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Which is the lower-cost conservation strategy: long- or short-term agreements?

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Why would there be a difference in the cost of longterm and short-term agreements?

Payment structures differ: Historically, long-term agreements offer an upfront payment as opposed to a series of annual payments.

- 1) Past analyses have found individuals' personal rate of discount (PRD) to be greater than market discount rates. This behavior may represent a preference for holding a large sum of money and in may reflect riskaverting behavior
- 2) The existence of higher-than-market PRD will make upfront payments a lower-cost option for funding conservation activities

Our hypothesis (H_1) is that program costs can be reduced by offering an upfront payment as opposed to a series of annual payments. We test our hypothesis using Wetland Reserve Program (WRP) and Conservation Reserve Program (CRP) contract data on wetland restoration and protection. Program similarities allows side-by-side comparisons. The WRP:

- Provides an upfront payment for wetland restoration and long-term (most are 30 year and permanent) easements
- 2) Uses a competitive enrollment strategy where states select contracts based on cost and expected environmental benefits

The CRP:

- **1) Provides annual payments** for shorter term (10- and 15-year) agreements and an upfront payment to cover restoration costs
- 2) Uses two enrollment strategies: The CRP general signups are competitive and the continuous signups are constrained by criteria

Program differences must be taken into account.

WRP and CRP contracts exist in all states, but the distribution of contracts varies





Total (land + restoration) cost will depend on the value of the land, which varies spatially.

Total cost will also depend on the actions needed to restore wetlands' hydrology and ecosystems. NRCS has identified 11 wetland regions.



Adjustments for program differences:

Differences in enrollment criteria: CRP general signups appear to be more competitive than the CRP continuous signups

• Solution: First, test whether there are significant differences in the costs of the CRP wetlandrelated enrollment strategies and, if so, then evaluate the WRP against each CRP strategy.

Differences in contract lives and the specification of the dependent variable: Cost comparisons must embody the same period of time. If not accounted for, the CRP contracts would probably always be cheaper.

• Solution: Capitalize CRP costs based on a market (triple A bond) rate of interest (4 percent) and assuming continual re-enrollment.

Differences in the spatial distribution of programs' contracts: Some programs may have a greater share of contracts in counties where land costs are higher.

• Solution: Evaluate cost differences by county.

Differences in the number and sizes of contracts across programs within each county: Direct comparisons of observed values will embody these idiosyncratic differences

 Solution: Estimate cost functions for each enrolment strategy, predict costs of median sized wetlands, and test the significance of per-acre cost differences across strategies within each county

Differences in the restoration activities required: The hydrology and biota of different types of wetlands will (among other things) affect restoration costs

• Solution: Estimate separate cost functions for each type of wetland—specifically, we group observations by wetland region

Specification of the cost model

TCC = f(LandValue, LandValueSq, Acres, AcresSq)

- *TCC* (total contract cost)= land acquisition + restoration costs
- Acres and AcresSq: contract size (and contract size squared) measures of the size of the wetland
- LandValue and LandValueSq: the land's agricultural value and value squared (rental value based on county data and contract size, serves as a proxy for the land's value
- We dropped other variables (urban influence and hunting pressure) because they were not significant

The independent variables are likely to be correlated with each other and excluded determinants of costs. This leaves variable coefficients difficult to interpret and increases the coefficients' standard errors.

However, our overriding interest is the models' predictive capabilities.

OLS models' predictive capabilities are good, given the complexity of costs

Wetland	WRP	CRP_	CRP_				
regions		cont	gen				
	Adjusted R-square						
Glaciated							
Interior Plains	0.81	0.90	0.97				
Prairie Pothole							
Region	0.79	0.96	0.99				
High Plains	0.71	0.98	0.97				
Mississippi							
Aluvial Valley	0.60	0.96	0.99				
Gulf-Atlantic							
Coastal Plain	0.70	0.98	0.99				
Central Plains	0.84	0.90	0.97				

To test our hypotheses, we:

- Generate county-level estimates of the total cost of a typical-sized (median) wetland
- 2) Convert total cost estimates (Ŷ) to per-acre costs (Ŷ)
- 3) Test the statistical significance of the differences in costs of wetland restoration strategies. The approach is analogous to testing the significance of differences in sample means.

$$\bar{Y}_{Gen}$$
- \bar{Y}_{Cont})/(s^s_{Gen}/n_{Gen}+s²_{Cont}/n_{Cont})^{1/2}

 $(\bar{Y}_{\text{Gen}}-\bar{Y}_{\text{WRP}})/(s^{s}_{\text{Gen}}/n_{\text{gen}}+s^{2}_{\text{WRP}}/n_{\text{WRP}})^{1/2}$

 $\overline{Y}_{Cont} - \overline{Y}_{WRP})/(s^2_{Cont}/n_{Cont} + s^2_{WRP}/n_{WRP})^{1/2}$

Hypotheses tests—H_o: Costs do not differ between 1) CRP general and continuous signup strategies, 2) CRP general and WRP strategies, and 3) CRP continuous and WRP strategies*

	CRP_Gen – CRP_Cont			CRP_Gen – WRP			CRP_Cont - WRP		
Region	% significant	Average diff	s.e.	% significant	Average diff	s.e.	% significant	Average diff	s.e.
Glaciated Interior Plain	100	-986	248	100	506	122	100	1,492	370
Prairie Pothole	97	-488	363	87	4	294	100	479	95
High Plains	29	-212	100	0		0	13	489	108
Mississippi Aluvial Valley	98	-492	175	68	304	69	100	743	94
Gulf-Atlantic Coastal Plains	99	-222	11	63	378	229	98	484	257
Central Plains	0		0	79	598	476	78	583	506

*Values are reported in dollars per acre

Results:

- 1) In most regions, the expected cost of restoring and preserving a wetland through the CRP continuous strategy is significantly higher than the CRP general signups in 97 to 100 percent of the counties—a smaller share of the counties in the High Plains show a significant difference
 - The regional-average differences in per-acre costs range from \$222 to \$986
- 2) The expected costs of restoring and preserving a wetland through the CRP general signups is significantly higher than the WRP in 63 to 100 percent of the counties
 - The regional-average difference in per-acre costs range from \$4 to \$598
- 3) The expected costs of restoring and preserving a wetland through the CRP continuous signups is significantly higher than the WRP in 98 to 100 percent of the counties in four wetland regions, 78 percent in one, but only 13 percent of the counties in the High Plains
 - The regional-average difference in per-acre costs range from \$472 to \$1,492

CONCLUSIONS: 1) Long-term conservation agreements with lump-sum payments can cost less than long-term agreements with annual payments. 2) In a first-round test, we concluded that the PRD is less than 18 percent.

Caution: We have only evaluated costs. Benefits are likely to be affected by program design features. Benefits may offset or enhance the advantages of conservation strategies.