Research Brief – Sagebrush, agriculture and sage-grouse

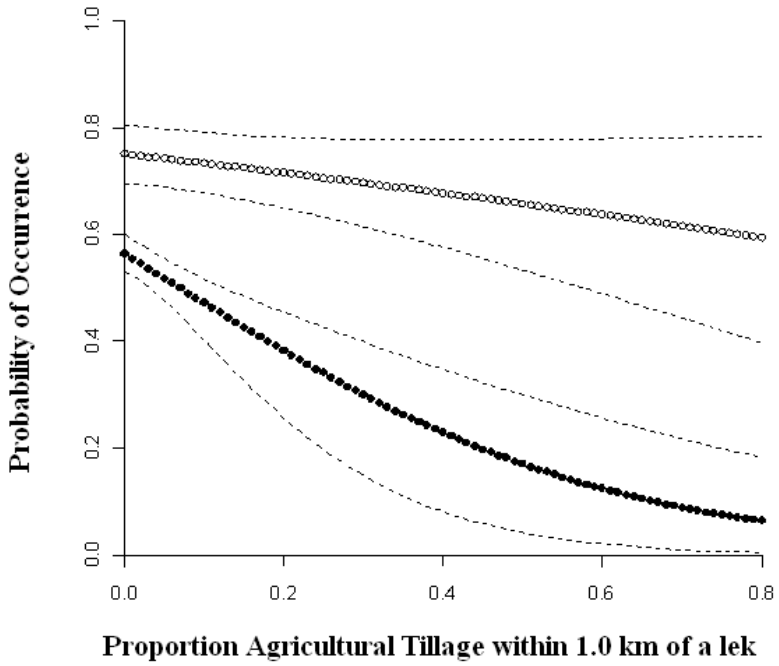
Impacts of cropland agriculture on sage-grouse populations

Swenson, J.E., C.A. Simmons and C.D. Eustace. 1987. Decrease of sage grouse *Centrocerus urophasianus* after ploughing of sagebrush steppe. Biological Conservation 41:125-132.

- Number of males on leks declined by 73% in Shields River Valley (Park Co.) between 1973 and 1984. 16% of the winter habitat area was plowed by 1984. No trend in nearby area where plowing did not occur.
- With 84% of total area in sagebrush steppe, the population index for sage grouse declined from 241 to 65 males on leks. This equated to halving the population every seven years.
- Sagebrush loss was on a relatively small area but a relatively large portion of winter habitat (30%).

Tack, J.E. 2009. Sage-grouse and the human footprint: implications for conservation of small and declining populations. M.S. Thesis, University of Montana, Missoula.

- Large leks are 4.5 times less likely to occur than small leks when agricultural tillage fragments 21% of land within 1.0km of breeding sites.
- Figure below. Probability of active lek occurrence of leks with < 25 males (open circles), and leks >25 males (closed circles) and agricultural tillage within 1.0km of a lek, values predicted for leks in big sagebrush habitat.



Knick, S.T., S.E. Hanser, R.F. Miller, D.A. Pyke, M.J. Wisdom, S.P. Finn, E. Thomas Rinkes, and C.J. Henny. 2011. Ecological influence and pathways of land use in sagebrush. Pp. 203-251 *in* S.T. Knick and J.W. Connelly (eds.). Greater Sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol 38), University of California Press, Berkeley, CA.

- Agriculture, mostly mapped croplands, currently covers >230,000 km^2 (11%) of sage-grouse habitat.
- In the Great Plains (MZI), agriculture covers 18.7% and area influenced by agriculture ranges from 68.1 to 90.7% of the landscape.

Knick, S.T., S.E. Hanser, and K.L. Preston. 2013. Modeling ecological minimum requirements for distribution of greater sage-grouse leks: implications for population connectivity across their western range, U.S.A. Ecology and Evolution doi:10.1002/ece3.557.

- <2% of leks were in areas surrounded by >25% agriculture within a 5-km radius and 93% by <10% agriculture.

Copeland, H.E., A. Pocewicz, D.E. Naugle, T. Griffiths, D. Keinath, J. Evans, and J. Platt. 2013. Measuring the effectiveness of conservation: a novel framework to quantify the benefits of sage-grouse conservation policy and easements in Wyoming. PLoS One 8(6): e67261. Doi:10.1371/journal.pone.0067261.

- "Targeted easements [$250 mil] averted an additional 9-11% of expected declines compared to that of the core area policy alone." In Wyoming.
- "…random placement of easements within core areas has much lower potential for benefiting sage-grouse populations."

Importance of Sagebrush Habitats to Sage-grouse

Johnson, D.H., M.J. Holloran, J.W. Connelly, S.E. Hanser, C.L. Amundson, and S.T. Knick. 2011. Influences of environmental and anthropogenic features on greater sage-grouse populations, 1997-2007. Pp. 407-450 *in* S.T. Knick and J.W. Connelly (eds.). Greater Sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol 38), University of California Press, Berkeley, CA.

- Lek trends increased modestly but steadily with the cover of all sagebrush at both 5-km and 18-km radius around leks.

Wisdom, M.J., C.W. Meinke, S.T. Knick, and M.A. Schroeder. 2011. Factors associated with extirpation of sage-grouse. Pp. 451-472 *in* S.T. Knick and J.W. Connelly (eds.). Greater Sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol 38), University of California Press, Berkeley, CA.

- Compared historical locations in occupied (n=239) vs extirpated (n=136) range for sage-grouse
- Historical locations in occupied range contained almost twice as much are in sagebrush as those in extirpated range (46% vs. 24% area).
- Mean patch size of sagebrush was >9 times larger, and mean core area >11 times larger, in occupied versus extirpated range. Sagebrush patches also were substantially closer to one another in occupied range.

Knick, S.T., S.E. Hanser, and K.L. Preston. 2013. Modeling ecological minimum requirements for distribution of greater sage-grouse leks: implications for population connectivity across their western range, U.S.A. Ecology and Evolution doi:10.1002/ece3.557.

- Lek locations had approximately twice the average large-scale sagebrush cover for the study area and three times that of historic locations. 79% of area within 5km of lek was in sagebrush cover at active leks, 28% at historic but no longer occupied leks, and 35% for the study area.
- Active leks were surrounded by >40% landscape cover of sagebrush on average.

Martin, N.S. 1970. Sagebrush control related to habitat and sage grouse occurrence. Journal of Wildlife Management 34:313-320.

- Only 4% of 415 sage grouse observations were made on sprayed strips. Sprayed strips were ~9x the area of unsprayed habitat.
- Study area in southwest Montana

Wallestad, R. and D. Pyrah. 1974. Movement and nesting of sage grouse hens in central Montana. Journal of Wildlife Management 38:630-633.

- Radio-collared 31 sage-grouse hens and located 22 nests in central Montana.
- All nests occurred in sagebrush stands with a canopy coverage that exceeded 15% and sagebrush formed the nesting cover over all of the 41 nests located.
- Successful nests had significantly greater sagebrush cover within 24 inches of nest, within a 100 ft^2 plot around nest and were located in stands of sagebrush with a higher average canopy coverage than those of unsuccessful nests.
- Wintering and nesting areas are dominated by dense stands of sagebrush and should be considered together as a wintering-nesting complex. No sagebrush control should be considered on these wintering–nesting complexes.

Baker, M.R., R.L. Eng, J.S. Gashiler, M.H. Schroeder, and C.E. Braun. 1976. Conservation Committee report on effects of alteration of sagebrush communities on the associated avifauna.

- "…control of sagebrush in large blocks (larger than 16 ha) appears to be detrimental [to sage-grouse]."

Braun, C.E., T. Britt, and R.O. Wallestad. 1977. Guidelines for maintenance of sage grouse habitats. The Wildlife Society Bulletin 5:99-106.

- "[Patterson] affirmed that sage grouse have not adjusted, and doubtlessly will not adjust their life processes to fit a pattern of land use that eliminates or seriously disturbs large tracts of the sagebrush-grassland types on any of their seasonal ranges."
- The authors summarized research documenting the dependence of sage-grouse on sagebrush ecosystems.
- Recommended control of vegetation be avoided on all lands within a 3km radius of occupied leks and any areas known to have supported important wintering concentrations of sage grouse within the past 10 years.

Wambolt, C.L. and H.W. Sherwood. 1999. Sagebrush response to ungulate browsing in Yellowstone. Journal of Range Management 52:363-369.

- "Ultimately, many organisms are sacrificed with the loss of quality big sagebrush habitat."