

A REVIEW OF GRASSLAND ECOSYSTEMS
IN THE MICA WILDLIFE COMPENSATION AREA



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for:

The B.C. Ministry of Environment, Lands and Parks,
and
The Mica Wildlife Compensation Program

July, 1993

Acknowledgements

I would like to thank the staff of the Invermere Forest Service for their assistance. These include Gail Berg, Phil Burke and Russ Hendry.

The staff of the Invermere Museum were very helpful with historical information and gave me access to the archives. Special thanks go to Jaryl McIsaac.

Thanks also go to long-time residents Dix Anderson and Albert Cooper, for their long-term perspective on the area, and to Wayne Chouquette, who is always generous.

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1. INTRODUCTION

Grassland ecosystems of the East Kootenays are poorly understood. Accounts of early explorers paint a picture of large, widely spaced trees with lush grass beneath (T. Braumandl, pers. comm.). Old stumps do remain to this day as witness to that earlier time when light intensity ground fires went through frequently, removing the newly established trees, while the older, fire-protected ponderosa pine and Douglas fir remained. Over the past 50 years, however, fire suppression in the Rocky Mountain Trench has been carried out, with the result that ingrowth and encroachment of trees onto grasslands has drastically altered this ecosystem. Not only has the size and number of grasslands decreased, but there have been profound changes in species composition and in the health of the stands that have become established. A further complication is an increased risk of catastrophic fires as the fuel loads in these ingrowing stands continue to increase in the absence of light, frequent fire. Research conducted by the U.S. Forest Service has indicated that there has been a major change in the fire regime; a significantly higher proportion of fires "crown" now than did in the past due to high fuel loads (S. Hagle, 1992). The B.C. Ministry of Forests is currently examining this issue with a view to reintroducing a more natural fire cycle to parts of the East Kootenay Trench.

In addition to fire suppression, agricultural development has also had a negative impact on East Kootenay grasslands. Alfalfa and non-native grass species have been planted in many areas which previously supported native range.

The purpose of this review, undertaken as part of the Columbia River Mica Dam Compensation program, is to identify and map existing grasslands from Radium Hot Springs south to Canal Flats, to develop a general floristic list of each site and, where possible, to collect historical information on their previous extent. It is hoped that this review will provide grassland researchers and soils experts with a catalogue of sites that will be easy to use and will facilitate more detailed, site-specific research on the dynamics of grassland ecosystems.

2. STUDY AREA

The study area is located in that portion of the Columbia basin which is between Canal Flats and Radium Hot Springs in the East Kootenay Trench Ecosection (Fig. 1). The trench lies in a north-south direction between the Purcell Range in the west and the Rocky Mountains to the east, at an elevation of approximately 800 m. The north portion of the ecosection is drained by the Columbia River, while the Kootenay River drains the southern portion.

During the most recent of the Pleistocene glaciations, the Fraser glaciation, glacier ice up to 1300 m thick extended the full length of the valley. This glacier, and the processes accompanying deglaciation (which occurred from 12,000 to approximately 9,000 years ago) are largely

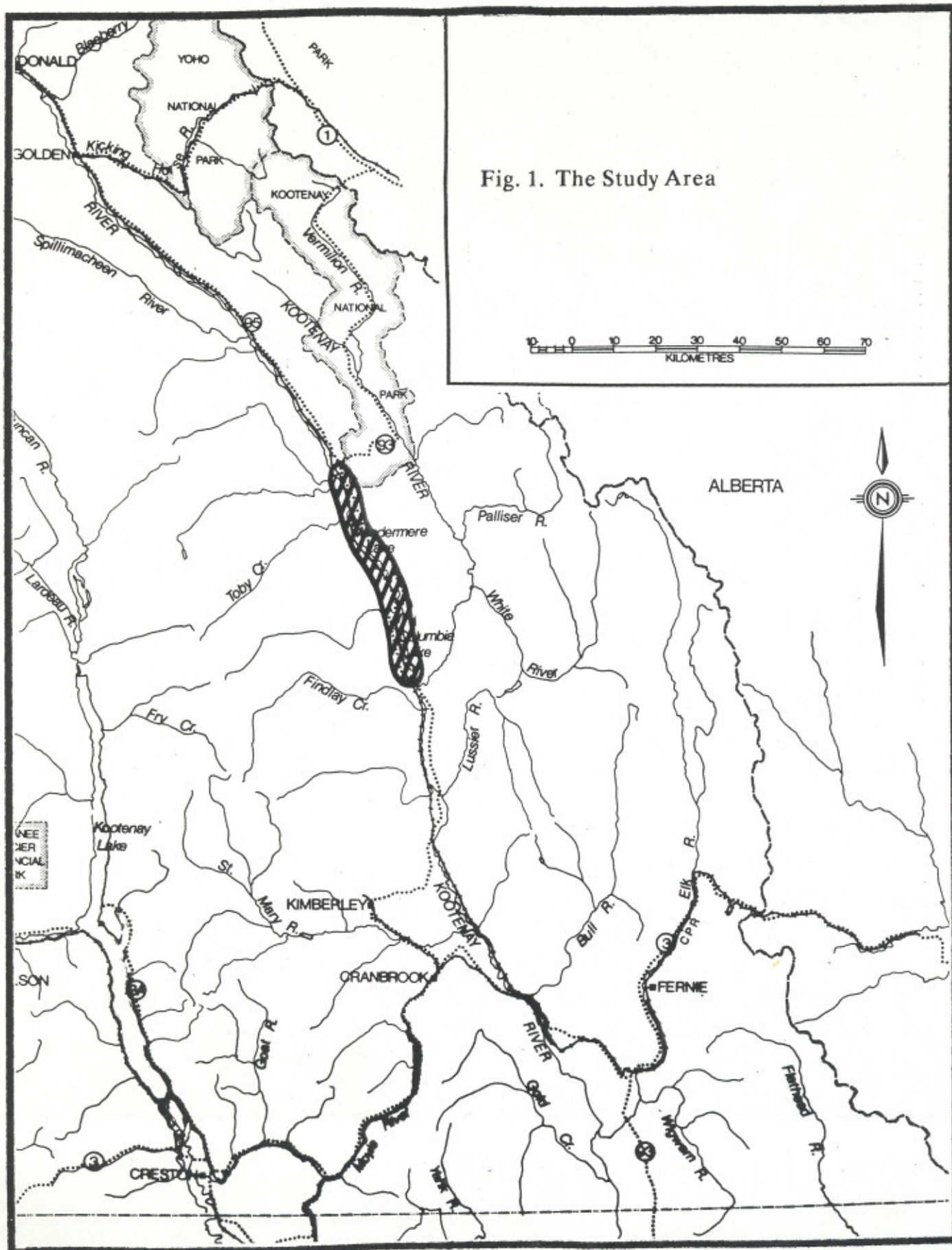


Fig. 1. The Study Area

responsible for the landforms and surficial materials present today. The grasslands identified in this overview are found on a variety of bases, including glaciofluvial fans and terraces, gravelly morainal materials, in soils developed atop rubbly colluvium and on the silty, glacio-lacustrine terraces that line the shores of Columbia and Windermere Lakes (Lacelle 1990). Post glacial events such as the eruption of Mt Mazama (Crater Lake Oregon) in 6900 BP (which deposited volcanic ash on the area) (Enns and Ryder 1993), the movement and deposition of fine loess soils by the wind (aeolian veneers), and gully erosion on steep slopes also contributed to the land forms and soil types that occur at present in the study area.

Parent materials from which soils are derived are generally limestone and dolomite in and at the base of the Rocky Mountains, while the bedrock geology of the Purcells is more varied, consisting of limestone, andesite breccia, quartzite, argillite and dolomite. Soils are often calcareous on both sides of the trench (Lacelle 1990), however this trait appears to be more extreme on the east side of the valley.

The climate of the East Kootenay Trench is characterized by dry, hot summers and cold winters with light snowfall. Most of the precipitation that does occur falls as snow between November and February, although there is a secondary peak in June (Kemper 1971). Intense solar radiation in the Trench forms convective currents which push air masses upward and discourage cloud buildup over the valley (Demarchi 1986). As a result the southern East Kootenay Trench receives only about 35 cm (14 in) of precipitation annually, which is much less than the surrounding mountainous areas. Soils may dry out for long periods in the late summer, and the lack of soil moisture is a major limitation to the growth of trees in some areas.

The grasslands of the East Kootenay Trench Ecosection occur within two biogeoclimatic zones, the Interior Douglas Fir Biogeoclimatic Zone and the Ponderosa Pine Biogeoclimatic Zone. Within these zones, characteristic subzones and variants have been described (Braumandl and Curran 1992). These are:

I. INTERIOR DOUGLAS FIR BIOGEOCLIMATIC ZONE

Subzone: Interior Douglas Fir

Variants:

IDFun - Undifferentiated Interior Douglas-fir variant

IDFdm2 - Kootenay Dry Mild Interior Douglas-fir variant

II. PONDEROSA PINE BIOGEOCLIMATIC ZONE

Subzone: Ponderosa Pine

Variant: PPdh2 - Kootenay Dry Hot Ponderosa Pine var.

the dry, hot Ponderosa Pine Variant, PPdh2, includes both very dry, open, bunchgrass sites

The grasslands and shrublands examined in this review, however, are in the IDFun and IDFdm2 variants of the Interior Douglas Fir Biogeoclimatic Zone; the very dry, hot bunchgrass sites in the ponderosa pine zone occur south of the Mica Compensation Program's current area of concern, so they are not included in this report.

3. METHODS

1:20,000 air photos were studied and those areas which appeared on the photos to be grass or shrub-dominated sites with crown closure of < 5% were visited in the field. In the field it was discovered that immature conifers were present on most sites although these did not show up in the air photos. Topographic, legal and floristic descriptions of these sites were developed. Topographic features included slope (described as flat, gentle, moderate or steep) and surface regularity and shape (gently undulating to strongly hilly). Aspect was, in many cases inapplicable where the size of the unit was large and the terrain undulating. Where floristic differences were evident in these undulations, they were described. The status of the land (crown or private), its legal description and, where relevant, the name(s) of the owners were documented. Size estimates of the sites are provided.

Soil information was obtained from Lacelle (1990) soil maps. The soil map unit symbols are displayed in each unit description, for example FX1⁶M2⁴/D. Knowledge of these symbols is not required to understand this report as a description of the soil is included. The superscripts, however, denote the percentage of the unit that is occupied by the soil association to which they refer. It should be noted that the soil information in Lacelle (1990) is based on a reconnaissance level of mapping, and site specific inspections were not carried out in the present overview.

Range condition was evaluated based on the following criteria; species composition - ie the presence or absence of the more sensitive "decreaser" grass species such as bluebunch wheatgrass or rough fescue, amount of exposed soil, etc. The spring and summer of 1993 had much higher than usual rainfall; the effect of this on apparent vigor and species composition was considered, and grading of range condition not influenced by the excessive rain.

Sites were visited from June 3 to July 20, 1993 and a floristic list was prepared for each unit. Although the vegetation lists are fairly complete for the dates visited, no sampling was carried out prior to or subsequent to the above dates, with the result that some ephemeral forbs and grasses were not included. The dominant grass and/or shrub species are recorded as well as associated species. Other relevant information, such as tree ingrowth, the presence or absence of stumps, and spacing and size of stumps is noted also. In addition to information on present land use, fire and/or logging history has been included wherever that information was available. A photo plot was taken at each unit.

The area was divided into three large sections for mapping purposes (Figs 2, 3 and 5). Within these larger areas, smaller sites were mapped as distinct units if they were separated by a) large distances b) differences in vegetation c) major differences in topographic base d) differences in fire history. These were then plotted on 1:50,000 base maps. As this scale was too small, each unit was again plotted in greater detail on color air photos at 1:20,000. These are accompanied by text and an oblique photo.

Airphotos from 1947 and 1949 were examined and the size and shape of openings compared with photos taken in 1988. Care was taken, where possible, to use only the center portion of the photos to minimize effects of

distortion. Historical borders of grasslands were superimposed on the mapping of the present grasslands to give a graphic visual comparison of the effects of tree ingrowth. A figure of <5% crown closure was used to determine if a historical opening qualified as a "grassland", and care was taken when working with the old black and white photos that wet meadows and/or agricultural fields were not mistakenly included. Several old oblique photos dating from 1900 to 1910 were also examined, and current photos were taken from the same spot for comparative purposes.

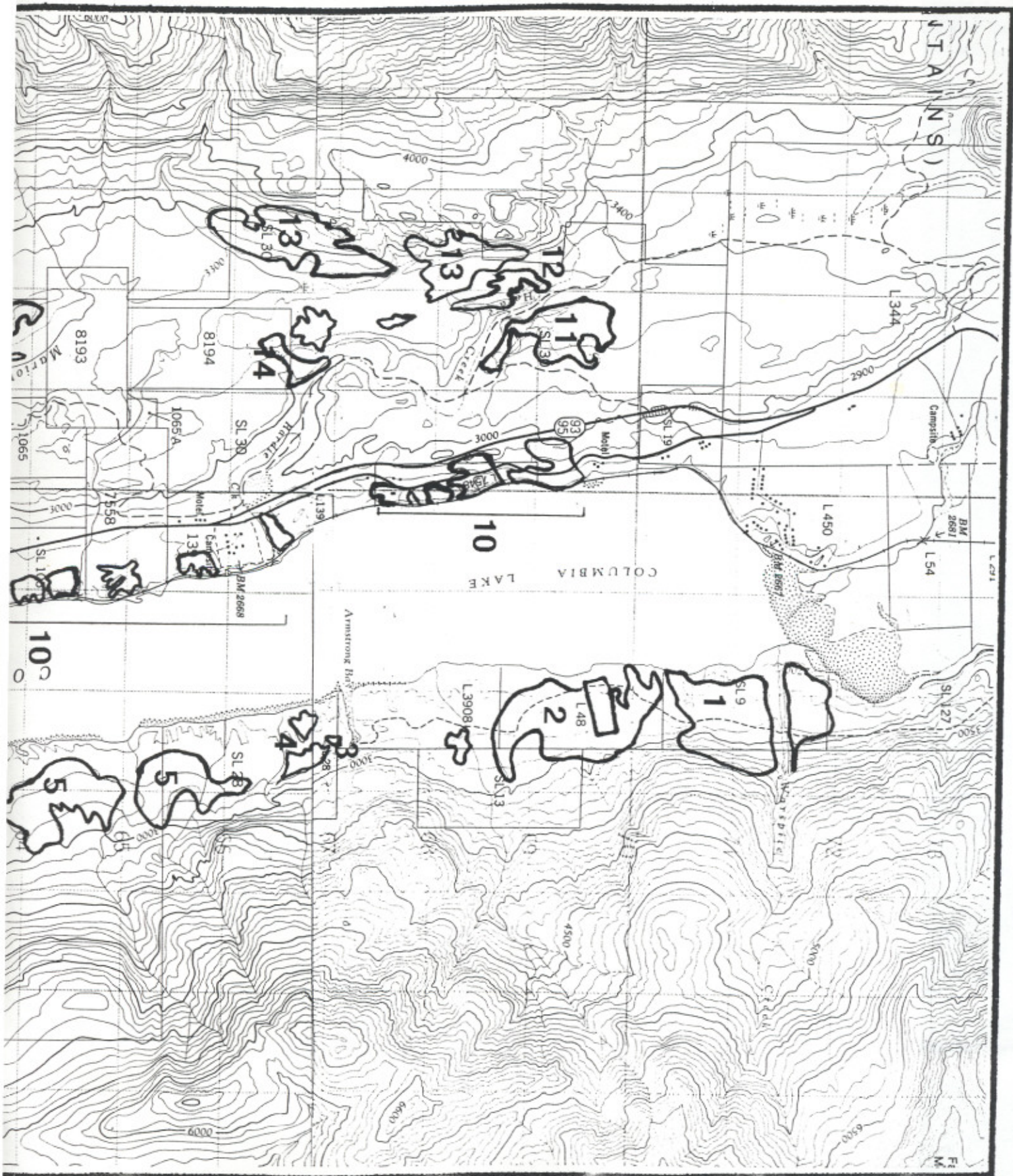
Wildlife observations and sign were recorded for each area. The ecological context, or the ecological relationship of a site with adjacent habitats was also noted, as this may have profound implications when determining the type and extent of habitat manipulation that may be recommended in future.

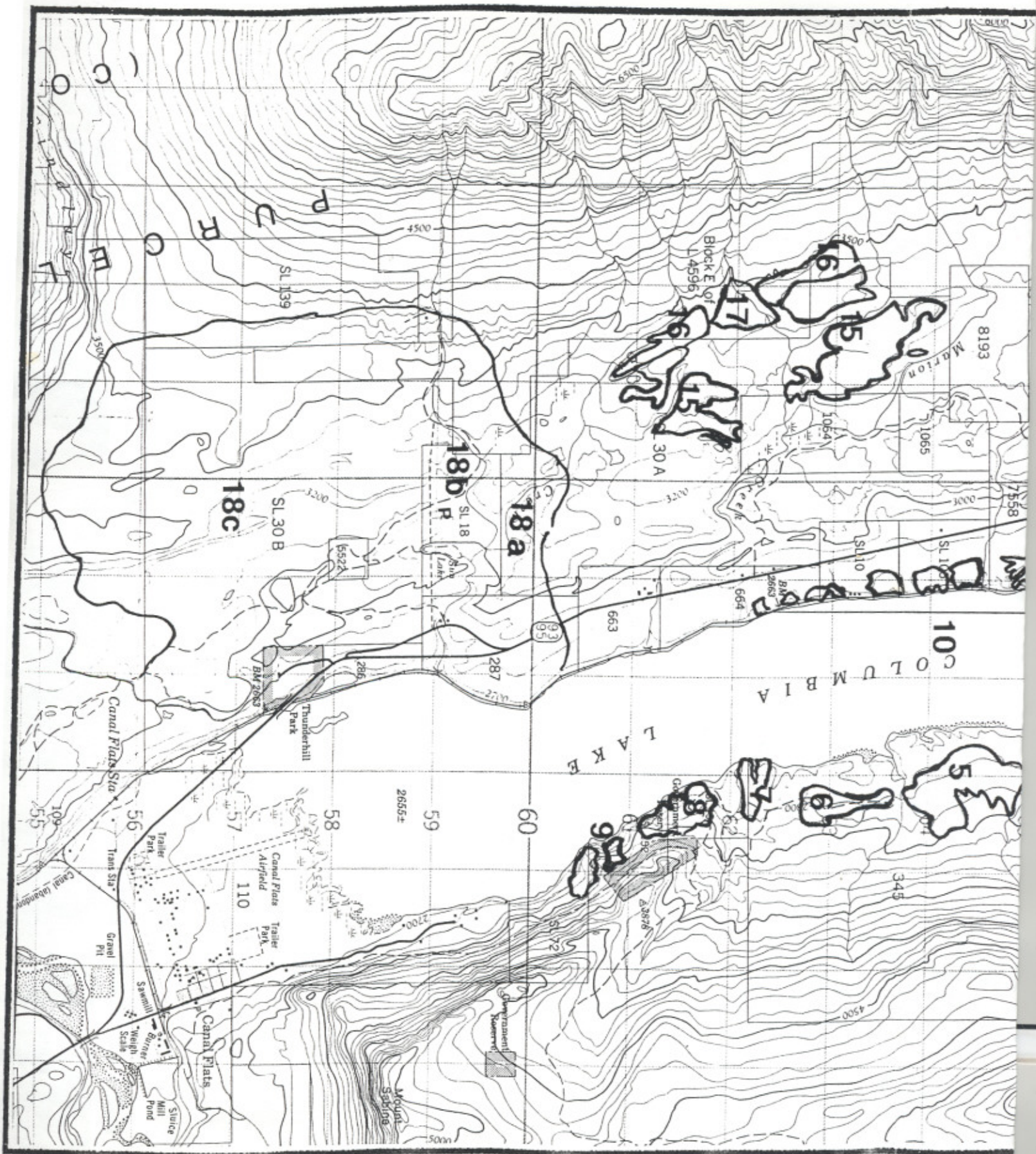
As the true nature of East Kootenay grasslands and their dependence on fire is still undetermined, management recommendations in this report have been made rarely and with caution. Management will require site-specific analysis and that is beyond the scope of this overview.

4.0 GRASSLAND SITES

4.1.0 SECTION 1: COLUMBIA LAKE AREA

Fig. 2 Overview map of grassland units in the southern portion of the study area near Columbia Lake (1:50,000)





UNIT # 1	APPROX. SIZE: 38 ha
LOCATION: Columbia Lake Provincial Park	
TOPO MAP: Fairmont 82J/5	AIRPHOTO #: 30BCCC 851-169
LOT: S.L. 9	LAND STATUS: Provincial Park
BEDROCK GEOLOGY AND SOILS: FX2 ⁸ M2 ² /D. FX2 - Fishertown soil association: fluvioglacial origin, gravelly, sandy loam, with high amounts of coarse fragments, calcareous, rapidly drained, Orthic Dark Brown. Equivalent to SAHA 10 (chernozemic order) soil association (Lacelle 1990). M2 - Mayook soil association: glaciolacustrine origin, silty, well drained. As with FX2, less common soils have well developed surface horizons, organically enriched as a result of their development under grassy vegetation.	
SLOPE: gentle	ASPECT: W
SURFACE REGULARITY AND SHAPE: smooth slope	

DOMINANT VEGETATION Bluebunch wheatgrass Rabbitbush	ASSOC. VEGETATION Needle and thread grass Canada bluegrass Bluestem wheatgrass Fleabane Timber milk vetch Aster (sp) Nodding onion Resin weed Pussytoes Flax Mariposa Lily Locoweed Brown-eyed Susan Spike goldenrod Saskatoon (<30 cm) Rocky Mtn. juniper Douglas fir
RANGE CONDITION: good	

PRESENT LAND USE: Provincial park

WILDLIFE USE: High elk sign, but cursory inspection suggests lower use than grassland to south, perhaps due to availability of domestic hay crop adjacent to that unit. Bird use of trees nearby; grassland good foraging area for woodland hawks (Accipiters) and red-tailed hawks.

30BCC 822 No. 169

DOMESTIC SEEDING

P.

UNIT 1



ECOLOGICAL CONTEXT:

This grassland is heavily dissected with rows of Douglas fir trees which occur in very obvious lines running parallel to the slope (see air photo). This may reflect underlying drainage patterns.

HISTORICAL INFORMATION:

Air photos from the 1940's reveal an almost identical distribution of trees; encroachment does not appear to have occurred during this time interval on this site, nor on several other sites along the east shore of Columbia Lake which show similar lines of trees.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

This unit's status as part of a Provincial Park has allowed the community of species that are sensitive to grazing (bluebunch wheatgrass and rough fescue) to flourish. Overall plant species diversity is also higher on this site than in Unit 2 immediately to the south. Maintain as is.



UNIT #2	APPROX. SIZE: 63
LOCATION: N. End Columbia Lake East	
TOPO MAP: Fairmont 82J/5	AIRPHOTO #: 30BCC 851-170
LOT: L. 48, S.L. 13,3908 crown to east and south.	LAND STATUS: private, sm. area of
BEDROCK GEOLOGY AND SOILS: FX2 ⁸ M2 ² /D. FX2 - Fishertown soil association: fluvioglacial origin, gravelly, sandy loam, with high amounts of coarse fragments, calcareous, rapidly drained, Orthic Dark Brown. Equivalent to SAHA 10 (chernozemic order) soil association (Lacelle 1990). M2 - Mayook soil association: glaciolacustrine origin, silty, well drained. As with FX2, less common soils have well developed surface horizons, organically enriched as a result of their development under grassy vegetation.	
SLOPE: gentle	ASPECT: W
SURFACE REGULARITY AND SHAPE: smooth	

DOMINANT VEGETATION Junegrass Rabbitbush	ASSOC. VEGETATION Needle and thread grass Canada bluegrass (pockets) Bluestem wheatgrass (pockets) Bluebunch wheatgrass * Rough fescue * Pasture sage Fleabane Nodding onion Spike goldenrod Oyster plant Brown-eyed Susan Flax Pussytoes
RANGE CONDITION: poor to fair. * Occasional occurrence	

PRESENT LAND USE: cattle grazing — *not now*

WILDLIFE USE: Very high elk sign. Meadowlarks, vesper sparrows, high variety of birds in adjacent trees, including red crossbills, chickadees, nuthatches. The open grassland is a good foraging area for woodland hawks (Accipiters) and red-tailed hawks. Great horned owls and golden eagles likely nest in rocky outcrops nearby.

ECOLOGICAL CONTEXT: This grassland is located near steep cliffs of bedrock immediately to the east. There is an irrigated hay field nearby, which likely provides additional forage for ungulates. There are some snags



3080

in the solid stands of Douglas-fir which occur in small hollows. Most of these trees occur in discrete pockets, while single mature trees occur throughout the grassland.

HISTORICAL INFORMATION: Comparison with 1947 air photos indicate little or no encroachment during this time interval.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

Bluebunch and rough fescue plants occur occasionally, near trees or downed logs - generally those areas which are cluttered and impede easy animal movement. Cattle have been grazed on this site in the past. It is possible that the bluebunch and fescue plants may improve in abundance and vigor if cattle are not grazed on this site. The range condition Unit 1 (in the provincial park) is far superior; both units are ecologically similar, have the same soils, aspect and drainage.



UNIT #3	APPROX. SIZE: 4 ha
LOCATION: pocket grass/shrub comm. south of Armstrong Bay	
TOPO MAP: Canal Flats 82J/4	AIRPHOTO #: s. of 851-171
LOT: S.L. 28	LAND STATUS: private?
BEDROCK GEOLOGY AND SOILS:	
SLOPE: gentle	ASPECT: SWW
SURFACE REGULARITY AND SHAPE: gently undulating	

DOMINANT VEGETATION	ASSOC. VEGETATION
Bluebunch wheatgrass	Pasture sage
Junegrass	Douglas fir
Needle and thread grass	
Rabbitbush	
RANGE CONDITION: fair	

WILDLIFE USE: Deer/sheep sign elk.

ECOLOGICAL CONTEXT: Very near steep gullies going to Armstrong Bay and cliffs to the east. Douglas fir of varying ages around the pocket.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:
Douglas-fir not much ingrowth.

30BCC 851 No.107



UNIT #4	APPROX. SIZE: 12 ha
LOCATION: East Columbia Lake	
TOPO MAP: Canal Flats 82J/4 AIRPHOTO #:s. of 851-171	
LOT:S.L 28	LAND STATUS: Min. of Environment
BEDROCK GEOLOGY AND SOILS: M2/DG. Mayook2 soil assoc: developed on silty glaciolacustrine terrace. Less common soil developed under grassy vegetation, and has organically-enriched surface horizons. Soils are silty and have a clay component in some areas. While the more common soil is classified Orthic Eutric Brunisol, the less common in M2 is Orthic Dark Brown.	
SLOPE:flat to v. gentle	ASPECT: W
SURFACE REGULARITY AND SHAPE: smooth	

DOMINANT VEGETATION	ASSOC. VEGETATION
Rabbitbush	Bluebunch wheatgrass
Needle and thread grass	Brown-eyed Susan
Junegrass	Pussytoes
	Resin weed
	Rocky Mtn. juniper
	Bluegrass (downslope)
RANGE CONDITION: poor to fair. exposed soil but some bluebunch present.	

WILDLIFE USE: Good habitat for species that prefer an open canopy forest.

ECOLOGICAL CONTEXT: Excellent large diameter Douglas fir in this area, so is likely flammulated owl habitat. Deciduous community to the west (mostly alder) which adds to the insect and bird diversity of the area. To the northeast are some cliffs and the steeper grassy slopes to the southwest appear to be bluebunch wheatgrass dominated (not visited). Small Rocky Mtn. juniper are abundant here.

COMMENTS AND MANAGEMENT RECOMMENDATIONS: High moisture holding capability with high pH (Enns 1993). Not a grassland but shrub-dominant (here, rabbitbrush) in an open-canopy Douglas fir system. Douglas fir trees not arrayed in lines as they are on units 210, 250, wilders and park

UNIT #5	APPROX. SIZE: 91 ha
LOCATION: East Columbia Lake	
TOPO MAP: Canal Flats 82J/4	AIRPHOTO #: 30BCC 851-31
LOT: L.345 & S.L. 28	LAND STATUS: Gov't res. & private
BEDROCK GEOLOGY AND SOILS: COL2 ⁶ E2 ⁴ /E. COL2: Colin Creek soil association: colluvial, E2 soil assoc: silty sandy fluvial veneer overlying fluvioglacial outwash fan. Less common soils of both associations have well developed organic matter - enriched Ah due to grassy vegetation. E2 equivalent to Saha 10 soil assoc. (chernozemic).	
SLOPE: v. gentle	ASPECT: W and SW
SURFACE REGULARITY AND SHAPE: v smooth, fan-like	

DOMINANT VEGETATION	ASSOC. VEGETATION
Junegrass	Bluestem wheatgrass
Rabbitbush	Needle & thread gr. (low occurrence)
	Bluebunch wheatgrass (v. low occurrence)
	Pasture sage
	Nodding onion
	Flax
	Douglas-fir
	Rocky Mtn. juniper
RANGE CONDITION: poor, exposed soil	

PRESENT LAND USE: historical cattle grazing

WILDLIFE USE: Elk sign quite high but not as high as on Units 7 and 8, perhaps due to poorer range condition on this site. Lots of ant colonies, nighthawks, kestrels. Should be flammulated owls and other raptors as mature trees occur near this open area.

HISTORICAL INFORMATION:

Comparison with 1947 photographs show no significant encroachment since that time. The number of trees on the site prior to 1947 cannot be determined; the trees that are present are mature and soils information (Lacelle 1990) indicates that grassland vegetation may have dominated for over the long term.

ECOLOGICAL CONTEXT:

Plant species diversity appears low on this site. Trees on fan are not young, with the exception of a few scattered seedlings and some immature trees at edges of fan. Douglas fir trees arrayed in distinct lines running downslope. This may reflect distinct subsurface moisture channels. The greater portion



of the immature Douglas-firs are adjacent to the trees at the base of the slope rather than those trees growing mid- and up-slope; this may simply be reflective of more moisture downslope. There are significant numbers of snags with holes in them at the forest edge, and to a lesser degree in the open. The southern edge of the more northerly fan abutts a deciduous community; this provides even more habitat diversity than if all edge of these fans was comprised of conifers.

COMMENTS AND MANAGEMENT RECOMMENDATIONS: Vegetation is similar to Unit 6, however soil in that unit developed on morainal materials (Enns 1993) while this unit is clearly a glaciofluvial fan. Shrub development, specifically that of rabbitbush is significantly less than on site to north (Unit 4). The very low occurrence of bluebunch wheatgrass may reflect cattle grazing history on this site. More research is required on the long-term dynamics of the vegetation on this site.



UNIT #6	APPROX. SIZE: 24 ha
LOCATION: East Columbia Lake	
TOPO MAP: Canal Flats 82J/4	AIRPHOTO #: 30BCC 822-93
LOT: L. 345 GR	LAND STATUS: Gov't reserve
BEDROCK GEOLOGY AND SOILS: WY2 ⁸ E2 ¹ COL2 ¹ /dg. WY2: Wycliffe soil association: morainal, gravelly silty, derived from calcareous bedrock. Orthic Eutric Brunisol, with less common soil classified as Calcareous Dark Brown, as it developed under grassy vegetation. Well drained, shallow solum. E2: Elko soil association: developed in silty sandy fluvial or aeolian veneer overlying gravelly fluvio-glacial outwash. E2 = equivalent to Saha 10 (chernozemic order). COL2: Colin Creek soil association: colluvial material, derived from calcareous bedrock, gravelly; less common soil type developed under grassy vegetation.	
SLOPE: gentle	ASPECT: W
SURFACE REGULARITY AND SHAPE: gently undulating	

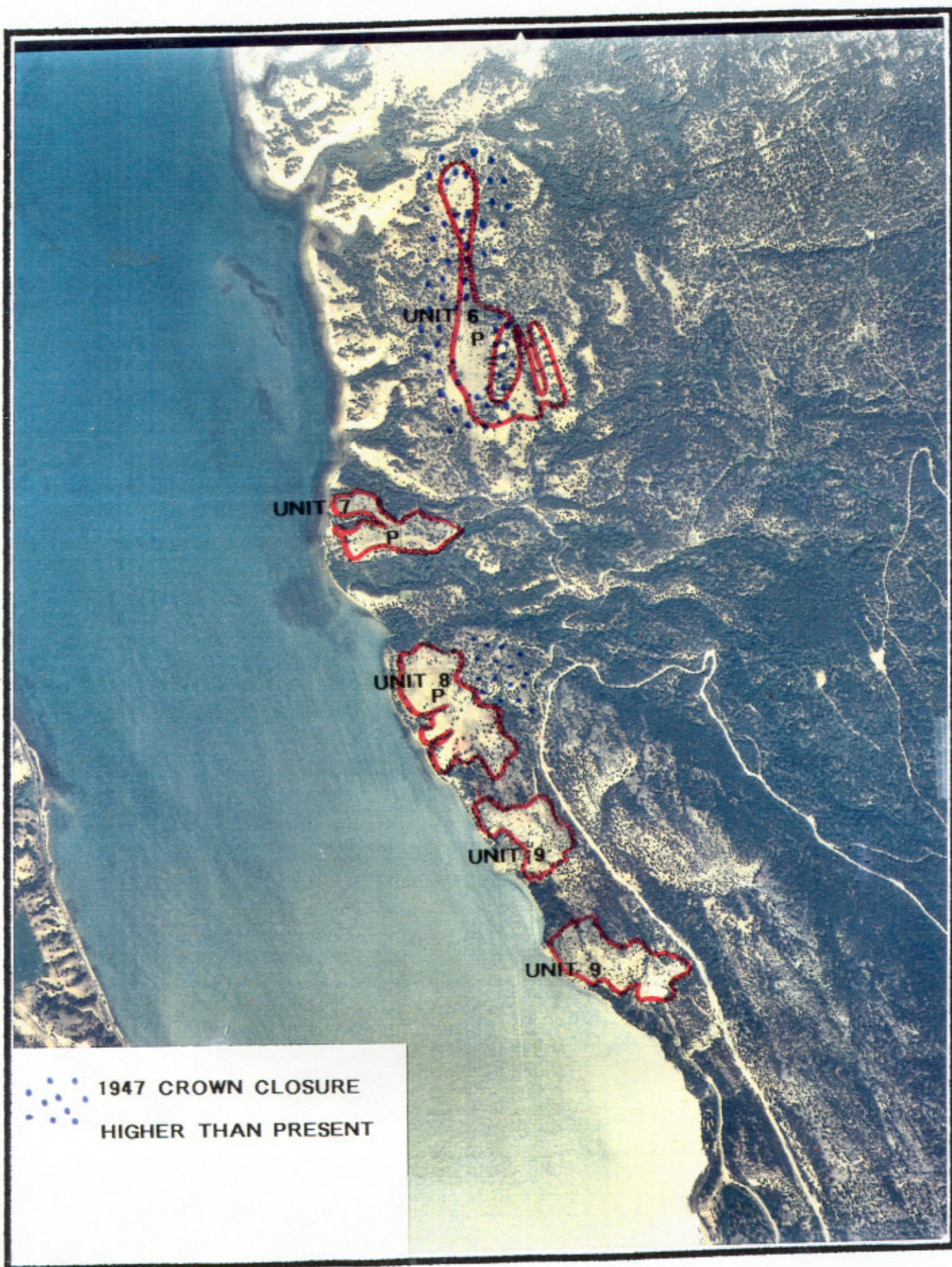
DOMINANT VEGETATION	ASSOC. VEGETATION
Junegrass	Needle and thread grass
Bluebunch wheatgrass (at edges)	Brown eyed Susan
Rabbitbush	Flax
	Nodding onion
	Pussytoes
	Resin weed
	Snowberry (v. small)
	Pasture sage
	Rocky Mtn. juniper
	Douglas-fir
RANGE CONDITION: poor, much exposed soil, in spite of relatively mesic conditions and gentle slopes.	

PRESENT LAND USE: nil

WILDLIFE USE: High elk sign. cursory observation indicated no sign of fossorial animals, however deeper soils suggests that northern pocket gophers and Columbian ground squirrels should be present.

ECOLOGICAL CONTEXT:

Unit surrounded by young to medium aged Douglas fir forest. Some logging has taken place in forest. Small snags present with little holes. Ingrowth by small Douglas firs, less than 5 cm dbh and only .3 to 1 m high.



HISTORICAL INFORMATION: This grassland was small 40 years ago, and the surrounding area's crown closure is less now as it has been logged in the meantime

COMMENTS AND MANAGEMENT RECOMMENDATIONS:
Leave as is or hand remove small Douglas firs.



UNIT #7	APPROX. SIZE: 7 ha
LOCATION: East Columbia Lake	
TOPO MAP: Canal Flats 82J/4	AIRPHOTO #: 30BCCC 822-93
LOT: 345 GR	LAND STATUS: Gov't reserve
BEDROCK GEOLOGY AND SOILS: M2/Dg Mayook soil association: glaciolacustrine origin. Finer, siltier than unit x, largely stone-free. Well developed A horizon which has been enriched with organic matter due to develop under grassy vegetation.	
SLOPE: flat to gentle, steep dropoff to west. ASPECT: W & SW	
SURFACE REGULARITY AND SHAPE: terrace incised by 2 east to west-running gullies, steep drop off to west.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Junegrass	Needle and thread grass
Rabbitbush	Bluestem wheatgrass (pockets)
	Kentucky bluegrass
	Bluebunch wheatgrass
	Pasture sage
	Nodding onion
	Flax
	Mariposa lily
	Rocky Mtn. juniper
	Douglas-fir
RANGE CONDITION: poor	

PRESENT LAND USE: nil, some camping below.

WILDLIFE USE: Very high elk, deer and sheep sign. Possible overgrazing of bluebunch wheatgrass in open, level areas as a result of high ungulate use. Flammulated owls and poorwills are reported from near this area (M. Porter, pers. comm.).

ECOLOGICAL CONTEXT:

Large aspen, alder and mature conifers in gully to south, with diverse variety of bird species including eagle's nest and western tanagers. Site is very much a pocket grassland surrounded by forest.

HISTORICAL INFORMATION:

Forested area to north has been logged and has lower crown closure now than in late 1940's. The grassland itself, however, appears little changed

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

An investigation into how high ungulate use has effected vigor and abundance of bluebunch wheatgrass on this site and Unit 8 would be valuable. Cursory observation suggests that bluebunch wheatgrass is less here, although some remains near trees. Hand removal of encroaching, immature Rocky Mountain juniper and Douglas fir would be beneficial. Mature trees nearby provide thermal cover for ungulates and valuable habitat for other species, and should be retained.



UNIT #8	APPROX. SIZE: 14 ha
LOCATION: East Columbia Lake	
TOPO MAP: Canal Flats 82/J4	AIRPHOTO #: 30BCC 822-93
LOT: 345 GR	LAND STATUS: Gov't reserve
<p>BEDROCK GEOLOGY AND SOILS: WY2⁸RO¹E2¹/f. WY2: Wycliffe soil association: morainal, gravelly silty, derived from calcareous bedrock. Orthic Eutric Brunisol, with less common soil classified as Calcareous Dark Brown. Well drained, shallow. RO: Rocky outcropping E2 Elko soil association: Small proportion of this site composed of silty, sand overlying gravelly fluvioglacial terrace. Well drained, classified as Orthic Eutric Brunisol with less common soil Orthic Dark Brown or Calcareous Dark Brown. Site generally has coarse, shallow soils, with some organically enriched surface horizons due to development under grassy vegetation.</p>	
SLOPE: gentle - mod in west	ASPECT: S and W
SURFACE REGULARITY AND SHAPE: benchlike	

DOMINANT VEGETATION	ASSOC. VEGETATION
Junegrass	Needle & thread grass
Bluebunch wheatgrass	Kentucky bluegrass
Rabbitbrush	False tarragon
	Resin weed
	Prairie cinquefoil
	Nodding onion
	Flax
	Pasture Sage
	Rocky Mtn. Juniper
	Douglas fir
	Rosy pussytoes
	Yarrow
	Harebells
	Brown-eyed Susan
RANGE CONDITION: good	

PRESENT LAND USE: not grazed by cattle

WILDLIFE USE: Very high elk sign in openings. Vesper sparrows, probably flammulated owls and poorwill. Other cavity nesters include flickers and bluebirds.

ECOLOGICAL CONTEXT: Large Douglas fir trees and snags (some > 24"). Adjacent areas heavily gullied, both dry gullies (conifer dominated) and a steep, wet watercourse with Douglas maple, alder and western larch. The very irregular terrain also includes cliffs in the east.

HISTORICAL INFORMATION: Size of this opening does not appear changed since 1947.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

Although some seedlings are present, the tree ingrowth here is low. The bluebunch wheatgrass is less abundant and less vigorous in open flats where the elk sign is higher. There is low fuel in open flat areas and rocky outcroppings and thin soils are evident here.



UNIT #9	APPROX. SIZE 13 ha
LOCATION: East Columbia lake sw of Ecological Reserve	
TOPO MAP: Canal Flats 82J/4	AIRPHOTO #: 822-93
LOT: 345 GR	LAND STATUS: Gov't reserve
BEDROCK GEOLOGY AND SOILS: RB5 ⁶ RO ⁴ /fh /Rockbluff soil assoc: Orthic Eutric Brunisol derived from rubbly colluvium, very shallow lithic phase (20 to 50 cm thick over calcareous bedrock). Rapidly drained. Large portion of area consisting of rocky outcrops.	
SLOPE: mod steep to steep	ASPECT: variable, predom. SW
SURFACE REGULARITY AND SHAPE: strongly rolling to v. hilly	

DOMINANT VEGETATION	ASSOC. VEGETATION
Bluebunch wheatgrass	Rabbitbush
	Nodding onion
	Pussytoes
	Gromwell
	Spike goldenrod
	Oyster plant
	Yarrow
	Douglas fir
RANGE CONDITION: fair	

PRESENT LAND USE: nil

WILDLIFE USE: Great horned owl foraging grounds, vespers sparrows seen. Bighorn sheep, elk.

ECOLOGICAL CONTEXT: These grassland openings with highly irregular, steep slopes support bluebunch wheatgrass on thin, stony soils.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:
No management activities are recommended for these sites.

UNIT #10	APPROX. SIZE: 73 ha (fragmented)
LOCATION: West shore of Columbia Lake	
TOPO MAP: Fairmont 82J/5 & Canal Flats 82J/4 AIRPHOTO #: 30BCC 851-169 & 30BCC 851-31 (see unit 5)	
LOT: 30,7548, 139,7558, 105,664 LAND STATUS: crown & private	
BEDROCK GEOLOGY AND SOILS: M2/dg (south); M2 ⁸ E2 ² /Eg (north). The predominant soil association here is Mayook2. It has developed on silty glaciolacustrine terraces, some of which are deeply incised with gullies. M2 soils developed under grassy vegetation, and have organically-enriched surface horizons. Soils are silty and have a clay component in some areas. While the more common soil is classified Orthic Eutric Brunisol, the less common in M2 is Orthic Dark Brown.	
SLOPE: gentle to mod steep	ASPECT: E & SE
SURFACE REGULARITY AND SHAPE: Flat to gently sloping terraces which are deeply incised with gullies in some places.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Bluebunch wheatgrass	Rough fescue
Rabbitbush	Junegrass
	Arrowleaf balsamroot
	Phlox
	Pasture sage
	Locoweed
	Spike goldenrod
	Nodding onion
	Resin weed
	Pussytoes
	Flax
	Douglas fir
RANGE CONDITION: good	

PRESENT LAND USE: Due to the fact that much of this shore is privately owned, present land uses vary from grazing to development to total non-use. Photo taken at Min. of Trans. and Highways Rest Area.

WILDLIFE USE: On the top bench of the rest area there was very little elk sign, and little evidence of ground squirrels. Swallows feeding above grass, pine siskins.

ECOLOGICAL CONTEXT: The floristic list above was taken at sample sites near the Rest Area. Species composition of this site differs in several respects from other grasslands visited in the present overview; balsamroot and phlox are present here, two species that are more abundant in grasslands to the south and found to be rare to non-existent on other sites

north of Canal Flats. Rough fescue is co-dominant with bluebunch wheatgrass on the flat, whereas bluebunch is dominant on the drier slopes. The site is by a busy highway, and terraces lead down to a bulrush-dominated shoreline.

HISTORICAL INFORMATION: Comparison with photos from the late 1940's indicate that, although trees were present, these sites were not heavily treed in the past, and grass predominated. Further to the west crown closure is slightly less than in the late 1940's, due to logging.

COMMENTS AND MANAGEMENT RECOMMENDATIONS: The soil association (Mayook2) which is attributed to this area (Lacelle 1990) developed partly under grassland conditions. The Douglas fir trees at this site vary in age from immature to mature and they are spaced in clumps. It is likely that bluebunch is not present at all on some of the terraces along the shore that are heavily grazed by cattle. At the Rest Area elk sign is very low and good stands of fescue and bluebunch wheatgrass occur here.



UNIT #11	APPROX. SIZE: 42 ha
LOCATION: west of Columbia Lake	
TOPO MAP: Fairmont 82J/5.	AIRPHOTO #: 30BCC 851-168
LOT: S.L. 30	LAND STATUS: crown
BEDROCK GEOLOGY AND SOILS: MD1/e. Marmalade soil association (morainal), Orthic Eutric Brunisol, gravelly silty, derived from calcareous bedrock. Well drained.	
SLOPE: flat, mod. steep	ASPECT: flat and sw
SURFACE REGULARITY AND SHAPE: benchlike, with steep slope in west.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Rich. needlegrass Domestics (brome and alfalfa)	Pinegrass (near trees) Bluebunch wheatgrass Clover (2 sp. domestic) Kentucky bluegrass Soopallalie Lodgepole pine Douglas fir
RANGE CONDITION: fair to good	

PRESENT LAND USE: cattle grazing

WILDLIFE USE: Two mule deer observed. Alfalfa grazed by wildlife. Much elk and deer sign, especially in more open western area near breaks.

ECOLOGICAL CONTEXT:

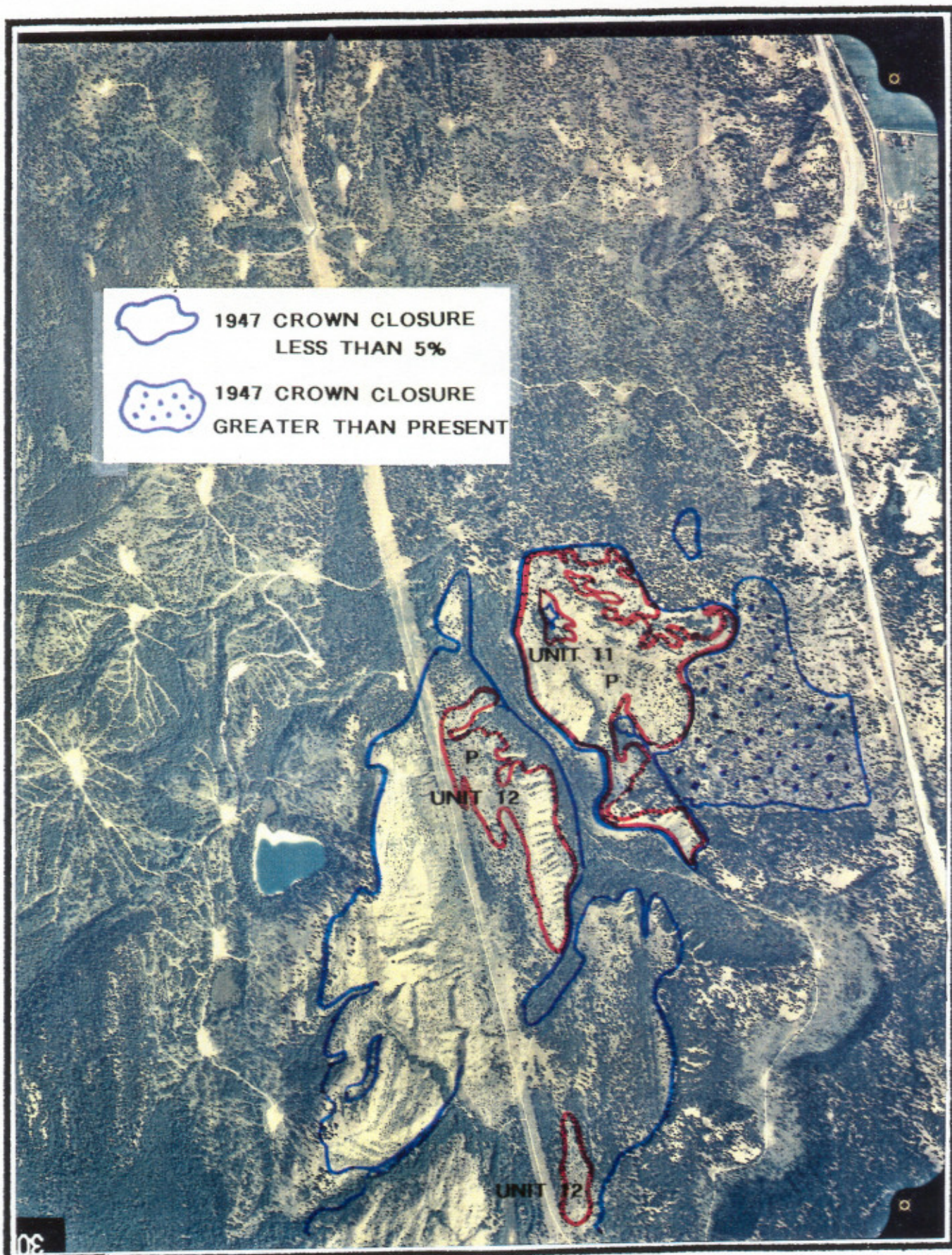
Domestic seeding has modified this unit, especially in the eastern portion. This grassy area is surrounded by forested area, and ingrowth of both Douglas fir and lodgepole pine is extensive.



1947 CROWN CLOSURE
LESS THAN 5%



1947 CROWN CLOSURE
GREATER THAN PRESENT



HISTORICAL INFORMATION:

Ingrowth has occurred in this unit since 1947. Large old stumps, many > 60 cm dbh (2 feet) are spaced about 10 m apart. The area to the east has been logged and the crown closure is less now than at that time.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

Forest ingrowth is extensive here. Soils indicate that the site was not a long-term historic grassland, as the Ah is not well developed and organically enriched as it would be had this been a grassland community for a long time. The site is highly differentiated between the eastern portion, which is dominated by domestic species, and the open, steeper slopes to west.



UNIT #12	APPROX. SIZE: 22 ha & 14 to south
LOCATION: west of Columbia Lake, n. of Marion Creek	
TOPO MAP: Fairmont 82J/5.	AIRPHOTO #:30BCC 851-109
LOT: S.L. 30	LAND STATUS: crown
BEDROCK GEOLOGY AND SOILS: MD1/e. Marmalade soil association (morainal), Orthic Eutric Brunisol, gravelly silty, derived from calcareous bedrock. Well drained	
SLOPE: flat to v. gentle	ASPECT: SE
SURFACE REGULARITY AND SHAPE: low parallel ridges and shallow gullies running north-south.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Soopallalie Richardson's needlegrass Bluegrass sp	Junegrass Pinegrass Brown-eyed Susan Locoweed Rose Saskatoon (low frequency) Trembling aspen Lodgepole pine Douglas fir
RANGE CONDITION: fair to good, no exposed ground	

PRESENT LAND USE: cattle grazing

WILDLIFE USE: Elk sign, adjacent groves used by evening grosbeaks, juncos, flickers, etc. mtn. bluebirds in openings.

ECOLOGICAL CONTEXT: adjacent steep rocks with aspens at base. Not very dry site, high frequency of Poa species and abundant aspen regeneration. Dense stands of 10 - 12 m lodgepole pine nearby.

HISTORICAL INFORMATION

This area was burned in 1931 and again in recent years. Comparison with 1947 air photos indicate that extensive ingrowth has occurred since that time, and regeneration of trees continues to advance rapidly.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

This area is very much a shrub-tree community, mixed aspen and lodgepole; forest ingrowth is extremely high. The soil description indicates that this

site is an Orthic Eutric Brunisol and does not have a well developed Ah, enriched with organic matters as would be expected had it supported a grassland community over the long term. The vigor with which the trees are growing in here further substantiates this. B.C. Hydro effectively removes trees from the powerline right-of-way before they get too large, about every 8 - 10 years by hand slashing, using brush saws and chain saws (G. Clibbert, pers. comm.). This method may be useable on other areas to remove tree ingrowth if begun while trees are still small.



UNIT #13	APPROX SIZE: 160 ha
LOCATION: west of Columbia Lake	
TOPO MAP: Fairmont 82J/5	AIR PHOTO #:30 BCC 851-109
LOT: S.L. 30	LAND STATUS: crown
BEDROCK GEOLOGY AND SOILS: RY6 ⁶ RO ⁴ /h. Ryanier soil association (developed in rubbly colluvium) complexed with rock outcropping. Very shallow lithic phase (20 to 50 cm thick over bedrock) of Orthic Eutric Brunisol, derived from non-calcareous parent material. Rapidly drained, stony soil.	
SLOPE: moderate to steep	ASPECT: SSE
SURFACE REGULARITY AND SHAPE: flat area gradually becoming steeper as one moves upslope to west. Complex topography with rock outcroppings nearby.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Richardson's needlegrass	Junegrass (upslope)
Bluegrass sp	Pinegrass (near trees) Bluebunch
wheatgrass (upslope)	Rose
	Saskatoon (abundant newly established plants)
Soopallalie	Mahonia
	Kinnikinick
	Gromwell
	Aspen
	Lodgepole pine
	Douglas fir
RANGE CONDITION: fair - good, little exposed soil, good cover.	

PRESENT LAND USE: cattle grazing

WILDLIFE USE:

Moose sign and high elk sign. Fossorial mammals present, many Col. ground squirrels, a badger burrow. Waxwings, bluebirds and other passerine birds, as well as woodpeckers and accipters seen.

ECOLOGICAL CONTEXT:

Heavily gullied with a high deciduous component in gullies. Excellent juxtaposition of aspen groves and openings. Some large trees providing nest sites for raptors and adjacent rocky outcrops which may also provide habitat for golden eagles, etc. Soils can be very shallow in places.



HISTORICAL INFORMATION: 1947 photos indicate that crown closure was less at that time, especially on south facing slopes to the west. This area had been burned in 1931.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

Area was logged and burned. Soils indicate that this area has not been a long-term historic grassland, as they are Orthic Eutric Brunisols, and do not have a well developed, organically enriched Ah. There is much aspen and lodgepole pine regeneration on this site. Community definitely mixed, reflecting undetermined stage = partial grassland, partial pinegrass/forested site. Single larch on top of slope reflects former forest character. There is a high diversity of habitat types here, however, the grasses will become diminished in future as a result of tree ingrowth if management is not undertaken. Protection of the well-developed and valuable aspen communities should be considered here if any plans for prescribed fire are contemplated in future for this area.



UNIT #14	APPROX SIZE: 31ha
LOCATION: west of Columbia Lake	
TOPO MAP: Fairmont 82 J/5	AIRPHOTO #: 30BCC 851-109
LOT: S.L. 30 and 8194	LAND STATUS: crown and private
BEDROCK GEOLOGY AND SOILS: MD1/e. Marmalade soil association (morainal), Orthic Eutric Brunisol, gravelly silty, derived from calcareous bedrock. Well drained.	
SLOPE: gentle to moderate	ASPECT: SE
SURFACE REGULARITY AND SHAPE: smooth	

DOMINANT VEGETATION	ASSOC. VEGETATION
Richardson' needlegrass	Bluebunch wheatgrass
Junegrass	Bluegrass
Soopallalie	Locoweed
	Timber milk vetch
	Yarrow
	Saskatoon (immature)
	Lodgepole pine
	Douglas fir
	Trembling aspen
RANGE CONDITION: fair - little exposed soil	

PRESENT LAND USE: cattle grazing

WILDLIFE USE: vesper sparrows, meadowlarks

ECOLOGICAL CONTEXT: Heavily gullied in adjacent areas. Gullies of mature conifer and/or mixed conifer-deciduous communities. Nearby cultivated fields on the private land, however, northernmost ones are not irrigated every year. Immediately to the west is another unit of shrub-tree area (Unit 12), and further to west is a moist riparian area with varying amounts of water

HISTORICAL INFORMATION: This area had been recently burned. It was open grassland in 1947.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

Very vigorous shrub community. The dominant shrub is soopallalie, however there is some immature saskatoon becoming established as well. High encroachment of 3 species of trees, Douglas fir, lodgepole pine and trembling aspen. Soil type, (Orthic Eutric Brunisol) with shallow Ah horizon indicates that this area has not historically been a climax grassland. Fire will be required to maintain open grassland qualities. A limitation is that it is partially private land.



UNIT #15	APPROX. SIZE: 188 ha
LOCATION: west side of Columbia Lake, s. of Marion Cr.	
TOPO MAP: Canal Flats 82J/4	AIRPHOTO #: 30BCC 822-90
LOT: S.L. 30A & BLK E of 4596	LAND STATUS: crown & Nature Trust
BEDROCK GEOLOGY AND SOILS: MD2 ⁸ KE1 ² /ef. MD2 component (morainal) has a less common soil that is Orthic Dark Brown, having developed in drier location dominated by grassy vegetation; the Ah horizon is more enriched with organic matter. Lime-stone derived, gravelly silty, well drained. KE1 component (fluvioglacial) has a fine sandy loam surface texture and gravelly sandy loam subsurface texture, well-drained.	
SLOPE: flat to gentle	ASPECT: S
SURFACE REGULARITY AND SHAPE: Flat areas series of gullies of varying steepness running along a northwest-southeast axis. Grasslands on flat benchtops.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Columbian needlegrass Prickly Rose	Kentucky bluegrass Poa sp. Rich. needlegrass (in pockets) Gromwell Pussy-toes Yarrow
RANGE CONDITION: poor to fair	

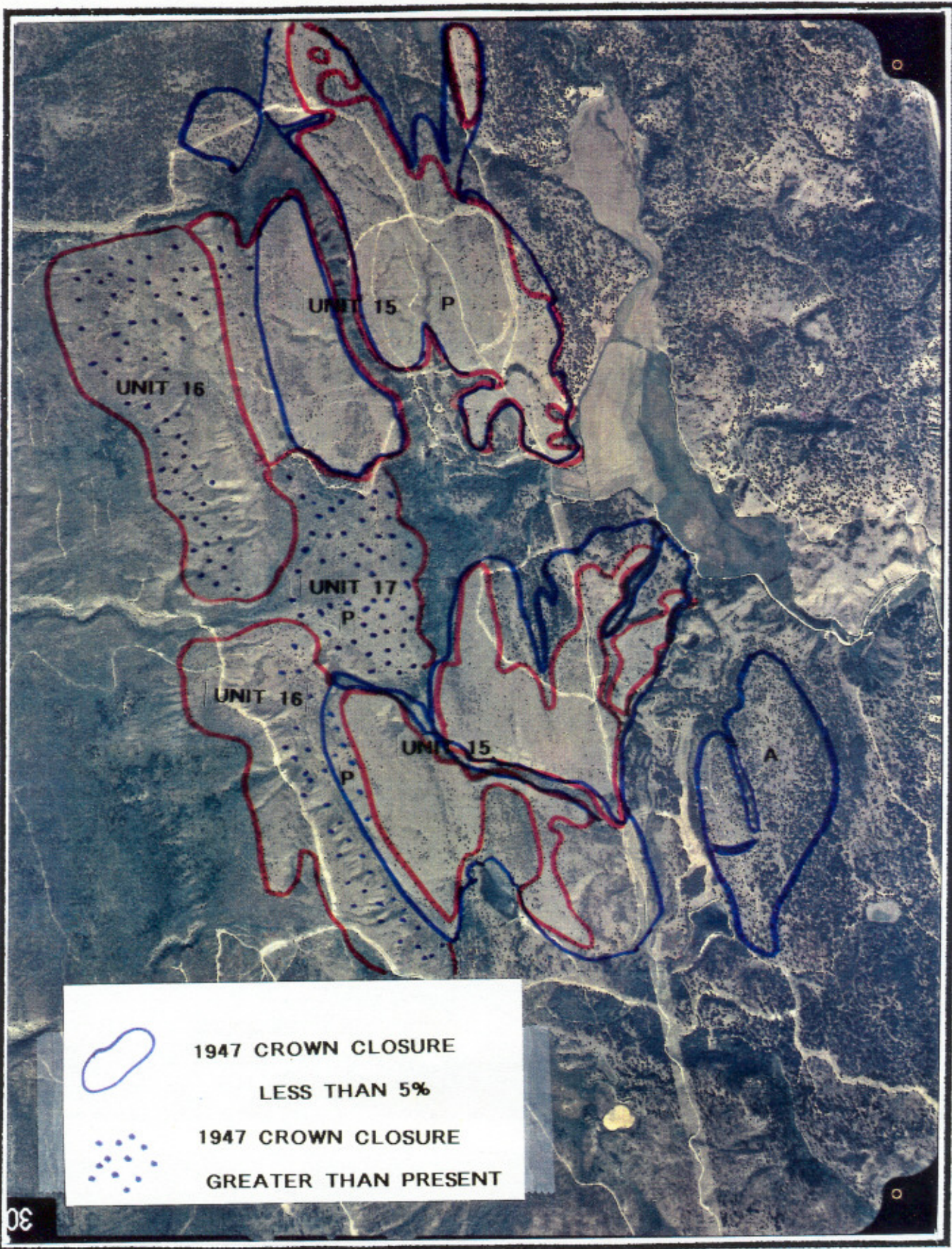
PRESENT LAND USE: cattle grazing

WILDLIFE USE: Very high elk sign. Meadowlarks, vesper sparrow, vulture. Elk seen (July 8) on shrub-dominated hills to west, deer.

ECOLOGICAL CONTEXT:

A stream with a well developed deciduous community (including 2 species of alder, aspen, willow and red-osier dogwood), beaver ponds and northern leopard frogs bisects this grassland and provides excellent habitat diversity as well as alternate food sources for ungulates.

HISTORICAL INFORMATION: Air photos from the 1940's indicate that in some areas tree ingrowth has advanced very rapidly. the main grassland areas of this unit are still grass, like due to the Spen burn. Areas to the west were very shrubby in the 1940's. the recent burn return the site to its condition in the 1940's after the great fire of 1931.



COMMENTS AND MANAGEMENT RECOMMENDATIONS:

This grassland area has less tree ingrowth than in other areas, and may represent a climax grassland (see photo). This is further supported by the soil profile - descriptions in Lacelle (1990) indicate that a well-developed, organic matter-enriched Ah should be expected here, indicating that the site supported grassland vegetation. Saskatoon here is less than 30 cm in height, and as one moves to the west, its occurrence increases (see Unit 16). Fire-killed, blown down lodgepole patches occur to west as well. An old M.O.E. vegetation plot was found at the southwest end of this unit.



UNIT #16	APPROX SIZE: 130 ha
LOCATION: Transition between grassland and forest/shrub community. Col. Lake west.	
TOPO MAP: Canal Flats 82J/4	AIRPHOTO #: 30BCC 822-90
LOT: S.L. 30A & BLK E of 4596	LAND STATUS: crown & Nature Trust
BEDROCK GEOLOGY AND SOILS: MD1/DF/ Marmalade soil association (morainal), Orthic Eutric Brunisol, gravelly silty, derived from limestone bedrock. Well drained, shallow solum.	
SLOPE: mod to steeply sloping	ASPECT: SE
SURFACE REGULARITY AND SHAPE: Series of terraces and gullies running north to south.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Soopallalie	Col. needlegrass
Saskatoon (immature)	Rose
Bluegrass	Pussytoes
	Resin weed
	N. bedstraw
	Lodgepole pine (regen)
RANGE CONDITION: n/a	

PRESENT LAND USE: Wildlife and some cattle grazing.

WILDLIFE USE: Badger, ground squirrel, northern pocket gopher, deer mouse. Very high elk use here and on hillside to west (herd of 8 seen mid-July)

ECOLOGICAL CONTEXT:

The shrub community here is dominant. Burned 1985. This portion of the Spen burn includes pockets of lodgepole pine regen. Rings indicated trees to be up to 5-6 years of age. As expected, there is pinegrass here as well. Further to the west on a bench are resprouting fire-damaged birch trees with small grass openings, and high occurrence of pinegrass, snowberry, juvenile birch, mahonia and northern bedstraw.

HISTORICAL INFORMATION:

This unit was more heavily treed and shrubbier in the 1940's than at present. The stems which were killed in the Spen fire are not large diameter.

COMMENTS AND MANAGEMENT RECOMMENDATIONS: Soils in this unit did not develop under grassy vegetation. Management activities should be directed at the pockets of ingrowing lodgepole while trees are

still small. The size, species diversity, and frequency of shrubs is much greater here than in the grassland unit to the east - if any burning is contemplated for this site, these shrubs' response to reburning so soon after the Spen fire should be examined first, because they are very small and may be more susceptible to damage.



UNIT #17	APPROX. SIZE: 40 ha
LOCATION: W. side Columbia Lake, s. of Marion Creek	
TOPO MAP: Canal Flats 82J/4	AIRPHOTO #: 30BCC 822-90
LOT: BLK E of 4596	LAND STATUS: Nature Trust
BEDROCK GEOLOGY AND SOILS: KE1w/CD. Keeney soil association. Soil developed in fluvial veneer overlying fluvioglacial outwash. Relatively well drained, yet soil moisture retention of this site higher than adjacent areas. Fine sandy loam over gravelly subsoil. Limestone derived, Orthic Eutric Brunisol.	
SLOPE: gentle	ASPECT: E
SURFACE REGULARITY AND SHAPE: smooth	

DOMINANT VEGETATION	ASSOC. VEGETATION
Soopallalie	Col. needlegrass
Bluegrass	Snowberry
Pinegrass	Saskatoon
	Currant
	Flat-topped spirea
	Mahonia
	Common goldenrod
	Northern bedstraw
	Harebells
	Willow
	Lodgepole pine
RANGE CONDITION: n/a	

PRESENT LAND USE: cattle grazing

WILDLIFE USE: Very high elk use. Willow browsed, moose sign seen. Ground squirrels.

ECOLOGICAL CONTEXT:

This unit is shrubbier than the others, and provides excellent forage for ungulates. The floristic list above clearly indicates that the moisture regime is markedly different from other units in this area. It is a discrete unit, bordered by an aspen community to the north and east, and a creek with a riparian deciduous community. Lodgepole pine regeneration is advancing rapidly, however.

HISTORICAL INFORMATION:

This fan was quite heavily treed in the 1940's.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

This unit is not a grassland; its inclusion in this report is for the purpose of comparison, which becomes clear when the site is visited. It should be maintained as a shrub community and attention should be directed at controlling the regeneration of lodgepole pine that is occurring.



UNIT #18a (n. of Sun Lake), 18b (around Sun Lake) and 18c (s. of Sun Lake)	
APPROX. SIZE:	
LOCATION: w. of Col. Lake. Spent burn, north of Sun Lake.	
TOPO MAP: Canal Flats 82J/4 AIRPHOTO #: 30BCC 854-108 & next flightline north.	
LOT: S.L. 30B	LAND STATUS: crown
<p>BEDROCK GEOLOGY AND SOILS: Unit 18a: E1⁶WY1⁴/g. Elko soil association: (fluvioglacial) fine sandy loam, shallow solum, developed in aeolian veneer. Wycliffe soil association: (morainal) developed in gravelly silty materials, shallow. Both from calcareous bedrock and classified as Orthic Eutric Brunisols. Well drained. Unit 18b: FX1x⁶E2x⁴/D. Fishertown soil assoc: (fluvioglacial), gravelly, rapidly drained, derived from predominantly limestone, classified as Orthic Eutric Brunisol. Elko2 soil assoc: (fluvioglacial) fine sandy loam and gravelly sandy loam, well drained. Organically enriched Ah, classified Orthic Dark Brown. Unit 18c: WY1⁸FX1²/cd; Predominantly Wycliffe soil association (see Unit 18a).</p>	
<p>SLOPE: Unit 18a: hilly Unit 18b: moderately sloping, Unit 18c: undulating to gently rolling ASPECT: varied</p>	
SURFACE REGULARITY AND SHAPE: highly irregular over large scale.	

DOMINANT VEGETATION

Columbian needlegrass
Kentucky bluegrass
Rose
Alfalfa (along powerline)

ASSOC. VEGETATION

Bluebunch (on slopes)
Rabbitbrush
Sagebrush
Saskatoon (gen. young)
Locoweed
Timber milk vetch
Gromwell
Balsamroot
Spike goldenrod
Brown-eyed Susan
Yarrow
Oyster plant
Resin weed

RANGE CONDITION: poor to fair

PRESENT LAND USE: cattle grazing

WILDLIFE USE:

The old burned snags provide excellent habitat for Lewis' woodpeckers, which are on the provincial Blue List and which occur here. Flycatcher in

live pine, red-tailed hawk, vesper sparrow, meadowlark, vultures. Two active osprey nests on powerline.

ECOLOGICAL CONTEXT: (Floristic list above is from sample sites near Sun Lake). Unit 18 is very diverse; open grasslands, large, downed burned logs and valuable standing snags occur as do clumps of live conifers in fairly dense stands. In the open areas the trees that do remain are generally mixed ponderosa pine, Douglas-fir, with a crown closure of $< 5\%$. There is less evidence of tree ingrowth than in some of the other study sites; there are some young Douglas-fir and, in pockets which had been lodgepole pine stands prior to the fire, regeneration of pine is extensive. There are aspens in gullies and creeks support a deciduous community of alder, silverbush which provides habitat for veerys, song sparrows, etc. Columbia Lake is nearby, the feeding area of the osprey. In general, this area offers excellent juxtaposition of live clumps, dead snags and grasslands as well as shrubby riparian corridors.

HISTORICAL INFORMATION: Parts of this area was burned in the 1931 fire. It was reburned again in 1985 (Spen burn).

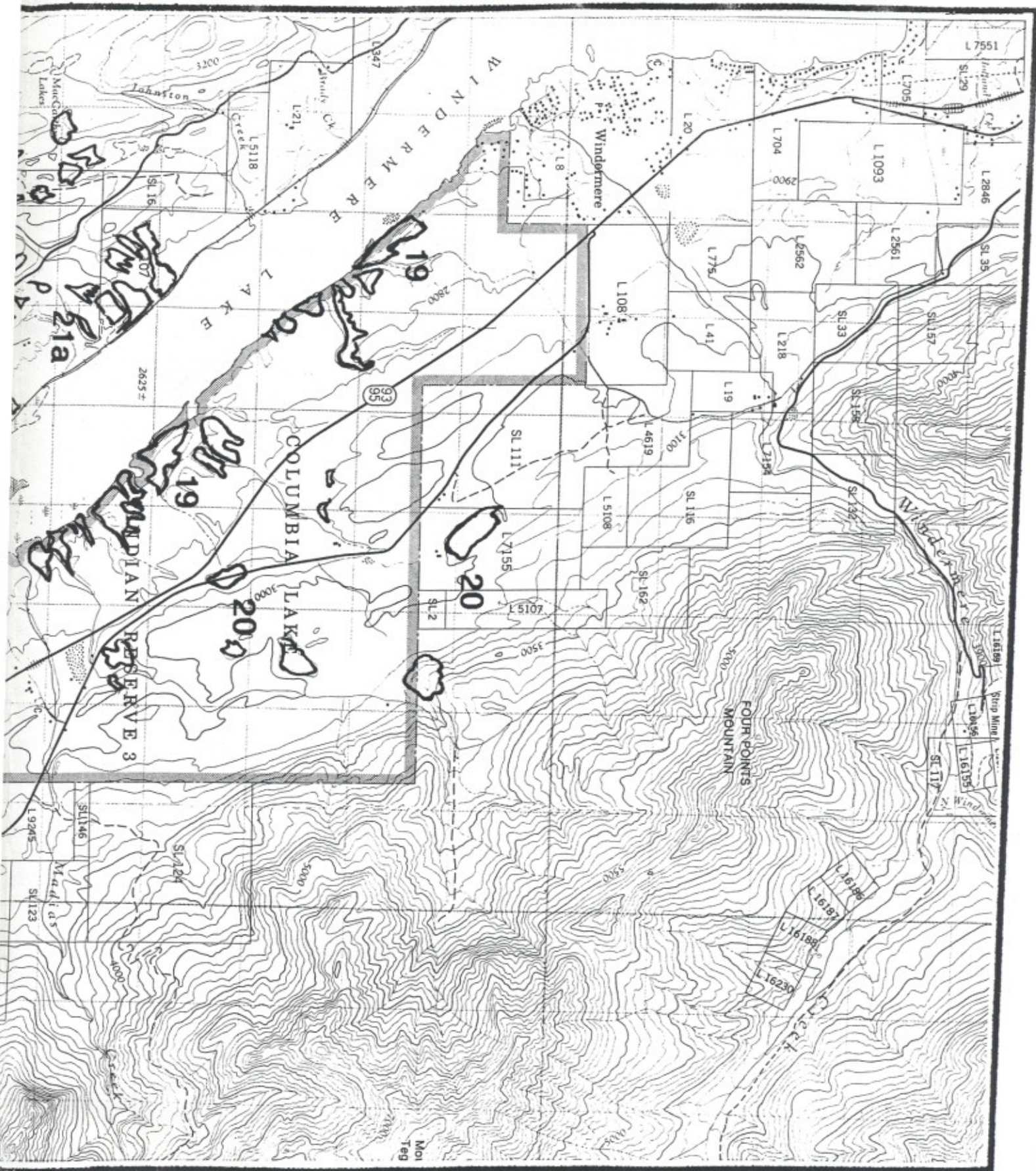
COMMENTS AND MANAGEMENT RECOMMENDATIONS:

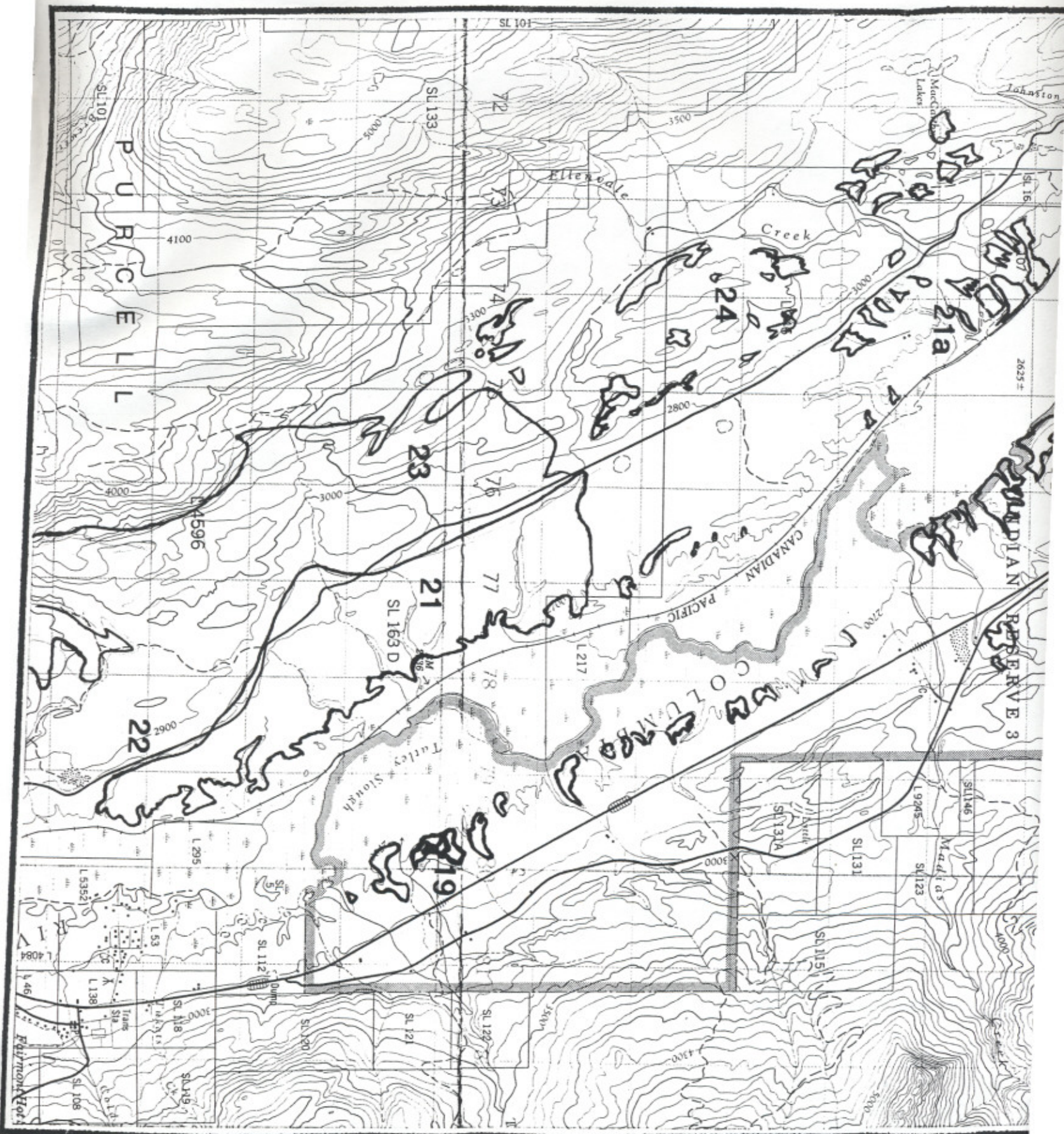
Because this area is so large it has been treated in this report as a single unit. Soil information indicates that the area around Sun Lake may have been a grassland for a longer time than the area to the north; the Elko 2 soil association (Orthic Dark Brown) which occurs in this area, has a well-developed, organic matter-enriched surface horizon (Ah), suggesting that it developed under grassy vegetation. More detailed soil studies of this area would likely reveal that this soil association is present in other areas as well. It is important that the large fire-killed snags be retained for Lewis' woodpecker, flickers and other cavity nesters. In the event that this area is reburned, care should be taken that they are not lost, and that deciduous groves are maintained. The diversity of this area is valuable - hand cut excessive tree ingrowth on the open grasslands; on these sites ingrowth does not appear to be advancing rapidly.



4.2.0 SECTION 2: WINDERMERE LAKE AREA

Fig. 3. Overview map of grassland units in central portion of the study area near Windermere Lake (1:50,000).





UNIT #19	APPROX. SIZE: 150 ha *
LOCATION: East shore of Windermere Lake	
TOPO MAP: Fairmont 82J/5	AIRPHOTO #:30BCC 871-90,92; 853-136, 58; 852-206
LOT:Col Lk. Ind. Reserve 3	LAND STATUS: Indian Reserve
BEDROCK GEOLOGY AND SOILS: M2/Eg. Mayook soil association. Glaciolacustrine terrace. Orthic Eutric Brunisol, but less common soil association Orthic Dark Brown, developed under grassy vegetation. Textures silty, clayey loam.	
SLOPE: mod to steep	ASPECT: S and W
SURFACE REGULARITY AND SHAPE: Glaciolacustrine terrace heavily incised with gullies, small openings and steep hills.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Junegrass	Bluebunch wheatgrass (slopes)
Pasture Sage	Needle-and-thread grass
Rabbitbush	Snowberry (low)
	Nodding onion
	Resin weed
	Douglas-fir
RANGE CONDITION: poor. Pockets of range in fair condition.	

WILDLIFE USE: Elk sign

ECOLOGICAL CONTEXT:

Shrub community is not very well developed, with rabbitbrush the dominant shrub and snowberry and saskatoons very not vigorous. Generally harsh sites. North slopes heavily treed with mature Douglas fir. Frequent deciduous communities along watercourses are interspersed with dry breaks all along the lake shore. Some slopes are so steep that vegetation is sparse. There are a few immature Douglas-firs growing along these slopes. Along the southern portion of these breaks, the marshes and levees of Tatley Slough and Mud Lake occur at their feet. Along the north, the shoreline of Windermere Lake does this.

HISTORICAL INFORMATION:

Eastern edges of terrace tops have been logged since 1947. Comparison of modern airphotos and those taken in the late 1940's indicate that ingrowth and encroachment of trees on this area has been minimal.

DOMESTIC SEEDING

UNIT 18



COMMENTS AND MANAGEMENT RECOMMENDATIONS: The area visited along the breaks was at Lakeshore resort - a campground on the lake which abutts a cattail marsh. Few management options for breaks. Discussions with administrators of these native lands should be engaged in and an overall plan of grassland maintenance/enhancement developed. * Size estimate is not reflective of real area as much of this unit is steep, silty clay banks.



UNIT #20	APPROX. SIZE: 40 ha
LOCATION: Columbia Lake Indian Reserve and environs -pocket upland slopes	
TOPO MAP:Fairmont 82J/5	AIRPHOTO 30BCC-853-215
LOT:Col.Lk.Ind Res.3, SL 7155 & crown	LAND STATUS: Ind. Res., private land and crown land
BEDROCK GEOLOGY AND SOILS: varied MD1/e or MD4/G. Maryland soil association. MD1 soils have developed on gravelly silty morainal deposits from calcareous bedrocks. Coarse fragments usually present, generally well drained, Orthic Eutric Brunisol. MD4 soils are as above but the less common soil has a clay-enriched subsurface horizon.	
SLOPE: mod. to steep	ASPECT: S, SE and SW
SURFACE REGULARITY AND SHAPE: variable	

DOMINANT VEGETATION	ASSOC. VEGETATION
Bluebunch *	Pasture sage
Junegrass *	Resin weed
Needle and thread grass *	Fleabane
Rabbitbush	
RANGE CONDITION: *highly variable from excellent (bluebunch wheatgrass dominant) where no stock have grazed to poor (junegrass and/or needle and thread grass-dominant)	

PRESENT LAND USE: Cattle grazing on some areas, others no present use.

WILDLIFE USE: Some use by meadowlarks, deer and vesper sparrows.

ECOLOGICAL CONTEXT:

Most of the open areas visible on air photos of this reserve and adjacent lands support domestic species. The native grasslands that do remain occur on the slopes directly above fields that are presently or have historically been cultivated with alfalfa and other domestics, or in small relic parcels. They are, as such, highly fragmented, however, adjacent alfalfa may provide additional food for ungulates although this is likely not desired by the landholders. Many of these pocket grasslands have invading sweet clover, alfalfa and domestic grass species. The largest of these is on crown land on the south flank of Four Points Mountain.

HISTORICAL INFORMATION: Anecdotal information from Dix Anderson indicates that this entire area from Fairmont north had far fewer trees in the early decades of the century. Photographic evidence from the





area immediately to the north supports this as well (Fig. 6). Comparison with 1947 air photos does not indicate, however, that significant tree ingrowth has taken place since that time, but this may be simply too short a time frame to detect the increase in ingrowth in stands that were already established.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

Surrounding forests are generally of low age classes. At present there are no realistic management options other than cattle removal to allow recovery and development of more vigorous bluebunch wheatgrass on the few pockets of grass that remain. Agriculture and tree ingrowth that has occurred has made them highly fragmented and too small. No viable management options.



UNIT #21 & 21a includes units 21, 22 and 23).	APPROX. SIZE: 12-15 km ² (area
LOCATION: West Side Road - Eastern portion, breaks above lake	
TOPO MAP: Fairmont 82J/5	AIRPHOTO #: 30BCC 852-208 & 43 and 871-90 (unit 21a)
LOT: S.L. 163D, L. 346,107,21	LAND STATUS: private
BEDROCK GEOLOGY AND SOILS: M2/Dg. Mayook soil association. Glaciolacustrine terrace. Orthic Eutric Brunisol, but less common soil association Orthic Dark Brown, developed under grassy vegetation. Textures silty, clayey loam.	
SLOPE: flat to steep	ASPECT: S and SE
SURFACE REGULARITY AND SHAPE: flat terraces, deeply incised with gullies, steep sand/clay breaks	

DOMINANT VEGETATION	ASSOC. VEGETATION
Junegrass	Bluebunch wheatgrass
Rabbitbrush	Pasture sage
	Resin weed
	Flax
	Eleagnus
	Soopallalie (more in draws)
	Rose
	Aspen
	Douglas fir
RANGE CONDITION: poor, much exposed soil	

PRESENT LAND USE: some private land used for grazing.

WILDLIFE USE: High elk use, especially in south end. Remaining snags provide nesting opportunities for Lewis' woodpecker, however, these will be lost over time as they are not abundant near the breaks. Other species present were vesper sparrows, flickers, juncos and chickadees in aspens in draws.

ECOLOGICAL CONTEXT:

Harsh sites along breaks - Some ingrowth of Douglas fir, although less than in areas to west, probably due to dry site conditions. Aspen in gullies provide cover and habitat diversity. There are no mature conifers in this area. Breaks provide sites for bank swallows and possibly kingfishers. Further north these breaks are more heavily treed as they were not burned in 1971.

30BCC 852 No.208



HISTORICAL INFORMATION:

The southern end of this unit (21) burned in 1971. Prior to this time, it was forested except for small grassland terrace tops along the breaks. The north end of this unit, in contrast, (21a) was not burned and the breaks are more heavily treed. A photo from the early 1900's (Fig. 4) indicates that at this time the northern end of this unit was open as a result of a previous fire, while the area to the south (now unit 21) was forested.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

Ingrowth on the breaks is less than elsewhere on this site. There is a clear distinction in vegetative cover on the north aspect slopes of the gullies; these have more shrubs, especially soapallie, than do flats and the slopes with south or eastern exposure. Many of the slopes with the southern aspect are too steep to support much vegetative cover. Harsher, drier exposure decreases likelihood of establishment of shrubs and aspens and other soil-stabilizing vegetation. In the north, extensive cultivated fields had already been developed by 1947.



Fig. 4. View to the south from the Stoddart and Ellis (K2) ranch in the early 1900's.



UNIT #22	APPROX. SIZE: (see above 21)
LOCATION: West side road - Western portion	
TOPO MAP: Fairmont 82J/5	AIRPHOTO #: 30BCC 852-208 & 43
LOT: S.L. 163D	LAND STATUS: private
BEDROCK GEOLOGY AND SOILS: MD2 ⁸ RY5 ² /fg Marmalade and Ryanier soil associations. MD2 component (morainal) has a less common soil that is Orthic Dark Brown, having developed in drier location dominated by grassy vegetation; the A horizon is more enriched with organic matter. Limestone derived, gravelly silty, well drained. RY5 component developed in rubbly colluvium. Orthic Eutric Brunisol, shallow lithic phase (Can be 20 to 50 cm thick over bedrock), rapid drainage.	
SLOPE: flat to moderately steep ASPECT: variable	
SURFACE REGULARITY AND SHAPE: highly variable over a large area, gently undulating to steep.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Kentucky bluegrass	Richardson's needlegrass
Junegrass	Pinegrass
	Unidentified grass *
Bluebunch wheatgrass (slopes)	Rose
Saskatoon (prolific & small)	Kinnikinnick
Snowberry	Soopallalie
	Rabbitbrush
	Flax
	Yarrow
	Locoweed
	Resin weed
	Harebells
	Pasture sage
	Rocky mountain juniper
	Douglas fir
	Trembling aspen
	Lodgepole pine
RANGE CONDITION: poor to fair, with pockets of good	

PRESENT LAND USE: cattle grazing, Christmas tree

WILDLIFE USE: Much elk sign. Lewis woodpeckers, mountain bluebirds

ECOLOGICAL CONTEXT: Abundant snags remaining from burn are valuable, however, these have small diameters, likely because larger stems were logged, and as such will likely fall out in a short time. Aspen in gullies

provide ecological diversity, as do the deciduous groves along streams in west.

HISTORICAL INFORMATION: All forested prior to 1971 fire (see Unit 21 above) after which it was salvage logged.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

There is serious conifer regeneration on this burn - largely Douglas-fir, with some lodgepole pine and aspen. This unit and unit 23 have not been delineated on the photo as separate units, but rather are examples of 2 distinct types found in this large area.



UNIT #23	APPROX. SIZE: (see above)
LOCATION: West side Road - approx. 2km up Hawke Rd. higher elevation than Unit 22	
TOPO MAP:Fairmont 82J/5	AIRPHOTO #: 30BCC 852-209
LOT: S.L. 163D	LAND STATUS: private
BEDROCK GEOLOGY AND SOILS: MD2 ⁸ RY5 ² /fg Marmalade and Ryanier soil associations. MD2 component (morainal) has a less common soil that is Orthic Dark Brown, having developed in drier location dominated by grassy vegetation; the A horizon is more enriched with organic matter. Limestone derived, gravelly silty, well drained. RY5 component developed in rubbly colluvium. Orthic Eutric Brunisol, shallow lithic phase (Can be 20 to 50 cm thick over bedrock), rapid drainage.	
SLOPE:flat to moderate	ASPECT: SE, SW, E and S
SURFACE REGULARITY AND SHAPE: undulating	

DOMINANT VEGETATION Bluebunch wheatgrass Saskatoon (immature, low)	ASSOC. VEGETATION Rough fescue Junegrass Snowberry Rose Soopallalie Eleagnus Kinnikinnick Yarrow Brown-eyed usan Mariposa lily Aster sp.
RANGE CONDITION: fair to good	

PRESENT LAND USE: Cattle grazing, Christmas trees

WILDLIFE USE: High elk sign.

ECOLOGICAL CONTEXT: Range condition on the west side road varies considerably throughout. This site was in fair to good condition, with remnant rough fescue present. The soil here appeared shallow with much exposed rock. Tree ingrowth of both conifers and aspen is extreme throughout the area. Young Douglas fir on hillside are < 2 m apart in some areas. Nearby there is a young, but developing deciduous community, with Swainson's Thrush, etc. Further to the west of this area is the upper portion of the burn. Here, there is a great number of lodgepole coming in. The

30BCC 852 No. 209

UNIT 23

P



previous stand had many stems, and domestic species, including orchardgrass, smooth brome and clover predominate in the understory. Because of these domestic species was not included in this grassland survey. The area does provide excellent ungulate forage, however. Larch and spruce trees present too.

HISTORICAL INFORMATION: Burned 1971, forested prior to that time (see Unit 21)

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

The most significant threat to this area is the large number of conifers returning on the site. Many of these are nearing 20 years of age, and reburning the area appears to be the only option which would prevent the return of this area to forest. Selected conifer thickets should be fire-guarded and retained throughout the area to provide thermal cover in the winter. Possible conflict with prescribed burning of this area may be the Christmas tree operation. Deciduous communities near water courses should be fire-guarded to preserve the valuable habitat diversity they provide. Investigation by soils experts and others should precede any prescribed burn. Several trial burns in circumscribed areas may be advisable to help determine optimal timing and intensity of a burn.



UNIT #24	APPROX. SIZE: 48ha
LOCATION: W. side of Windermere Lake, SE of McCarthy Lakes	
TOPO MAP: Fairmont 82J/5	AIRPHOTO #: 30BCC 853-57
LOT: 346 and 163D	LAND STATUS: private
BEDROCK GEOLOGY AND SOILS: MD2 ⁸ RY5 ² /fg Marmalade and Ryanier soil associations. MD2 component (morainal) has a less common soil that is Orthic Dark Brown, having developed in drier location dominated by grassy vegetation; the A horizon is more enriched with organic matter. Limestone derived, gravelly silty, well drained. RY5 component developed in rubbly colluvium. Orthic Eutric Brunisol, shallow lithic phase (Can be 20 to 50 cm thick over bedrock), rapid drainage.	
SLOPE: level to mod. sloping	ASPECT: S and SW
SURFACE REGULARITY AND SHAPE: Area is moderately to strongly rolling.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Junegrass	Richardson's needlegrass
	Pinegrass
	Unidentified grass *
Bluebunch wheatgrass (on slopes)	Rose
	Soopallalie
	Rabbitbrush
	Flax
	Yarrow
	Locoweed
	Resin weed
	Rocky mountain juniper
	Douglas fir
	Trembling aspen
	Lodgepole pine
RANGE CONDITION: highly variable	

PRESENT LAND USE: cattle grazing

ECOLOGICAL CONTEXT:

Scattered pocket grasslands on south and southwest facing slopes just north of the edge of the 1971 burn.

HISTORICAL INFORMATION: 1947 air photos indicate that these "pocket" grasslands were already discrete units at this time, but they were slightly larger. Now there is very high ingrowth.

DOMESTIC

FORMERLY

CULTIVATED



1947 CROWN CLOSURE

LESS THAN 5%



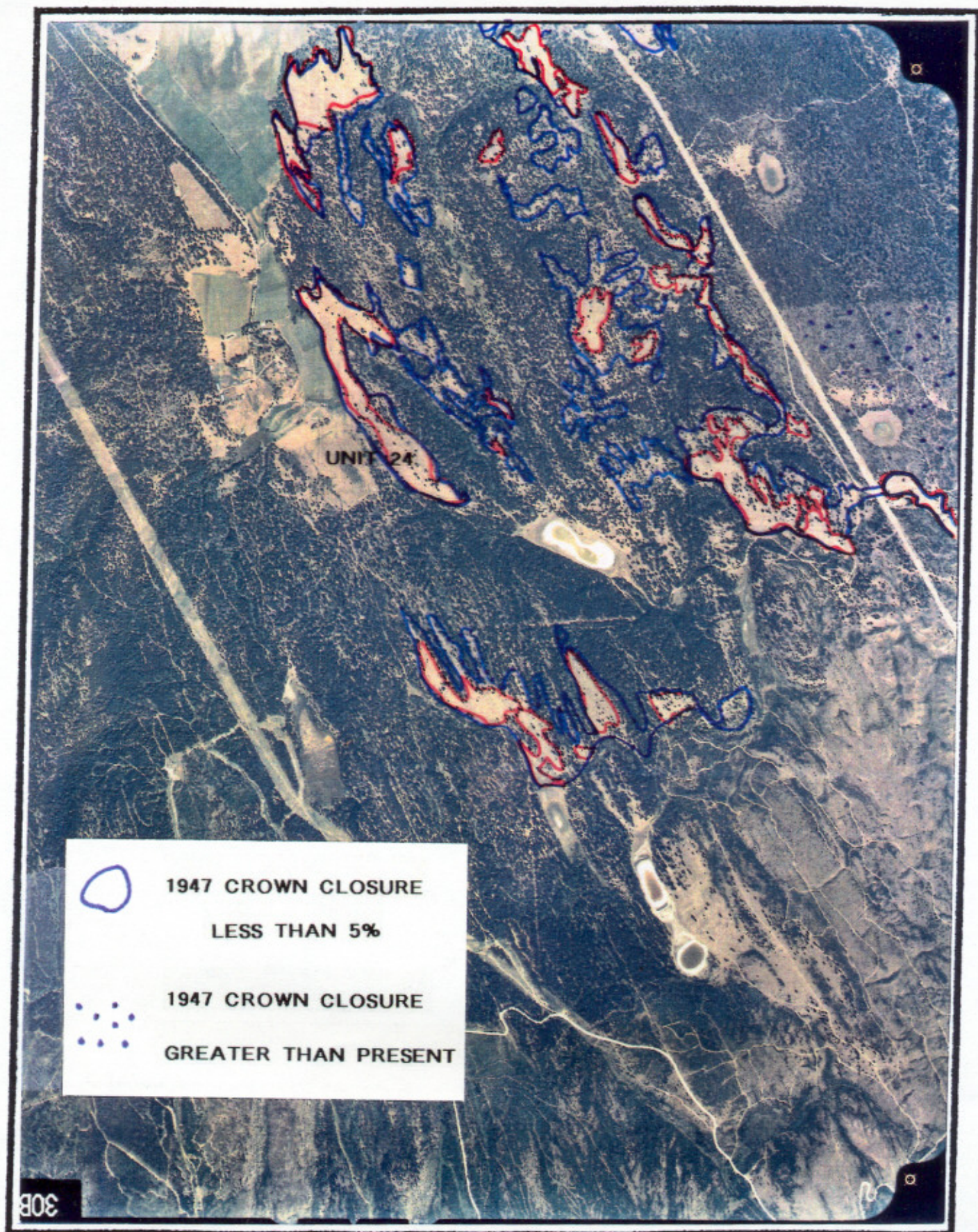
EARLY CROWN CLOSURE

LESS THAN 5% (see text)

UNIT 21a

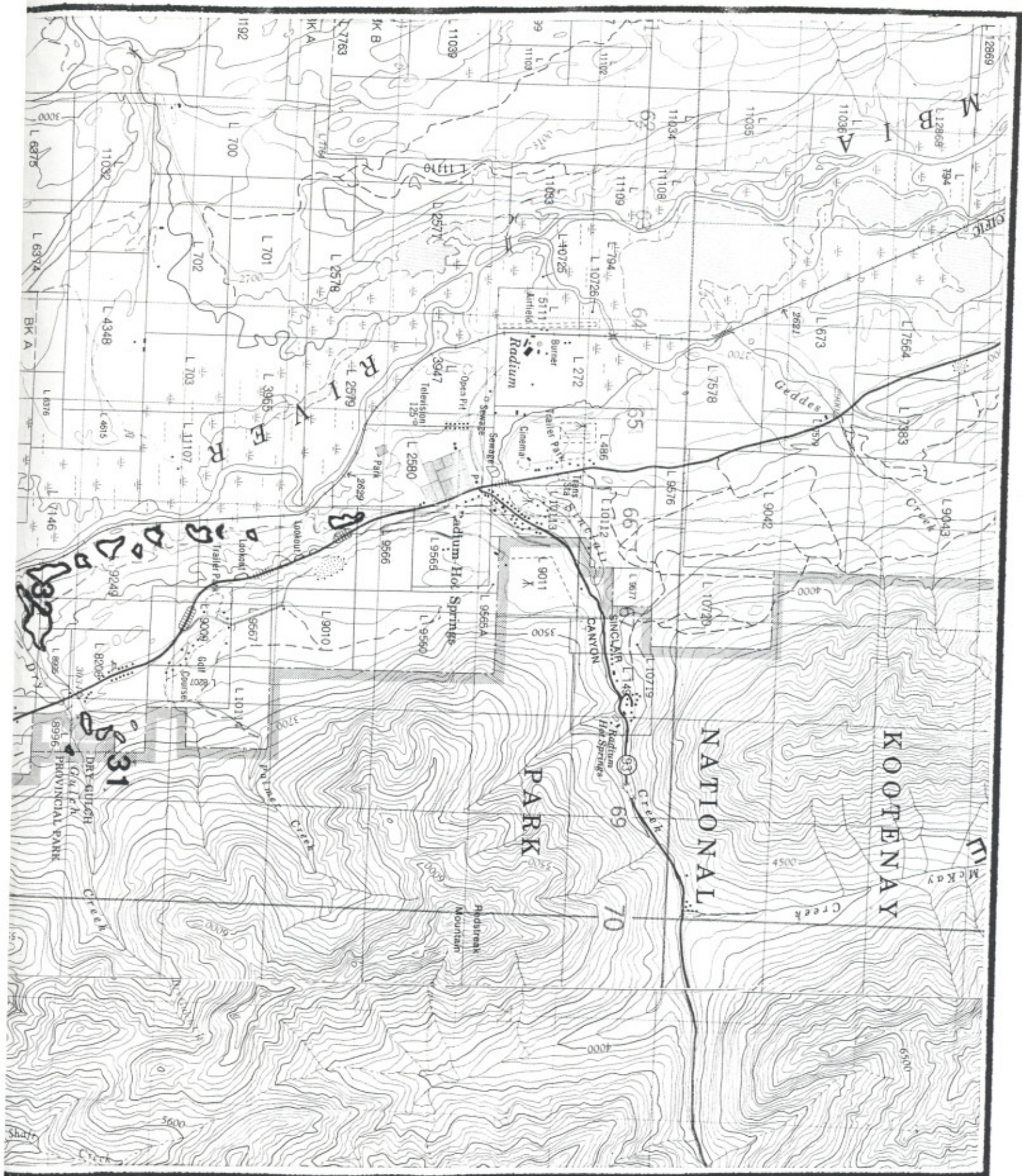
UNIT 24

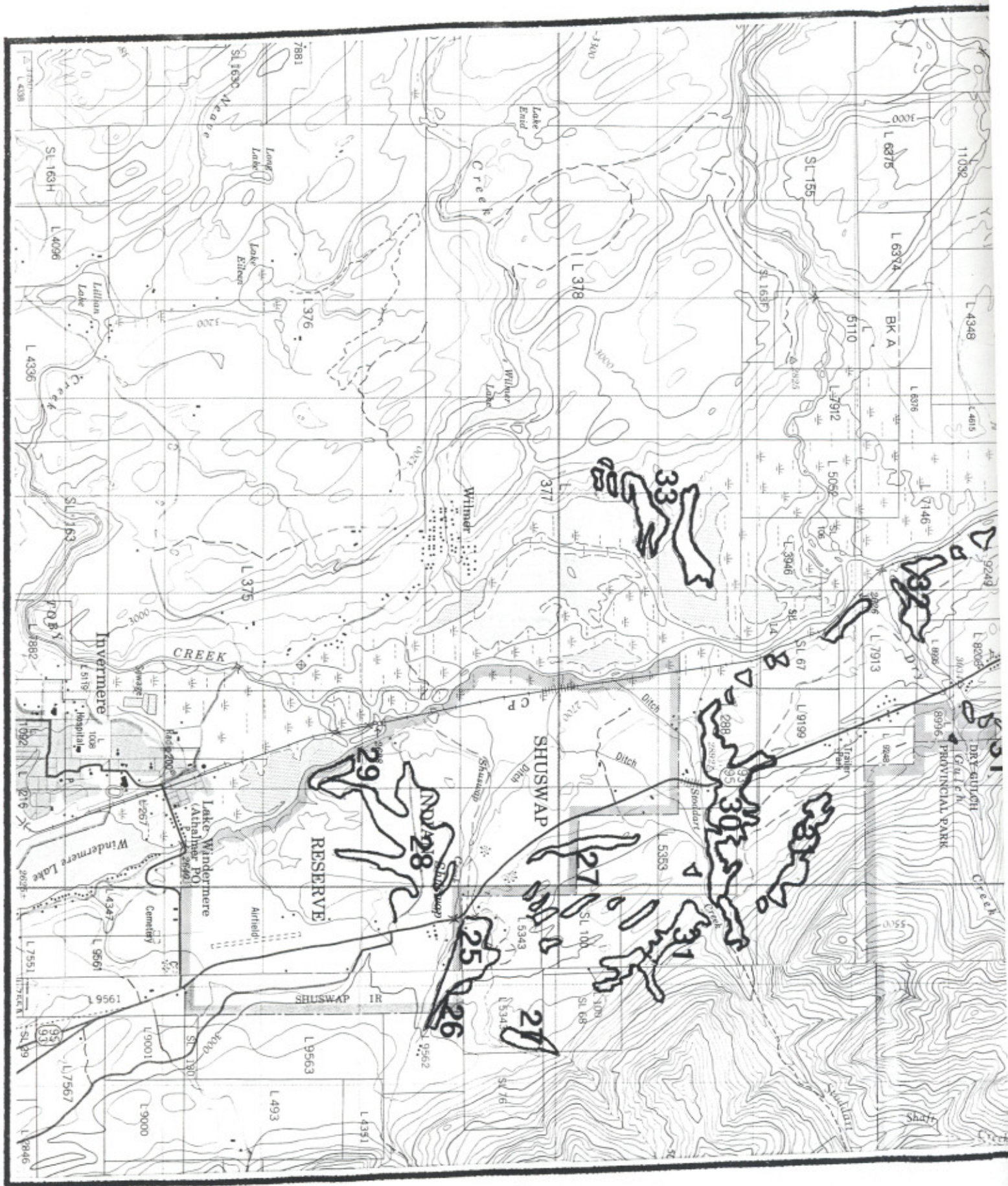
30BCC 871 No. 90



4.3.0 SECTION 3: INVERMERE TO RADIUM

Fig. 5 Overview map of grassland units in northern portion of the study area, Invermere to Radium (1:50,000)





UNIT #25	APPROX. SIZE: 27 ha
LOCATION: just north of Shuswap Cr	
TOPO MAP: Radium 82K/9	AIRPHOTO #: 30BCC 923-90
LOT:5343, Shuswap Ind Res.	LAND STATUS:private & Ind. Reserve
SLOPE:level	ASPECT: n/a
SURFACE REGULARITY AND SHAPE: smooth	

DOMINANT VEGETATION	ASSOC. VEGETATION
Leafy spurge Snowberry	Old alfalfa Brome Kentucky bluegrass Rocky Mtn. juniper Rose Douglas fir (imm)
RANGE CONDITION: poor (due to leafy spurge)	

PRESENT LAND USE: speculation for development

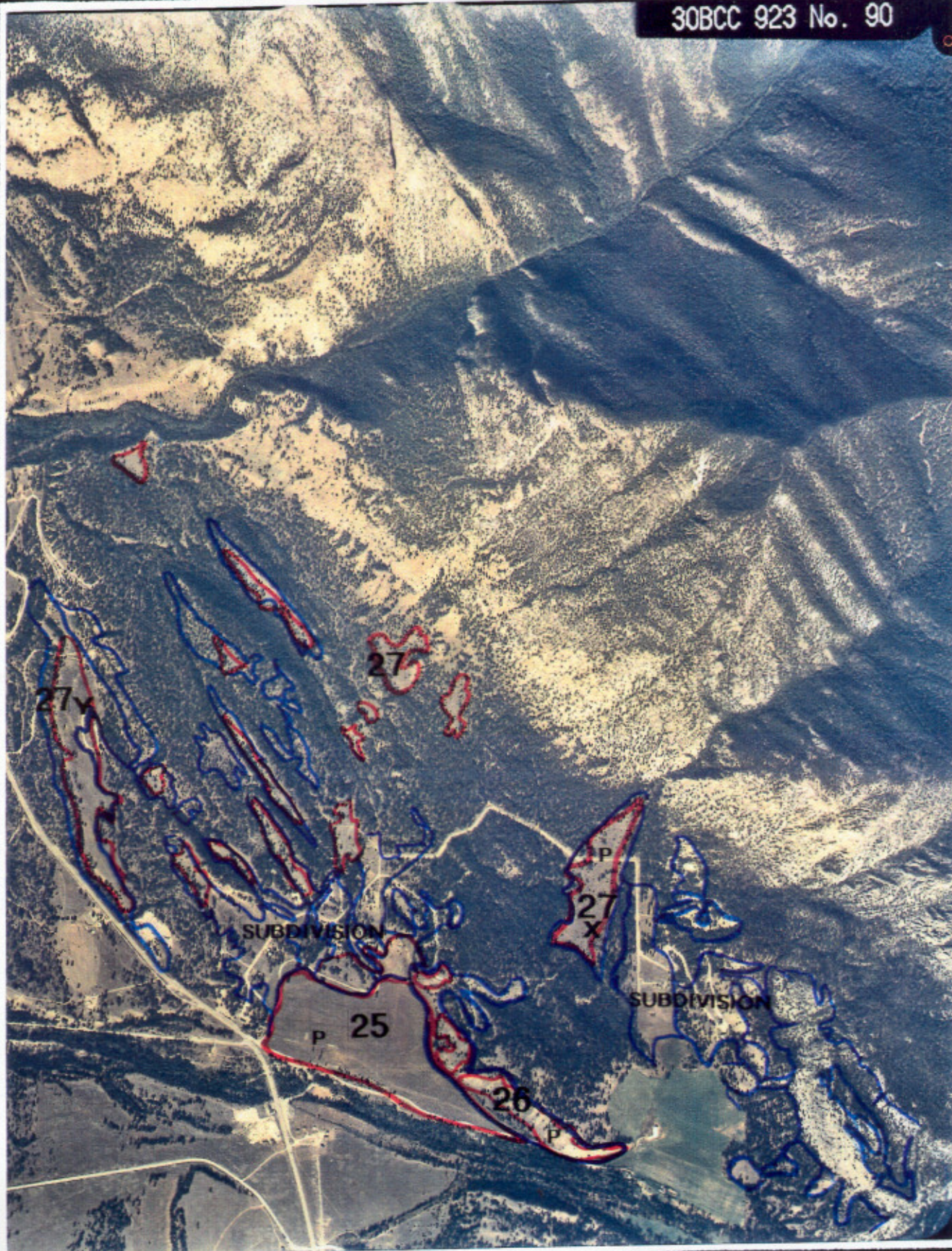
WILDLIFE USE: Goldfinch, meadowlark, savannah sparrows, deer feeding on remnant alfalfa plants

ECOLOGICAL CONTEXT:

Bordered by roads on 3 sides, with residential area to north and potential subdivision on this site itself. This unit has been heavily altered by agriculture and soil disturbance has resulted in a heavy infestation of leafy spurge. There is good riparian habitat across the road to the south along Shuswap Creek, and some strips of native grassland are present on slopes to the east.

HISTORICAL INFORMATION:

This unit was a cultivated field in 1947.



COMMENTS AND MANAGEMENT RECOMMENDATIONS:
Species composition is so altered that this cannot be considered a grassland. Unlikely that options for enhancement exist as subdivision development will probably proceed.



UNIT #26	APPROX. SIZE: 17 ha
LOCATION: Remnant native grasslands on slopes	
TOPO MAP:Radium 82K/9	AIRPHOTO #: 30BCC 923-90
LOT: 9562, Shuswap Reserve	LAND STATUS:private and Ind. Res.
BEDROCK GEOLOGY AND SOILS: no data	
SLOPE:mod to steep	ASPECT: S and SW
SURFACE REGULARITY AND SHAPE: smooth	

DOMINANT VEGETATION	ASSOC. VEGETATION
Pasture sage	Bluebunch wheatgrass (sparse)
Junegrass	Rocky Mtn. juniper
	Rabbitbush
	Brown-eyed Susan
RANGE CONDITION: poor	

PRESENT LAND USE: nil

WILDLIFE USE: Some elk and deer use. No sign of fossorial animals.

ECOLOGICAL CONTEXT: These sparsely treed slopes abut a heavily forested benchland. Although the deciduous community of Shuswap Creek is adjacent to this area, a new subdivision is being built here as well. These areas are very small (rarely > 2ha), highly fragmented and in poor condition generally, partly because of thin soils and fairly steep slopes.

HISTORICAL INFORMATION: Tree ingrowth on the benches above these slopes has occurred since 1947. Grasslands here have also been lost to rural subdivisions.

COMMENTS AND MANAGEMENT RECOMMENDATIONS: No options in light of the urban development that will occur here.

UNIT #27	APPROX. SIZE: 35 ha
LOCATION: Series of longitudinal openings on small ridges south of Stoddart Creek.	
TOPO MAP:Radium 82K/9	AIRPHOTO #: 30BCC 923-90
LOT:5343, SL 68, 100, 5353	LAND STATUS: private and crown
SLOPE:gentle to moderate	ASPECT: S and SW
SURFACE REGULARITY AND SHAPE: Generally smooth, sloping.	

DOMINANT VEGETATION Bluebunch wheatgrass	ASSOC. VEGETATION Rough fescue Columbian needlegrass Rocky Mtn. juniper Douglas fir
RANGE CONDITION: excellent	

PRESENT LAND USE: nil

WILDLIFE USE: Bighorn sheep winter range. Edge created by adjacent forest makes these areas excellent foraging grounds for owls and hawks.

ECOLOGICAL CONTEXT:

Small relic grassland openings surrounded by forest. Largest of these (subunit 27x) is in excellent condition with large, vigorous rough fescue and bluebunch wheatgrass plants, as well as the lowest amount of exposed soil of study area. The slope of this site is very gentle, and it is less dry than elsewhere. Douglas-fir encroachment, however, is severe on these sites. Other sites, such as subunit 27y, are on private land, support little or no bluebunch wheatgrass and can be considered lost due to extensive human activity including horse grazing, etc.

HISTORICAL INFORMATION:

Air photos indicate that much open grassland has been lost to tree encroachment since 1947. In addition, housing and intensive grazing in this area have also had a negative impact on the grasslands.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

The floristic list above was taken from sample sites in subunit 27x. The excellent condition of this site is indicated in the figure below. Options for burning are limited here because of proximity to housing developments. Immature encroaching Douglas-fir should be removed.



UNIT #28	SIZE: 70
LOCATION: south of Shuswap Creek, Westrock Plant Road	
TOPO MAP:Radium 82K/9	AIRPHOTO #: 30BCC 868-125
LOT: Shuswap Ind. Reserve	LAND STATUS: Indian Reserve
SLOPE:Flat	ASPECT: n/a
SURFACE REGULARITY AND SHAPE: smooth	

DOMINANT VEGETATION

Canada bluegrass *
Snowberry

ASSOC. VEGETATION

Junegrass *
Needle and thread grass
Occas. relic rough fescue
Pussytoes
Pasture sage
Brown-eyed Susan
Spike goldenrod
Common goldenrod
Flax
N. bedstraw

RANGE CONDITION: poor *patches where Junegrass is dominant, elsewhere are solid mats of residual (1992) bluegrass.

PRESENT LAND USE: Fields themselves appear not used, however there is an old sawmill site to the west and a large industrial development (gravel pits) near the breaks.

WILDLIFE USE: Very low sign of ungulates. Clumps of snowberry may attract birds when berries ripe, however, this is not a preferred species.

ECOLOGICAL CONTEXT: Eastern portion has been domesticated and supports brome and remnant alfalfa plants. Majority of the area, however, is dominated by a mosaic of low (30-60 cm) snowberry clumps interspersed with patches where bluegrass is dominant and others where junegrass is dominant. There are signs of Douglas fir ingrowth. Between this site and the slopes to the west (Unit 29) there has been excessive damage to the sandy soil.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

The presence of only relic bluebunch and rough fescue plants indicates that this area has been heavily grazed by domestic stock in the past. Some grassland has been lost to industrial development. Photos indicate that some tree encroachment has occurred on this area since the late 1940's, however this has been offset by logging and stands to the west show lower crown closure values now than previously. Immature Douglas fir trees on the grassland should be slashed while still small, the area should be left

30BCL 868 No. 125

UNIT 28

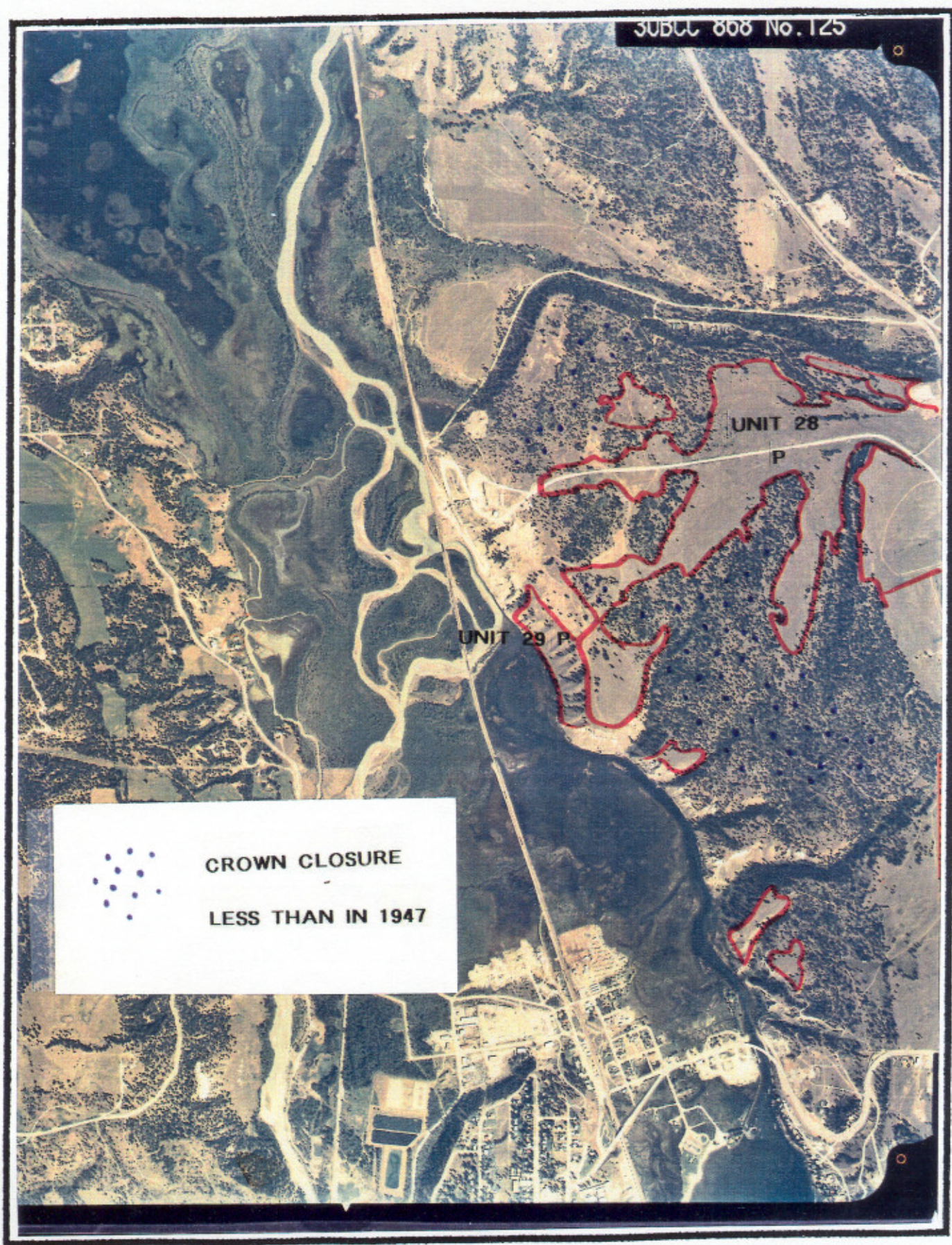
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UNIT 29 P

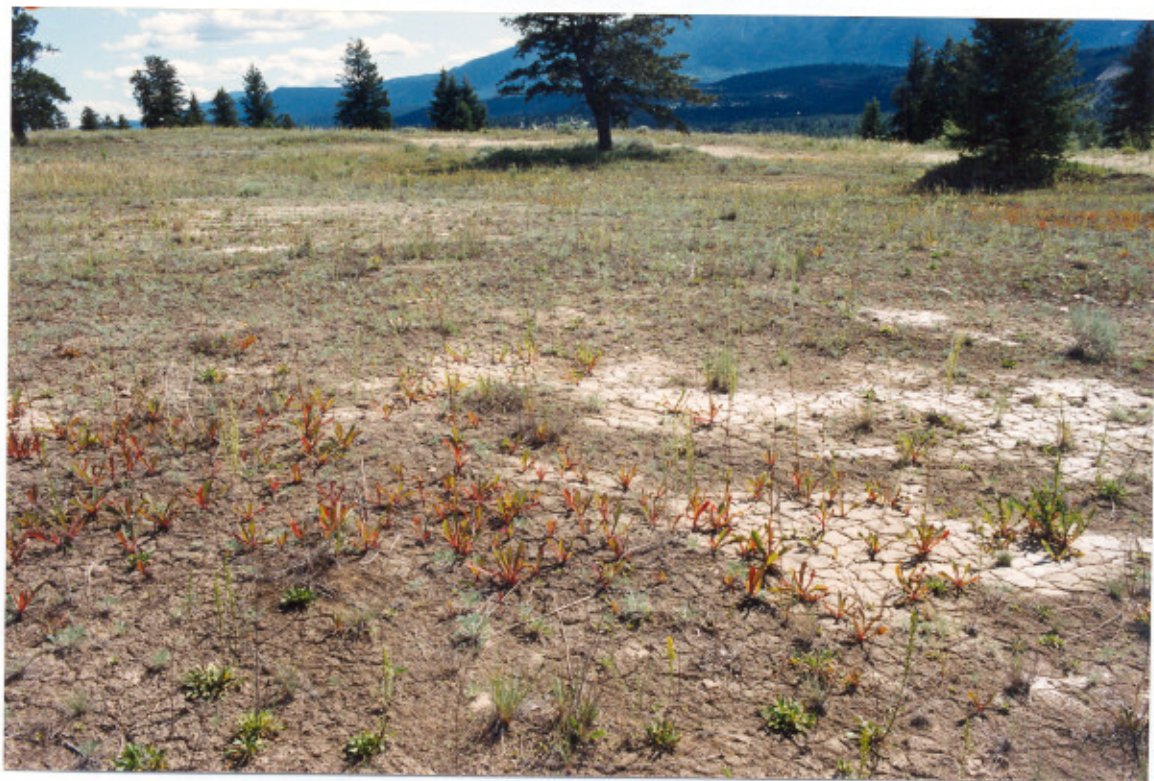


CROWN CLOSURE

LESS THAN IN 1947



ungrazed and possibly some rough fescue or bluebunch plants transplanted or sown.



UNIT #29	SIZE: 23 ha
LOCATION: Terrace and slopes s. of Westroc pit, Shuswap Reserve	
TOPO MAP: Radium 82K/9	AIRPHOTO #: 30BCC 868-125
LOT: Shuswap Ind. Reserve	LAND STATUS: Indian Reserve
BEDROCK GEOLOGY AND SOILS: Glaciolacustrine terrace, sandy silty loam. Highly erodable.	
SLOPE: flat to mod. steep	ASPECT: W
SURFACE REGULARITY AND SHAPE: Terrace and relatively smooth slopes to west down to water's edge.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Rough fescue	Junegrass
Bluebunch wheatgrass	Needle and thread grass
	Mariposa lily
	Spike goldenrod
RANGE CONDITION: good	

PRESENT LAND USE: nearby gravel pit.

WILDLIFE USE: No ungulate sign observed, likely because of intense industrial activity nearby to the north, and the surrounding disturbed sites. Eastern kingbirds and other passerines occupy a deciduous community at the base of the slope.

ECOLOGICAL CONTEXT:

The rough fescue occurs largely on the flat while bluebunch wheatgrass dominates the drier slopes. Some immature Douglas fir but very little encroachment. There is very little rabbitbush on the slopes and what there is is small. There is very little saskatoon, and plant species diversity is generally low at this site although range condition is good. At the foot of the slope at the grassland/water interface is a deciduous shrub community and some conifers. The area to the east has been highly disturbed, likely through mechanized vehicle damage or prior industrial disturbance, and supports Sonchus, sweet clover, and foxtail, as well as an unidentified member of the chenopodiaceae family.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

The area reflects a highly variable set of environmental conditions. The pristine stands of rough fescue near the slope edges show no signs of having been grazed. Management recommendations could include rehabilitation of seriously damaged sites (see above).



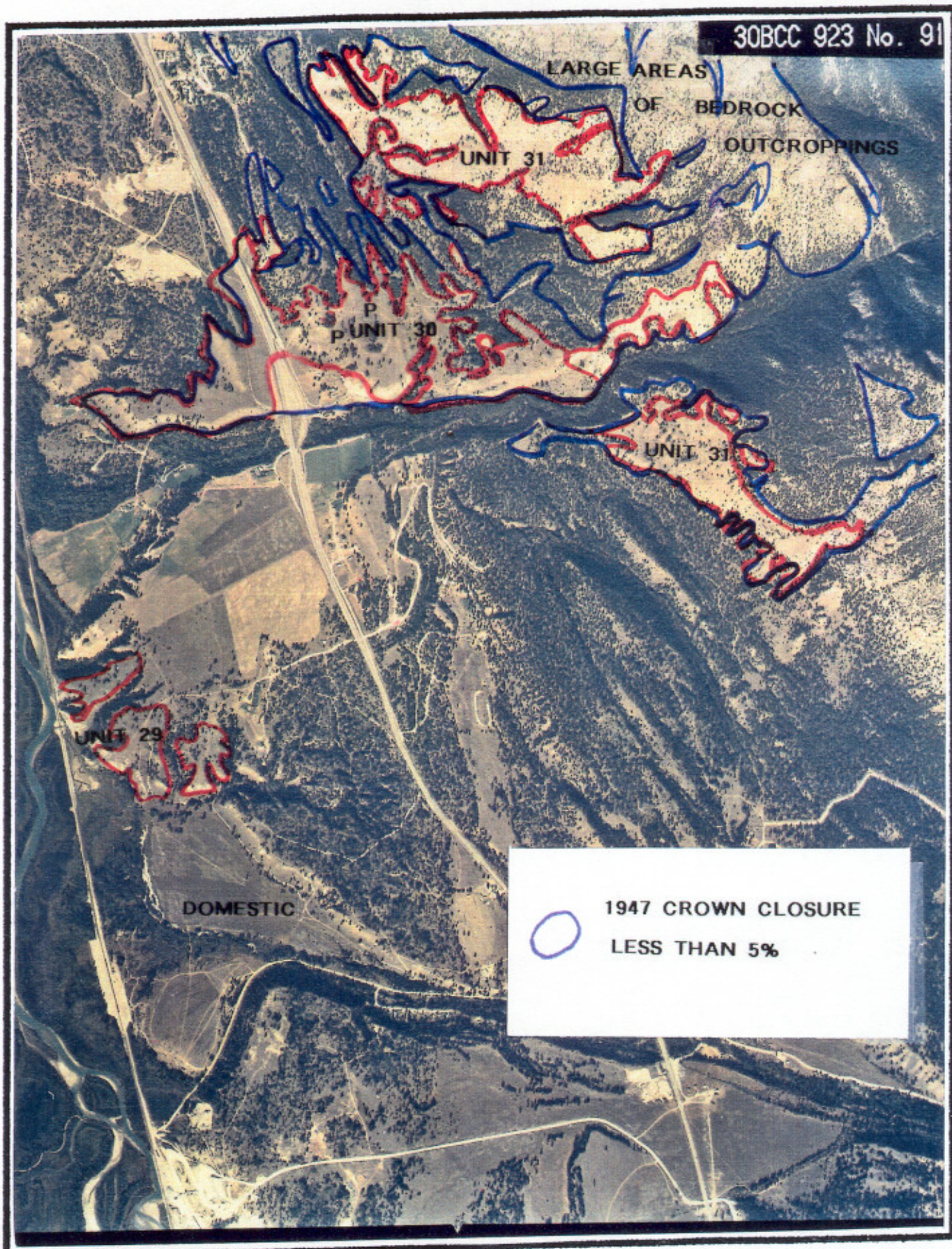
UNIT #30	
LOCATION: Grassland on both sides of highway just north of Stoddart Creek	
TOPO MAP: Radium 82K/9.	AIRPHOTO #: 30BCC 923-91
LOT: L.288 & 5353 & crown	LAND STATUS: private & crown
SLOPE: flat (bench) mod. - steep	ASPECT: s.w.
SURFACE REGULARITY AND SHAPE: Undulating plateau on top of bench w. frequent small depressions and gullies. Drier southwest facing slopes along south edge of bench.	

DOMINANT VEGETATION	ASSOC. VEGETATION
Bench:	
Junegrass	Richardson's needlegrass
Pasture sage	Needle & thread grass
Bluegrass	Rough fescue
	Bluebunch wheatgrass
	R. mtn juniper
	Death camas
Slopes:	
Bluebunch wheatgrass	Rabbitbrush
Junegrass	
Few shrubs, the most abundant being rabbitbrush. Relatively high diversity of grass and forb species on plateau due to presence of small depressions and changing moisture regimes. Lower species diversity on slopes. Juvenile D. fir and lodgepole pine encroaching on both plateau and slopes.	
RANGE CONDITION: Fair. Some rough fescue, however frequent patches of exposed soil on site and 4-WD damage.	

WILDLIFE USE: Some elk sign on bench. Little evidence of fossorial animals. Numerous gullies with aspen, pine and D. fir thickets provide good habitat for song birds and excellent cover.

ECOLOGICAL CONTEXT:

This grassland is adjacent to excellent winter range for Rocky Mtn. bighorn sheep. There are steep cliffs to the north which could provide nesting opportunities for falcons, golden eagles and vultures, as well as escape terrain for sheep. The lower slopes abutt the deciduous community in the riparian zone along Stoddart Creek, thus adding to habitat diversity of the area. There is, however, some housing development on the bench below the



LARGE AREAS
OF BEDROCK
OUTCROPPINGS

UNIT 31

P
UNIT 30

UNIT 31

UNIT 29

DOMESTIC



1947 CROWN CLOSURE
LESS THAN 5%

slopes on both sides of the highway, and to the south is a new golf development.

HISTORICAL INFORMATION: On the west side of the highway and out onto the breaks there has been no significant change in tree distribution or crown closure since 1947. East of the highway, however, tree ingrowth and encroachment has been very high.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

As most of this land is privately owned, a discussion of management options is not applicable unless some cooperative program between land owners and the government can be developed. Where it is crown, however, some removal of D. fir regen. would be valuable, especially while the trees are small.



UNIT #31	SIZE: 81 ha
LOCATION: Scattered v. thin soiled, steep openings in region of Stoddart and Dry Gulch	
TOPO MAP: Radium 82K/9.	AIRPHOTO #:30BCC 923-91
LOT:8996 & crown crown and Dry Gulch Provincial Park	LAND STATUS: Koot. Nat. Park &
SLOPE:steep	ASPECT: W & SW

DOMINANT VEGETATION	ASSOC. VEGETATION
Bluebunch wheatgrass	Junegrass
Rabbitbush	Kinnickinnick
	Rocky Mtn juniper
	Douglas-fir
Leafy spurge (in areas)	
RANGE CONDITION: poor, but soils are very thin	

PRESENT LAND USE:

WILDLIFE USE: An important component of the Radium bighorn sheep herd's winter range

HISTORICAL INFORMATION:

Comparison with 1947 air photos indicate that the size of this grassland slopes has been significantly diminished by tree encroachment and ingrowth.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

Because of the steep slopes and thin soils, vegetative cover is sparse in some areas. No benefit is likely to be derived from any enhancement activities, and erosion potential may be increased on this unit. An enhancement plan consisting mainly of thinning and burning has been developed for the surrounding area (Armstrong and Assoc. 1993). Pockets of Douglas-fir in this unit can be retained for cover.

UNIT #32	SIZE: 60 ha
LOCATION: Network of breaks and benches between Stoddart Creek and Radium.	
TOPO MAP: Radium 82K/9.	AIRPHOTO #: 30BCC 872-67 & 6
LOT: S.L. 67, 7913, 8995, 9429.	LAND STATUS: crown
SLOPE: breaks-steep, benches-flat	ASPECT: S & W & SW
SURFACE REGULARITY AND SHAPE: irregular, strongly gullied	

DOMINANT VEGETATION	ASSOC. VEGETATION
Junegrass (bench)	Needle & thread grass
Bluebunch wheatgrass (slopes)	Rough fescue
Rabbitbrush	Bluestem wheatgrass
	Kentucky bluegrass
	Pasture sage
	Rocky Mtn. juniper
	Saskatoon (immature)
	Snowberry (small)
	Rose
	Nodding onion
	Woolly sunflower
	Fleabane
	Gromwell
	Harebells
	N. Bedstraw
RANGE CONDITION: fair	

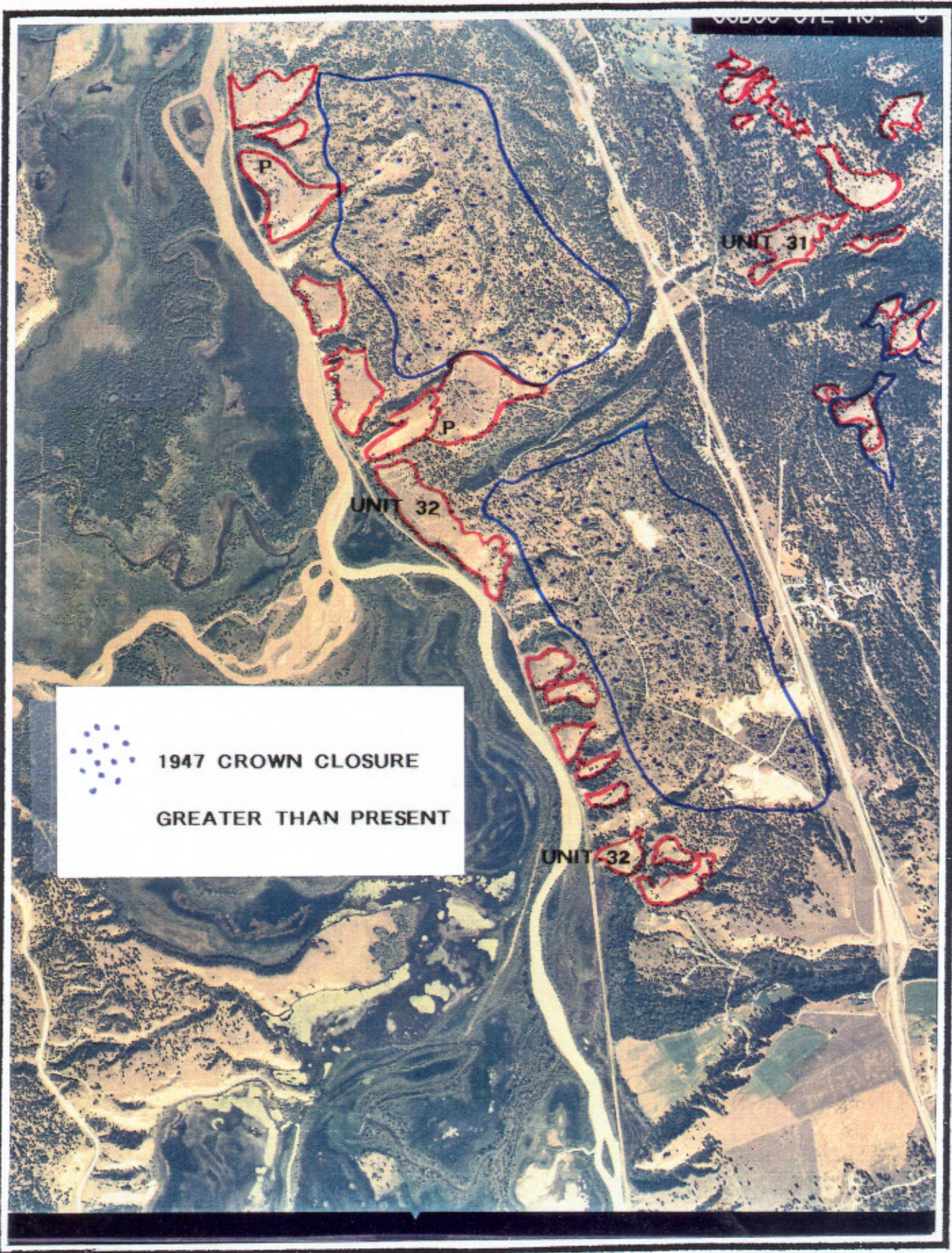
PRESENT LAND USE: Christmas trees on adjacent area. Some vehicular damage

WILDLIFE USE: There was evidence of high elk and some deer use on the benches. Two mule deer were seen in July.

ECOLOGICAL CONTEXT:

Deep gullies, with deciduous shrubs and some aspen provide some habitat diversity. The aspect and relatively exposed position of the slopes suggest it is valuable elk habitat, especially in winters with high snow depth. There is no urban development on these sites, and the only industrial development consists of several gravel pits away from the breaks in the south end. North aspects are more heavily treed and support soopallalie as well as thick stands of D. fir of varying ages. The dominant shrub is rabbitbrush, however, there is some immature Saskatoon establishing in those areas with less slope. The open areas of grassland just above the breaks are highly

00000 07E 10. 0



1947 CROWN CLOSURE
GREATER THAN PRESENT

UNIT 32

UNIT 31

UNIT 32

fragmented due to much D. fir encroachment. This becomes more extreme as one moves further away from the breaks as the majority of the bench is treed. There are small (< 1 ha) openings throughout the treed bench area, and in many of these the grasses are in v. good condition, with rough fescue present and a vigorous shrub component.

HISTORICAL INFORMATION:

Historic large diameter (> 70 cm dbh) stumps, spaced from 8 to 20 m apart occur, indicating that grassy vegetation, under widely spaced trees occurred over the long term. Historical photos indicate that the interior of these benches was more heavily forested than now, and the area has been logged.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

The quality of grasses in the larger openings in the treed area suggest that, if Christmas tree growing is continued range quality will not deteriorate to the degree it would should these trees be allowed to mature. Future options for burning, however, are compromised by the presence of Christmas tree permits.



UNIT #33	SIZE: 43 ha
LOCATION: north of Wilmer	
TOPO MAP: Radium 92K/9	AIRPHOTO #:30BCC 872-7
LOT: 377	LAND STATUS: Nat. Wildl. Refuge
SLOPE:flat to gentle	ASPECT: SE, E. Breaks S aspect
SURFACE REGULARITY AND SHAPE: A series of smooth, gentle benches descending to marsh edge with some shallow gullies on upper slopes. Tops of terraces in south flat with steep banks.	

DOMINANT VEGETATION Junegrass Rabbitbush	ASSOC. VEGETATION Needle and thread grass Bluestem wheatgrass Unidentified grass * Pasture sage Immature snowberry Spike goldenrod Pussytoes Flax Fleabane Mariposa lily Nodding onion
RANGE CONDITION: poor	

PRESENT LAND USE: cattle grazing

WILDLIFE USE: Deer and elk sign. Nighthawks, Vesper sparrows. Bank swallows and possibly kingfishers in cliffs.

ECOLOGICAL CONTEXT:

North slopes of breaks heavily treed with mature Douglas-fir. Juxtaposition of dry grassland, deciduous community, and marsh provides an uncommon variety of differing habitats. Breaks to the south are more typical of the trench, with heavily treed north aspects, flat grassy tops and steep, sparsely vegetated banks facing south.

HISTORICAL INFORMATION:

There has been little significant tree encroachment on this unit since 1947.

COMMENTS AND MANAGEMENT RECOMMENDATIONS:

There is vehicular damage on this area and intrusion of roadside and domestic species on to the grasslands as well, primarily alfalfa plants and sweet clover. Range condition is poor, there is much exposed soil, and neither bluebunch wheatgrass nor rough fescue is prevalent. Although the



Province

30BCC 872 No. 7

BIG SAGEBRUSH



1947 CROWN CLOSURE
GREATER THAN PRESENT

UNIT 33

P

area is small (approximately 30 to 40 ha) a range recovery plan should be developed, which would likely include removal of cattle grazing.





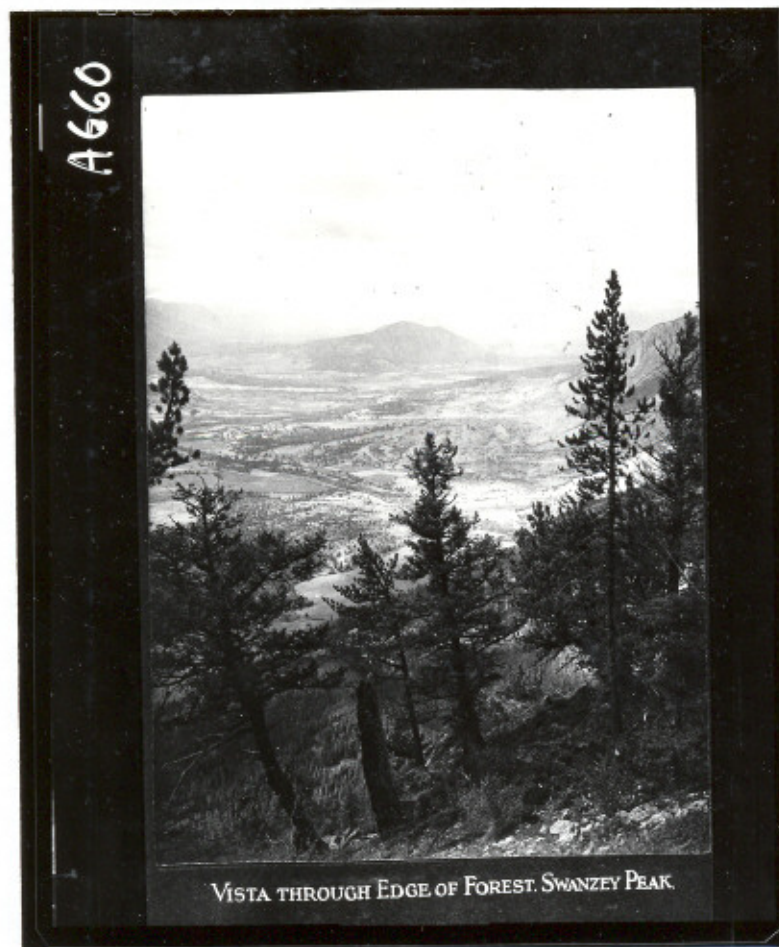


PHOTO CREDIT:
WINDERMERE DISTRICT
HISTORICAL SOCIETY

Fig. 6. View from Mt. Swansea in 1910 and 1993, indicating tree encroachment and ingrowth occurring since that time.

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