Assessing the Effects of Conservation Practices on Priority Birds throughout the Intermountain West (Bird Conservation Regions 9, 10 and 16)

CEAP - CESU Agreement #68-7482-11-502

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Executive Summary

American Bird Conservancy (ABC), under contract with the Natural Resources Conservation Service (NRCS) Resource Assessment Division, conducted an assessment of the effects of conservation program and practice delivery across the intermountain West. We used the Habitat and Populations Strategies (HABPOPS) database developed for the Intermountain West Joint Venture (IWJV) to develop estimates of the predicted population response (change in carrying capacity) for five species primarily dependent on grassland and sagebrush-dominated habitats. Predicted population responses were compared to population objectives for portions of the three Bird Conservation Regions (BCRs) comprising the majority of the IWJV landscape: the Great Basin (BCR 9), the Northern Rockies (BCR10), and the Southern Rockies (BCR16).

We developed comprehensive population estimates for Long-billed Curlew, Grasshopper Sparrow, Brewer's Sparrow, Sage Sparrow and Sage Thrasher on selected land units where 13 selected conservation practices were delivered under the EQIP, WHIP and CRP programs. Our analysis area included those portions of BCRs 9, 10 and the northern portion of BCR 16 within the IWJV. These population estimates defined the scope of potential influences of practice delivery within each program by defining our estimate of the current carrying capacity of the affected land units, and of the maximum net potential response to each of the 13 conservation practices delivered under each of these three programs.

Conservation programs and practices administered by the NRCS and FSA clearly have the potential to deliver bird conservation benefits across broad geographical scales and in multiple habitats. We estimated that 1.5% of the Long-billed Curlew population of our analysis area occurs on the lands where our selected practices were implemented, and that practice delivery met nearly 2% of the IWJV objective increase for the analysis area. We estimated that 4.3% of the Grasshopper Sparrow population of our analysis area occurs on the lands where our selected practices were implemented, and that practice delivery met nearly 1% of the IWJV objective increase for the analysis area. We estimated that 1.6% of the Brewer's Sparrow population of our analysis area occurs on the lands where our selected practices were implemented, and that practice delivery met 1% of the IWJV objective increase for the analysis area. We estimated that 2.8% of the Sage Sparrow population of our analysis area occurs on the lands where our selected practices were implemented, and that practice delivery met nearly 6% of the IWJV objective increase for the analysis area. We estimated that 1.5% of the Sage Thrasher population of our analysis area occurs on the lands where our selected practices were implemented, and that practice delivery met 1% of the IWJV objective increase for the analysis area.

Potential increases on the order of 1-6% based on 7 years conservation practice implementation may be adequate progress toward the 30-yr population objectives for these species, but more targeted application of specific conservation measures on selected habitats to provide specific desired habitat conditions would certainly improve our ability to meet objectives.The Sage Grouse Initiative is one example of such a targeted conservation approach. We predict that the combination of conifer removal, grazing system implementation, weed management and revegetation implemented under SGI alone has potentially resulted in meeting 1% of the Brewer's Sparrow objectives for the analysis area, 2% of the Sage Sparrow objectives, and 1% of the Sage Thrasher objectives, with subregion (state/BCR) increases meeting as much as 25% or more of objectives. These were all achieved on fewer acres and at fewer sites than recent dispersed implementation under the EQIP, WHIP and CRP programs.

User-friendly versions of our HABPOPS decision-support tool were developed for continued conservation planning and effects analysis. Focal areas have been identified for enhanced program delivery.

Acknowledgements

This project would not have been possible without financial support from the Natural Resources Conservation Service (NRCS) and the Intermountain West Joint Venture (IWJV). Collaborators providing data, guidance and review included Bob Altman, Mike Carter, Skip Hyberg, the Farm Services Asministration (FSA), Joe Fleskes, Wendell Gilgert, Randy Gray, Tim Griffiths, Aaron Holmes, Pete Husby, the Klamath Bird Observatory, Mark Petrie, Point Blue Conservation Science, Charlie Rewa, Rocky Mountain Bird Observatory, Christopher Rustay, Dave Smith, Jaime Stephens, Dave Wiedenfeld, and Josh Vest.

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Introduction

Background. American Bird Conservancy (ABC) has undertaken a series of contracts with the Natural Resources Conservation Service (NRCS) Resource Assessment Division to conduct an assessment of the effects of conservation program and practice delivery on the populations of bird species of conservation priority in the intermountain west. Working with the Intermountain West Joint Venture (IWJV), Daniel Casey of American Bird Conservancy (ABC) built a Habitat and Populations Strategies (HABPOPS) database to inform conservation in the region. That database allowed the calculation of habitat-based population estimates and objectives for the three Bird Conservation Regions (BCRs) comprising the majority of the IWJV: the Great Basin (BCR 9), the Northern Rockies (BCR10), and the Southern Rockies (BCR16).

The HABPOPS database also allows for the testing of scenarios that result in changes in vegetative association or condition, and provides estimates of the predicted population response (change in carrying capacity) for five species primarily dependent on grassland and sagebrush-dominated habitats. Those species, the Long-billed Curlew (*Numenius americanus*), Grasshopper Sparrow (*Ammodramus savannarum*), Brewer's Sparrow (*Spizella breweri),* Sage Sparrow (*Artemisiospiza nevadensis*; recently reclassified as the Sagebrush Sparrow, but referred to throughout this document by its prior AOU name), and the Sage Thrasher (*Oreoscoptes montanus*). All are considered species of conservation priority not only by the IWJV, but by most or all Federal and State agencies across their range, the major bird conservation initiatives, and ABC.

We initially undertook an analysis of the response of these species to practice delivery under the Environmental Quality Incentives Program (EQIP) in the BCR 9 and BCR10 portions of Oregon and Washington. But the scope of the project eventually grew to include all of BCR 9 and 10 within the IWJV, and the northern portion of BCR 16, and to incorporate practices delivered through the Wildlife Habitat Incentives Program (WHIP) and the Conservation Reserve Program (CRP).. This final report summarizes the outputs from our most recent agreement (CEAP-CESU Agreement #68-7482-11-502), completed during April 2013. Our work elements for this contract period were:

1) Verifying and validating our HABPOPS database outputs and assessment of practice delivery in BCRs 9, 10 and 16 through meetings with selected NRCS partners , providing HABPOPS/CEAP outputs to partner networks for peer review and comment as we refining our analysis of the net effects of EQIP, WHIP and WRP delivery;

2. Filling data gaps in our analysis (e.g. current CRP contracts), refining the outputs for sage and grassland species described in our final report for contract #68-7842-9-519, particularly the **net effects** of each of the practices analyzed as a portion of regional population objectives. We explored similar calculations for Sharp-tailed Grouse, (but were not satisfied that our approach would work well for this species, without a lek-based element);

3. Provided synthesis between our analysis and that of other investigators looking at Greater Sage-Grouse core area by using the HABPOPS database to assess the effects of conservation actions delivered under the Sage Grouse Initiative (SGI);

4. Worked with the IWJV waterfowl team to expand our WRP analysis for the SONEC region to other focal areas in the IWJV, to quantify the conservation benefits of WRP program delivery (resulting in a CEAP Conservation Insight soon to be released); and

5. Developed both a desktop application and a user-friendly web-based application for our HABPOPS database that captures our CEAP elements within the HABPOPS interface, and which can provide linkages to other biodiversity metrics.

This report summarizes the methods we used to analyze the effects of program and practice delivery for EQIP, WHIP and CRP, including the structure and function of the HABPOPS database. We present the results of our analysis of the potential rangewide impacts of conservation delivery (2005-2011) across three programs, 3 BCRs and 9 states. Our analysis includes the potential net effects of the combined delivery of 13 primary conservation practices on each of the five species in the HABOPS database, and the comparison of all outputs to the population objectives for those five species, which are a primary element of the Landbird Chapter of the 2013 IWJV Implementation Plan. We also assessed the combined effects of conifer removal, grazing management, weed control and revegetation efforts implemented under SGI, on our five focal species. We make recommendations regarding the value of more targeted application of NRCS and FSA conservation practices to meet the needs of these priority birds.

Methods

Analysis Area. The analyses we conducted under our original CEAP contract focused on those portions of Oregon and Washington within the IWJV and within BCRs 9 and 10. With subsequent support from the IWJV and through the CEAP program, we expanded our analysis to all of BCRs 9 and 10. During 2011, we received the updated CLU and shapefile data for all states with portions of those two BCRs, including Colorado, Idaho, Utah and Wyoming. This allowed us to include the BCR16 portions of those states in our analysis, as well. Our final analysis areas therefore included All of BCRs 9 and 10, and the northern half of BCR 16, within the IWJV (Figure 1).

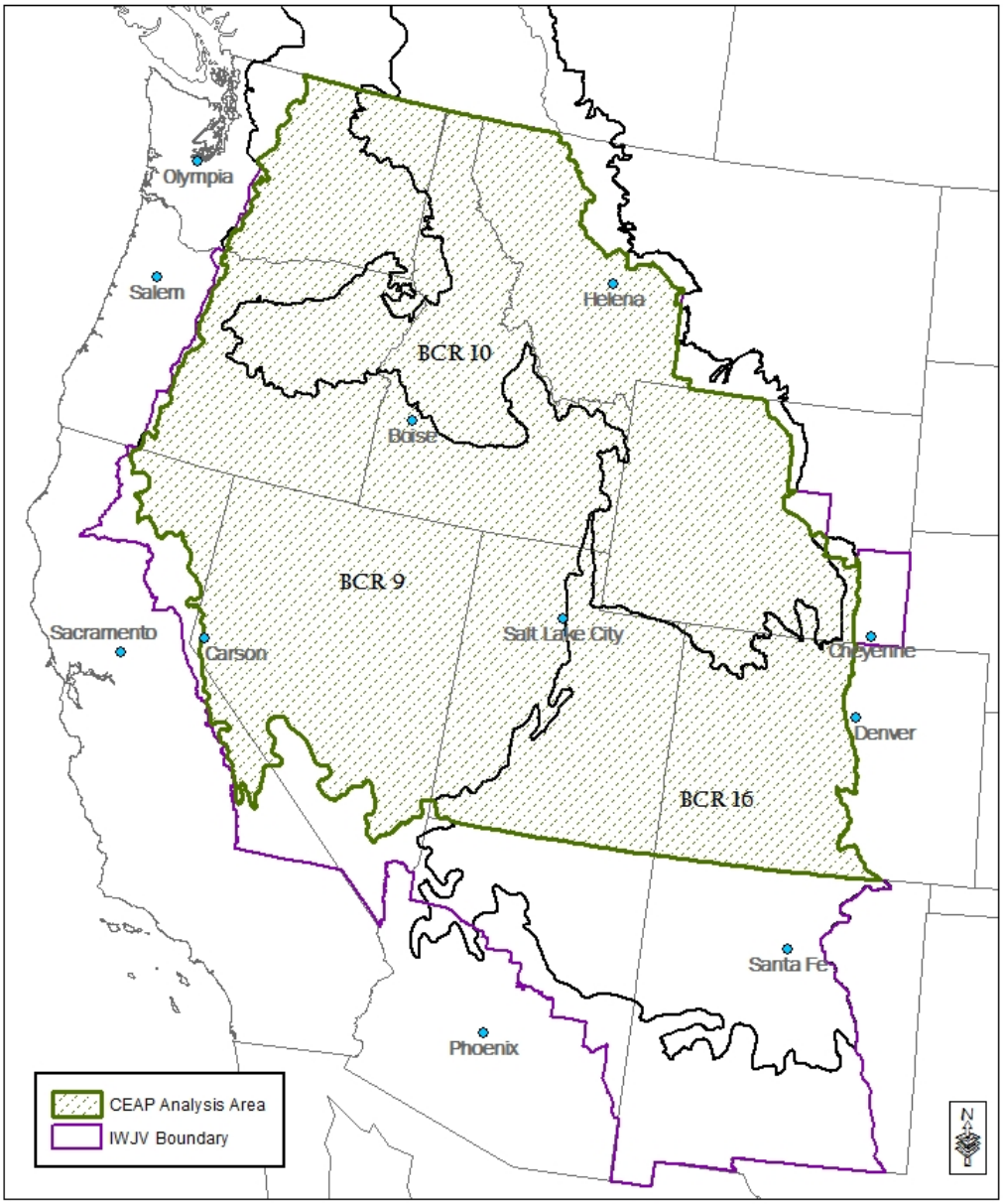

Figure 1. Analysis area for CEAP - CESU Agreement #68-7482-11-502, American Bird Conservancy, for portions of Bird Conservation Regions 9, 10 and 16 within the Intermountain West Joint Venture.

Our Approach. Our primary analysis involved processing practice (CLU) data and land unit shapefiles by program and practice, then overlaying shapefiles on our species models to generate estimates of the acreages affected. We then estimated the potential population effect of practice delivery, relative to regional population estimates/objectives, using the IWJV Habitats and Populations Strategies (HABPOPS) database.

HABPOPS Database. The IWJV HABPOPS database is a Microsoft Access database based on the successful Heirarchical All-Bird Strategy (HABS) database of the Playa Lakes JV. It combines estimates of current habitat extent and condition with the best available data describing focal species occupancy rates and density to derive population estimates at the BCR/State polygon scale. It can be used as a strategic tool for the development of habitat projects and programs, by predicting the change in breeding populations that will result from changes in the extent and condition of one or more habitats in a specified geographic area. It also allows us to develop "bottom-up" habitat objectives by providing a tool to examine the overall potential to change carrying capacity on the landscape and testing various scenarios to see how (or if) we can meet trend-based goals.

Updated population estimates and objectives from our HABPOPS database were an integral part of the Landbird Chapter of the 2013 IWJV Implementation Plan (final to be released in September 2013). They were developed through extensive compilation of density values from the scientific literature (e.g. Holmes and Barton 2003, Schuler et al. 1993), contracted surveys done by the Klamath Bird Observatory in sage-steppe habitats (in Oregon and Washington), monitoring data from the Rocky Mountain Bird Observatory, known or assumed occupancy rates and habitat associations. We utilized regional GAP (ReGAP) layers as our base layers for planning and analysis. With the completion of the SW ReGAP dataset (AZ,CO,NM,NV,UT) in 2004 (Prior-Magee et al. 2007), and the NW (ID,MT,OR,WA,WY) ReGAP in 2009 (http://gap.uidaho.edu/index.php/gap-home/Northwest-GAP), we had "wall-to wall" updated imagery to inform our efforts. Except where it was overlain by the more recent NW ReGAP imagery,we used the 2002 California Wildlife Habitat Relationships dataset for the California portion (http://www.dfg.ca.gov/whdab/cwhr/whrintro.html) of the joint venture .

The basic building blocks of the HABPOPS database are:

- **Acreage.** The acreage each habitat (vegetative association) within each BCR-State polygon, calculated from compiled vegetation layers.
- **Condition Classes.** The percentage of each habitat in defined condition classes (e.g. poor,/fair/good as defined variably by canopy coverage, structure or vegetative composition; young/mature/old growth). Our assumptions of the percentages of any given vegetative association in each condition class came from the summaries in PIF and previous IWJV state plans, or from the literature. Little is available in the way of regional spatial datasets that specify habitat condition at the association level. For the interior Columbia Basin, we extrapolated from "Range Integrity Ratings" in the support documents for the muti-agency planning documents for the region (Quigley et al. 1996).
- **Predicted Occurrence.** The amount of potential habitat for each focal species in each BCR-State polygon, based on predictive models combining deductive habitat associations with the mapped known range of the species. We used shapefiles of the mapped ranges (from Nature Serve) of each focal species to clip raster files of the habitats assigned as suitable for each species. Species habitat relationships were provided by PIF state plans, review by the Landbird Science Team, and ReGAP vertebrate modeling.
- **Occupancy, Density.** Occupancy rates and breeding density values for each condition class of each predicted habitat type for each focal species, locally-derived when available, or the best

available information, were used for population estimation. Where voluminous density values that included 0 values were available, we used a default value of 1.0 for occupancy. For most others, where density values were limited and until better occupancy rates are available, we used a default of 0.8 (i.e. 80% occupancy for selected types). All assumptions used in assigning occupancy and density values in the database were tracked and summarized in project files.

- **Carrying Capacity.** Carrying capacity (population estimate) for any given region or habitat was calculated by multiplying the area of habitat assumed to be suitable for the species times the occupancy rate, times the appropriate density value. Mapping the maximum values for each species also provided a means of displaying species distribution and key habitats (e.g. Figure 2).

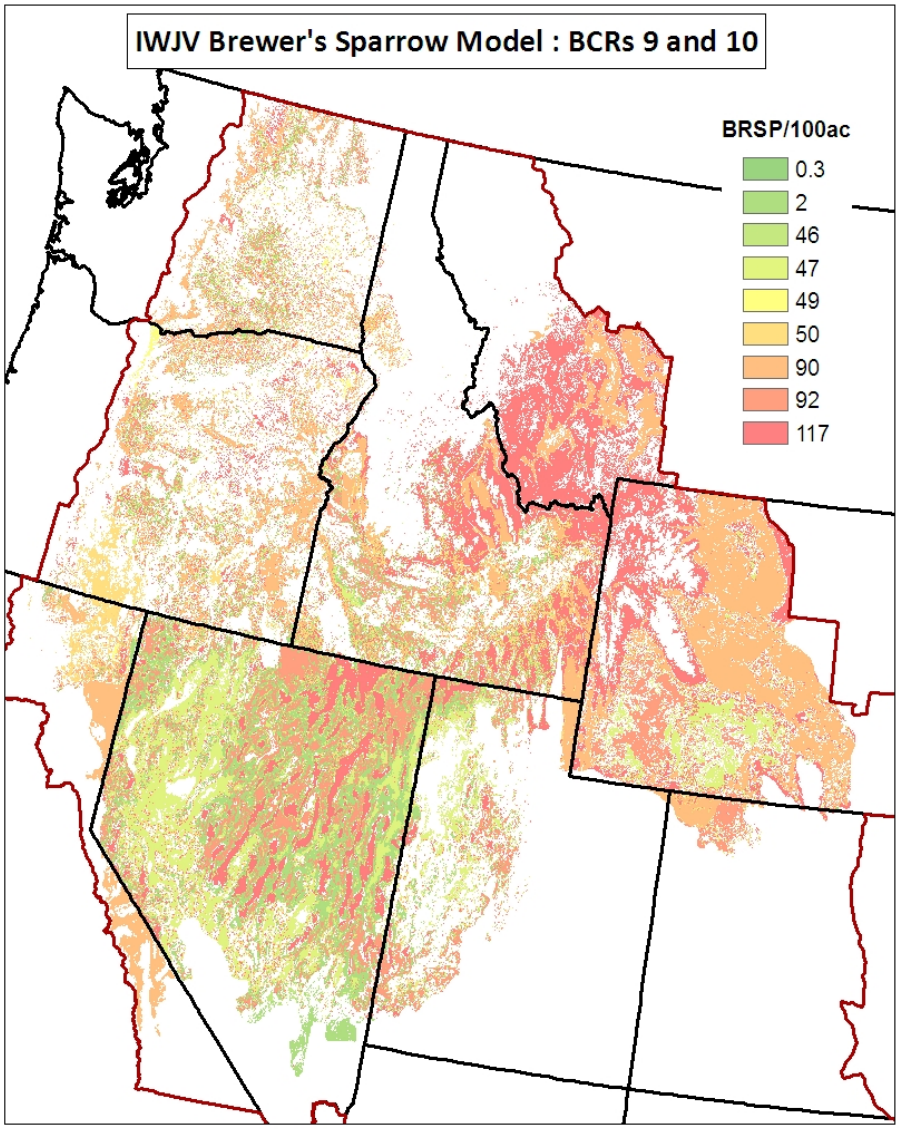

Figure 2 . Brewer's Sparrow habitat model, BCRs 9 and 10 in the IWJV. Colors correspond to the potential carrying capacity of the mapped vegetative associations in our HABPOPS model, under the best habitat conditions (highest densities) for the species.

In order to maintain the level of specificity characteristic of the spatial habitat data available, we maintained classifications at the Vegetative Association level in our GIS analysis and in the construction of the HABPOPS database. This facilitated linking specific density values for focal species to each of the habitat associations included in the individual species models. Each combination of association, state and BCR was given a unique code in the HABPOPS database, and each was assigned (crosswalked) to one of our 20 generalized cover types (Figure 3) .

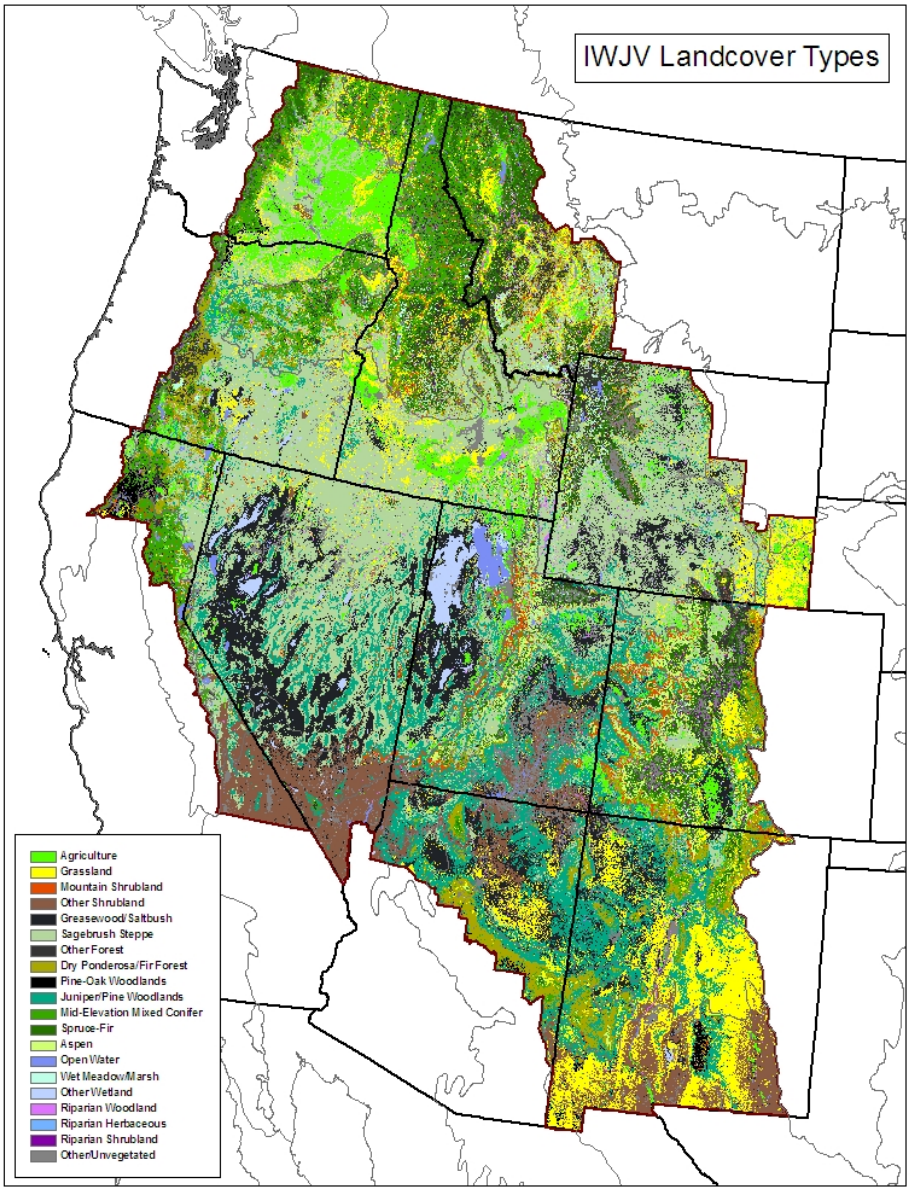

Figure 3. Generalized habitat scheme used for conservation planning in the Intermountain West Joint Venture. Habitat categories were developed from reclassified vegetation associations mapped in regional landcover datasets (SWReGAP, NWReGAP, California WHR).

The five focal species from the IWJV Plan Landbird Chapter dependent on primarily on grassland, agricultural and sagebrush steppe habitats were the primary focus of both the IWJV Implementation Plan Landbird Chapter and our CEAP analysis. These are the Grasshopper Sparrow, Long-billed Curlew, Brewer's Sparrow, Sage Sparrow, and Sage Thrasher. A tabular summary of their habitat associations, densities and occupancy rates as included in the HABPOPS database is available upon request; they are the data behind the population estimates driving our analyses.

Population estimates and 30-yr objectives (by State-BCR polygon) from the IWJV (Appendix A) are the benchmarks against which the estimated population effects of practice delivery were measured. For several of these species, objectives total in the millions of birds, meaning that extensive and directed habitat management will be needed to meet them. Our HABPOPS tool (latest desktop version delivered with this report), and the outcome of analyses such as these may serve to give all conservation partners a better sense of what is realistically achievable within conservation programs. We continue to refine and update population estimates/objectives for these five species, and have developed a web-based version with PRBO Conservation Science (now Point Blue Conservation Science) during spring 2013 (http://data.prbo.org/partners/iwjv/iwjvmap.php). The refinement of this original version, and its use for assessing conservation efforts delivered through NRCS programs, is discussed later in this document.

Potential Population Impacts by Program

As summarized in previous project reports, the original EQIP/WHIP database supplied by NRCS for BCR 9 and 10 in OR and WA alone had 37,083 records. The practices (CLU) data and shapefiles we received from the NRCS during 2011 included all practices delivered under CRP, EQIP, WHIP, WRP and other programs from 2005 through 2011, and totaled 616,124 instances and 147,343 land units for the western states comprising BCRs 9,10 and 16 in the IWJV (Figure 4). We sorted these data spatially by BCR/State polygon, because this is the geographic unit used for biological planning for focal species in the IWJV.

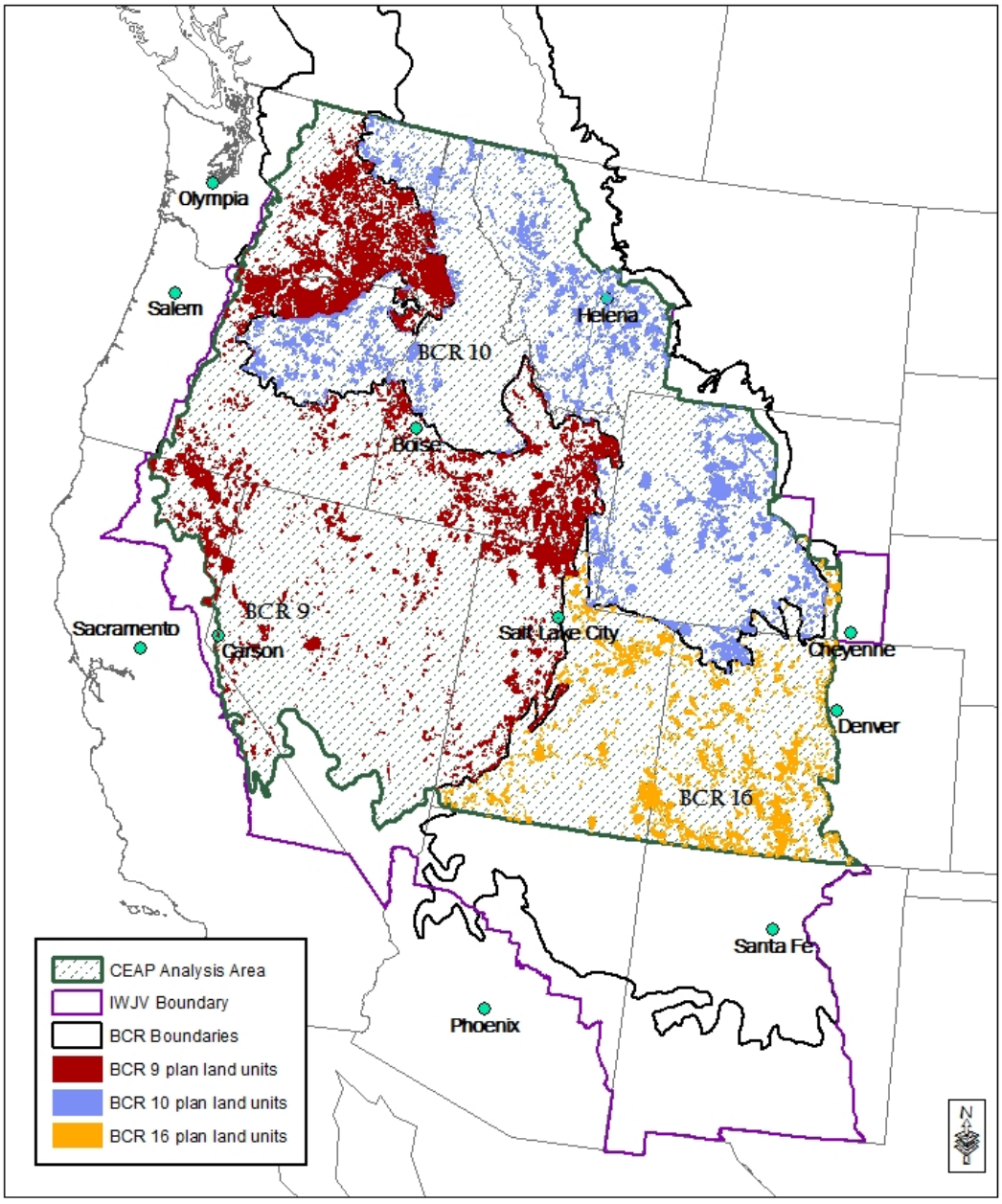

Figure 4. Distribution of all land units where EQIP, WHIP and CRP practices were delivered, 2005-2011, for the IWJV portions of BCRs 9, 10 and the northern portion of BCR16 (N=147,343).

While it might be argued that most conservation practices delivered under the EQIP, WHIP and CRP programs are likely to have at least secondary benefits to bird species and their habitats, we originally selected a subset of 23 practices that were judged most likely to directly affect our focal bird species (Table 1). These were similar, but not entirely coincident with, those identified by Berkland and Rewa (2005) in their summary of the contributions of the EQIP program to wildlife conservation.

Table 1. Conservation practices originally considered for the analysis of the potential population impact of EQIP, WHIP and CRP delivery in BCRs 9, 10 and the northern portion of BCR16.

Practice Code	Practice Name
314	Brush Management
322	Channel Bank Vegetation
327	Conservation Cover
328	Conservation Crop Rotation
338	Prescribed Burning
340	Cover Crop
342	Critical Area Planting
380	Windbreak/Shelterbelt Establishment
384	Forest Slash Treatment
390	Riparian Herbaceous Cover
391	Riparian Forest Buffer
512	Pasture and Hay Planting
528	Prescribed Grazing
550	Range Planting
580	Streambank and Shoreline Protection
612	Tree/Shrub Establishment
643	Restoration Rare/Decl. Habitat
644	Wetland Wildlife Habitat Mgmt.
645	Upland Wildlife Habitat
647	Early Successional Habitat Develop/Mgmt
657	Wetland Restoration
659	Wetland Enhancement
666	Forest Stand Improvement

Based on small sample sizes and/or indirect ties to breeding densities of our final list of grassland and sagebrush-dependent focal species, several of the original 23 practices we selected were later dropped from the analysis. These included, for example, Windbreak/Shelterbelt Establishment (380), Riparian Herbaceous Cover (390), Wetland Restoration (657), Wetland Creation (658) and Wetland Enhancement (659). Others were more related to the forest and riparian species we had originally envisioned including in the HABPOPS tool but which were precluded for now by workload and IWJV priorities (e.g. Willow Flycatcher, Flammulated Owl). Those practices included Riparian Forest Buffer (391) and Forest Slash Treatment (384), for example. The remaining 13 practices (Table 2) were used to frame our analysis of the potential impact of practice delivery.

Table 2. Conservation practices and sample sizes (practice delivery incidences) considered in our final analysis of the potential population impact of EQIP, WHIP and CRP delivery in BCRs 9, 10 and the northern portion of BCR16.

Practice Code	Practice Name	EQIP	WHIP	CRP	Totals
314	Brush Management	686	105	6	797
327	Conservation Cover	166	27	11,675	11,868
328	Conservation Crop Rotation	1,584	0	24	1,608
338	Prescribed Burning	42	0	10	52
340	Cover Crop	683	4	21	708
342	Critical Area Planting	76	9	122	207
512	Pasture and Hay Planting	853	9	7	869
528	Prescribed Grazing	3,675	106	1,030	4,811
550	Range Planting	350	64	64	478
612	Tree/Shrub Planting	294	26	377	697
643	Restoration Rare/Decl. Habitat	58	21	23	102
644	Wetland Wildlife Habitat Mgmt.	129	23	268	420
645	Upland Wildlife Habitat	752	298	10,851	11,901
	Totals	**9,348**	**692**	**24,478**	**34,518**

In order to overlay the appropriate land units onto our species models, we needed to sort out those instances where more than one practice code was included for any given land unit. In these cases, we assigned the land unit to the practice with the maximum delivered acreage, the most recent delivery date, or the practice most logically related to our focal species, in that order. In each such case, we kept the associated practices associated with each record in our databases. For example, the following set of (partial) records:

land_unit	practice_code	practice_name	applied_yr	applied_amt
Ae41b2…	314	Brush Management	2008	80
Ae41b2…	528	Prescribed Grazing	2009	240
Ae41b2…	645	Upland Wildlife Habitat	2009	80
004bc8…	327	Conservation Cover	2006	240
004bc8…	327	Conservation Cover	2008	240
2me57…	612	Tree Planting	2009	8.5
2me57…	612	Tree Planting	2009	12.5
2me57…	612	Tree Planting	2009	5

Was reduced to:

land_unit	practice_code	practice_name	applied_yr	applied_amt	with	And	sum
Ae41b2…	528	Prescribed Grazing	2009	240	314	645	
004bc8…	327	Conservation Cover	2008	240			
2me57…	612	Tree Planting	2009	12.5			21.5

In the first case, we assumed that 240 was the maximum treated acreage, and that the other two practices were delivered within the context of the prescribed grazing. In the second case, we merely selected the more recent treatment, again assuming the same acreage was involved. In the third case, we summed acreages for the same treatments delivered in the same years, if the applied amounts differed, and stored this as a separate variable, but use the maximum value as the "applied amount". All of these approaches (assumptions) may underestimate the potential of practice delivery on those land units where practices

were not applied on the same acreage, but we felt were the most conservative way to deal with overlapping practice delivery. There were literally thousands of such records.

Arguably, many of the individual practices that have been implemented were delivered on such a small scale that they had little chance to influence even individual pairs of birds, let alone populations. For example, 13,518 (17%) of the 78,925 individual instances of practice delivery we originally considered covered less than 5 ac, and only 17,771(23%) covered more than 100 ac. In our species models, even dramatic improvements in habitat quality on 100 ac are predicted to add just 1 - 75 individuals to the populations of the IWJV focal species. We excluded all land units < 2.5 ac from our analyses.

EQIP Practice Data

Prescribed Grazing (528) was the predominant practice applied through the EQIP program in our analysis area, comprising nearly 40% of the 9,348 instances we analyzed (Figure 5), and more than 10% of our entire EQIP/WHIP/CRP subsample (Table 2). Conservation Crop Rotation (328) was the second-most frequently implemented EQIP practice (1,584 instances).

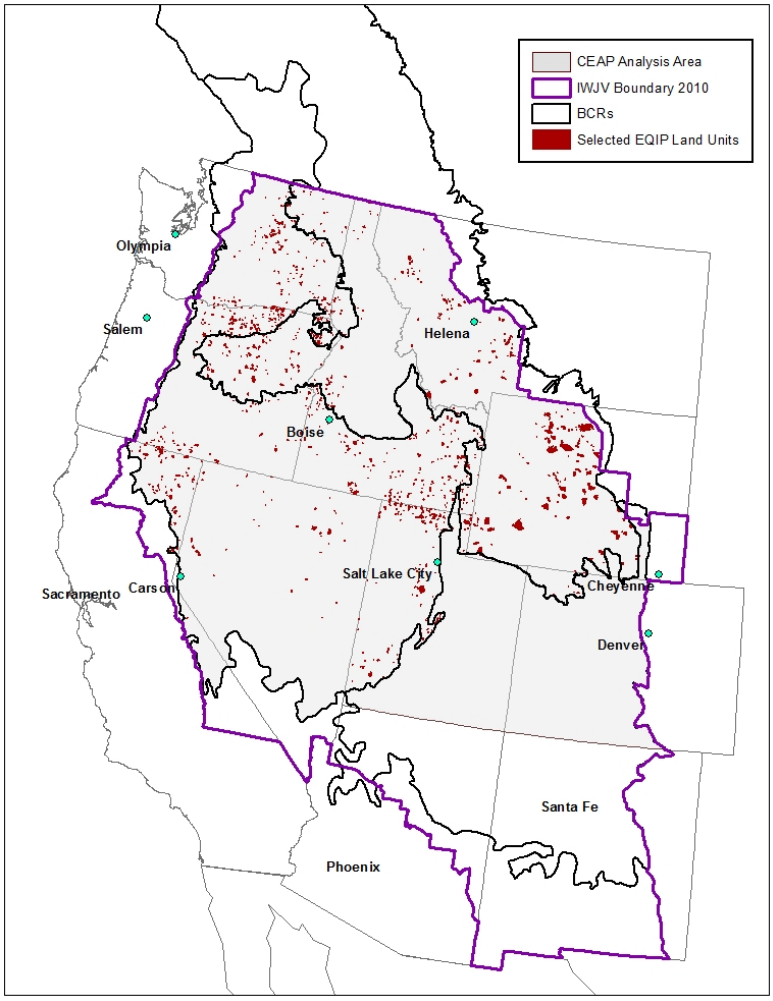

Figure 5. Distribution of land units where selected conservation practices were delivered through the EQIP program, 2005-2011, for the IWJV portions of BCRs 9, 10 and the northern portion of BCR16 (N=9,348)

WHIP Practice Data

Prescribed Grazing (528) and Brush Management (314) were the two most frequently applied practices in our WHIP subsample (Table 2). With only 692 total unique practice instances, WHIP was the least widely applied of the three programs we analyzed (Figure 6).

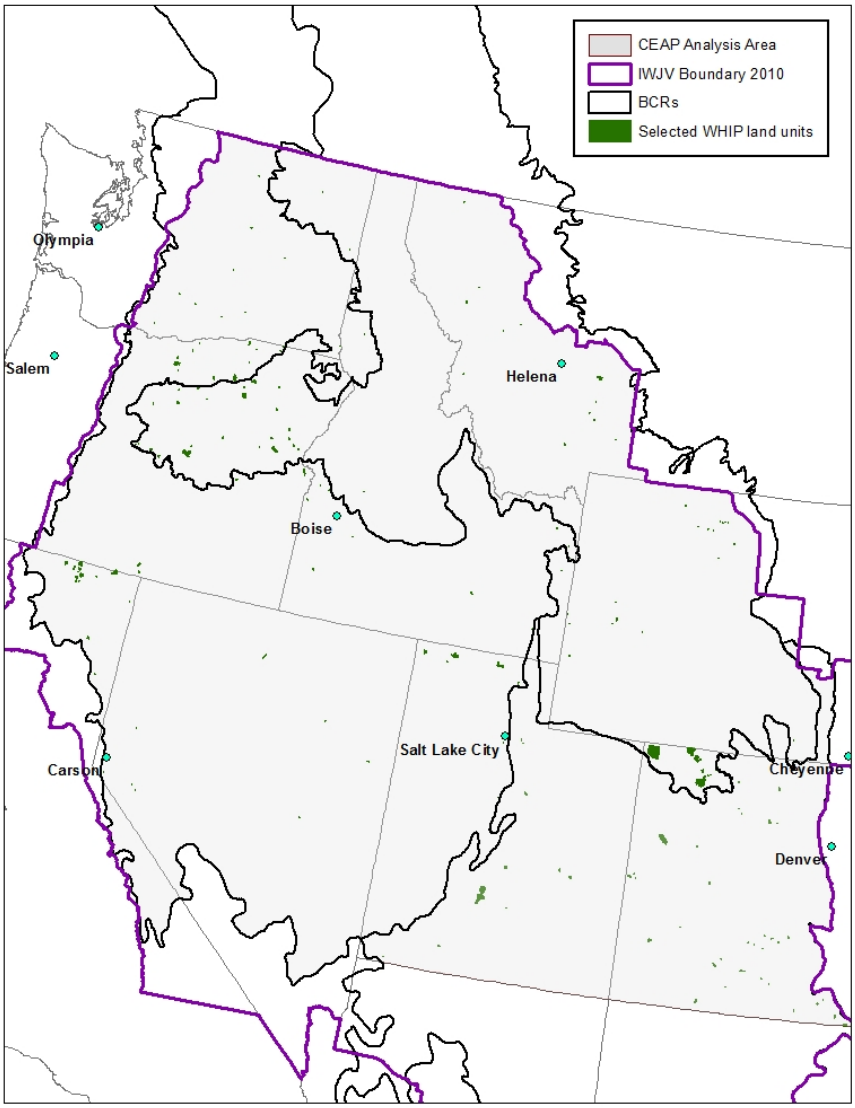

Figure 6. Distribution of land units where selected conservation practices were delivered through the WHIP program, 2005-2011, for the IWJV portions of BCRs 9, 10 and a portion of BCR16 (N=692)

CRP Practice Data

Although the vast majority of CRP practice instances were Conservation Cover (327), twelve of the other practices we analyzed were implemented through CRP within BCRs 9 and 10 between 2005 and 2011. After sorting for duplicate and "stacked" practices, we were left with 13,083 land units (Table 2) with at least one practice implemented through this program, most in BCR 9 in Oregon, Washington and Idaho (Figure 7).

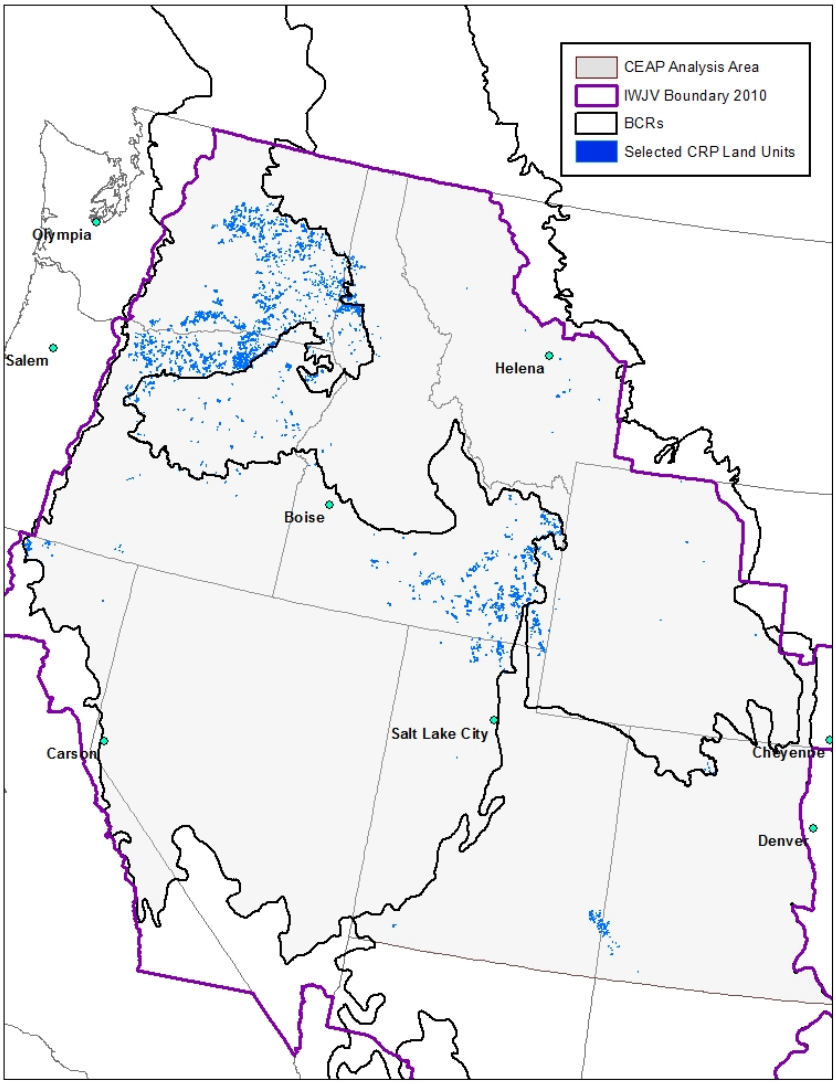

Figure 7. Distribution of land units where selected conservation practices were delivered through the CRP program, 2005-2011, for the IWJV portions of BCRs 9, 10 and the northern portion of BCR16 (N=24,478)

Net Effects by Program

We used the HABPOPS Database to assess the potential net effects of the delivery of selected conservation practices under each of three programs (CRP, EQIP, and WHIP). In each instance, we compared the estimated population under alternative (e.g. "poor" and "good") conditions (see below), and identified the maximum potential effect (positive or negative) that could occur as a result of practice delivery. The estimates were derived by clipping our species model raster files with the land unit polygons associated with each respective practice set (within each program).

Condition classes assigned in the HABPOPS database were general, and designed to capture those variables affecting density of our focal species. For some associations, conditions were defined by a

single characteristic, e.g. Dryland/Irrigated for Agricultural types; Wet/Dry for seasonal wetland types; Grazed/Ungrazed for certain grassland types. For shrubland and most grassland types, we defined condition classes as "Poor", "Fair" and "Good". When working at such large geographic scales, and with such varied vegetative associations, we defined these condition classes broadly by necessity, relative to such characteristics as shrub canopy cover, diversity of understory vegetation, or forest age and structural classes, rather than defining them individually by species' needs. For example, in Juniper Woodland and Savanna types, conditions were defined by succession and woody cover: Grass, Shrub, and Woodland (>30% tree cover). For sagebrush associations:

- **Poor Condition:** (<10% sage, very low diversity/few native plants, high invasives)
- **Fair Condition:** (10-20% sage, moderate native plant cover, some invasives)
- **Good Condition** (>20% sage, diverse native understory, little or no invasives)

For grassland types:

- **Poor Condition:** Little residual cover, much bare ground, invasives prevalent
- **Fair Condition:** Moderate grass cover, patchy, native grass/forb mix, few invasives
- **Good Condition:** Moderate to heavy residual grass/litter; natives prevalent

Descriptions of each association in our models and the condition classes used to drive the outputs are available on the web-based version of the HABPOPS tool under a link tied to each vegetative association (http://data.prbo.org/partners/iwjv/iwjvmap.php). For each practice we analyzed, we made assumptions about changes in condition based on the nature of the conservation action and the associations on which it was applied. Generally, we were comparing the highest condition-based population estimate for a given association, and the lowest condition-based population estimate for the same association. We did this for each of the five species and for each association in each subsample (e.g. practice 314 delivered through EQIP).

Once we had reduced the data sets to one record per land unit, we then joined the data to the spatial data set in ArcView to assemble grouped polygons for each primary practice. These were used to extract the raster data from our individual species models, and then each affected habitat was assigned an appropriate change in occupancy/density to run through our HABPOPS database. Though each practice instance included an assigned land use type in the CLU data, we conducted our analyses primarily independent of that assignation, instead basing our assessment on the vegetative associations in our dataset for the polygons in question. In order to identify the most potential impact that practice delivery may have had on populations, we also assume that any benefit accrued since initial delivery has been maintained through subsequent management. For example, we are judging the effect of 50 acres of Prescribed Grazing delivered in 2006 to be the same as that delivered in 2011.

Our outputs are descriptions of (changes in) the estimated potential change in carrying capacity of the landscape, not population dynamics through time. Similarly, given the vast number of instances, doubtlessly characterized by differing effectiveness, our assessments are based on the best (or worst) case scenario. If we judged a practice to be potentially beneficial, we generally adjust density values from our lowest value to the highest for that habitat, or visa-versa. Depending on the habitat type and treatment, the worst case scenario would be a pre- or post-treatment density value of zero. Whether a particular practice has a potential positive or negative influence (Table 3) on a given species' occupancy and/or density values could differ substantially from cover type to cover type.

Table 3. Conservation practices considered in our final analysis and the directional effects on focal species populations in grassland and sagebrush-steppe habitats. Four-letter codes: GRSP = Grasshopper Sparrow; LBCU = Long-billed Curlew; BRSP = Brewer's Sparrow; SAGS = Sage Sparrow; SATH = Sage Thrasher.

Practice Code	Practice Name	GRSP	LBCU	BRSP	SAGS	SATH
314	Brush Management	+	+	-	-	-
327	Conservation Cover	+	+	+/-	+/-	
328	Conservation Crop Rotation	-	-			
338	Prescribed Burning	+/-	+/-	+/-	+/-	+/-
340	Cover Crop	+	+			
342	Critical Area Planting	+	+	+	+	+
512	Pasture and Hay Planting	+	+	-	-	-
528	Prescribed Grazing	+/-	+/-	+/-	+/-	+/-
550	Range Planting	+/-	+/-	+/-	+/-	
612	Tree/Shrub Planting	-	-	-	-	-
643	Restoration Rare/Decl. Habitat	+	+	+	+	+
645	Upland Wildlife Habitat	+	+	+	+	+

For each of the practices treated in our net effects analysis, we made certain assumptions based on the modeled habitats in each data set. These are summarized below:

Brush Management (314): For our three sagebrush obligates, we assumed that where this practice was utilized the relative amount of shrub cover reduction decreased densities from those associated with our "Good" condition (30% shrub cover) to "Poor" condition (<10% shrub cover). Of course, in many instances shrubs may have been removed altogether, making a site unsuitable for our focal species. For our grassland species we assumed a positive effect of woody cover removal, but only for those steppe habitat types for which our models had assigned densities for these species (e.g. Columbia Basin Palouse Prairie). Our analysis does not therefore account for instances where brush removal may have created suitable habitat from denser shrubland or woodland habitat.

Conservation Cover (327). Widely applied, particularly as a main activity within the CRP program, and generally as grasses and forbs only. We assumed maximum positive response by our grassland species (both Long-billed Curlew and Grasshopper Sparrow). We also assumed positive response by our shrub-nesting species, though our assumption was that in order to achieve that response, sagebrush establishment would need to have been part of the contracted activity. And in this case, our assumption was that previously unsuitable habitats reached densities consistent with "poor" quality shrubland (e.g. <10% shrub cover).

Conservation Crop Rotation (328). Although certain crops (particularly graminoids) in rotational systems may serve as suitable nesting habitat for our grassland focal species, we assumed that many others (e.g. corn, soybeans, canola) would not be. We assumed that the net effect of implementing this practice would therefore be to reduce carrying capacity.

Prescribed Burning (338). This practice could result in positive effects for any of our focal species, depending on the intensity of the fire and resultant changes in residual cover, invasives, and woody cover.

Our analysis, again with each species being considered separately, represented the highest potential positive response in each case, assuming that fire resulted in improved conditions for the species at hand. In reality, carrying capacity was almost certainly reduced in some cases (e.g. too much woody vegetation removed for shrub-nesting species, or adverse increases in invasives).

Cover Crop (340). Generally grasses or legumes, and assumed to be beneficial to our grassland focal species.

Critical Area Planting (342). Our analysis assumed in each case that maximum population response could be achieved by critical area plantings that matched the structure and function of the best condition for each grassland and shrub-steppe association and for each species.

Pasture and Hay Planting (512). We assumed that any shrubland converted to pasture or hay land through this practice was in "Fair" condition prior to treatment (moderate densities of our shrub-nesting focal species), and that densities increased for either of the two grassland species.

Prescribed Grazing (528). Clearly, grazing (like prescribed fire) that is managed to reduce invasives and provide sustainable annual production without compromising the shrub layer can be beneficial to our focal species when administered in grassland and shrub-steppe habitats. But because our model conditions for pinyon-juniper were more dependent on the canopy cover of shrubs and trees, we treated this practice as neutral in our net calculations for those types.

Range Planting (550). Our analysis assumed in each case that maximum population response could be achieved by critical area plantings that matched the structure and function of the best condition for each association and each species (as per practice 342).

Tree/Shrub Planting (612). Because this practice was not often done in conjunction with practice 645 (Upland Wildlife Habitat Management), and mostly to meet other objectives rather than improving shrubland, we assumed that most instances involved tree planting, which decreased suitability for all of our focal species.

Restoration of Rare/Declining Habitats (643). Our analysis assumed in each case that maximum population response could be achieved by critical area plantings that matched the structure and function of the best condition for each grassland and shrubland association for each species (as per practices 342 and 550)

Upland Wildlife Habitat Management (645). This practice code was often used in association with one or more of the other practice codes for on individual land units used in our analysis. But where it was used as a stand alone practice code, our assumption for each association is that the maximum density for each species was achieved for each association in the land unit polygon.

Sage Grouse Initiative

The landbird chapter of the 2013 IWJV Implementation Plan identified objectives to maintain and promote growth of native forbs and grasses in shrubsteppe habitats, to control juniper encroachment in sagebrush habitats, and to control large-scale wildfires that promote cheatgrass invasion and the loss of high-value older sagebrush stands. These objectives are consistent with the needs of Greater Sage-Grouse, and much of the recent (and planned) conservation actions years in sagebrush habitats across the west have been driven by the needs of that species. A majority of the polygons used to represent 100% of the density of Greater Sage-Grouse range-wide, and driving conservation planning for that species, occur in the IWJV. Most lie within our analysis area (Figure 8).

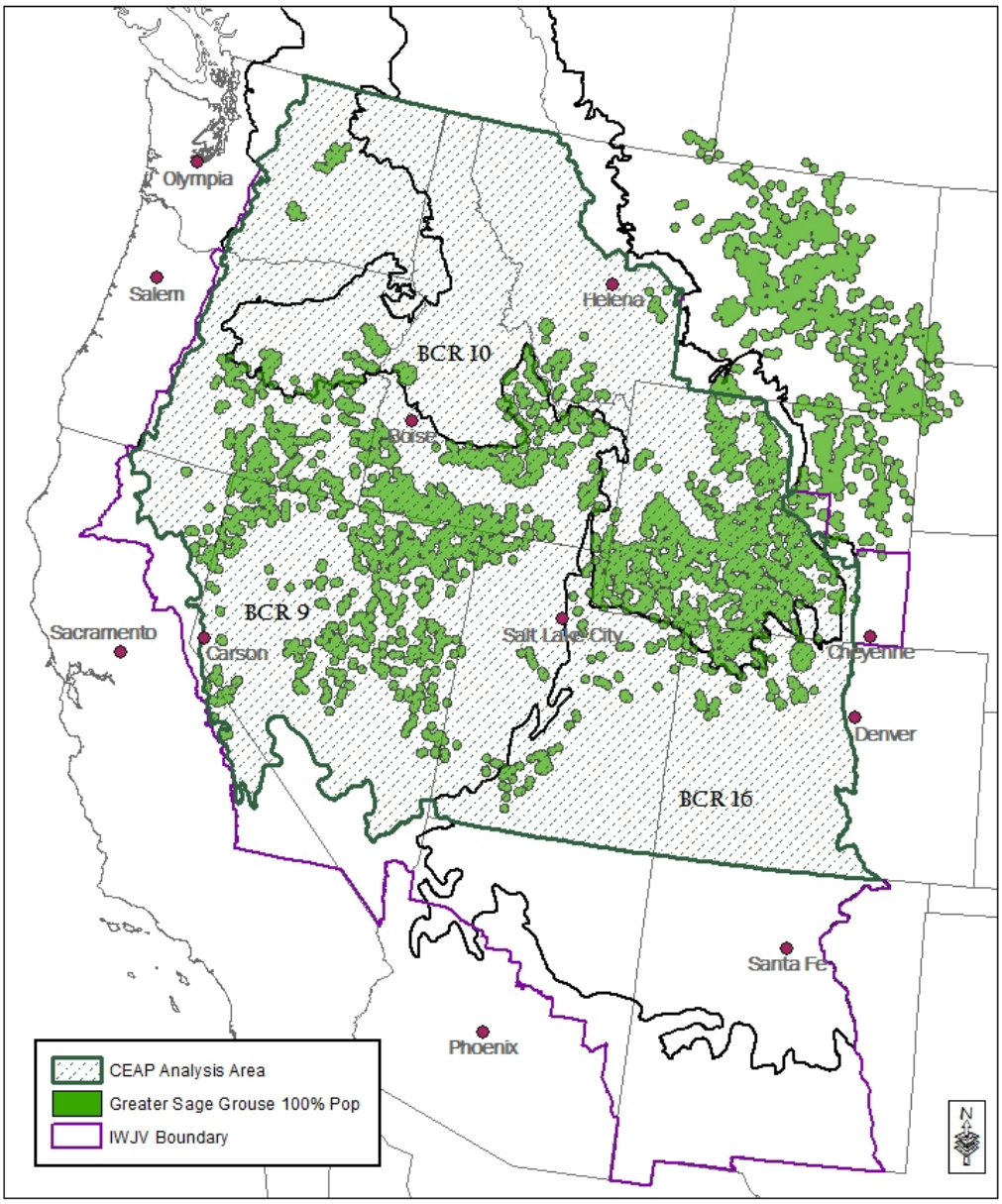

Figure 8. Greater Sage-Grouse 100% density polygons overlaid onto CEAP-CESU analysis area, Intermountain West Joint Venture.

Delivery of the Sage Grouse Initiative (SGI) (http://sagegrouseinitiative.com/) through the NRCS and its partners has played an important role in providing support for much-needed juniper removal, invasives control, grazing management and other approaches to improve and protect grouse habitat. But much of the range of other sagebrush obligate focal species lies outside of the range of the grouse. For example, just 38.8% of the predicted Brewer's Sparrow habitat in BCRs 9 and 10 lies within the 100% population polygons for Greater Sage-Grouse **(Figure 9)**. While the grouse layer does appear to include most of the highest quality habitat for Brewer's Sparrow in these two BCRs, our HABPOPS model predicts that these areas support just 36% of the BRSP population in BCR 9, and 54% of the BCR 10 population . One objective or our CEAP work was to quantify the potential effect that delivery of SGI (2010-2012) has had on populations of other sagebrush obligate landbirds (Brewer's and Sage Sparrows, Sage Thrasher).

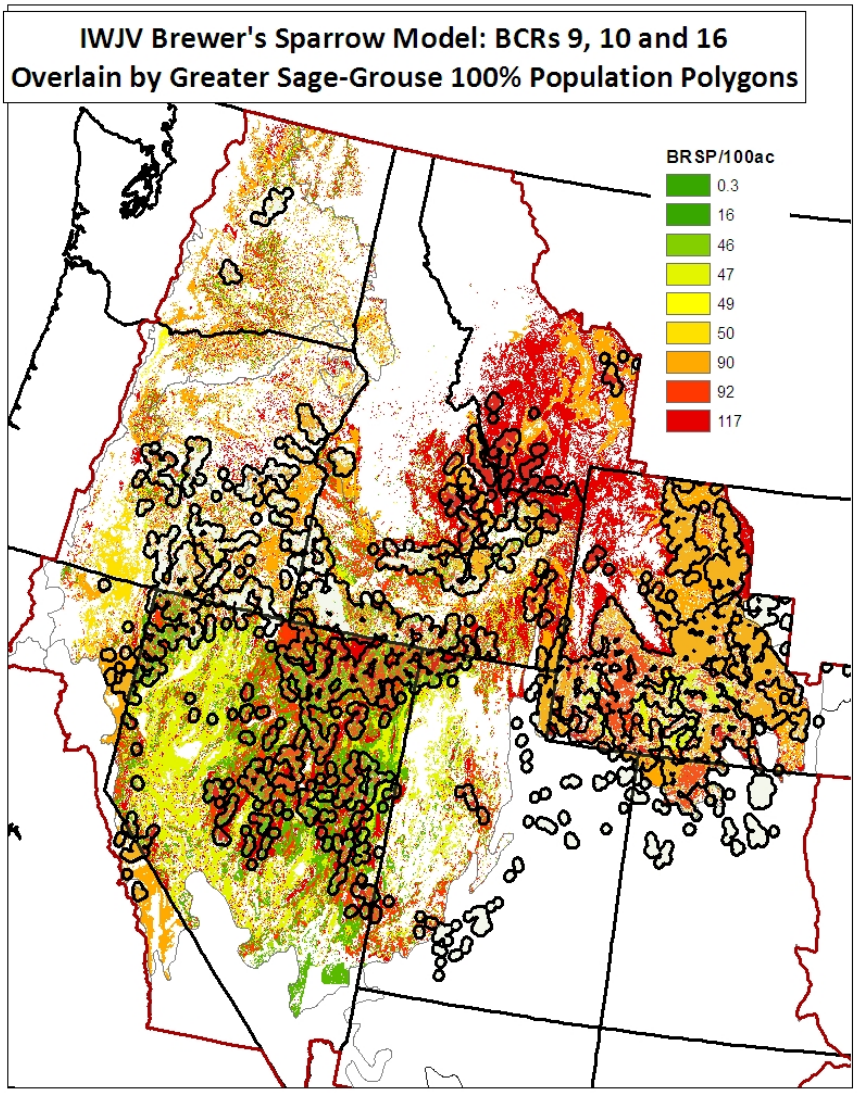

Figure 9. IWJV Brewer's Sparrow model for BCRs 9 and 10, overlain by the polygons which define 100 of the known Greater Sage-Grouse leks.

We based our analysis of SGI accomplishments on the totals acreages put into EQIP and WHIP contracts for the period 2010 – 2012, provided by Tim Griffiths (pers. comm.) (Table 4). Though we did not have point and shapefiles for each practice (land unit) on which conservation actions took place, we were able to develop totals by BCR and state. In order to assign activities to the habitat associations used in our HABPOPS model, we assumed that the proportions of targeted habitat types within each state/BCR polygon matched the ratios available within the overall Greater-Sage Grouse 100% density polygons (Figure 8), for those BCR polygons where the contracts were delivered (Figure 10). We used the same methods described for our net effects analysis to assess the maximum potential population effect of SGI delivery on our three sagebrush-obligate focal species.

Table 4. Number of agreements, contracts, projects and acreage implemented under the NRCS Sage Grouse Initiative, 2010-2012 (data summary provided by Tim Griffiths).

	EQIP		WHIP		FRPP		GRP		WRP		Grand Total	
State	No. of Contracts	Acres	No. of Contracts	Acres	No. of Contracts	Acres	No. of Contracts	Acres	No. of Contracts	Acres	Contracts/ Agreements	Acres
California	14	93,473	3	1,026							17	94,499
Colorado	5	8,452			6	12,563	1	1,200			12	22,215
Idaho	24	89,031					13	14,038			37	103,069
Montana	11	169,261	10	6,080			1	3,809			22	179,150
Nevada	15	328,964	6	4,347	1	4,064	1	741	2	6,136	25	344,252
Oregon	28	44,854	10	8,315							38	53,169
Utah	10	31,002									10	31,002
Washington	5	8,299	7	12,482							12	20,781
Wyoming	29	355,002	11	37,314	7	14,065	1	8,402			48	414,783
Total	**141**	**1,128,338**	**47**	**69,563**	**14**	**30,692**	**17**	**28,190**	**2**	**6,136**	**221**	**1,262,919**

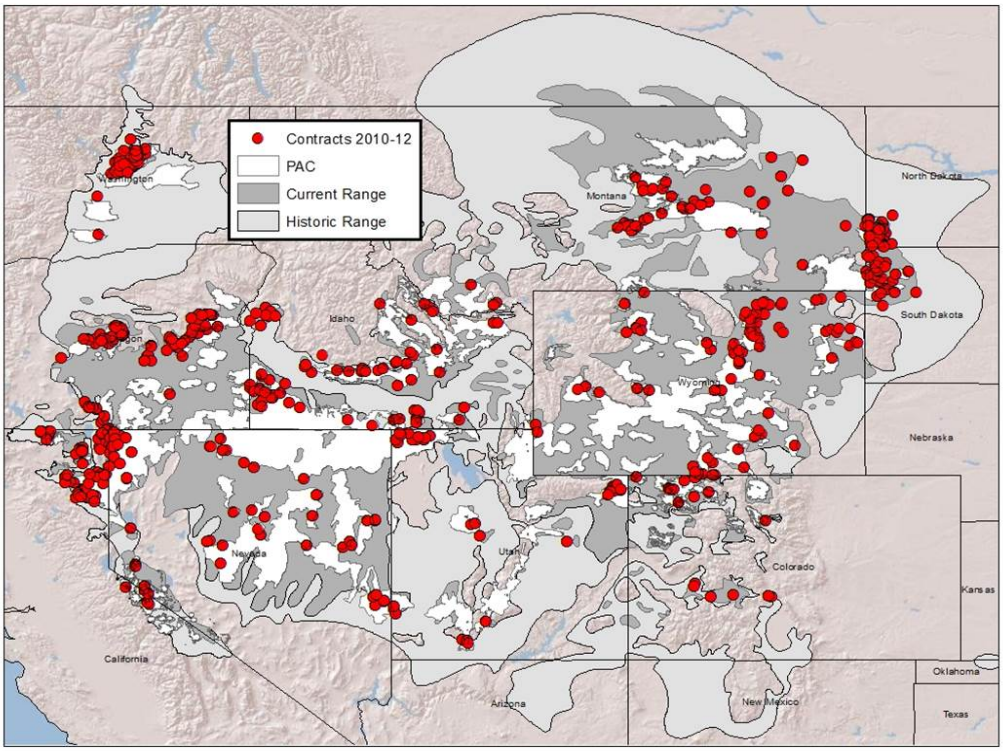

Figure 10. Distribution of EQIP and WHIP contracts implemented under the NRCS Sage Grouse Initiative, 2010-2012. (via Tim Griffiths).

Results and Discussion

Potential Population Impacts by Program (EQIP/WHIP/CRP)

We developed the first comprehensive population estimates for our five focal species on the selected land units, by conservation program, and by BCR/state polygon within BCRs 9, 10 and the northern portion of BCR 16 within the IWJV. For each of these five grassland and sage-steppe dependent species, these population estimates define the scope of potential influences of practice delivery within each program by defining our estimate of the current carrying capacity of the affected land units.

Long-billed Curlew. We predict that Long-billed Curlews occur on 400,177 acres of the land units where our selected practices were delivered through the EQIP program, and those lands support an estimated 0.9% of the combined population estimates for the analysis area (Table 5). We predict that Long-billed Curlews occur on 17,959 acres of selected land units in the WHIP program, accounting for 0.1 % of the combined population. CRP practices were delivered on land units totaling 293,240 acres of curlew habitats, estimated to support 1.5% of the Long-billed Curlew population in our analysis area. We estimate that the selected conservation programs delivered under these three programs had the potential to affect 1.5% of the Long-billed Curlew population in the analysis area (Table 5).

Table 5. Estimated population (current carrying capacity) of Long-billed Curlews inhabiting those land units where selected conservation practices were delivered, 2005-2011, under the EQIP, WHIP and CRP programs.

State	BCR	Population	EQIP Est.	% Pop	WHIP Est.	% Pop	CRP Est.	% Pop	All	% Pop
CA	9	10,500	45	0.43%	3	0.03%	0	0.00%	48	0.46%
ID	9	49,400	419	0.85%	3	0.01%	584	1.18%	1006	2.04%
NV	9	24,500	48	0.20%	1	0.00%	0	0.00%	49	0.20%
OR	9	46,800	392	0.84%	44	0.09%	225	0.48%	661	1.41%
UT	9	13,000	333	2.56%	4	0.03%	25	0.19%	362	2.78%
WA	9	16,300	63	0.39%	0	0.00%	104	0.64%	167	1.02%
WY	9	10	0	0.00%	0	0.00%	0	0.00%	0	0.00%
CO	10	700	0	0.00%	1	0.14%	0	0.00%	1	0.14%
ID	10	4,000	44	1.10%	0	0.0,0%	17	0.43%	61	1.53%
MT	10	6,600	72	1.09%	14	0.21%	8	0.12%	94	1.42%
OR	10	10,300	83	0.81%	22	0.21%	19	0.18%	124	1.20%
UT	10	500	0	0.00%	0	0.00%	2	0.40%	2	0.40%
WA	10	500	3	0.60%	6	1.20%	0	0.00%	9	1.80%
WY	10	19,000	391	2.06%	1	0.01%	1	0.01%	393	2.07%
CO	16	100	3	3.00%	0	0.00%	0	0.00%	3	3.00%
ID	16	20	0	0.00%	0	0.00%	1	5.00%	1	5.00%
UT	16	300	8	2.67%	1	0.33%	3	1.00%	12	4.00%
WY	16	900	17	1.89%	0	0.00%	0	0.00%	17	1.89%
TOTALS		**203,430**	**1,921**	**0.94%**	**100**	**0.05%**	**989**	**0.49%**	**3,010**	**1.48%**

Grasshopper Sparrow. We predict that Grasshopper Sparrows occur on 593,348 acres of the land units where our selected practices were delivered through the EQIP program, and those lands support an estimated 1.8% of the combined population estimates for the analysis area (Table 6). We predict that they occur on none of the selected land units in the WHIP program. CRP practices were delivered on land

units totaling 320,870 acres of Grasshopper Sparrow habitat, estimated to support 2.5% of the population in our analysis area. We estimate that the selected conservation programs delivered under these three programs had the potential to affect 4.3% of the Grasshopper Sparrow population in the analysis area (Table 6). This was the highest proportion of any of our focal species potentially affected by delivery of the conservation practices included in our analyses.

Table 6. Estimated population (current carrying capacity) of Grasshopper Sparrows inhabiting those land units where selected conservation practices were delivered, 2005-2011, under the EQIP, WHIP and CRP programs.

State	BCR	Population	EQIP Est.	% Pop	CRP Est.	% Pop	All	% Pop
ID	9	35,400	250	0.71%	213	0.60%	463	1.31%
NV	9	300	0	0.00%	0	0.00%	0	0.00%
OR	9	10,000	234	2.34%	428	4.28%	662	6.62%
UT	9	5,000	329	6.58%	83	1.66%	412	8.24%
WA	9	71,900	779	1.08%	3208	4.46%	3987	5.55%
ID	10	700	3	0.43%	11	1.57%	14	2.00%
MT	10	16,300	239	1.47%	20	0.12%	259	1.59%
OR	10	200	1	0.50%	10	5.00%	11	5.50%
UT	10	600	34	5.67%	3	0.50%	37	6.17%
WA	10	3,200	13	0.41%	2	0.06%	15	0.47%
WY	10	11,000	663	6.03%	1	0.01%	664	6.04%
ID	16	30	0	0.00%	0	0.00%	0	0.00%
UT	16	800	30	3.75%	4	0.50%	34	4.25%
WY	16	3,200	254	7.94%	1	0.03%	255	7.97%
TOTALS		**158,630**	**2,829**	**1.78%**	**3,984**	**2.51%**	**6,813**	**4.29%**

Brewer's Sparrow. We predict that Brewer's Sparrows occur on 1,469,955 acres of the land units where our selected practices were delivered through the EQIP program, and those lands support an estimated 1.3% of the combined population estimates for the analysis area (Table 7). We predict that they occur on 236,547 acres of selected land units in the WHIP program, accounting for 0.2% of the combined population. CRP practices were delivered on land units totaling 162,762 acres, estimated to support 0.1% of the Brewer's Sparrow population in our analysis area. We estimate that the selected conservation programs delivered under these three programs had the potential to affect 1.6% of the Brewer's Sparrow population in the analysis area (Table 7).

Sage Sparrow. We predict that Sage Sparrows occur on 1,197,514 acres of the land units where our selected practices were delivered through the EQIP program, and those lands support an estimated 1.3% of the combined population estimates for the analysis area (Table 8). We predict that they occur on 202,110 acres of selected land units in the WHIP program, accounting for 0.2% of the combined population. CRP practices were delivered on land units totaling 64,345 acres, estimated to support 0.1% of the Sage Sparrow population in our analysis area. We estimate that the selected conservation programs delivered under these three programs had the potential to affect 1.5% of the Sage Sparrow population in the analysis area (Table 8).

Table 7. Estimated population (current carrying capacity) of Brewer's Sparrows inhabiting those land units where selected conservation practices were delivered, 2005-2011, under the EQIP, WHIP and CRP programs.

State	BCR	Population	EQIP Est.	% Pop	WHIP Est.	% Pop	CRP Est.	% Pop	All	% Pop
CA	9	963,300	7,472	0.78%	6,719	0.70%	911	0.09%	15,102	1.57%
ID	9	8,381,500	69,573	0.83%	753	0.01%	28,631	0.34%	98,957	1.18%
NV	9	20,248,800	40,785	0.20%	1,350	0.01%	0	0.00%	42,135	0.21%
OR	9	7,678,800	35,946	0.47%	8,497	0.11%	33,941	0.44%	78,384	1.02%
UT	9	3,810,000	69,671	1.83%	10,134	0.27%	2,037	0.05%	81,842	2.15%
WA	9	2,465,700	24,293	0.99%	552	0.02%	11,086	0.45%	35,931	1.46%
WY	9	900	0	0.00%	0	0.00%	0	0.00%	0	0.00%
CO	10	626,200	798	0.13%	41,598	6.64%	80	0.01%	42,476	6.78%
ID	10	2,430,000	22,246	0.92%	2	0.00%	10,309	0.42%	32,557	1.34%
MT	10	2,898,800	34,681	1.20%	1,924	0.07%	1,495	0.05%	38,100	1.31%
OR	10	2,866,300	22,250	0.78%	10,721	0.37%	5,161	0.18%	38,132	1.33%
UT	10	342,000	18,971	5.55%	0	0.00%	1,905	0.56%	20,876	6.10%
WA	10	75,500	372	0.49%	29	0.04%	22	0.03%	423	0.56%
WY	10	12,583,600	493,196	3.92%	699	0.01%	891	0.01%	494,786	3.93%
CO	16	1,979,000	18729	0.95%	4758	0.24%	993	0.05%	24,480	1.24%
ID	16	25,100	0	0.00%	0	0.00%	106	0.42%	106	0.42%
UT	16	3,513,100	35983	1.02%	17715	0.50%	1,656	0.05%	55,354	1.58%
WY	16	186,300	7090	3.81%	0	0.00%	5	0.00%	7,095	3.81%
TOTALS		**71,074,900**	**902,056**	**1.27%**	**105,451**	**0.15%**	**99,229**	**0.14%**	**1,106,736**	**1.56%**

Table 8. Estimated population (current carrying capacity) of Sage Sparrows inhabiting those land units where selected conservation practices were delivered, 2005-2011, under the EQIP, WHIP and CRP programs.

State	BCR	Population	EQIP Est.	% Pop	WHIP Est.	% Pop	CRP Est.	% Pop	All	% Pop
CA	9	330,300	3,174	0.96%	0	0.00%	0	0.00%	3174	0.96%
ID	9	1,358,900	11,250	0.83%	109	0.01%	8,507	0.63%	19866	1.46%
NV	9	8,238,700	26,208	0.32%	1,670	0.02%	0	0.00%	27878	0.34%
OR	9	1,549,200	8,142	0.53%	444	0.03%	64	0.00%	8650	0.56%
UT	9	1,502,500	43,616	2.90%	4,634	0.31%	1,066	0.07%	49316	3.28%
WA	9	4,600	0	0.00%	0	0.00%	0	0.00%	0	0.00%
CO	10	440,300	992	0.23%	24,816	5.64%	50	0.01%	25858	5.87%
ID	10	68,200	862	1.26%	0	0.00%	2,755	4.04%	3617	5.30%
OR	10	312,600	8,167	2.61%	1,904	0.61%	474	0.15%	10545	3.37%
UT	10	96,700	6,040	6.25%	0	0.00%	509	0.53%	6549	6.77%
WY	10	3,906,300	129,632	3.32%	161	0.00%	278	0.01%	130071	3.33%
CO	16	583,900	3,919	0.67%	806	0.14%	224	0.04%	4949	0.85%
ID	16	2,400	0	0.00%	0	0.00%	19	0.79%	19	0.79%
UT	16	2,026,100	16,692	0.82%	3,390	0.17%	1,648	0.08%	21730	1.07%
WY	16	10,600	293	2.76%	0	0.00%	0	0.00%	293	2.76%
TOTALS		**20,431,300**	**258,987**	**1.27%**	**37,934**	**0.19%**	**15,594**	**0.08%**	**312,515**	**1.53%**

Sage Thrasher. We predict that Sage Thrashers occur on 963,202 acres of the land units where our selected practices were delivered through the EQIP program, and those lands support an estimated 1.0 % of the combined population estimates for the analysis area (Table 9). We predict that they occur on 236,360 acres of selected land units in the WHIP program, accounting for 0.3 % of the combined population. CRP practices were delivered on land units totaling 166,529 acres, estimated to support 0.2% of the Sage Thrasher population in our analysis area. We estimate that the selected conservation programs delivered under these three programs had the potential to affect 1.5% of the Sage Thrasher population in the analysis area (Table 9).

Table 9. Estimated population (current carrying capacity) of Sage Thrasher inhabiting those Plan Land Units where selected conservation practices were delivered, 2005-2011, under the EQIP, WHIP and CRP programs.

State	BCR	Population	EQIP Est.	% Pop	WHIP Est.	% Pop	CRP Est.	% Pop	All	% Pop
CA	9	217,000	1,099	0.51%	814	0.38%	195	0.09%	2,108	0.97%
ID	9	936,800	4,314	0.46%	76	0.01%	3,559	0.38%	7,949	0.85%
NV	9	2,470,100	8,617	0.35%	500	0.02%	0	0.00%	9,117	0.37%
OR	9	783,200	3,418	0.44%	774	0.10%	3,921	0.50%	8,113	1.04%
UT	9	472,900	12,451	2.63%	1,458	0.31%	313	0.07%	14,222	3.01%
WA	9	268,900	349	0.13%	61	0.02%	1,104	0.41%	1,514	0.56%
WY	9	30	0	0.00%	0	0.00%	0	0.00%	0	0.00%
CO	10	144,100	344	0.24%	8,693	6.03%	20	0.01%	9,057	6.29%
ID	10	94,900	262	0.28%	0	0.00%	697	0.73%	959	1.01%
MT	10	135,800	120	0.09%	122	0.09%	143	0.11%	385	0.28%
OR	10	205,700	2,999	1.46%	1,080	0.53%	640	0.31%	4,719	2.29%
UT	10	33,500	2,042	6.10%	0	0.00%	186	0.56%	2,228	6.65%
WA	10	6,600	9	0.14%	0	0.00%	0	0.00%	9	0.14%
WY	10	494,900	21,277	4.30%	14	0.00%	86	0.02%	21,377	4.32%
CO	16	10,000	2,270	22.70%	514	5.14%	123	1.23%	2,907	29.07%
ID	16	2,400	0	0.00%	0	0.00%	11	0.46%	11	0.46%
UT	16	232,100	6,582	2.84%	2,885	1.24%	501	0.22%	9,968	4.29%
WY	16	22,400	853	3.81%	0	0.00%	1	0.00%	854	3.81%
TOTALS		**6,531,330**	**67,006**	**1.03%**	**16,991**	**0.26%**	**11,500**	**0.18%**	**95,497**	**1.46%**

Net Impacts by Program

For each of the following sections, we present summary tables of our estimated net potential population impact of the practices delivered under each major program analyzed (EQIP, WHIP, CRP). Each of our five focal species is covered in a single table for each program area. Results are lumped by practice and by BCR within each table, and population effects (delta) are combined and presented as a percentage of the IWJV objective increase for the combined BCR/State polygons for that portion of the BCR(s) in our analysis area (i.e. all of BCRs 9 and 10 within the IWJV; BCR16 in Colorado, Idaho, Utah and Wyoming).

EQIP

We predict net positive effects of conservation practice delivery under the EQIP program, for each of the five species we analyzed (Tables 10 through 14). Net increases in carrying capacity were <1% were predicted for all but the Sage Sparrow, where we predicted a net increase of 5% (Table 13).

Grazing enhancements through brush management (314), prescribed grazing (528) and range planting (550), combined with upland wildlife habitat enhancement (645), were the primary contributors to a predicted net increase of 474 Long-billed Curlews (Table 10). Grasshopper Sparrow carrying capacity was predicted to increase by 552 birds (Table 11), primarily through these same practices (314, 528, 645).

Table 10. Net predicted Long-billed Curlew population effects of selected practice delivery under the EQIP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

EQIP	LBCU	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	+	56,282	94	59,261	42	14,575	0	136
327	+	3,967	9	1,655	2	0	0	11
328	-	65,925	-62	12,808	-3	0	0	-65
338	+/-	77	0	252	0	0	0	0
340	+	517	0	0	0	0	0	0
342	+	941	0	275	0	0	0	0
528	+/-	28,856	70	5,586	4	0	0	74
550	+/-	21,546	99	8,174	12	11,981	0	111
612	-	327	-1	3,853	-7	50	0	-8
643	+	842	1	66	0	0	0	1
645	+	12,905	36	96,085	178	1,284	0	214
Totals		**192,185**	**246**	**188,015**	**228**	**27,890**	**0**	**474**
Obj. Incr.			48,200		15,400		1,900	65,500
% of Obj.			**0.51%**		**1.48%**		**0.00%**	**0.72%**

Most predicted net benefits to sagebrush obligate birds accrued under the EQIP program (Tables 12-14) assume that the benefits of prescribed grazing (528) offset some of the losses due to brush removal (314). In the case of the Brewer's Sparrow, we predicted that brush removal reduced carrying capacity by nearly 95,000 birds, but that prescribed grazing improved carrying capacity by more than 500,000 birds (Table 12). But those benefits were only accrued if the grazing systems protected shrubs, reduced invasives and protected the diversity of native forbs and grasses.

Almost all of the net increase in Sage Sparrow carrying capacity delivered under EQIP (>180,000 birds, or nearly 5% of the IWJV objective for our analysis area) came from prescribed grazing (Table 13).This was also the case for the Sage Thrasher, where we predicted a gain of >26,000 birds offsetting a loss of more than 5,000 birds due to brush management (Table 14).

Table 11. Net predicted Grasshopper Sparrow population effects of selected practice delivery under the EQIP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

EQIP	GRSP	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	+	14,122	33	79,310	76	8,537	3	112
327	+	3,240	2	38	0	0	0	2
328	+	37,739	-27	5,653	-3	70	0	-30
338	+/-	0	0	1,655	2	206	0	2
340	+	6,616	3	66	0	0	0	3
342	+	2,490	1	46	0	0	0	1
512	+	9,509	7	7,742	8	0	0	15
528	+/-	113,418	107	151,542	128	72,023	53	288
550	+/-	17,651	31	1,170	1	11,906	3	35
612	-	192	-1	178	0	0	0	-1
643	+	929	0	520	0	0	0	0
645	+	14,122	33	79,310	75	6,639	17	125
Totals		**220,028**	**189**	**327,230**	**287**	**99,381**	**76**	**552**
Obj. Incr.			94,900		31,500		1,800	128,200
% of Obj.			**0.20%**		**0.91%**		**4.22%**	**0.43%**

Table 12. Net predicted Brewer's Sparrow population effects of selected practice delivery under the EQIP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

EQIP	BRSP	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	-	11,167	-5,571	122,433	-77,512	43,139	-11,862	-94,945
327	+/-	55	19	1,420	382	2,095	567	968
338	+/-	3,678	1,465	7,176	4,152	409	208	5,825
342	+	915	385	536	284	57	18	687
512	-	328	-167	60	-60	1,399	-513	-740
528	+/-	327,876	153,729	613,816	360,958	134,129	28,954	543,641
550	+/-	47,369	18,531	11,912	5,999	30,843	5,245	29,775
612	-	327	-192	5,516	-3,384	5,541	-1,430	-5,006
643	+	13	6	0	0	0	0	6
645	+	11,167	5,593	122,434	77,512	12,259	3,156	86,261
Totals		**402,895**	**173,798**	**885,303**	**368,331**	**229,871**	**24,343**	**566,472**
Obj. Incr.			42,316,200		12,657,500		7,491,200	62,464,900
% of Obj.			**0.41%**		**2.91%**		**0.32%**	**0.91%**

Table 13. Net predicted Sage Sparrow population effects of selected practice delivery under the EQIP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

EQIP	SAGS	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	-	88,688	-17,007	55,288	-5944	42,961	-3606	-26,557
327	+/-	14	1	1,420	47	2,430	450	498
338	+/-	0	0	2,610	352	437	38	390
342	+	906	292	0	0	82	8	300
512	-	338	-107	60	-21	1,492	-192	-320
528	+/-	233,786	50,629	468,056	112,749	118,515	7,178	170,556
550	+/-	41,086	7882	9,172	807	34,652	273	8,962
612	-	39	-12	5,310	-768	3,708	-463	-1,243
645	+	4,857	885	117,874	24,738	6,477	1,412	27,035
Totals		**369,714**	**42,571**	**659,790**	**132,248**	**210,754**	**5,362**	**180,181**
Obj. Incr.			2,593,900		634,700		405,100	3,633,700
% of Obj.			**1.64%**		**20.84%**		**1.32%**	**4.96%**

Table 14. Net predicted Sage Thrasher population effects of selected practice delivery under the EQIP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

EQIP	SATH	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	-	78,312	-2,419	37,491	-1,074	58150	-1509	-5,002
327	+/-	13	0	1,420	12	2441	241	253
338	+/-	0	0	1,539	35	282	4	39
342	+	925	35	641	40	82	5	80
512	-	4,909	-374	563	-44	1875	-72	-490
528	+/-	189,878	5,455	247,000	17,967	161604	2822	26,244
550	+/-	50,707	1,787	17,458	555	37902	487	2,829
612	-	328	-26	7,730	-486	5801	-250	-762
643	+	13	1	5	0	0	0	1
645	+	13	1	1,420	126	2431	56	183
Totals		**325,098**	**4,460**	**315,267**	**17,131**	**270568**	**1,784**	**23,375**
Obj. Incr.			2,467,000		299,700		167,700	2,934,400
% of Obj.			**0.18%**		**5.72%**		**1.06%**	**0.80%**

WHIP

There was very little overlap of WHIP delivery and our grassland species models. Net gains in carrying capacity were well below 1% for both Long-billed Curlew (Table 15) and Grasshopper Sparrow (Table 16). Predicted net gains for all three sagebrush species came primarily through upland wildlife habitat management (645), again offsetting predicted losses caused through delivery of brush management practices. In every case, net gains were also less than 1%, with prescribed grazing (528) and upland wildlife habitat management being the major contributing positive factors (Tables 17 through 19).

Table 15. Net predicted Long-billed Curlew population effects of selected practice delivery under the WHIP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

WHIP	LBCU	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	+	3,713	2	18,777	10	0	0	12
327	+	1,287	2	31	0	0	0	2
340	+	329	1	0	0	0	0	1
342	+	43	0	226	0	0	0	0
512	+	0	0	196	0	0	0	
528	+/-	765	5	1,839	7	0	0	12
550	+/-	7,482	17	241	1	26	0	18
612	-	56	0	3,185	-25	69	0	-25
643	+	282	0	2	0	0	0	0
645	+	15,920	42	23,710	18	0	0	60
Totals		**29,877**	**69**	**48,207**	**11**	**95**	**0**	**80**
Obj. Incr.			48,200		15,400		1,900	65,500
% of Obj.			**0.14%**		**0.07%**		**0.00%**	**0.12%**

Table 16. Net predicted Grasshopper Sparrow population effects of selected practice delivery under the WHIP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

WHIP	GRSP	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	+	1,757	2	296	0	0	0	2
327	+	991	1	48	0	0	0	1
340	+	445	0	0	0	0	0	0
512	+	0	0	5	0	0	0	0
528	+/-	1,639	2	1,124	6	0	0	8
550	+/-	109	0	74	0	0	0	0
612	-	0	0	105	0	0	0	0
643	+	236	0	136	0	0	0	0
645	+	1,078	1	3,852	3	0	0	4
Totals		**6,255**	**6**	**5,640**	**9**	**0**	**0**	**15**
Obj. Incr.			94,900		31,500		1,800	128,200
% of Obj.			**0.01%**		**0.03%**		**0.00%**	**0.01%**

Table 17. Net predicted Brewer's Sparrow population effects of selected practice delivery under the WHIP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

WHIP	BRSP	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	-	18,691	-9,389	47,333	-15,431	235,098	-4,726	-29,546
327	+/-	74	28	1,420	3	0	0	31
338	+/-	715	369	0	0	0	0	369
342	+	17	6	140	65	0	0	71
512	-	0	0	19	-14	23	-9	-23
528	+/-	339	210	15,683	4,668	45,733	11,315	16,193
550	+/-	16,573	8,143	47	28	467	133	8,304
612	-	218	-109	979	-312	9,442	-2,827	-3,248
643	+	415	213	24	9	0	0	222
645	+	14,158	5,886	60,975	20,534	8,874	2,535	28,955
Totals		**51,200**	**5,357**	**126,620**	**9,550**	**299,637**	**6,421**	**21,328**
Obj. Incr.			42,316,200		12,657,500		7,491,200	62,464,900
% of Obj.			**0.01%**		**0.08%**		**0.09%**	**0.03%**

Table 18. Net predicted Sage Sparrow population effects of selected practice delivery under the WHIP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

WHIP	SAGS	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	-	17,188	-868	44,694	-7,170	22,324	92	-7,946
327	+/-	8	1	0	0	0	0	1
342	+	16	3	0	0	0	0	3
512	-	0	0	0	0	8	-6	-6
528	+/-	0	0	15,213	2,659	40,705	1759	4,418
550	+/-	12,626	2,482	4	1	1,812	14	2,497
612	-	65	-23	340	-33	10,231	-202	-258
645	+	1,613	460	54,271	15,902	9,497	636	16,998
Totals		**31,516**	**2,055**	**114,522**	**11,359**	**84,577**	**2293**	**15,707**
Obj. Incr.			2,593,900		634,700		405,100	3,633,700
% of Obj.			**0.08%**		**1.79%**		**0.57%**	**0.43%**

Table 19. Net predicted Sage Thrasher population effects of selected practice delivery under the WHIP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

WHIP	SATH	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	-	19,168	-790	44,583	-2,107	22,049	-233	-3,130
327	+/-	79	3	11	0	0	0	3
342	+	20	0	405	8	0	0	8
512	-	0	0	7	0	22	-1	-1
528	+/-	464	7	15,935	355	45,518	696	1,058
550	+/-	17,942	622	69	4	1,947	21	647
612	-	177	-10	777	-80	10,231	-89	-179
643	+	517	33	6	2		0	35
645	+	14,353	766	60,381	2,741	12,102	125	3632
Totals		**52,720**	**631**	**122,174**	**923**	**91,869**	**519**	**2,073**
Obj. Incr.			2,467,000		299,700		167,700	2,934,400
% of Obj.			**0.03%**		**0.31%**		**0.31%**	**0.07%**

CRP

The vast majority of practice delivery under the CRP program has been conservation cover (327), typically grasses and forbs. In the case of Long-billed Curlews, our calculations of net increases of 630 birds (Table 20) would require that most CRP conservation cover overlapping the species range (our model) was native seed mixes, and these benefit would be enhanced by managed grazing or mowing.

Table 20. Net predicted Long-billed Curlew population effects of selected practice delivery under the CRP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

CRP	LBCU	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	+	8	0	12	0	0	0	0
327	+	294,959	502	30,462	32	309	1	535
328	-	397	-6	13	0	0	0	-6
338	+/-	77	0	252	0	0	0	0
340	+	517	0	0	0	0	0	0
342	+	941	0	275	0	0	0	0
528	+/-	28,856	70	5,586	3	0	0	73
550	+/-	424	1	1,048	1	0	0	2
612	-	6,124	-20	1,329	-1	0	0	-21
643	+	44	0	106	0	0	0	0
645	+	12,270	25	7,121	22	4	0	47
Totals		**344,617**	**572**	**46,204**	**57**	**313**	**1**	**630**
Obj. Incr.			48,200		15,400		1,900	65,500
% of Obj.			**1.19%**		**0.37%**		**0.05%**	**0.96%**

Grasshopper Sparrows have shown positive responses to CRP conservation cover, both native and non-native, elsewhere in their range (Dechant et al. 1998, Haufler 2005). We predicted small net gains in our analysis area, equating to less than 1% of objectrive increases, only because much of the CRP delivery in our area did not overlap our modeled habitat for the species. The largest gains were in BCR 9 (Table 21).

Table 21. Net predicted Grasshopper Sparrow population effects of selected practice delivery under the CRP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

CRP	GRSP	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	+	4	0	0	0	0	0	0
327	+	275,674	448	13,803	10	45	0	458
328	+	1,011	-2	0	0	0	0	-2
338	+/-	77	0	253	0	0	0	0
340	+	386	0	0	0	0	0	0
342	+	259	0	0	0	0	0	0
528	+/-	10,008	15	2,563	2	0	0	17
550	+/-	189	0	976	1	0	0	1
612	-	5,744	-29	481	-1	0	0	-30
643	+	48	0	93	0	0	0	0
645	+	8,079	8	1,148	2	85	0	10
Totals		**301,479**	**440**	**19,317**	**14**	**130**	**0**	**454**
Obj. Incr.			94,900		31,500		1,800	128,200
% of Obj.			**0.46%**		**0.04%**		**0.00%**	**0.35%**

All net calculations of the potential influence of CRP practice delivery on our three sagebrush obligate focal species (Tables 22 through 24) include benefits from conservation cover (327) delivery that would only be accrued if sagebrush cover was a significant component of the cover provided. Since most CRP delivery moves plowed ground into grass/forb cover, the actual effects of this practice delivery on the nesting density of sagebrush obligates are likely to be neutral.

Table 22. Net predicted Brewer's Sparrow population effects of selected practice delivery under the CRP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

CRP	BRSP	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	-	14	-9	0	0	0	0	-9
327	+/-	99,123	36797	20,396	6,143	5,839	1,595	44,535
338	+/-	0	0	13	8	0	0	8
342	+	7	5	469	264	0	0	269
512	-	0	0	0	0	160	-48	-48
528	+/-	16,912	9,025	4,571	2,869	479	139	12,033
550	+/-	414	229	561	325	0	0	554
612	-	1,088	-544	621	-361	0	0	-905
643	+	29	17	14	8	369	111	136
645	+	7,104	3,648	4,937	2,464	0	0	6,112
Totals		**124,691**	**49,168**	**31,582**	**11,720**	**6,847**	**1,797**	**62,685**
Obj. Incr.			42,316,200		12,657,500		7,491,200	62,464,900
% of Obj.			**0.12%**		**0.09%**		**0.02%**	**0.10%**

Table 23. Net predicted Sage Sparrow population effects of selected practice delivery under the CRP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

CRP	SAGS	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	-	0	0	0	0	0	0	0
327	+/-	28,231	3,040	14,128	474	6,354	836	4,350
338	+/-	0	0	0	0	0	0	0
342	+	7	1	40	5	0	0	6
512	-	0	0	0	0	170	-16	-16
528	+/-	6,898	1,493	3,911	916	484	149	2,558
550	+/-	29	7	126	24	0	0	31
612	-	319	-81	416	-48	0	0	-129
643	+	0	0	23	3	0	0	3
645	+	148	45	2,649	485	421	55	585
Totals		**35,632**	**4,505**	**21,293**	**1,859**	**7,429**	**1,024**	**7,388**
Obj. Incr.			2,593,900		634,700		405,100	3633700
% of Obj.			**0.17%**		**0.29%**		**0.25%**	**0.20%**

Table 24. Net predicted Sage Thrasher population effects of selected practice delivery under the CRP program, 2005-2011, BCRs 9, 10 and the northern half of BCR16 within the IWJV.

CRP	SATH	BCR 9	BCR 9	BCR10	BCR10	BCR16	BCR16	Total
Practice	**Effect**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Acres**	**Pop. Delta**	**Pop.Delta**
314	-	31	0	8	-4	0	0	-4
327	+/-	101,114	4,117	18,439	389	6,415	437	4,943
342	+	26	0	492	34	0	0	34
512	-	0	0	0	0	170	-9	-9
528	+/-	17,922	976	4,077	353	516	16	1,345
550	+/-	458	33	580	42	0	0	75
612	-	858	-56	875	-38	0	0	-94
643	+	30	3	28	0	0	0	3
645	+	7,634	487	6,517	342	438	24	853
Totals		**128,073**	**5,560**	**31,016**	**1,118**	**7,539**	**468**	**7,146**
Obj. Incr.			2,467,000		299,700		167,700	2,934,400
% of Obj.			**0.23%**		**0.37%**		**0.28%**	**0.24%**

Sage Grouse Initiative

The HABPOPS database will allow us to assess what portion of the estimated breeding population of our focal species occurs on the 33 easements totalling nearly 65,000 ac implemented to date under the SGI umbrella within the WRP, Grassland Reserve Program (GRP) and Farm and Ranch Protection Program (FRPP) programs (Table 4). But lacking those polygons at the time of this analysis, we have not yet assessed that conservation effect. Tables 25 through 27 summarize the results of our analysis on the

potential population effects of conifer removal, grazing managment, weed control and revegetation efforts implemented under SGI on our three sagebrush-obligate focal species. In each case, we have expressed the potential increase in carrying capacity by geographic area (state and BCR).

The IWJV objectives for increasing Brewer's Sparrows (Appendix A) primarily call for doubling populations, based on past and ongoing declines. (Rich et al. 2004). But the species is abundant, and objective increases are therefore in the tens of millions. While our predictions therefore put the benefits of SGI delivery to this species in the range of <1% of objectives overall, we nevertheless predict that SGI has resulted in raising the carrying capacity of our analysis area by more than 400,000 birds (Table 25). The biggest gains are predicted to come from grazing systems implementation in BCR 9 in Idaho and Washington, and from conifer removal in BCR 9 in Oregon.

Implementation of grazing systems under SGI contributed the most toward meeting objectives for the Sage Sparrow, with predicted carrying capacity increases of more than 50,000 birds (Table 26). Increases equated to >4% of objectives in Colorado (BCRs 10 and 16), >5% in Idaho (BCR 9), and more than 60% in Washington (BCR 9). We predict that SGI has met >2% of the IWJV objectives for the species in the analysis area in just three years of practice delivery.

Sage Thrasher carrying capacity increase equating to just under 1% of IWJV objectives have occurred due to SGI delivery to date, by our predictions (Table 27). The greatest gains have come through delivery of improved grazing systems on nearly 600,000 acres. Taken as a whole, the combination of practices delivered through SGI have resulted in a predicted response meeting nearly 10% of the objective increases for Sage Thrasher in Colorado (BCRs 10 and 16).

Table 25. Predicted maximum population response by Brewer's Sparrows to conservation practices implemented by the Sage Grouse Initiative, 2010-2012, for selected state-BCR polygons. Calculations from the IWJV HABPOPS database, assessed against population objectives from the 2013 IWJV Implementation Plan.

Treatment	State	BCR	Acres Treated	BRSP Net Increase	Obj Increase	% Objective
Conifer Removal	CA	9	40,272	18,188	963,315	1.9%
Conifer Removal	CO	16	1,776	0	1,978,953	0.0%
Conifer Removal	CO	10	268	144	626,166	0.0%
Conifer Removal	ID	9	18,357	9,212	8,381,518	0.1%
Conifer Removal	NV	9	13,284	6,333	20,248,752	0.0%
Conifer Removal	OR	9	97,907	46,674	7,678,751	0.6%
Conifer Removal	UT	16	15,229	0	3,513,115	0.0%
		Totals:	**187,094**	**80,552**	**43,390,570**	**0.19%**
Grazing Systems	CA	9	28,630	5,578	963,315	0.6%
Grazing Systems	CO	10/ 16	35,737	10,543	2,605,119	0.4%
Grazing Systems	ID	9	352,575	187,031	8,381,518	2.2%
Grazing Systems	NV	9	3,605	1,280	20,248,752	0.0%
Grazing Systems	OR	9	10,177	4,604	7,678,751	0.1%
Grazing Systems	UT	9/16	54,288	29,668	7,323,123	0.4%
Grazing Systems	WA	9	113,137	57,079	1,232,838	4.6%
		Totals:	**598,150**	**295,783**	**48,433,416**	**0.61%**
Weed Management	CA	9	864	168	963,315	0.0%
Weed Management	CO	10/16	421	125	2,605,119	0.0%
Weed Management	ID	9	100	53	8,381,518	0.0%
Weed Management	NV	9	672	238	20,248,752	0.0%
Weed Management	OR	9	532	240	7,678,751	0.0%
Weed Management	UT	9/16	2,493	1,366	7,323,123	0.0%
Weed Management	WA	9	4,652	2,347	1,232,838	0.2%
		Totals:	**9,735**	**4,538**	**48,433,416**	**0.01%**
Revegetation	CA	9	1,214	374	963,315	0.0%
Revegetation	CO	10/16	3,832	2,153	2,605,119	0.1%
Revegetation	ID	9	4,209	3,934	8,381,518	0.0%
Revegetation	NV	9	2,281	1,632	20,248,752	0.0%
Revegetation	OR	9	20	16	7,678,751	0.0%
Revegetation	UT	9/16	13,903	13,622	7,323,123	0.2%
Revegetation	WA	9	480	416	1,232,838	0.0%
		Totals:	**25,939**	**22,148**	**48,433,416**	**0.05%**
All Practices	**Grand Totals**		**820,917**	**403,020**	**48,433,416**	**0.83%**

Table 26. Predicted maximum population response by Sage Sparrows to conservation practices implemented by the Sage Grouse Initiative, 2010-2012, for selected state-BCR polygons. Calculations from the IWJV HABPOPS database, assessed against population objectives from the 2013 IWJV Implementation Plan.

Treatment	State	BCR	Acres Treated	SAGS Net Increase	Objective Increase	% Objective
Conifer Removal	CA	9	40,272	0	165,150	0.00%
Conifer Removal	CO	16	1,776	94	58,387	0.16%
Conifer Removal	CO	10	268	0	44,030	0.00%
Conifer Removal	ID	9	18,357	0	679,442	0.00%
Conifer Removal	NV	9	13,284	0	823,872	0.00%
Conifer Removal	OR	9	97,907	5,151	774,580	0.67%
Conifer Removal	UT	16	15,229	1,602	202,615	0.79%
		Totals:	**187,094**	**6,847**	**2,748,076**	**0.25%**
Grazing Systems	CA	9	28,630	936	165,150	0.57%
Grazing Systems	CO	10/16	35,737	4,147	102,417	4.05%
Grazing Systems	ID	9	352,575	36,037	679,442	5.30%
Grazing Systems	NV	9	3,605	744	823,872	0.09%
Grazing Systems	OR	9	10,177	1,044	774,580	0.13%
Grazing Systems	UT	9/16	54,288	8,620	352,867	2.44%
Grazing Systems	WA	9	113,137	277	456	60.78%
		Totals:	**598,150**	**51,805**	**2,898,784**	**1.79%**
Weed Management	CA	9	864	30	165,150	0.02%
Weed Management	CO	10/16	421	49	102,417	0.05%
Weed Management	ID	9	100	10	679,442	0.00%
Weed Management	NV	9	672	138	823,872	0.02%
Weed Management	OR	9	532	55	774,580	0.01%
Weed Management	UT	9/16	2,493	394	352,867	0.11%
Weed Management	WA	9	4,652	11	456	2.50%
		Totals:	**9,735**	**687**	**2,898,784**	**0.02%**
Revegetation	CA	9	1,214	59	165,150	0.04%
Revegetation	CO	10/16	3,832	652	102,417	0.64%
Revegetation	ID	9	4,209	599	679,442	0.09%
Revegetation	NV	9	2,281	701	823,872	0.09%
Revegetation	OR	9	20	3	774,580	0.00%
Revegetation	UT	9/16	13,903	3,408	352,867	0.97%
Revegetation	WA	9	480	1	456	0.33%
			25,939	**5,421**	**2,898,784**	**0.19%**
All Practices	**Grand Totals**		**820,917**	**64,760**	**2,898,784**	**2.23%**

Table 27. Predicted maximum population response by Sage Thrashers to conservation practices implemented by the Sage Grouse Initiative, 2010-2012, for selected state-BCR polygons. Calculations from the IWJV HABPOPS database, assessed against population objectives from the 2013 IWJV Implementation Plan.

Treatment	State	BCR	Acres Treated	SATH Net Increase	Objective Increase	% Objective
Conifer Removal	CA	9	40,272	652	108,489	0.60%
Conifer Removal	CO	16	1,776	26	996	2.62%
Conifer Removal	CO	10	268	4	14,413	0.03%
Conifer Removal	ID	9	18,357	282	468,401	0.06%
Conifer Removal	NV	9	13,284	215	1,235,044	0.02%
Conifer Removal	OR	9	97,907	1,585	391,619	0.40%
Conifer Removal	UT	16	15,229	247	116,028	0.21%
		Totals:	**187,094**	**3,011**	**2,334,990**	**0.13%**
Grazing Systems	CA	9	28,630	821	108,489	0.76%
Grazing Systems	CO	10/16	35,737	714	15,409	4.64%
Grazing Systems	ID	9	352,575	11,079	468,401	2.37%
Grazing Systems	NV	9	3,605	60	1,235,044	0.00%
Grazing Systems	OR	9	10,177	545	391,619	0.14%
Grazing Systems	UT	9/16	54,288	281	352,491	0.08%
Grazing Systems	WA	9	113,137	6,901	26,893	25.66%
		Totals:	**598,150**	**20,401**	**2,598,346**	**0.79%**
Weed Management	CA	9	864	25	108,489	0.02%
Weed Management	CO	10/16	421	9	15,409	0.06%
Weed Management	ID	9	100	3	468,401	0.00%
Weed Management	NV	9	672	11	1,235,044	0.00%
Weed Management	OR	9	532	28	391,619	0.01%
Weed Management	UT	9/16	2,493	13	352,491	0.00%
Weed Management	WA	9	4,652	284	26,893	1.05%
		Totals:	**9,735**	**372**	**2,598,346**	**0.01%**
Revegetation	CA	9	1,214	154	108,489	0.14%
Revegetation	CO	10/16	3,832	366	15,409	2.37%
Revegetation	ID	9	4,209	362	468,401	0.08%
Revegetation	NV	9	2,281	200	1,235,044	0.02%
Revegetation	OR	9	20	2	391,619	0.00%
Revegetation	UT	9/16	13,903	1,114	352,491	0.32%
Revegetation	WA	9	480	41	26,893	0.15%
			25,939	**2,239**	**2,598,346**	**0.09%**
All Practices	**Grand Totals**		**820,917**	**26,023**	**2,898,784**	**0.90%**

HABPOPS Desktop and Web-based Tools

In addition to using the HABPOPS database to conduct the analyses summarized herein, during the first half of 2013 we developed two different user –friendly versions of the database that can be used as a decision support tool by conservationists, project managers or planners. The first is a desktop Microsoft Access application that provides species' population and occupied habitat estimates by BCR and state, and allows scenario testing for habitat enhancement, protection or restoration. A copy has been provided to the NRCS CEAP program with this report. The second is a web-based application, built in conjunction with Point Blue Conservation Science, that includes a map interface and allows scenarios which include multiple habitats. It is available at http://data.prbo.org/partners/iwjv/iwjvmap.php.

Both versions of the HABPOPS interface will be updated as improved density and occupancy data are available, and as population and habitat objectives are refined by the IWJV and its partners. Beta versions will be available during fall of 2013 as feedback is received from users, and as we refine the appearance and performance to better meet the needs of partners.

Conclusions

Conservation programs and practices administered by the NRCS and FSA clearly have the potential to deliver bird conservation benefits across broad geographical scales and in multiple habitats. We have quantified the potential that selected practices delivered within the IWJV in portions of the three largest western U.S. Bird Conservation Regions between 2005 and 2011. We did this for 13 selected practices, across three large conservation programs, for five of the highest priority grassland and sagebrush-dependent bird species in the Intermountain West JV region.

We estimated that 1.5% of the Long-billed Curlew population of our analysis area occurs on the lands where our selected practices were implemented, and that the net potential effect of practice delivery was to raise the carrying capacity of those lands by 1,184 curlews, or nearly 2% of the IWJV objective increase for the analysis area. The primary potential contributing practices to this increase were Brush Management (314) and Upland Wildlife Habitat Improvement (645) delivered under the EQIP program.

We estimated that 4.3% of the Grasshopper Sparrow population of our analysis area occurs on the lands where our selected practices were implemented, and that the net potential effect of practice delivery was to raise the carrying capacity of those lands by 1,021 individuals, or nearly 1% of the IWJV objective increase for the analysis area. The primary potential contributing practices to this increase were Conservation Cover (327) in the CRP program, and Prescribed Grazing (528) delivered under the EQIP program.

We estimated that 1.6% of the Brewer's Sparrow population of our analysis area occurs on the lands where our selected practices were implemented, and that the net potential effect of practice delivery was to raise the carrying capacity of those lands by 627,654 individuals, or 1% of the IWJV objective increase for the analysis area. The primary practice contributing to this potential increase was Prescribed Grazing (528) delivered under the EQIP and WHIP programs. Conservation Cover (327) in the CRP program also contributed (with the caveat that those increases would only be realized if said cover had a significant shrub component).

We estimated that 2.8% of the Sage Sparrow population of our analysis area occurs on the lands where our selected practices were implemented, and that the net potential effect of practice delivery was to raise the carrying capacity of those lands by 210,384 individuals, or nearly 6% of the IWJV objective increase

for the analysis area. The primary potential contributing practices to this increase were Prescribed Grazing (528) and Upland Wildlife Habitat Management (645) delivered under the EQIP and WHIP, respectively, and Conservation Cover (327) in the CRP program (with the caveat that those increases would only be realized if said cover had a significant shrub component).

We estimated that 1.5% of the Sage Thrasher population of our analysis area occurs on the lands where our selected practices were implemented, and that the net potential effect of practice delivery was to raise the carrying capacity of those lands by 32,594 individuals, or 1% of the IWJV objective increase for the analysis area. The primary potential contributing practices to this increase were Prescribed Grazing (528) and Upland Wildlife Habitat Management (645) delivered under the EQIP and WHIP, respectively, and Conservation Cover (327) in the CRP program (with the caveat that those increases would only be realized if said cover had a significant shrub component).

Potential increases on the order of 1-6% based on 7 years conservation practice implementation may be adequate progress toward the 30-yr population objectives for these species, with objective increases varying from a low of a 10% (e.g. Sage Sparrow in BCR 10; Sage Thrasher in BCR 9) to 100% (doubling) for Brewer's Sparrow in BCR 9 (Appendix A). But the vast majority of practice implementation summarized and analyzed during this project was not specifically designed or located to benefit our focal species. It was only their broad geographic application that resulted in overlap with our modeled habitats, and our prediction that 1-5% of the focal species' populations might be affected. And our net effects analysis assumed that the specific needs of focal species were provided in the majority of instances, though provision of such species-specific habitat quality was only rarely an objective of practice delivery. More targeted application of specific conservation measures on selected habitats to provide specific desired habitat conditions could certainly result in achieving some of the potential population increases predicted by our models, or indeed improving on those predictions (i.e. making more progress toward regional population goals).

The Sage Grouse Initiative is one example of such a targeted conservation approach, and because it is aimed specifically at a widespread sagebrush-obligate bird, we predicted that tangible progress has been made toward meeting the objectives set for our three sagebrush obligates. We predict that the combination of conifer removal, grazing system implementation, weed management and revegetation implemented under SGI alone has potentially resulted in meeting 1% of the Brewer's Sparrow objectives for the analysis area, 2% of the Sage Sparrow objectives, and 1% of the Sage Thrasher objectives, with subregion (state/BCR) increases meeting as much as 25% or more of objectives. These were all achieved on fewer acres and at fewer sites than recent dispersed implementation under the EQIP, WHIP and CRP programs.

Our models are no replacement for the collection of site-specific research and monitoring that ties specific population response to management activities and resultant habitat changes on the ground. But our HABPOPS tool, and it use to assess both broad-scale and targeted implementation, can help shape our approach to where and how to maximize the benefits of conservation program and practice delivery. Species- or habitat-specific initiatives such as the Sage Grouse Initiative, or Special EQIP programs delivered in strategically located habitats may best meet the needs of sagebrush-obligate and grassland birds. Toward that end, ABC has worked with the IWJV and the Western Working Group of Partners in Flight to identify focal areas for sagebrush-obligate landbirds (other than Sage-Grouse), using HABPOPS output and other sources. It is our hope that adoption of these areas, and further refinement of decision support tools such as the HABPOPS database, will make the ambitious population objectives of the IWJV achievable. Part of the ongoing refinement of those focal areas will be to review them in light of our SGI analysis and further implementation, to see where outside the range of the Sage-Grouse species (Figure 11) conservation will be most effective.

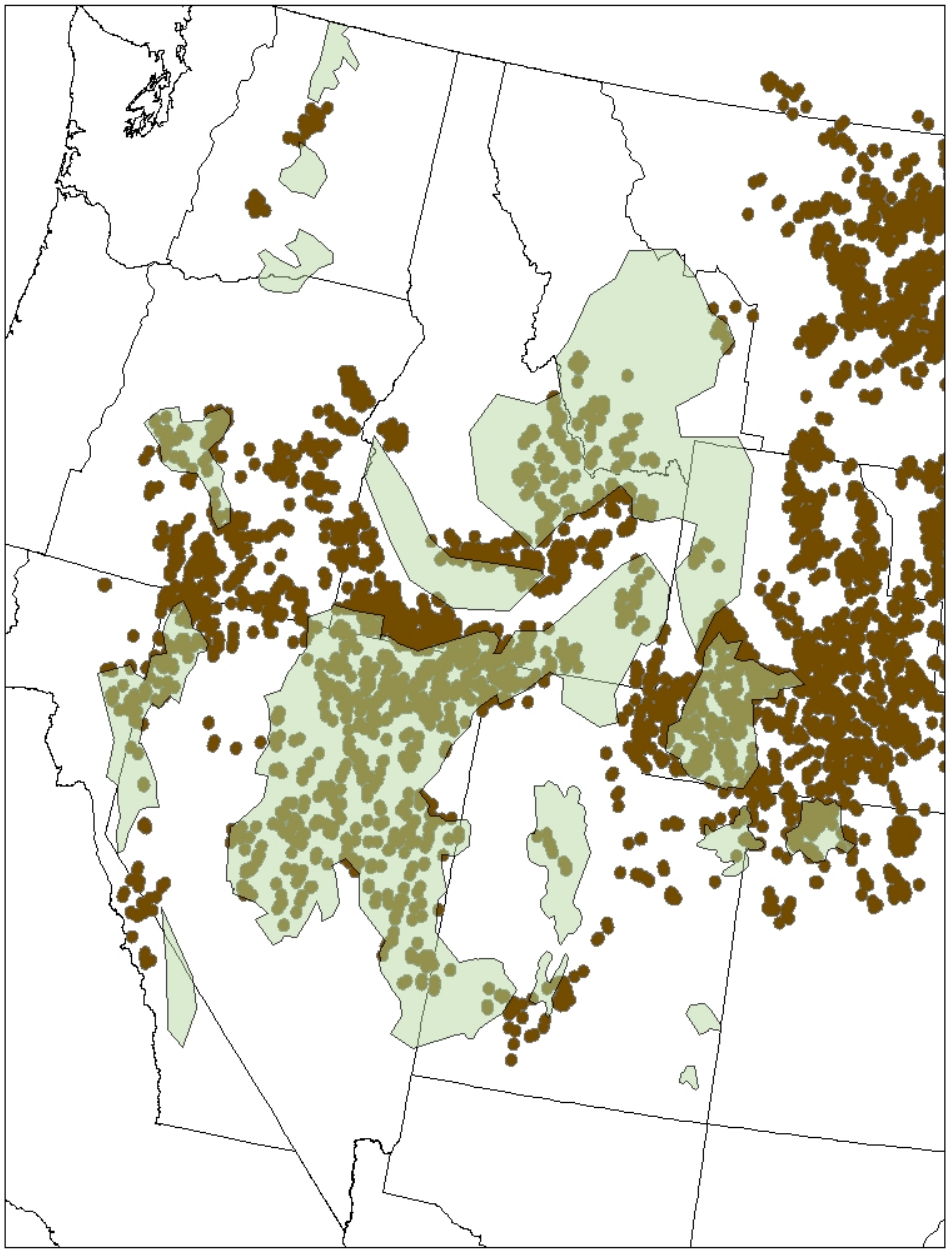

Figure 11. Draft focal areas for sagebrush-obligate landbirds (Brewer's and Sage Sparrow, Sage Thrasher), overlain by the 100% desnity polygons for the Greater Sage-Grouse.

ABC has also recently completed a Conservation Strategies document for the Long-billed Curlew (Casey 2013) that also identifies continental focal areas for the conservation of that species (Figure 12). Private lands conservation will be an important component of any success. We have not yet identified focal areas for Grasshopper Sparrow conservation.

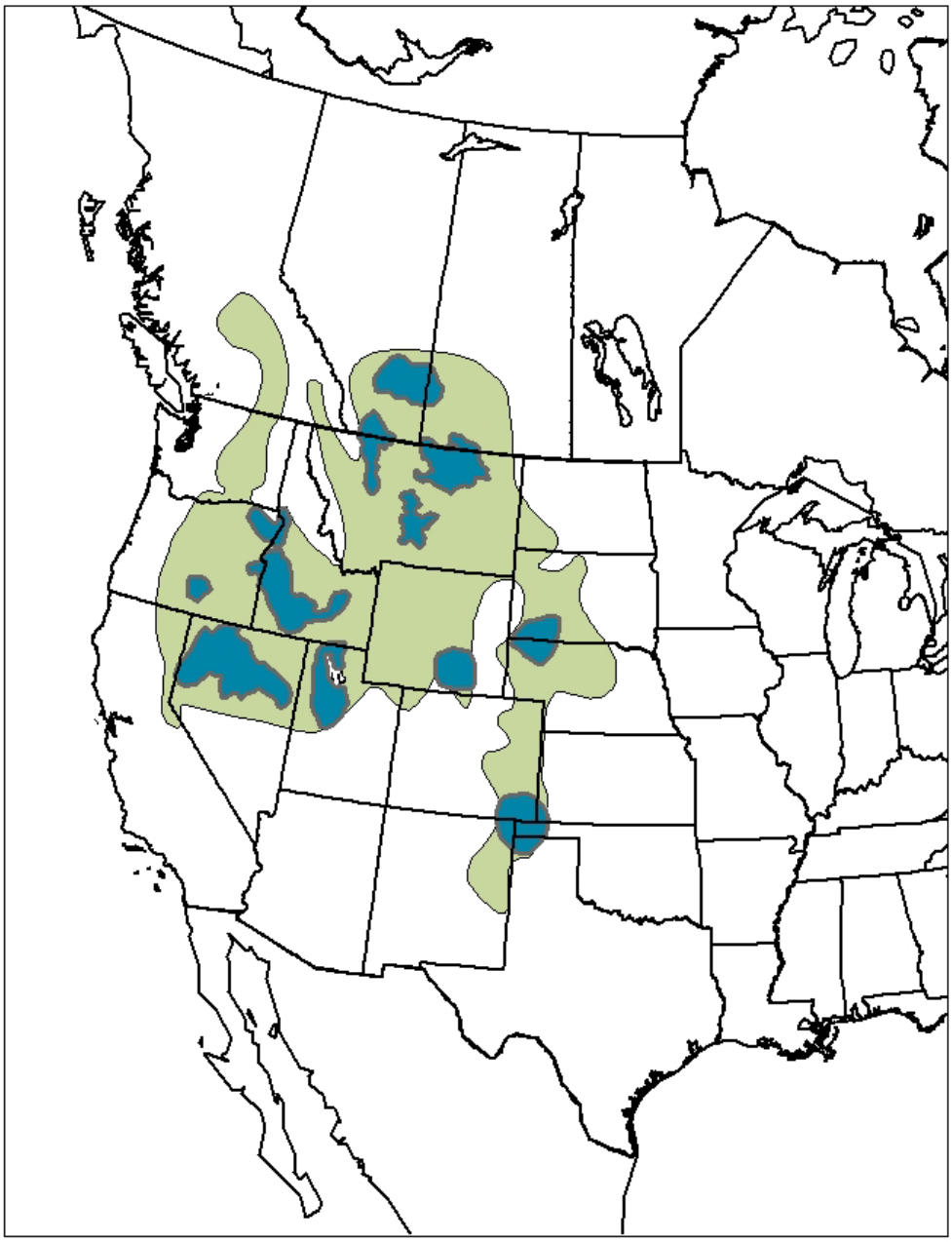

Figure 12 . Draft Primary (continental) focal areas for Long-billed Curlew breeding habitat conservation (from "Conservation Strategies for the Long-billed Curlew – Final Working Draft", American Bird Conservancy.

While this summary of our effects analysis reveals broad patterns and opportunities, we recommend continued collaboration between the IWJV, ABC, NRCS and our other science partners to more fully realize the potential of the HABPOPS tool. For example, future iterations, in addition including more

focal bird species, we would hope to include a polygon tool that would allow “instantaneous” calculation of affected acreages. Better crosswalk of our simplistic condition codes with Ecological Site Descriptions would also help the decision-making tool and allow more integration with other CEAP-sponsored research and products.

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APPENDIX A

Population estimates and objectives for the five primary focal species in grassland and sagebrush habitats in BCRs 9, 10, and 16 from the IWJV Implementation Plan, as determined with the HABPOPS database in conjunction with trend-based objectives from the PIF Continental Landbird Conservation Plan. Estimates and objectives are presented by the BCR portion of each state, within the IWJV, and have been updated as of July 2013.

Species Codes: LBCU: Long-billed Curlew; GRSP: Grasshopper Sparrow; BRSP: Brewer's Sparrow; SAGS: Sage Sparrow; SATH: Sage Thrasher

Species	BCR	State	Occupied Acres	Population Estimate	% of BCR IWJV Population	Trend-based Objective	Population Objective
LBCU	9	CA	545,644	10,500	6%	1.3x	13,700
LBCU	9	ID	2,380,713	49,400	31%	1.3x	64,200
LBCU	9	NV	1,366,569	24,500	15%	1.3x	31,900
LBCU	9	OR	3,078,511	46,800	29%	1.3x	60,800
LBCU	9	UT	665,714	13,000	8%	1.3x	16,900
LBCU	9	WA	980,465	16,300	11%	1.3x	21,200
LBCU	9	WY	623	5	<1%	1.3x	10
BCR Totals in IWJV:			9,018,239	**160,500**	**100%**	**(1.3x)**	**208,700**
LBCU	10	CO	89,182	700	2%	1.3x	900
LBCU	10	ID	253,192	4,000	10%	1.3x	5,100
LBCU	10	MT	966,134	6,600	16%	1.3x	8,600
LBCU	10	OR	722,998	10,300	25%	1.3x	13,400
LBCU	10	UT	73,342	500	1%	1.3x	700
LBCU	10	WA	60,259	500	1%	1.3x	600
LBCU	10	WY	1,732,017	19,000	45%	1.3x	27,700
BCR Totals in IWJV:			3,897,126	**41,600**	**100%**	**(1.3x)**	**57,000**
LBCU	16	CO	5,857	100	1%	1.3x	130
LBCU	16	ID	1,489	20	<1%	1.3x	30
LBCU	16	NM	327,227	4,700	79%	1.3x	6,100
LBCU	16	UT	25,543	300	4%	1.3x	400
LBCU	16	WY	39,284	900	15%	1.3x	1,200
BCR Totals in IWJV:			**399,398**	**6,000**	**100%**	**(1.3x)**	**7,900**
GRSP	9	ID	1,667,110	35,400	30%	1.5x	53,100
GRSP	9	NV	11,625	300	<1%	1x	300
GRSP	9	OR	397,307	10,000	8%	1.5x	14,900
GRSP	9	UT	223,734	5,000	4%	1.1x	5,500
GRSP	9	WA	2,405,384	71,900	57%	2.0x	143,700
BCR Totals in IWJV:			**4,705,160**	**122,600**	**100%**	**(1.9x)**	**217,500**

Appendix A, continued

Species	BCR	State	Occupied Acres	Population Estimate	% of BCR IWJV Population	Trend-based Objective	Population Objective
GRSP	10	ID	31,734	700	2%	2x	1,300
GRSP	10	MT	744,397	16,300	52%	2x	32,600
GRSP	10	OR	8,906	200	<1%	1.5x	300
GRSP	10	UT	23,619	600	2%	1.5x	900
GRSP	10	WA	159,230	3,200	11%	2x	6,400
GRSP	10	WY	327,572	11,000	34%	2x	22,000
BCR Totals in IWJV:			**1,295,458**	**32,000**	**100%**	**(2x)**	**63,500**
GRSP	16	ID	1,329	30	1%	1.5x	50
GRSP	16	UT	34,810	800	17%	1.1x	900
GRSP	16	WY	69,211	3,200	82%	1.5x	4,800
BCR Totals in IWJV:			**105,350**	**4,000**	**100%**	**(1.4x)**	**5,800**
BRSP	9	CA	3,481,111	963,300	2%	2x	1,926,600
BRSP	9	ID	12,576,366	8,381,500	19%	2x	16,763,000
BRSP	9	NV	40,901,606	20,248,800	46%	2x	40,497,600
BRSP	9	OR	14,052,651	7,678,800	18%	2x	15,357,500
BRSP	9	UT	7,911,916	3,810,000	9%	2x	7,620,000
BRSP	9	WA	4,426,720	2,465,700	6%	1.5x	3,698,500
BRSP	9	WY	1,357	900	<1%	2x	1,800
BCR Totals in IWJV:			**83,351,727**	**43,549,000**	**100%**	**(2x)**	**85,865,200**
BRSP	10	CO	1,542,505	626,200	3%	2.0x	1,252,400
BRSP	10	ID	3,627,279	2,430,000	11%	1.5x	3,645,000
BRSP	10	MT	4,316,150	2,898,800	13%	1.5x	4,348,200
BRSP	10	OR	5,196,008	2,866,300	13%	2.0x	5,732,600
BRSP	10	UT	513,357	342,000	2%	1.5x	513,000
BRSP	10	WA	108,371	75,500	0%	1.5x	113,300
BRSP	10	WY	18,952,601	12,583,600	58%	1.5x	18,875,400
BCR Totals in IWJV:			**34,256,271**	**21,822,400**	**100%**	**(1.6x)**	**34,479,900**
BRSP	16	AZ	7,321,127	1,365,600	17%	2.0x	2,731,200
BRSP	16	CO	6,095,469	1,979,000	25%	2.0x	3,958,000
BRSP	16	ID	39,731	25,100	0%	2.0x	50,200
BRSP	16	NM	4,326,063	844,100	11%	1.5x	1,266,200
BRSP	16	UT	9,739,062	3,513,100	44%	2.0x	7,026,200
BRSP	16	WY	492,081	186,300	2%	2.0x	372,600
BCR Totals in IWJV:			**28,013,532**	**7,913,200**	**100%**	**(1.9x)**	**15,404,400**

Appendix A, continued

Species	BCR	State	Occupied Acres	Population Estimate	% of BCR IWJV Population	Trend-based Objective	Population Objective
SAGS	9	CA	1,032,321	330,300	3%	1.5x	495,500
SAGS	9	ID	6,117,916	1,358,900	11%	1.5x	2,038,400
SAGS	9	NV	46,702,349	8,238,700	64%	1.1x	9,062,600
SAGS	9	OR	9,142,307	1,549,200	12%	1.5x	2,323,800
SAGS	9	UT	9,279,082	1,502,500	12%	1.1x	1,652,800
SAGS	9	WA	34,170	4,600	<1%	1.1x	5,000
BCR Totals in IWJV:			**72,308,145**	**12,984,200**	**100%**	**(1.2x)**	**15,578,100**
SAGS	10	CO	1,476,615	440,300	9%	1.1x	484,300
SAGS	10	ID	407,929	68,200	1%	1.5x	102,300
SAGS	10	OR	2,571,747	312,600	6%	1.5x	468,900
SAGS	10	UT	513,573	96,700	2%	1.1x	106,400
SAGS	10	WY	16,233,732	3,906,300	81%	1.1x	4,296,900
BCR Totals in IWJV:			**21,203,596**	**4,824,100**	**100%**	**(1.1x)**	**5,458,800**
SAGS	16	AZ	4,062,460	343,000	11%	1.1x	377,300
SAGS	16	CO	6,088,990	583,900	18%	1.1x	642,300
SAGS	16	ID	35,188	2,400	<1%	1.5x	3,600
SAGS	16	NM	2,454,612	215,000	7%	1.5x	322,500
SAGS	16	UT	13,849,871	2,026,100	64%	1.1x	2,228,700
SAGS	16	WY	123,850	10,600	<1%	1.1x	11,700
BCR Totals in IWJV:			**26,614,971**	**3,181,000**	**100%**	**(1.1x)**	**3,586,100**
SATH	9	CA	2,513,952	217,000	4%	1.5x	325,500
SATH	9	ID	10,702,322	936,800	18%	1.5x	1,405,200
SATH	9	NV	41,153,803	2,470,100	48%	1.5x	3,705,200
SATH	9	OR	12,538,570	783,200	15%	1.5x	1,174,800
SATH	9	UT	9,864,842	472,900	9%	1.5x	709,400
SATH	9	WA	3,877,616	268,900	5%	1.1x	295,800
SATH	9	WY	405	30	<1%	1.1x	30
BCR Totals in IWJV:			**81,651,510**	**5,148,930**	**100%**	**(1.1x)**	**7,615,900**
SATH	10	CO	1,570,998	144,100	13%	1.1x	158,500
SATH	10	ID	1,355,616	94,900	9%	1.5x	142,500
SATH	10	MT	2,066,722	135,800	12%	1.5x	203,700
SATH	10	OR	4,573,087	205,700	18%	1.5x	308,600
SATH	10	UT	520,133	33,500	3%	1.5x	50,300
SATH	10	WA	69,535	6,600	1%	1.1x	7,300
SATH	10	WY	7,349,030	494,900	44%	1.1x	544,400
BCR Totals in IWJV:			**17,505,119**	**1,115,500**	**100%**	**(1.3x)**	**1,415,200**

Appendix A, continued

Species	BCR	State	Occupied Acres	Population Estimate	% of BCR IWJV Population	Trend-based Objective	Population Objective
SATH	16	AZ	7,293,778	123,800	27%	1.1x	136,200
SATH	16	CO	323,201	10,000	2%	1.1x	11,000
SATH	16	ID	38,426	2,400	1%	1.5x	3,600
SATH	16	NM	4,932,820	69,900	15%	1.5x	104,800
SATH	16	NV	1,119	60	<1%	1.5x	90
SATH	16	UT	2,977,001	232,100	50%	1.5x	348,100
SATH	16	WY	440,348	22,400	5%	1.1x	24,600
BCR Totals in IWJV:			**16,006,692**	**460,660**	**100%**	**(1.4x)**	**628,390**

APPENDIX B

Acreages and ratios of shrubland and juniper habitat associations by state and BCR within the 100% density Greater Sage-Grouse polygons in that portion of the IWJV where Sage Grouse Initiative conservation actions were assessed under the CEAP-CESU agreement between ABC and the NRCS.

ASSOCIATION	Field2	STATE	BCR	Acres	
Inter-Mountain Basins Juniper Savanna	Juniper	CA	9	8	100%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	Desert Shrubland	CA	9	46	0%
Inter-Mountain Basins Mixed Salt Desert Scrub	Desert Shrubland	CA	9	3,601	0%
Inter-Mountain Basins Semi-Desert Shrub Steppe	Desert Shrubland	CA	9	137	0%
Columbia Plateau Scabland Shrubland	Sagebrush Steppe	CA	9	12,424	1%
Columbia Plateau Low Sagebrush Steppe	Sagebrush Steppe	CA	9	35,305	4%
Inter-Mountain Basins Big Sagebrush Shrubland	Sagebrush Steppe	CA	9	81,902	9%
Great Basin Xeric Mixed Sagebrush Shrubland	Sagebrush Steppe	CA	9	11,341	1%
Inter-Mountain Basins Montane Sagebrush Steppe	Sagebrush Steppe	CA	9	13,391	2%
Inter-Mountain Basins Big Sagebrush Steppe	Sagebrush Steppe	CA	9	52,404	6%
Sagebrush	Sagebrush Steppe	CA	9	655,281	76%
Colorado Plateau Pinyon-Juniper Shrubland	Juniper	CO	10	18	0%
Colorado Plateau Pinyon-Juniper Woodland	Juniper	CO	16	224199	87%
Inter-Mountain Basins Juniper Savanna	Juniper	CO	10 and 16	33,882	13%
Inter-Mountain Basins Greasewood Flat	Desert Shrubland	CO	16	8376	0%
Inter-Mountain Basins Mixed Salt Desert Scrub	Desert Shrubland	CO	10 and 16	33,864	2%
Inter-Mountain Basins Semi-Desert Shrub Steppe	Desert Shrubland	CO	10 and 16	11,607	1%
Colorado Plateau Mixed Low Sagebrush Shrubland	Sagebrush Steppe	CO	16	270	0%
Inter-Mountain Basins Big Sagebrush Shrubland	Sagebrush Steppe	CO	10 and 16	1,076,986	50%
Inter-Mountain Basins Big Sagebrush Steppe	Sagebrush Steppe	CO	10	321,864	15%
Inter-Mountain Basins Montane Sagebrush Steppe	Sagebrush Steppe	CO	10 and 16	709,315	33%
Wyoming Basins Low Sagebrush Shrubland	Sagebrush Steppe	CO	16	3397	0%
Inter-Mountain Basins Juniper Savanna	Juniper	ID	9	54,236	100%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	Desert Shrubland	ID	9	64,114	1%
Inter-Mountain Basins Mixed Salt Desert Scrub	Desert Shrubland	ID	9	59,905	1%
Inter-Mountain Basins Semi-Desert Shrub Steppe	Desert Shrubland	ID	9	29	0%
Columbia Plateau Scabland Shrubland	Sagebrush Steppe	ID	9	46,814	1%
Columbia Plateau Low Sagebrush Steppe	Sagebrush Steppe	ID	9	477,359	6%
Inter-Mountain Basins Big Sagebrush Shrubland	Sagebrush Steppe	ID	9	2,483,331	33%
Great Basin Xeric Mixed Sagebrush Shrubland	Sagebrush Steppe	ID	9	75,938	1%
Inter-Mountain Basins Montane Sagebrush Steppe	Sagebrush Steppe	ID	9	1,987,535	27%
Inter-Mountain Basins Big Sagebrush Steppe	Sagebrush Steppe	ID	9	2,279,096	30%
Inter-Mountain Basins Montane Sagebrush Steppe	Sagebrush Steppe	MT	10	994,154	86%
Inter-Mountain Basins Big Sagebrush Steppe	Sagebrush Steppe	MT	10	160,029	14%
Inter-Mountain Basins Juniper Savanna	Juniper	NV	9	6,085	100%

APPENDIX B, continued

ASSOCIATION	Field2	STATE	BCR	Acres	
Inter-Mountain Basins Semi-Desert Shrub-Steppe	Desert Shrubland	NV	9	3,378	0%
Inter-Mountain Basins Mixed Salt Desert Scrub	Desert Shrubland	NV	9	583,477	5%
Mojave Mid-Elevation Mixed Desert Scrub	Desert Shrubland	NV	9	59	0%
Inter-Mountain Basins Semi-Desert Shrub Steppe	Desert Shrubland	NV	9	28,328	0%
Columbia Plateau Scabland Shrubland	Sagebrush Steppe	NV	9	5,482	0%
Columbia Plateau Low Sagebrush Steppe	Sagebrush Steppe	NV	9	123,795	1%
Inter-Mountain Basins Big Sagebrush Shrubland	Sagebrush Steppe	NV	9	6,402,465	51%
Great Basin Xeric Mixed Sagebrush Shrubland	Sagebrush Steppe	NV	9	2,604,556	21%
Inter-Mountain Basins Montane Sagebrush Steppe	Sagebrush Steppe	NV	9	2,503,651	20%
Inter-Mountain Basins Big Sagebrush Steppe	Sagebrush Steppe	NV	9	384,904	3%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	Desert Shrubland	OR	9	413	0%
Inter-Mountain Basins Mixed Salt Desert Scrub	Desert Shrubland	OR	9	8,008	0%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	Desert Shrubland	OR	9	39	0%
Inter-Mountain Basins Mixed Salt Desert Scrub	Desert Shrubland	OR	9	147	0%
Columbia Plateau Scabland Shrubland	Sagebrush Steppe	OR	9	100,845	2%
Columbia Plateau Low Sagebrush Steppe	Sagebrush Steppe	OR	9	978,533	19%
Inter-Mountain Basins Big Sagebrush Shrubland	Sagebrush Steppe	OR	9	1,136,425	22%
Great Basin Xeric Mixed Sagebrush Shrubland	Sagebrush Steppe	OR	9	10,392	0%
Inter-Mountain Basins Montane Sagebrush Steppe	Sagebrush Steppe	OR	9	262,417	5%
Inter-Mountain Basins Big Sagebrush Steppe	Sagebrush Steppe	OR	9	2,556,976	51%
Colorado Plateau Pinyon-Juniper Woodland	Juniper	UT	16	539309	100%
Great Basin Pinyon-Juniper Woodland	Juniper	UT	16	89	0%
Inter-Mountain Basins Greasewood Flat	Desert Shrubland	UT	16	4373	0%
Inter-Mountain Basins Mixed Salt Desert Scrub	Desert Shrubland	UT	9 and 16	107,174	4%
Inter-Mountain Basins Semi-Desert Shrub Steppe	Desert Shrubland	UT	9 and 16	30,620	1%
Colorado Plateau Mixed Low Sagebrush Shrubland	Sagebrush Steppe	UT	9 and 16	36,477	2%
Great Basin Xeric Mixed Sagebrush Shrubland	Sagebrush Steppe	UT	9	105,041	4%
Inter-Mountain Basins Big Sagebrush Shrubland	Sagebrush Steppe	UT	9 and 16	879,162	36%
Inter-Mountain Basins Big Sagebrush Steppe	Sagebrush Steppe	UT	9 and 16	16,340	1%
Inter-Mountain Basins Montane Sagebrush Steppe	Sagebrush Steppe	UT	9 and 16	1,230,452	51%
Wyoming Basins Low Sagebrush Shrubland	Sagebrush Steppe	UT	16	207	
Inter-Mountain Basins Semi-Desert Shrub-Steppe	Desert Shrubland	WA	9	5	0%
Inter-Mountain Basins Mixed Salt Desert Scrub	Desert Shrubland	WA	9	105	0%
Columbia Plateau Scabland Shrubland	Sagebrush Steppe	WA	9	29,261	9%
Columbia Plateau Low Sagebrush Steppe	Sagebrush Steppe	WA	9	150	0%
Inter-Mountain Basins Big Sagebrush Shrubland	Sagebrush Steppe	WA	9	78,409	24%
Inter-Mountain Basins Montane Sagebrush Steppe	Sagebrush Steppe	WA	9	137	0%
Inter-Mountain Basins Mixed Salt Desert Scrub	Desert Shrubland	WY	10	1,336,493	10%
Inter-Mountain Basins Big Sagebrush Shrubland	Sagebrush Steppe	WY	10	4,231,875	32%
Inter-Mountain Basins Montane Sagebrush Steppe	Sagebrush Steppe	WY	10	1,072,881	8%
Inter-Mountain Basins Big Sagebrush Steppe	Sagebrush Steppe	WY	10	6,674,516	50%