APPLICATIONS AND COSTS OF WILDLIFE HABITAT RECLAMATION

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ABSTRACT: The costs and methods of wildlife habitat reclamation are discussed for three examples. The first example, the Cascade Landfill site in Banff National Park, illustrates the approach and costs of reclaiming wildlife habitat after a site has been abandoned. The second example, the Healy gravel pit in Banff National Park, shows how wildlife habitat reclamation can be incorporated into the site development plan at little or no extra cost. The third example, the Olsen Consolidation Pond, illustrates how wildlife habitat reclamation can be integrated with other land uses (in this case, agriculture), and in doing so, help to reduce the cost of the overall development. Although new techniques for the reclamation of wildlife habitat are being and have been developed at a number of industrial sites in Alberta, and the utility of these methods are apparent, there is a need to monitor the success of these methods in developing or enhancing wildlife habitat.

1.0 INTRODUCTION

During the past decade, an increasing number of industrial projects in the Mountain and Foothills region of Alberta have included or are planning to include wildlife habitat reclamation as the primary or a secondary objective of their reclamation program (Green et al. 1986). Many of the older programs focused on the rehabilitation and enhancement of abandoned sites for wildlife habitat, whereas a number of the newer programs have planned sites specifically for a wildlife end use prior to project development. Regardless of the approach, a variety of new techniques have been employed to modify landforms, water forms and vegetation communities for wildlife. The suitability of these techniques for different reclamation applications and the probability for success under a range of reclamation conditions has not yet been established. Of equal importance to reclamation planners, the costs of specific methods relative to their value for wildlife habitat reclamation is also not known.

Information on the practicality and costs of wildlife habitat reclamation methods is important in determining the most suitable reclamation end use or uses for a site. Selection of the reclamation objectives for a particular area must take into account the local management concerns for wildlife, the practicality of the reclamation objective for the site, and the cost of achieving successful reclamation for that end use.

Several examples of ongoing reclamation projects for wildlife habitat are presented in this paper to illustrate some of the applications for wildlife habitat reclamation in Alberta, the techniques that have proven useful, and approximate costs associated with the type of application and the methods used.

2.0 RECLAMATION OF AN ABANDONED SITE: THE CASCADE LANDFILL PROJECT

The Cascade Landfill Site, located to the northeast of the Banff townsite in Banff National Park, had been used at different times as a borrow site, a landfill site and an industrial waste site up until it's abandonment in 1983. The disturbed area is approximately 10 ha in size and is surrounded predominantly by lodgepole pine forest (Figure 1). Ungulate use, particularly by elk (*Cervus elaphus*), is common in the meadow areas peripheral to the site with herds of up to 21 animals being reported in the immediate vicinity of the landfill (Harrison et al. 1982). Elk have also been observed to feed frequently in willow (*Salix* sp.) - trembling aspen (*Populus tremuloides*) communities in the surrounding area. Animal trails are abundant both to the south and west of the reclamation area.

Prior to the start of the reclamation program, site preparation was necessary to bury exposed garbage layers, to cover a sand lens, and to remove the concrete base of the former perimeter fence. Once a stabilized soil base was present throughout the site, the majority of the reclamation effort focused on recontouring of the site and revegetation of the specific landforms to provide wintering habitat for elk.

Four areas of the pit required reworking with large machinery (Figure 1). Along the southern boundary of the site, the landfill had produced very steep slopes from the surface of the landfill down to the surrounding forest. To encourage animal movement from the forest onto the site, several access routes were considered, two of which were constructed. The first access route had one of the shallowest slopes (approximately 30°) along the south boundary of the landfill and was bordered by an existing depression within the landfill. It also connected well with existing animal trails in the surrounding forested area. Although this site had several clear advantages for development of an access route, a concrete retaining wall/fence base and up to 5 m of fill material blocked clear passage of wildlife onto the site. Following removal of the fence base and fill material, the access route and new gully were resloped to approximately 15° and the gully contours were smoothed to reduce water erosion. The gully was also extended further into the central portion of the landfill to provide an access route for wildlife that offered visual protection from the adjacent roadway. Excavated material was used to bury a layer of exposed garbage, creating a shallow rise in the central area of the landfill (see below). A second and smaller access route was also developed to the east of the first site by reducing the slope of the landfill edge.

The second major recontouring involved a borrow pit in the southwest corner of the site. Excavation of the pit had left almost vertical banks that restricted animal movements onto the site. Prior to topsoil replacement, the slopes of the pit were regraded and the edges rounded to provide a gradual approach into the pit. The existing landform now resembles a bowl-shaped swale.

The third area to be recontoured was a layer of partially exposed garbage that ran approximately east-west through the central area of the site. Although the berm was to have originally been re-oriented along a north-south axis, the shallow soil layer (< 15 cm) over the garbage layer prevented reworking. Instead, excavated material from the nearby gulley was used to build up the berm and provide additional visual protection to animals entering the landfill along the gully. At the same time, this provided a deeper soil base over the garbage layers.

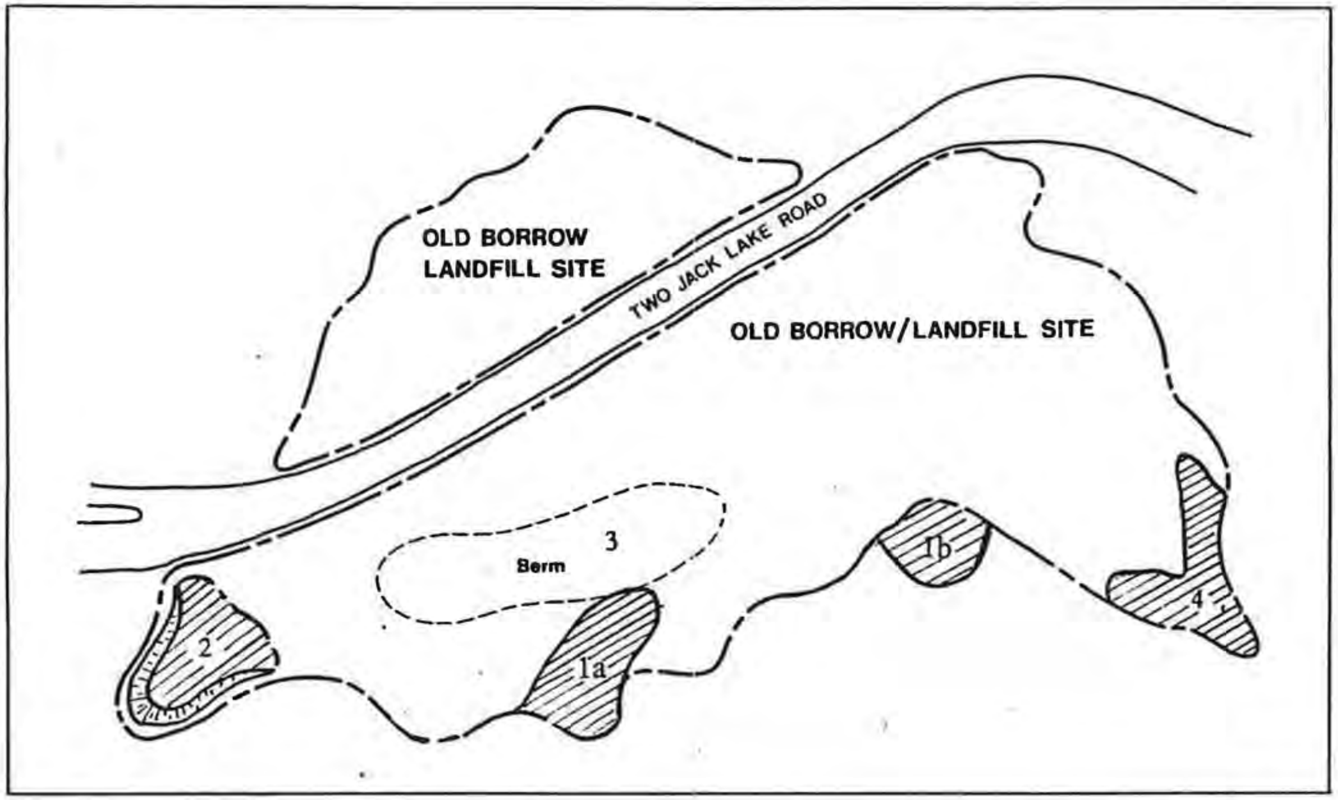

Figure 1. The Cascade Landfill in Banff National Park. (The four types of recontouring that have been completed on the site are shown. Site 1a is the location of the new gully. Site 1b is the second access route for wildlife. Site 2 is the borrow pit that was developed as a bowl-shaped swale. Site 3 is the rise enhanced by dumping excess fill material from 1a over the shallowly-buried garbage layer. Site 4 is the resloped access route at the east end of the site.)

The fourth recontoured site was in the east end of the landfill. A short steep slope in combination with piles of waste material and soil restricted animal movements onto the site. Removal of the waste material and resloping of the landfill face provided a gradually sloped access route onto the site.

Revegetation on the site is presently directed towards the development of meadow communities for use by elk. Although the planting patterns for ground covers have been strongly influenced by the testing of several soil reclamation alternatives -- addition of compost/mulch , addition of topsoil, addition of sewage sludge and use of Pro-seed™ blankets -- the meadow communities will be made up of areas of palatable and less palatable groundcovers. Most of the landfill sites will be reseeded with palatable grasses (Table 1). The species selected are preferred forage species of elk and are also known to be successful revegetation species for the prevailing site conditions. In addition, a small area of the landfill will be seeded using less palatable species of grasses and legumes (Table 1).

Following the monitoring of groundcover establishment and animal use on the site (i.e., 2 - 3 growing seasons), revegetation may also include the planting of trees and shrubs to increase vegetation diversity and browsing opportunities on the site. Three types of plantings may be used: shrub clusters, topsoil islands and forest stringers. The proposed sites for each type of planting were based on the compatability of the planting to the landform and to promoting the use of the landfill area by elk.

Shrub clusters may be planted along the gully and in other small depressions on the site (Figure 2) where they may benefit from the moister soil conditions. In addition, shrubs along the gully will provide greater visual protection for animals entering the landfill site.

Topsoil islands may be used in several locations where tree and shrub cover is necessary for encouraging elk use yet soil depths are insufficient for establishing such cover. One or two topsoil islands will be constructed on the site (Figure 2). The proposed topsoil islands will be approximately 0.8 ha in size with a 35-40 cm layer of topsoil. Trees and tall shrubs will be planted primarily in the central portion of each island with low shrubs planted around the periphery and interspersed among the trees and tall shrubs. Tree plantings will be trembling aspen and white spruce (*Picea glauca*), whereas shrub plantings will include palatable species (willow and wolf willow [*Eleagnus commutata*]) and less palatable species (rose [*Rosa* sp.] and buffaloberry [*Shepherdia canadensis*]).

A forest stringer may also be developed along part of the gully and a natural extension of the gully (Figure 2). The stringer will consist of a central core of trembling aspen and white spruce and peripheral plantings of low shrubs. When mature, it will provide a visual break for wildlife and a travel corridor further into the open meadow communities on the landfill. The stringer will also reduce wind exposure and soil moisture losses on the site.

Work on the site to date has costs $9 960 for recontouring and topsoil replacement. Costs for dry seeding and fertilizer were $555.90/ha.

Because of the many revegetation and fertilizer treatments on the site, a monitoring program will be started in fall 1986 to determine the response of elk to the soil ammendments and the use of the palatable and less palatable plantings for forage. The success of the various soil and seed treatments and tree/shrub plantings will also be monitored by evaluating the survival and vigor of plants in each treatment.

Table 1. List of ground cover species that will be planted on the Cascade Landfill site during fall 1986. (Fertilizer will be applied to all areas of the site, with the exception of the sewage sludge treatment areas, prior to seeding [1,2].)

	Common Names	Scientific Name	Percentage of Seed Mix
Palatable Species	Climax timothy	*Phleum pratense*	15
	Reubans Canada bluegrass	*Poa compressa*	25
	Revenue slender wheatgrass	*Agropyron trachycaulum*	20
	Boreal creeping red fescue	*Festuca rubra*	25
	Durar hard fescue	*Festuca ovina duriscula*	15
Less Palatable Species	Streambank wheatgrass[3]	*Agropyron riparum*	30
	Tufted hair grass[3]	*Deschampsia caespitosa*	20
	Alpine bluegrass[3]	*Poa alpina*	25
	Cicer milk vetch	*Astragalus cicer*	25

1. Recommended seeding rate 50 kg/ha

2. Fertlizer will be applied as follows:
   168 kg/ha 33-0-0 amonium nitrate
   56 kg/ha 11-55-0 ammonium phosphate

3. Seed made available through the native grass propagation program.

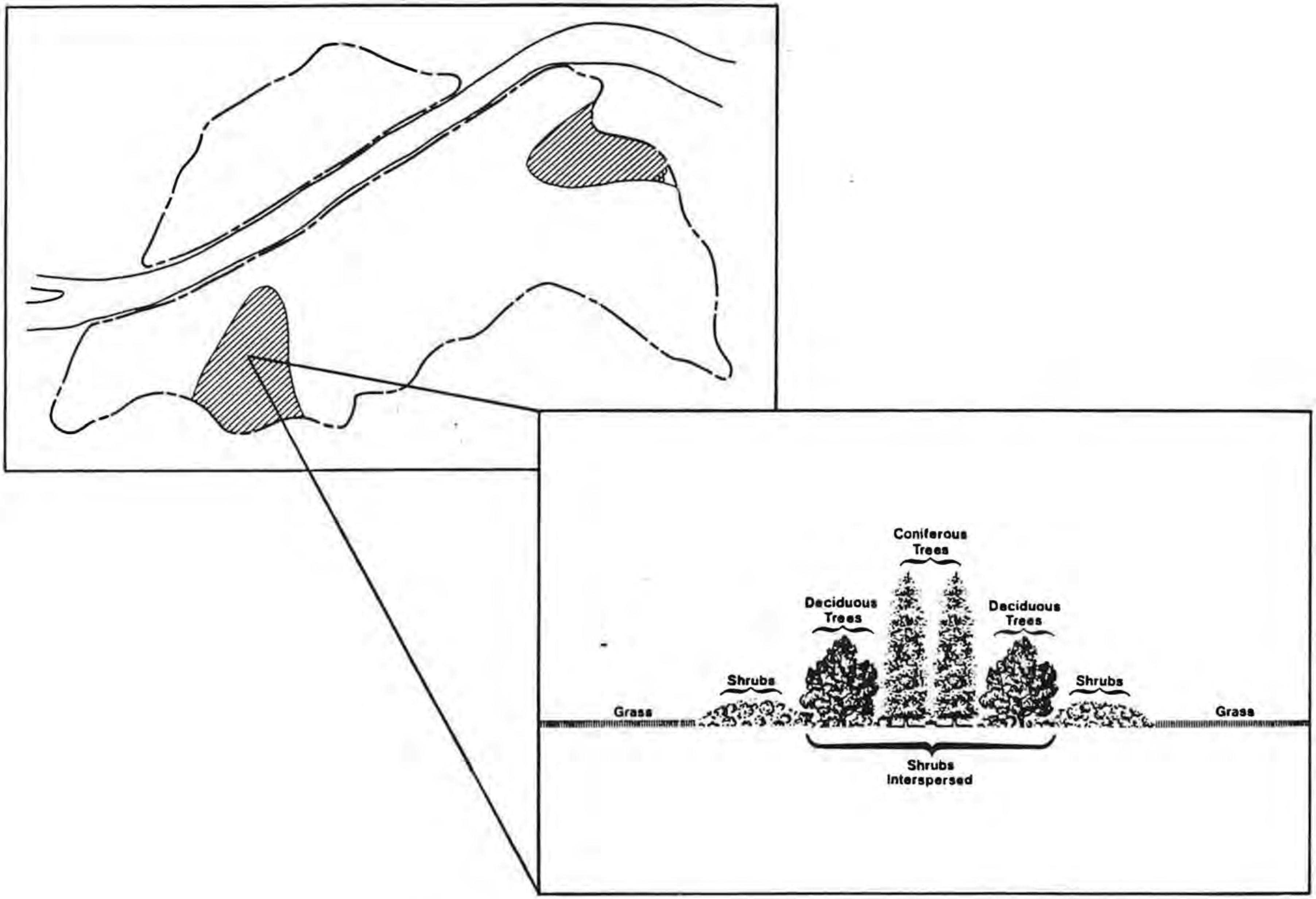

Figure 2. The proposed locations for planting of trees and shrubs on the Cascade Landfill site.

3.0 PLANNED RECLAMATION FOR WILDLIFE HABITAT: THE HEALY BORROW PIT

The Healy borrow pit is located directly north of the Sunshine Turnoff on the Trans Canada Highway in Banff National Park. A small borrow pit had existed at the site but with the twinning of the Trans Canada Highway, gravel requirements necessitated a large-scale expansion of the site. Identification of the site as a reclamation area for wildlife habitat, lead to the development and implementation of a plan for reclamation of elk foraging habitat. The development area was approximately 26 ha in size and was surrounded on three sides by conifer forest comprised of a mix of white spruce, Engelmann spruce (*Picea engelmanni*) and lodgepole pine (*Pinus contorta*)(Figure 3). The fourth side of the pit is separated from the Trans Canada Highway and the Sunshine turnoff by a 5-10 m wide band of mature trees and shrubs.

The site plan for the borrow pit was based on the maximum line of site distance for elk as discussed by Thomas (1979)[1] . Rather than develop one large borrow pit, the initial clearing of forest cover created a series of seven small circular shaped pits. Each pit was approximately 366 m in diameter and was separated from adjacent pits by forest stringers that were 5-15 m in width.

As the pit design was incorporated into the development plan for gravel extraction, the final pit contours resembled shallow bowl-shaped depressions. On completion of use, the few remaining sharp edges were rounded and recontoured to gradual slopes that were compatible with the overall contours of the pits. Gradually-sloped berms were maintained or reconstructed between the seven pit cells to visually separate each pit from the adjacent pit(s) and to increase the security of the site for wildlife. Following recontouring, topsoil was respread throughout the site.

In most of the pit cells, the pit bottoms were undulated to ensure that water ponding would be localized in the event of a rise in the water table. In two of the pits, however, gravel was intentionally removed below the average level of the groundwater table to create three permanent ponds (Figure 3). Since elk prefer foraging areas within 320 m of a free water source (Mackie 1970), these waterbodies will enhance the value of the surrounding meadow communities for elk. The ponds will also provide habitat for waterfowl. The three ponds range from 0.2 - 0.5 ha in size with maximum depths of 1-2 m. A gravel island was also constructed in the centre of one pond to provide a secure nesting site for waterfowl (probably Canada geese). During fall 1986, topsoil was spread on each island and along the exposed portion of the pond bottom to provide a soil base for planting and establishment of grass cover and aquatic plants, respectively.

Revegetation of the borrow pits has focused on the development of meadow communities for use as foraging areas by elk, and the placement of tree/shrub plantings to break the visual expanse of several pits. The groundcover mix will be comprised of palatable species (Table 2) that will be dry seeded throughout the seven pits. Tree and shrub plantings will consist of tree and shrub seedlings and transplants of 1.5 - 3.0 m high trees. The species and locations of these plantings are shown in Figure 4.

Because the site was planned and developed for a wildlife end use from the inception of the project, the costs for reclamation to elk habitat were very similar to the

1 Based on Reynold's (1962,1966) data, Thomas (1979) suggested openings between units of suitable hiding cover should not have any point further than 183 m from cover, thus allowing for a maximum opening size of 366 m.

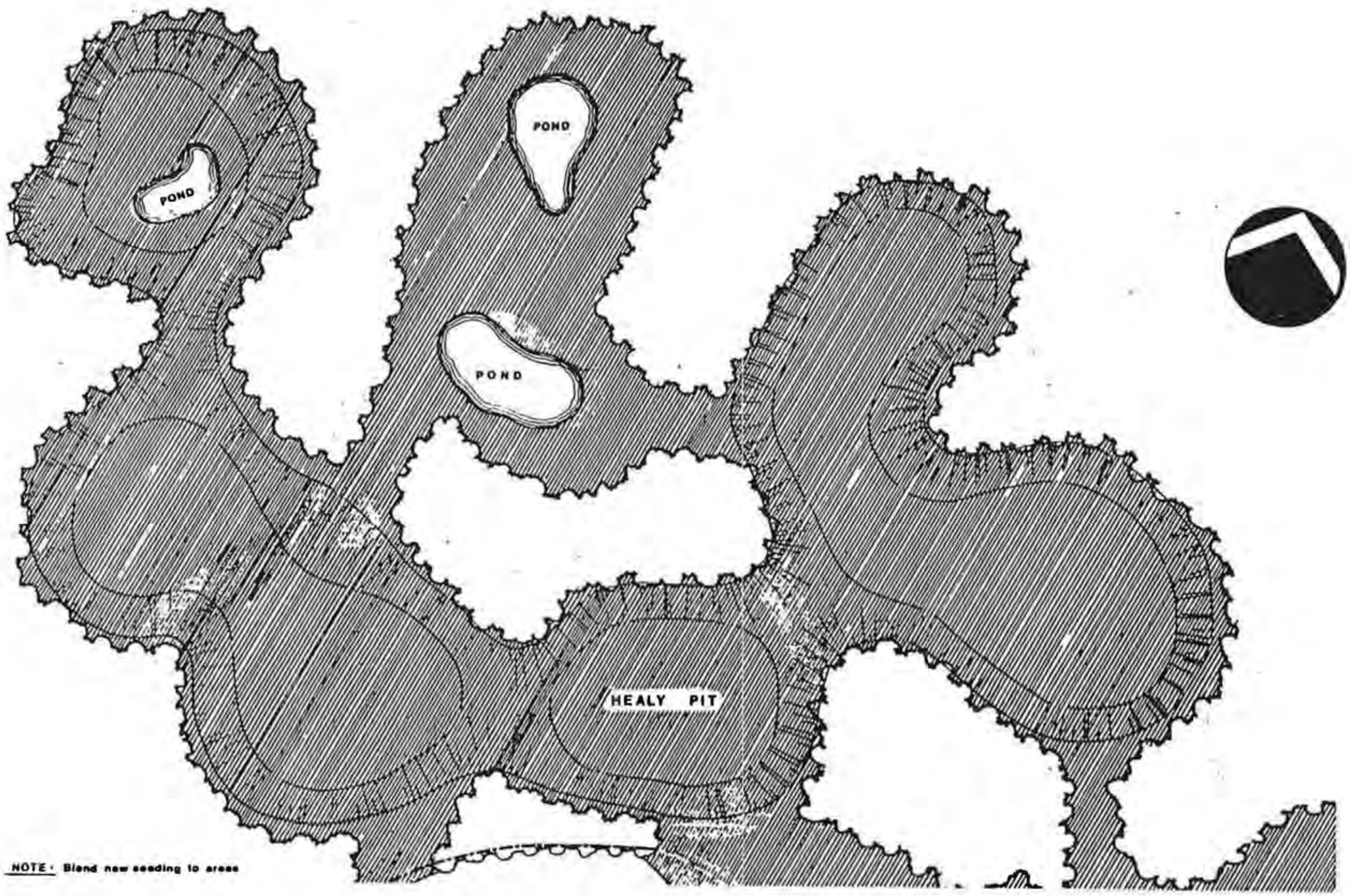

Figure 3. The Healy Borrow Pit in Banff National Park. (The seven pit cells, the forested fingers and berms between the cells, and the three newly created ponds are shown.)

Table 2. Ground cover seed mix used on the Healy pit[1].

Common Names	Scientific Name	Percentage of Seed Mix
Reubens Canada bluegrass	*Poa compressa*	25
Boreal creeping red fesuce	*Festuca rubra*	30
Revenue slender wheatgrass	*Agropyron trachycaulum*	10
Durar hard fecue	*Festuca ovina dursicula*	20
Annual rye grass	*Lolium multiflorum*	15

1. Recommended seeding rate 100 kg/ha.

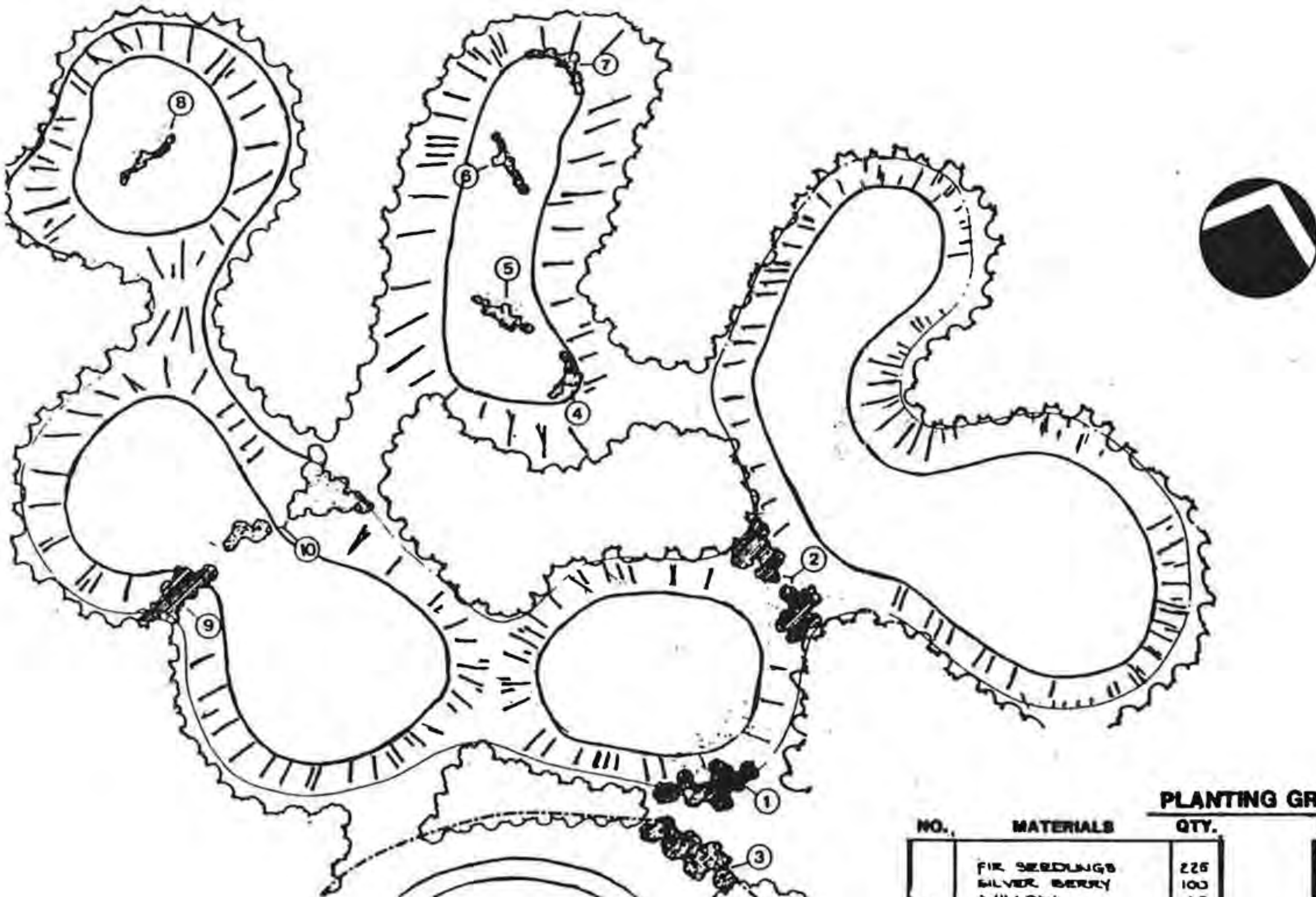

Figure 4. The location of tree and shrub plantings on the Healy Pit. (The species, number and size of trees and shrubs are shown in the inset box.)

PLANTING GROUPS

NO.	MATERIALS	QTY.
1	FIR SEEDLINGS	225
	SILVER BERRY	100
	WILLOW	60
	SPRUCE (1.5 M)	12
	SPRUCE (2.0 M)	18
	SPRUCE (3.0 M)	10
2	SILVER BERRY	150
	FIR SEEDLINGS	325
	SPRUCE (1.5 M)	14
	SPRUCE (2.0 M)	16
	SPRUCE (3.0 M)	8
	POPLAR	15
3	RELOCATED TREE CORES FROM SUNSHINE INTERCHANGE	50
4	DOGWOOD	50
	SPRUCE (1.5 M)	3
	SPRUCE (2.0 M)	2
5	DOGWOOD	60
	POPLAR	7
	WILLOW	75
6	DOGWOOD	50
	POPLAR	6
	WILLOW	75
7	DOGWOOD	50
	POPLAR	8
	SPRUCE (1.5 M)	5
	SPRUCE (2.0 M)	3
	WILLOW	75
8	DOGWOOD	50
	POPLAR	10
	SPRUCE (1.5 M)	–
	SPRUCE (2.0 M)	–
	WILLOW	75
9	FIR SEEDLINGS	225
	SPRUCE (1.5 M)	8
	SPRUCE (2.0 M)	6
	SPRUCE (3.0 M)	5
	WILLOW	40
10	POPLAR	40
	FIR SEEDLINGS	125
	SPRUCE (1.5 M)	10
	SPRUCE (2.0 M)	10
	SILVERBERRY	100

costs expected if the borrow pit had been developed under more traditional methods. Recontouring and soil replacement costs for the wildlife oriented pits were \$5.64/m^3. Dry seeding costs (seed mix, fertilizer, and application) were \$555.60/ha, with the total revegetation cost, including the transplanting of trees and shrubs being \$42,000 for the 26 ha reclamation area.

A monitoring study will begin in spring 1987 to assess the numbers and distribution of wildlife that are present in the reclaimed area. In particular, the monitoring study will focus on the influence of distance from hiding cover and landform on the use of the reclaimed areas by elk and other wildlife. Wildlife use on the Cascade Borrow pit (near the Cascade Landfill site), a large partially-reclaimed but active gravel pit where a wildlife end use was not planned, may be monitored to provide a comparable index of ungulate use in the absence of protective tree and shrub cover.

4.0 INTEGRATING WILDLIFE HABITAT RECLAMATION WITH OTHER END USES: THE OLSEN DRAINAGE CONSOLIDATION POND

The Olsen drainage consolidation pond was developed as part of a demonstration project for the Inventory of Alberta's Drainage Requirement Program (IADR) and is located in the Peace River region , approximately 8 km north of Rycroft, Alberta. Although this example is obviously not from the Mountain and Foothills Biomes, it illustrates methods of integrating wildlife habitat reclamation with other end uses that are relevant to this discussion.

The pond is located on 2.8 ha of poorly drained land that is adjacent to an actively farmed property. Because of its downslope position relative to most of the farmed area, it was selected as the site for a consolidation pond in conjunction with an intensive wetland consolidation program (Figure 5). Drainage water from the adjacent farm, associated with the spring runoff or peak rainfall events is temporarily stored in the consolidation pond for slow release into the nearby creek drainage. The original consolidation pond was to have consisted of two 4-5 m deep dugouts, each 0.4 ha in size, interconnected by an existing natural channel. Both dugouts, the channel and adjacent lowland areas were to be surrounded by a 3 m high berm (constructed from the excavated material) to provide overflow protection in the event of two back-to-back peak hydrological events. Topsoil from the dugouts and the construction area was to have been stripped and respread on the surrounding farmland.

In order to replace some of the wetland habitat lost through drainage, the consolidation pond was instead designed and operated to provide nesting and brood rearing habitat for waterfowl while still providing temporary water storage for the drainage system. Instead of the two dugouts, the pond was designed to have two deep water (5 m) basins interconnected by a shallow water area (< 2 m) and a deeper channel (Figure 6). The pond was constructed in fall 1985 and has a total water area of 1.2 ha at full storage level (fsl). During the late spring to early fall period, the lower seasonal and permanent water portions of the pond provide an assured source of water for wildlife whereas the temporary and upper seasonal water portions of the pond provide the water storage capacity needed for drainage (Figure 7). The operating regime for the pond allows filling of the upper seasonal and temporary regions of the pond during peak rainfall events followed by slow (trickle) drainage of the water into the nearby creek. During the late fall (following fall waterfowl staging), the temporary and seasonal areas of the pond are slowly drained to provide maximum storage capacity for the spring runoff.

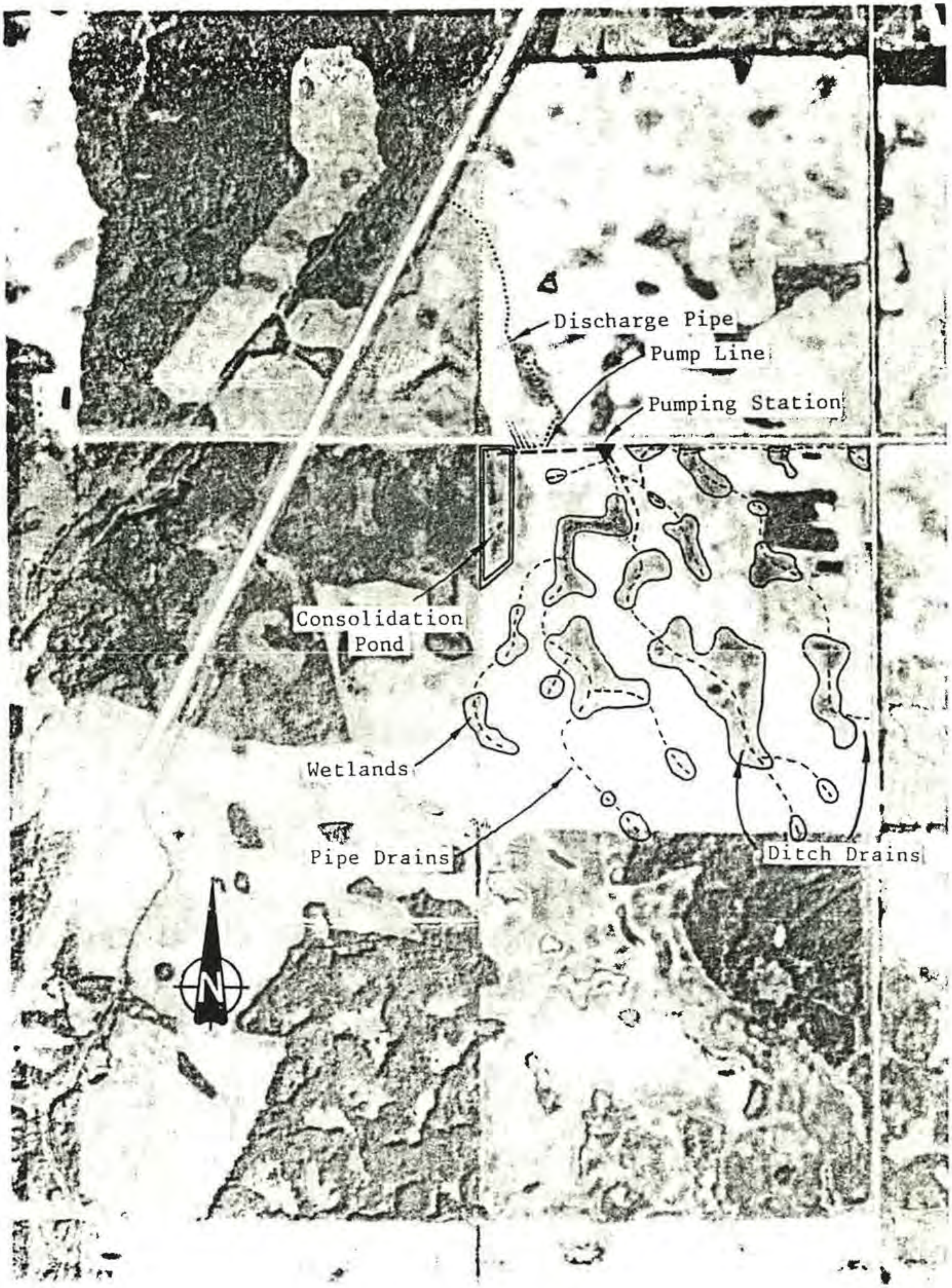

Figure 5. The wetland drainage network and the drainage consolidation pond for the Olsen Project, October 1985.

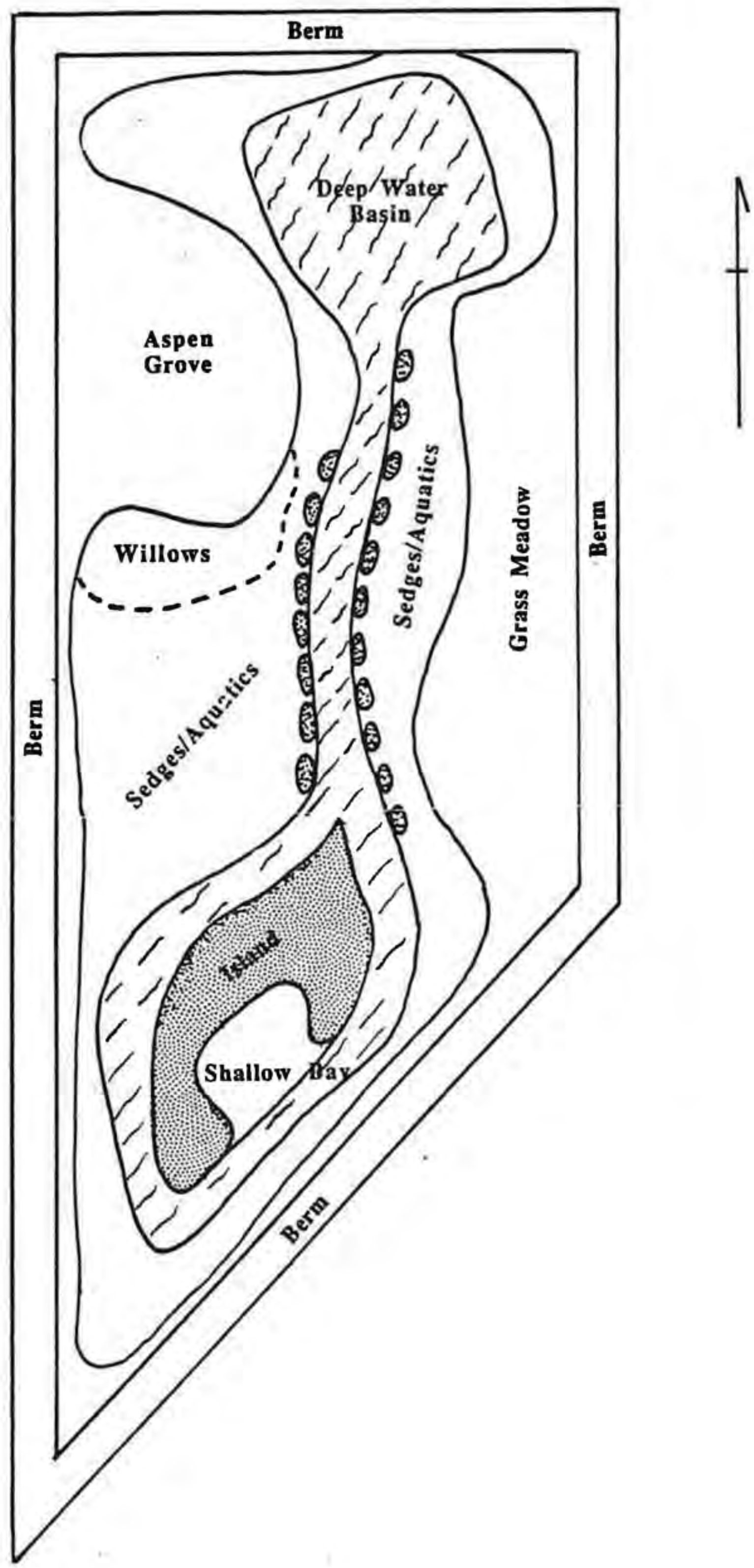

Figure 6. Schematic overview of the Olsen Drainage Consolidation Pond near Rycroft, Alberta. (At full storage level, the sedge/aquatics area and the lower portion of the grass meadow would be flooded.)

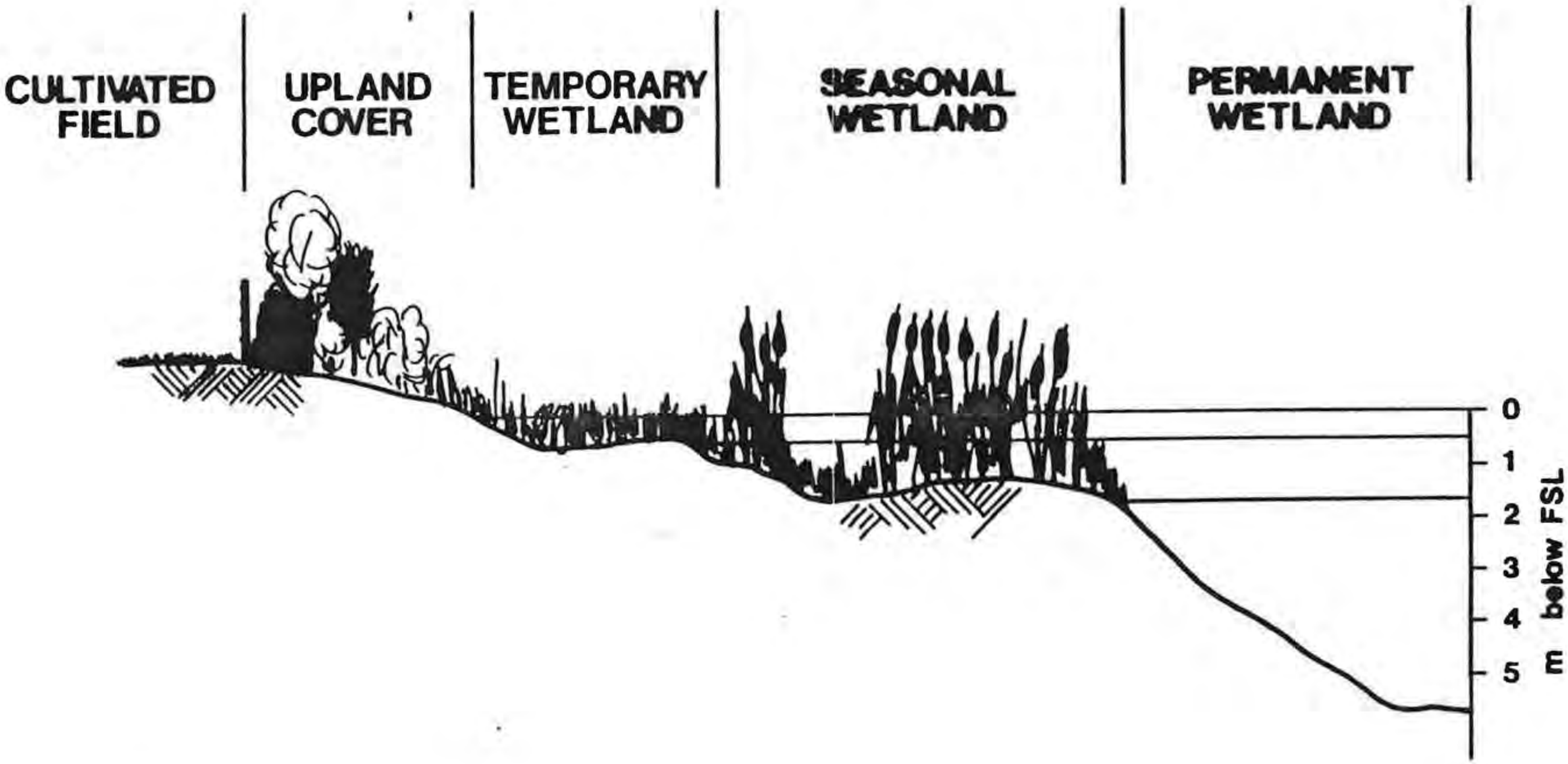

Figure 7. Schematic cross-section of a wetland consolidation pond showing the temporary, seasonal and permanent water areas. (Drainage water would be stored in the upper 1.5 m of the pond and would create the temporary and seasonal water components in the wetland. The remaining water would be permanently retained for use by wildlife. Water drawdowns in the temporary and seasonal water layers would provide a seasonal water regime similar to the hydrological cycles in natural wetlands.)

The remaining 1.6 ha in the poorly drained area originally consisted of a small copse of trembling aspens (up to 8 m in height), approximately 0.3 ha of low shrubs and 1.2 ha of sedge and grass meadows. To promote use of the wetland by nesting waterfowl and to increase the value of the area for terrestrial wildlife, most of this area was developed or left as upland nesting cover and tree/shrub cover.

To provide secure sites for nesting and loafing waterfowl, several islands were also constructed in the pond[2]. One large nesting island was constructed in the southern deep water basin to provide secure nesting habitat for waterfowl. The island is crescent shaped with the horns directed away from the prevailing winds to provide a small calm water bay adjacent to the island. A series of loafing islands were also constructed along the channel.

Revegetation on the area concentrated primarily on the establishment of nesting cover for waterfowl and the development of a screen of shrubs and trees along the north boundary of the pond, adjacent to the existing county road. The ground cover seed mix included grass species, each of which was suitable for a specific range of soil moisture conditions (Table 3). Reed canary grass, creeping red fescue, timothy and alsike clover were selected for their tolerance of damp to wet soils, whereas slender wheatgrass was selected for its suitability for drier upland areas. The seed mix was applied at a rate of 20 kg/ha during May of 1986 and was supplemented with 28-26-0 fertilizer at a rate of 60 kg/ha. No seeding of aquatic plants was believed necessary as ample root and seed stock was present in the existing soil base and surrounding area.

Only a small amount of tree and shrub planting was necessary since only a small area of tree and shrub cover was disturbed during construction. Furthermore, in the areas that were disturbed, large numbers of tree and shrub suckers were already visible during the spring 1986 (i.e., the spring following construction). Tree and shrub planting was instead concentrated along the berm closest to the road to provide a vegetation screen from vehicular traffic. Approximately 20 tree seedlings and 30 shrub seedlings were transplanted by hand from adjacent areas, consisting primarily of trembling aspen, willows, and red osier dogwood. Additional seedlings have been ordered from the county nursery for planting in spring 1987 and include hybrid poplars, white spruce , high-bush cranberry (*Vibernum edule*), chokecherry (*Prunus virginiana*) and several varieties of willows.

Estimated costs for the original consolidation pond were actually higher than for the consolidation pond enhanced for wildlife (Table 4). The major cost savings reflected the salvage of the topsoil from the pond area and respreading of topsoil on surrounding farmland in the original drainage proposal verses the use of the topsoil on both the pond bottom and meadow areas in the wildlife option. Construction of the nesting island and the loafing islands in the wildlife oriented pond also reduced the amount of material that needed to be moved to the edge of the consolidation area (for use in constructing the berm).

Monitoring of waterfowl use of the pond and establishment of vegetation in the pond will likely begin in spring 1987 and continue for an additional two to three years.

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2 The original plan for the pond had called for 2 deep water basins, each with a central nesting island. Five loafing islands were also to have been developed by level ditching between the two basins. However, as a result of poor weather conditions during construction, only one island could be constructed and more loafing islands were developed than necessary. Subsequent modifications to the area removed several loafing islands, expanded the central channel between the two basins and increased the water depth between the loafing islands and the temporary water areas..

Table 3. Ground cover seed mix used on the Olsen Pond consolidation site [1].

Common Names	Scientific Name	Percentage of Seed Mix
Frontier reed canary grass	*Phalaris arundinacea*	20
Boreal creeping red fesuce	*Festuca rubra*	25
Revenue slender wheatgrass.	*Agropyron trachycaulum*	22
Aurora alsike clover	*Trifolium hybridum*	20
Climax timothy	*Phleum pratense*	13

1. A 28-26-0 fertlizer was applied at the same time as the seed. Seed and fertlizer were mixed in a 1:3 ratio. Seed was applied at 20 kg/ha and fertilizer at 60 kg/ha.

Table 4. Costs of habitat reclamation for the Olsen Consolidation Pond.

Specific Reclamation Activity or Item	Approximate Cost
WILDLIFE HABITAT OPTION PLUS STANDARD CONSTRUCTION COSTS	
Additional design input for habitat options (professional services)	$ 1 050
Additional Earthwork for islands and extended shallow water areas	$ 3 000
Reseeding (purchase of seed and fertilizer, equipment rental and labour)	$ 635
Tree planting (1986 and estimated 1987 costs)	$900
Construction costs for basic drainage pond	$ 25 200
Total Costs for Reclamation and Enhancement of Wildlife Habitat	$30 785
DRAINAGE CONSOLIDATION ONLY PLUS STANDARD CONSTRUCTION COSTS	
Removal and respeading of topsoil / transport of excess subsoil material (1916 yd^3 @ $5.50/$yd^3$)	$ 10 538
Construction costs for basic drainage pond	$ 25 200
Total Costs for Reclamation and Enhancement of Wildlife Habitat	$35 738

5.0 DISCUSSION AND CONCLUSIONS

The three examples of wildlife habitat reclamation presented in this paper illustrate the adpatability of wildlife habitat reclamation to a wide range of site conditions and types of disturbances. Furthermore, the methods required can often involve simple techniques that can be incorporated into the reclamation plan at little or no extra cost to the program.

Cost for wildlife habitat reclamation are not prohibitive, and in some cases, may reduce the overall costs for development and/or reclamation. In the case of the Olsen Pond example, the integration of wildlife habitat enhancement with the drainage requirements of the pond resulted in a substantial reduction in the cost of constructing the pond, and reclaiming the area adjacent to the pond. In the Healy Pit example, planning and implementation of wildlife habitat reclamation, in conjunction with site operation and development, permitted the wildlife end use to be incorporated with only a minimal increase in the cost of reclamation. The Cascade Landfill is perhaps representative not only of abandoned developments, but also sites where reclamation has been completed or is near completion. As shown in the Cascade landfill example, reclamation of wildlife habitat in abandoned or already reclaimed sites can be more expensive than for sites where the reclamation end use is preplanned. The higher reclamation costs are primarily reflective of the need to implement reclamation after project completion rather than the costs of reclaiming habitat for wildlife. Costs for the wildlife option are likely no greater than if other reclamation end uses (forestry, watershed protection or agriculture) were developed on this site.

Reclamation costs for wildlife habitat are strongly influenced by the need for modifications to landforms and waterforms following the development of a site. If modifications to landforms and/or water forms can be minimized, the costs for habitat reclamation can be reduced. If habitat reclamation is planned prior to site development, much of the landform modification can be incorporated into the site operations such that total costs for development are minimally affected. Large recontouring work is best accomplished with machinery of comparable size to that which was originally used in creating the site. While recontouring can be cost prohibitive if machinery is brought back to the site specifically for habitat reclamation, recontouring can be relatively inexpensive while machinery is still on the site. For example, the landform modifications for the Healy pit were totally incorporated into the operating budget for the borrow pit. Maintenance of highwall habitats in some coal mine developments in the foothills and mountains of Alberta, may also result in reduced reclamation costs.

Since the mid-1970s, a variety of large and small scale wildlife habitat reclamation projects have been undertaken in the Mountain and Foothills biomes of Alberta (e.g., Banff National Park, Cardinal River Coal, Coal Valley, Greg River Resources, Jasper National Park, Obed Marsh) and British Columbia (e.g., Crowsnest Resources, Fording Coal, Westar)(Green et al. 1986). Several of these projects have included the development of new reclamation techniques or the refinement of existing techniques, and have provided considerable information on the application and potential success of specific reclamation measures. However, there is growing need for additional new or modified techniques and assessments of their success in re-establishing wildlife habitat. Towards this end, monitoring studies of wildlife use and distributions on development sites prior and during industrial use and on sites reclaimed for wildlife and other end uses are required.

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PROCEEDINGS

ALBERTA RECLAMATION CONFERENCES

1985
Planning and Certification of Land Reclamation
April 16-17, 1985
Edmonton Inn, Edmonton

1986
Reclamation in the Eastern Slopes of Alberta
September 25-26, 1986
Overlander Lodge, Hinton

C.B. Powter
R.J. Fessenden
D.G. Walker
Compilers

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CANADIAN LAND RECLAMATION ASSOCIATION

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1985 AND 1986
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For more information on the Alberta Chapter of the Canadian Land Reclamation Association please write to CLRA, Box 682, Guelph, Ontario, Canada N1H 6L3.

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