CHAPTER 2

Opportunities and Challenges in Growing Perennial Forage in Important Wildlife Areas — Lessons Learned in Delta, BC

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Figure 1. Example of a third-year grassland set-aside showing tall canopy structure and dense vegetative cover. PHOTO CREDIT: M. MERKENS.

The conversion of native North American grasslands and wetlands to farmland and other anthropocentric land-use objectives has contributed to declines in many wildlife species that have affinities for these habitats. At the same time, some wildlife that is now dependent on surrogate habitat features provided by these new agricultural landscapes, are inflicting considerable economic damage to farming enterprises. Several land stewardship practices and landscape level management strategies involving forage production are capable of supporting a variety of wildlife while partially mitigating negative consequences of intense waterfowl use of farmland. Some of these strategies and tactics have been developed for use on the Fraser River delta, an important agricultural and wildlife region of British Columbia, Canada. Several landscape level and field level practices combined with compensation programs have the potential to offset these economic losses.

Introduction

A variety of human induced changes to the native grasslands of North America are thought to be a major contributing factor to the decline of many grassland-dependent bird species (Herkert et al. 1999; Brennan and Kuvlesky 2005; Donald et al. 2006; With et al. 2008). The wholesale conversion of grassland to agricultural systems is one of several land-use decisions that have altered the ecology of these once widespread biomes, and the continued intensification of agricultural practices over the last 50 years is contributing to further declines (Murphy 2003). The widespread production of grain, oilseed, vegetable, livestock and, most recently, energy crops has resulted in conditions that can no longer provide the habitat characteristics necessary to support grassland obligate species. The loss of wetland habitat has for the same reasons impacted migratory waterfowl (Lynch-Stewart 1983; Dahl 1990).

The lower Fraser River delta is recognized as an internationally significant wildlife area along the west coast of North America. In addition to providing year-round habitat for resident birds, the delta is an important staging and over-wintering area for migratory birds using the Pacific flyway and has been considered Canada's most significant 'Important Bird Area'. It is estimated that a minimum of 1.4 million migratory birds including waterfowl, shorebirds,

1. Disclaimer: Contributions by M. Merkens are on a volunteer basis and do not reflect decisions of Metro Vancouver Board.

neotropical migrants and raptors (hawks and owls) use the delta every year (Butler and Campbell 1987). Habitats used by these species include marshes, bogs, intertidal flats and remnant upland grasslands (Breault and Butler 1992). The contribution of agricultural land in supporting wildlife has become significant as natural areas have been converted to farmland and urban areas. In particular, agricultural fields are used extensively by wintering waterfowl, raptors, wading birds and breeding songbirds.

As the human population on and around the Fraser delta continues to grow, resource managers are faced with the challenge of conserving ecosystem resources important in supporting both humans and the many wildlife species with which they share the landscape. The grasslands, shrub-grasslands and wetlands that dominated the lower Fraser River delta prior to European and Asian immigration in the mid-1800s (North and Teversham 1984) have been replaced by diverse agricultural enterprises, urban communities, industrial lands and transportation infrastructure (Moore 1990).

The combination of important wildlife populations and diverse farms and crops has resulted in opportunities and challenges for integrated resource management on the Fraser River delta. Despite uncertain land tenure as well as the intensification of crop production systems, Delta farmers have, over the last two decades, adopted stewardship practices that can contribute to the long-term sustainability of both agriculture and wildlife populations. Specifically, perennial forage crops play an integral role in this management. While perennial forage can be managed to increase its habitat value, wildlife can inflict considerable economic damage. A variety of management strategies are available to support wildlife while mitigating negative consequences.

Grassland set-asides on the Fraser River delta

Establishing and maintaining rotations of tall grass habitats, also known as grassland set-asides, (Fig. 1) using perennial forage species can be a management tool for maintaining agricultural soil fertility while providing surrogate habitat for bird populations that have affinities for grasslands. Many farms no longer include livestock hence have little incentive to include perennial forages in their cropping rotation. The cost-share payments provided by the Delta Farmland & Wildlife Trust for grassland set-asides encourage farmers to incorporate short term perennial forage mixes in field rotations as break crops or to increase soil organic matter. The high water tables, poor drainage and fine texture (silty-clay loams) characteristic of the delta farm soils render these soils particularly susceptible to structural degradation (Hermawan and Bomke 1996). The repeated inclusion of short- to moderate-term perennial grass and legume mixes in long-term crop rotations helps to maintain adequate levels of soil organic matter (Wiel et al. 1993; Magdoff and van Es 2009). Hermawan and Bomke (1996) were able to reasonably restore soil health to a degraded field using a two-year grass fallow rotation along with improved subsoil drainage.

Some delta farmers, lacking suitable alternatives, now regularly include short-term set-asides in rotations to achieve these benefits. Delta Farmland and Wildlife Trust has developed a set-aside seed mix to promote soil conservation. The mix (25% orchardgrass, 28% tall fescue, 15% timothy, 15% chewing's fescue, 15% creeping red fescue and 2% double cut red clover by weight), is seeded at a rate of 35 kg/ha (31 lb/ac) often with the addition of annual ryegrass (11 kg/ha; 10 lb/ac) or harvestable barley or oats to act as a nurse crop.

Some farmers have used this strategy to transition to organic production and may cycle into set-asides at regular intervals to maintain soil organic matter and promote soil fertility using organic methods. Grass fallow fields are returned to cash crop production when the desired benefits are attained.

Figure 2. Mixed flock of snow geese (white geese towards rear of picture) and white-fronted geese (foreground) on heavily trampled grassland set-aside. PHOTO CREDIT: M. MERKENS

The tall grass provided by grassland set-asides is similar to that encountered in old fields and can act as surrogate habitat for many grassland-obligate wildlife species. In fact, re-introduction of short- to medium-term grassland rotations into farmland management plans have provided valuable habitat for a variety of waterfowl, raptors and songbirds. During their first winter, grassland set-asides are frequently grazed by wintering waterfowl (Fig. 2). These winter forage resources can offset waterfowl grazing impacts to perennial forage crops by acting as alternative feeding areas for many herbivorous waterfowl species. During most years many first-year set-asides show evidence of waterfowl grazing by March and about half of them are heavily grazed (Merkens unpublished data).

Mature set-asides (those in their second or more years) provide habitat structure and forage resources to many grassland dependent species. Set-asides contain populations of an important prey species, Townsend's Vole (Fig. 3), which is utilized by many birds of prey including federally-listed at-risk species like the short-eared owl and barn owl (Merkens 2005). Townsend's vole prey density in mature grassland set-asides is equal to or greater than densities in old-field sites (Merkens 2005). Likewise, high raptor density and hunting effort was found in 2- to 4-year-old set-asides relative to 'old fields' or hay or pasture fields (Merkens 2005). The effect of mowing whole set-asides (akin to harvesting hay or silage in a forage field) reduced vole populations and raptor use substantially. It is apparent that both voles and raptors are dependent on the high level of cover provided by mature grassland set-asides.

Landscape level surveys indicate that set-asides are preferred as wintering habitat by several raptors that frequent the delta (Fig. 4). Data on habitat use (proportion of raptor detections/field type) were compared to habitat availability to determine raptor affinity for specific habitat types. An index of habitat preference for two raptor species was obtained by calculating the ratio of relative use of habitat to availability of habitat (red dots in Fig. 4). Both Northern Harriers and Red-tailed Hawks showed greatest preference for tall grass habitat, most of which was grassland set-aside.

Both short-eared owls and barn owls are commonly seen using mature set-asides. The short-eared owls hunt in set-asides primarily at dawn and dusk; day-time surveys within set-asides frequently uncover short-eared owl communal roost sites and up to 8 individuals have been flushed from a single roost.

Bird surveys in set-asides during breeding season indicated that some songbird species associated with grasslands used these fields to establish territories and build nests. In particular, savannah sparrows and common yellow-throats were found to be prevalent in mature set-asides. Singing male densities of up to 7 and 0.8 per hectare were encountered for savannah sparrow and common yellow-throat, respectively. Another common species seen during breeding season was the barn swallow which frequently appeared to be hunting for aerial arthropods just above the grass canopy.

Figure 3. Townsend's vole hiding in the dense cover of a grassland set-aside. PHOTO CREDIT: M. MERKENS.

Waterfowl and perennial forage

Agricultural crops grown on the Fraser River delta provide important forage for migratory waterfowl during fall, winter and spring (Hirst and Easthope 1981). The presence of perennial forage in the crop rotation contributes to the conservation of waterfowl species by functioning as foraging habitat. Both hay and pasture fields are grazed by herbivorous waterfowl, including American wigeon, lesser snow geese, Canada geese, white-fronted geese, trumpeter swans, mallards, northern pintail and green-winged teal. American wigeon are well adapted to grazing and are the most frequently sighted dabbling duck using perennial forage (Lovvorn and Baldwin 1996). In spring, lesser snow geese make extensive use of forage crops, especially those located in west delta (Bradbeer 2007). Waterfowl, especially northern pintail, will also feed on invertebrates associated with perennial forage (Hirst and Easthope 1981). Measurements of waterfowl fecal pellets accumulated in permanent plots have shown that a forage crop can support an average of 1600 waterfowl use days /ha (650 /ac), with each waterfowl use day being equivalent to 1 bird spending an entire day (Bradbeer and Halpin 2010).

Factors influencing waterfowl use of forage crops

The physiology of herbivorous waterfowl is well adapted to feeding on the intensively managed forage crops. Waterfowl have relatively small digestive tracts compared to other herbivores, and therefore must feed on vegetation that is low in indigestible fiber (Sedinger 1997). While energy intake is an important consideration of any foraging animals' dietary choices, herbivorous waterfowl have been shown to make foraging decisions that maximize digestible nitrogen (protein) intake (Durant et al. 2004). Smaller species, such as wigeon, accomplish this by selecting short grasses that are high in protein and low in structural fibers. Larger species, such as geese, have correspondingly larger bills and gastrointestinal tracts. They can maximize digestible nitrogen intake on lower quality forage stands by ingesting a greater amount of forage compared to the smaller dabbling ducks (Durant et al. 2004).

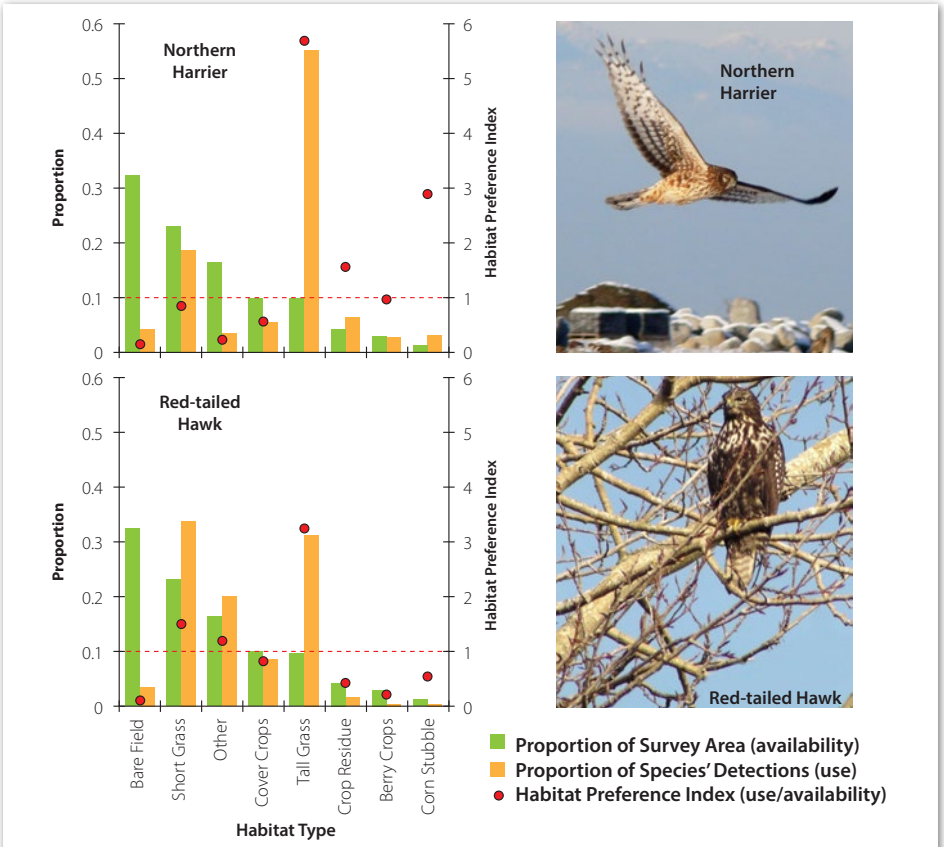

Figure 4. Habitat-use, -availability and preference indices for Northern Harriers and Red-tailed Hawks using upland farmland in Delta, British Columbia during the winter of 2005/06. PHOTO CREDITS: NORTHERN HARRIER – M. MERKENS; RED-TAILED HAWK – D. BRADBEER.

Many agricultural forage stands are managed for feed quality, in order to maintain milk production in dairy cattle. These crops provide a highly profitable feeding opportunity for waterfowl. For instance, orchard grass is a commonly used forage species that can contain up to 20% crude protein in its 4th and 5th cut (Zbeetnoff and McTavish 2004). The application of fertilizer to forage grass further increases the protein content of the stand and has been identified as a factor in attracting waterfowl to farm fields (Hassal and Lane 2001). Standing water can also attract waterfowl to farm fields (Mayhew and Houston 1989). The silt-clay soils of the lower Fraser are poorly drained and water accumulates on many fields during heavy winter rains, making them more attractive to waterfowl.

Waterfowl and forage crop depredation

Though waterfowl populations can be supported by perennial forage, the grazing exerted by the birds brings them into direct conflict with forage growers, especially when spring yields are reduced as a result. Winter grazing can delay the first spring cut of forage stands and reduce yield (Zbeetnoff and McTavish 2004) and some fields do not survive wintertime waterfowl grazing. The combination of grazing, wet soil conditions and waterfowl traffic kills some of the grasses and clovers in the stand and such heavily grazed fields may require over-seeding. Reseeded fields experience reduced 2nd and 3rd cuts, and often fail to produce a 4th or 5th cut. Some fields can be so extensively grazed that the entire forage stand must be replanted (Fig. 5). Damage to forage crops occurs when waterfowl (especially mallards and northern pintail) and gulls damage forage roots when grubbing for soil invertebrates (R. Butler, pers. comm.).

Waterfowl grazing incurs financial costs on forage producers in a number of ways (Zbeetnoff and McTavish 2004). Dairy farmers who rely on hay to feed their herd must purchase supplemental feed when bird grazing reduces expected yields. Supplemental alfalfa hay is usually purchased from Alberta, adding considerable feed replacement costs to operating budgets. Where hay is to be sold for revenue, there is lost opportunity to invest the gross profit associated with feed sales. Over-seeding and re-seeding forage crops incurs additional management costs on farming operations, including purchasing seed, labor, tillage (required for over-seeding) and weed control. The cumulative impact of waterfowl grazing strains the economic viability of perennial forage operations on the delta.

Forage and waterfowl conservation into the future

While forage production is an asset for waterfowl populations, it is ironic that waterfowl can impact the viability of

the cropping system that sustains them. The role of perennial forage in wildlife conservation hinges on the capacity of farmers, land managers and agrologists to maintain its place in delta crop rotations. How can we mitigate the conflict between commercial forage production and herbivorous waterfowl?

Farmers have already modified forage management practices to reduce waterfowl depredation. Many growers have switched from orchardgrass to tall fescue. Tall fescue has a somewhat lower crude protein and higher fiber content than orchardgrass (Zbeetnoff and McTavish 2004) so it is a less profitable foraging option for waterfowl. While switching grasses reduces the incidence of waterfowl grazing (Merkens et al. 2012), it may result in poorer quality feed for dairy cattle.

Field drainage has the potential to reduce the attractiveness of forage fields. Farmers can laser level fields, filling low spots where water accumulates. Surface and subsurface (tile) drains help to remove standing water from fields, but both are costly measures for mitigating bird damage. Also tile drains may be ineffective during periods of heavy rains when drainage ditches are full.

Provisioning of alternative feeding areas has been suggested for mitigating the conflict between waterfowl and agriculture (Vickery and Gill 1999). Alternative feeding areas can be any habitat that is more favourable to waterfowl than perennial forage. Both winter cover crops (including cereals, legumes and annual forage grasses) and vegetable crop residue serve as alternative feeding areas. Potatoes left on fields after harvest are the primary vegetable residue used by waterfowl. Alternative feeding areas have been shown to influence waterfowl use of perennial forage in the delta (Merkens et al. 2012). An observational study revealed that snow geese switch forage selection several times overwinter, eventually choosing forage fields in late winter (Bradbeer 2007). The switches correspond with the depletion of cover crops and potato biomass. A recent experiment showed that establishing winter cereals in late August and early September increased the number of waterfowl supported compared to planting in late September (Bradbeer and Halpin 2010). These results indicate the potential for cover crop management to increase their value as alternative feed for waterfowl.

A provincial program currently provides financial compensation to forage producers on the lower Fraser River for production losses due to waterfowl grazing. However current compensation falls $1,100–$2,500 /ha ($445–$1,012/acre) short of actual losses (Zbeetnoff and McTavish 2004) and the gap was 10–30% greater when feed replacement costs were added. There has been a recent modest increase in farmer compensation.

Conclusion

The inclusion of perennial forage production in crop rotations is essential for soil and wildlife conservation on the lower Fraser River delta. Crop rotations that utilize forage to emulate historical tall grass habitats have the capacity to conserve a variety of species, including raptors, wading birds, songbirds and waterfowl. Waterfowl also benefit from feed provided by forage crops. However, waterfowl depredation of perennial forage will not likely abate so long as the two co-exist on the landscape of the lower Fraser River. It is imperative for the continued conservation of grassland and migratory bird populations that the value of perennial forage crops are recognized and the economic viability of lower Fraser River farming operations is maintained.

References available online at www.farmwest.com

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Figure 5. Forage field decimated by gull damage and waterfowl grazing in Delta, British Columbia. Grass mat within waterfowl exclosure is an indication of the forage growth that should have covered the field. PHOTO CREDIT: M. MERKENS.