

Rainwater Basin Joint Venture

Species Distribution
Models to Increase the
Impacts of Cedar
Management in the
Sandhills



CEAP Overview

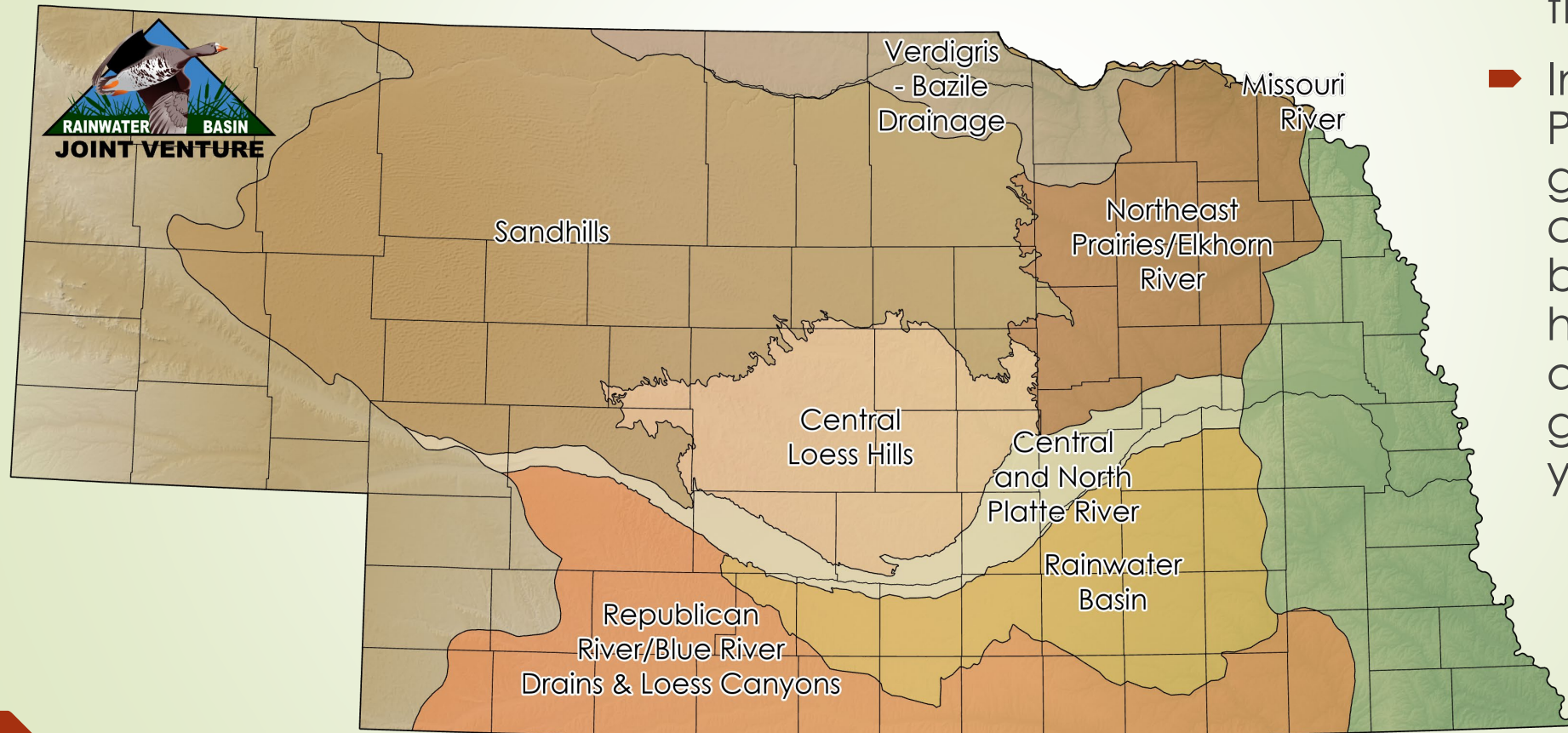
- ▶ Conservation Effects Assessment Project (CEAP) quantifies and reports on trends in conservation practices, and associated outcomes, over time.
- ▶ CEAP findings are used to guide conservation program development and support conservationists, agricultural producers, and partners in choosing the most effective conservation actions and making informed management decisions backed by data and science (Working Lands for Wildlife Framework, WLFW).
- ▶ Sandhills CEAP has two primary components:
 - ▶ 1) evaluate priority bird species impacted by NRCS conservation delivery 2016-21 (opportunistic, landowner initiated) vs. prioritized delivery using the WLFW framework.
 - ▶ 2) provide guidance for future conservation delivery using the WLFW framework, near (1-10 year) and long-term (10-30 year) delivery and habitat targets (corresponding to the JV Landbird Plan)



A Brief Diversion into the RWBJV Landbird Plan (available at RWBJV.org)

- ▶ Identified Priority Species and Planning Species Subset:
 - ▶ Initial list of 120+ species, 23 Priority Species, 8 Planning Species
- ▶ Assess Current State of Populations and Formulate Population Objectives:
 - ▶ Partners in Flight (PIF) State Population Estimates scaled to each Geographic Focus Area (GFA)
 - ▶ Population targets based on but not necessarily identical to PIF conservation strategies
- ▶ Identifying Limiting Factors (Threats):
 - ▶ RWBJV projected future grassland habitat (30-year) for each GFA based on the two primary conversion threats (row crop agriculture and woodland encroachment).
 - ▶ Row crop conversion rate based on midpoint of Potentially Undisturbed Lands (PUDL, Fields & Barnes 2019) and Cropland Data Layer (NASS, Lark et al.).
 - ▶ Crop conversion restricted by constraining soil types (Non-irrigated Capability Class ≥ 4) and areas under long-term conservation easement or conservation fee title.
 - ▶ Woodland encroachment rates based on upland % canopy change (Rangeland Analysis Platform) from 2009-11 (avg) to 2017-19 (avg).
- ▶ Compared projected habitat availability in relation to threats with population targets for each GFA

Geographic Focus Areas within the Rainwater Basin Joint Venture



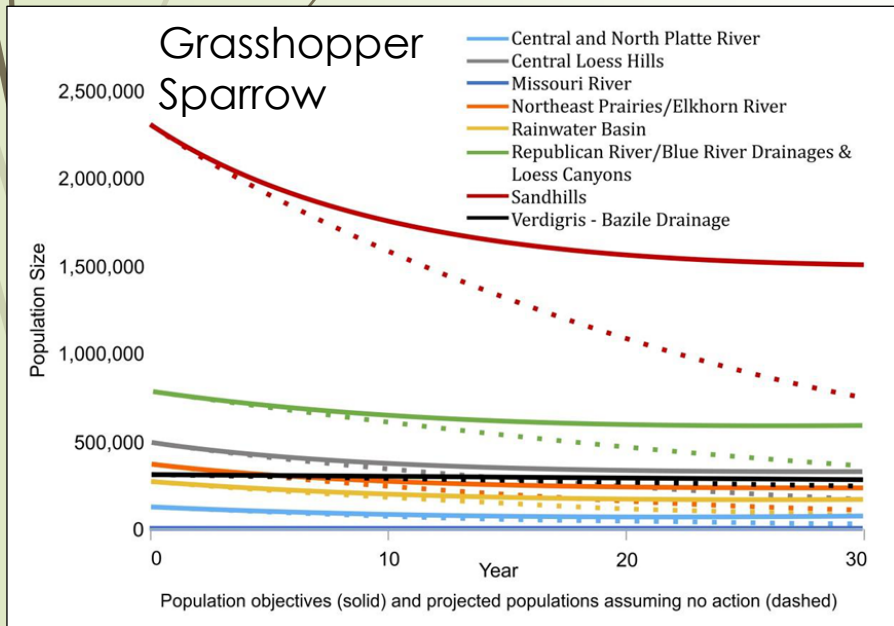
- 8 Geographic Focus Areas within the RWBJV region
- In the Landbird Plan, Each GFA has grassland habitat conservation goals based on projected habitat availability and population goals (10 & 30-year).

Grassland Bird Conservation Strategies

Conservation Strategy: Stabilize

- Allow no more than 33% population loss, with no loss after 30 years.

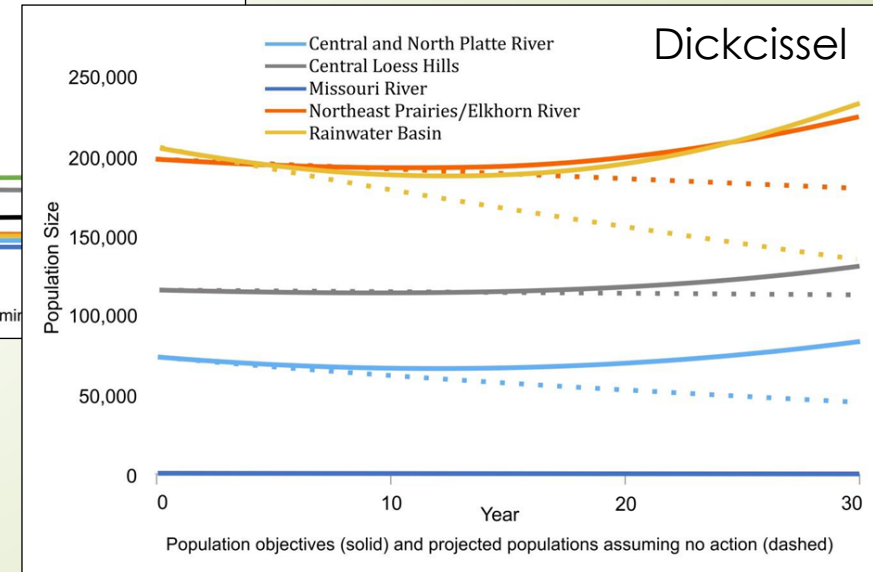
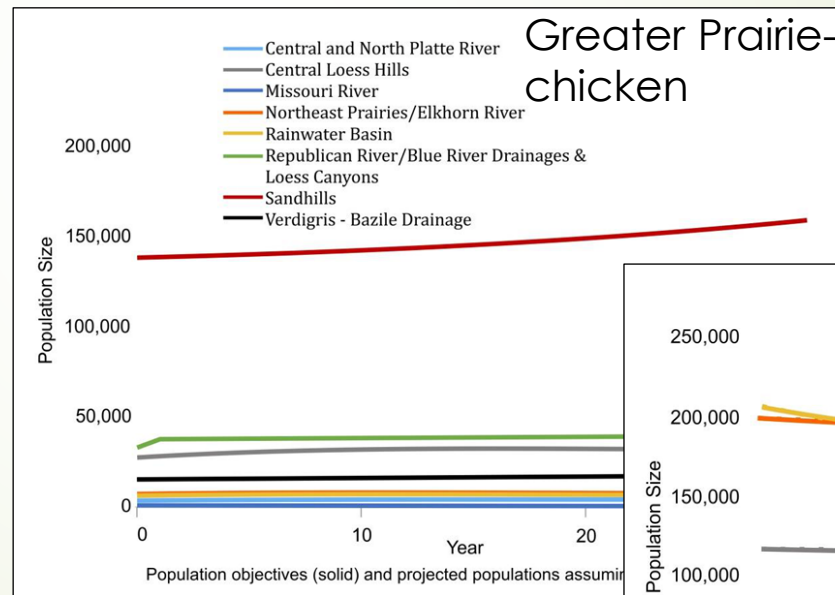
➤ EAME, GRSP, WEME



Conservation Strategy: Reverse Declines

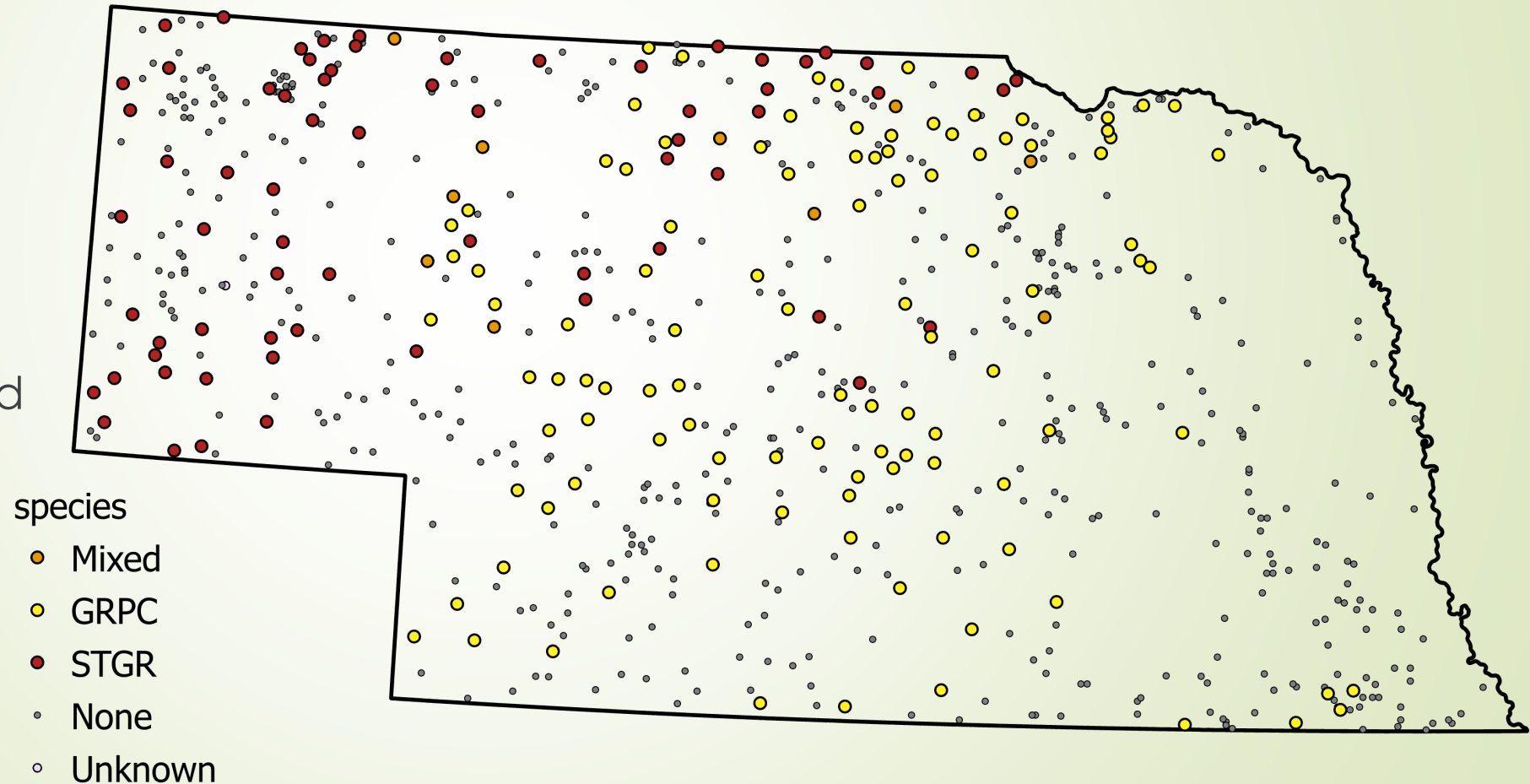
- Increase current population by 15% AND no loss in each GFA

➤ GRPC, DICKC



Grouse Samples 2020-22

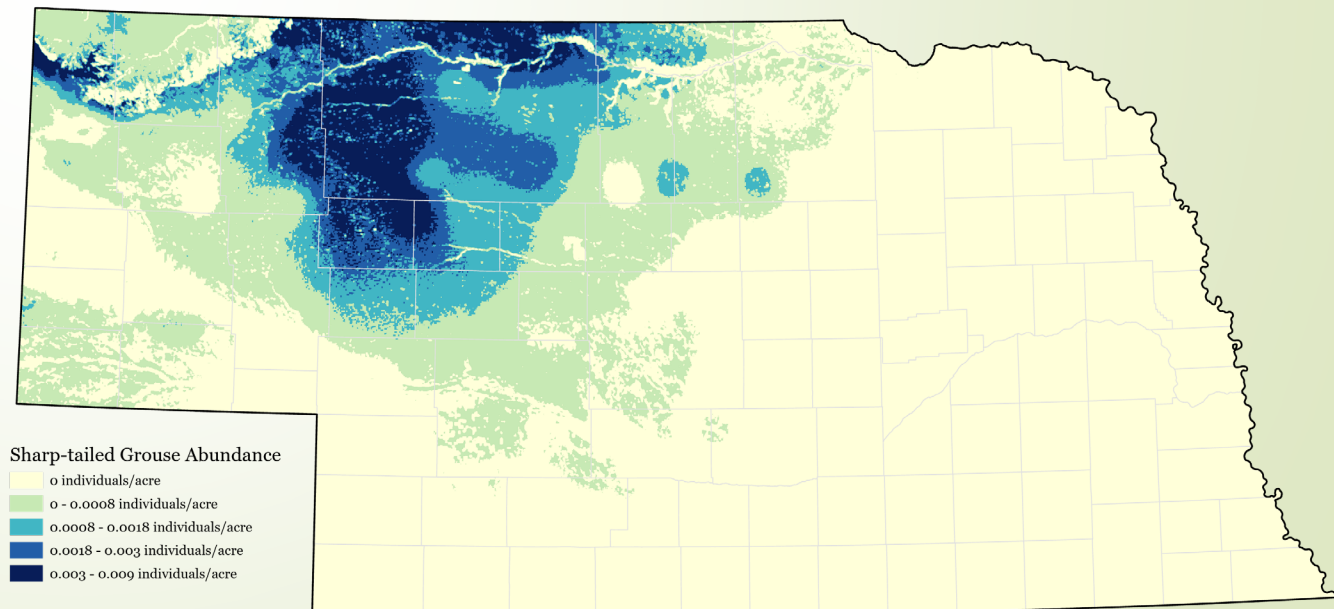
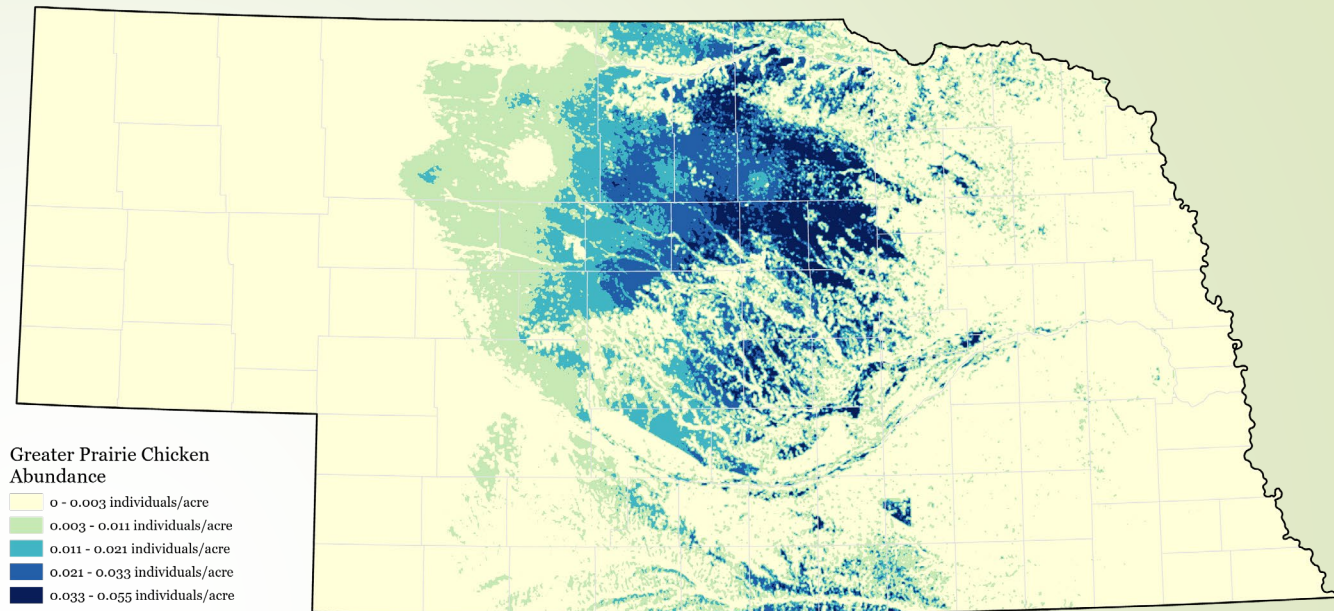
- 656 section surveys were conducted
- 108 surveys finding Greater Prairie-Chicken
- 67 finding Sharp-tailed Grouse
- 10 finding both
- A total of 1,656 birds recorded.



Grassland Bird Species Abundance Models: State-wide Grouse Surveys



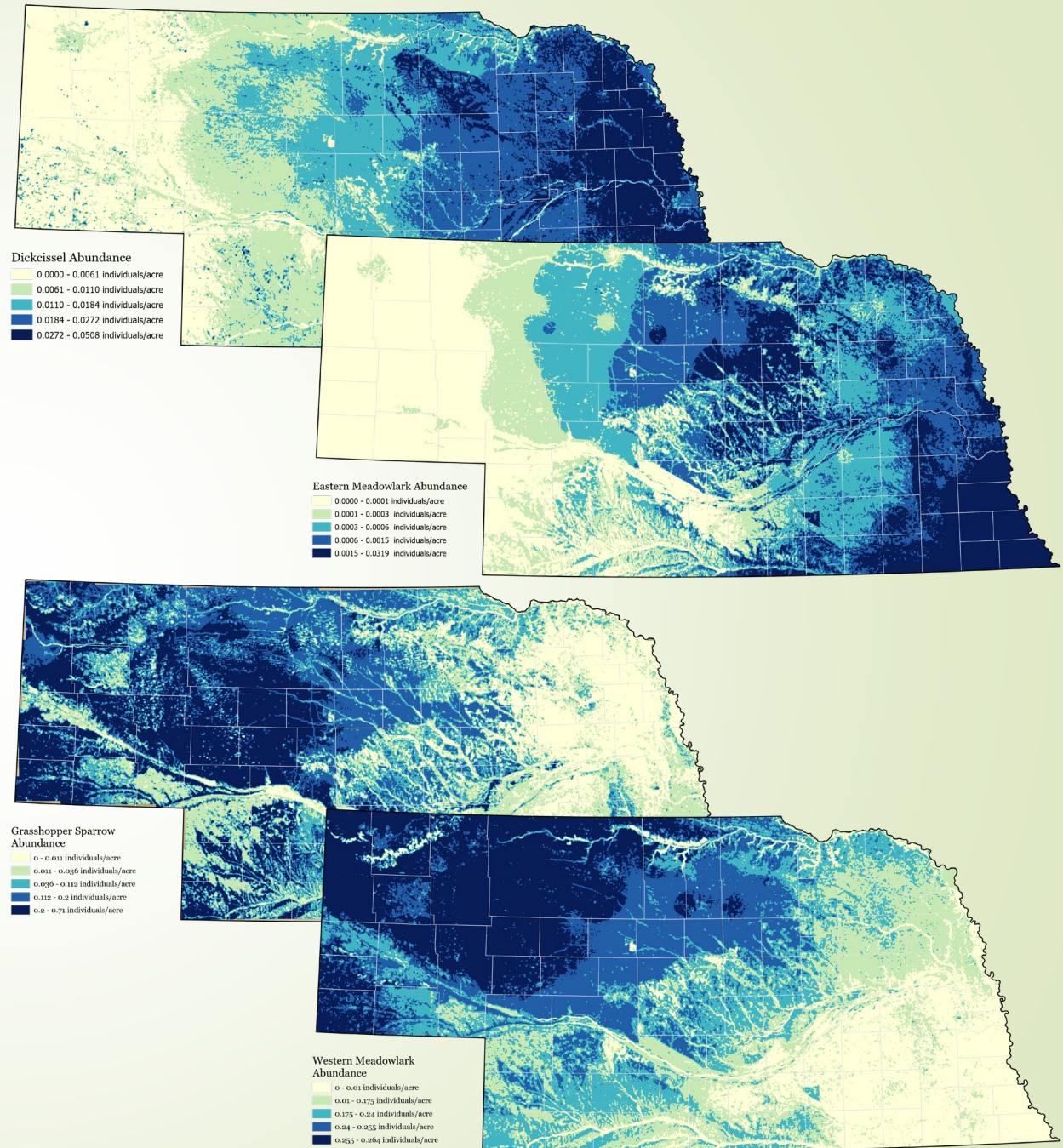
- Nebraska Game and Parks Commission (NGPC) developed grouse surveys, Greater Prairie-chicken (GRPC) and Sharp-tailed Grouse (STGR) 2020-22 (USFWS R6 SA Financial Assistance).
- RWBJV assisted landscape stratification & sample design, annual sample selection, and access logistics.
 - Similar methods used in ND & SD to facilitate regional modeling
- Relative abundance models developed by the RWBJV in cooperation with NGPC and USFWS R6 HAPET (N. Niemuth and K. Barnes).



Grassland Bird Species Abundance Models: Breeding Bird Survey

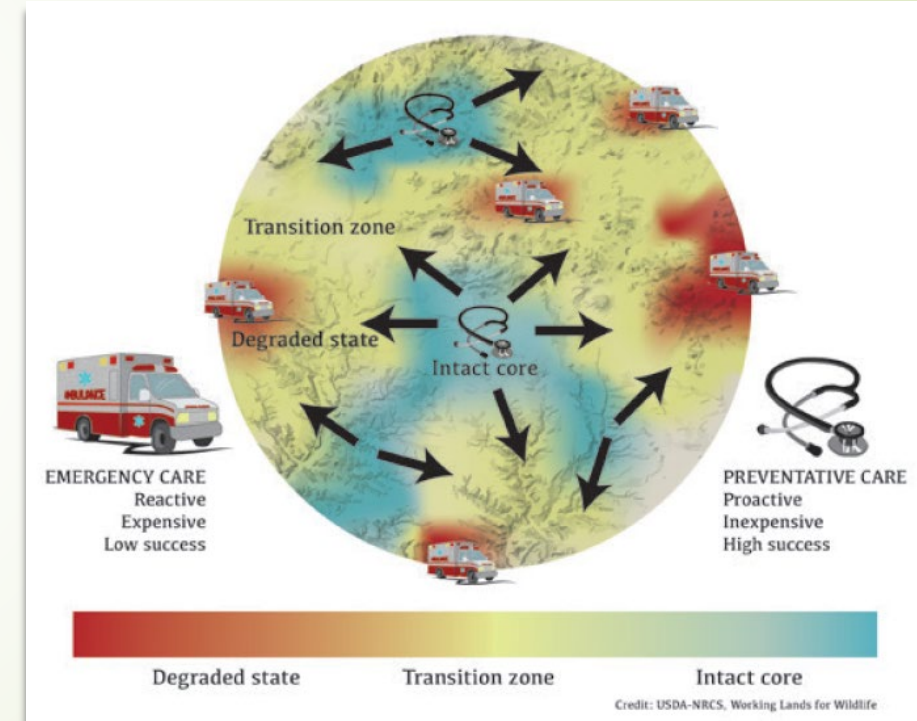


- Occurrence models developed by the RWBJV using stop-level Breeding Bird Survey (BBS) data.
- Pseudo-abundance estimates using Partners In Flight (PIF) population estimates, species detection distance, and pair ratio.
- Combined models estimate population distribution of six grassland bird species (G6) used as target species in the RWBJV Landbird Plan: Dickcissel (DICKc), Eastern Meadowlark (EAME), Grasshopper Sparrow (GRSP), Greater Prairie-Chicken (GRPC), Sharp-tailed Grouse (STGR), and Western Meadowlark (WEME).



Great Plains Grasslands Initiative: Working Lands for Wildlife Framework

- USDA Natural Resources Conservation Service's (NRCS) approach to delivering voluntary, incentive-based conservation that improves agricultural productivity and wildlife habitat on working lands through Farm Bill and Private Land Programs.
- WLFW approach applied to Sagebrush and Grassland Biomes.
- Emphasizes preventative maintenance of Intact Landscape Cores over reactive management.
- **Expansion** of Cores through **Restoration** and **Protection** of Cores through **Maintenance & Infrastructure**.



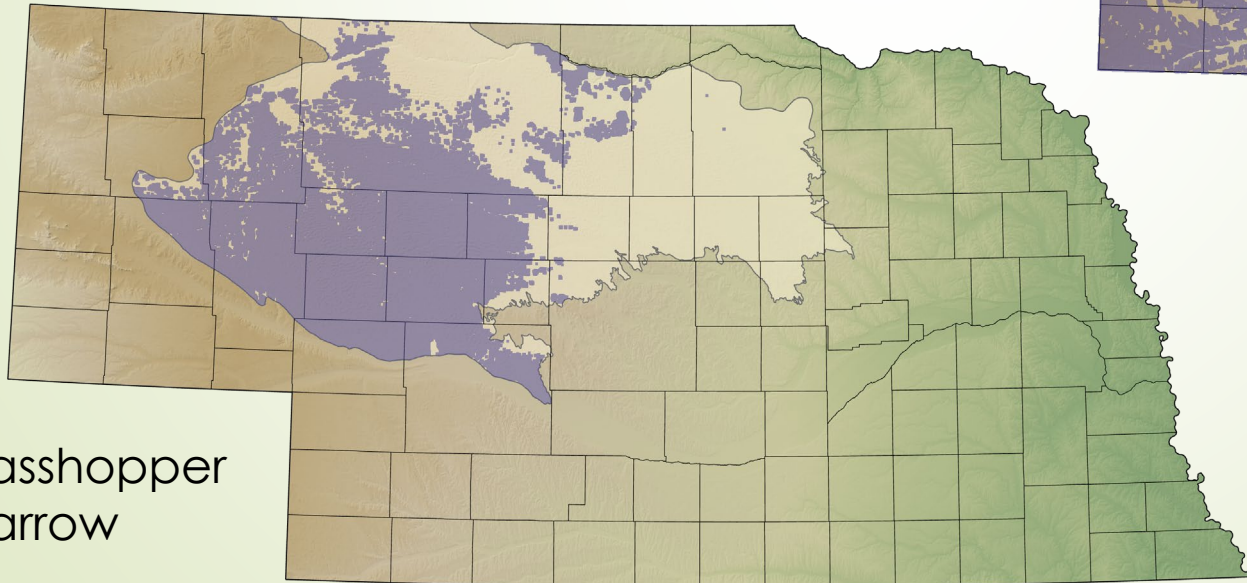
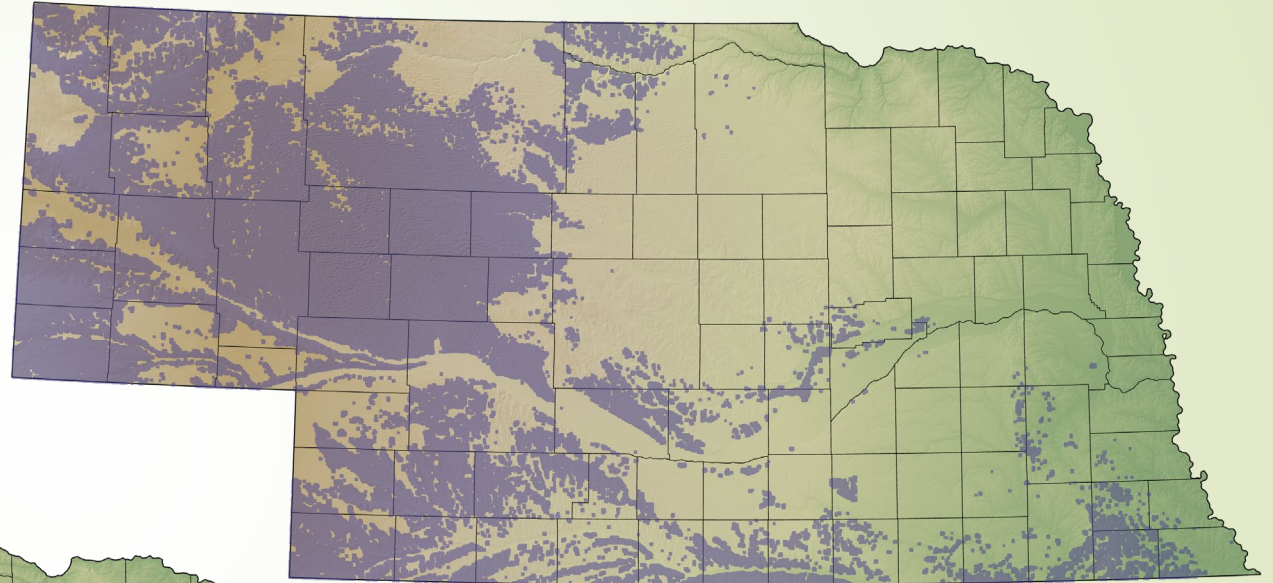
Great Plains Grasslands Initiative: Working Lands for Wildlife Framework

- ▶ Project delivery with WLFW approach requires identifying overlap of three spatially defined factors: Wildlife Strongholds, Intact Landscape Cores, and Cultural Will.
- ▶ Sandhills project delivery CEAP focuses on quantifying impact to Wildlife Strongholds (Grassland Birds) and Intact Landscape Cores (Woody Encroachment of Grasslands).
- ▶ Comparing opportunistic (random) delivery that occurred through NRCS programs (EQIP, General CTA, etc.) from 2016-2021 with WLFW strategic approach.



Defining Wildlife Cores

- Wildlife Cores are the smallest area that supports 50% of the population and the habitat supporting those populations (800-meter scale).

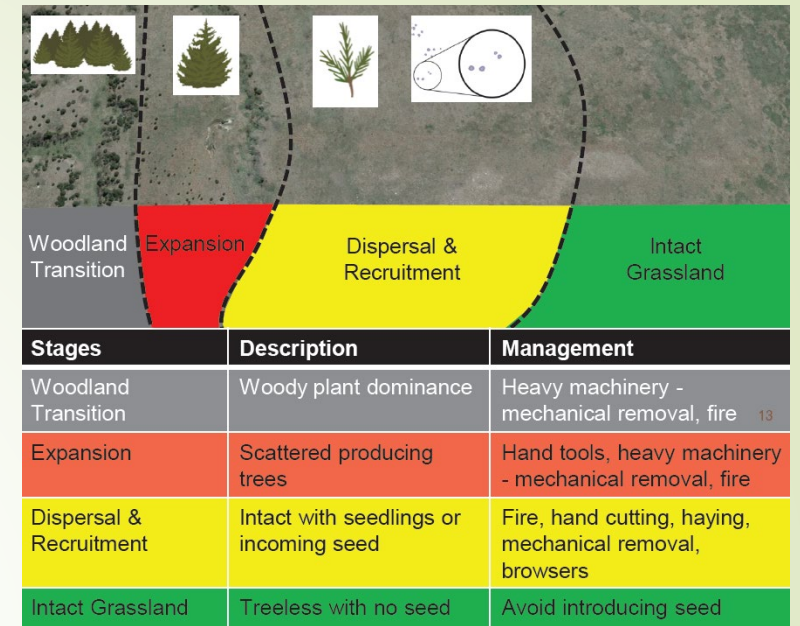


Grasshopper Sparrow

- Wildlife Cores can be calculated for any input region, which allows cores to be tailored to partner focus areas.

Defining Grassland Cores: Woodland Transitions and Encroachment into Intact Grasslands

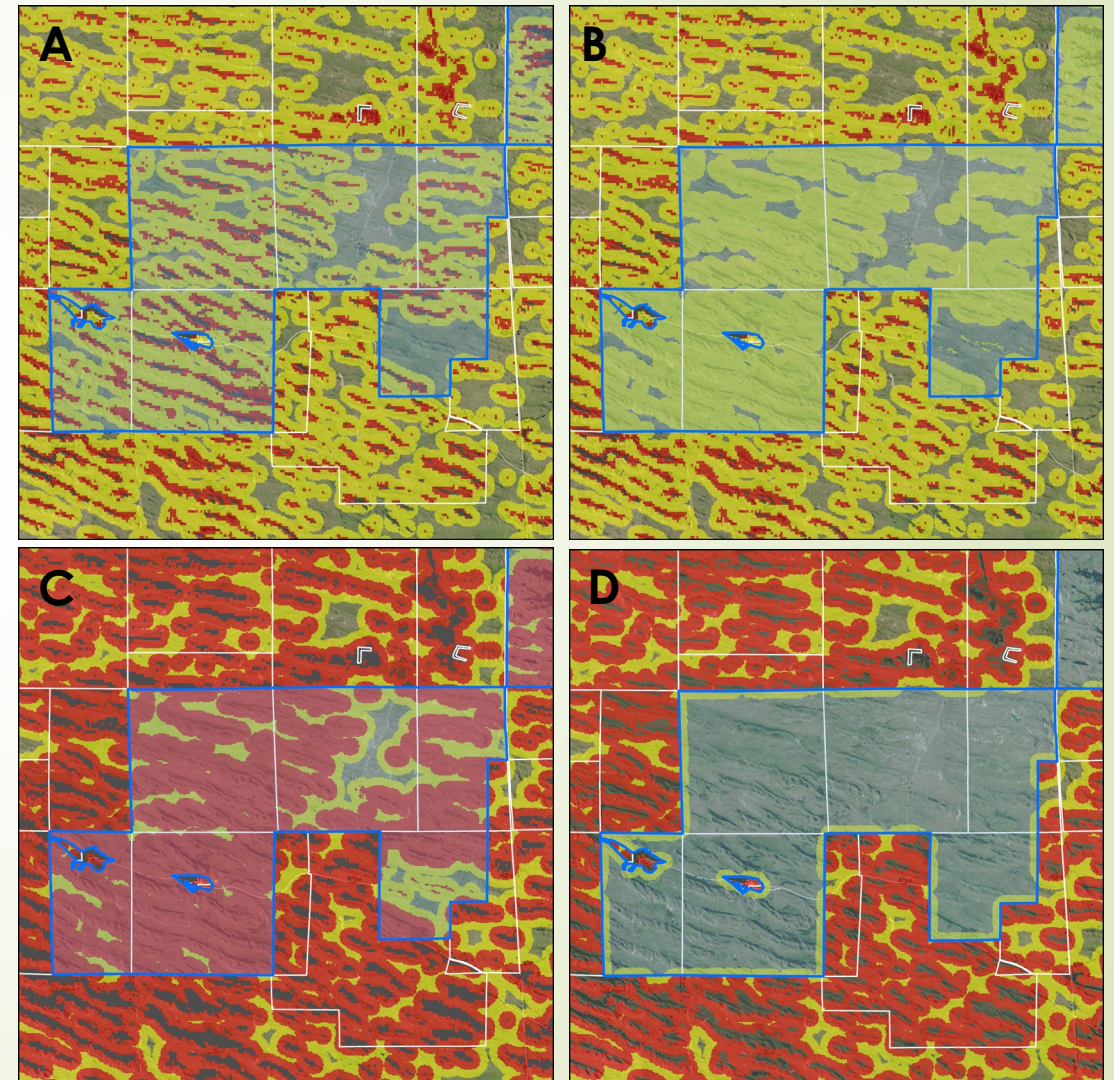
- GPGI has defined woodland encroachment zones into intact grasslands: Woodland Transition, Expansion, and Dispersal & Recruitment.
- RWBJV developed a Toolbox to convert % canopy (RAP, RaBET, NLCD, etc.) to hybrid GPGI and NRCS Practice Payment Scenario definition (table at right).
- Woodland Transition and Expansion zones both contain mature trees - direct reclassification of % Canopy
- Dispersal & Recruitment – defined as 90% within 90-meters and 95% within 180-meters (Fogerty et al. 2022). CEAP uses 90% (90-m) definition.
- Intact Grassland defined by MoRAP Land Cover, all canopy inputs resampled to 10-meters (Nebraska specific).



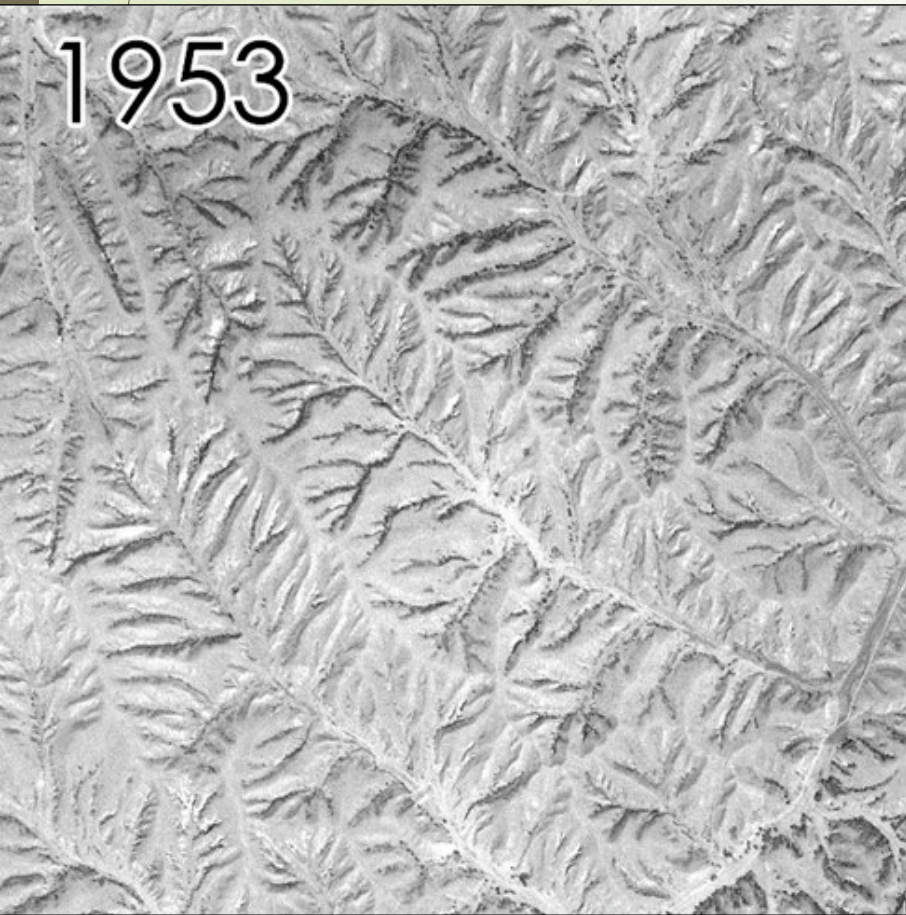
CEAP Encroachment Zones	NRCS Practice Payment Scenario	Hybrid GPGI and NRCS Practice Payment Scenario Definition	Nebraska Practice Payment (USD/Acre)
Woodland Transition (Severe)	#78 – Mechanical and Chemical, Severe Infestation	>45% RAP tree canopy	\$451.15
Expansion (High)	#5 – Mechanical and Chemical, Heavy Infestation	15-45% RAP tree canopy	\$290.63
Expansion (Moderate)	#38 – Mechanical and Chemical, Medium Infestation	6-15% RAP tree canopy	\$110.68
Expansion (Low)	#3 – Mechanical and Chemical, Low Infestation	3-5% RAP tree canopy	\$43.31
Dispersal and Recruitment (Ultra-Low)	#276 – Mechanical, Hand tools	<3% RAP tree canopy, within 90-meters of Woodland Transition or Expansion zones	\$10.13
Grassland Cores (Ultra-low)	Landowner responsibility in CEAP	<3% RAP tree canopy, outside encroachment zones	-

Grassland Cores: Woodland Encroachment Progression in Response to Management

- A) Current landscape composition of woodland encroachment
- B) Mature trees are treated through mechanical tree removal, small trees and seeds in the soil survive
- C) Without follow-up treatments of mechanical removal and/or prescribed fire, mature trees re-establish as if no treatment was ever performed, and the dispersal zone continues outward.
- D) Only when the follow-up treatments, targeting trees before they mature, allows depletion of woody seed bank. Encroachment risk is limited to the periphery and intentional shelterbelt retentions.

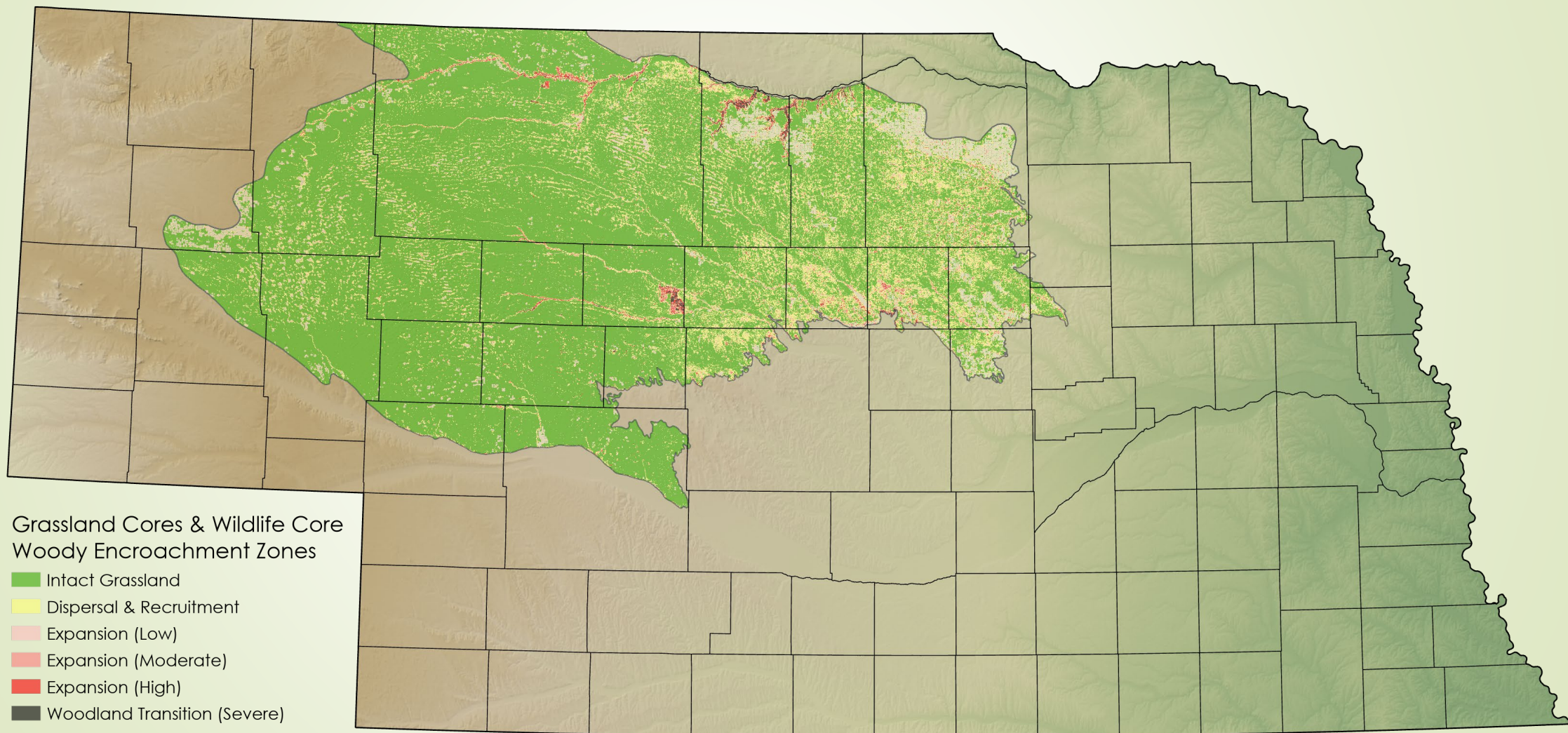


What does encroachment look like?



Eastern red cedar encroachment West of Jeffrey Lake Wildlife Management Area in Lincoln County, Nebraska.

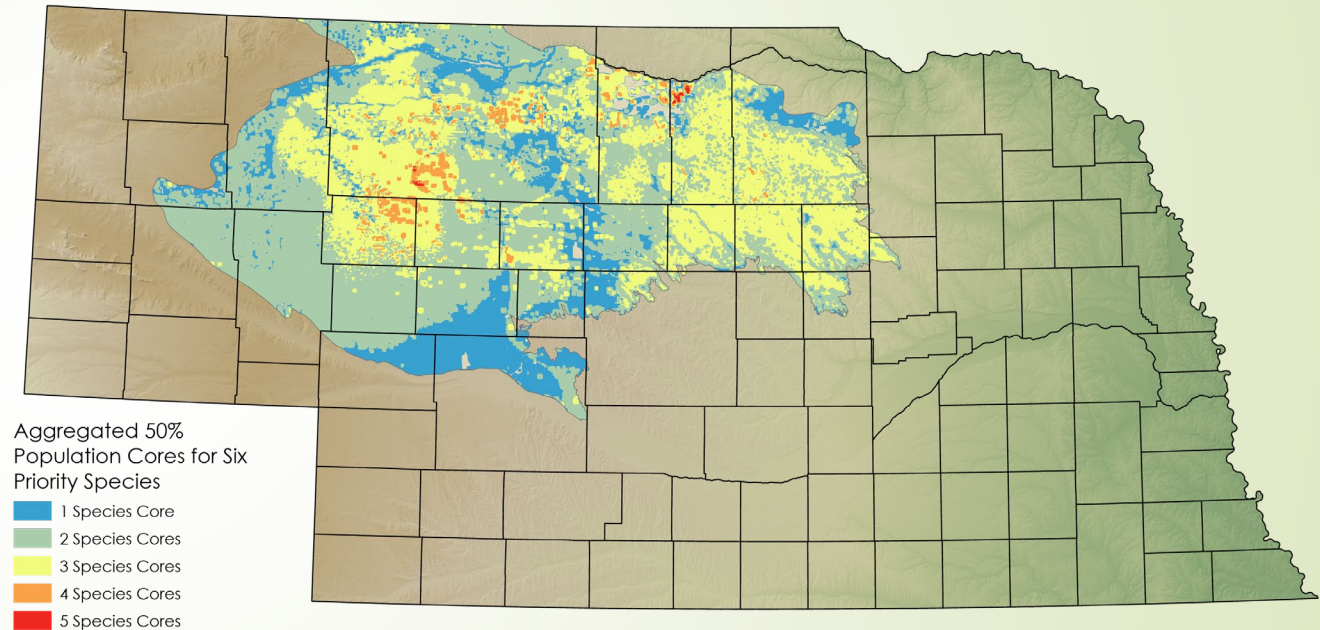
Sandhills Grassland Core: Composition of Woody Encroachment (Rangeland Analysis Platform, RAP v3 2021)



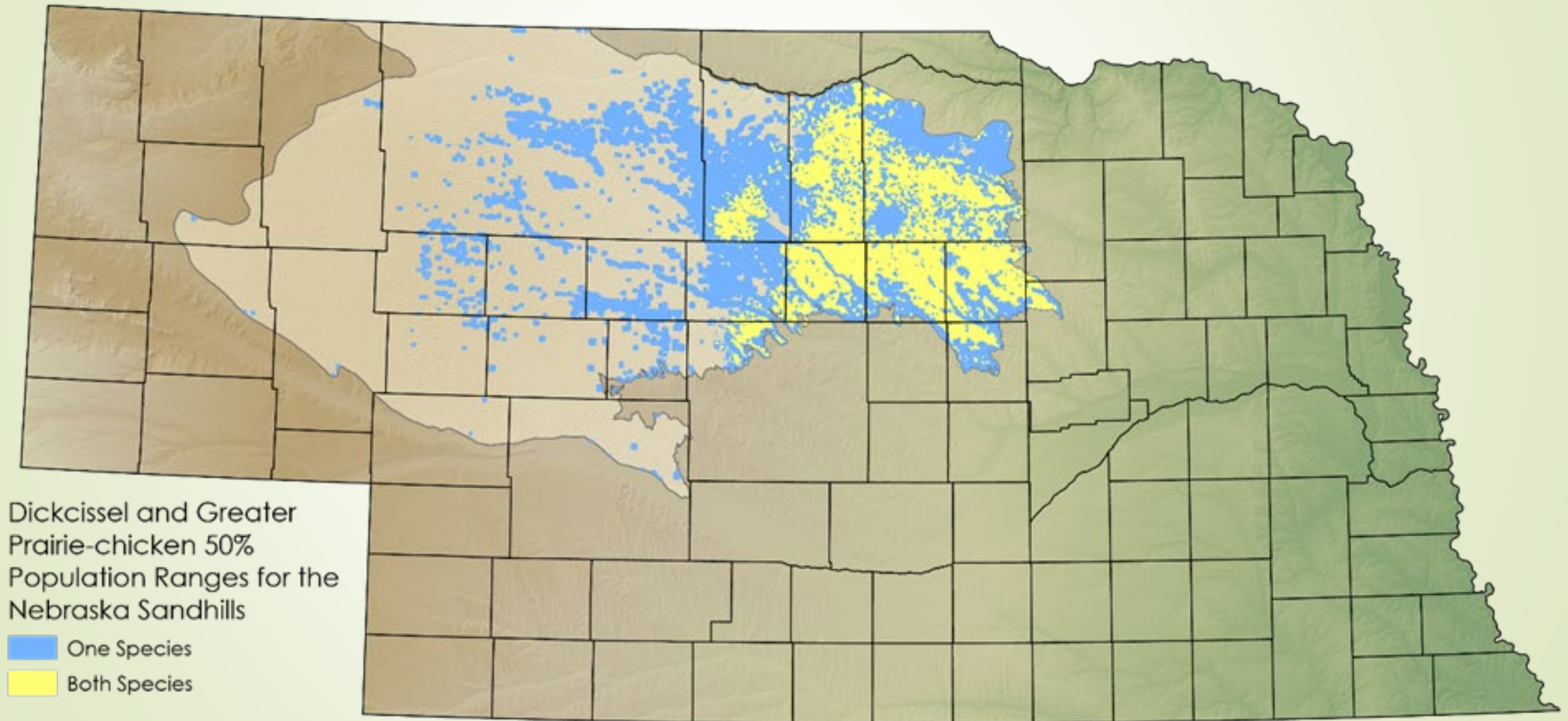
Combining Grassland and Wildlife Cores



- Initially looked at maximizing conservation delivery to impact the highest diversity of species.
 - Prioritized delivery results impacted a higher diversity of birds but resulted in fewer overall birds impacted than opportunistic (random) delivery.
- Instead, CEAP uses species with the most aggressive conservation strategy identified in the RWBJV Landbird Plan.

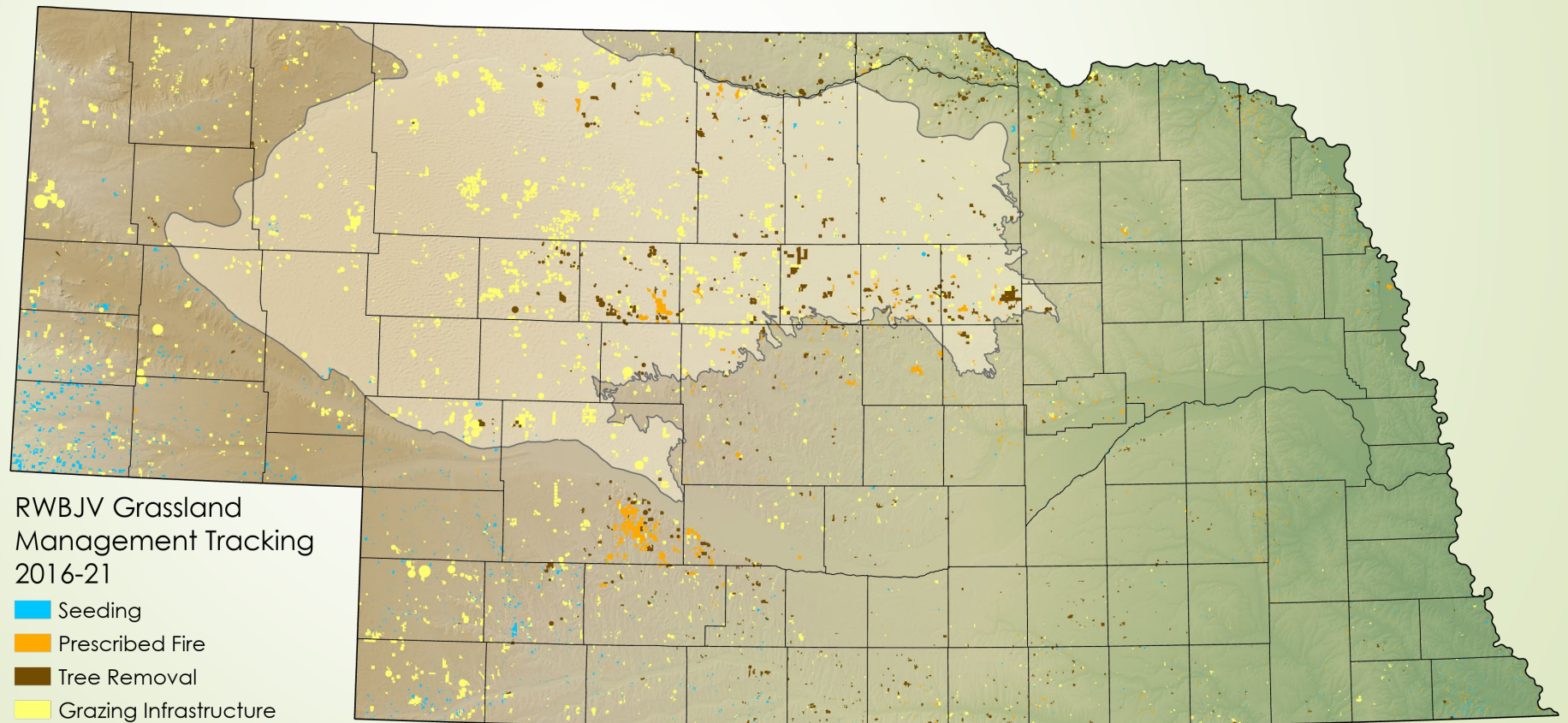


Sandhills Wildlife Core Used in CEAP



RWBJV Project Tracking 2016-21

- ▶ Projects are spatially tracked by partners and compiled by the RWBJV.
- ▶ Allows the partnership to evaluate habitat management and restoration goals.



NRCS Grassland Project Delivery for the Sandhills 2016-21

Treatments 2016-21	Treated Acres	Grassland Core	Dispersal & Recruitment	Expansion (Low)	Expansion (Moderate)	Expansion (High)	Woodland Transition
Unique Area	684,110 (764,983)	558,438 (612,760)	80,535 (90,177)	14,441 (15,403)	8,411 (9,569)	7,051 (8,087)	2,381 (2,710)
Grazing Infrastructure	577,300 (596,100)	495,985 (509,133)	55,746 (59,752)	9,075 (9,871)	3,986 (4,441)	2,872 (3,105)	963 (1,002)
Prescribed Fire	19,394 (47,415)	8,046 (25,016)	5,657 (14,238)	1,501 (2,945)	1,157 (2,014)	1,000 (1,616)	308 (382)
Tree Removal	118,364 (168,584)	69,286 (101,130)	27,875 (39,939)	5,879 (7,983)	4,797 (5,927)	4,639 (5,402)	1,763 (2,042)

- Values indicate Conservation delivery through NRCS programs.
- Values in parenthesis indicate conservation delivery by all Partners.

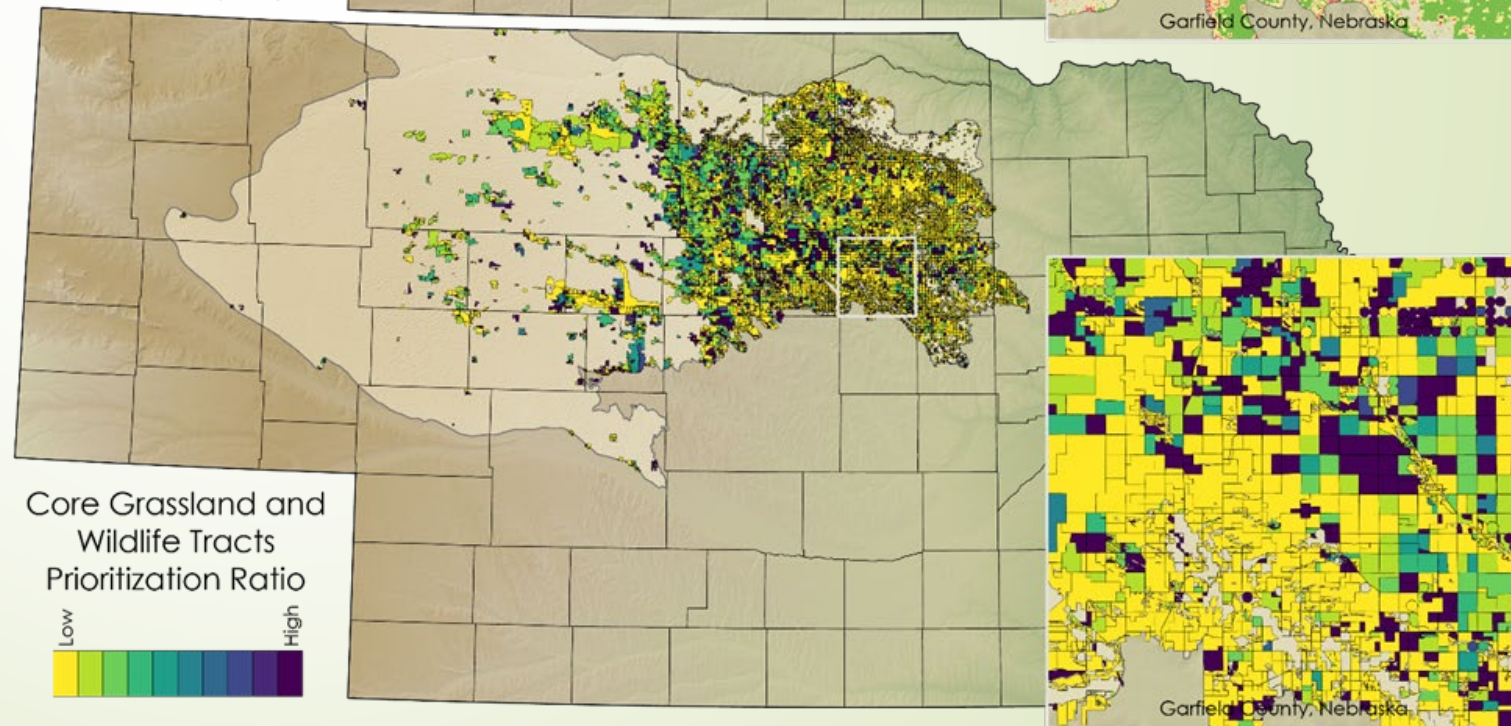
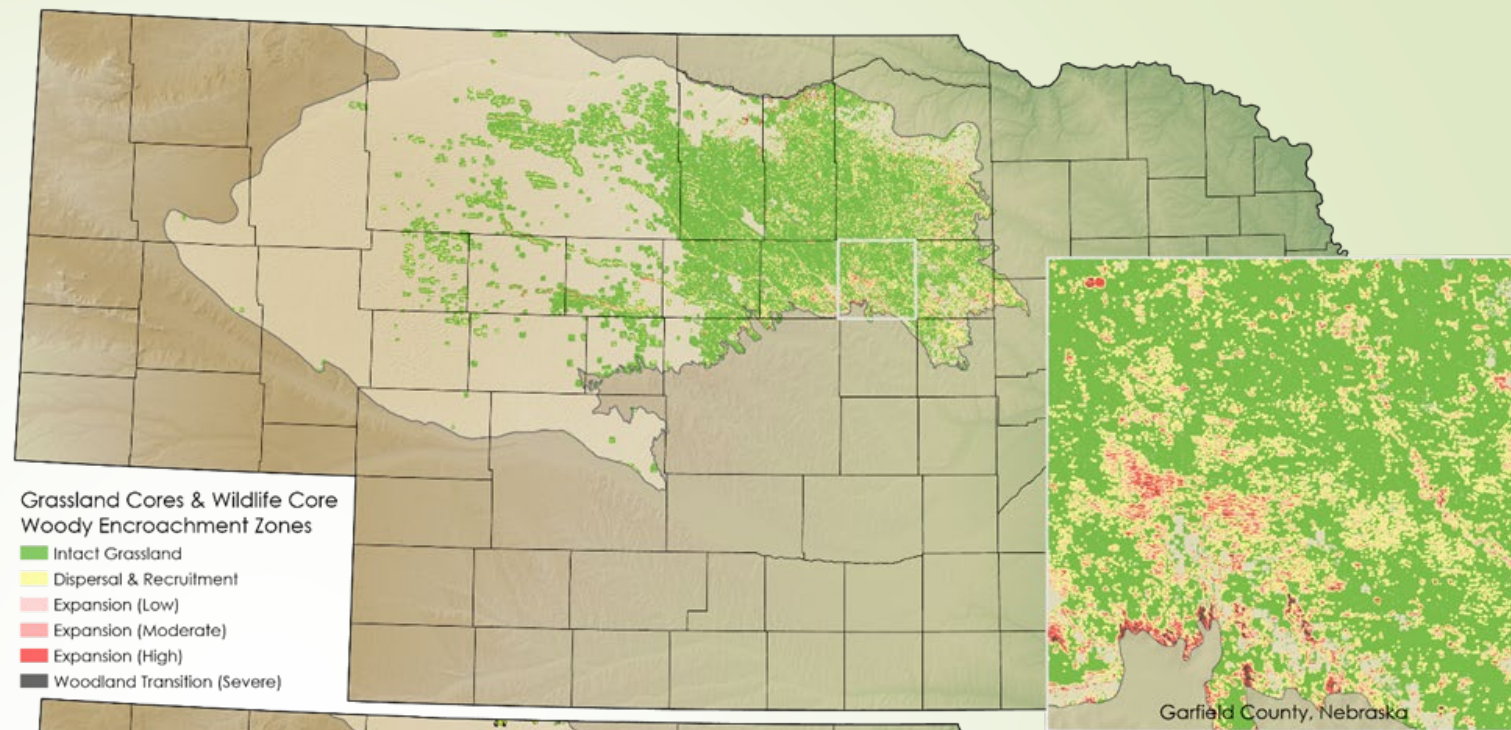
NRCS Tree Removal Project Delivery 2016-21

Tree Removal 2016-21	Treated Encroachment Acres (RAP 2016)	FY 2022 Payment Estimates/Acre	Total Treatment Cost 2016-2021 (USD)	Average Annual Treatment Cost (USD)
Woodland Transition	1,763	\$451.15	\$795,377.45	\$132,562.91
Expansion (High)	4,639	\$290.63	\$1,348,232.57	\$224,705.43
Expansion (Moderate)	4,797	\$110.68	\$530,931.96	\$88,488.66
Expansion (Low)	5,879	\$43.31	\$254,619.49	\$42,436.58
Dispersal & Recruitment	27,875	\$10.13	\$282,373.75	\$47,062.29
Grassland Core	69,286	\$10.13	\$701,867.18	\$116,977.86
Total	114,239	-	\$3,913,402.40	\$652,233.73

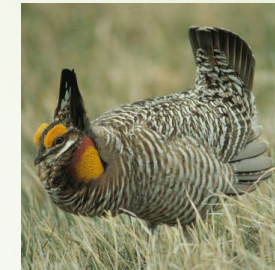
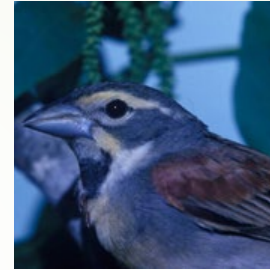
- Compare delivered acres & bird impact estimates (based on FY22 NRCS payments) with prioritized delivery (6-year, non-intact expenditures = \$535,256)
- Prioritization is based on ratio of Intact Grassland + Dispersal & Recruitment + Expansion (Low) : Expansion (Moderate + High) + Transition zones

Prioritization 2016

- CLUs used to represent project delivery land units
- Prioritization is based on ratio of Intact Grassland + Dispersal & Recruitment + Expansion (Low) : Expansion (Moderate + High) + Transition zones




Estimated Grassland Bird Impact



Resources = \$535,256 (est. 2016-21)

Mechanical Tree Removal Delivery	Average Annual Acres Impacted	Average Annual Dickcissel Impacted	Average Annual Greater Prairie-chicken Impacted
NRCS Tree Removal 2016-2021	19,727	1,408	331
Prioritized Tree Removal	303,209	23,481	6,665
Additional Impact Through Prioritization	283,482	22,073	6,334



CEAP Part 2: Provide Guidance for Future Conservation Delivery

- ▶ Consider encroachment progression rates as delivery roll-out proceeds at 30-year goals.
- ▶ Use prioritization method used to prevent further encroachment of the most intact acres
 - ▶ May result in the loss of some habitat at high-risk of encroachment
- ▶ Compare 30-year habitat loss estimates with species habitat goals (Western Meadowlark).
 - ▶ Identify costs to meet Western Meadowlark habitat goal.

CEAP Landbird Habitat Goals

- 30-year WEME grassland habitat projection (4,227,459- acres) in core area short of goal (4,474,048-acres)
- 30-year WEME grassland habitat projection across the GFA is not short
 - Millions of acres at continued threat = Unsustainable

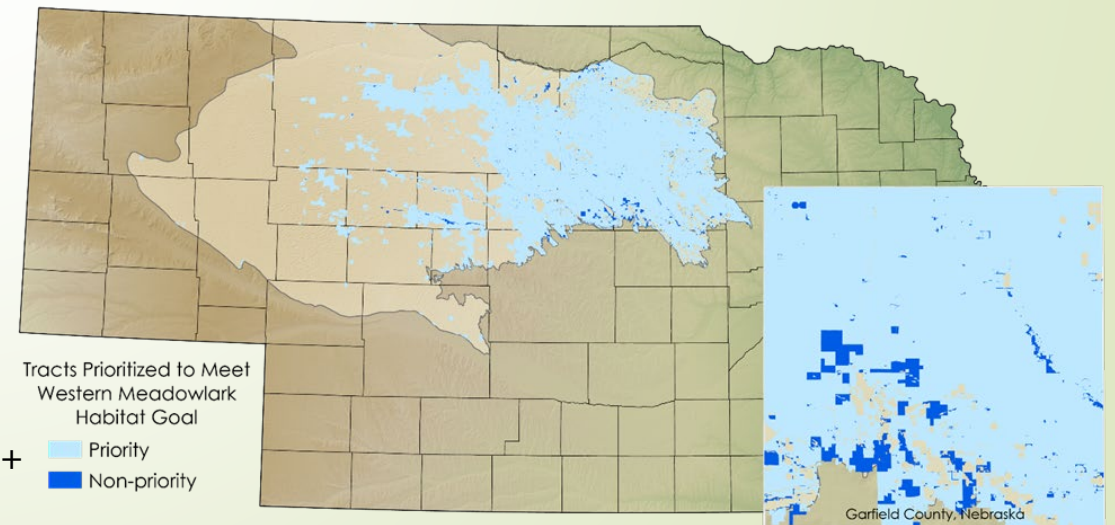
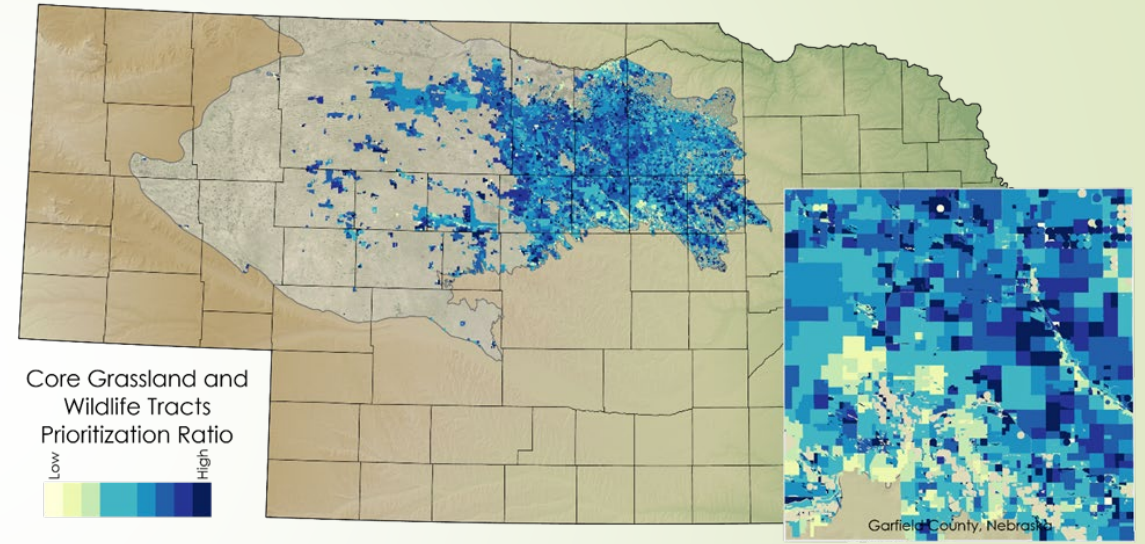
Sandhills GFA	10-yr Rate	2021 Acres	Projected 10-yr Acres	Projected 30-year Acres
Dispersal Recruitment	0.4070452 28	2,068,010	2,909,784	4,593,331
Expansion (Low)	0.1058008 2	297,509	328,986	391,939
Encroachment (Moderate)	0.0435663 21	143,818	150,084	162,615
Encroachment (High)	0.1402668 98	49,184	56,083	69,881
Transition (Severe)	0.0093047 91	3,136	3,165	3,224

Dickcissel and Western Meadowlark Core Area	10-yr Rate	2021 Acres	Projected 10-yr Acres	Projected 30-year Acres
Dispersal Recruitment	0.3899975 56	1,325,659	1,842,663	2,876,670
Expansion (Low)	0.1162085 43	196,390	219,212	264,856
Expansion (Moderate)	0.0632449 52	92,398	98,242	109,929
Expansion (High)	0.0375872 58	22,940	23,802	25,527
Transition (Severe)	0	670	670	670

Core Prioritization using GPGI WLFW Prioritization 2021

- With retreatment cost-share on Expansion/Transition included, priority areas treatments cost as little as \$25,342,000
- Dispersal & Recruitment area within the non-priority tracts is 26,855-acres, but is not necessary to treat since encroachment is allowed to continue within these tracts.

Prioritization is based on ratio of Intact Grassland + Dispersal & Recruitment + Expansion (Low) : Expansion (Moderate + High) + Transition zones





Entire Sandhills GFA

- ▶ Estimated cost to the partnership to treat the entire Sandhills region range from \$70,461,671-109,625,500 USD.
 - ▶ Variation in range largely dependent on how quickly conservation partners can deliver treatments.
- ▶ At the current rate of woodland encroachment, an additional \$578,000 USD in treatment cost is incurred on an annual basis.

