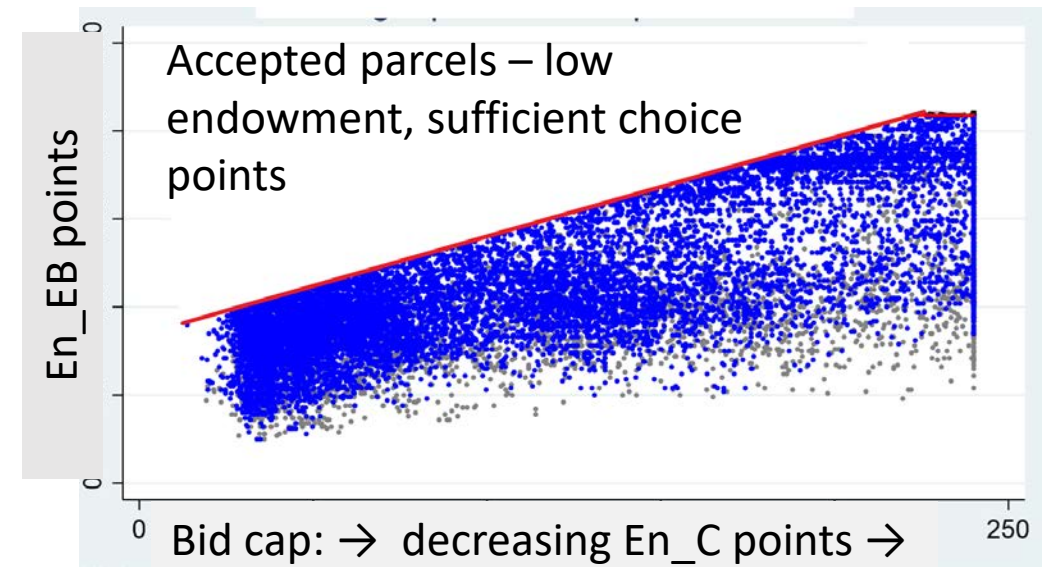
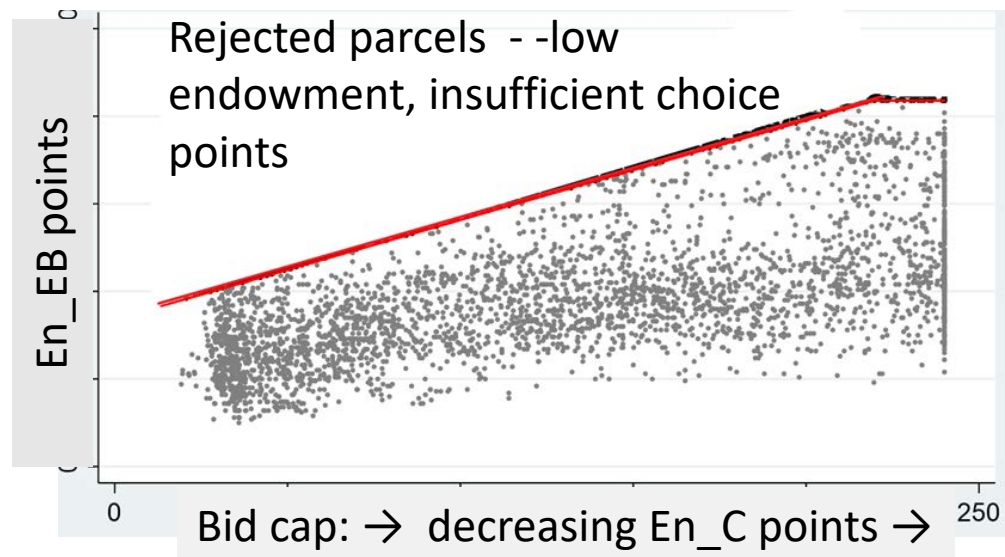


The red line is the *En\_EB* (endowed Environmental Benefit) points that, when added to *En\_C* (endowed Cost) points, achieve an acceptable EBI score.

Each point is a parcel – showing its endowed EB points and bid cap.



*Reminder: each point is a parcel.*



## Continuous signup

Continuous CRP is focused on environmentally sensitive land. Its acreage has grown continuously from its start in 1997, and now accounts for more than 1/3 of program acres.

Eligibility: determined at the local level (for example, proximity to a waterway).

Enrollment is non-competitive: **if you are eligible, you will be automatically accepted**

Supported practices tend to be more intensive than under general signup



*Wetlands Buffer*



*Grass Waterways*



*Contour Grass Strips*



*Riparian Buffer*



*Filter Strips*



*Shelter Belts*



*Wetland Restoration*



*Buffers for Wildlife Habitat*

Source: USDA/FSA <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp>

Ranking: A number of initiatives address particular issues – such as wildlife enhancement, flood plain wetlands, and pollinator habitat.

*The choice of areas (and practices) is an implicit ranking?*

Payment: rates under continuous signups tend to be higher than under general signups (due to various incentives)



## Continuous signup: CREP

The 0.38 million hectare **Conservation Reserve Enhancement Program** is an offshoot of Continuous CRP

CREP is a partnership between state governments and the federal government. Over 25 states have one (or more) CREP projects.

Eligibility is similar to Continuous, plus additional requirements specific to each CREP project

Allowed practices are typically specific to each CREP project

Ranking --- same as with continuous. *Establishment of a project an implicit ranking?*

Payment tends to be higher than continuous, due to additional incentives provided by State governments



## *A cost share example: The Environmental Quality Incentives Program (EQIP)*

Environmental Quality Incentives Program

In contrast to the CRP -- which takes land out of agricultural production -- EQIP pays for conservation practices on working agricultural land.

### *Some of the over 100 Eligible Practices*

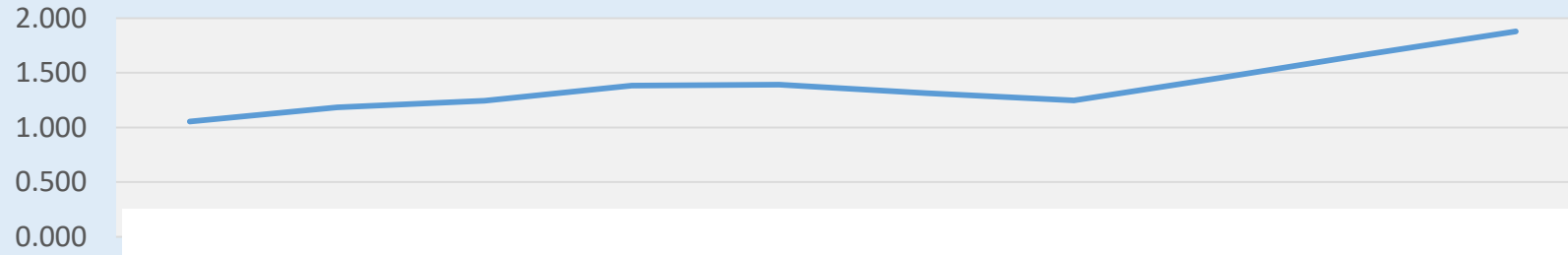
Buffer strips • Contour strip cropping • Cover crops • Critical area plantings • Erosion control • Grassed waterways • Grazing management • Livestock water systems • Manure management systems including storage structures and barnyard runoff protection • Nutrient management • Pollinator and wildlife habitat • Stream exclusion/fencing



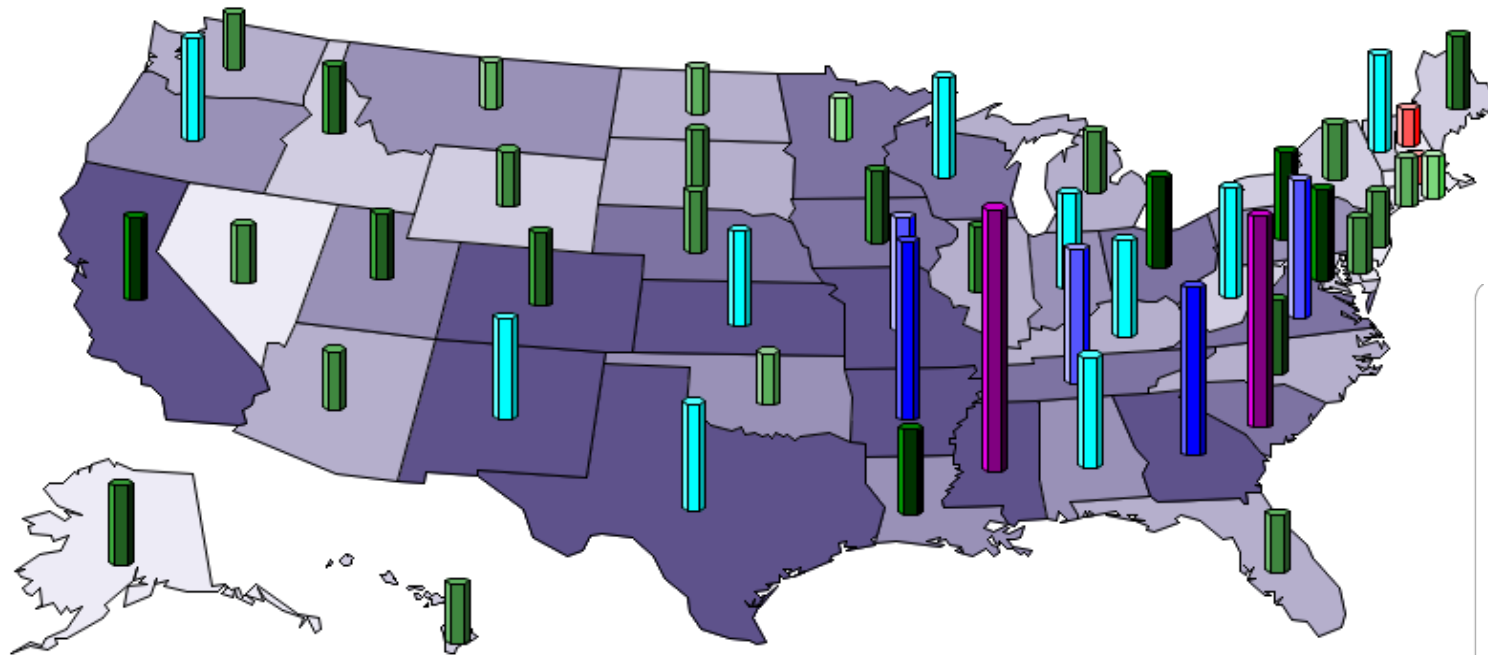
Between 2009 and 2018, EQIP obligations increased from 1.05 to 1.87 \$billion

**Projected funding:**  
2019: \$1.8 billion  
2023: \$2.0 billion

EQIP obligations  
(\$billion)



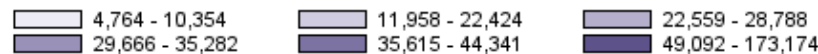
EQIP funding is spread across the nation



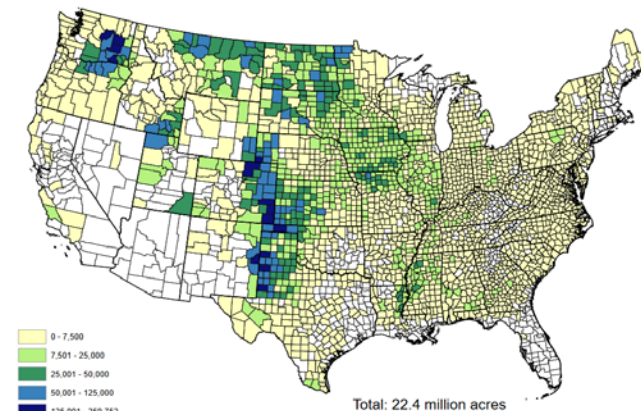
% increase in EQIP obligations: 2009 to 2018



EQIP obligations 2018 (\$k)



CRP Enrollment - February 28, 2019



Prepared by FSA/EPAS/NRA



EQIP enrolls acreage through multiple, essentially independent funding pools...

Eligibility: Defined over state (or sub-state) regions

NRCS determines which resource interests to focus on in a given area

- There can be many “pools” over the course of a year and within a state
- Each pool is focused on a particular resource concern

Ranking: based on the quality of the practice installed on a parcel

- NRCS uses state specific ranking
- Global datasets and models (such as **CART**) are used
- Landowners can examine and compare the scores of several sets of practices

*The choice of pools -- what to focus and the funding levels is an implicit ranking?*

Payment: Cost share of estimated practice installation expenses

- As of 2002, “Bid downs” (requesting a lower cost share) can **not** be used as a deciding factor

# Performance oriented targeting: An analysis of minimizing the cost of reducing hypoxia in the Gulf of Mexico.

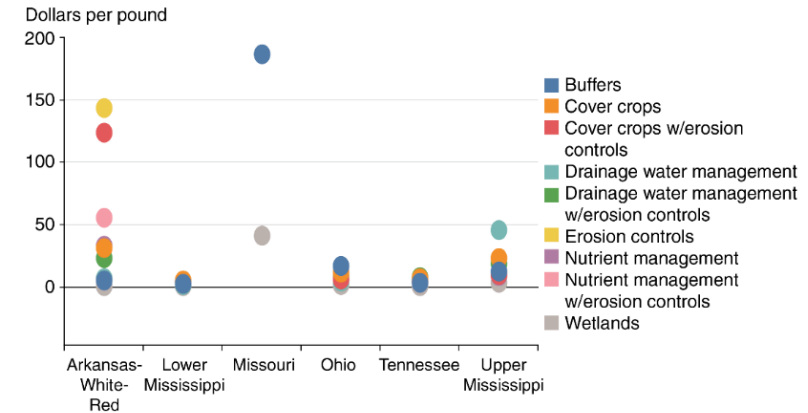
Using the REAP modeling tool, the cost of reducing nitrogen by 45% is examined.

The hypoxic zone develops at the mouth of the Mississippi/Atchafalaya River Basin, which is subdivided into six sub-basins



Note: The area and location of the hypoxic zone are estimated based on data collected by the Louisiana State University and Louisiana University Marine Consortium during the National Oceanic and Atmospheric Administration 2017 Shelfwide Cruise.  
Source: USDA, Economic Research Service.

The most cost-effective opportunities for reducing nitrogen delivered to the Gulf of Mexico were generally found in the Lower Mississippi, Tennessee, and Ohio sub-basins



Practice-by-region costs to achieve a unit reduction in nitrogen loadings at the Gulf of Mexico

## Findings

imposing a “regional constraint” -- where **each** of 135 production areas are required to achieve the **same** 45% reduction –

- requires **over twice as many acres** (78.5 million versus 36.7 million)
- retires an additional 12 million extra acres of idled cropland.
- shifts the geographic distribution of conservation investments



## Payments for practices vs. payments for performance... some thoughts

The issue	The impact
Performance based policies require data (or measures of data) at the parcel level	Measurement data (or robust models) may not be available, or may be expensive.
The impacts of practice based policies can vary substantially across the landscape	Targeting is imprecise, yielding higher average costs per unit improvement
Landowner response to performance payment	Behavioral & labor economics has mixed evidence on how actors respond to micro incentives. Is it certain that payments-for-performance will induce more efficient effort?
Equity	Is it “fair” to favor some lands simply due to cost considerations?





## A few words on data and models ...

CRP	Soil data (SSURGO-- National Cooperative Soil Survey database)	To adjust parcel bid caps, determine eligibility, and assign soil erodibility EBI points
EQIP	Application Evaluation and Ranking Tool (ALERT, to be superseded by CART)	Assigns scores to offers (based on parcel characteristics, and practices to be installed)
Hypoxia analysis	Regional Environment and Agriculture Programming (REAP) model	Using CEAP data on the conservation benefits of onfield practices: assess the most cost-effective mix of conservation investments and land allocations





# Summary

- Most US agricultural conservation expenditures are for land retirement, or incentive payments for practice adoption
- Given an excess demand for these programs, targeting to achieve cost effectiveness is feasible
- Eligibility requirements, ranking methods, and payment schemes are used to target expenditures
- The geographic scale of these tests -- National, State, and local tests – varies across programs
- Effectiveness is a concern, but not the only concern, for programs
  - Cost is a factor in some, but not all, programs
- Explicit payments for performance are not currently used
  - But do inform cost- effectiveness analysis
- Data needs can be significant– often models (with less intensive data) are used to approximate benefit flows

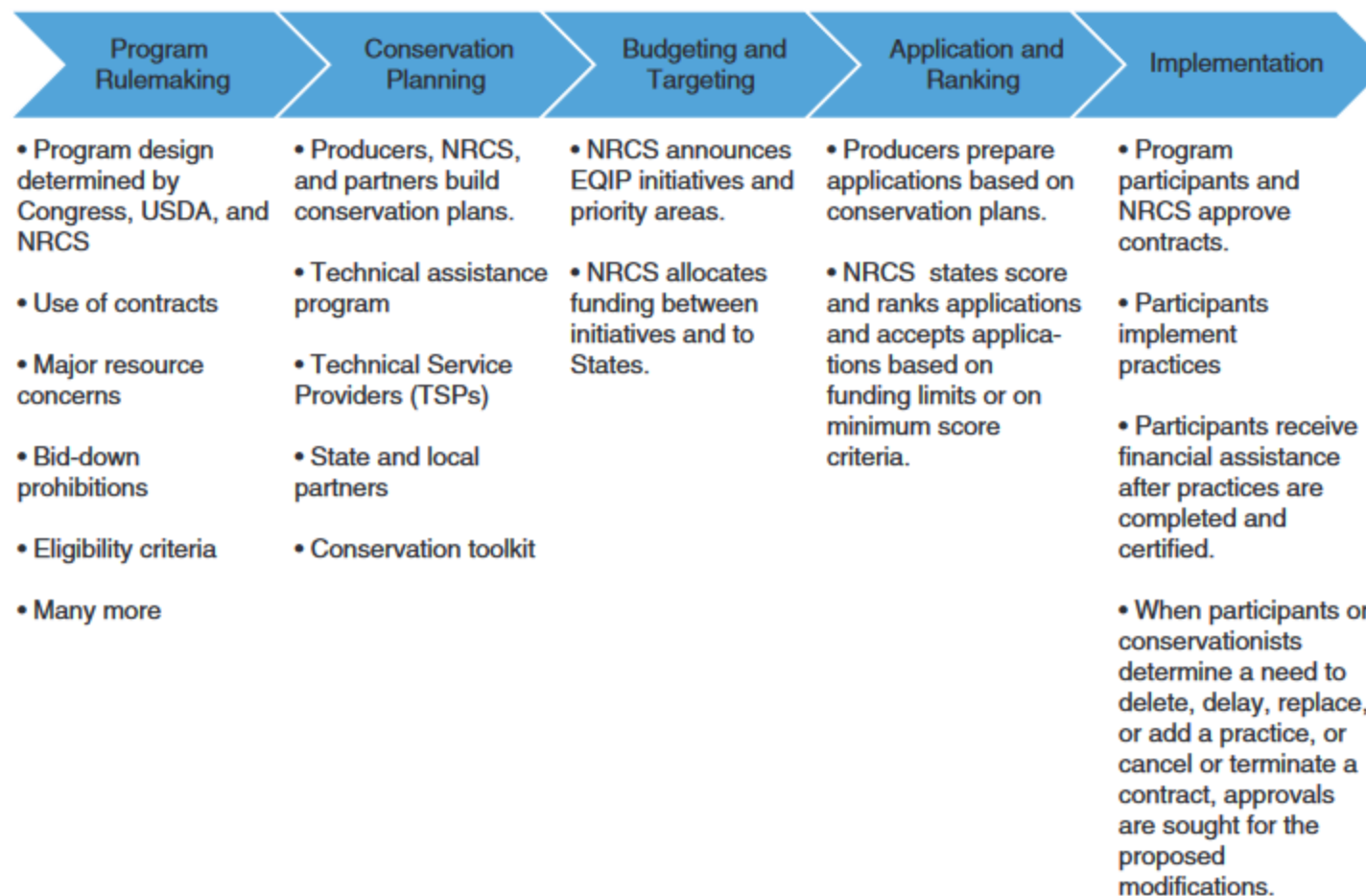


# Extra slides



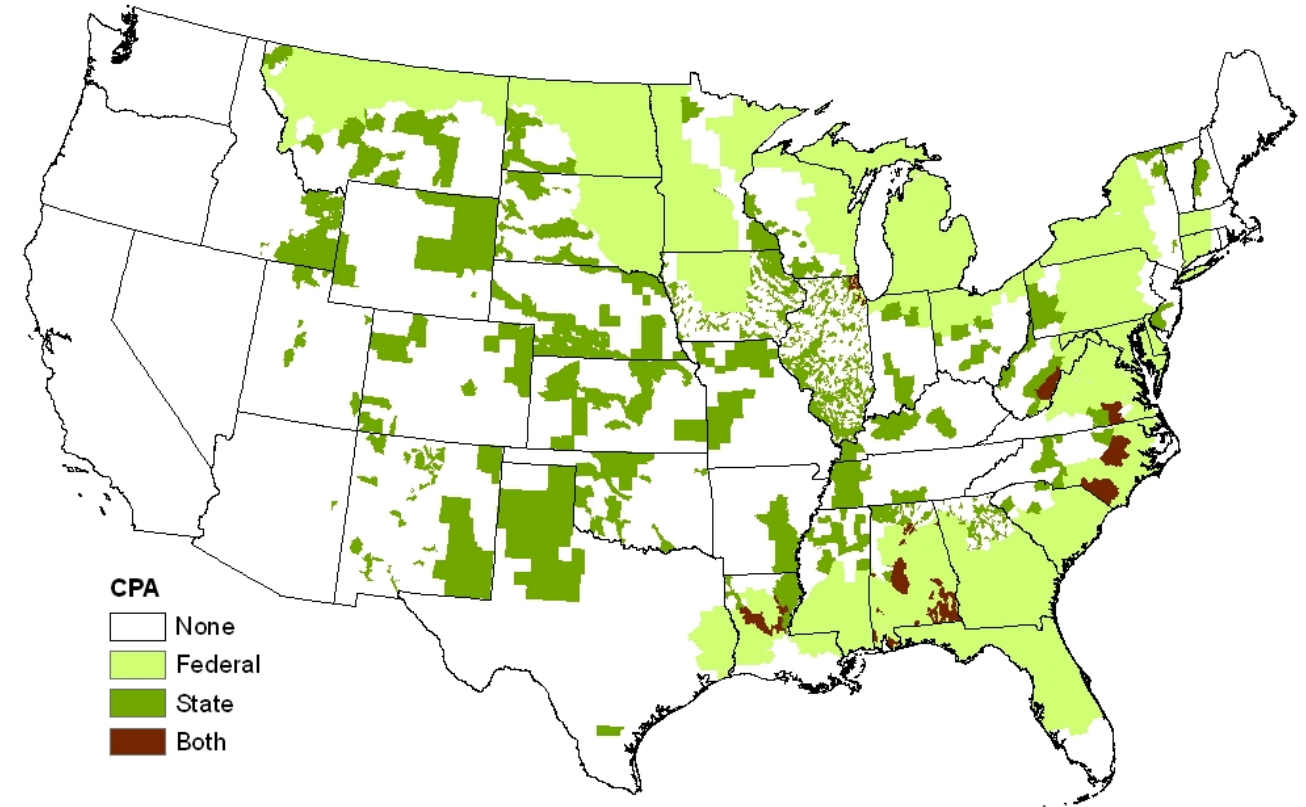
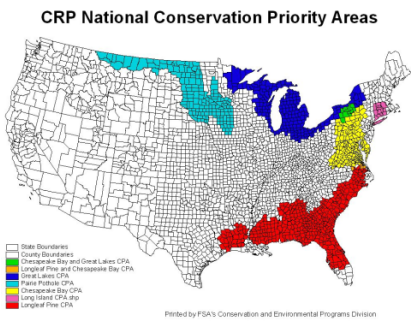
Maximum available EBI points in CRP signup #45 2013)	
Wildlife [100] =	Cover (introduced grass, native grass, trees) [50] + Wildlife enhancement [20] + Wildlife priority zones [30]
Water quality [100] =	Location within designated State water quality zone [30] + Groundwater quality [25] + Surface-water quality [45]
Erosion [100] =	Erodibility index [100]
Enduring benefits [50] =	Enduring benefits (tree plantings, wetland restoration, existing trees, grass seeding) [50]
Air quality [45] =	Wind erosion impacts [25] + Wind erosion soils [5] + In air quality zones [5] + Carbon sequestration [10]
Costs [150] =	Per-acre rent [125] + Bid below maximum rate [25]
Source: FSA <a href="https://www.fsa.usda.gov/Internet/FSA_File/su45ebifactsheet.pdf">https://www.fsa.usda.gov/Internet/FSA_File/su45ebifactsheet.pdf</a>	

## Conceptual map of the NRCS conservation process for establishing EQIP contracts



EQIP=Environmental Quality Incentives Program.

Source: USDA, Economic Research Service conceptual framework developed from review of Farm Acts, Natural Resources Conservation Service (NRCS) handbooks, and USDA program materials.

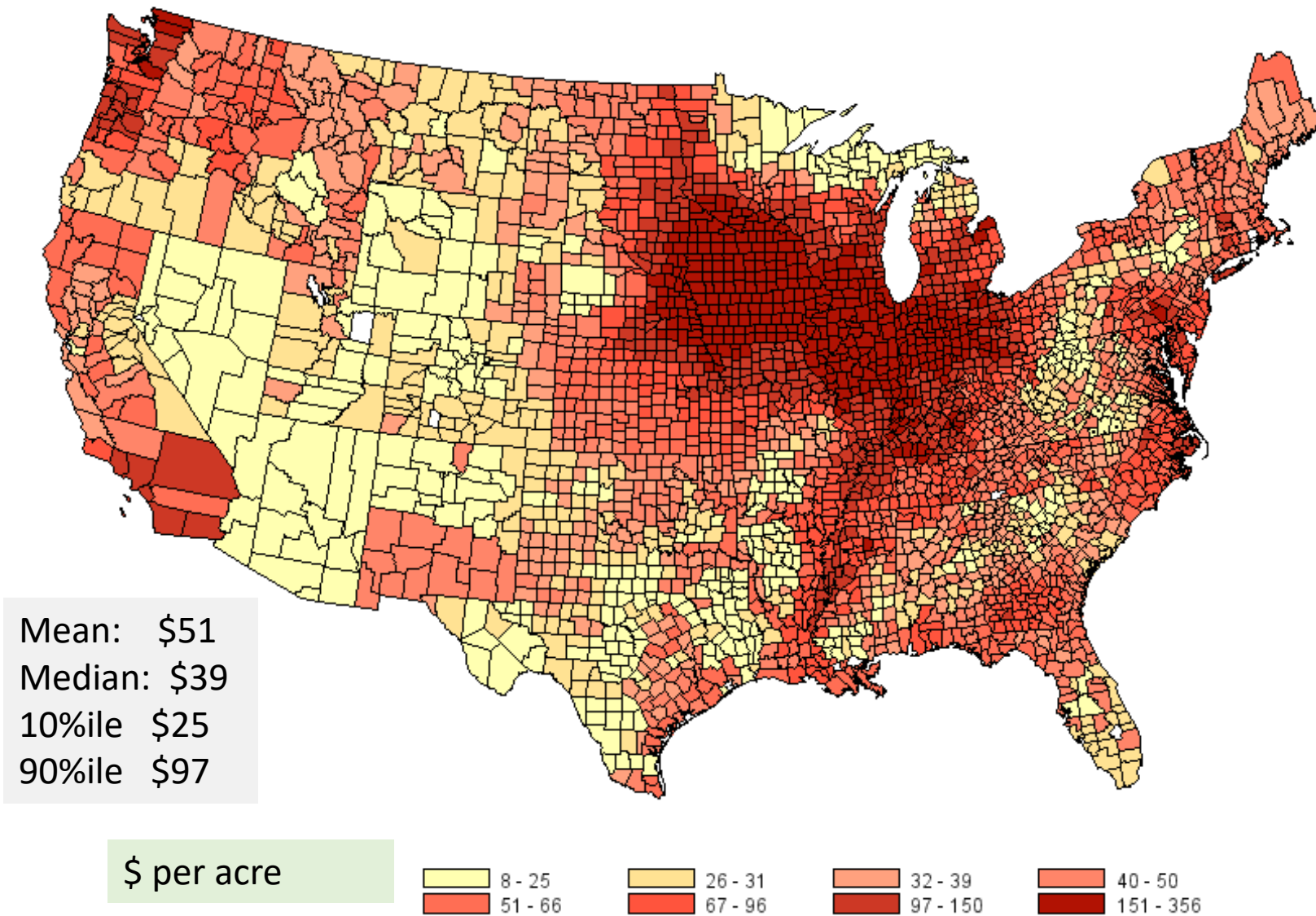


Location of CRP Conservation Priority Areas (CPA). 2010

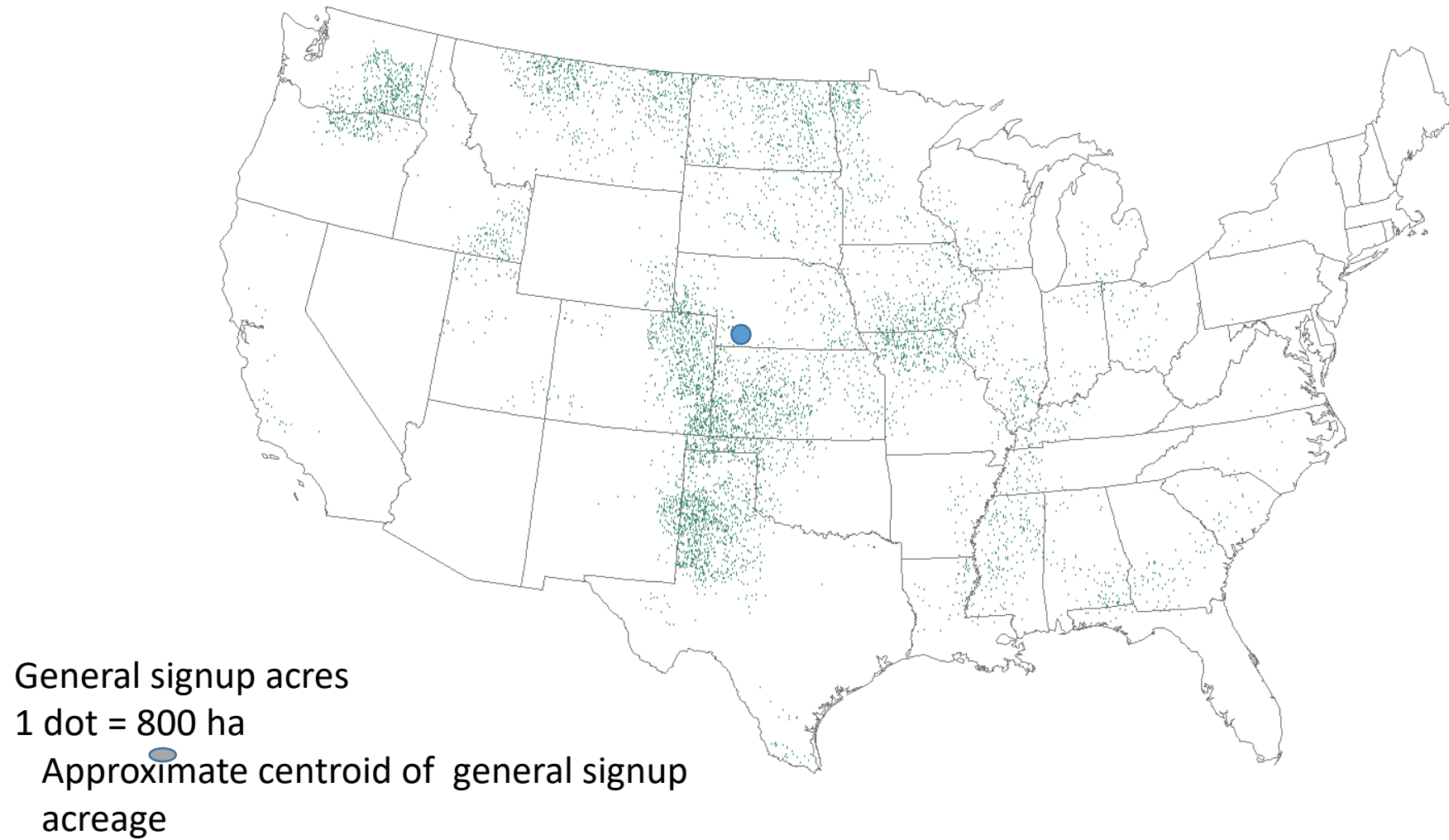
Source: ERS analysis of CRP eligibility criteria used by USDA Farm Services Agency



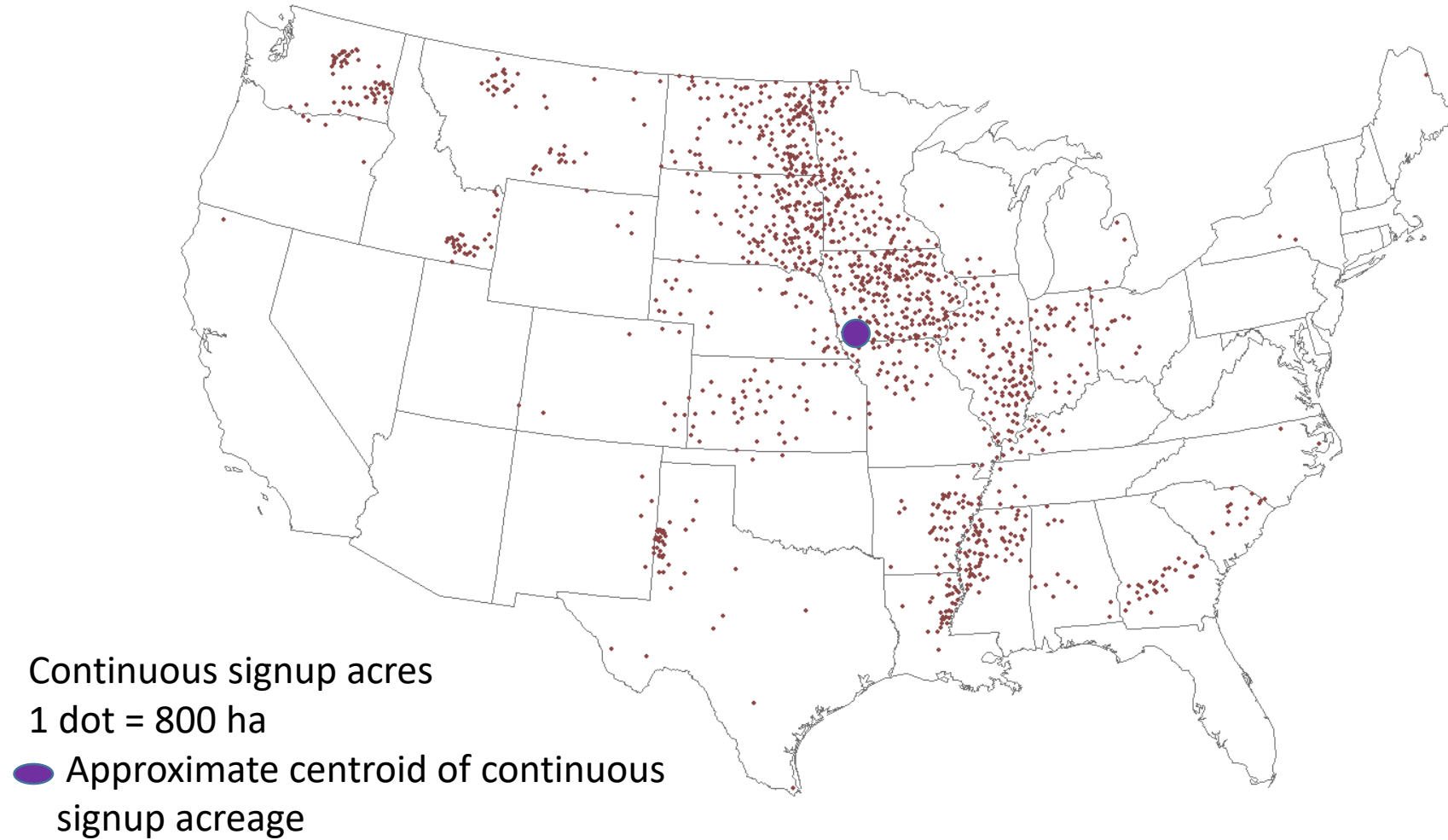
## 2012 County average bid caps (SRR)



## CRP 2013 acreage: general

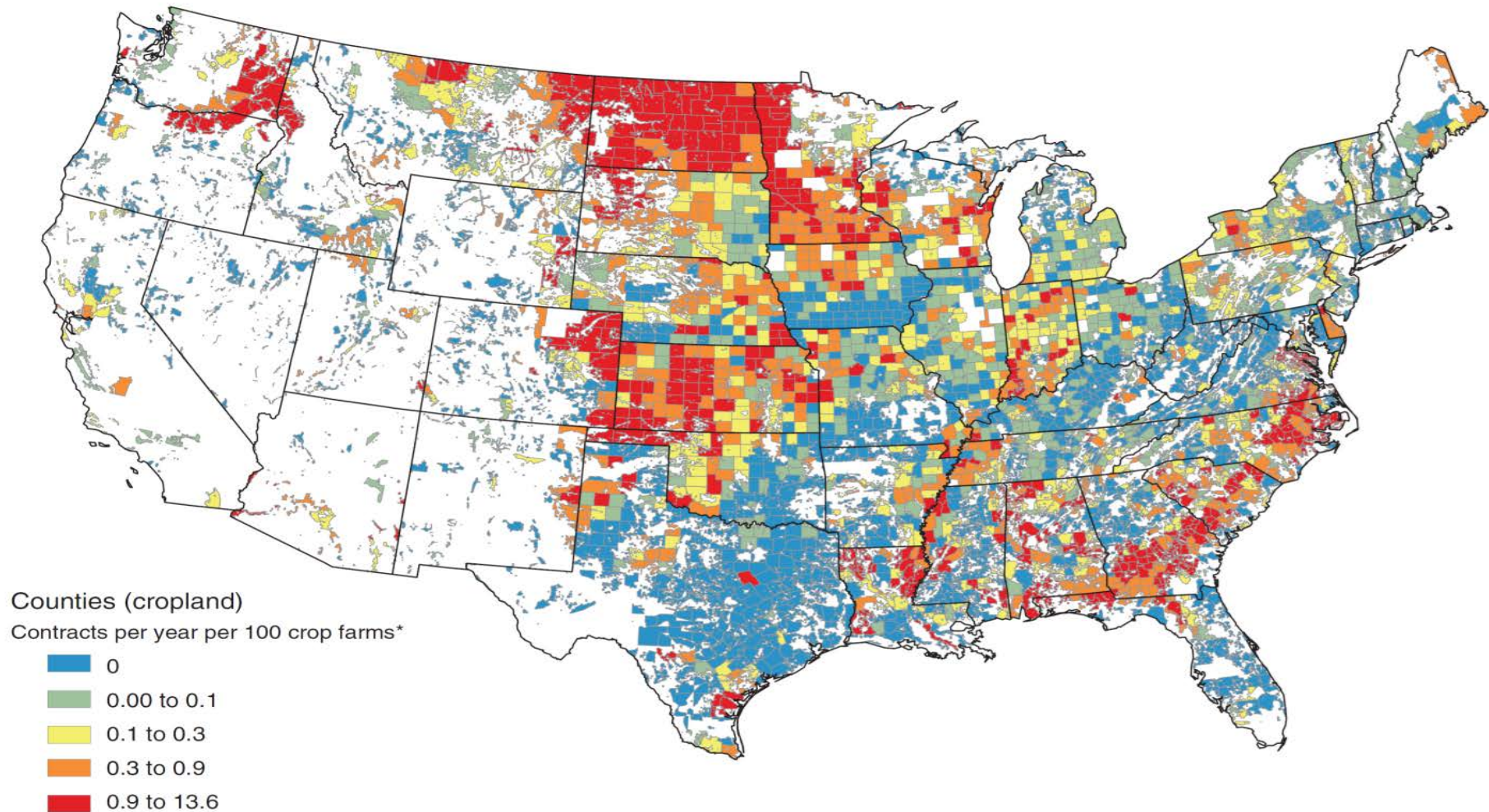


## CRP 2013 acreage: continuous





**Conservation tillage-related Environmental Quality Incentives Program participation rates  
by county, 2002-10**



\*Contract data are obtained from the USDA's Natural Resources Conservation Service (NRCS) ProTracts database and totaled within the county in which the practices are located. The number of farms in the county is maximum value within each county of the number of operations with crop sales in each Agricultural Census (1997, 2002, and 2007).

Source: Data on tillage-related contracts were compiled from the NRCS ProTracts database. Data on the number of farms with crop sales was compiled from the 1997, 2002, and 2007 Agricultural Censuses. EQIP expenditures (or contract counts or other appropriate variable) are Economic Research Service estimates using NRCS data and are not official NRCS values.



# CRP bidding:

## Key facts and implications

- Bids are subject to field-specific caps
  - Producers bid only if the payment they are willing to accept is less than or equal to the bid cap
- Producers know EBI cutoff score for past signups
  - Producers form expectations about acceptable score
- Producers know environmental score *before* bidding
  - If high, producer may bid at cap even if willing to accept a lower payment



# The Roles of Ranking Tools

Purpose	Alternative Tools	Behavioral Response
<b>Clearing:</b> For when a program is oversubscribed.	Priority Lottery	
<b>Targeting:</b> Ranking steers a program toward higher quality lands.	Eligibility Technical assistance	<b>Participation:</b> Ranking can influence whether a given field makes an offer.
<b>Offer Quality and Cost:</b> For a given set of offers, ranking ensures that the better offers will be selected.	Cost-share rates Technical assistance	<b>Offer Improvement:</b> Participants may select better practices if their baseline ranking is lower.
		<b>Program Outcomes:</b> Ranking can influence <b>contract compliance</b> or <b>strategic behavior</b> through interaction with on-farm benefits, cost-share rates, practice standards, etc.



# USDA Conservation Program Ranking

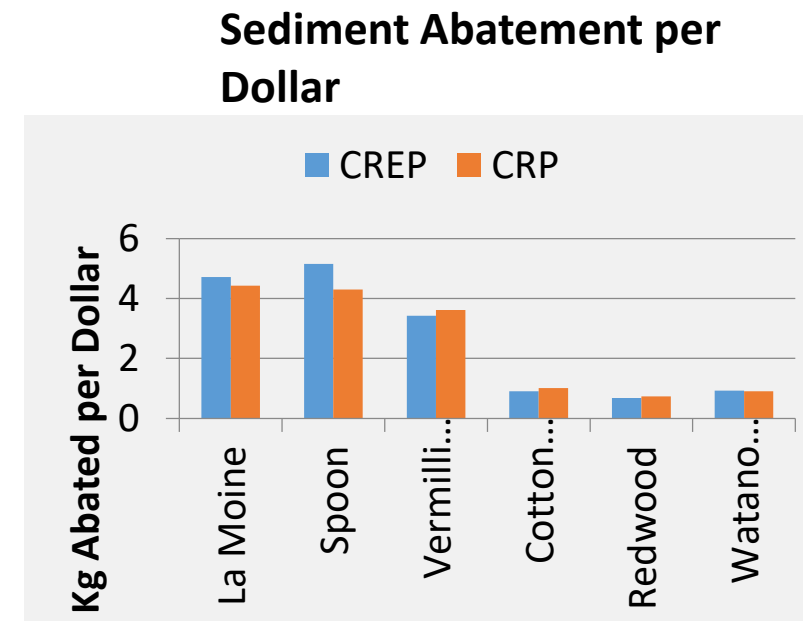
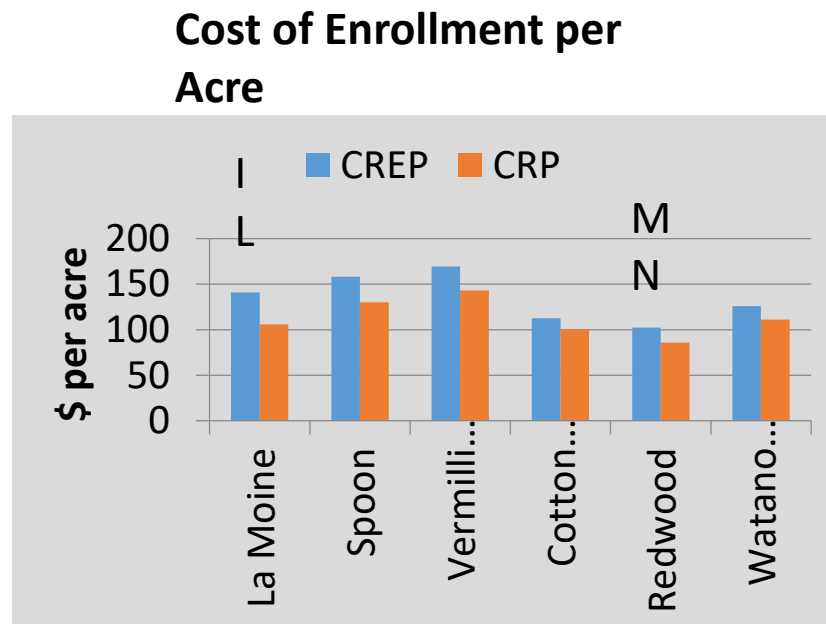
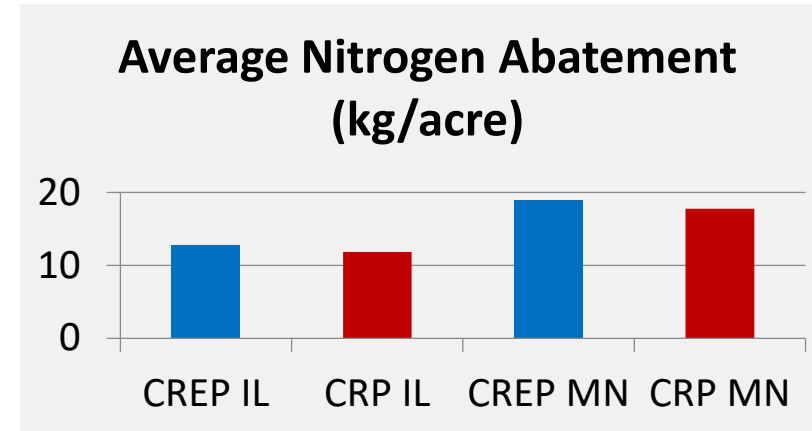
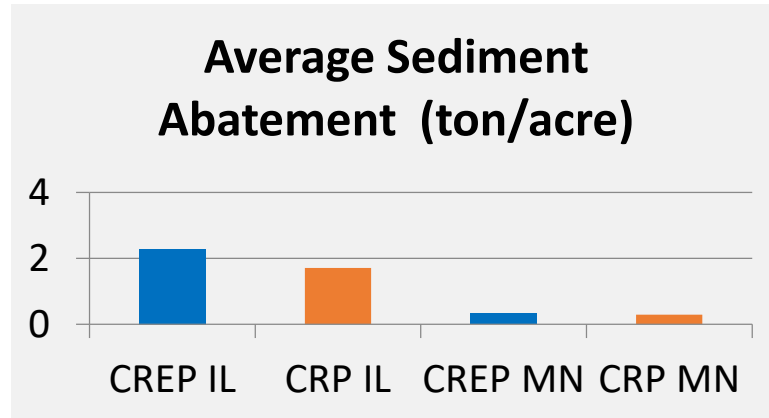
Program	Tool	Offer Selection Setting
Conservation Reserve Program (CRP - General Sign-up)	Environmental Benefits Index (EBI)	Single national auction pool every one to two years. If county acreage enrollment caps are binding, then counties are essentially a separate auction with a different cut-off EBI
Environmental Quality Incentives Program (EQIP)	Application Evaluation and Ranking Tool (AERT, to be superseded by CART)	Details vary, somewhat, by initiative and funding pool, and contracts awarded in batching periods. So there are hundreds of independent “auctions” in each year.



# General vs continuous

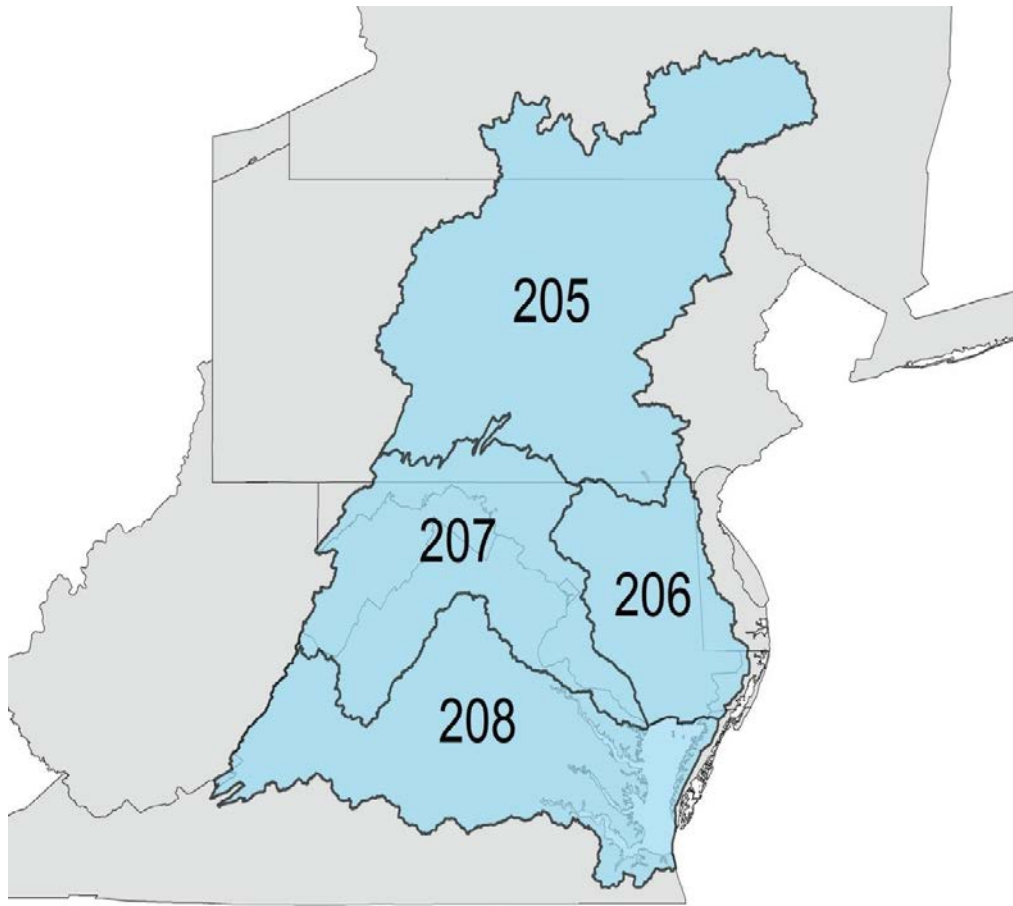
## A limited comparison of the effectiveness of general and continuous signup

(Source: unpublished research from University of Illinois)



# Analysis: the cost of the cost of meeting TMDL in the Chesapeake Bay.

Using data on practice cost, yield, edge-of-field nitrogen loss, and nitrogen delivery to the tidal waters of the bay: estimate the least-cost option to supply credits for a trading market, subject to meeting the eligibility baseline.



## *Findings*

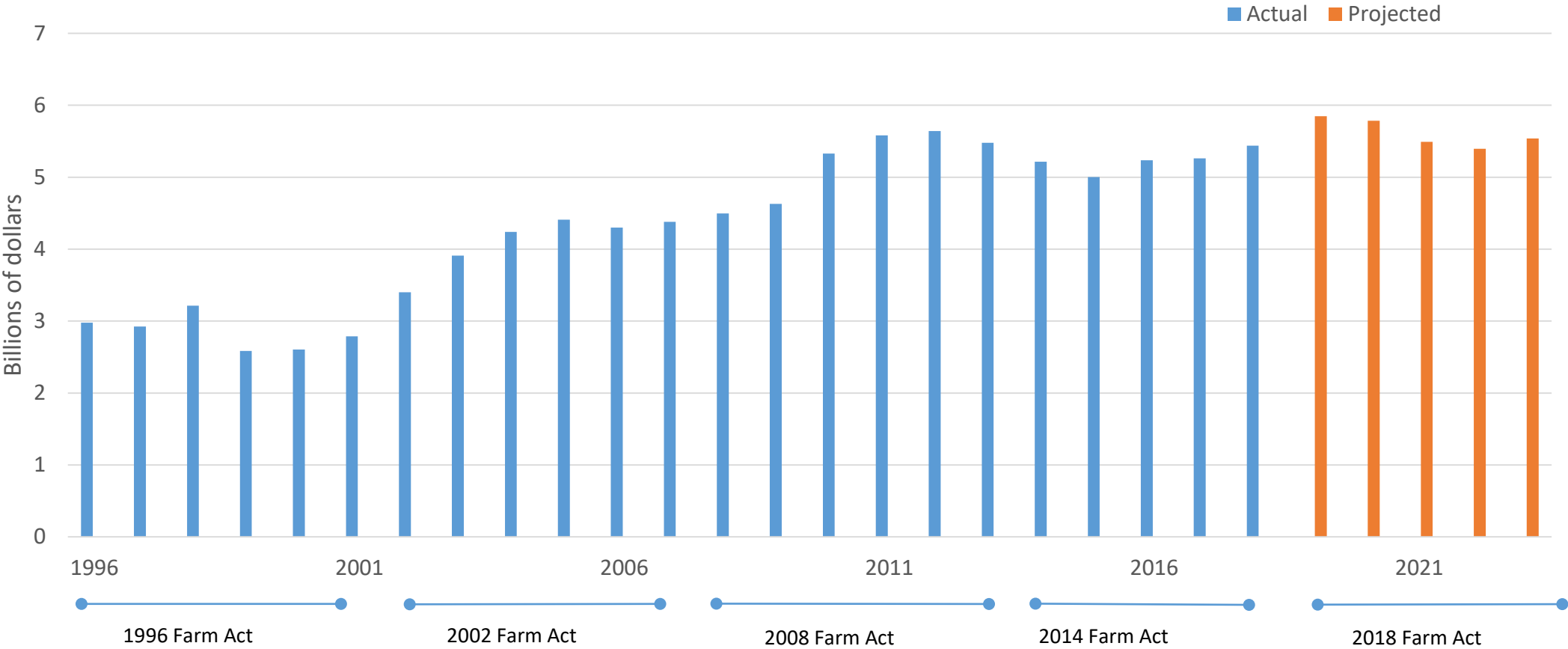
TMDL goals could be met by installing management systems on a relatively small share (about 12 percent) of cropland in the Chesapeake Bay watershed.

However if “per field” or “per watershed” constraints are in place, costs can increase substantially

Using additional information (like proximity to water) can reduce the cost disadvantage from using targeting



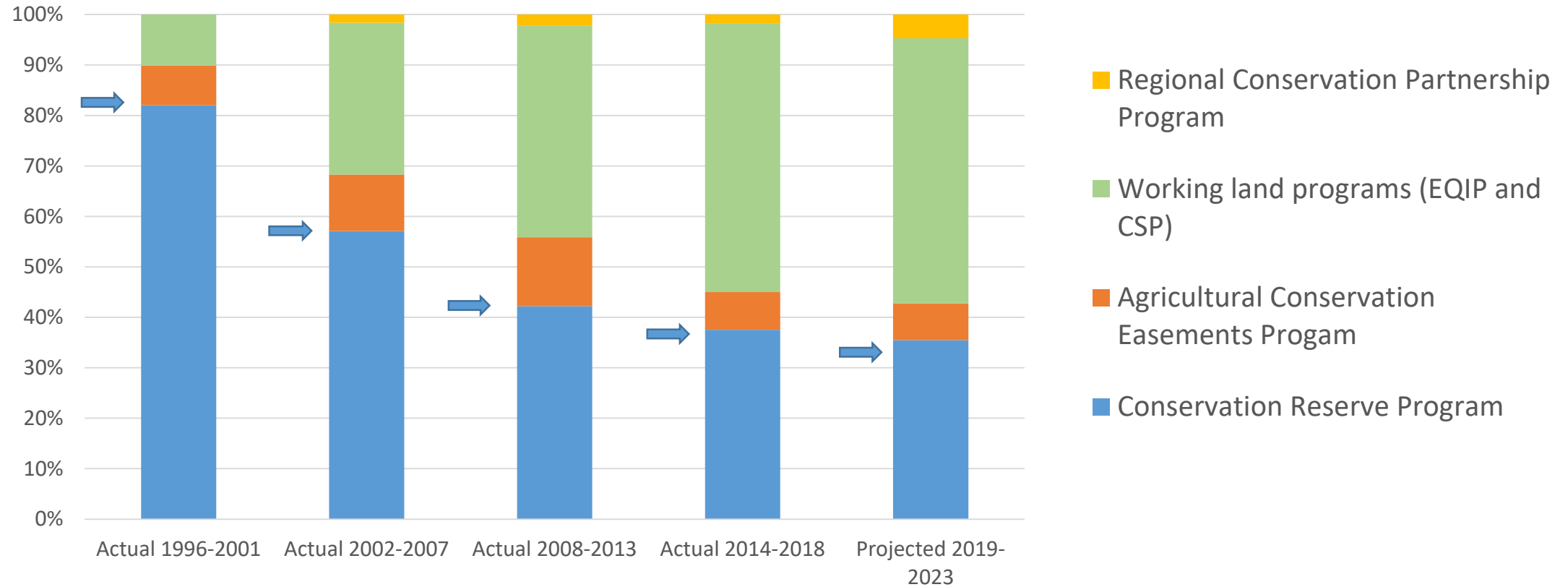
# Inflation-adjusted spending for major conservation programs 1996-2018, with projections to 2023



Source: ERS analysis of Office of Budget and Policy Analysis data for 1996-2017 and Congressional Budget Office Estimates for 2018-2023.



# Share of conservation spending by major programs and predecessors in the 2018 and previous farm acts



Source: ERS analysis of Office of Budget and Policy Analysis data for 1996-2017 and Congressional Budget Office Estimates for 2018-2023.

# CART Objectives

## Streamline, Efficiency & Customer Service

- Streamline Reading the Land
- Efficient Conservation Planning and Ranking
- Improve Services and Time to Interact with the Client

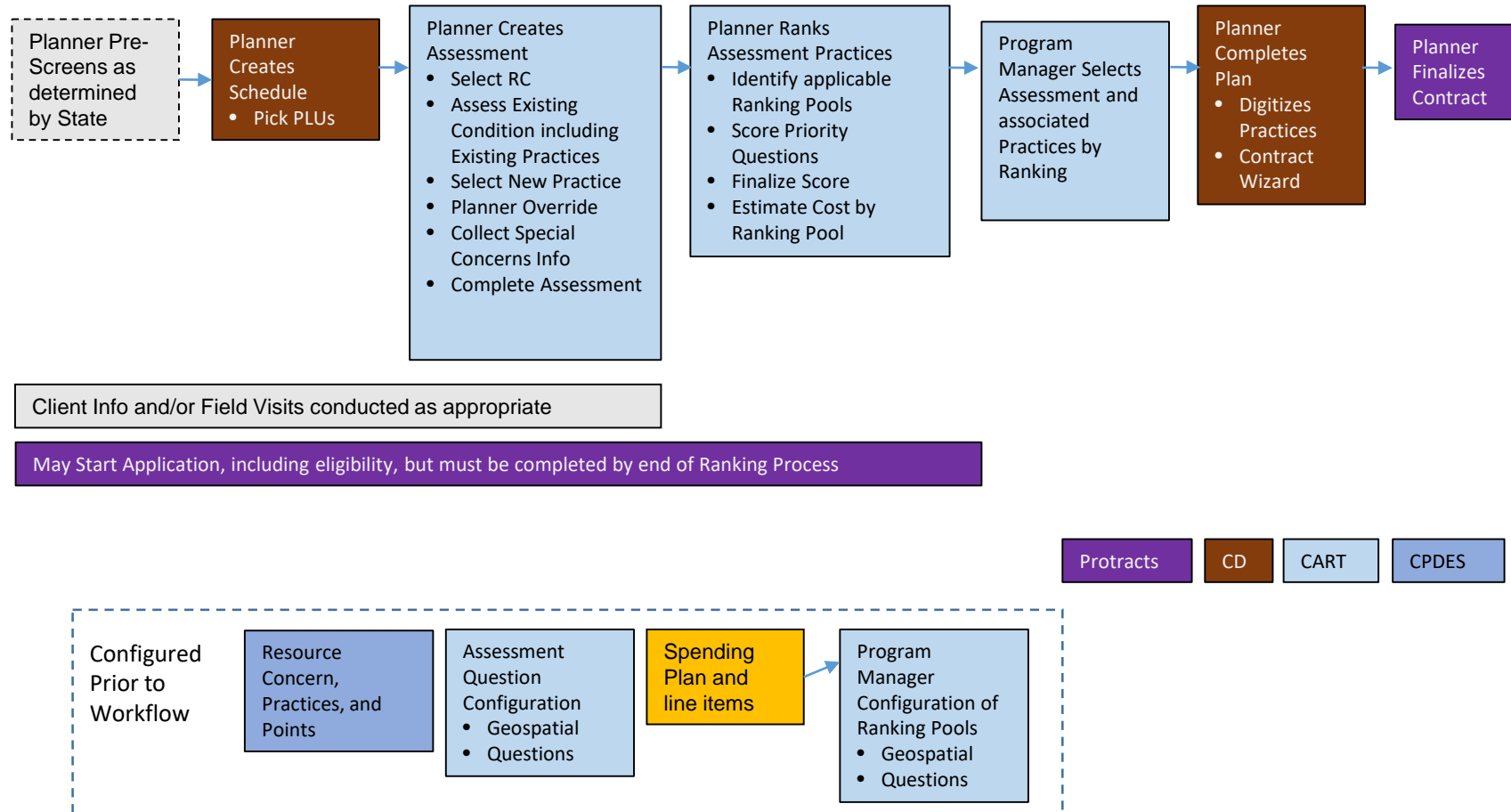
Program Neutral Planning informs Programs in a consistent, integrated process.

## Adaptive Learning Framework

CART will be fully integrated into Planning and Program Policy. No Duplication of Work



# CART Enhanced Field Office Workflow





# *A cost share example/ financial incentives : Conservation Stewardship Program (CSP)*

*Similar to EQIP, the CSP pays for conservation practices on working agricultural land*

More than 70 million acres of agricultural and forest land are currently enrolled in CSP.  
Funding will be \$700 million in 2019, rising to \$1 billion in 2023

- CSP contracts are for five years, with the option to renew
- Most agriculture producers approved to participate in CSP already have conservation practices on their land.

*CSP steps in and offers enhancements for those practices.*

Examples of CSP management activities

- Grazing management to improve wildlife habitat
- Extending filter strips to reduce excess sediment, nutrients and chemicals in surface water
- Planting cover crops to reduce wind and water erosion



ACTIVITY	NUMBER OF ENHANCEMENTS				
	TOTAL	CROP	PASTURE	RANGE	FOREST
AIR QUALITY	8	8	1	1	2
ANIMAL	71	50	22	15	22
ENERGY	5	5	3	0	0
PLANT	33	8	14	16	18
SOIL EROSION	22	18	4	4	1
SOIL QUALITY	26	21	2	2	3
WATER QUALITY	34	27	7	6	7
WATER QUANTITY	10	8	3	0	2

There are lots of management options available to landowners!



# Conservation Stewardship Program Attempt to Pay for Performance

From 2009 to 2016 payments were based on simulated environmental performance, which was calculated with a modeling tool (Conservation Measurement Tool).

*The CMT determines the conservation performance for existing conservation activities on the agricultural operation, and measures additional conservation activities a producer is willing to undertake to enhance the natural resource on the farm.*

## Replaced in 2017

Eligibility: Conservation Activity Evaluation identifies eligible lands, and resource concerns being met.

*You must be meeting the stewardship threshold for at least two resource concerns on each land use at the time of application.*

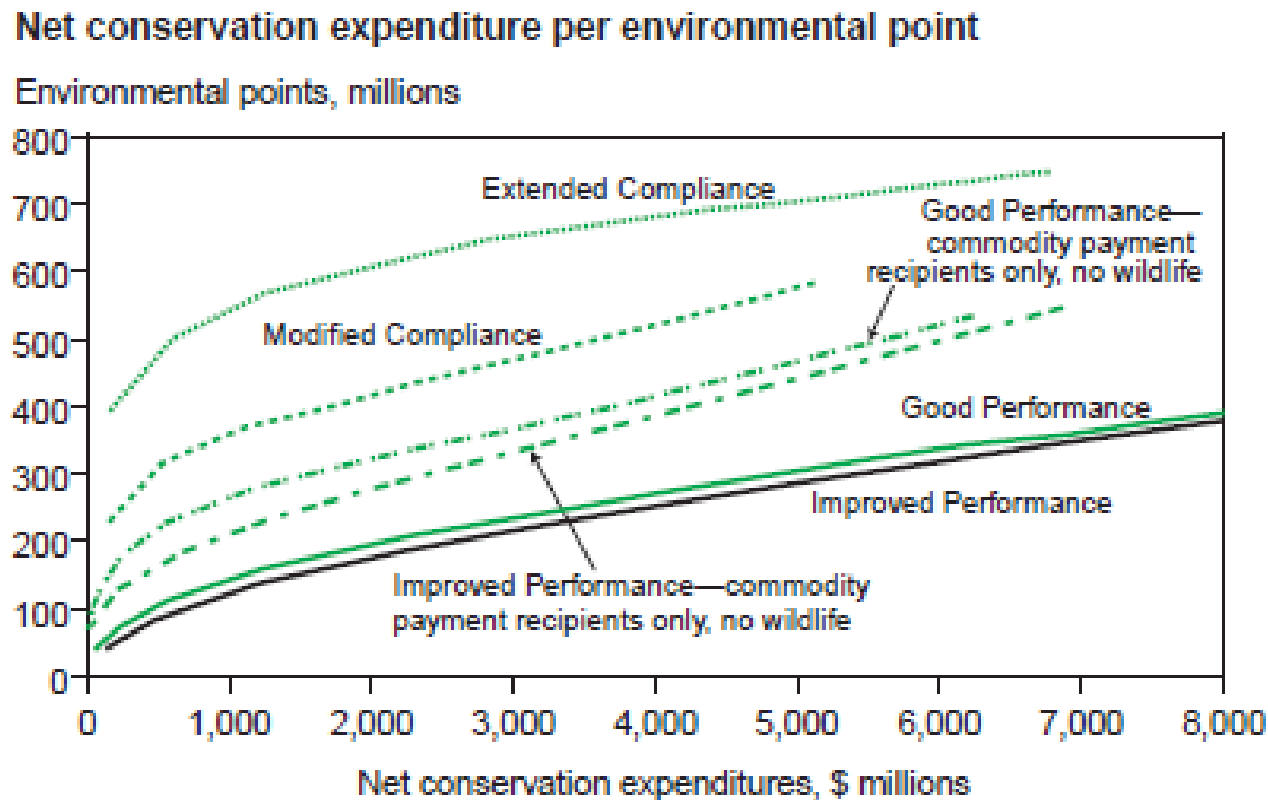
Ranking: The Application, Evaluation, and Ranking Tool (AERT, soon to be replaced by CART) evaluates and ranks applications

- Uses national, state, and local “ranking questions”
- Offers with the highest points will be selected until that state’s acreage allotment is used up.
- There is a small (5% of rank) cost/benefit ratio factor

Payment: State specific payment schedules for all eligible conservation practices (that do not depend on scoring)

## Analysis: cost effectiveness of “compliance” versus direct support

Using a generalized environmental benefits index, compare the costs of achieving different levels of total environmental improvements under different enrollment mechanisms



### Findings

performance based measures are more cost effective than using compliance



# Measuring impacts on ecosystem services: the CRP

## Numerous studies on the biophysical & environmental impacts of the CRP.

Estimating Water Quality,  
Air Quality, and  
Soil Carbon  
Benefits  
of the  
**Conservation  
Reserve Program**



### Monitoring Conservation Reserve Program Prairie-Chicken Initiative for Biodiversity Grassland Bi Southern Great Pla

#### CONSERVATION IN PRACTICE

#### Treatment wetlands: Cost-effective practice for intercepti nitrate before it reaches and adversely impacts surface waters

Richard Iovanna, Skip Hyberg, and William Crumpton

**C**onstructed treatment wetlands—an innovative conservation practice advocated by the USDA Farm Service Agency (FSA)—can be an exceedingly cost-effective approach to reducing nitrogen loadings in watersheds dominated by tile-drained cropland. The practice has potential to enhance water quality in regions such as the Corn Belt that are extensively tile drained.

The treatment wetland practice is part of the Iowa Conservation Reserve Enhancement Program (CREP), a partnership between FSA and the Iowa

ratio stipulated by the program permits these wetlands to reduce nitrogen runoff from a much greater area. Monitoring data from these wetlands show they remove 40% to 90% of the nitrate flowing into the wetlands. Given the focus on surface water quality improvements, these treatment wetlands are not necessarily located where wetlands existed historically.

A review of the practice's costs found them to be relatively modest. We reviewed the federal and state funds spent to establish 27 of the existing treatment wetlands. Federal funds defrayed most of the con-



## Economic and Policy Analysis

### Natural Resources Analysis

The Natural Resources Analysis Group (NRA), Economic Policy and Analysis Staff, serves the Farm Service Agency (FSA) and USDA as the primary analytical resource for the analysis of economic issues related to existing and proposed natural resource policies and programs, particularly the following:



### Assessing the Biological Benefits of the SDA-Conservation Reserve Program (CRP) for Waterfowl and Grassland Passerines in the Prairie Pothole Region of the United States:

*Spatial analyses for targeting CRP to maximize  
benefits for migratory birds*



### Management of Conservation Reserve Program Grasslands to Meet Wildlife Habitat Objectives

STATE OF WASHINGTON

October 2006

### Use of CRP Fields by Greater Sage-grouse and other Shrubsteppe associated Wildlife in Washington



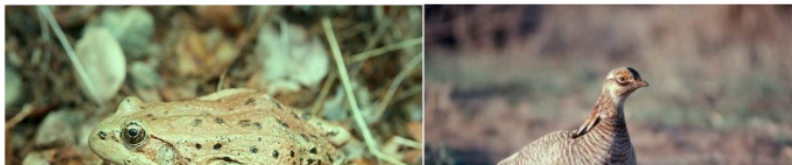
Bird  
Conservancy  
of the Rockies



### Estimating the Effect of the Conservation Reserve Program on Endangered, Threatened, and Candidate Wildlife Species

by Benton, N., G. Hammerson, J. McNees, S. Menard, and R. White.  
Provided by NatureServe to the USDA Farm Services Agency.

December 2012



### The Conservation Reserve Program— Planting for the Future: Proceedings of a National Conference, Fort Collins, Colorado, June 6–9, 2004

