

Nevada

Sagebrush Ecosystem Program

A History of Pivots in the
Conservation Credit System

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NEVADA
**SAGEBRUSH ECOSYSTEM
PROGRAM**



Nevada Department of
**CONSERVATION &
NATURAL RESOURCES**



Nevada
Department
of Agriculture





Pivots have always been considered non-habitat for greater sage-grouse from the beginning of the Program due to the increase in predator subsidies/densities.

Policy

- Not considered a debit project due to the agricultural exemption
- Removed from credit projects and considered non-habitat when on the landscape near a CCS project
- Considered a “sink” due to the attraction of a limited resource – meadow – but with an increase in mortality due to increased predation

Center Pivot Irrigation

- Method of watering crops where a long metal pipe on wheeled towers rotates in a slow, steady circle around a central point
 - Uses up to 30% to 50% less water than flood irrigation by reducing evaporation and runoff
 - Powered by electric or hydraulic motors
 - Has a power source (transmission lines or generator)
 - Connected to a water source like a well with pipelines
- Ranges in length from 60 feet up to 2,800 feet (1/2 mile), watering fields that range from 5 acres to over 500 acres
- Ranges in height from 6-16 feet depending on the crop it is watering
 - 9-10 feet is standard, while 6-7 feet can be used for alfalfa



Lack of Data

- There is currently no research on the direct impacts that pivots may have on Greater Sage-grouse (GRSG)
- Indirect research
 - Croplands (pivots included) remove sagebrush cover necessary for GRSG survival
 - Croplands (pivots included) attract GRSG by offering limited brood rearing resources
 - Pivot structures and the increased subsidies in croplands draw predators and create perching and nesting opportunities
 - Ravens have been named as one of the greatest impacts to GRSG populations



Brood Rearing Habitat

Sage Grouse Management for Montana Landowners – MSU

“As soon as they are hatched, chicks are able to search for food. Hens usually rear their brood approximately one to two miles from the nest site...Sagebrush and meadow habitat is used for food, shade and protection. Because of the importance of forbs during this time, drainage bottoms, streambeds and agricultural fields are also used.”



Avian Predation

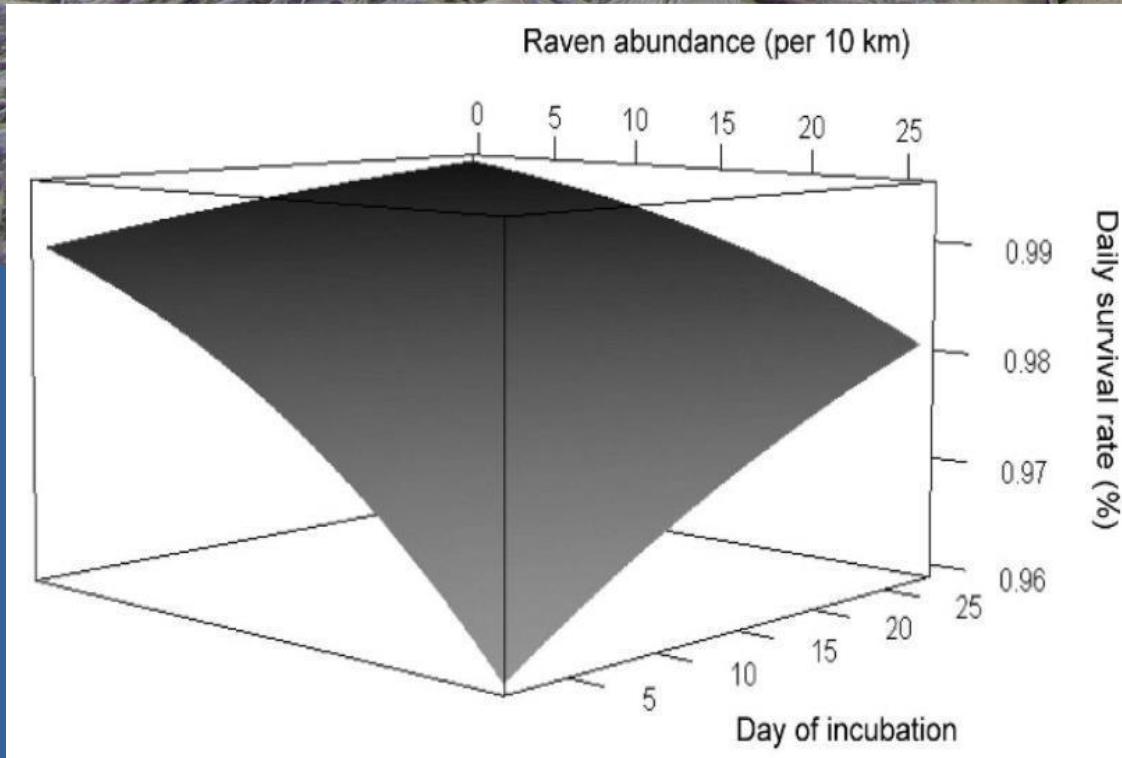
Conover and Roberts 2016

- “Most adults [sage-grouse] (51% [of 117]) were taken by eagles, primarily by golden eagle, but 3 mortalities were caused by bald eagles. Great horned owls and snowy owls killed 15%, coyotes killed 21%. Adult sage-grouse were also killed by prairie falcons, northern goshawks, red foxes, bobcats, badgers, and American mink.”



Nest Predation from Ravens

Coates and Delehanty 2010



Resp.	Covariate	Estimate	95% CI	
			lower	upper
Raven	raven	0.23	0.11	0.41*
	shrub cover	-0.08	-0.15	-0.02*
	grass	0.17	-0.63	0.41
	forb	0.16	-0.40	0.70
	understory	0.02	-0.04	0.08
	shrub height	0.00	-0.06	0.06
Badger	understory	0.10	0.03	0.12*
	forb	0.70	0.13	1.43*
	grass	0.23	-0.02	0.49
	shrub cover	0.02	-0.02	0.06
	shrub height	0.01	-0.01	0.42

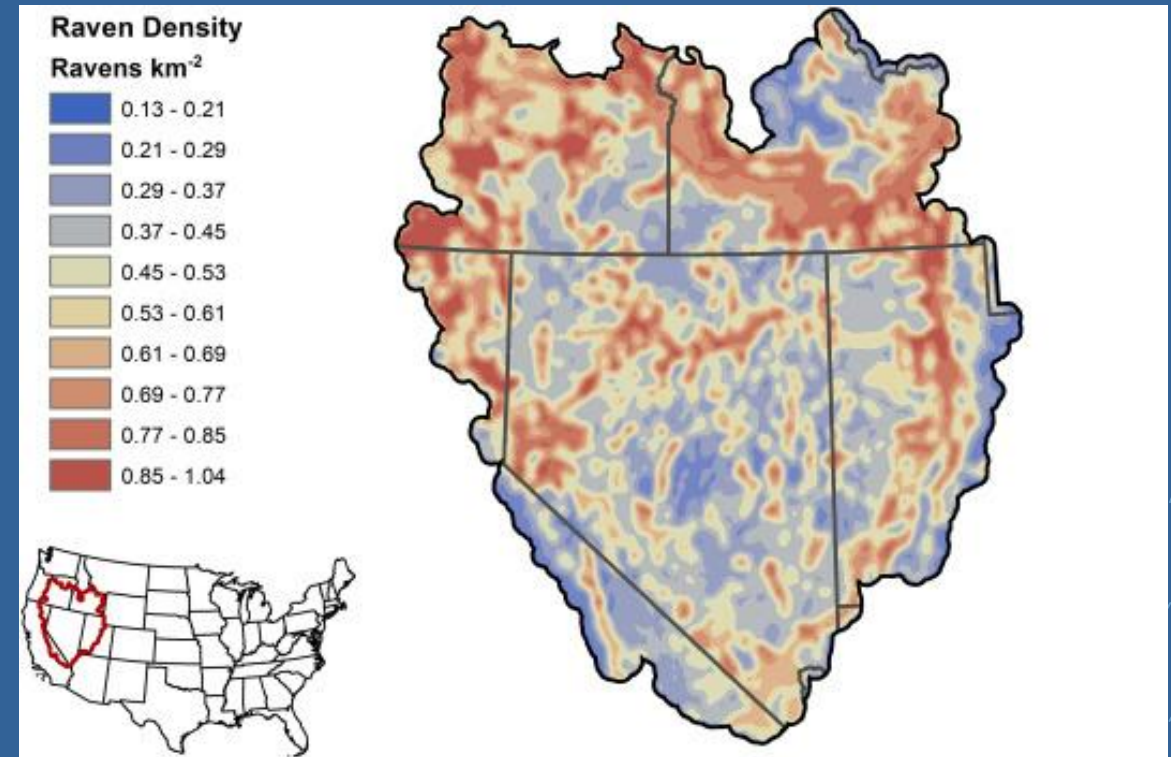
“An increased index value of one observed raven (per 10 km) was associated with an approximately 7.4% increase in the odds of nest failure (odds ratio 5 1.074, 95% CI 5 1.034–1.114).”

“A 1% decrease in shrub cover increased the odds of raven predation by 7.5% (95% CI 5 2.0–15%).”

Raven Density

Coates et al. 2020

“Common ravens (*Corvus corax*; hereafter, ravens) are opportunistic generalist predators native to North America (Boarman and Heinrich, 1999)...Average [raven] density [in the Great Basin] was 0.54 ravens km^{-2} (95% CI: 0.42–0.70), with higher densities at lower relative elevations comprising increased agriculture and development...We identified negative impacts to nesting sage-grouse, especially where raven density exceeded $\sim 0.40 \text{ km}^{-2}$, a potential ecological threshold. We mapped regions where elevated raven densities were predicted to depress sage-grouse population growth in the absence of compensatory demographic responses from other sage-grouse life-history stages, and found $\sim 64\%$ of sage-grouse breeding areas were adversely impacted by high raven density.”



Cropland Conversion

Smith et al. 2016

- “Cropland has been implicated as a limiting factor for sage-grouse (e.g., Walker et al., 2007, Aldridge et al., 2008, Knick et al., 2013) but the spatial scale at which cropland affects sage-grouse distribution has received little attention. For example, Knick et al. (2013) found that approximately 25% cropland within 5 km constituted an upper threshold for sage-grouse breeding habitat in the western portion of their range, and Aldridge et al. (2008) found that extirpation was likely in counties comprised of >25% cropland.”

Knick et al. 2013

- “Percent agriculture varied widely across individual lek locations, but <2% of the leks were in areas surrounded by >25% agriculture within a 5km radius, and 93% by <10% agriculture (Fig. 5B).”

(Note agriculture here is defined as cultivated croplands)

Aldridge et al. 2008

- “[There was] a 3.7% decrease in sage-grouse persistence per 1% increase in the percentage of cultivated cropland... Conversely, sage-grouse extirpations were more likely to occur in areas where cultivated crops exceeded 25% (Fig. 2b). Although sage-grouse are known to forage on agricultural crops, such as alfalfa (Patterson, 1952), extensive cultivation and fragmentation of native habitats have been associated with sage-grouse population declines (Schroeder, 1997; Braun, 1998; Leonard et al., 2000; Aldridge & Brigham, 2003).”

Cropland Conversion

Smith et al. 2016

“Adding to evidence that sage-grouse respond negatively to a growing human footprint, we show that a 10 percentage point increase in cropland in a 32.2 km² (12.4 mi²) landscape can reduce lek density by more than half. Ten percent of 32.2 km² equates to slightly more than one Public Land Survey System section (2.59 km² or 1 mi²); a single landowner breaking out a new field can thus strongly reduce persistence of leks in a landscape ten times the size of the field itself. Our findings suggest that half of known active leks risk extirpation with $\leq 22\%$ of the landscape in cropland, which generally agrees with results of previous investigations that found low tolerance for this disturbance (e.g., Aldridge et al., 2008, Knick et al., 2013). Importantly, our study builds upon previous work by clarifying the scale at which the cropland effect manifests. Approximately 96% of known active leks in MZ1 have $< 15\%$ cropland within the 32.2 km² landscape (Fig. 2), highlighting once again the importance of large, intact sagebrush landscapes to sage-grouse persistence. Conservation efforts to prevent future conversion should focus on protecting landscapes with little or no existing cropland.

Several mechanisms could be responsible for the strong negative effect of cropland fragmentation on lek density. Populations in crop-fragmented landscapes may be exposed to increased risk of nest predation or early brood failure due to altered predator abundance or their foraging efficiency—a phenomenon well documented in ground-nesting ducks (Greenwood et al., 1995, Phillips et al., 2003). Processes affecting the suitability of the breeding grounds more directly might include increased predation during lekking or while birds are concentrated near leks in spring.”



Summary

- Pivots, while increasing the abundance of important wet meadow-like areas for wildlife, have always been considered a sink for GRSG due to increased mortality from predation.
 - The direct effects of pivots on GRSG have not been studied
 - Pivots increasing the presence of GRSG predators has been found
 - Could be ways to reduce impacts if studied
 - Effective perch deterrents and increased predator control
 - Lowering the height of the pivot arm
 - Increasing cover immediately adjacent to site
 - Reducing the contiguous acreage of cropland
 - Reduction of other available subsidies

Consideration

- SETT Recommendation:
 - Continue to consider pivots as non-habitat
 - Maintains consistency for ranchers
 - Continue waiting for further research



Resources

Aldridge, C.L., Nielsen, S.E., Beyer, H.L., Boyce, M.S., Connelly, J.W., Knick, S.T., Schroeder, M.A., (2008), Range-wide patterns of greater sage-grouse persistence. *Divers. Distrib.*, 14, pp. 983-994.

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Thank You

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