CONSERVING HABITAT THROUGH VOLUNTARY STEWARDSHIP: DOES IT WORK?

MARGARET SKEEL[1] and ROBERT WARNOCK[2]

Nature Saskatchewan, 206-1860 Lorne Street, Regina, SK S4P 2L7, Canada,

[1] mskeel@naturesask.com, [2] warnockr@accesscomm.ca.

Conserving remaining natural habitats is a priority to maintaining the biological diversity that sustains the natural processes that provide the food, water and air that allow us to enjoy our place on earth. A number of strategies with varying levels of security and costs are used to attain this goal, including voluntary habitat stewardship agreements, conservation easements and land acquisition. Applying these together strategically is likely the most effective course. Our study focused on determining whether voluntary habitat stewardship can be an effective strategy to conserve habitat.

Voluntary habitat stewardship programs are increasingly used as part of species-at-risk habitat protection strategies in Canada. [4] Currently, only 20% of former grasslands in Saskatchewan have remained as natural habitat, and in highly arable areas of the Province only 2% of natural grasslands remain. [6] Because most native prairie is privately owned, stewardship by landowners, both voluntary and through conservation easements, is the most desired and practical way to conserve the remaining habitat which, while only a fraction of its former self, comprises an area too large for formal protection solely through acquisition. Voluntary stewardship is the more economical and locally-accepted option, although it offers less long-term security than a conservation easement.

What is voluntary habitat stewardship? It generally includes a "handshake" agreement between the landowner and a conservation organization to preserve or enhance some natural habitat. These signed agreements involve a personal commitment from the landowner, and are non-threatening as they are not legally binding, do not involve change in ownership of the land, and are indefinite in duration (usually last until cancelled by the landowner). Although not binding, voluntary stewardship agreements provide an opportunity for the conservation organization to strengthen the commitment of the landowner. This is accomplished by raising awareness of the elements of biologically diverse natural habitats, and the value of biodiversity to ecosystem stability and the landowner's operation. In recognition of their participation, landowners often receive gate signs, certificates, educational materials, newsletters

and extension services. Landowners could receive financial incentives as well for habitat enhancement, usually involving an agreement (e.g. 10-year) to maintain the enhanced land. Some Saskatchewan examples of active voluntary habitat stewardship programs include Operation Burrowing Owl (OBO), Rare Plant Rescue and Shrubs for Shrikes (Nature Saskatchewan); Prairie Stewardship (Saskatchewan Watershed Authority); and Wildlife for Tomorrow (Saskatchewan Wildlife Federation).

Comment: It is now simply called the Prairie Stewardship program

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Kleiman et al. stated the need for performance evaluation of conservation programs to determine and improve their effectiveness. [9] Until recently, voluntary stewardship programs have not been evaluated for their effectiveness in conserving habitat. In addition, direct evaluation of habitat conservation programs through comparison with historical data sets is rare, but increasingly important. We examined whether the OBO program achieved conservation of grassland habitat by using a historical data set as a control sample. [8] Our work is summarized here, and the complete published report is available from the authors. [15]

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Why Evaluate Operation Burrowing Owl?

Because almost all arable land in Canada's prairie landscape is privately owned, conservation initiatives largely depend on, or are driven by, landowners. The need for public awareness and habitat protection was demonstrated in 1986 when a study of the Regina Plain (considered to be the core of the Burrowing Owl range in Saskatchewan) found owls on only 13 of 703 grassland plots searched, and also found that suitable Burrowing Owl nesting habitat was vanishing rapidly. [8] Because of rapidly diminishing numbers, the Burrowing Owl was classified as endangered in 1995 by the Committee on the Status of Endangered Wildlife in Canada. [16] Habitat loss, degradation and fragmentation, and the associated low productivity and high mortality, have been identified as primary causes contributing to the Burrowing Owl's decline in Saskatchewan. [3, 14]

Operation Burrowing Owl (OBO), one of the longest running voluntary habitat stewardship programs in Canada, was initiated in 1987 to protect from cultivation those grassland parcels used by nesting Burrowing Owls. Through OBO, the Burrowing Owl has become a conservation symbol, and the objectives of OBO have broadened to recognize the Burrowing Owl's role as an ambassador to garner support for further conservation goals, including conservation and restoration of prairie habitat for other species. [11] Although privately held lands were initially

targeted, participants also include stewards of public lands, including provincial community and federal Prairie Farm Rehabilitation Administration (PFRA) pastures and urban centres. OBO has been delivered by Nature Saskatchewan (formerly Saskatchewan Natural History Society), with support from other agencies, since 1990.

Methods

Voluntary Agreements. The core of Operation Burrowing Owl is a one-page voluntary agreement that OBO staff discuss and sign with landowners who have Burrowing Owls nesting on their property. [7] Participating landowners agree to report annually the number of Burrowing Owls on their land, and agree to not cultivate the described area. Each agreement covers all or part of a quarter-section (65 ha), and landowners with owls on more than one location (quarter-section) sign an agreement for each location. Public lands are an exception and have one agreement for the entire enrolled area. Landowners continue to participate in OBO even if owls do not return to nest, and thus continue to conserve habitat and report numbers (or absence) of owls. [11] In recognition of their participation, landowners receive an OBO gate sign with their name and outreach material, including an annual newsletter. The works of Hjertaas and Skeel et al. fully describe the OBO program. [7, 11]

Study area. Our study area was located in southern Saskatchewan, Canada, represented by the Weyburn (62E) and Regina (72I) 1:250,000 map areas of the National Topographic Survey of Canada (Figure 1). [15] These map sheets represent areas that contained relatively high numbers (10-15) of known occupied Burrowing Owl sites during 1987-1993. [16] The study area was the same as Hjertaas and Lyon from which study the control dataset was derived. [8] The landscape composition in the study area is: 83% cropland, 11% native grassland, 3% tame pasture 2% tree/shrub and 1% water/other. About 75% of the native grassland is on land that is severely limited or unsuitable for crop production. [6]

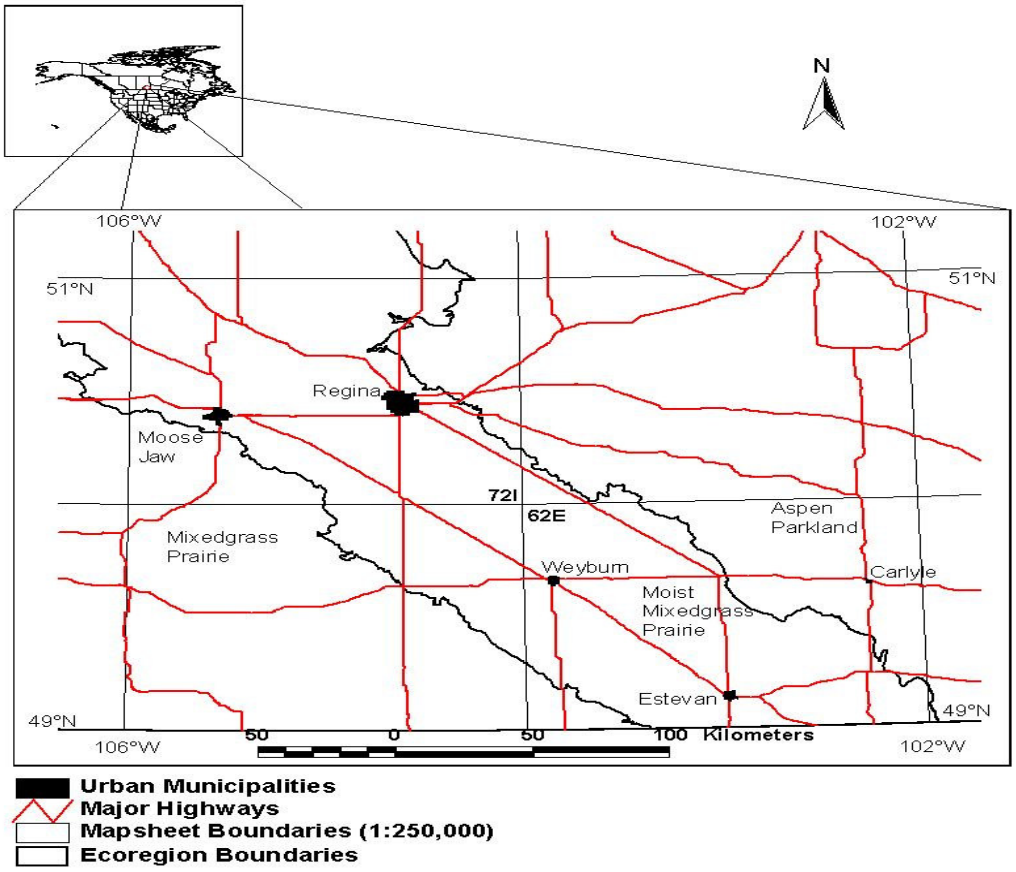

Figure 1. Map of the Regina and Weyburn Study Area of Saskatchewan, Canada (from Warnock and Skeel).[15]

Evaluation of habitat conservation. We compared OBO and random parcels of land that were grassland in 1986 with land use in 1993 to determine if grassland retention was greater at OBO sites. Our sample was the 108 private grassland parcels enrolled in the OBO program in 1987-1988, and 98 of 882 grassland parcels surveyed by Hjertaas and Lyon that were systematically selected as random sites. [15] These selected random sites were all privately owned, were not known to support Burrowing Owls and had similar habitat and soil types as OBO sites.

All OBO and random sites were assigned to one of three parcel size classes: <2 ha (≈5 acres), 2-12 ha (≈5-30 acres), and >12 ha (≈30 acres) following Hjertaas and Lyon. [8] The parcel size (grassland area) for OBO sites was obtained from the 1987-1988 voluntary stewardship agreements, where the maximum parcel size was 65 ha (160 acres). The parcel size for random sites was taken from the1986 survey (Dale Hjertaas, Unpubl. Data), where the maximum parcel size was 16 ha (40 acres) due to the 1986 study design. [15] Each site was also assigned to one of three agricultural soil suitability classes: Class 1- very fertile low relief sites; Class 2 - modestly fertile low relief sites; and Class 3 - sites with fertility limited by salinity and/or drainage or high relief, stoniness or susceptibility to erosion. [15] The agricultural soil suitability classes were based on a combination of land system (from land system maps) and soil type (from soil survey maps). [5, 10, 13]

Land use in 1993 of OBO and random sites was determined from satellite (LANDSAT) imagery, using 1992 and 1993 Southern Saskatchewan Digital Land Cover Maps. The accuracy of the digital land cover maps was assessed by verifying a sample of 96 OBO and random sites; a correction factor was then determined and applied. [15] The map was deemed accurate at a site if the size of grassland did not differ more than 10-20% from the site verification. Verification of a sample of sites suggested that the Southern Saskatchewan Digital Land Cover Map accuracy was 78% even with the seven-year time lag. [15] Through verification of 47% of grassland sites, the estimated accuracy of the data set was improved from 78% to 88%. Of the sites that were checked, the digital land cover data indicated complete grassland loss when grassland was intact at 18% of sites, underestimated the extent of grassland by an average of 50% at 4% of sites, and did not overestimate the extent of grassland at any sites. The proportions from this apparent bias were used to adjust grassland retention for 21 sites. [15]

Land use was classified into 24 cover classes according to standard procedures. [15] The area of grassland habitat in 1993 was calculated as the sum of native grassland, tame grassland (haylands were combined with tame grassland), and shrub habitats. These three habitats were judged by Dale Hjertaas (pers. comm.) to best correspond to Burrowing Owl grassland habitat as determined in Hjertaas and Lyon. [8] The 1993 grassland area for the selected sites was then compared to the 1986 grassland area for the same sites.

Retention of grassland at sites was calculated as: 1993 area / 1986 area. [15] Retention values thus ranged from 0 (no grassland was retained) to 1 (the entire grassland was retained).

Grassland retention at OBO sites was compared to retention at random sites using standard univariate (t-tests) and multivariate (MANOVAs) statistical methods. [15]

Results and Discussion

***Grassland retention rates*.** Grassland conservation was significantly higher at Operation Burrowing Owl (OBO) sites at **66%** of area retained in grassland from 1986 to 1993, than at random sites where retention averaged only **49%**. [15] These retention rates were for all parcel size and agricultural soil suitability classes combined.

When parcel size and agricultural soil suitability are considered, it becomes apparent that OBO was important to grassland conservation at sites that were at greater risk from cultivation. Both parcel size and agricultural soil suitability significantly affected grassland retention at random sites ($P<0.001$); smaller parcels sizes and better agricultural soils experienced higher loss to cultivation. [15] However, grassland retention did not differ significantly ($P>0.05$) within parcel size and agricultural soil classes at OBO sites, where grassland retention was uniformly relatively high. 15 Furthermore, grassland retention at OBO sites was significantly higher than at random sites for smaller grassland parcels (12 ha or less) and grassland parcels with excellent to average agricultural soils, although retention did not differ statistically at the larger sites or sites with poor soils (Table 1). [15]

When site type (OBO or random), parcel size and soil class were considered together, grassland retention was affected most by site type ($P=0.000$), parcel size ($P=0.012$) and their interaction ($P=0.005$). [15] Agricultural soil suitability also had an effect on grassland retention approaching statistical significance.

Table 1: Comparisons of Grassland Retention between OBO and Random Sites

	OBO Sites		Random Sites		
	Average Retention	Number of Sites	Average Retention	Number of Sites	P
All Sites	**66%**	108	**49%**	98	**0.005**
Parcel Size Classes					
<2 ha	**69%**	25	**23%**	29	**<0.001**
2-12 ha	**62%**	36	**38%**	36	**0.031**
> 12 ha	68%	47	82%	33	0.113
Agricultural Soil Suitability Classes					
Excellent	**54%**	34	**25%**	33	**0.007**
Average	**76%**	52	**49%**	41	**0.004**
Poorest	63%	22	80%	24	0.166

Habitat areas at risk. Smaller parcels were at a greater risk, likely because they are logistically easier to cultivate or they may be considered to be of little economic value as grassland to the landowner. Economically, as well as intuitively, it is not surprising that better agricultural soils were also at greater risk of cultivation. Currently, only 10% of remaining native grassland in Saskatchewan occurs on land with high productive potential, while 75% of remaining native grassland occurs on land that is severely limited or unsuitable for crop production. [6] Focusing conservation actions initially on these areas most at risk of loss would be a strategic use of resources. However, although larger grassland parcels (>12 ha) and grassland parcels with poor agricultural soils were at lower risk from cultivation, future changes in agricultural practices, and climatic and economic conditions (government policies, crop prices), could contribute to changes in the risk from cultivation of these grassland sites.

Conservation through voluntary stewardship. Voluntary stewardship through the OBO program was successful in conserving grassland habitat, and in particular at sites most at risk of loss. The conservation of Burrowing Owls, the target (and charismatic) species of the program, on their land may have been an important consideration to OBO landowners in retaining land as grassland., In addition, increased conservation awareness by OBO participants

(through OBO educational programming and other means) may have resulted in sites being maintained as grassland as owls decreased in numbers over the years, and even where there were no longer owls. The Burrowing Owl as a conservation focus and increased awareness by landowners both likely contributed to the greater retention of habitat at OBO sites compared to random sites in the area.

Our results suggest that, for the present, the OBO program focus grassland conservation resources on more vulnerable sites (i.e. small size and/or good agricultural soils) to maintain this habitat and its biological diversity within the agricultural landscape. In addition, this will provide nesting habitat for Burrowing Owls, which nest on sites as small as 1 ha or less (as well as larger sites). [3] Consideration of which sites are most valuable to owls to attain highest productivity, in addition to vulnerability of sites, would also be necessary in targeting OBO to aid in recovery of the endangered Burrowing Owl.

Fortuitously, the OBO program was initiated at a time when grassland loss in the study area accelerated. The rate of privately owned grassland loss of 3.2 % per year for 1979-1986 (based on Hjertaas and Lyon) increased to 6.0 % per year for 1987-1993. [8, 15] The latter rate is comparable to rates reported during this period by Adams and Didiuk and in Agricultural Census Data (unpub. data). [1] In addition, the percentage of grassland parcels lost significantly increased from 22.7% during 1979-1986 to 42.0% during 1987-1993. [15] However, because OBO sites comprised only 0.7% of the remaining grasslands in 1987 in the study area, it's overall effect in the area was limited. [15]

Landowner retention in the OBO program during 1987-1993 was lower in the study area at 62% than the 75% overall retention across Saskatchewan (Nature Saskatchewan unpubl. data) suggesting greater grassland loss in the study area, likely due to the overall better agricultural soils. [11] Cultivation of grasslands (followed by change of ownership) was the main reason for withdrawal from the OBO program. During the 1987-1993 period, there were strong incentives to break marginal land and disincentives to convert land back to pasture. [15] In order to maximize economic benefits from agricultural programs and policies landowners needed to maximize cultivated acreages. The removal of farm subsidies and changes in government farm policies are continuing to impact the landscape, with positive and negative effects on grasslands. [2, 12]

Conclusions

The Operation Burrowing Owl (OBO) voluntary stewardship program had a significant impact on conservation (retention) of grassland habitat at enrolled sites, and even during an era of accelerated grassland loss in the area. Does voluntary stewardship work? Our study strongly suggests that it can work to achieve conservation goals.

The success of the OBO program and other voluntary habitat stewardship programs in conserving habitat depends on landowner awareness and maintaining a long-term commitment by landowners to retain habitat. Landowners may be more willing to undertake habitat conservation and enhancement if they understand the benefits to them of natural processes, and if they can associate results of their actions with specific species responses. [17] A charismatic species such as the Burrowing Owl can serve as a conservation symbol to motivate conservation at many levels. Through OBO and other complementary programming, the Burrowing Owl has become a visible, well-known ambassador for prairie habitat conservation. Thus, maintaining a population of Burrowing Owls and other prairie conservation symbols may be important in encouraging landowner commitment. Retaining landowners in the OBO and other voluntary stewardship programs will likely depend on financial and conservation incentives, including awareness of the long-term economic benefits of maintaining biologically diverse grasslands, as well as maintaining interest through educational means and personal contact. The OBO model has proven to be a cost-effective stewardship program, and has demonstrated that voluntary habitat stewardship can effectively conserve habitat.

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