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Cover Practice Definitions and Incentives in the Conservation Reserve Program

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Cover Practice Definitions and Incentives in the Conservation Reserve Program

Bryan Pratt and Steven Wallander

Abstract

The environmental benefits of the USDA Conservation Reserve Program (CRP) depend on both the environmental sensitivity of land enrolled and the conservation covers selected for that land. The CRP's General Signup, which enrolls the majority of program acreage, uses a combination of competitive pressure and cost sharing to encourage higher quality conservation covers. In this report, we examine recent data obtained for General Signups 45, 49, and 54 (implemented in 2013, 2016, and 2020, respectively) to understand offer value and cost-share payments for cover choices. The findings in the report include identifying the most common practice choices, reporting on the average practice cost paid by the participants and USDA, how the participant's choice of cover practice responds to these costs and the incentive points associated with practices. We use our empirical results and a simple conceptual model to describe the implications of policy changes that would adjust the ranking or financial incentives to select higher quality conservation covers. The report presents evidence to suggest that the costs of cover practices—and related policy levers—impact producers decisions and, by extension, program outcomes.

Keywords: Carbon sequestration, conservation covers, conservation practices, conservation program, Conservation Reserve Program, cost sharing, Environmental Benefits Index, reverse auction, soil erosion, wildlife habitat

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Errata

On February 28, 2022, figure 2a was revised to correct the image used in the figure and table A.2C was revised to correctly label the table. None of the underlying data, other figures, or text were impacted.



Cover Practice Definitions and Incentives in the Conservation Reserve Program

Bryan Pratt and Steven Wallander

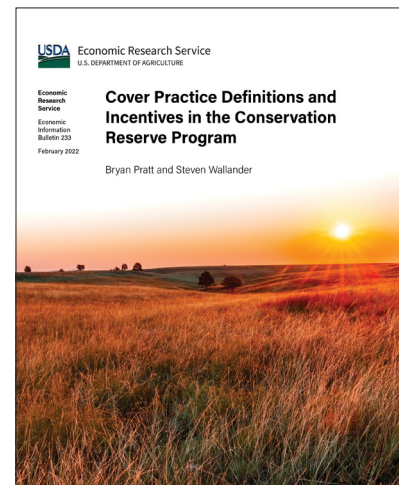
What Is the Issue?

USDA's Conservation Reserve Program (CRP) is one of the largest and longest running programs to provide payments for environmental services. Landowners enrolled in the program remove their environmentally sensitive cropland from crop production and maintain an approved conservation cover for the 10- to 15-year term of the CRP contract. Most land is enrolled in CRP through the General Signup, a competitive offer process which is the focus of this report. This report explores the tradeoff between quality and cost for program participants and USDA. Every offer in each General Signup is scored using the Environmental Benefits Index (EBI) ranking tool. The EBI reflects differences in the environmental sensitivity of the land, the selected conservation cover, and annual cost. This study examines recently developed data on the costs of cover practices to demonstrate how CRP's use of ranking points in the EBI and cost-share payments combine to incentivize some participants to adopt higher public-benefit practices.

What Did the Study Find?

Producers submitting offers in CRP General Signups must choose between a variety of cover practices. The choice of practice impacts the probability that their offer is accepted, and it also affects the costs of practice establishment. This report identifies seven common practice choices and two supplementary practices to demonstrate the underlying program incentives. In this report, the use of "Base," "Premium," and "Native" refers to variation in cover options within the standard program cover practice codes. The USDA, Farm Service Agency (FSA) does not use these or any other terms to identify these options. They are identified in FSA documentation only by their descriptions and point values.

- In the 2013, 2016, and 2020 General Signups, the seven most common cover practices represented well over half of total offered acreage: two non-native grassland practices (CP1–Base and CP1–Premium), two native grassland practices (CP2–Base and CP2–Premium), and three wildlife practices (CP4D–Base, CP4D–Native, and CP25).



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- Between 10 and 20 percent of offers include a supplementary wildlife or pollinator practice (CP12 and CP42) on part of the offered acreage.

For the offer process, participants select cover practices based on the incentives created by the EBI and the net cost to the participant after considering any cost share.

- Higher quality cover practices earn more EBI points, but typically cost more to establish than the lowest scoring practices.
- The most common practice is the higher species count version of a native grass mix (CP2–Premium). On land that is establishing a new cover, this practice is more than four times the cost of the simplest possible mix of non-native grassland (CP1–Base) (\$107 versus \$25 per acre).
- The net cost per acre for CRP participants is lower due to the FSA cost-share payments—intended to defray the costs of cover establishment and maintenance—typically reimbursing 50 percent of total costs.
- Within each cover practice, there is variation in observed establishment cost, due to differences in State standards, soil types, climate, and other factors. In the Plains and Mountain States, the median total cost of upgrading from CP1–Base to CP2–Premium ranges from \$21 to \$43 per acre. In the Midwest, the median total cost of upgrading ranges from \$65 to \$112 per acre.

Based on the observed relationship between practices choices and costs combined with a simple conceptual model, this study predicts the impacts of changing the incentives built into CRP by altering the EBI or the statutory cost-share payment rates for particular practices.

- Generally, CRP participants with lower net costs for upgrading practices are more likely to use higher quality practices. We estimate that if the net cost to the farmer of CP2–Premium was to decrease by \$10 per acre, approximately 0.6 percent of offered acreage would move towards that practice.
- An alternative policy approach is to further increase the number of points awarded to higher quality practices. This would indirectly increase program costs through both additional cost-share and higher rental payments.

How Was the Study Conducted?

The USDA, Economic Research Service (ERS) combined two datasets from the USDA, Farm Service Agency (FSA) administrative data for this study. Cover practice selection rate data are obtained from the CRP “offer” files, which record all CRP General Signup offers. Cover practice costs are obtained from the CRP receipts data that detail reimbursed and unreimbursed costs for implemented practices. This cost analysis relies exclusively on contracts from Signup 45 (2013).

Using these data on the cost and choice of cover practices, we estimate the relationship between practice cover costs and choices among offers enrolling new land in Signup 45. Using this empirical exercise and a simple conceptual model grounded in the existing literature on the CRP, we analyze how several program design options available to FSA or Congress would change cover practice choices and program costs.

Cover Practice Definitions and Incentives in the Conservation Reserve Program

Background

The USDA's Conservation Reserve Program (CRP) enrolls environmentally sensitive cropland in long-term conservation contracts. Landowners and operators enrolled in the program receive annual rental payments and agree to establish environmentally beneficial cover on this land. From Fiscal Year 2015 through Fiscal Year 2019, annual rental payments in CRP have averaged \$1.7 billion.¹ Over the same time period, cost-share payments from USDA to cover a portion of the costs of cover practice establishment and maintenance have ranged from \$52 to \$113 million per year.

There are several enrollment methods and groups within the CRP, including General Signup and Continuous Signup (see box, "Enrollment Methods and Groups within CRP"). This report focuses on General Signup, which is a large competitive offer process. Owners and operators offer to enroll land in CRP in an approved conservation cover in exchange for an annual rental payment from the Federal Government. General Signup accounted for 60 percent of enrolled acres in 2020, down from over 85 percent in 2010 (FSA, 2010; FSA, 2020).

Within the General Signup offer process, the Farm Service Agency (FSA) calculates an Environmental Benefits Index (EBI) score for each offer. This score is comprised of points both for characteristics of the land and for the choices of the owner or operator with respect to contract rental rate requested and practice (see box, "The Environmental Benefits Index"). Since land-characteristic-based EBI points vary by field, certain parcels have a more competitive starting score. All landowners and operators, though, can increase their chances of successfully competing for a CRP contract by reducing the rental rate they request, by upgrading to a higher benefit cover, or both. In providing guidance to owners and operators interested in the program, FSA places considerable emphasis on the benefits of cover choices in making competitive offers, FSA (2013; 2015; 2019) by noting the following:

The single most important producer decision involves determining which cover practice to apply to the acres offered. Planting or establishing the highest scoring cover mixture is the best way to improve the chances of offer acceptance.

When a General Signup closes, USDA ranks all submitted offers nationally based on their EBI scores, selects a minimally acceptable EBI threshold based on those offers taking into account the statutory acreage cap for the program, as well as other factors, and then enrolls all offers with an EBI score above that threshold.²

¹ Total payments by type are available by fiscal year from the Farm Service Agency. Payments for 2013 and 2014 are only available as projections. For prior years, haying and grazing adjustments are calculated separately. During fiscal year 2012 and prior, rental payments were similar in magnitude, while cost-share payments ranged from \$67 to \$100 million per year. Some of the variation in cost-sharing outlays is due to changes in the number of new enrollments. In addition, lower cost-share outlays prior to fiscal year 2011 are consistent with auction disincentives for cost sharing during prior enrollment periods. Source: "Conservation Reserve Program Statistics." U.S. Department of Agriculture, Farm Service Agency.

² While the U.S. Department of Agriculture rejects offers on the basis of an Environmental Benefits Index threshold, the fundamental reason the program cannot accept all offers is that the program is required by law not to exceed national and county acreage maxima. In counties where this county acreage maximum is binding, the highest ranked offers are accepted until the county acreage maximum is met, leading to the rejection of some offers meeting the national EBI threshold. See box "The Environmental Benefits Index" for a full discussion.

Since USDA determines the cutoff EBI score for enrollment in the program after offers are submitted, owners and operators are faced with a general rule that higher final EBIs are more likely to be accepted. This uncertainty is a standard feature of all quality-ranked and price-ranked offer processes. The combination of competitive pressure and partial uncertainty achieves three important program outcomes:

- (1) Targeting: More environmentally sensitive land has a higher initial EBI score. Lower value land also has a higher initial EBI score. In both cases, knowing that these fields start from a more competitive position, owners and operators with these fields are more likely to be accepted and are therefore more likely to make an offer.
- (2) Lower Costs: Some offers agree to accept lower annual rental payments, which increases their ranking and reduces the cost of the program.
- (3) Higher Benefits: Many owners and operators agree to install higher quality cover practices, which also increases their offers' rankings and increases the benefits of the program to the public.

The third outcome involves the choice of cover practices and depends upon the interaction of the EBI-related incentives and the costs of establishing different conservation cover practices. The cost of cover practices depends upon a second set of incentives in CRP, the use of a cost-share payment to lower the conservation cover practice cost to program participants.

As discussed in the box “The Environmental Benefits Index,” an offering producer’s likelihood of securing enrollment in the program increases as the producer’s offer EBI increases. If cover practices with higher benefits—EBI points—tend to cost more, then producers face a decision of how many additional EBI points they are willing to “purchase” by agreeing to implement higher scoring and higher cost practices. This report examines the extent to which this relationship between EBI points and practice costs holds in the actual program and how this can vary across space. Under current program rules, most participants receive a cost share of 50 percent for all qualified expenses on all cover practices. Therefore, the use of cost-share payments reduces the absolute difference between the costs of any two practices, which effectively reduces the cost for gaining additional EBI points and incentivizing the establishment of higher cost, higher benefit practices.

Prior literature has examined the effectiveness of the General Signup offer process for providing incentives for practice improvement through the enrollment mechanism design, by providing additional EBI points for practices that produce greater environmental benefits (Feather and Hellerstein, 1997; Feather et al., 1999; Claassen et al., 2008; Hellerstein and Higgins, 2010; Hellerstein et al., 2015; Schilizzi, 2017). The literature finds substantial evidence that participating owners and operators face competitive pressure and submit offers which go beyond the minimum requirements at the expense of profit under contract enrollment. However, few studies have looked specifically at the role of conservation cover establishment costs and the Government cost share in determining which practices producers choose to offer. This report builds on our understanding of the General Signup offer mechanism by incorporating the cost of competing on quality (via practice choice) and the consequences of differing costs for competing on quality.³

³ Given the need for long-term data on costs, this report primarily focuses on Signup 45, which was conducted in 2013 and is the oldest signup with rich data on practice costs. The practices studied in this report are still the core practices available for enrollment through the General Signup mechanism.

Enrollment Methods and Groups within the Conservation Reserve Program

General versus Continuous Signups

Conservation Reserve Program (CRP) participants can enroll through several different subprograms, including the General Signup, a variety of Continuous Signup initiatives, and the Grasslands Program. The General Signup is a large, competitive offer process in which owners and operators with eligible land can submit an offer to enroll. Offers are ranked and accepted in a single, national signup period during each General Signup (see box, “The Environmental Benefits Index”). Continuous initiatives have their own eligibility requirements, are generally geographically focused, and most frequently accept offers to enroll as they are received (first come, first in). The State Acres For wildlife Enhancement (SAFE) has been a continuous program, except for its inclusion in General Signup 54 in 2020. SAFE consists of geographically targeted initiatives, similar to continuous signup, but SAFE offers were ranked and accepted within the General Signup framework in 2020. The Grasslands program is a competitive offer process similar to General Signup, but it targets the preservation of grazing grasslands with longer contracts.

Wildlife Priority Zones

Within General Signup, offers to enroll are ranked according to the Environmental Benefits Index. Offers can receive more EBI points if land is located in one of three types of zones: air quality zones, water quality zones, and wildlife priority zones. Offers in air quality zones and water quality zones receive additional points for benefits related to their location in these zones. Wildlife priority zones (WPZ) are relevant for the choice of practices, because offers in a WPZ receive additional points only if they also select cover practices that provide at least a certain threshold of wildlife habitat benefit points, specifically those scoring at or above 40 points for subfactor N1a, which is discussed in the box “The Environmental Benefits Index.”

New acres versus re-enrollments

As part of the eligibility criteria established for General Signup, land that is on an expiring (or recently expired) CRP contract is eligible to re-enroll. In the three most recent signups, previously enrolled CRP acreage comprised 78 percent of offered acreage in 2013, 45 percent in 2016, and 82 percent in 2020.⁴ For ranking purposes, offers on re-enrolling acres are treated the same as offers on “new” lands that were not previously enrolled. However, re-enrolled lands have the choice between simply retaining the existing conservation cover so long as the quality of the cover meets FSA standard (ASCS Handbook 2-CRP, Exhibit 26) or establishing a new cover practice. New lands, which are generally coming out of a crop rotation, are necessarily choosing among eligible conservation covers.

⁴The percentage of offers with only expiring Conservation Reserve Program land was 81 percent in 2013, 45 percent in 2016, and 70 percent in 2020. Between 2 and 6 percent of offers include both new and re-offered land, across these three signups.

The Environmental Benefits Index

Features of the EBI

Producers with offers seeking to enroll in a General Signup are ranked nationally against all other offers using the Environmental Benefits Index (EBI), a metric created and implemented by the Farm Service Agency (FSA) that has had a fairly consistent structure for the past 20 years (Claassen et al., 2008; Hellerstein, 2017). Offers are accepted only if they have an EBI score at or above the “cut-off” EBI, which is determined by the USDA after all offers are submitted. Due to a rule that enrolled acreage in any county may not exceed 25 percent of total cropland, in some instances individual counties may have higher cut-off EBIs.

Farm Service Agency (FSA) program materials describe the EBI as comprised of six components (N1 through N6), some of which are in turn comprised of as many as four sub-components. The full EBI is an additive index. While the EBI is not a benefit-cost ratio, it does serve a proxy measure of net benefits since the first five components (the “environmental EBI”) reflect indirect measures of benefits and the sixth component (the “cost factor”) is an adjusted measure of per-acre cost. For the economic analysis in this report, ERS reconfigures these subcomponents into four parts that capture the incentives facing program participants: Land EBI, Maximum Rental Rate EBI, Cover EBI, and Discount EBI (table 1). A decomposition of this type was first suggested by Claassen et al. (2008). Two of these parts—the Land EBI and the Maximum Rental Rate EBI—comprise the EBI “endowment,” which is the starting score for any offer based on the physical field characteristics. This endowment is the minimum possible score and would be the final score if an offer makes no improvements (e.g., chooses the most basic practice and selects an annual rental rate equal to the offer-specific maximum rental rate). The other two components comprise the EBI score for offer improvement.

Table 1

Environmental Benefits Index point decomposition and maximum possible points

	Endowment score	Offer improvement score	Total
Environmental score	Land EBI: 235	Cover EBI: 160	395
Cost score	Maximum rental rate EBI: 117	Discount EBI: 33 to 150	150
Total score	235 to 352	193 to 310	545

EBI=Environmental Benefits Index

Notes: Land EBI consists of subfactors N2, N3, N5a, N5b, and N5c. Cover EBI consists of subfactors N1a, N1b, N1c, N4, and N5d. Maximum rental rate EBI is the value of subfactor N6a. While this has a theoretical maximum of 125 points, the maximum observed is 117 points. Discount EBI consists of N6b and the remaining points available under N6a, which varies with the maximum rental rate.

Source: USDA, Economic Research Service analysis based on USDA, Farm Service Agency EBI subfactors.

EBI Components and Practice Choice

Of the six EBI component factors, N1, N4, and part of N5 depend on practice choice. The first component, N1, provides up to 100 points for wildlife benefits and is one of the key areas where cover practices lead to different scores. Subfactor N1a awards up to 50 points on the basis of wildlife habitat benefits provided by the selected cover. Subfactor N1b provides up to 20 points for wildlife enhancement, while subfactor N1c provides an additional 30 points if an offer receives at least 40 points for N1a and if the majority of

the offer is located within a wildlife priority zone (WPZ). N4 provides up to 50 points for enduring benefits. This component is exclusively determined by cover selection. These points relate to the likelihood of benefits from the cover practice beyond the expiration of the CRP contract. In addition, 10 points from component N5 are awarded for carbon sequestration, under N5d, which is awarded on the basis of the offer's practice choice. Appendix tables A.1A and A.1B examine the relationship between cover practice choice and EBI points in greater depth.

There is a sixth component, N6, which awards points for offers with lower rental rates. The first subfactor, N6a, provides points on the basis of a formula determined after offers are submitted. It is important to recall that all offers are subject to an offer-specific maximum allowed rental rate, and that potential participants are able to ask for that rental rate or a lower rental rate. Because the rental rate is constrained, offers are awarded some N6a points on the basis of their maximum rental rate, which is a function of observed county rental rates for dryland crop production and parcel-specific estimated soil productivity. Offers are also awarded additional N6a points for offering below their maximum rental rate. Separately, subfactor N6b provides a fixed number of points for offering less than the offer-specific maximum rental rate. Specifically, offers are awarded 2 points for reducing their rental rate 1 percent, up until a 10-percent reduction. Reducing the rental rate by 1 percent is then worth one point. No additional points are awarded for N6b for rental rate reductions beyond 15 percent.

Notably, N2, N3, and the remainder of N5 do not depend on practice choice nor rental rate. N2 provides up to 100 points for water quality benefits. These estimated benefits are not affected by cover selection. They relate primarily to the erosion, runoff, and leaching potential of the land and the sensitivity of the soil and location to these water quality impacts. N3 provides up to 100 points for erosion benefits. These estimated benefits are also not affected by cover selection and primarily related to wind and water erosion, using an erodibility index. Of the 45 points for air quality benefits related to reduced wind erosion within N5, 35 points are awarded for characteristics of the parcel, including wind erosion potential and the location of the parcel in an air quality zone that contributes to nonattainment of air quality standards.

Cover Practice Overview, Selection Rates, and Average Ranking Scores

The CRP General Signup is a large and complex offer process. The rules around eligibility and rental rates alone are subject to significant rule making and restrictions. In this report, we focus primarily on the complexity around the conservation cover practice choices, the frequency with which offers make different selections, and how those selections translate into points under the Environmental Benefits Index (EBI).

Practice Options

One of the key choices that a potential participant can make is deciding which conservation cover to establish. When submitting an offer, a producer seeking to enroll in CRP General Signup has a number of options for which conservation cover to establish on enrolled acreage. The core set of options available for General Signup include the following:⁵

- Primary practice codes
 - CP1: Permanent introduced grasses
 - CP2: Permanent native grasses
 - CP3: Softwood tree planting
 - CP3A: Hardwood tree planting
 - CP4B: Permanent wildlife corridor
 - CP4D: Permanent wildlife habitat
 - CP25: Rare and declining habitat
- Supplemental practices
 - CP12: Wildlife food plot
 - CP42: Pollinator habitat

These various practices differ in several ways, particularly in the EBI points awarded.⁶ In addition, within most of these practice codes, there are additional practice choices. For example, both CP1 and CP2 have a base level of new or existing grasses, as well as a higher EBI level that requires planting at least one forb, legume, or (for CP2-only) shrub “best suited for wildlife in the area,” as well as a more diverse species mix.

⁵ In Signup 54, General Signup included CP3, CP3A, and CP25 under CP38C and CP1, CP2, CP4D, CP12, CP25, and CP42 under CP38E for eligible lands (FSA, 2019).

⁶ A detailed discussion of the different benefits of each practice or sub-practice choice for soil health, water quality, air quality, wildlife, and other outcomes of interest is beyond the scope of this report. However, it is worth noting that certain practices are more targeted towards wildlife outcomes (CP4B, CP4D, CP12, CP25, and CP42).

As an additional complexity, a single offer may include areas with different cover practices. For example, an offer may include primarily CP1 introduced grasses, but it may have a small section of rare and declining habitat. When this is the case, the EBI N1a score for that offer is the acreage-weighted average of the N1a scores for the various practice areas. In this example of CP1 and CP25, supposing that 20 percent of the acreage is in CP25 and that the producer is only offering the base version of CP1, then the offer would receive an N1a score of 18.⁷

Figure 1 presents the average points awarded for each practice, separately for acreage that is within a WPZ and eligible for a wildlife bonus and acreage that is not.⁸ Note that CP4B and CP4D are similar practices primarily differentiated by context. Because CP4B is exceedingly rare, average practice points are only shown for CP4D. CP12 is a practice used exclusively as a supplement to other practices and is, therefore, not shown. See the appendix for a full description of the practice choices available during Signup 45.

Figure 2 presents the share of offer acreage with a given practice offered on the entirety, a majority, or a minority of offered acreage, with offers weighted by total offer acreage. Furthermore, practice choices are segmented into four groups: grassland practices, wildlife practices, supplemental practices, and trees.

Grassland practices include CP1 (non-native grass mixes) and CP2 (native grass mixes). These are the most popular practice choices and offer a range of EBI points. Within grassland practices, the most popular practice choice is CP2–Premium, a diverse mix of native grasses, shrubs, forbs, and legumes. CP2–Premium is also the grassland practice with the highest EBI point value. For Signup 45, a grassland practice was the only practice on 64 percent of offered acreage and 74 percent of offered acreage when excluding offers re-enrolling expiring CRP land.

Wildlife practices include CP4D (wildlife habitat) and CP25 (rare and declining habitat). In terms of EBI points, sub-practices within each of these practices range from similar points as upgraded grassland practices to substantially more EBI points. The points distinction within CP25 is whether the cover is primarily trees, but this distinction is too rare to show.⁹ Likewise, CP4B (wildlife corridors) is very rare, with less than 0.1 percent of offers (weighted by acreage) including CP4B on any part of their proposed contract. Wildlife practices are the only practice on 11 percent of offer acreage. Excluding re-enrollments, wildlife practices are the only practice on 12 percent of offered acreage.

In this report, CP12 (wildlife food plots) and CP42 (pollinator habitat) are categorized as supplemental practices. As noted previously, wildlife food plots (CP12) are only allowed as supplemental practices, and they are most commonly in place on offers with a majority of CP1 or CP2. While CP42 can be used as the only practice in General Signup, the structure of the EBI provides a binary bonus of 20 points on N1b for offers meeting the minimum requirements for CP42. The large majority of offers with CP42 include only the minimum necessary to accrue points on N1b.

General Signup tree practices include CP3 (softwood trees) and CP3A (hardwood trees). Within these practices, there is a wide range of possible EBI scores. Tree practices are relatively rare at a national level and are geographically concentrated. A further breakdown of choice within CP3 and CP3A is outside the scope of

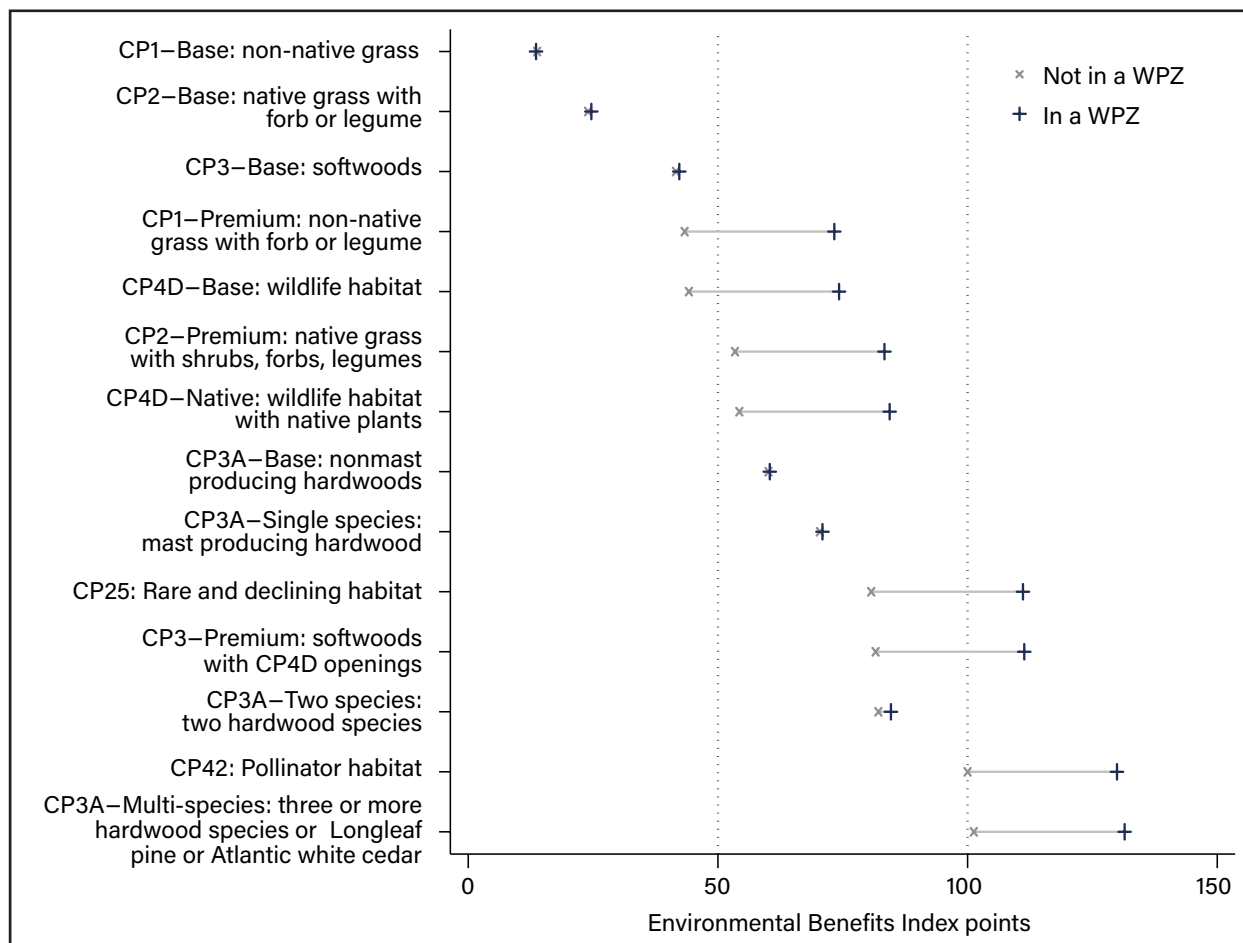
⁷Note that: $N1a_{mix} = \text{frac}_{CP1} \times N1a_{CP1} + \text{frac}_{CP25} \times N1a_{CP25} = 0.8 \times 10 + 0.2 \times 50 = 18$

⁸Note that there is a point difference between new and existing stands of trees for CP3 and CP3A choices, as well as a point difference between CP25 that is majority trees and CP25 that is majority grassland or shrub.

⁹The figure does not separate out CP25 habitat practices which are primarily planted to trees. Such practices comprise no more than 10 percent of CP25 offers.

this report, but the most common tree practice choice is CP3–Base. In addition, more than 1 percent of offers choose CP3–Premium or CP3A–Premium.¹⁰

Figure 1
Practice options in the 2013, 2016, and 2020 General Signups



WPZ = Wildlife Priority Zone

Notes: Points are awarded based on several within-practice choices. Averages shown for offers with all or approximately all acreage in a single practice. Note that CP42 is rarely present on single-practice offers and that a subset of points awarded for CP42 only require the greater of 10 percent of offer acreage or 1 acre. Data from Signup 45, 49, and 54 in 2013, 2016, and 2019, respectively. Averages are calculated separately based on whether more than 50 percent of an offer's acreage is in a wildlife priority zone (WPZ). As noted in box: The Environmental Benefits Index, parcels with more than 50 percent of offered acreage in a WPZ are eligible for a 30-point bonus on practice choices that result in a score of 40 or greater on N1a.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency Conservation Research Program offer data.

As shown in figure 2, most offers (80.2 percent in signup 45, 78.5 percent in signup 49, and 82.1 percent in signup 54) include only one practice, which is a grassland practice for most offers.¹¹ For signups 45, 49, and 54, wildlife practices comprised 13.5, 21.3, and 22.2 percent of single-practice offers, respectively.¹² Similarly, tree practices comprised 6.2, 4.7, and 3.8 percent of single-practice offers during signups 45, 49, and 54,

¹⁰ CP3–Premium includes all softwood practices with CP4D managed clearings. CP3A–Premium includes all plantings of Longleaf pine, Atlantic white cedar, or a mixed stand of three or more mast-producing hardwoods best suited to local wildlife

¹¹ These figures are, when excluding re-enrollments: 87.3 percent; 77.9 percent; and 78.3 percent.

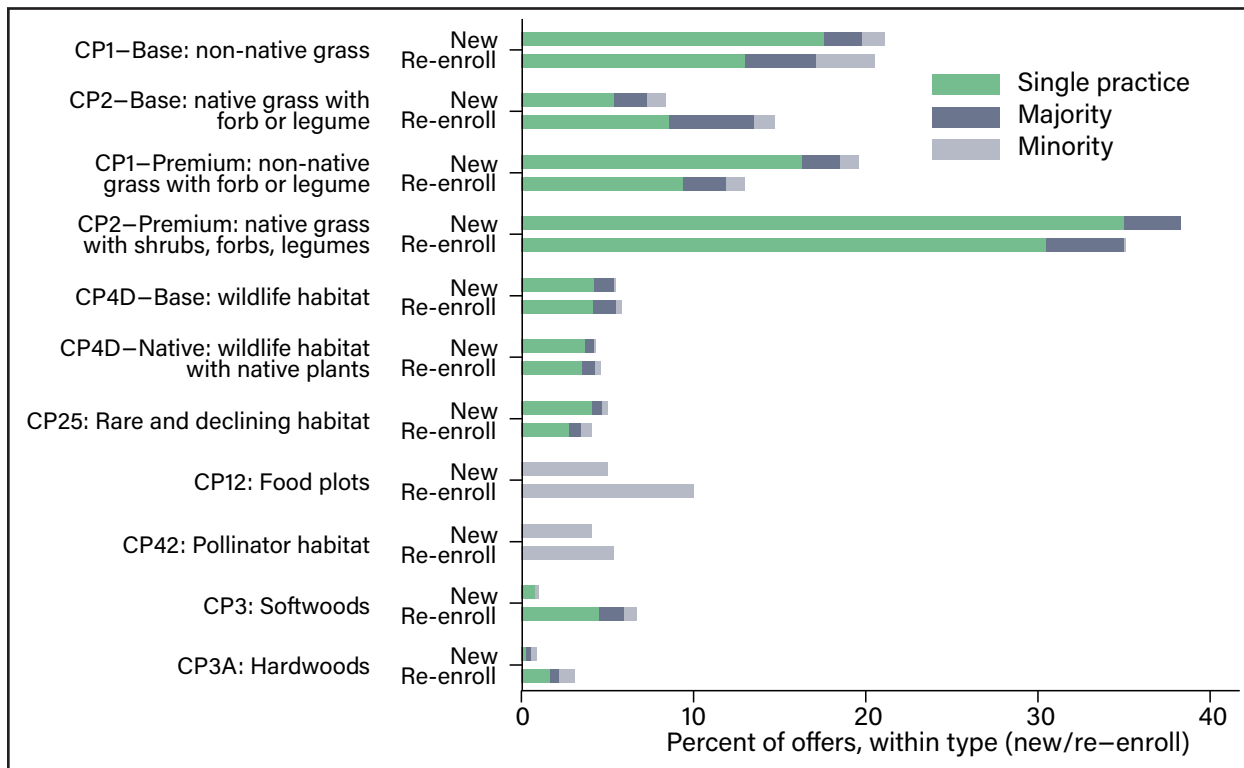
¹² These figures are, when excluding re-enrollments: 13.7 percent; 22.7 percent; and 24.6 percent.

respectively.¹³ Given that the vast majority of offers enroll with one of the seven grassland or wildlife practices, these will be the focus of this report with respect to costs and incentives.

For the approximately 20 percent of offers that select multiple practices, the most common minority practice is one of the supplemental practices. CP12 (Wildlife Food Plots) is a common supplement to non-native grassland practices, especially CP1–Premium, and CP4D (wildlife habitat). CP42 only requires a minimum of 1 acre or one-tenth of offer acreage to provide an additional 20 points, and it is used more frequently with grassland and wildlife practices that already provide a high number of EBI points.

Figure 2a

Share of offer acreage by cover practice choice, Signup 45, 2013



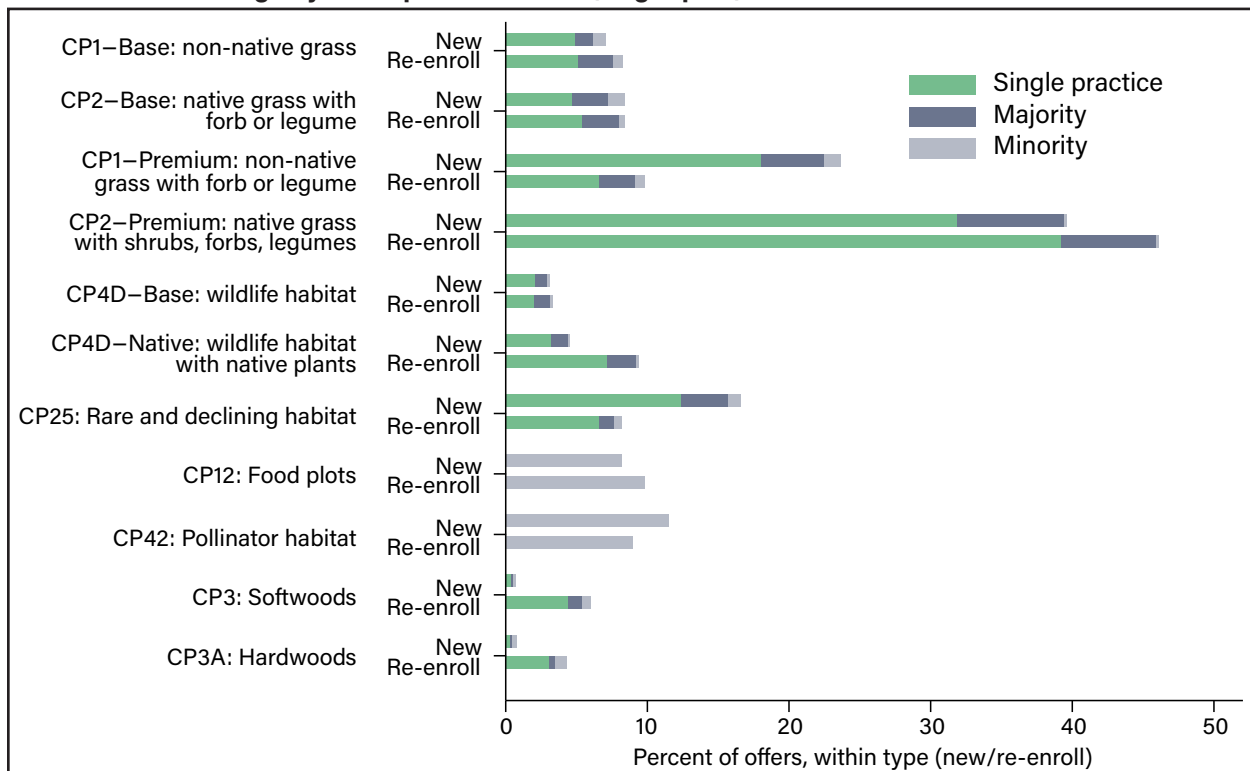
Notes: Offers are counted for each practice they contain. Share of offers is weighted by offer acreage. For example, an offer with 10 acres in CP1–Base and 5 acres in CP42 will be counted as 15 acres for CP1–Base, Majority, and as 15 acres for CP42, Minority. Results are similar without weighting by acreage of offer, except for high-value practices as all or majority offers. These practices are rarely offered as the majority or all of an offer, but when they are offered as the majority or all of an offer, the total offer acreage is small, on average. CP4B is not shown because of its rarity. Sub-practice decisions are not shown for CP3, CP3A, and CP25, due to the low total offered acreage in these practices across all sub-practice choices.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program offer data.

¹³ These figures are, when excluding re-enrollments: 1.1 percent; 0.9 percent; and 2.6 percent.

Figure 2b

Share of offer acreage by cover practice choice, Signup 49, 2016

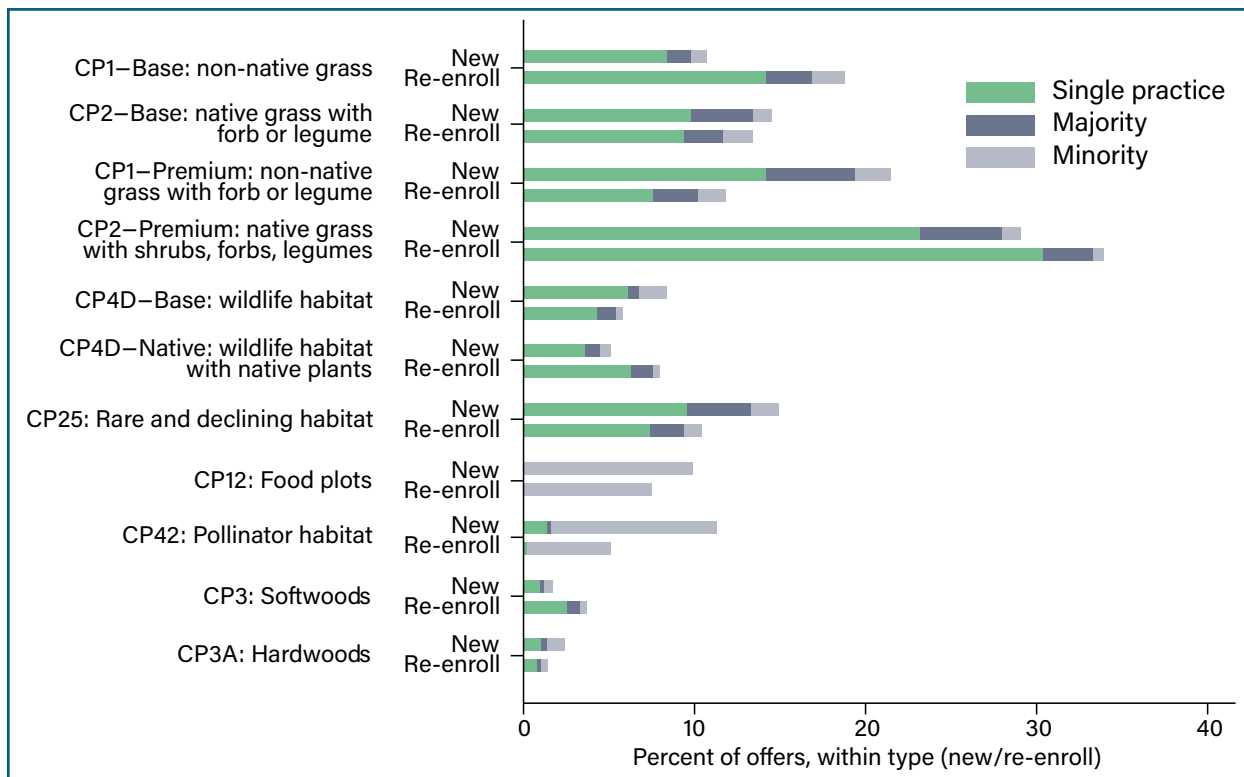


Notes: Offers are counted for each practice they contain. Share of offers is weighted by offer acreage. For example, an offer with 10 acres in CP1–Base and 5 acres in CP42 will be counted as 15 acres for CP1–Base, Majority, and as 15 acres for CP42, Minority. Results are similar without weighting by acreage of offer, except for high-value practices as all or majority offers. These practices are rarely offered as the majority or all of an offer, but when they are offered as the majority or all of an offer, the total offer acreage is small, on average. CP4B is not shown because of its rarity. Sub-practice decisions are not shown for CP3, CP3A, and CP25, due to the low total offered acreage in these practices across all sub-practice choices.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program offer data.

Figure 2c

Share of offer acreage by cover practice choice, Signup 54, 2020



Notes: Offers are counted for each practice they contain. Share of offers is weighted by offer acreage. For example, an offer with 10 acres in CP1–Base and 5 acres in CP42 will be counted as 15 acres for CP1–Base, Majority, and as 15 acres for CP42, Minority. Results are similar without weighting by acreage of offer, except for high-value practices as all or majority offers. These practices are rarely offered as the majority or all of an offer, but when they are offered as the majority or all of an offer, the total offer acreage is small, on average. CP4B is not shown because of its rarity. Sub-practice decisions are not shown for CP3, CP3A, and CP25, due to the low total offered acreage in these practices across all sub-practice choices. Note that Signup 54 included offers submitted within the State Acres For wildlife Enhancement (SAFE) initiatives. Offers with SAFE practices are excluded for comparability, and the total for the figure comprises only offers without SAFE practices.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program offer data.

The Costs of Establishing Conservation Covers

Offers to the General Signup may be either on re-enrolled acres or on “new” land. Since the new land is generally used as cropland prior to enrollment, producers with accepted offers on new land must establish the offered cover practice according to State-determined Natural Resources Conservation Service (NRCS) standards. In some cases, offers on re-enrolled land may be replacing the existing conservation cover with a new cover practice. In both cases, these producers pay the establishment costs up front. A pre-determined portion is reimbursed by USDA through cost-share payments, generally for 50 percent of eligible costs.

From the perspective of FSA, costs of practice establishment include both materials and labor, even if that labor is provided by the CRP participant.¹⁴ These cost components can include seed or seed mix, seeding, chemical or tillage-based seedbed preparation, chemical or physical clearing, prescribed burning, and weed control, among other expenditures. Most cost components are submitted with a cost per acre, but some costs may have alternative cost structures, such as hardwoods (cost per tree) or lime for grass planting (cost per ton). Costs for mid-contract management are an important component of lifetime contract costs. All CRP contracts are required to conduct mid-contract management to ensure that the contracted cover is maintained throughout the life of the contract. Costs for mid-contract management include disking, weeding, and other costs associated with reducing unwanted species and strengthening the stands of desired species. Notably, due to the heterogeneous timelines for submitting receipts and providing reimbursement, it is not possible to completely separate costs of cover establishment from mid-contract management. Participants are also expected to maintain the cover throughout the life of the contract. However, these costs are not submitted to FSA or recorded, as they are not reimbursed as part of the cost share. Before the period of this study, contracts included \$5 per acre annually for maintenance.

The incentives for potential participants include the reimbursable costs of practice establishment, but also the non-reimbursable costs and benefits of a given practice and the opportunity and financial costs that may be incurred after contract expiration. This research only examines the reimbursable costs of practice establishment, inclusive of mid-contract management. It does not include certain benefits, such as the potential for hunting or emergency grazing, or costs, such as pest pressure, that a certain cover choice may provide during a contract. In addition, it does not include certain benefits, such as ease of timber harvesting, or costs, such as difficulty in clearing land, which may be incurred if a parcel leaves CRP for productive use. Many of these costs are either difficult or impossible to observe. However, they may still be important factors influencing practice choice and program participation.

Cost Sharing in the Conservation Reserve Program

At present, FSA offers to defray some of the costs of establishing a practice on enrolled CRP acreage. For new enrollments and for reenrollments with new practices, eligible costs for establishing conservation covers can be partially reimbursed. Reimbursements are based on receipts submitted to local FSA offices, with FSA authorized to reimburse 50 percent of actual costs, unless actual costs exceed a “not to exceed” limit for any particular cost component. All components of practice establishment, such as seed, seeding equipment rental, seeding labor, etc., are reimbursed in this way, subject to eligibility.¹⁵

¹⁴ Unbilled labor costs, such as the cost of a Conservation Reserve Program participant’s time, is an eligible cost that can be reimbursed at locally competitive wage rates.

¹⁵ The Farm Service Agency requires expenditures to comply with general regulations to qualify as eligible costs, in order to prevent inappropriate expenditures. There is no evidence that this is a substantial factor in reimbursements.

While cost sharing has been a part of the program since its inception, there were 10 EBI points available for any offer not requesting cost-sharing assistance prior to General Signup 39. In other words, for two otherwise comparable offers where one requests cost sharing and the other does not, the offer requesting cost sharing would receive 10 fewer points. Beginning with General Signup 39, this difference does not exist, and the two offers would be treated the same.

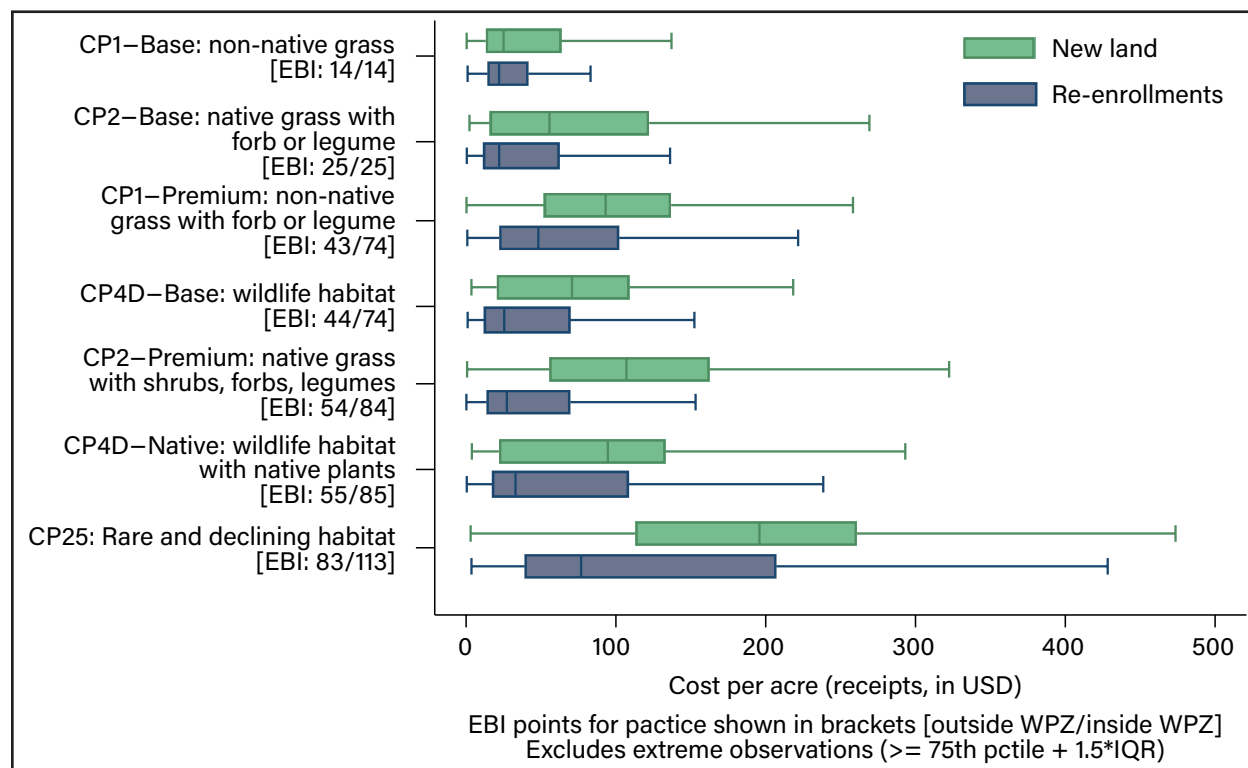
National Cost Estimates

For the most common single-practice covers, figure 3 presents the distribution of observed cost per acre for new land and re-enrollments. While there is substantial variation in the cost of establishing a given practice nationwide, for a typical contract, costs are largely increasing in the points available for choosing a given practice. The primary exception is CP4D (wildlife habitat), but it is important to note that the monetary cost of CP4D does not include the time and effort required by the participants to complete a wildlife conservation plan, which is a required component for CP4D contracts. More broadly, non-financial costs and costs (or profits) which would be accrued after the contract are not included.¹⁶

For many contracts, reimbursement is provided at 50 percent of submitted costs, and the cost per acre is approximately evenly divided between net cost per acre to the farmer and reimbursements per acre paid by FSA. Appendix table A.2 contains the median and interquartile range for total cost per acre and net cost per acre to the farmer for each practice and sub-practice choice shown in figure 3.

¹⁶This may be particularly relevant for tree practices, which are not shown, where the trees could be harvested after the expiration of the contract. The profits available for post-contract harvesting may vary across practice choice, given that tree practices with higher point totals include species mixes or including clearings. Both of these environmentally beneficial upgrades reduce the ease and profitability of post-contract harvest.

Figure 3
Practice cost data, Signup 45, 2013



EBI=Environmental Benefits Index, WPZ=Wildlife Priority Zone

Notes: Practice-specific total cost per acre calculated from receipts for component costs and details of the associated contract. Data from Signup 45 in 2013, including receipts submitted by 2020. Costs not submitted for reimbursement and non-financial costs are not included due to lack of availability. The distributions of costs are displayed graphically as follows: 25 percent of observed costs within practice and enrollment designation are less than or equal to the left edge of the shaded box; 50 percent of observed costs are less than or equal to the vertical line within the shaded box; and 75 percent of observed costs are less than or equal to the right edge of the shaded box. The lines extending to the left and right represent the approximate extent of the distribution, excluding observations as noted in the chart.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.

The Net Costs of Cover Practice Upgrades

Based on the comparison of observed total practice costs detailed above, higher scoring practices tend, on average to be more expensive. Two adjustments to these observed costs are needed to translate these costs into the incentives faced by program participants. The first adjustment is straightforward. For each practice, the observed net costs to program participants who have selected that practice is simply the total practice cost minus any cost-share payment.

The second adjustment is difficult because the observed costs for selected practices may not accurately represent the unobserved costs for the practices not selected. This means that the change in net costs when upgrading may not be accurately reflected using only the administrative data. One solution is to calculate net costs of upgrading within smaller geographic areas, based on the assumption that similar participants within a geographic area face the same expected net costs for the same practice. While many factors can lead to variation in practice establishment costs, the most significant factors such as soils, climate, and seed markets are likely to be similar for fields within a given geographic area. Geographic variation is, therefore, important for understanding the extent to which net costs of upgrading drives cover practice selection. The following analysis looks at this variation for CRP offers on new lands, since re-enrollments often have the option of simply retaining the existing conservation cover as long as the condition of the cover meets FSA standards for cover quality.

Potential Determinants of Spatial Variation

Since this study relies on spatial clusters to estimate net costs of upgrading, an important first step is to determine whether net costs of covers vary predominately at the State level or at a more local level, such as county. There are several aspects of the CRP rules that can lead to variation at both levels.

One possible driver of differences in practice costs is different practice standards. Even though the practice definitions are the same nationally, States can and do vary the specific standards that practices must meet. This is an important source of flexibility for the program since, for example, cover species that are native vary with regional differences in ecology. In addition, differences in regional climate can influence the amount of seed that is needed to establish a healthy cover. Seed companies that sell CRP seed mixes develop different mixes to meet these State-specific standards. To examine whether State standards are the primary drivers of practice cost variation, we estimate the amount of variation that is explained by State average practice costs per acre.

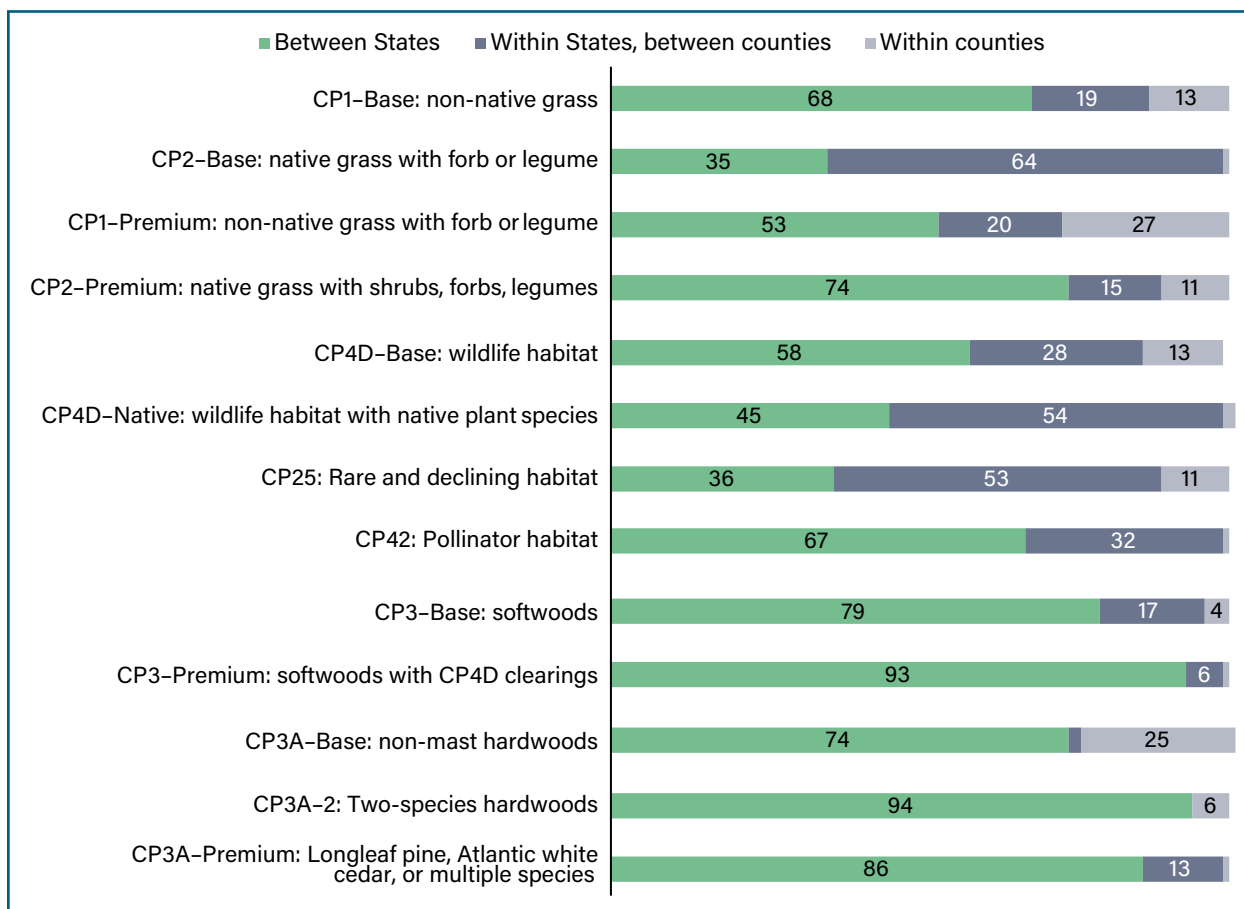
Figure 4 presents estimates of the percentage of variation in practice costs attributable to differences across States, within States across counties, and within counties, by practice. Specifically, the first horizontal bar of the figure, shown in green, provides the percentage of variation in practice costs due to differences in State averages. These differences are substantial, ranging from 35 percent of all observed variation for CP2–Base to 94 percent of all observed variation in CP3A–Two Species. In general, differences across States explain the highest fraction of observed variation in tree practices. On the other hand, differences across States explain the lowest fraction of observation variation in wildlife practices, especially CP4D–Native and CP25. Notably, the percentage of observed variation explained by differences across States ranges substantially across grass-land practices.

The second bar, shown in blue, presents the percentage of observed variation explained by differences across counties, within States. Total variation across counties includes variation due to differences across States, such that the total variation explained by county averages is represented by the sum of the first (green) and second (blue) bars. The total variation explained by county averages ranges from 73 percent of all observed variation in CP1–Premium to 99 percent of all observed variation for CP2–Base, CP4D–Native, CP42,

CP3–Premium, and CP3A–Premium. Notably, while a relatively smaller amount of variation in practice costs is explained by differences across States for wildlife practices, a relatively large percentage of variation in practice costs is explained by variation within States but across counties, ranging from 28 percent of observed variation in CP4D–Base to 54 percent of observed variation in CP4D–Native.

The third horizontal bar, shown in gray, represents the percentage of observed variation in practice costs that is within counties. For a number of practices, this percentage is as low as 1 percent of all variation. However, for CP1–Premium and CP3A–Base, this percentage represents at least one-quarter of all variation.

Figure 4
Sources of practice cost variation, Signup 45, 2013



Notes: Percent of variation explained based on R^2 of the regression of total costs per acre for a given practice on fixed effects for States (State Variation) and counties (County Variation), following Wooldridge (2002, p. 274). See appendix section "Econometric Specifications" for details. The percentages in the first (green) bar represents the percent of variation in practice costs attributable to differences across States. The percentages in the second (blue) column represent the percent of variation in practice costs attributable to differences across counties, within States. Note that the total variation attributable to differences across counties include variation across States (the green bar). The gray represents the remainder of the variation, which shows the amount of practice cost variation attributable to variation within counties. Data for CP12 and CP3A–1: Single Species omitted due to insufficient coverage. Values below 4 are not shown due to sizing. Horizontally, values sum to 100, within rounding error precision. Data exclude contracts with re-enrolling acreage.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.

If practice standards or geographic conditions are driving a lot of the variation in cover costs, then this is likely reflected in differences in the price of seed. Seed mixes must be approved by NRCS to meet State requirements for a given CRP practice, and it is substantially easier to purchase a pre-approved seed mix than to develop a mix and work through approvals. As a result, there is a substantial market for pre-approved seed mixes from major seed companies.

We examine publicly available pricing from two national seed companies. According to one company, options for CP2 range from \$100 to \$145 per acre in Illinois and from \$110 to \$185 per acre in Indiana.¹⁷ In Iowa, the price is \$102/acre for the company's only CP2 mix. The within-State variation reflects variation in price across seed mixes designed for different soil and climate conditions. The least expensive seed mix for CP2 in Indiana is for dry mesic grassland, at \$110/acre. The most expensive is for wet mesic and dry mesic floodplain conditions, at \$185/acre. Outside of floodplain acreage, mixes for wet mesic land and "muck" are priced at \$160/acre. Notably, company materials do not differentiate between seed mixes that qualify only for CP2–Base and those that qualify for CP2–Premium.

Another company offers quality tiers for pre-approved mixes.¹⁸ In Iowa, they offer an economy CP2 mix for \$60/acre and a standard CP2 mix for \$105/acre. In Illinois, they offer CP2 mixes for \$80 or \$85/acre, depending on conditions and desired grasses. In Indiana, they offer CP2 mixes for as low as \$85/acre as an economy mix for some soils, but standard mixes in other soils range from \$110 to \$125/acre outside of floodplain areas. As above, company materials do not differentiate between seed mixes that qualify only for CP2–Base and those that qualify for CP2–Premium.

In addition to extensive variation in the posted cost of seed for the same practice across States, there is extensive variation in the posted cost of seed for the same practice across soil type and climate conditions within States. In practice, the observed cost differences across States may differ from the observed comparison of seed company prices across States for the same soil type and climate conditions. This is because the soil type and climate conditions of parcels choosing to enroll in CRP may differ substantially across States. In other words, the observed receipts data in one State may be primarily for dry soils, while the observed receipts data in another State may be primarily for wet soils.

In order to empirically examine the differences in observed seed costs across States, we separate practice establishment expenses by their purpose. We define expenditures on "seed" as expenditures that include "seed" or "seeds" but not "seeding," "seedbed preparation," "interseeding," or "seed" as part of a larger word. Statistics for tree practices are not presented.¹⁹ Some contracts may only report a more aggregated expenditure which includes both seed cost and other seeding costs. On contracts with seed expenditures defined in that way, the total amount spent on seed for Signup 45 is \$11,833,180. Of this, FSA reimbursements for seed total to \$5,711,848.

Figure 5 presents statistics on the costs per acre attributable to seed alone. These statistics are only for contracts with seed specifically isolated as a cost component and exclude contracts with re-enrolling acres. With the exception of CP25, the grassland and wildlife covers have similar distributions of non-seed costs.²⁰ Consequently, the observed pattern of rising seed costs across practices also reflects a rising percentage of total

¹⁷ "CRP Seed Mixes." Pheasants Forever. Accessed November 2019–May 2020.

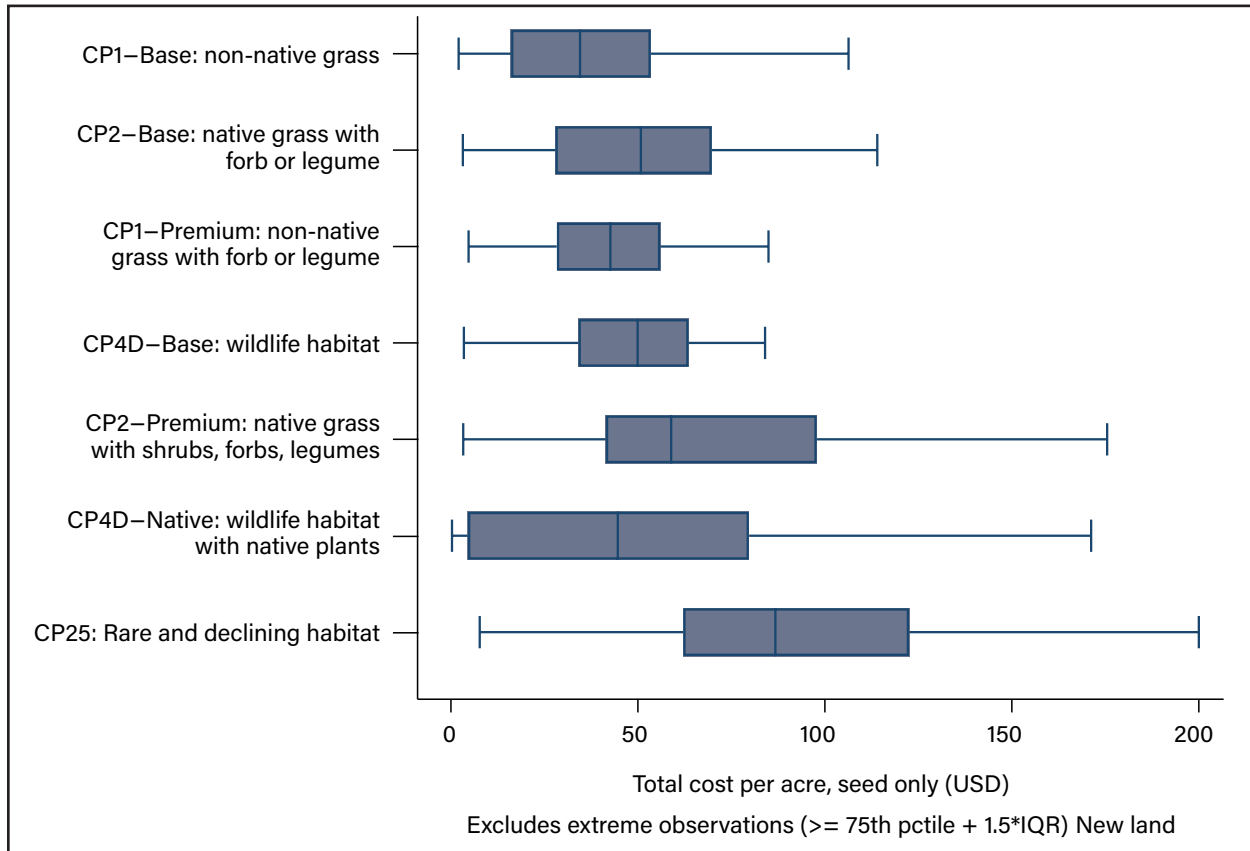
¹⁸ "Shop Conservation." Millborn Seeds. Accessed November 2019–May 2020.

¹⁹ The majority of offers enrolling in CP3 or CP3A are enrolling existing stands of trees. This includes over 40 percent of offers with new acreage that was not enrolled in CRP. As a result, the data for seedling costs are limited. The observed median cost of seedlings is \$56.81 per acre for CP3 and \$125 per acre for CP3A in Signup 45.

²⁰ CP25 is not broken out here into habitat with primarily tree cover and habitat with primarily grass or shrub cover, which may lead to some tree costs skewing the CP25 distribution. However, CP25 contracts with trees represent less than 10 percent of CP25 contracts in the expenditure data.

costs attributable to seed. Among grassland practices, there is clear evidence that native seed mixes are more costly, on average. For the majority of contracts with CP2, seed cost comprises more than half of practice establishment costs. Figure A1.C provides estimates for the fraction of total practice costs attributable to seed costs, by practice.

Figure 5
Seed costs per acre, Signup 45, 2013



Notes: Data only for contracts with seed expenditures listed separately, Signup 45. Tree practices and supplementary practices excluded due to data limitations. Contracts with re-enrollment acres excluded. The distributions of costs are displayed graphically as follows: 25 percent of observed costs within practice are less than or equal to the left edge of the shaded box; 50 percent of observed costs are less than or equal to the vertical line within the shaded box; and 75 percent of observed costs are less than or equal to the right edge of the shaded box. The lines extending to the left and right represent the approximate extent of the distribution, excluding observations as noted in the chart.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.

Observed Variation by State

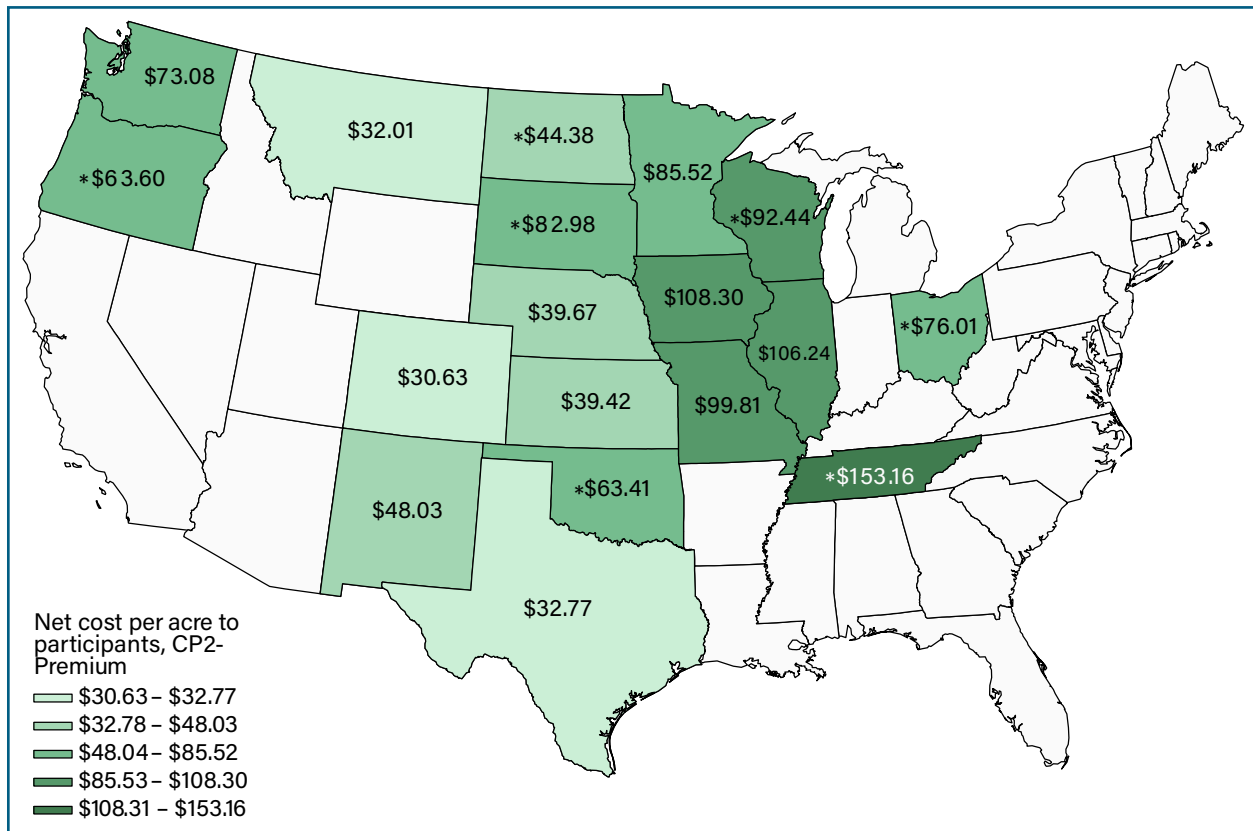
To explore more deeply the variation that exists across States, figure 6 shows the variation in net cost to participants, per acre, for the most commonly implemented cover, CP2-Premium.²¹ There are noticeable geographic differences, with average net costs per acre at the State level ranging from \$12.14 to \$87.51.²² In general, the cost per acre is higher in major Corn Belt States (e.g., Illinois, Iowa, and Ohio), while it is lower

²¹ Note that States with fewer than three contracts with receipts for CP2-Premium expenditures are excluded.

²² For reference, the average maximum allowed rental rate among Signup 45 contracts was \$89.34 per year. The State-level averages ranged from \$32.91 per year to \$202.44 per year.

in the High Plains (e.g., Kansas and Nebraska). Because CP2–Premium requires a diverse mix of native species, including grasses, shrubs, forbs, and legumes, variation in which species are native may have contributed to this variation.

Figure 6
Net cost per acre to participants, CP2–Premium, 2013 signup



Notes: Acreage-weighted average net cost per acre to participants among contracts reporting receipts for CP2–Premium. Data from Signup 45. States with fewer than five contracts with expenditures for CP2–Premium omitted. States marked with an asterisk (*) have fewer than 20 contracts with expenditures for CP2–Premium submitted for Signup 45. Darker shades of green indicate a higher cost, while lighter shades indicate a lower cost.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.

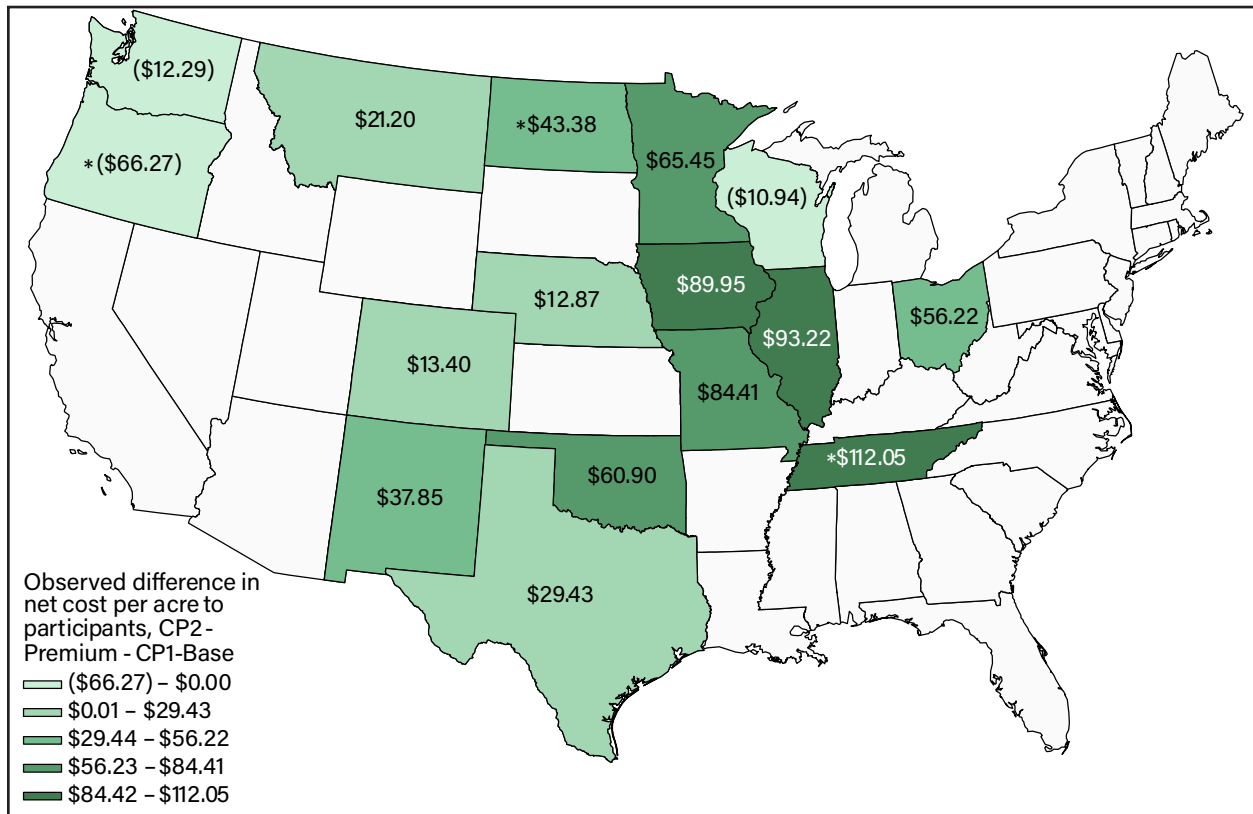
In addition to examining the cost of CP2–Premium, figure 7 displays the additional net cost per acre to participants from choosing CP2–Premium instead of CP1–Base.²³ With few exceptions, the cost of upgrading from CP1–Base to CP2–Premium appears to be positive and, in some cases, very large relative to the cost of CP1–Base alone. In the Plains and Mountain States, the cost of upgrading ranges from \$21 to \$43 per acre. In the Midwest, the range is higher, from \$65 to \$112 per acre. In the Pacific Northwest, observed costs for CP2–Premium are lower than observed costs for CP1–Base. For context, the cost of upgrading from CP1–Base to CP2–Premium is 490, 716, and 648 percent higher in Iowa, Illinois, and Missouri, respectively. In both the amount of money per acre and the relative cost across options, there are substantial financial incentives to not upgrade in these areas, which can be compared to lower costs, or even cost savings, of

²³ Note that States with fewer than three contracts with receipts for CP2–Premium expenditures are excluded, as are States with fewer than three contracts with receipts for CP1–Base.

upgrading in other areas, such as Oregon and Washington.²⁴ The next section examines how and whether participants appear to respond to these incentives.

Figure 7

Observed premium for CP2-Premium relative to CP1-Base, 2013 signup



Notes: Difference between the acreage-weighted average net cost per acre to participants for CP2-Premium expenditures and the acreage-weighted average net cost per acre for CP1-Base expenditures. Data from Signup 45. States with fewer than five contracts reporting expenditures in either practice omitted. States marked with an asterisk (*) have fewer than 20 contracts with expenditures for either CP1-Base, CP2-Premium, or both. Darker shades of green indicate a higher premium, while lighter shades indicate a lower premium. The lightest shade indicates a cost saving to the participant from practice improvement, as well as the labeling in white. Values in parentheses—for example, "(\$12.29)"—indicate negative values. In other words, the average observed net cost of CP2-Premium is lower than the average observed net cost of CP1-Base.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.

²⁴ With respect to Oregon and Washington, where submitted CP2-Premium costs are lower than submitted CP1-Base costs, there may be concerns about within-State correlation in the usage of these practices and the costs of farming. While this report will not establish the particular cause of this relationship, it is worth noting that these figures may stem from data limitations in these States.

Incentives and Practice Choice

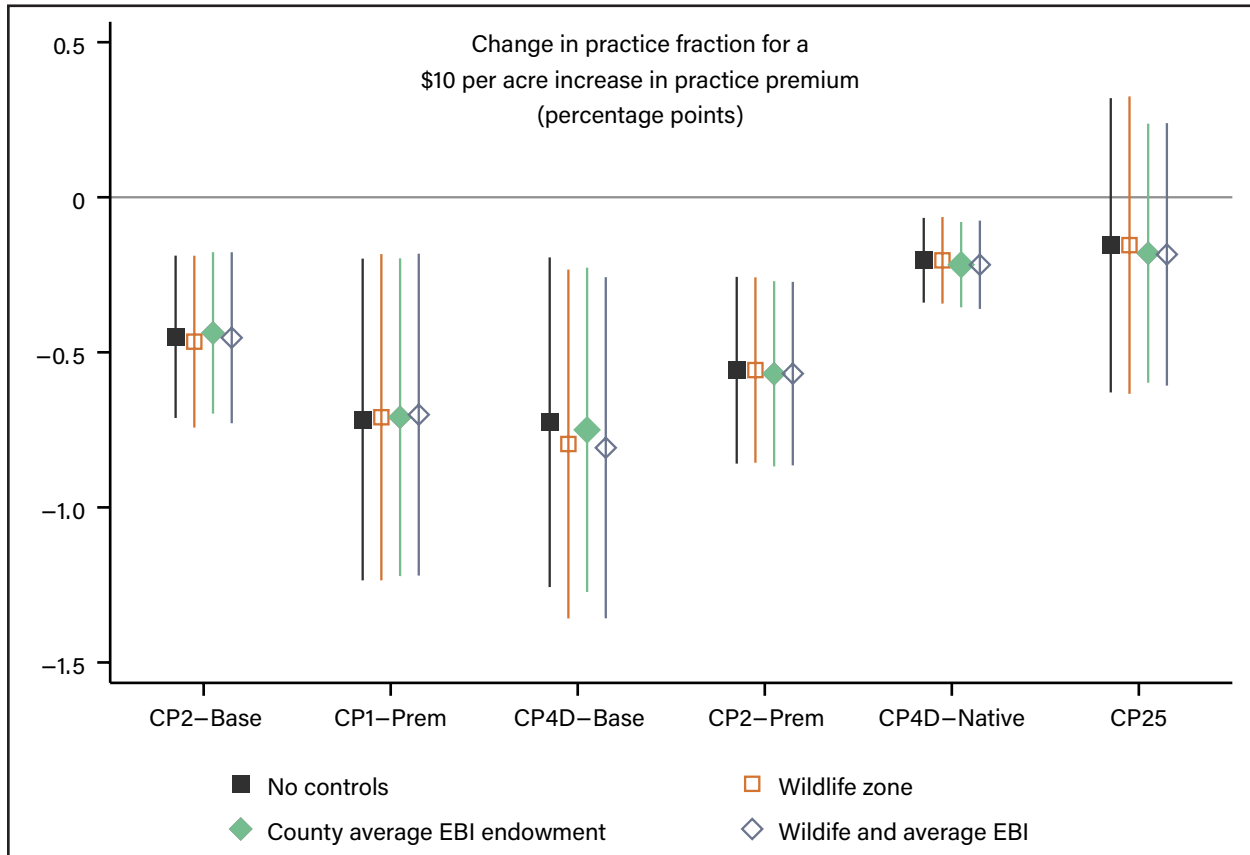
Beyond identifying the cost of practices and upgrading from one practice to another, this report seeks to identify whether these incentives to upgrade are correlated with observed practice decisions to upgrade. The practice choice with the lowest point total is CP1–Base. One way of framing the practice choice decisions—for producers not considering tree practices, in particular—is to consider the benefits and costs of alternative grassland and wildlife practices relative to this baseline.²⁵ In order to assess whether potential participants may respond to the cost of higher EBI practices relative to the cost of CP1–Base, we examine regression results for this relationship across six practices, as described in appendix section "Econometric Specifications." Figure 8 plots the results of these regressions under four different specifications, showing a negative and statistically significant relationship between upgrading cost and offered acreage for all practices except for CP25, which is also negative but not statistically different from zero at conventional levels. In terms of magnitude, these coefficients express the expected change in proportion of acreage offered in a given practice for a \$1 increase in the observed cost premium for that practice. For example, these estimates suggest that a \$10 increase in the difference to participants between CP2–Premium and CP1–Base is associated with just under 1 percent of offered acreage moving away from CP2–Premium.

For each regression, the share of offered acreage in a particular practice was regressed on the observed difference in net cost per acre to the participant between the practice in question and CP1–Base. The level of observation is the county-wildlife zone eligibility pair, which means these are county-level observations. For some counties, the observations are further divided into offered acreage eligible for wildlife priority points and offered acreage that is not. The first of the four specifications is a base specification with just the share of offered acreage in a given practice and the observed cost premium for that practice. The second specification shown includes an indicator for if the observation includes offers eligible for the wildlife priority points, in addition to the cost premium. The third specification shown includes the cost premium and the average EBI endowment in the county-wildlife zone eligibility pair, but it excludes the wildlife zone indicator. The EBI endowment of any particular offer is the minimum EBI score that an offer could receive based on its location and characteristics. This is the score an offer would receive if offering the maximum rental rate allowed and enrolling all acreage in CP1–Base with no additional components. The average for the county-wildlife zone eligibility pair is the acreage-weighted average of this EBI endowment for all offers in the county-wildlife zone eligibility pair. The fourth and final specification shown includes the cost premium, the wildlife indicator, and the average EBI endowment. All results include 95-percent confidence intervals based on standard errors that are robust to heteroscedasticity. The econometric specifications are addressed further in the appendix.

²⁵ This analysis excludes the choice of whether to add a supplemental practice and, if so, which supplemental practice to add.

Figure 8

Observed correlation, offer choice and practice premium, 2013 signup



Notes: Each coefficient presented is from a regression of the fraction of acreage offered in the practice on the observed difference in net cost per acre to the participant between the practice and CP1-Base. Observations are at the county-wildlife zone pair level, with costs calculated from contracts with new acreage submitting costs for Signup 45. County-wildlife zone pairs without this cost data are omitted from the analysis. The four estimates for each practice represent results from each of four regression specifications, as labelled. The "No Controls" regression includes only the observed cost premium as an explanatory variable. The "Wildlife Zone" regression also includes an indicator for whether the observations are eligible for wildlife zone bonus points. The "County Average EBI Endowment" regression includes the observed cost premium and the average Environmental Benefits Index endowment (minimum possible score) for the observations. The "Wildlife and Average EBI" regression includes both control variables. The 95-percent confidence interval is shown with the vertical lines, which account for heteroscedasticity-robust standard errors.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program offer and cost-share receipts data.

Policy Implications and Alternative Policy Options

As noted above, the two main policy options to encourage particular practices within the CRP are the EBI and the cost-share rates. With the current EBI structure and cost-sharing policy, general signup results have consistently shown more offers with practice upgrades than with rental rates below their maximum. The current EBI structure incentivizes certain practices, such as wildlife habitat, over others, such as non-native grasses. The current cost-share rates also encourage practices by reducing the net cost to the participant of upgrading. The purpose of this section is to combine the results of the previous section with a limited set of assumptions and a simple theoretical model to understand the potential implications of various alternative policy options that FSA might pursue to impact the types of offers submitted to the program.

Assumptions and Conceptual Model

Our earlier empirical analysis confirms that participants do respond to these incentives when making practices choices. To extend beyond that analysis for a broader look at these policy options, we outline a simple theoretical model of CRP producers' behavior. This model assumes that producers seek to maximize the expected net benefits when structuring their CRP offer. Because the probability of successfully enrolling depends on the offer's EBI, producers face a tradeoff between improving the probability of having their offer accepted—through choosing either a reduced rental rate or a practice with more EBI points—and maximizing the returns conditional on getting accepted—through choosing either a higher rental rate or a lower cost practice.

We expect that producers differ in their willingness to reduce their rental rate offers or to select improved practices for individual reasons. In particular, the structure of the offer process means that the marginal improvement in enrollment probability differs depending on the starting or “endowment” EBI score for a given parcel. Notably, this is an uncertain endowment, because the subfactor for the rental rate is determined after the signup period closes. In addition, there is individual variation in the net gains from enrollment, which include opportunity costs and benefits and costs from enrollment that arise separately from the features of the program. Such separate benefits and costs may relate to the wildlife and hunting impacts or the long-term impacts of having trees when the contract expires, among other possibilities. While we can incorporate the endowment EBI into our framework and our empirical analyses, the uncertainty around the endowment and individual net gains are generally unobservable and not incorporated into our modeling.

We also assume that participants, on average, face an ordered practice choice set. This means that higher scoring practices are generally more expensive.²⁶ Additionally, since participants are choosing between practices based on EBI score, the “price” that they face is the cost per additional EBI point when choosing between two practices. From this standard economic framework, we can infer how producers would change their offers when practice costs change and when EBI points for practices change.

While the previous section has focused on practice choice, producers also face two other choices: whether to participate in the offer process and the rental rate offered if participating. Encouraging practices with more EBI points may result in higher rental rate for two reasons. First, producers will offset higher cost practices by offering a higher rental rate. Second, producers will get more practice points—increasing their EBI score and probability of acceptance—and so will have less of an incentive to reduce their rental rate. If a policy change increases the net cost of EBI points or reduces the net returns of participation (say through reduced cost-share rate) then it can also push some potential participants out of the program by making their expected net

²⁶ There may be reasons that this is not true for some participants. In such cases, our theory would predict that these participants would never choose a higher cost but lower scoring practice.

returns negative. Hellerstein and Higgins (2010) and Hellerstein et al. (2015) discuss the dynamics of CRP enrollment mechanism design and participation.

Alternative Policy Options

Several policy options could increase the incentives for participants to upgrade their cover practices beyond CP1–Base. This research considers both options that would require congressional action, such as changing cost-share rates, and policy levers available to FSA within current legislation, such as changes to the EBI. These include such changes as:

- reducing the cost-share rate for the lowest scoring (CP1–Base);
- increasing the cost-share rate for a moderately improved practice (CP2–Premium);
- increasing the cost-share rate for all practices;
- reducing the EBI points for the lowest scoring practice (CP1–Base);
- increasing the EBI points for a moderately improved practice (CP2–Premium);
- increasing either the geographic extent or EBI points for wildlife-oriented practices in wildlife priority zones; and
- increasing the EBI points for subfactors related to practice improvements (Cover EBI, see box, “The Environmental Benefits Index”).

Table 2 provides predictions for each of these policy levers.

Table 2
Policy predictions

		CP1– Base share	CP2–Prem share	CP4D share	Participation	FSA rent costs	FSA practice costs
Cost Share	Lower CP1– Base	-	+	0/+	-	+	?
	Raise CP2– Premium	-	+	-	0/+	?	+
	Raise all CS	-	+	+	+	?	+
EBI	Lower CP1– Base	-	+	+	?	?	+
	Raise CP2– Premium	-	+	-	0/+	+	+
	Increase WPZ	-	+	+	?	?	+
	Increase Points, Cover EBI	-	+	+	?	+	+

EBI= Environmental Benefits Index, WPZ=Wildlife Priority Zone

Notes: A (+) indicates a predicted positive effect, while a (-) indicates a predicted negative effect. A (0) indicates a prediction of no change, while a (?) indicates that the overall net prediction depends on the magnitude of competing effects. Predictions are for only the stated policy change considered in isolation. Policies may have interaction effects with other policy changes. For example, the impacts of lowering cost-sharing rates for CP1 assume the EBI point structure remains fixed. Unknown predictions for participation generally depend on whether some participants will no longer submit offers. While minimum profit potential will not decrease, the decrease in the probability of success at an affordable rental rate and practice cost may dissuade producers with high costs of submitting an offer.

Source: USDA, Economic Research Service analysis.

Effects on Practice Choice

Since practice choice is based on relative prices, we expect that a decrease in the cost-share rate on the most basic practice of CP1–Base will lead to a decrease in offers of CP1–Base and an increase in offers on similar alternatives with additional EBI points, such as CP2–Base, CP1–Premium, or others. Alternatively, raising the cost share for CP2–Premium would cause a shift toward CP2–Premium and away from all alternatives, with a particular drop among substitutes (CP4D) and practices with lower costs and benefits, such as CP2–Base or CP1–Premium. Increasing cost share for all practices would make choosing a practice with higher EBI points relatively less expensive than before, and offers would shift away from CP1–Base and towards improved practices.

Lowering the EBI points for CP1–Base would be equivalent to making the cost per EBI point for CP1–Base greater, causing offers to shift away from CP1–Base and towards alternative practices. As above, most offers would likely shift to the choice most similar to the original costs and benefits of CP1–Base, which would be CP2–Base or CP1–Premium for most offers. Raising the EBI points for CP2–Premium would lead to offers shifting toward CP2–Premium from alternative practices, as described in the previous paragraph. Increasing the geographic extent or EBI bonus for wildlife priority zones would be equivalent to making the cost per EBI point lower for affected parcels choosing CP2–Premium or CP4D. In a relative sense, the cost per EBI point would increase for CP1–Base. As a consequence, the findings in this research would suggest that affected parcels would move toward practice choices that are awarded 40 or more points on the N1a subfactor and away from practice choices with fewer points, such as CP2–Base or CP1–Base. Lastly, the benefits to the participant of higher ranking through practice improvement could be strengthened by providing additional EBI points for such practice upgrades. Since the relative gain from practice improvements is larger under this change, this would favor improved practices over reduced rental rates and shift offers away from CP1–Base.

Effects on Participation

As noted above, changing cost-share rates changes net returns to program participation, where participation is defined as formally submitting an offer to enroll. If returns decrease, then some participants may exit the program. So, lowering the cost share on the lowest score practice (CP1–Base) to encourage upgrades to other practices would be expected to reduce participation. Conversely, raising the cost-share rate on a higher scoring practice (CP2–Premium) could encourage some additional participation. However, since this is not the least cost option, it is also possible that there would be no effect on participation. Lastly, raising the cost-share rate on all practices would unambiguously increase net returns for all participants and would likely increase participation.

Changing relative EBI scores would have a number of potential effects on participation. Lowering the points available for CP1–Base could cause lower participation by increasing the cost per point to enter the program but could also cause higher participation among potential producers that are able to implement practices with more EBI points by reducing competitive pressure. Raising the EBI points available for an improved practice, such as CP2–Premium could increase participation or have little effect. Increased EBI points on practices through expected use of wildlife priority zone incentives would only impact participation if fields getting the additional incentives would have previously been so much less competitive that they opted out of the program, making this effect weakly negative. Lastly, increasing the incentive to upgrade practices by increasing the EBI benefit of all practice upgrades would favor parcels with an ability to implement high-point covers while implicitly disfavoring parcels which have more ability to compete on rental rate reduction. Any participation effect of a broad change in EBI is ambiguous but likely small in magnitude.

Effects on Program Outlays

The basic theoretical model suggests that offered rental rates will typically get higher as adoption of improved practices increases. The total impact from decreasing cost share for CP1–Base is not clear. Lower cost share for CP1–Base would increase practice costs both directly and indirectly. The indirect effect would be through higher rental rates to cover these costs. The direct effect would be through higher cost-share payments on the improved and more expensive practices. However, there would be cost savings with lower cost-share payments to CP1–Base contracts. Raising the cost share for CP2–Premium would increase rent outlays and cost-share payments as offers shift to practices with more EBI points and feel less competitive pressure to generate EBI points by reducing rental rates. However, the total impact on rent outlays may also decrease with existing CP2–Premium offers having more incentive to reduce requested rental rates. Raising the cost share for all practices would, as described above, induce offers to shift towards more expensive practices and pay a greater fraction of those costs. The impact on FSA outlays for rental payments, however, is less clear. Because offers are shifting towards practices with more EBI points, there is less pressure to reduce rental rates to compete. However, with an increase in participation and aggregate quality, there could also be an increase in the pressure to reduce rental rates. The overall effect is therefore ambiguous.

Lowering the number of EBI points awarded for CP1–Base would lead to greater FSA outlays for practice establishment costs. The prediction is ambiguous only because of the potential for countervailing pressure from the changing composition of participants, potentially towards lower-cost parcels. Raising the number of EBI points awarded for CP2–Premium would result in larger outlays from FSA both for practice establishment costs and rental rates. Increasing the geographic extent or EBI bonus of wildlife priority zones is expected to shift affected parcels towards practice choices with more EBI points and higher costs, so FSA outlays for practice establishment costs and rental rates probably would increase. Increasing the EBI points awarded for practice improvements would increase FSA outlays for cost-sharing and rental rates, as more offers select higher cost practices to increase their chance of enrollment instead of reducing their rental rate.

Conclusions

USDA's Farm Service Agency (FSA), which administers the Conservation Reserve Program (CRP), informs owners and operators making an offer to enroll in the program that the best way to improve the chances of their offer being accepted is to offer higher quality or "improved" conservation practices. Over the three most recent CRP General Signups (2013, 2016 and 2020), only 17 percent selected the most basic cover practice (CP1–Base). This means that about 83 percent of offers chose some upgrade out of the dozens of possible ways of improving the offers. The single most widely chosen practice in each signup is a diverse native mixture of grasses with forbs, legumes, or shrubs (CP2–Premium).

The CRP General Signup incentivizes improved cover practices through a combination of the Environmental Benefits Index, which is used to rank offers, and cost share on the cost of cover establishment and maintenance. To understand why participants choose a given practice or practice mix, and to understand the implications for the program and its budget, we analyze the costs of establishing these covers and how the mix of practice points and cost share influences the participants' choices.

In this report we summarize new data on cover practice costs and show the frequencies with which different practices are chosen. Using statistical models, we show that participants are less likely to choose the most common practices when facing higher net implementation costs. Based on this confirmation of the underlying theory of the enrollment mechanism design, we develop a set of hypotheses regarding how practice adoption, participation, and program costs would be likely to respond to different policy measures aimed at increasing the adoption of higher quality practices.

Using receipts submitted to USDA, this report finds that the costs of practice establishment vary meaningfully both across practice choices and across space within each practice choice. The median total costs per acre for grassland practices (CP1 and CP2) and CP4D range from \$22 to \$60, while median total costs per acre for rare and declining habitat (CP25) is over \$100. Pollinator habitat is nearly twice as expensive as rare and declining habitat, with a median total cost per acre of approximately \$200. Furthermore, the interquartile range of within-practice costs range from \$50 to over \$100. Restricting attention only to practices without reenrolling acreage, the median total costs per acre for grassland practices and CP4D range from \$25 to \$107. The median total cost per acre for both rare and declining habitat and for pollinator habitat is approximately \$196.

While there is variation in practice costs within States, most of the variation in practice cost can be captured simply in State-level averages for each practice. Several factors may contribute to State-level variation in price, including program restrictions on seed mixes and planting, local market conditions for non-seed costs, and soil and climate factors. Examining the share of within-practice variation costs attributable to differences across counties, this share is greater than 75 percent for all practices other than CP1–Premium. Seed costs comprise a large share of practice costs and vary both across practice and space. However, seed costs comprise less than 50 percent of total costs for most contracts.

Using variation in practice costs at the county and wildlife priority zone level, this report finds that for many practices (CP1–Premium, CP2, and CP4D), higher net costs for the participant are associated with lower rates of adoption. Higher net costs for CP25 may also be associated with lower rates of adoption, but the relationship is not statistically significant, likely because data on CP25 costs are much noisier due to the lower adoption rates. These results support the idea that cost share influences incentives to upgrade and the behavior of participants to the CRP. Using both the empirical findings of this report and theoretical assumptions grounded in existing literature, this report provides predictions for how policy alternatives might impact the program. EBI points and cost-share changes each have the potential to increase the acreage offered in high-EBI practices, but these incentives may also lead to higher program costs at the same time.

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Appendix

Details of the Conservation Cover Practice Choice

Table A.1A provides an in-depth presentation of the choices available to those applying to the CRP General Signup, derived from Farm Service Agency (FSA) documentation (2013; 2015; 2019). The distinction of “No WPZ” or “WPZ” is, as discussed in the box titled “The Environmental Benefits Index,” a reference to whether at least 51 percent of the parcel being offered is located within a Wildlife Priority Zone (WPZ). For those practices which may be eligible for up to 20 points under N1b, these points are accrued in fewer than 3 percent of offers. Accordingly, it is appropriate to think of the minimum points awarded in these situations as the most accurate for a typical producer. All offers with CP12 receive 5 points for N1b, and all offers with sufficient acreage in CP42 receive 20 points for N1b. Table A.1B provides mean observed points outside and inside WPZ eligibility for a simplified set of practice choices.

Recall that the total EBI score is comprised of $N1+N2+N3+N4+N5+N6$. Of these, N1, N4, and the N5d subfactor are affected by practice choice. Table A.1A illustrates the available points by practice choice for each of these components, as well as the total points affected by practice choice. Because the lowest point practice receives 10 points from N1a and 3 points from N5d (13 points total) as a minimum, we can consider these 10 N1a points and 3 N5d points as being part of the endowment score under Land EBI.

Table A.1A

Practice choices and points awarded in the 2013, 2016, and 2020 signups

Practice – Level	Description	N1a	N1b	N1c - No WPZ/WPZ	N4	N5d	Total - No WPZ/WPZ
CP1-Base	Existing stand (1-3 species) or new stand (2-3 species) of introduced grasses	10	0	0/0	0	3	13/13
CP1-Premium	Existing or new mixture of at least 3 introduced grass species and at least 1 forb or legume species	40	0	0/30	0	3	43/73
CP2-Base	Existing stand (1-3+ species) or new stand (3+ species) of at least 2 native grass species and at least 1 forb or legume species	20	≤20	0/0	0	3	23-43/ 53-73
CP2-Premium	Existing or new mixture (5+ species) of at least 3 native grass species and at least 1 shrub, forb, or legume species	50	≤20	0/30	0	3	53-73/ 83-103
CP3-Base, Existing	Solid stand of softwoods, existing at State standards	10	0	0/0	20	10	40/40
CP3-Premium, Existing	Solid stand of softwoods at required density with 10 to 20 percent openings managed to CP4D requirements	50	0	0/0	20	10	80/80
CP3-Base, New	Solid stand of softwoods, existing at State standards	10	≤20	0/0	30	10	50-70/ 50-70
CP3-Premium, New	Solid stand of softwoods at required density with 10 to 20 percent openings managed to CP4D requirements	50	≤20	0/30	30	10	90-110/ 120-140
CP3A-Base, Existing	Existing solid stand of non-mast-producing hardwoods*	10	0	0/0	40	10	60/60
CP3A-Single-species, Existing	Existing solid stand of 1 mast-producing hardwood*	20	0	0/0	40	10	70/70
CP3A-Two-species, Existing	Existing mixed stand of 2 hardwood species	30	0	0/0	40	10	80/80
CP3A-Multi-species, Longleaf Pine, or Atlantic White Cedar, Existing	Existing mixed stand of 3 or more hardwood species; or of Longleaf pine or Atlantic white cedar at appropriate density	50	0	0/30	40	10	100/130
CP3A-Base, New	New solid stand of non-mast-producing hardwoods*	10	≤20	0/0	50	10	70-90/ 70-90
CP3A-Single-species, New	New solid stand of 1 mast-producing hardwood*	20	≤20	0/0	50	10	80-100/ 80-100

Table continued onto next page.

* Mast is a term for nuts or fruits produced by trees and other woody-stemmed plants. Mast-producing trees include oaks, walnut, hickory, maples, black cherry, and others. Non-mast trees include willows, cottonwoods, and others. See, for discussion: "Hardwood Tree Planting, Michigan Conservation Reserve Program CRP-CP3A." USDA Natural Resources Conservation Service, 2006. Available online.

Continued from previous page:

Table A.1A

Practice choices and points awarded in the 2013, 2016, and 2020 signups

Practice – Level	Description	N1a	N1b	N1c - No WPZ/WPZ	N4	N5d	Total - No WPZ/WPZ
CP3A–Two-species, New	New mixed stand of 2 hardwood species	30	≤20	0/0	50	10	90–110/ 90–110
CP3A–Multi-species, Longleaf Pine, or Atlantic White Cedar, New	New mixed stand of 3 or more hardwood species; or of Longleaf pine or Atlantic white cedar at appropriate density	50	≤20	0/30	50	10	110–130/ 140–160
CP4B–Base	Existing or new stand of grasses, trees, shrubs, forbs, or legumes (4+ species) in mixes, blocks, or strips best suited to local wildlife. Wildlife conservation plan must be developed	40	≤20	0/30	0	4	44–64/ 74–94
CP4B–Native	As in CP4B, but with a minimum of 5 species and no introduced grasses	50	≤20	0/30	0	4	54–74/ 84–104
CP4D–Base	As in CP4D–Base	40	≤20	0/30	0	4	44–64/ 74–94
CP4D–Native	As in CP4D–Native	50	≤20	0/30	0	4	54–74/ 84–104
CP12	Wildlife food plots added to other practices in small areas	-	5	-	-	-	-
CP25–Grasses	Preservation or creation of rare and declining habitat	50	≤20	0/30	25	5	80–100/ 110–130
CP25–Trees	Preservation or creation of rare and declining habitat	50	≤20	0/30	50	10	110–130/ 140–160
CP42	Pollinator habitat: existing or new diverse mix of multiple species suited for pollinators	50	20*	0/30	25	5	100*/ 130*

Notes: CP12 acreage is not calculated when calculating a weighted average for the N1a score. Points for CP42 in N1b requires a minimum of 10 percent of offer acreage or 1 acre in CP42, whichever is larger. Potential points for N1b unrelated to CP42 and CP12 require planting native species best suited to local wildlife as a replacement for an existing monoculture, with at least 51 percent of offered acreage. Only 1.32 percent of offers without CP42 were awarded 20 points for N1b in Signups 45, 49, and 54. The fraction of CP25 practices primarily planted to trees (with consequences for N4 and N5d) is less than 5 percent. Based on scores for N4, the majority of CP3 and CP3A practices offered in Signups 45, 49, and 54 were existing stands.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program offer data.

In addition to EBI points awarded through N1a, N1b offers points for practices meeting certain requirements. There are three possible ways to accrue N1b points, but the total N1b points available for an offer is 20. The qualifications are as follows:

- 20 points for practices that convert at least 51 percent of a primarily monoculture stand to a mix of native species with wildlife benefits.

- 20 points for CP42, subject to minimum habitat size requirement. For CRP offers less than 10 acres, the requirement is at least 1 acre of pollinator habitat. For larger offers, the requirement is at least 10 percent of offered acreage. All habitat must be in contiguous areas of at least 0.5 acres.²⁷
- 5 points for CP12, up to 10 percent of a field and not to exceed 5 acres per field. CP12 acreage is not calculated when calculating a weighted average for the N1a score.

In addition, it is possible to accrue up to 50 points through N4:

- 0 points for CP1, CP2, CP4B, or CP4D;
- 20 points for an existing CP3 stand;
- 25 points for CP25 where the plant community is or will be established to a primarily grass and/or shrub complex;
- 25 points for CP42;
- 30 points for a new CP3 stand; or
- 40 points for existing or enhanced hardwood, Longleaf pine, and/or Atlantic white cedar planting under CP3A; or
- 50 points for new hardwood, Longleaf pine, and/or Atlantic white cedar, or for CP25 if the plant community is or will be established to primarily trees.

Also, it is possible to accrue up to 10 points through N5d for air quality benefits:

- 0 points for CP12;
- 3 points for CP1 or CP2;
- 4 points for CP4B or CP4D;
- 5 points for CP42 or CP25 planted primarily to grasses and/or shrubs; or
- 10 points for CP3, CP3A, or CP25 planted primarily to trees.

As discussed in the box titled "The Environmental Benefits Index," there are also EBI points for practice choices that depend on the characteristics of the land offered. For offers with at least 51 percent of the offered acreage in a wildlife priority zone, offers receive an additional 30 points in subfactor N1c if their practice choice results in an N1a score greater than or equal to 40 points. In other words, for offers with the majority of their acreage in a wildlife priority zone, there are 30 additional points awarded when choosing a practice or mix of practice with a high EBI point value.

Table A.1B provides the average points awarded for N1, N4, and N5d. This includes the 13 points accrued with even the most basic practice choice. Note that CP3 and CP3A here do not include the delineation of whether the stand is new or existing. Furthermore, CP25 is shown without distinction of whether it is planted primarily to grasses or trees. Average practice points are shown for offers with all or approximately all acreage in a single practice. Average points differ slightly from the totals presented in table A.1A due to the

²⁷ The vast majority of offers with CP42 offer approximately the minimum required amount.

potential for secondary practices to appear or errors in ERS inference about assignment of offers to practices below the level of practice codes.

Table A.1B

Practice options and observed practice points in the 2013, 2016, and 2020 signups

Practice - Level	Brief description	Average practice points	
		Not in WPZ	In WPZ
CP1-Base	New or existing introduced grasses	13.9	13.7
CP1-Premium	New or existing introduced grasses with forb or legume	43.3	73.5
CP2-Base	Basic new or existing native grasses and forb or legume	24.7	25.0
CP2-Premium	More diverse new or existing native grasses and shrub, forb, or legume	53.7	83.7
CP3-Base	Softwoods	41.9	42.2
CP3-Premium	Softwoods with 10 to 20 percent openings managed to CP4D requirements	80.9	110.9
CP3A-Base	New or existing non-mast-producing hardwoods	60.2	60.3
CP3A-Single-species	New or existing mast-producing hardwood	70.5	70.9
CP3A-Two-species	New or existing stand of 2 hardwood species	81.9	84.7
CP3A-Multi-species, Longleaf pine, or Atlantic white cedar	New or existing stand of three or more hardwood species; or of Longleaf pine or Atlantic white cedar at appropriate density	101.0	131.0
CP4D-Base	Wildlife plantings and conservation plan	44.3	74.4
CP4D-Native	Native-species wildlife plantings and conservation plan	54.8	84.9
CP25	Preservation or creation of rare and declining habitat	83.0	112.7
CP42	Pollinator habitat: existing or new diverse mix of multiple species suited for pollinators	100.0	127.6

WPZ= Wildlife Priority Zone

Notes: Points are awarded based on several within-practice choices. Averages shown for offers with all or approximately all acreage in a single practice. Note that CP42 is rarely present on single-practice offers. Data from Signups 45, 49, and 54 in 2013, 2016, and 2020, respectively. Average points differ slightly from the totals presented in table A.1A due to the potential for secondary practices to appear or errors in ERS inference about assignment of offers to practices below the level of practice codes.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program offer data.

Econometric Specifications

For the results shown in figure 4, we run a regression of cost on a set of fixed effects for each State. The resulting R_S^2 is our estimate of the percent of variation that is between States.

$$Cost_i = \theta_s + \epsilon_i$$

We then run a regression of cost on a set of fixed effects for each county. The resulting R_C^2 is our estimate of the percent of variation that is between counties.

$$Cost_i = \gamma_c + \epsilon_i$$

The percent of variation within States but between counties is the difference between the variation between States and between counties, because variation between counties includes variation between States. Mathematically, the percent of variation within States, between counties is equal to $R_C^2 - R_S^2$. The percent of variation within counties is the remainder, equal to $1 - R_C^2$.

For the results shown in figure 8, we employ four variations of a cross-sectional, county-level regression. In each of these specifications, the unit of observation is the intersection counties and wildlife priority zone (WPZ). For counties entirely within or outside of a WPZ, offer data are aggregated for the whole county. For a county only partially within a WPZ, observations within and outside of a WPZ in a single county are separated, such that we observe county-WPZ pairs. For each county or county-WPZ pair, we observe the fraction of acreage among CRP offers in each practice. For example, if 25 acres of a total 100 offered acres is offered in CP2–Premium, the CP2–Premium fraction is 0.25. The explanatory variable of interest in each regression is the observed cost to the producer per acre (net of FSA reimbursement) for the practice of interest, minus this net cost for CP1–Base. A separate regression is conducted for each practice choice. This implies the fairly strong assumption that all practice upgrade decisions are made relative to CP1–Base and that we can omit the net cost of other practices. Unfortunately, a richer estimation strategy that includes the costs of all practice upgrades and the share of offered acreage in those practice upgrades is not possible with the existing data. This is because such a model requires an observation of cost for all of the practices shown in figure 8, which is only the case for 22 county-wildlife pairs.

We estimate the following relationship, separately for each practice (p) where c denotes the county of the observation and w=1 if an observation is in a wildlife zone.

$$Acreage\ share_{p,c,w} = \alpha_p + \gamma_p Net\ Upgrade\ Premium_{p,c,w} + \epsilon_{p,c,w}$$

Note that:

$$Acreage\ share_{p,c,w} = \frac{Acreage_{p,c,w}}{Total\ Acreage_{c,w}}$$

$$Net\ Upgrade\ Premium_{p,c,w} = Net\ Cost_{p,c,w} - Net\ Cost\ of\ CP1\ Base_{c,w}$$

The coefficient of interest is γ_p , which is graphed in figure 8. As shown in figure 8, we also consider two modifications to this specification. First, we control for county average EBI endowments, which is a measure of how competitive the average offering parcel would be without practice improvements or rental rate reductions:

$$Acreage\ share_{p,c,w} = \alpha_p + \gamma_p Net\ Upgrade\ Premium_{p,c,w} + \phi_p County\ Avg\ EBI\ Endowment_{c,w} + \epsilon_{p,c,w}$$

Second, we control for whether a county–WPZ pair is in a wildlife zone, which can add additional points for upgrading to certain practices:

$$Acreage\ share_{p,c,w} = \alpha_p + \gamma_p Net\ Upgrade\ Premium_{p,c,w} + \omega_p WPZ_{c,w} + \epsilon_{p,c,w}$$

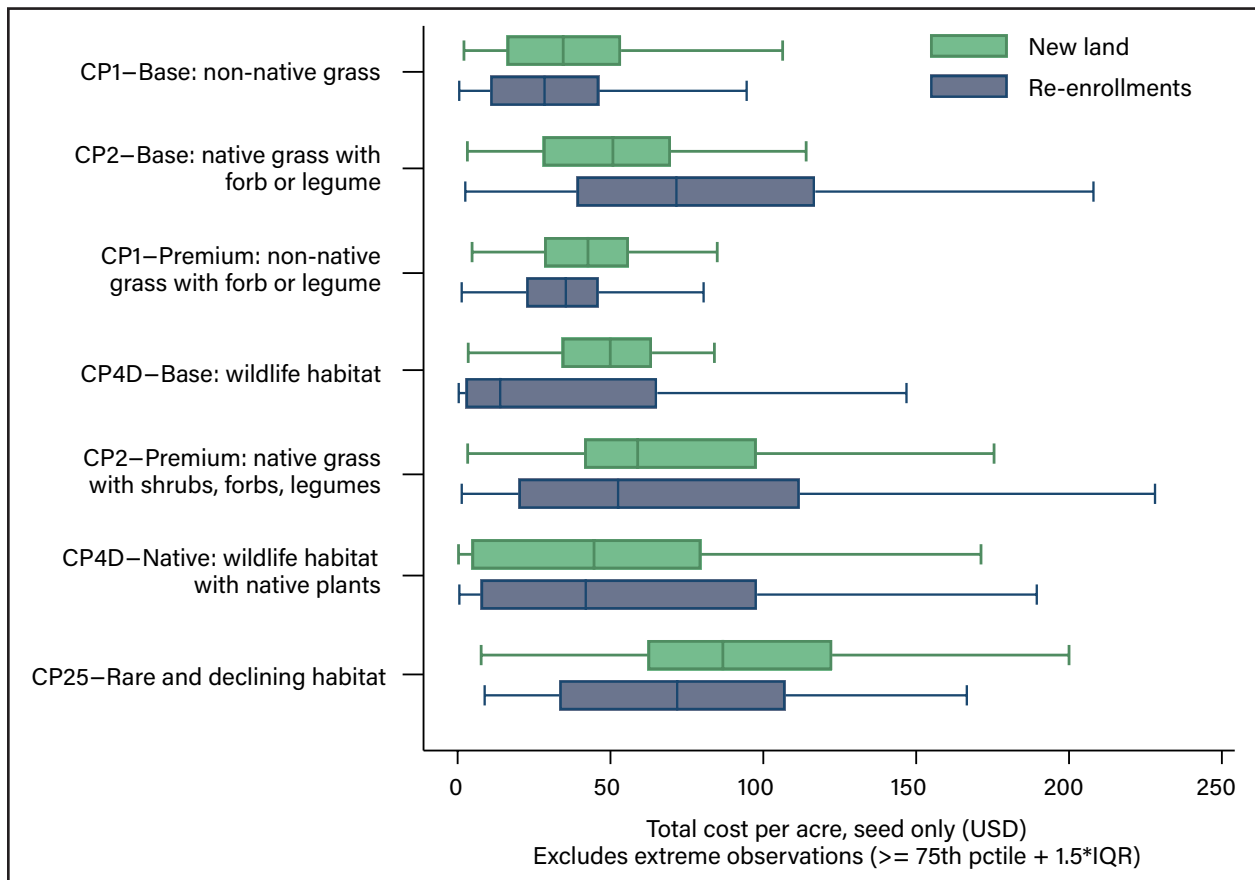
Where WPZ=1 when an observation is in a wildlife priority zone. Lastly, we estimated the relationship with both controls:

$$Acreage\ share_{p,c,w} = \alpha_p + \gamma_p Net\ Upgrade\ Premium_{p,c,w} + \phi_p County\ Avg\ EBI\ Endowment_{c,w} + \omega_p WPZ_{c,w} + \epsilon_{p,c,w}$$

Our estimates of $\hat{\phi}_p$ and $\hat{\omega}_p$ are not of interest and are omitted from the presentation of results. The results in figure 8 represent $10 \times \gamma_p$ to provide coefficient magnitudes more representative of the types of changes one might consider. An interpretation of coefficient estimates and magnitudes is included in the text. The standard errors are adjusted to account for the possibility of heteroscedasticity, using the sandwich estimator of variance.

Additional Seed Cost Figures

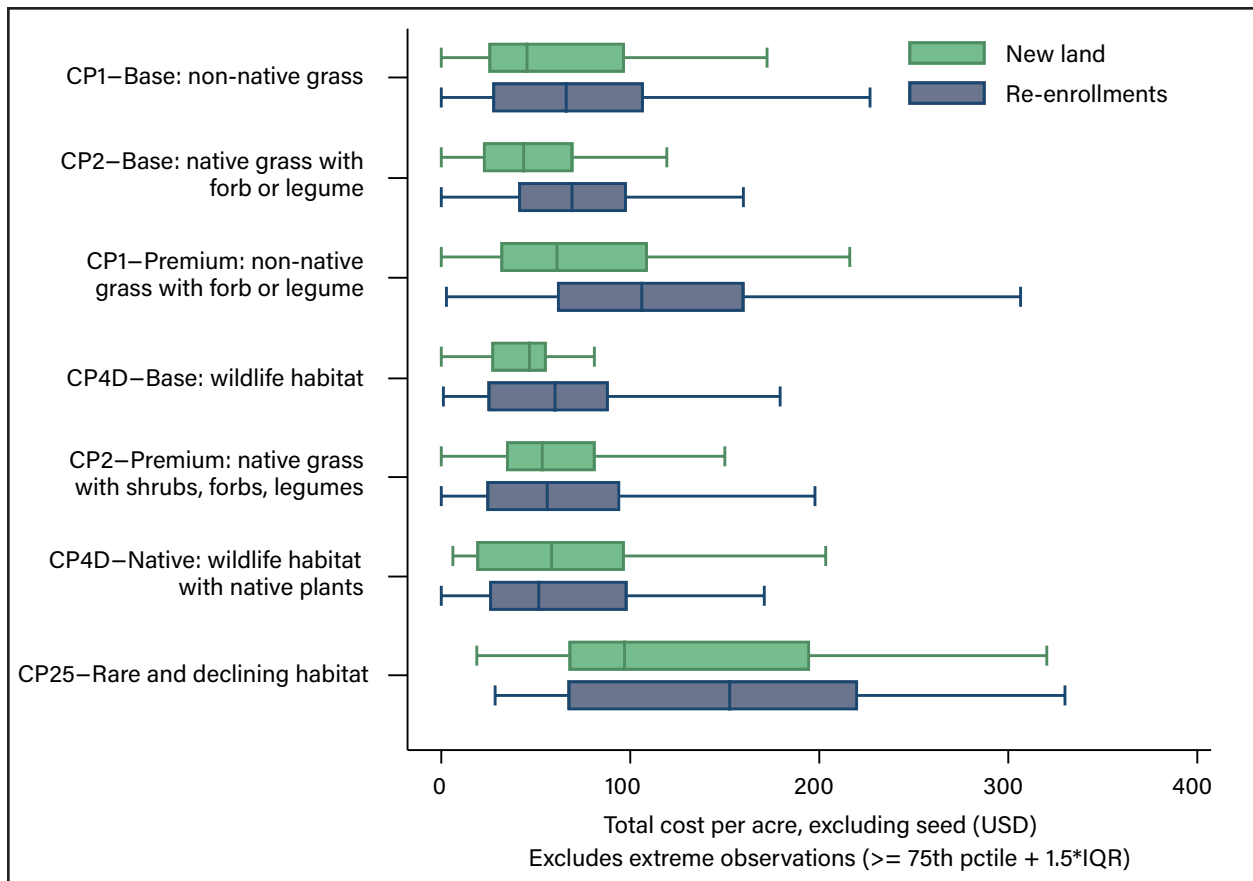
Figure A.1A
Seed costs per acre, 2013 signup



Notes: Data only for contracts with seed expenditures listed separately. The distributions of costs are displayed graphically as follows: 25 percent of observed costs within practice and enrollment designation are less than or equal to the left edge of the shaded box; 50 percent of observed costs are less than or equal to the vertical line within the shaded box; and 75 percent of observed costs are less than or equal to the right edge of the shaded box. The lines extending to the left and right represent the approximate extent of the distribution, excluding observations as noted in the chart.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.

Figure A.1B
Non-seed costs per acre, 2013 signup

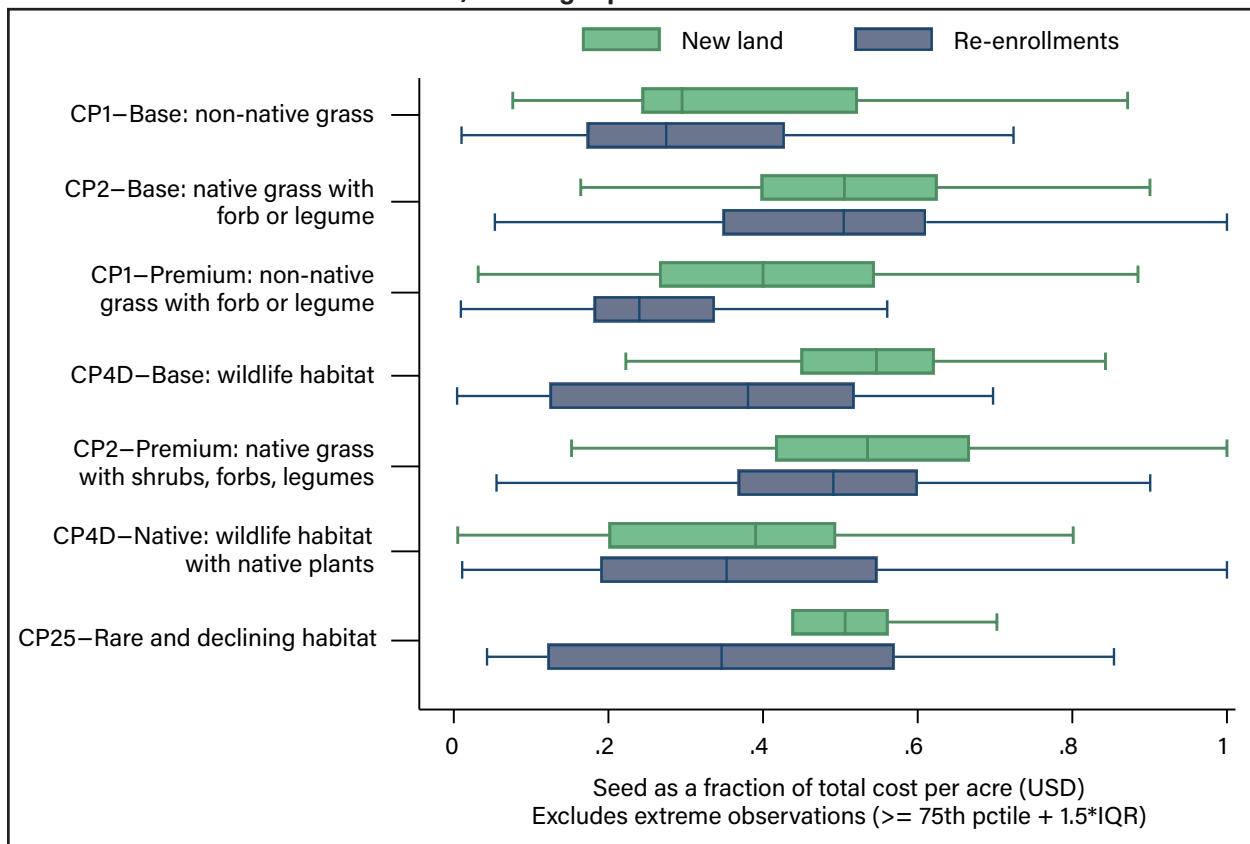


Notes: Data only for contracts with seed expenditures listed separately. The distributions of costs are displayed graphically as follows: 25 percent of observed costs within practice and enrollment designation are less than or equal to the left edge of the shaded box; 50 percent of observed costs are less than or equal to the vertical line within the shaded box; and 75 percent of observed costs are less than or equal to the right edge of the shaded box. The lines extending to the left and right represent the approximate extent of the distribution, excluding observations as noted in the chart.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.

Figure A.1C

Seed costs as a fraction of total cost, 2013 signup



Note: Data only for contracts with seed expenditures listed separately. The distributions of seed costs as a fraction of total costs ("seed cost shares") are displayed graphically as follows: 25 percent of observed seed cost shares within practice and enrollment designation are less than or equal to the left edge of the shaded box; 50 percent of observed seed cost shares are less than or equal to the vertical line within the shaded box; and 75 percent of observed seed cost shares are less than or equal to the right edge of the shaded box. The lines extending to the left and right represent the approximate extent of the distribution, excluding observations as noted in the chart.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.

Cost Distributions by Practice Choice

Table A.2A

Practice cost data, 2013 signup, all contracts

County level variation in cost of practice establishment (dollars per acre)				
Practice	Total cost (dollars per acre)		Net cost (dollars per acre)	
	Median	IQR	Median	IQR
CP1	32.00	60.97	17.14	30.87
CP1–Base	22.00	29.26	11.80	16.42
CP1–Premium	60.00	91.93	29.76	45.48
CP2	35.00	86.80	18.55	44.23
CP2–Base	23.76	57.46	12.52	32.79
CP2–Premium	41.18	96.63	20.80	48.64
CP4D	33.58	84.40	18.79	41.68
CP4D–Base	31.25	71.81	18.26	35.25
CP4D–Native	37.60	99.65	19.73	50.30
CP25	119.89	183.19	60.60	90.96
CP42	199.92	186.13	100.52	99.10
CP12	13.22	29.74	6.64	15.75
CP3	38.22	109.44	21.54	60.03
CP3–Base	65.65	138.50	33.80	79.77
CP3–Premium	22.79	73.25	12.73	48.60
CP3A	151.13	356.21	83.36	200.32
CP3A–Base	114.24	258.18	57.22	147.69
CP3A–Single-species	120.00	460.39	49.88	306.45
CP3A–Two-species	204.00	340.63	99.33	165.61
CP3A–Premium	146.22	365.44	83.60	206.60

IQR=Interquartile Range

Notes: Data from Signup 45. Designations of sub-practice choices inferred using awarded EBI points. Costs are for submitted receipts and may exclude non-financial or non-reimbursable costs of practice establishment. The interquartile range is the difference in the middle value of the lower and upper half of the data. Practice descriptions are provided in table A.1B. Total cost represents the actual costs incurred in practice establishment, while net cost represents the costs incurred net of FSA reimbursement.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.

Table A.2B

Practice cost data, 2013 signup, excluding offers with re-enrolling acreage

County level variation in cost of practice establishment (per acre)				
Practice	Total cost (dollars per acre)		Net cost (dollars per acre)	
	Median	IQR	Median	IQR
CP1	72.12	99.33	34.44	49.49
CP1-Base	25.00	50.72	12.40	27.86
CP1-Premium	93.13	84.98	41.98	45.82
CP2	102.51	109.38	48.79	54.52
CP2-Base	55.64	106.55	33.61	49.09
CP2-Premium	107.02	107.18	51.43	53.80
CP4D	72.30	97.13	35.24	48.96
CP4D-Base	70.68	88.78	33.55	42.42
CP4D-Native	94.61	111.36	42.56	56.26
CP25	195.80	148.04	94.35	83.59
CP42	195.50	179.31	102.12	106.06
CP12	-	-	-	-
CP3	162.48	132.24	78.26	78.55
CP3-Base	162.48	131.78	68.50	79.98
CP3-Premium	165.03	139.48	88.33	82.70
CP3A	463.56	547.88	262.83	335.10
CP3A-Base	433.01	158.23	219.47	199.75
CP3A-Single-species	-	-	-	-
CP3A-Two-species	424.49	958.95	172.82	479.38
CP3A-Premium	490.18	559.28	263.17	336.21

IQR=Interquartile Range

Notes: Data from Signup 45. Designations of sub-practice choices inferred using awarded EBI points. Costs are for submitted receipts and may exclude non-financial or non-reimbursable costs of practice establishment. Contracts with existing CRP acreage excluded. The interquartile range is the difference in the middle value of the lower and upper half of the data. Practice descriptions are provided in table A.1B. Total cost represents the actual costs incurred in practice establishment, while net cost represents the costs incurred net of FSA reimbursement.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.

Table A.2C

Practice cost data, 2013 signup, including only offers with re-enrolling acreage

County level variation in cost of practice establishment (dollars per acre)				
Practice	Total cost (dollars per acre)		Net cost (dollars per acre)	
	Median	IQR	Median	IQR
CP1	27.50	45.34	14.85	24.08
CP1-Base	22.00	27.58	11.78	15.69
CP1-Premium	48.18	80.24	24.26	38.81
CP2	25.05	53.21	13.35	29.04
CP2-Base	22.04	49.68	11.88	27.07
CP2-Premium	27.20	56.15	14.36	31.04
CP4D	29.12	68.90	16.10	36.03
CP4D-Base	25.44	56.47	14.71	29.66
CP4D-Native	32.99	89.95	16.88	41.31
CP25	76.74	168.33	42.55	85.65
CP42	204.37	192.00	101.09	100.84
CP12	13.00	41.49	6.44	21.00
CP3	25.45	65.69	14.65	41.37
CP3-Base	42.45	95.34	21.06	55.91
CP3-Premium	20.00	46.01	11.05	32.81
CP3A	122.86	273.88	69.87	154.61
CP3A-Base	75.00	114.58	40.88	72.84
CP3A-Single-species	109.69	474.96	49.66	366.01
CP3A-Two-species	200.72	319.39	95.40	160.80
CP3A-Premium	108.31	269.27	65.30	148.92

IQR=Interquartile Range

Notes: Data from Signup 45. Designations of sub-practice choices inferred using awarded EBI points. Costs are for submitted receipts and may exclude non-financial or non-reimbursable costs of practice establishment. Contracts with existing CRP acreage only. The interquartile range is the difference in the middle value of the lower and upper half of the data. Total cost represents the actual costs incurred in practice establishment, while net costs represents the costs incurred net of FSA reimbursement. Practice descriptions are provided in table A.1B.

Source: USDA, Economic Research Service analysis of USDA, Farm Service Agency, Conservation Reserve Program cost-share receipts data.