WILDLIFE HABITAT MITIGATION FOR THE OLDMAN RIVER DAM PROJECT, ALBERTA, CANADA[1]

by

Jeffrey E. Green, P. Biol.[2]

and

Alan Nilson, P. Eng.[3]

Abstract. To compensate for losses of wildlife habitat associated with the construction and operation of the Oldman River dam in southern Alberta, an extensive wildlife habitat mitigation program has been undertaken. Habitat evaluation procedures were used to determine the amount and types of habitat losses in the reservoir area, and the most important habitat needs of wildlife in the mitigation program. Three major types of mitigation, involving thirteen specific measures, are being employed in the Mitigation Program: habitat protection, habitat enhancement and habitat creation. A concept plan was developed that addressed the biological requirements of wildlife (e.g., movement corridors, core habitat areas and other specialized sites) in conjunction with existing land uses, the need for a good distribution of projects around the reservoir, and the suitability for establishment of woody vegetation. In total, 65 habitat projects are being developed, as well as additional projects for cliff nesting raptors. Other habitat enhancement and creation projects may be developed as opportunities arise during dam construction and reclamation.

Additional Key Words: habitat reclamation, mule deer, waterfowl

Introduction

The Oldman River Dam is currently being constructed a short distance downstream from the confluence of the Oldman, Crowsnest and Castle rivers in southern Alberta. When completed in 1990, the dam will create a reservoir covering an area of approximately 2420 ha at full supply level (FSL). Figure 1 shows the location of the reservoir.

Although cultivated fields, pastureland, winter feedlots and farmsteads occupy most of the bottomland areas in these valleys, the remaining valley areas and adjacent coulees are important overwintering habitats for wildlife. For example, approximately 350-400 mule deer (*Odocoileus hemionus*) overwintered in and around the

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[2] Jeffrey E. Green is a Principal and Senior Biologist for The Delta Environmental Management Group Ltd., Suite 101, 622 - 5th Avenue S.W., Calgary, Alberta T2P 0M6 .

[3] Alan Nilson is the Program Manager of Wildlife Mitigation, Alberta Public Works, Supply and Services,5th Floor, College Plaza , 8215 - 112 Street, Edmonton, Alberta T6G 5AG.

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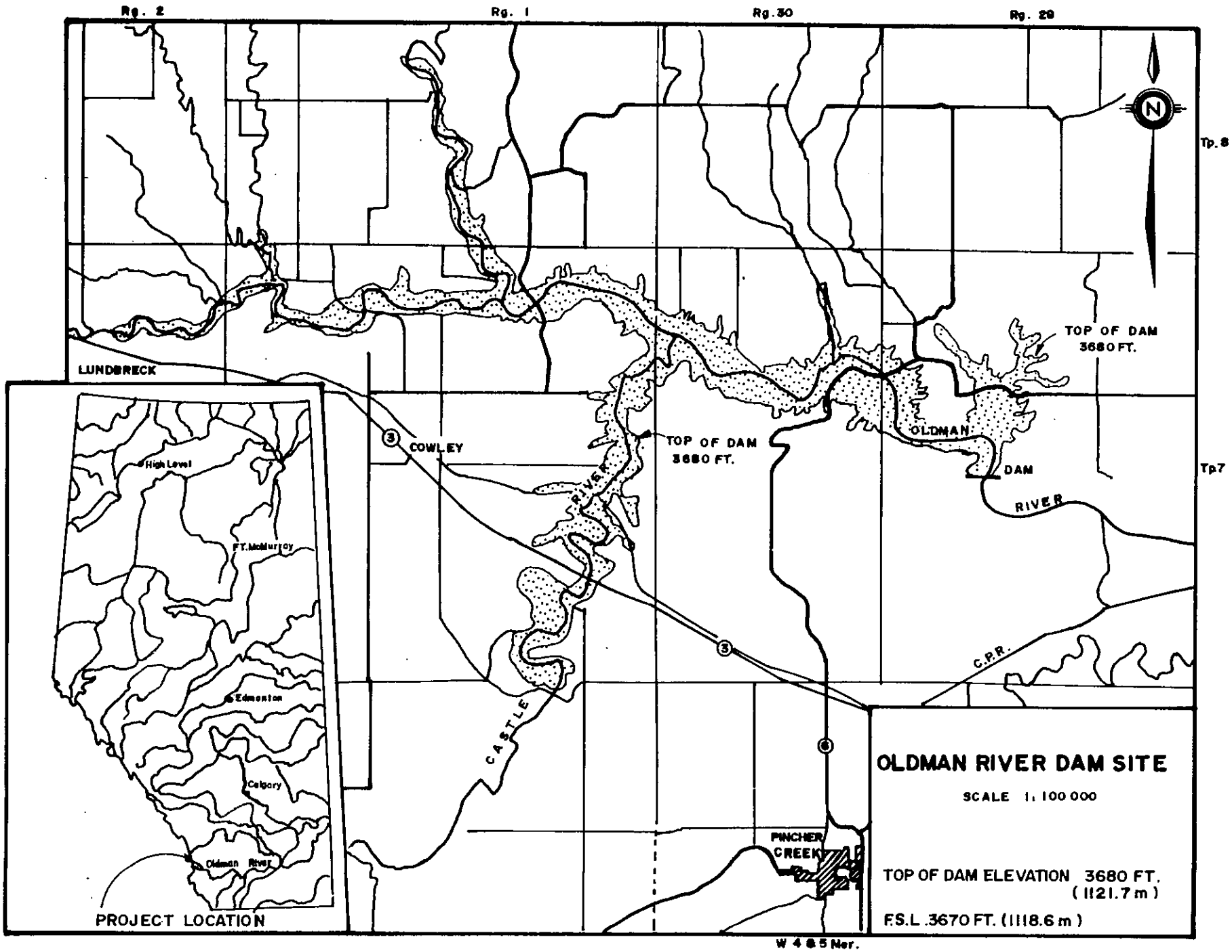

Figure 1. General location of the study area for the Oldman River Wildlife Habitat Mitigation Plan in southeastern Alberta, Canada.

reservoir area during 1985-86, with slightly more than half that number being present during the spring and summer months (Allison and Russell 1986). The reservoir area also supports a variety of other mammals and avifauna on a seasonal or year-round basis including white-tailed deer (*O. virginianus*), moose (uncommon) (*Alces alces*), yellow-bellied marmots (*Marmota flaviventris*), badgers (*Taxidea taxus*), beaver (*Castor canadensis*), mink (*Mustela vison*), Ferruginous hawks (*Buteo regalis*), prairie falcons (*Falco mexicanus*), Canada geese (*Branta canadensis*), mallards (*Anas platyrhyncos*), and common mergansers (*Branta merganser*) (Young et al. 1986).

Because of the importance of the flooded area to wildlife, Alberta Public Works, the Alberta Fish and Wildlife Division and Alberta Environment have undertaken a program to enhance existing habitat conditions around the proposed reservoir. The Delta Environmental Management Group Ltd. (The Delta Group) was retained to develop practical, effective habitat improvement and creation projects which could be implemented in the vicinity of the reservoir area during 1988 to 1993 (Green and Eccles 1988; Nilson and Green 1988). Recent studies on wildlife numbers, distributions and habitat preferences in the vicinity of the Oldman River Dam (Allison and Russell 1985, 1986; Westworth 1984; Young et al. 1986), as well as information from the Alberta Fish and Wildlife Division, the Local Advisory Committee, and field surveys, aided in the selection and design of appropriate projects for the area.

The major objectives of the Wildlife Habitat Mitigation Plan, as described by Alberta Environment (1988) are:

1. To minimize the potential negative impacts of the Oldman River dam project on wildlife species, and

2. To take advantage of mitigation opportunities arising from the development of the dam and reservoir.

This paper describes the major measures which will be implemented as part of the Wildlife Habitat Mitigation Plan with emphasis on specific wildlife considerations relating to the water level fluctuations of the Oldman River Dam Reservoir.

Habitat Mitigation Projects

The wildlife habitat mitigation program involves three major classes of mitigation methods: habitat protection, habitat enhancement and habitat creation.

Habitat Protection Measures

Two initiatives have been undertaken to complete the habitat protection phase of the wildlife habitat mitigation program. A land base of approximately 700 hectares (2300 acres) has been secured from crown lands for use in the wildlife habitat mitigation program. An additional 50 ha of private land may be secured through easements, leases or purchase agreements to complete the wildlife mitigation program.

1. Vegetation clearing guidelines have been established to retain as much habitat as possible. These include:

   - staging the clearing of the reservoir over 1989 and 1990 to delay disturbance of wildlife cover as long as possible;

   - retaining most shrubs of less than 3 metres in height within the flood zone of the reservoir;

   - preserving stands of black (*Populus trichocarpa*) and narrow leaf (*Populus angustifolia*) cottonwood and flood tolerant shrubs in those areas of the reservoir where only shallow flooding (i.e., <2 m) of short duration (e.g., <5 weeks) is expected to occur during the normal operation of the reservoir, or where soil erosion will not threaten moderate to long-term (>25 years) survival of trees and shrubs. This also includes leaving selected stands of vegetation within the borrow areas downstream of the dam.

   - minimizing the clearing of Douglas Fir (*Pseudotsuga menziesii*) and trembling aspen (*Populus tremuloides*) communities in the area between the full supply level and the reservoir takeline; and

2. All of the land base for wildlife will be fenced to permit management of grazing and other land uses utilizing a 3-wire fence with posts at 5 metre spacing. Fencing of the wildlife mitigation land base will add 7 km of fence to the 118 km fence that is required for the reservoir boundary.

A range management program will be developed for suitable areas of native and improved pasture that occur within the fenced boundaries of wildlife habitat mitigation projects. Range management plans will identify acceptable standards for cattle use (e.g., the number of animal use days, timing and duration of use), and recommend rest-rotational grazing schemes (e.g., location of water sources, additional fencing as necessary) to permit cattle use without detrimental effects to wildlife habitat. Gravelled water access will be provided to most check dams in the vicinity of existing private or crown owned pasture lands.

Operation and maintenance of this portion of the program is limited to the maintenance of the fence and the administration of the grazing permit system.

Habitat Enhancement Measures

Habitat enhancement projects involve the improvement and/or expansion of existing sites and natural habitats to provide more suitable and/or larger areas of habitat for terrestrial and wetland wildlife than presently exists. Habitat enhancement includes:

1. A total of 25 km of snowfence will be installed along the perimeter fence and/or within the land base of 31 projects. Snowfencing will locally improve soil moisture conditions (as a result of increased snow retention) and reduce exposure to wind. It will also encourage the expansion of native trees and shrubs up and out of the existing coulees, and aid in the establishment of planted shelterbelts. Irregularly-shaped shelterbelts comprised of upland species of trees and shrubs such as trembling aspen, chokecherry (*Prunus virginianus*), saskatoon (*Amelanchier alnifolia*), hawthorn (*Crataegus rotundifolia*) and Douglas fir will be planted immediately adjacent to the leeward side of the snowfencing in almost all projects. As native tree and shrub communities expand and the planted shelterbelts become established, snow catchment will increase, thereby reducing the future need for snowfencing. As a result, long-term maintenance of snowfencing will not be required.

2. Five existing wetland areas will be enhanced for waterfowl through stabilization of water levels (including the provision of supplemental water supplies during periods of poor water availability), construction of earthen or rock nesting islands in the central deep water areas of wetlands, enlargement of the wetland basin, planting of riparian shrubs and trees along some portions of the wetland shoreline, reseeding of nesting cover in adjacent upland areas, and/or maintenance of existing nesting cover.

3. Nine nesting sites for Canada geese will be constructed on several outcroppings that are likely to become large islands within the reservoir. Nest sites will include one or more log nest cribs and, in some cases, may include planting of small shelterbelts and erection of snowfencing.

4. Native and improved range in several areas within the takeline is in poor condition or has been removed by cultivation. These areas will be reseeded with native or suitable commercially-available grasses to provide a stable grass cover for control of noxious weeds and soil erosion, as well as forage for wildlife and cattle. Some pasture areas will be fertilized to promote rapid regeneration of ground vegetation.

All of the enhancement projects are within the fenceline provided for the habitat protection measures. Although short term maintenance will be required for establishment of aquatic and riparian vegetation in enhanced wetlands, tree and shrub establishment for nesting cribs, and range reseeding programs, no moderate or long term maintenance (i.e., >5 years) of these projects will be required. However, a process for administration and management of grazing permits within the wildlife mitigation areas will be implemented.

Habitat Creation

Habitat creation projects involve the construction or significant modification of existing sites to provide habitats with significantly different biological and physical conditions than existed previously. Habitat creation project will include:

1. The accumulation and storage of water in check dams and newly-created wetlands, and the distribution of water in the areas where soil moisture conditions may limit the initial establishment of tree and shrub cover. The accumulation and storage of water and the ability to provide water to the newly-planted seedlings on a frequent basis is essential to

the successfully establishment of new tree and shrub cover in exposed upland areas.

Water storage structures will range from dugouts with shallow catchment basins to small (<7 m in height) dams in several coulees. In areas where sufficient natural runoff exists to provide a two year supply of water, no ancillary measures are necessary. Where the natural runoff is insufficient, supplementary water will be provided by shelterbelts to improve and/or concentrate snow catchment, subsurface drainage to capture artesian springs, and pumping of water from the Oldman reservoir using electric, solar or wind powered systems.

Stored water will primarily be used to water tree and shrub seedlings that are located downstream of the check dams and dugouts, using subsurface irrigation tubing with slow release emitters. Methods are currently being investigated to automate the operation of these irrigation systems. Water levels in the check dams and dugouts will fluctuate seasonally in response to snowmelt and rainfall, evaporation, water removal for watering of trees and shrubs, and livestock use. In two locations, check dams will be used to maintain stable water levels in newly-created wetland basins. Riparian shrubs and emergent aquatic vegetation will be planted along the perimeter of most check dams and dugouts to provide vegetation cover and food for terrestrial and wetland wildlife. Thirty-one (31) check dams and dugouts are proposed.

2. New riparian habitat will be provided through the construction of terraces and/or dikes within the upper flood zone of the reservoir (i.e., up to 3 m below full supply level). Riparian wetlands will be constructed at 23 locations. These sites will backflood when the reservoir is brought to full supply level, and hold water 0.6 m below the full supply level of the reservoir when it is lowered. Where appropriate, nesting islands for waterfowl and Canada geese will be constructed in these wetlands. Narrow leaf cottonwood, sandbar willow (*Salix exigua*), sedges (*Carex* sp.) and aquatic plants will be planted in the area immediately at and below full supply level. Riparian trees and shrubs such as black cottonwood, sandbar willow, red osier dogwood (*Cornus stolonifera*) and white spruce (*Picea glauca*) will be planted in the areas immediately above full supply level. The proposed riparian wetland projects will replace some of the bottomland habitats that will be lost to flooding, and will provide several core habitat areas.

3. Fifteen new nesting cavities for prairie falcons and Ferruginous hawks have been constructed on cliffs above the full supply level of the reservoir or on cliffs adjacent to the reservoir edge (i.e., up to 2.0 km away from the reservoir) using controlled blasting, manual digging and prying. New nesting ledges for Canada geese have also been constructed on cliffs directly adjacent to the reservoir. Although constructed in January 1989, two nesting cavities are already being used by prairie falcons and several ledges have been used by Canada geese and great horned owls.

4. On the request of the local wildlife advisory sub-committee, two marmot colonies that are presently located in the reservoir area will be transplanted to new locations above full supply level. In one case, a rock pile will be constructed adjacent to suitable foraging habitat to provide a suitable core area for burrows and loafing/observation sites.

In general, new habitat projects will be the most difficult to establish and most will require an operations and maintenance commitment. The proposed check dams and dugouts will require annual inspection and maintenance to ensure their serviceability, stability and safety. Although the subsurface irrigation systems will be automated, routine inspections will be required to ensure operation. It is anticipated that all irrigation systems will be operated for a minimum of 5 years to allow trees and shrubs to become well established, thereby creating a micro-climate that is self-sustaining. Operations manuals and spare parts will be provided for the operations personnel to operate, maintain and inspect these mechanical systems at appropriate intervals.

Implementation Schedule

Completion of the wildlife mitigation program will be constrained by several project activities including:

- the filling schedule for the reservoir,
- attainment of a full operational level for the reservoir, and
- propagation of native tree and shrub stock.

However, as the land base has already been secured for the wildlife habitat mitigation program, most aspects of the mitigation projects involving construction of facilities, excavation, recontouring, and fencing can be completed during the 1987 - 1989 period.

Plantings of trees and shrubs will primarily utilize native species from the Oldman River region. To provide stock that is already conditioned to the biophysical conditions in the Oldman River area, cuttings and seeds of trees and shrubs were collected during the spring and summer 1988 and 1989 for propagation of containerized seedlings, bare root seedlings and cuttings. Species being grown include Douglas fir, limber pine, trembling aspen, black cottonwood, narrow leaf cottonwood, chokecherry, sandbar willow, saskatoon, hawthorn, red osier dogwood, buckbrush (*Symphoricarpos occidentalis*), snowberry (*S. albus*), and cinquefoil (*Potentilla fruticosa*). Most of these species will be available for planting in 1990 and 1991.

As the full supply level of the reservoir may not be achieved during the first year of operation (1991), the riparian marshes may not be backflooded from the reservoir until full supply level is attained. As a result, water may need to be provided and maintained by pumping water from the rivers or reservoir. Provision of water in these areas will permit the planting and establishment of riparian trees and shrubs and aquatic vegetation in and around the perimeter of these riparian wetlands, prior to full operation of the reservoir.

Several activities will be ongoing after 1991, including:

- Planting of remaining tree and shrub seedlings (predominantly those species that were not ready for planting in 1991).
- Maintenance of vegetation will continue until trees, shrubs and ground covers are well established.
- Reclamation activities in borrow sites and construction areas will continue as necessary.
- Remedial measures to specific mitigation projects or project components to ensure adequate wildlife habitat is established.

Monitoring and Evaluation

Physical, biological and botanical aspects of the program will be monitored after implementation to ensure the success, or the need for modification, of specific mitigation techniques.

The monitoring program will consist of three major components:

1. Assessments of Vegetation: Vegetation monitoring will include annual assessments of the survival of tree and shrub seedlings, surveys of ground covers in newly-seeded and/or fertilized pasture areas, inspections of transplanted and naturally invading aquatic vegetation in enhanced and newly-created wetlands and check dams, and range surveys in rest-rotational pasture areas. Vegetation monitoring will provide information on the establishment and response of native vegetation in the habitat projects and, in particular, will highlight the need for supplemental or replacement plantings of seedlings, ground covers and aquatic plants.

2. Assessments of Wildlife Distribution and Habitat Use: The wildlife monitoring component will require assessment of the response of wildlife to (i) the dam construction and clearing activities, and (ii) the habitat mitigation projects.

   Assessment of the responses of wildlife to the dam construction and clearing activities will require monitoring of changes in the abundance and distribution of several species and/or groups of wildlife that are representative of the habitat requirements of most wildlife in the Oldman River region. Recommended key wildlife species/groups include: mule deer, waterfowl, raptors, and songbirds. Proposed surveys include:

   - systematic surveys of mule deer populations in the vicinity of the Oldman River (in the vicinity of the project area) and in existing wetlands near the reservoir. Proposed surveys include an early spring breeding survey, brood counts, and a fall staging survey.

   - annual surveys of nesting and non-breeding prairie falcons, Ferruginous hawks and other raptors in the Oldman Project area. Data will also be obtained on the nesting success of prairie falcons and Ferruginous hawks in the immediate vicinity of the reservoir. Nesting prairie falcons have been colour banded to permit tracking of nesting pairs during and

following dam construction, and the modification of nesting cliffs for these species.

- breeding birds counts for song birds and upland game birds in the reservoir area. Permanent survey blocks will be established in representative vegetation communities.

Baseline data are available for ungulates and raptors from wildlife surveys conducted in 1985 - 1986. Systematic surveys during dam construction will be conducted in mid-winter 1989-90 and 1990-91. Post-flooding surveys will then be conducted, at minimum, on a biennial basis.

Monitoring of the responses of wildlife to the mitigation projects will involve annual and biannual assessments of the use of representative habitat projects by key species and groups of wildlife. Although data from the surveys described above will be used, information will also be obtained on the use of tree and shrub plantings by ungulates (e.g., browse surveys, pellet group counts), and wetland use by waterfowl.

3. Audits of Habitat Projects: Habitat designs for specific projects will generally involve hydraulic structures (e.g., check dams, subsurface irrigation systems), physical structures (e.g., perimeter fencing, snowfencing), vegetation components, and/or specialized habitat structures (e.g., nest cribs, nesting ledges, nesting islands, rock piles). In combination, these project components should provide specific types of habitat for terrestrial and/or wetland-associated wildlife.

   Audits of habitat projects will be used to determine if the habitat objectives of specific projects are being achieved, and that specific project components are performing as planned. Project audits will involve a combination of one or more of the following, depending on the complexity and scope of the habitat project:

   - annual inspections of check dams and dugouts to assess water retention capabilities,
   - annual inspection of subsurface irrigation systems to ensure that adequate water is being provided to tree and shrub seedings,
   - annual inspections of barbed-wired fencing and snowfencing,
   - seasonal inspections of rest-rotational pastures to assess range productivity, and to ensure compliance with the range management plan, and
   - annual assessment of habitat suitability in representative habitat projects. Quantification of habitat suitability will require measurement of vegetation features, terrain features, and physical structures (data from the vegetation monitoring and wildlife monitoring programs can be used to assist in assessment of habitat suitability), and use of field data in computerized habitat assessment models..

Project audits will allow early identification and correction of project deficiencies or problems, as well as the potential to identify other habitat enhancement or creation opportunities.

The Glass Project

Prior to the completion of the Wildlife Habitat Mitigation Plan, a comprehensive wildlife development program was initiated on a 200 ha parcel of land immediately adjacent to the dam construction site. Referred to as the Glass Property, it is comprised of approximately 150 ha of previously cultivated land and 50 ha of native pasture. As a result of recent poor land management, 120 ha of the cultivated land has been subjected to extensive wind erosion. A series of well-established shelterbelts, running east-west and north-south, divide the northern third of the area into four distinct blocks. Two major coulee systems occur in the southern third of the property. Three natural wetland depressions are located in the west-central portion of the property, but because of the extended drought in the Oldman region, have been completely dry for at least the past two years.

Due to the proximity to the dam, the land will be permanently held by the Crown. Because of the land tenure, the need to restabilize eroding soils, and the existence of natural wetland basins and coulees, the Glass Property provided an excellent opportunity to integrate and test several wildlife habitat mitigation measures.

Water was considered to be the limiting factor in the initial establishment of tree and shrub cover on the property. Based on the previous experience of local landowners in establishing shelterbelts in similar exposed sites, it is essential that young trees and shrubs receive adequate moisture for a period of at least 3 to 5 years. Although tree and shrub plantings on the Glass Property were located on north-facing slopes, protected coulees and the lee side of snow fences whenever possible, direct watering of seedlings by subsurface emitter irrigation tubing was employed throughout most of the planting areas. Subsurface irrigation was chosen over truck watering because it is more cost effective, allows seedlings on slopes, can be fully automated in most circumstances, and in light of its lower operating cost, it is less susceptible to budget restrictions over the long term.

Construction of the prototype irrigation system began in fall 1987 and was completed in summer 1988. The system is comprised of a 15 HP electric pump to deliver water through an 8 cm diameter PVC pipe to a central control system on the Glass Project, and a network of water lines, control valves and 20 km of subsurface emitter tubing to provide a maximum of 0.5 - 2.0 gal/hr to each individual or pair of tree and shrub seedlings. The central control system is a mechanical timer that operates the control valves on specific water lines, and permits specific units of the irrigation system to be turned off and on in specific sequences over a 24 hour period. The exact duration and sequence of watering will be determined through trial operation in late June - early September 1989 and 1990. In other mitigation projects, a combination of emitter irrigation tubing and check dams will be used to provide an initial water source for seedlings.

The Glass Property is presently planted with commercial tree species: Northwest poplar, caragana (*Caragana arborescens*), blue spruce (*Picea pungens*), white spruce and willow. In addition, small native Douglas firs were moved from within the reservoir area to the Glass site to determine their success at transplanting and growing in a different aspect. Tree and shrub seedlings have been and will be planted in different configurations (contour plantings, straight rows, irregular groupings) to provide a diversity of cover and to assess the wind revetment characteristics of snowfencing (which has been erected close to most of the planting areas). The caragana and willow seedlings were spaced at 1 m, the Northwest poplar at 2 m and the blue spruce, white spruce and Douglas fir at 3 m. Rows of seedlings were generally spaced at 4 m or 8 m. A total of 27,000 seedlings have been planted to date. Of this total, approximately 17,000 seedlings will be moved to other sites around the reservoir (on an as-need basis). Native trees and shrubs will then be used to infill-plant in some locations on the Glass Property.

The Glass Property contains two natural wetlands, and two additional wetlands have been constructed in shallow depresssions. Bulrushes (*Scirpus* sp.) were transplanted as plugs from the reservoir area to one of the constructed wetlands to determine the success of this method. All four wetlands are now being filled from the pumping system, but the option exists to fill the wetlands, as required, by gravity from the reservoir. Snow entrapment by the snowfences and trees/shrubs will also provide a water source in the spring. Earthen islands for waterfowl nesting have now been constructed in two of the wetlands (one natural, one constructed).

The entire site was planted with a mix of agronomic grasses and legumes under a winter wheat cover during fall 1988 to reduce soil erosion and control weed cover. The mix is comprised of rough fescue (*Fescue scabrella*), sheep fescue (*F. ovina*), western wheatgrass (*Agropyron smithii*), streambank wheatgrass (*A. riparium*), alfalfa (*Medicago* sp.), and sweet clover (*Melilotus alba*).

Snowfencing has been used extensively (4.0 km in total) on the Glass Property to reduce the drying effects of wind on young seedlings, and to aid in the trapping of snow to improve soil moisture conditions in the spring and early summer. As the trees and shrubs become better established, they will further improve snow retention.

The Glass Property is currently used by mule deer and waterfowl.

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