ARCHAEOLOGICAL OVERVIEW ASSESSMENT OF THE WALDO NORTH GRASSLAND RESTORATION DEMONSTRATION PROJECT

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1. Introduction

This report presents the results and recommendations of an Archaeological Overview Assessment of Waldo North Grassland Restoration Demonstration Project. Project activitieswill consist of a 'thin from below' timber harvest, (falling, skidding, decking) in conjunction with slashing of small stems and piling and burning of slash. These operations are expected to result in a degree of ecological restoration of the historic forest stand structure and understory vegetation. The report consists of a summary of background information pertaining to the environmental and cultural setting of the study area, a description of the methods employed in the study, and presentation and discussion of results. The report concludes with recommendations for conserving archaeological values in the context of the proposed project.

2. Study Area Biogeography

2.1 Present Environment

The present study area is at the north end of the Waldo range unitand will be referred to henceforth as Waldo North. It is situated on the east side of the Rocky Mountain Trench, bounded by the Kootenay River on the west and south, by Sand Creek on the southeast, and the Trench till plain and the Canadian Pacific Railway on the northeast. The Trench till plain consists of an undulating landscape of drumlins and scattered kettle ponds which presently exists in the study area as a surface at elevations above about 810 m a.s.l. In most of the study area the till plain has been dissected by glacial meltwater, leaving deposits of gravelly to sandy outwash; much of the latter has been reworked by wind. There is also a small area of exposed glaciolacustrine silt between about 780 and 811 m (c.f. Kelley and Sprout 1956). The inner valley of the Kootenay River including its Holocene floodplain are not part of the present study area as they have been inundated by the Libby Reservoir.

A major storm track crosses the Trench immediately north of the study area. The influence of the moist maritime air funnelled across the Trench is manifest here by relatively dense lodgepole pine forest whereas ponderosa pine - bunchgrass parkland still occupies most of the the study area. That this pattern is of considerable time depth is indicated by the grey luvisolic soils in the storm track whereas eutric brunisols characterize the Trench floor to the south (Lacelle 1990). Deciduous species occupy riparian zones and moist hollows throughout the study area. This area continues to be very important ungulate range despite forest ingrowth; it would have been savannah or open canopy forest for most of postglacial time.

2.2 Palaeoecology

The Rocky Mountain Trench is a product of a combination of downfaulting, uplift of the adjacent mountains, and erosion by local watercourses (Schofield 1913, Holland 1964). The Trench floor was subsequently modified by several major glacial advances, during the most recent of which it was occupied by a large trunk glacier. This glacier apparently advanced and retreated quite rapidly, between about 18,000 and 15,000 years ago (Clague et al 1980). Retreat of the Trench lobe from the study area vicinity left a drumlinized till plain. Scattered depressions resulting from melting of small chunks of ice in the moraine and outwash filled with water to become kettle lakes. The till plain was partially inundated by a glacial lake dammed further south, then most of Waldo North was subsequently overrun by meltwater, which both carved channels and left gravelly and sandy deposits. The chronology and sequence of deglacial events have yet to be worked out in detail for this part of British Columbia beyond noting that these deposits likely predate the 11,800 years before present (b.p.) age of Mount St. Helens' J tephra found overlying similar deposits in Montana ca.100 km to the south (Mierendorf 1984). Prior to stabilization by vegetation, the exposed sediments on the Trench floor were reworked by the wind into dunes and loess caps. As the postglacial drainage established itself, stream channels were carved into the till plain and subsequent erosion eventually concentrated flow into main channels now followed by the Kootenay River and Sand Creek.

The evolution of the post-glacial ecology and landscape of the southern Rocky Mountain Trench has been reconstructed from pollen studies, alluvial chronologies, soil/sediment sequences and fire histories summarized in Choquette (1985, 1987a, and 1996). The data indicates that 12,000 or more years ago, the region was being colonized by an open "steppe tundra" vegetation of sage and grasses, scattered birch, spruce, and fir, and cattails along lake margins. Charred plant remains on an early floodplain of the Kootenai River ca. 80 km to the south indicate that fire was already part of the regional ecology by 11,730 $\pm$ 410 years ago. Denser coniferous forest had invaded the region by 10,000 years b.p. but the next 3000 years were characterized by drought and the highest forest fire frequency of the entire post-glacial period.

The Maritime westerlies began to dominate the region's climate around 7000 years ago. Precipitation on the west side of the Purcell Mountains increased and forests would have expanded in storm tracks across the floor of the Rocky Mountain Trench. Rain shadows developed in other parts of the Trench, allowing grasslands to persist or possibly even expand. Fire intensity apparently increased after 7000 years b.p. due to higher fuel levels (Hallet and Walker 1999) but by 5,000 years ago, a global cooling trend had begun to affect the region. Forest fire frequency decreased after this time and forests expanded at the expense of the grasslands throughout the region. Conditions between about 4000 and 2500 years ago were cooler than during subsequent millenia (Baker

1983) and during this period, aquatic and riparian communities apparently flourished and the maritime elements of the regional flora became established.

Thereafter, the climate began to warm again, reaching a second, albeit lesser, peak of droughtiness between ca. 1500 and 400 years ago, when forest fire frequency and grasslands increased again. This resulted in a rejuvenation of grazing ungulate populations compared to the preceding period, including the expansion of bison into the southern Rocky Mountain Trench. The final episode in the region's palaeoclimate coincides with the widespread "Little Ice Age", which began in the seventeenth century and which was the most severe glacial episode in the northern Rocky Mountains since the Pleistocene retreat more than 10,000 years ago. The environmental effects were apparently severe, resulting in the disappearance of two species of grazers (bison and antelope) from the southern Rocky Mountain Trench (Johnson 1969).

3. Cultural Context

3.1 Previous Archaeological Investigations

All but two of the archaeological projects carried out in the study area have been associated with the Libby Reservoir. The original survey was conducted in 1954 by Charles Borden (Borden 1956); three precontact sites were recorded within the present study area. Further surveys were conducted from 1971 to 1973 during the Canadian Libby Reservoir Salvage project (Choquette 1971, 1972, 1973a and b) and during the 1989 Libby Reservoir post-inundation assessment (Choquette 1990). Eight loci of exposed precontact archaeological deposits were identified during these projects, two of which extend upward into the Waldo North study area.

The first non-reservoir-related archaeological project consists of the survey of the Alberta Natural Gas pipeline in 1975 (Reeves and Head 1976); no additional sites were found in the present study area. Finally, Landscape Unit C34, which includes Waldo North, was mapped for archaeological potential in 1999 (Choquette 1999). This consisted of stereoscopic air photo analysis and development of GIS-based mapping of individual polygons of high and medium archaeological potential with associated databases containing the criteria for polygon definition. The present study area includes part or all of seven archaeological potential polygons.

3.2 Culture History

The following summary is based on more detailed discussions of regional culture history presented in Choquette (1984, 1987a - c, 1993 and 1996).

The earliest defined archaeological complex in the region is named Goatfell for a major tourmalinite quarry in the southwestern Purcell Mountains. Sites related to this complex are situated on well-drained glaciolacustrine, glaciofluvial, and aeolian landforms associated with the later stages of proglacial lakes. The Goatfell Complex itself has not yet been formally identified as a land use/settlement pattern in the Rocky Mountain Trench but large stemmed and lanceolate spearpoints similar to Goatfell Complex specimens have been found on glaciofluvial landforms and in early fluvial deposits in the Libby Reservoir vicinity. A date of ca. 11,000 $\pm$ 1000 years b.p. is suggested for the inception of the Goatfell Complex in the upper Columbia drainage.

A second archaeological complex, Bristow, has been defined for the period ca. 8000 B.P. to 5000 b.p. in the Kootenai Valley and the southern Rocky Mountain Trench. During this time period, climatic change resulted in the development of the rain shadow on the east side of the Purcell Mountain crest. The shift in geographic focus of human occupation to the southeastern Purcells and the southern Rocky Mountain Trench may have been an adaptive response of resident humans to evolution of the regional ecology in response to this climatic change. The settlement pattern of the Bristow Complex displays a high terrace orientation.

When the climate became notably cooler after 5000 b.p., the upland orientation of the resident humans gave way to a more intensive focus on the resources of the valley bottoms. Rivers, ponds, and sloughs would have increased in size and evidence from archaeological sites dating between 5,000 and 2,500 years ago indicates that fishing, plant gathering, and the taking of waterfowl became more important. The vicinities of the numerous small kettle lakes that dot the floor of the Rocky Mountain Trench became typical locations for campsites, hence the name Kettle Lake Complex for the associated attribute constellation. The sites themselves tend to be small and they are usually situated on terraces either above the present shorelines of these small lakes or above the small marshes and meadows that are their remnants. The archaeological sample of kettle lake settings in the southern Trench is not sufficient to determine whether the Kettle Lake Complex is present in that area but present data indicates that many kettle lakes within the storm track just north of Waldo North were not intensively utilized. Within what is now the Libby Reservoir, a second, contemporary archaeological complex named Kikomun has been defined based on the content of sites situated on alluvial fans and in the alluvium of the large "second bottom" terraces of the Kootenay River. Deer bone greatly dominates the large mammal faunal assemblages.

During the last 2500 years, some significant but gradual shifts in settlement pattern, subsistence base, technology, and lithic material use are apparent in the southern part of the Kootenay Region. These reflect both further resource intensification and economic reorientation to apparently increased big game populations. Large, intensively inhabited sites on alluvial terraces dating to this

time period contain dense middens of fire-broken rock and bone. Smaller upland transitory encampments on higher terraces are also represented. Deer continued to be important but representation of herd grazers such as elk, sheep, and bison increases in the bone samples of the last two millenia.

3.3 Aboriginal Population

The study area is in the centre of the aboriginal territory of the Ktunaxa, also known as the Kutenai or Kootenay Indians. The Ktunaxa are a culturally and linguistically unique group whose cultural evolution paralleled the evolution of the diverse regional ecology. By late prehistoric time, they comprised four geographically and linguistically distinct subdivisions. The Upper Ktunaxa, with whom we are concerned here, inhabited the Rocky Mountain Trench from Tobacco Plains north to beyond Golden as well as the Rocky and eastern Purcell mountains. The major ethnographic works on the Ktunaxa are Schaeffer (1940) and Turney-High (1941); Johnson's 1969 book is a valuable popular work while Smith (1984) has compiled a recent synthesis.

The Upper Ktunaxa followed a nomadic seasonal round determined by the location and scheduling of abundance and ripening of a broad range of animal and plant resources. There is no information in the ethnographic literature regarding the hunting of resident bison but other large game animals, particularly deer and elk, were hunted singly with bows and with traps. Less frequent communal hunts were most important in the spring and fall, the latter providing the bulk of the meat that was dried and stored for winter consumption. From late spring through early fall, game, fish, waterfowl, and plant foods such as roots and berries were acquired by task groups, for example, a group of women picking berries accompanied by a few men who undertook casual hunting at the same time. After obtaining horses around A.D. 1730, the Ktunaxa began making thrice yearly treks to the bison grounds east of the Rockies.

Cooking by stone boiling was the preferred method of preparing food for immediate consumption, except for roots such as camas and bitterroot, which were baked in earth ovens. Foods not eaten directly were dried for winter storage. The main dwelling of the Upper Kootenay was the hide covered tipi; there is some conjecture that prior to obtaining horses, a covering of mats may also have been used. The Ktunaxa employed a wide range of materials in their traditional technology, which was characterized by a very high level of craft. Animal products such as hides, bone, antler and sinew were used for clothing and tools while plants provided materials for weapons, nets, and containers.

Ktunaxa social organization was based on kinship: they were loosely organized into politically independent bands of related families. The hallmark of this social structure was its flexibility, a highly adaptive trait from the diachronic perspective. Band membership was voluntary and both size and composition varied from year

to year. Chieftainship accrued to those with leadership qualities, although some tendency towards hereditary chiefs is apparent in latest times.

4. Methodology

The overall objective of the present project was to assess the Waldo North Grassland Restoration Demonstration Project to determine the potential for adverse impact to be caused to archaeological resources by the proposed timber harvest and ecological restoration activities. This involved the ground truthing of the mapped polygons of archaeological potential to assess the accuracy of the air photo analysis and associated delineation of polygons on TRIM maps (which have variable degrees of imprecision due to forest canopy closure, inaccurate drainage locations, and the 20 m contour interval). This effort also included identifying the presence or absence of precontact archaeological evidence, confirming or rejecting the projected archaeological potential of the individual polygons and obtaining information pertaining to surficial disturbance and post-contact land use.

4.1 Field Survey

The field survey was carried out via pedestrian visual inspection of the polygons, focusing on soil/sediment exposures created by disturbance of the postglacial sediment cap. This sampling strategy has been termed "arbitrary vector" (c.f. Choquette 1979) because the exact location and size of the inspected subsurface exposure is imposed by such arbitrary disturbance factors as machinery and ungulate movements, watercourse erosion, tree throw, rodent and bear activity, etc. and because the greatest exposures tend to be linear (roads, trails, cutbanks). A major value of this strategy lies in the fact that the archaeologist does not bias the specific sampling locations and their spatial parameters are quantifiable. With the location of the subsurface exposures being an independent variable, an objective means is provided for comparing field survey results from one sampling universe to another with regard to the presence/absence and intensity of archaeological deposits. Landforms and sediment are also objective criteria with regard to the presence/absence of cultural deposits (i.e. they are finite entities whose creation is independent of precontact cultural activity), thus it is possible to derive conclusions from geographically based predictions that provide the basis for extrapolation beyond a given sampled landform- or landscape-based polygon.

The project area outside the polygons was also briefly sampled by walking several vehicle tracks that provided linear, east-west traverses across a series of low terraces, possible beaches and other landforms of low relief. This was undertaken in order to ensure that potentially archaeologically significant landforms had not been overlooked during the original mapping and to determine

whether the study area had been characterized by widespread, low intensity human activity in the past that may have left many scattered artifacts across the landscape. The latter is an important consideration due to the very high intensity of precontact human inhabitation that characterized the present-day Libby Reservoir area.

4.2 Analysis

A number of archaeological surveys have been carried out in recent years in Landscape Units in the Rocky Mountain Forest District (RMFD) that have been mapped for archaeological potential. In those which involved ground truthing of the previously mapped polygons, the information gained from the field investigations has been used to re-evaluate the polygons and make adjustments as required. Such adjustments have ranged from deletion of polygons due to disturbance or negative survey results through changes in database entries and/or modification of polygon boundaries to re-assessment of the spatial scale of assessment of archaeological potential. In the latter instance, the 1:20,000 scale was found to be too gross to differentiate depth or geological agency of the Holocene sediment cap or to define relationships between disturbed and undisturbed ground. These cases present a land use management challenge that requires site specific mapping that typically has been beyond the scope of the project in question. However, this information can be made available for results-based management by utilizing the GIS capability to relate multiple data sets to a given geographic location. To this end, a management layer is created by developing a database of management constraints. These are at the inter-polygon scale and augment the geographic attributes in the polygon definition layer.

The primary dimension for this database may be considered as "site structure", the relationship between natural and cultural additions to the landscape. For the most part, the human depositional process has been inconsequential with regard to landscape evolution. This is not to say insignificant, but merely refers to the fact that natural geological processes have been responsible for sculpting the landscape and forming the surficial topography that has been described in Section 2 of this report. From a material perspective, the landforms and sediments can be conceived of as the "containers" of the archaeological evidence. Information about the sedimentary contexts of actual and probable cultural deposits and features forms the basis for identifying limitations to the extent to which these contexts are susceptible to further physical alteration.

These limitations can be considered as benchmarks that can be utilized to identify desirable outcomes in results-based management strategies. In this study, two major aspects of archaeological values are considered. The first may be termed "vulnerability" and relates largely to burial (or lackthereof) of precontact cultural evidence. The sedimentary depositional context is a primary

dimension, attributes being depth of actual or potential burial and resistence to physical manipulation, with the retreat of Pleistocene glaciers and drainage of terminal Pleistocene proglacial lakes representing the baseline. Resistence to physical manipulation is largely dictated by sediment texture and pedogenesis; it ranges from loose/unconsolidated (eg. non-calcareous sand, silt) through moderately unconsolidated (clay, calcareous silt, Cca horizons), and armouring (eg. cobble gravels, till) to resistant (bedrock).

The second aspect of site structure is disturbance, either natural or cultural. Fluvial action is probably the most significant natural agency of post-glacial disturbance that has affected the present study area. Other natural agencies such as bioturbation are relatively minor and consist mostly of tree throw or animal burrowing. Artificial levels of disturbance, on the other hand, have been found in some cases to be sufficiently great as to have altered the terrain beyond its ability to reveal more archaeologically meaningful data than the small measure of presence/absence. Such severe degrees of disturbance are often quite localized, however, so they can be factored into site-specific planning for further land alterations. This provides a valuable management tool in identifying those situations where delineation of preferable loci for further alteration would be a desirable planning component. Disturbances range from localized intensive (.e.g. flood channel, pipeline, bulldozed road/trail) to extensive surficial (wind deflation, logging, cattle traffic, human recreational activity).

The above considerations were distilled into dimensions amenable for inclusion into a database that can be attached to the GIS-based polygons. Seven classes of landscapes have been defined, based on age, extent and pace of natural erosion, and depositional processes. In addition to reflecting the potential for and likely nature of archaeological deposits and features in terms of distribution and intensity, these classes reflect the vulnerability to disturbance of archaeological deposits and, to some degree also correlate with terrain-based land and resource use constraints, for example, riparian area management and terrain stability. Three other dimensions of the management database summarize the survey result, describe the disturbance status and provide management information; definitions of these are presented in Sections 4.2.2 to 4.2.4 below.

4.2.1 Landscape Classes

Only those pertaining to Waldo North are described in detail in the following sections.

4.2.1.1 Class A

This is elevated structural or glacially sculpted bedrock terrain that is either at or above the upper limits of glaciation.

4.2.1.2 Class B

This defines stable elevated terrain in limited Holocene sedimentary source areas and includes most of the till plain of the Rocky Mountain Trench. Sedimentation in these areas during the early Holocene was primarily via accumulation of loess on elevated areas and colluvium at the bases of slopes, followed by surface stabilization by vegetation. The relatively gentle topography and limited relief restrict the amount of subsequent surficial geological activity.

These are old landscapes and thus available for human occupation for the entire post-glacial time span, translating into the potential for repeatedly used locales with consequently intensive cultural deposits. The density of the cultural deposits, and their vulnerability as well, is also related to the low rate of sediment accumulation. These landscapes are usually some distance from the major valley bottoms and watercourses and thus have relatively low potential for having been major human inhabitation foci; however, the small portion of Waldo North encompassing this Landscape Class is an exception due to its proximity to the Kootenay River. Site types would relate to subsistence activities such as hunting and plant gathering, with related small temporary activity loci (e.g. butchering and processing stations, workshops) and camp sites adjacent to streams, springs and ponds; kettle ponds, as described previously, are known to have been used for this purpose in the Rocky Mountain Trench to the north. Transitory sites such as trails, trail shrines and transient encampments can occur at the edges of these landscapes in topographically constrained locations such as saddles, ridge crests and terrace margins.

4.2.1.3 Class C

This class encompasses loose or easily eroded, often deeply dissected glacial drift terrain characterized by deep gulleys, steep slopes and irregular surface topography.

4.2.1.4 Class D

This is rocky structural terrain near valley bottoms that contains localized proglacial or immediate postglacial sediment accumulations such as discontinuous drift terraces/ridges or colluvial fans.

4.2.1.5 Class E

This class encompasses narrow glaciated valleys walled with moraine.

4.2.1.6 Class F

This class is termed inner drift valleys. It consists of the post-glacial terrain created by erosion of watercourses through morainal and glaciolacustrine valley

fill. Fluvial processes have been dominant in reworking the glacial drift into series of erosional terraces capped by alluvial and/or aeolian deposits. The terrain tends to resemble a staircase, in that expanses of level ground on the terrace surfaces are separated by steep slopes created by fluvial entrenchment.

This landscape type is characteristically very important from an archaeological point of view. The extensive, well drained level terraces with their riverine associations represent ideal campsites; furthermore, this valley bottom terrain tends to have great biodiversity that translates into the availability of a wide variety of plant and animal subsistence and technological resources. A further aspect of their potential significance lies in the representation of numerous discrete landforms that are often interrelated in a directly chronological relationship. This allows for relative dating of the associated archaeological evidence, in that the lower terraces are later than the higher ones and thus cannot by definition have intact primary cultural deposits associated with their surfaces that are older than the age of the landform itself. Most of Waldo North comprises this landscape class.

4.2.1.7 Class G

This class includes modern alluvial floodplains and fans, in this locality all of which have been inundated by the Libby Reservoir.

4.2.2 Survey Result

The results of the field investigations and analysis are summarized into four groupings:

1. Archaeological potential of the polygon is confirmed or supported as is.

2. New polygon

3. Polygon modified or potential reduced

4. No precontact archaeological evidence or potential not supported

4.2.3 Disturbance Status

The extent of disturbance is relatively defined as:

1. Low: less than 10 % of the Holocene surface or fines cap disturbed

2. Moderate: between 10 and 50% of the Holocene surface or fines cap disturbed

3. High: more than 50% of the Holocene surface or fines cap disturbed

4.2.4 Management Constraints

1. Any proposed development subject to Archaeological Impact Assessment (AIA), with constraint possible on activities involving severe disturbances.

2. Proposed alteration siting should be on previously disturbed terrain, otherwise AIA.

3. Dispersed surficial actions permitted including logging on frozen snow covered ground, but no disturbance of mineral soil within buffer zones.

4. Archaeological potential revised to low; no further archaeological concern.

5. Results

Previously undiscovered precontact archaeological remains were observed in three of the archaeological potential polygons, providing support for the archaeological potential assessments in this location. Only one artifact, a cobble chopper found on a high sandy ridge cut by the Alberta Natural Gas pipeline, was observed during survey of arbitrary vector transects of the low potential areas outside the mapped polygons. In addition to providing an almost total confirmation of the low potential indicated by the absence of mapped polygons, this result also indicates that the interior of the study area is not characterized by numerous scattered artifacts.

Table 1 summarizes the assessment of archaeological potential polygons in Waldo North in terms of the attributes presented in Section 4.2. This information is expanded below with regard to the forestry activities proposed for the Waldo North Grassland Restoration Demonstration Project.

POLYGON	LANDSCAPE CLASS	SURVEY RESULT	DISTURBANCE CLASS	MANAGEMENT CONSTRAINTS
C34-36	F	1	1	3
C34-54	F	1	1	1
C34-55	B	1	1	3
C34-64	F	1	2	3
C34-65	F	1	2	3
C34-66	F	1	2	3
C34-101	F	1	2	3

Table 1. Management database for archaeological potential polygons in Waldo North.

6. Assessment and Recommendations

Based on the information obtained via the field survey and presented in this report, the following outlines constraints with regard to the proposed timber harvest and ecological restoration. Each archaeological potential polygon is discussed separately, from north to south.

6.1 Polygon C34-36

This polygon derives its archaeological potential primarily from the continuous elevated terrace margin that was undoubtedly utilized as a pedestrian travel corridor along the Kootenay River during the Holocene. Secondary factors influencing archaeological potential relate to the presence of smaller outwash terraces and small depressions that could have served to focus human activity throughout the post-glacial period.

The surfaces of level to gently sloping terraces as well as areas of less than 15^{o} slope adjacent to any riparian pockets should be protected by a machine-free zone extending back 30 m from the margins. Slash piles should be burned on disturbances or on slopes greater than 15^{o}. Felling and random skidding are permissible elsewhere within the polygon but multiple use skid trails, if necessary, should follow existing roads and trails. Construction of any bladed structures such as roads or landings must be preceded by Archaeological Impact Assessment (AIA).

6.2 Polygon C34-54

This polygon captures a small erosional terrace above the Kootenay River west of Polygon C34-36. Precontact cultural deposits were observed at several locations within this polygon, confirming its archaeological potential. The mineral soil on the surface of the terrace and level to gently sloping portions of the immediately adjacent higher terrain should not be disturbed and nor should any piles be burned on slopes less than 15^{o} without a prior AIA.

6.3 Polygon C34-55

The only archaeological potential polygon in Waldo North that encompasses the Trench till plain, C34-55 encompasses terrain surrounding a kettle pond at the dissected southwest edge of the Trench till plain.

Areas of less than 15^{o} slope within 50 m of the riparian zone should be protected by machine-free zones as should terrace margins elsewhere in the polygon. Ridgecrests also must be avoided by machinery. Within the machine-free buffer zones, slash piles should be burned on slopes greater than 15^{o}. Construction of any bladed structures such as roads or landings must be preceded by Archaeological Impact Assessment (AIA).

6.4 Polygon C34-101

This polygon is situated south of Polygon C34-36 and likewise derives its archaeological potential from the continuous elevated terrace margin above and parallelling the Kootenay River. Precontact cultural deposits have been exposed by vehicle traffic and camping on this terrace margin, confirming the polygon's archaeological potential.

The level to gently sloping terrain within 100 m of the main terrace margin requires protection via a machine-free zone. Slash piles can be burned on disturbances or on slopes greater than 15^{o} within the machine-free buffer zone. Felling and random skidding are permissible elsewhere within the polygon but multiple use skid trails, if necessary, should follow existing roads and trails. Construction of any bladed structures such as roads or landings must be preceded by Archaeological Impact Assessment (AIA).

6.5 Polygon C34-65

The eastern- and southeasternmost parts of Waldo North are within polygon C34-65. It captures a variety of terrace and fluvial bar features created during dissection of the till plain. The long north-south portion of the polygon consists of an outwash channel that contains several ponds and marshes with one of Borden's previously recorded sites associated while the east-west portion of the polygon extends westward along the edge of the till plain where the Kootenay River has incised itself. Another of Borden's sites is situated where the high terrace margin parallelling Sand Creek meets its counterpart parallelling the Kootenay River.

All areas of less than 15^{o} slope within 100 m of the riparian zone and surfaces within 100 m of the margins of terraces with risers greater than 0.5 m must be protected by machine-free zones. Ridgecrests also must be avoided by machinery. Hand falling and dispersed long-line skidding are permissable in these machine-free zones. Within these buffer zones, slash piles should be burned on disturbances or on slopes greater than 15^{o}. Felling and random skidding are permissible elsewhere within the polygon but multiple use skid trails, if necessary, should follow existing roads and trails. Construction of any bladed structures such as roads or landings must be preceded by Archaeological Impact Assessment (AIA).

6.6 Polygon C34-66

This polygon encompasses terraces and ridges of glaciolacustrine fine sediment that have undergone erosion subsequent to drainage of the lake. The topography is irregular but is more subdued than that of Landscape Class C. No precontact archaeological remains were observed in this polygon despite considerable

subsurface exposure, but the presence of small ponds in the vicinity and the generally strategic location of the polygon with regard to pedestrian travel across the Trench floor justify retention of the archaeological potential of C34-66.

The undisturbed portions of level to gently sloping flat surfaced terraces and areas of less than 15^{o} slope adjacent to riparian pockets should be protected by 30 m machine-free zones. Ridgecrests also must be avoided by machinery. Within the machine-free buffer zones, slash piles should be burned on disturbances or on slopes greater than 15^{o}. Felling and random skidding are permissible elsewhere within the polygon but multiple use skid trails, if necessary, should follow existing roads and trails. Construction of any bladed structures such as roads or landings must be preceded by Archaeological Impact Assessment (AIA).

6.7 Polygon C34-64

This polygon is situated at the southwest edge of Waldo North. It encompasses the margins of high south- and west-facing terraces above the Kootenay River as well as terraces and ridges surrounding several small kettle lakes. It contains one site located by Borden in 1954; 4 sites identified by Choquette in 1989 are immediately adjacent and one additional locus of archaeological material was observed during the present survey.

All surfaces within 100 m of the margins of terraces with risers greater than 0.5 m and areas of less than 15^{o} slope within 100 m of the riparian zone must be protected by machine-free zones. Ridgecrests also must be avoided by machinery. Slash piles should be burned on disturbances or on slopes greater than 15^{o}. Felling and random skidding are permissible outside the machine-free zones in the polygon but multiple use skid trails, if necessary, should follow existing roads and trails. Construction of any bladed structures such as roads or landings must be preceded by Archaeological Impact Assessment (AIA).

7. Conclusion

The archaeological values in the Waldo North Grassland Restoration Demonstration Project area have been assessed via archaeological reconnaissance. The archaeological potential of all seven previously mapped polygons was confirmed and a range of constraints identified to allow for the proposed timber harvest and ecological restoration to be carried out without compromising the archaeological values.

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