Partners in Stewardship: An Example of Using Incentives for Agricultural Wildlife Habitat Enhancement

MARKUS MERKENS

Delta Farmland and Wildlife Trust, 205-4882 Delta Street, Delta, BC, V4K 2T8, Canada, email dfwt@dccnet.com

Abstract: The diverse landscape of British Columbia provides habitat for a wide variety of wildlife and conditions that support an important agricultural industry. As the human population continues to grow, pressures on wildlife habitat and agricultural land are increasing. This is particularly evident in the lower Fraser Valley of British Columbia. The Greater Vancouver Regional District, with a population of 1.64 million people distributed over an area of 2930 km^2, contained 470 km^2 of agricultural land in 1996. The regional population is expected to reach 2.9 million by 2021. This phenomenal growth will further impact land use on the Fraser River delta, which will likely result in a reduction of available land for wildlife and agriculture.

The Delta Farmland and Wildlife Trust is a nonprofit organization that was established in 1993 to promote the preservation of farmland and wildlife habitat in the lower Fraser River delta through sustainable farming and land stewardship. Although the Trust's constitution allows for the acquisition of land for the purposes of soil and wildlife conservation, the organization has concentrated on cost sharing land stewardship activities, primarily with farmers but also with other landowners, on private or leased land in the community. The Trust provides farmers with a variety of programs that offer financial incentives for agricultural field improvements and wildlife habitat enhancements. Ongoing stewardship programs include field laser leveling, and the establishment of grassland set-asides, winter cover crops, hedgerows, and grass field margins. Monitoring and evaluation of these programs has shown that wintering raptors, waterfowl, and songbirds have benefited from the implementation of these programs.

In 2002/03, the Delta Farmland and Wildlife Trust funded a total of 5703 acres (2309 ha) (almost ¼ of the land within Delta's Agricultural Land Reserve) of wildlife habitat and field improvements. The widespread geographical distribution of fields in their programs indicates that farmers throughout Delta are interested in improving their farms through stewardship that benefits both soil and wildlife conservation. Between 1999 and 2003, these programs affected approximately 60% of the farmland in Delta.

Key Words: stewardship, farmland, agricultural land, incentive programs, sustainable farming, wildlife habitat, Delta Farmland and Wildlife Trust, Fraser River delta, British Columbia

Introduction

The diverse landscape of British Columbia provides habitat for a wide variety of wildlife and conditions that support an important agricultural industry. This landscape diversity is a result of four major mountain ranges which separate wide valleys, and rich valley bottom soils that are important to both agriculture and productive ecosystems which support diverse wildlife communities. The Fraser River delta (Fig. 1) is recognized as one of the most productive agricultural areas in Canada due to its unique combination of climate and soil. In recent years, land use conversion, changes in land ownership, and other pressures on agricultural land have resulted in potential loss of agricultural productivity and wildlife habitat capacity in the delta. Concerns regarding this loss of capacity and the industrial/urban development of the land led to the establishment of the Delta Farmland and Wildlife Trust (DF&WT or the Trust), a nonprofit society whose goal is to address the problem and provide workable solutions.

Farmland and Wildlife Habitat in the Fraser River Delta

Prior to European contact, extensive grasslands, wetlands, and foreshore habitats dominated the Fraser River delta. Since then, the development of the land for agricultural purposes, combined with relatively mild winters and low probability of significant snow cover, has contributed to a very diverse and populous wildlife community that utilizes available habitat year round. Many bird species spend their entire life cycle within the delta, while others migrate to or through the delta annually. The delta has been described as the most important migration and winter habitat for many species of waterfowl and shorebirds on the Pacific coast of Canada (Wetmore and Cox 1992). Boundary Bay, which is part of the greater ecosystem surrounding the delta's farmland, has also been recognized as a globally significant Important Bird Area under the congregatory and threatened species categories of the Important Bird Area program (Rosalind Shaundy, pers. comm.); it may well be Canada's No. 1 Important Bird Area. Although much of the delta land has been drastically altered by regional dyking, drainage, and general development since the mid-1800s, it continues to support relatively dense wildlife populations.

The deep, rich, alluvial soil deposits of the delta were recognized as valuable farmland when pioneering families began to inhabit the area. By the late 1920s, farming operations were diverse and typically involved vegetable, forage, and stock production. The farms were managed on a crop rotation basis, which promoted long-term productivity by maintaining soil quality over time. Currently, the farmland continues to be productive and provides important wildlife habitat throughout the year despite intensive human use of the area for urban and industrial development. Land stewardship that promotes agriculture and wildlife habitat values can sustain this current state of farmland in the delta.

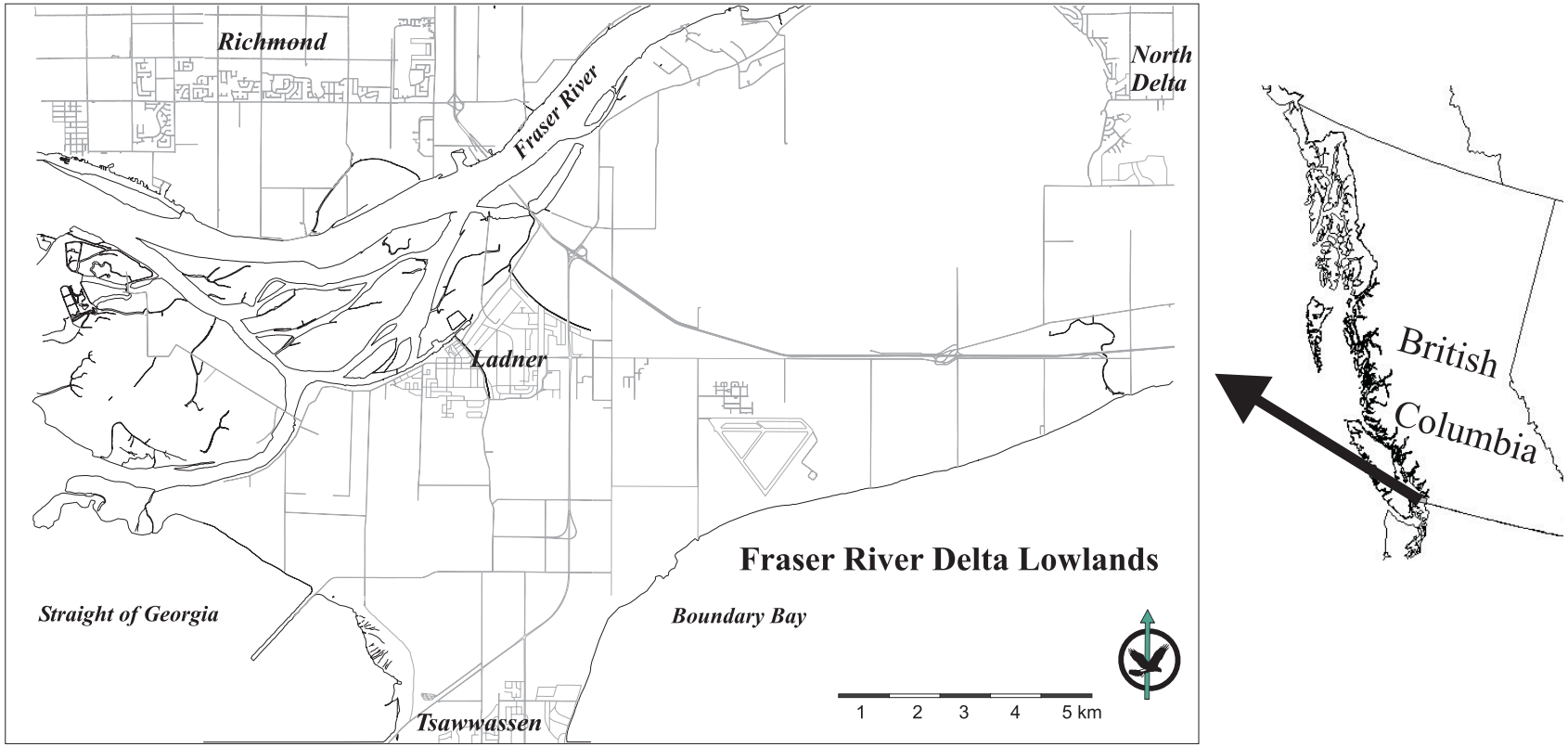

Figure 1. Fraser River delta lowlands where Delta Farmland and Wildlife Trust land stewardship programs take place.

A large proportion of the delta's farmland was removed from farm ownership as a result of government expropriation and land speculation that took place from the 1960s to the 1980s. In the late 1960s, the provincial government expropriated 4212 acres (1705 ha) of land for the purposes of establishing a large industrial area near the Roberts Bank coal terminal, a large port at the western edge of the delta. Although the land was expropriated at that time, it has continued to be used for agriculture, primarily by the farming families that owned the land prior to expropriation. Now, after 30 years, some of the original farming families have managed to repurchase some of the land for their farming operations. Land speculation from the early 1980s to 1990s drove up the value of farmland and resulted in some conversion of land from agricultural use to residential and recreational use. By 1989, close to two-thirds of the farmland in the delta was farmed on a rented or leased basis, and most of these agreements were short term (1–3 years) (Klohn Leonoff Ltd. et al. 1992). This farming scenario resulted in a rapid degradation of soil quality over large areas as farmers converted from mixed farming to vegetable cropping to meet the economic requirements of farming leased or rented lands. There was little incentive to invest in stewardship activities to promote soil conservation and good crop management practices given that there was, in many cases, no guarantee that the farmer would benefit from these actions in the long run.

As the human population continues to grow, pressures on wildlife habitat and agricultural land are increasing. This is particularly evident in the lower Fraser River delta. The Greater Vancouver Regional District, with a population of 1.64 million people distributed over an area of 2930 km^2, contained 470 km^2 of agricultural land in 1996. The regional population is expected to reach 2.9 million by 2021. This phenomenal growth will further impact land use in the delta, which will likely result in a reduction of available land for wildlife and agriculture. In the early 1990s, it became evident that concerted efforts were needed to conserve the delta's farmland so that the farming lifestyle and wildlife populations and their benefits to society could be preserved.

Partners in Stewardship

The Delta Farmland and Wildlife Trust is a nonprofit charitable society that was established in 1993. Operating within the bounds of the municipality of Delta, B.C., the Trust is committed to promoting the preservation of farmland and associated wildlife habitat in the Fraser River delta through sustainable farming and land stewardship.

The Trust's board of directors represents a partnership of farmers, naturalists, and community-minded individuals who work cooperatively to find solutions to land-use problems on farmland in the community. The board is made up of three members from the Boundary Bay Conservation Committee, three members from the Delta Farmers' Institute, and two members at large. Recognizing the significance of the Fraser River delta to large numbers of migratory and resident birds, the Trust was formed to encourage local farmers and naturalists to cooperatively implement farm stewardship programs and promote sustainable agriculture. The Trust offers a

forum for these two previously confrontational groups to find common ground in ensuring that both farming and wildlife survive in Delta.

Land Stewardship Programs

The Trust uses an integrated program of research, education, and financial incentives to develop and promote land stewardship activities that contribute to the soil conservation and enhancement of wildlife values in Delta. DF&WT has identified several areas where voluntary enhancement/conservation practices might be viable. Some of these increase habitat capability on farmland while others work to improve the capacity of the soil to produce crops for agriculture and wildlife. The cost of conducting these land stewardship activities is shared by DF&WT and the landowners.

Currently, the Trust offers incentive programs for field laser leveling and for establishing grassland set-asides, winter cover crops, new hedgerows, and grass field margins. Many of these programs had been developed and successfully implemented in Europe by such organizations as the Farming and Wildlife Advisory Group and the Royal Society for the Protection of Birds (Andrew and Rebane 1994). Under these programs, landowners enter into formal agreements with DF&WT that lay out acceptable management practices on specific pieces of property for varying periods of time. The period of time is dictated by the particular field use or habitat enhancement being carried out. In return for their cooperation, DF&WT shares the cost of managing the field or structure for the period outlined in the agreement. Although the Trust's constitution allows for the acquisition of land for the purposes of soil and wildlife conservation, the Trust has concentrated on cost sharing land stewardship activities, primarily with farmers but also with other landowners, on private or leased land in the community.

Grassland Set-asides

The Trust has provided funding to farmers for establishing grassland set-asides since 1994. The management objectives of these set-asides are two-fold: (1) contributing to soil conservation by improving soils for farming, and (2) providing wildlife habitat. Growers are encouraged to introduce short- to moderately long-term rotations of grass mixes into their crop rotations. The Trust shares the cost of seeding and compensates the growers for land used in the grassland set-asides. Under this program, growers can apply for up to 40 acres (16 ha) of grassland set-aside for up to five years. Growers are paid $300/acre/year ($120/ha/year) for land held in a grassland state provided that the land is adequately maintained. Payment is reduced to $150/acre/year ($60/ha/year) if the grower chooses to take one harvest for grain or hay. Growers may be asked to mow fields to increase grass growth and reduce weed density.

A grass seed mix has been developed locally for the grassland set-aside program. All of the grasses selected establish relatively quickly and provide good vegetative cover for beneficial

insects and for foraging, roosting, and nesting wildlife. One recommendation of the program is that a nurse crop of barley, oats, or annual ryegrass be planted with the seed mixture to reduce weeds and to provide a beneficial microclimate for the other grasses.

Implementation of the grassland set-aside program has resulted in improved soil structure and organic matter (Hermawan 1995; Temple and Bomke 1999), and has provided raptors with small- to moderately-sized patches of habitat that contain their primary food source, the Townsend's vole (*Microtus townsendii*) (Summers 1999; Merkens 2005).

The Trust funds approximately 500–600 acres (202–243 ha, see Fig. 2) of grassland set-asides in Delta at a cost of $150,000–$185,000 per year exclusive of administration and monitoring costs. Farmers are interested in installing approximately 250–300 additional acres (101–121 hectares) of grassland set-aside, but a funding source for this additional area is lacking. Set-asides within the program range from one to five years in age, with an unequal area covered by each age class. There is also considerable variability in field size. Individual funded set-asides range from 2 acres (0.8 ha) to a maximum of 40 acres (16 ha). In some instances, the actual field size may exceed 40 acres, in which case the area in excess of 40 acres is not funded by DF&WT; the farmer carries the associated expenses for this extra acreage.

In recent years, local farmers have been subscribing to the grassland set-aside program to bridge the transition period required for organic crop production. A three-year set-aside will allow a field to be classified as suitable for organic production provided that no restricted chemicals or management practices were used during the three-year period. The transition to organic agricultural production further benefits wildlife by reducing the amount of pesticides used in the delta.

Cover Crops

Cover crops have been grown in agricultural systems around the world for some time. The purposes for planting cover crops are varied, and in the delta, pertain primarily to maintaining overwinter cover for bare fields. Farmers associate cover crops with soil and crop improvements such as better soil tilth and fertility, reduced erosion, and increased water-holding capacity. Additionally, cover crops can provide valuable cover and foraging habitat for a wide variety of wildlife species, can help provide cleaner air and water, can improve landscape aesthetics, and can promote better quality of life. Most private landowners can integrate variations of basic cover cropping systems into their management practices without significantly impacting overall farm operation. In fact, cover crops can benefit farmers by improving a variety of soil-related characteristics that consequently increase the productivity of cash crops.

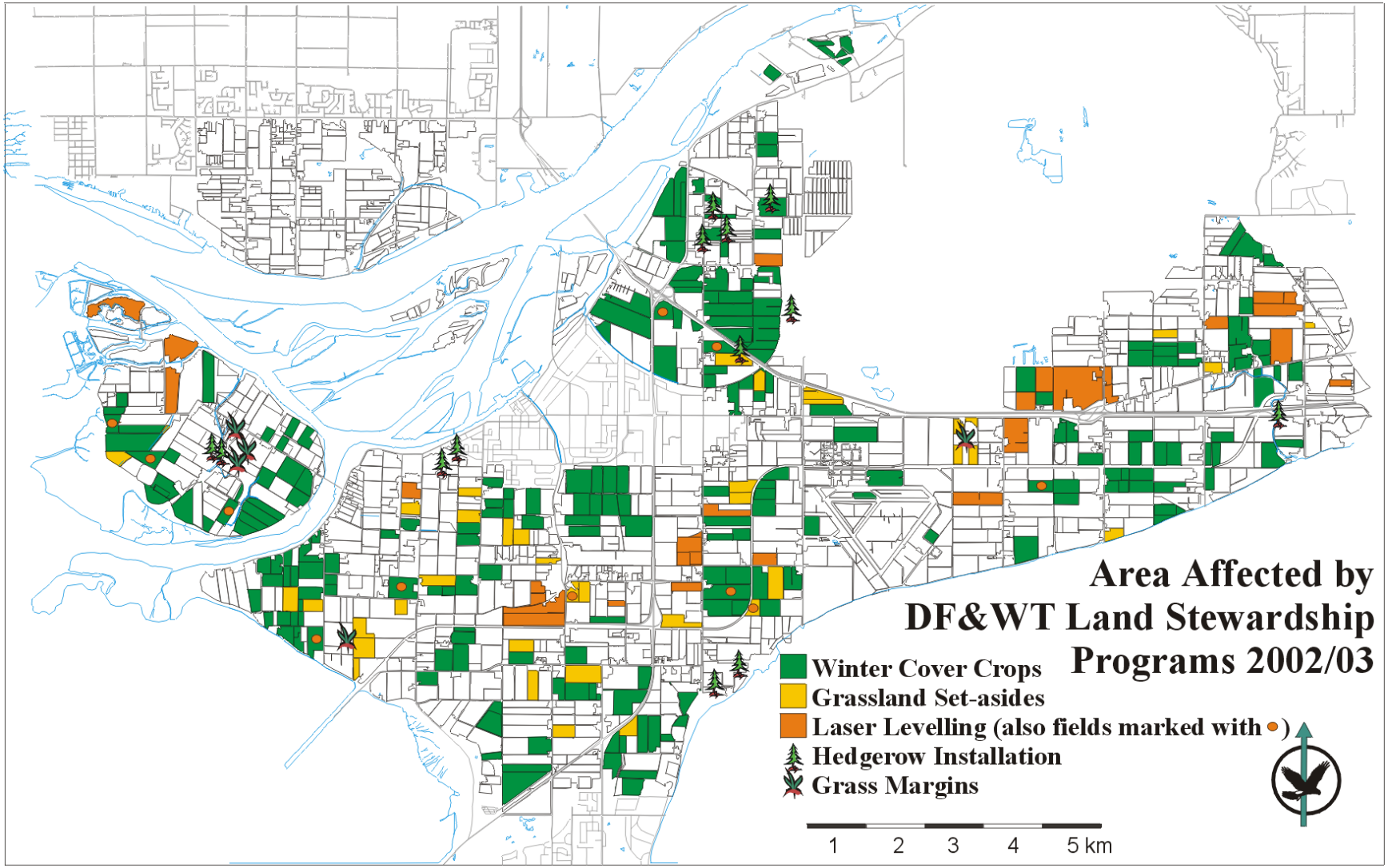

Figure 2. Area affected by five Delta Farmland and Wildlife Trust land stewardship programs during 2002/03.

From an agricultural perspective, cover crops are usually planted in the late summer and early fall in the delta. This protects and maintains the soil surface structure from intense winter rains, maintains soil surface infiltration so that most rain water is channeled down through the soils rather than overland to surrounding ditches or field low spots, and provides valuable organic matter to the soil when ploughed under in the spring.

From a wildlife perspective, cover crops provide habitat for large numbers of overwintering waterfowl such as snow geese (*Chen caerulescens*), trumpeter swans (*Cygnus buccinator*), mallards (*Anas platyrhynchos*), northern pintails (*A. acuta*), and American wigeons (*A. americana*) (Duynstee and Wareham 1993; Porter and Duynstee 1994; Summers 1995). Every year, a significant proportion of cover crops are grazed by these species (Merkens, unpublished data).

Cover crops also provide alternative feeding areas to perennial forage fields that are managed within the delta. Damage to hay and pasture fields by overwintering waterfowl inflicts a considerable economic impact on dairy and hay producers. It is likely that damage levels to forage fields would be much higher if winter cover crops were not planted.

Farmers in the Municipality of Delta can participate in the DF&WT cover-cropping program by planting a variety of crops late in the growing season in addition to well-established clover. Cooperators in the program will be reimbursed up to $45/acre ($18/ha) of cover crops planted. There is no limit to the number of acres for which a cooperator can apply. Since 1995, an average of 3192 acres (1292 ha, see Fig. 2) of cover crops have been funded per year through DF&WT at a cost of approximately $150,000 per year exclusive of administration, delivery, and monitoring costs.

Laser Leveling

The laser leveling program benefits farmers primarily by reducing winter water ponding, which lowers the chances of soil salination and compaction occurring in wet spots. Through laser leveling, low spots are removed from a field. This reduces the amount of wintertime surface water accumulation, so fields dry out more quickly in the spring and can be planted earlier. From a sustainable farming standpoint, this improves productivity by increasing the number of potential growing days while reducing the risk of soil compaction, which can occur if a field is worked when conditions are too wet. Leveled fields are also less susceptible to flooding during a wet growing season, resulting in drier growing conditions and a lower probability of fungal diseases in crops. This, in turn reduces the need for pesticides. Decreasing wintertime flooding of fields also improves the establishment and longevity of winter cover crops and grass fields which are subject to grazing by waterfowl. This improves wildlife habitat and reduces the risk of costly crop damage.

Since 1996, Delta farmers who have applied to the program have received 50% of the cost of laser leveling their fields up to $125/acre ($50/ha). Individual cooperators are limited to a

maximum of 50 acres (20 ha) of laser leveling under the program. On average, the Trust shares the cost of leveling approximately 500 acres (202 ha) annually at a cost of about $50,000/year, although in some years the acreage can be greater.

Hedgerows

The Delta Farmland and Wildlife Trust has been funding the establishment of hedgerows within Delta since 1995. Considerable work has been invested in designing hedgerows for wildlife habitat in the local agricultural landscape. The primary goal is to establish hedgerows that provide valuable year-round habitat for many bird species that inhabit the lower Fraser River delta. The Trust's approach is to provide a variety of native shrub and tree species that are intensively managed so that they develop into a structurally complex and species-diverse hedgerow.

DF&WT hedgerow agreements with cooperators span 10 years and can be extended for a second 10-year term. During this time, the cooperator is compensated at a rate of $300/acre/year ($120/ha/year) for any land taken out of agricultural production for the purposes of establishing a hedgerow. Planting modules have been developed that, for the most part, can be applied to any planting location with minor modifications made based on local conditions and objectives. Installation costs for these modules average approximately $1200–$1500 per 30-m module and include costs for soil amendments, planting material, irrigation systems, and labor. Although DF&WT approves only the use of native plant species, it gives cooperators the option of supplying/paying for additional plants that may not be native for inclusion in the plantings.

The value of hedgerows as songbird habitat increases with age (Merkens, unpublished data). Data from transect surveys indicate that bird density and diversity during the breeding and winter seasons increase with hedgerow age. Hedgerows established by the Trust are in their early stages with none older than 8 years of age. It is anticipated that the true value of these habitat structures will be realized somewhere between 15 and 25 years of age.

The creation and maintenance of new hedgerows is only one approach to maintaining or improving hedgerow habitat in the lower Fraser River delta. Existing hedgerows are frequently removed for various reasons, and the loss of this habitat may not be compensated for by the creation of new hedgerows. Preservation of existing hedgerows should be incorporated into a long-term management plan. At this point, no such management plan exists. Future work done by the Trust may include the conservation and enhancement of existing complex hedgerows within the area.

Landowners may need to be compensated for lost opportunities arising from the preservation of existing hedgerows. Presently, the Trust compensates growers in the delta at $300/acre ($120/ha) for land that is tied up in specific wildlife habitats (e.g., grassland set-asides, grass field margins, and new hedgerows). It is anticipated that a similar rate of compensation will be necessary to conserve existing hedgerows. Most hedgerows are 3–10 m wide. Based on the

greatest hedgerow width (10 m), approximately 400 m of hedgerow could be preserved through an annual payment of $300. Projecting this over a larger landscape, 40 km of 10 m wide existing hedgerow may be conserved at a cost of $30,000 per year.

Grass Field Margins

Linear patches of grassland habitat around cultivated fields can provide habitat for small mammals, songbirds, and raptors, and can benefit some farming operations such as organic crop production which requires field margins to be maintained around cultivated areas. If maintained properly, the grass in these margins can choke out agricultural weeds and provide refuges for beneficial insects. Grass margins can also provide a transition between agricultural fields and hedgerow or ditch habitats. Interest in the grass field margin program has been limited; however, with the increase in organic farming in the delta, the area covered by grass field margins may also increase.

Other Activities

As a community-based society, the Trust's activities are not limited only to field programs. DF&WT recognizes that public education and communication are valuable to the successful implementation of farm stewardship programs and wildlife habitat conservation. DF&WT actively cooperates with various government and nongovernment agencies in this process. The Trust maintains and updates a variety of extension materials, and its staff present lectures and slide shows to local and regional schools and other organizations such as naturalist groups. A broader audience is reached with the DF&WT newsletter and information displays that are set up at local community events. The Trust also issues press releases and publishes articles in local newspapers.

Future

DF&WT will continue to work with farmers and environmentalists to develop programs that benefit both farming and wildlife in the delta. As funds increase, the Trust expects to expand its programs to cover a greater area and a wider range of agricultural habitat types. As research identifies new management practices that benefit wildlife in the agricultural landscape, DF&WT may develop land stewardship programs that incorporate these practices.

Acknowledgments

DF&WT would like to thank the Delta Agricultural Society, YVR Wildlife Stewardship Fund (established as part of the wildlife habitat compensation arising from the expansion of the

Vancouver International Airport), Partners in Stewardship Fund (governed by the Boundary Shores Compensation Agreement), Ducks Unlimited Canada, the B.C. Waterfowl Society, the Canadian Wildlife Service, and all other individual donors for their generous financial support of our stewardship activities. We are also grateful to the many cooperating farmers in the delta for their stewardship of the land that supports our efforts, and for their acceptance of our vision of sustainable agriculture and wildlife capacity in the lower Fraser River delta. We thank the Delta Farmer's Institute and the Boundary Bay Conservation Committee for their shared goals in preserving the resources of the delta. Thank you also to Art Bomke and Wayne Temple (University of British Columbia) for their interest in the continued improvement of land stewardship on delta soils, and for their valued suggestions on improving our programs. We would also like to thank all the unnamed volunteers that help us meet our objectives. Finally, we thank Todd Kabaluk and Robert Batenburg (Agriculture and Agri-food Canada) for providing GIS data files to aid in our stewardship mapping.

References

Andrew, J., and M. Rebane. 1994. Farming and wildlife. Royal Society for the Protection of Birds. The Lodge, Sandy, Bedfordshire, United Kingdom. 358 pp.

Duynstee, T., and B. Wareham. 1993. The Greenfields Project 1991–92. Interim report to the Canadian Wildlife Service, Pacific and Yukon Region, Delta, British Columbia and Ducks Unlimited Canada, Surrey, British Columbia.

Hermawan, B. 1995. Soil structure associated with cover crops and grass leys in degraded soils of Delta. PhD thesis. University of British Columbia, Vancouver, British Columbia. 154 pp.

Klohn Leonoff Ltd., W.R. Holm and Associates, and G.G. Runka Land Sense Ltd. 1992. Delta agricultural study. Agri-Food Development Subsidiary Program, British Columbia Ministry of Agriculture, Fisheries and Food, Victoria, British Columbia, and Agriculture Canada.

Merkens, M. 2005. Value of grassland set-asides in increasing farmland habitat capacity for wintering raptors in the lower Fraser River delta. In T.D. Hooper, editor. Proceedings of the species at risk 2004 pathways to recovery conference. March 2–6, 2004, Victoria, British Columbia. Species at Risk 2004 Pathways to Recovery Conference Organizing Committee, Victoria, British Columbia.

Porter, M.S., and T. Duynstee. 1994. Winter wildlife use of spring cereals in Delta, B.C. Greenfields Project, Ducks Unlimited Canada, Surrey, British Columbia.

Summers, K. 1999. Wildlife monitoring survey results for the YVR farm stewardship program in Delta, B.C.: June 1998–June 1999. Prepared for the Delta Farmland and Wildlife Trust, Delta, British Columbia. 64 pp.

Summers, K. 1995. Winter wildlife use of spring cereals in Delta, B.C. Greenfields Project, Ducks Unlimited Canada, Surrey, British Columbia.

Temple, W., and A. Bomke. 1999. Farmland stewardship in Delta: 1998/99 interim annual report. Investment Agriculture Foundation of B.C., Victoria, British Columbia.

Wetmore, S.P., and B. Cox. 1992. Preface. In R.W. Butler, editor. Abundance, distribution and conservation of birds in the vicinity of Boundary Bay, British Columbia. Technical Report Series No. 155. Canadian Wildlife Service, Pacific and Yukon Region, Delta, British Columbia.

Personal Communications

Rosalind Shaundy, Technical Coordinator, Canadian Important Bird Area Program.