1.0 SPECIES-HABITAT MODEL FOR PLAINS BISON (*BISON BISON*)

Species Data

Species Name:	Plains Bison
Scientific Name:	*Bison bison*
Species Code:	M-BIBI
BC Status:	Blue-listed
Identified Wildlife Status:	No
COSEWIC:	Not at risk

Project Data

Ecoprovinces:	Northern Boreal Mountains, Sub-Boreal Interior
Ecoregions:	Northern Canadian Rocky Mountains, Central Canadian Rocky Mountains
Ecosections:	HYH, EMR, MUF, PEF
BGC Units:	AT, BWBSmw1, BWBSwk2, SWBmk, SWBmks
Map Scale:	1:50,000

1.1 Introduction

Bison have not been well studied in northeastern British Columbia and there are no specific published bison habitat studies for the study area. However, some aspects of bison habitat use are reasonably well understood by regional experts and some of this knowledge exists in the grey literature (unpublished reports etc…). In order to document unpublished expert opinion on bison habitat use in the study area, a regional workshop was held and was documented in EBA (2001). Information on habitat requirements for bison in other areas such as the Northwest Territories and Yellowstone National Park, Wyoming, is also drawn upon.

1.2 Ecology and Habitat Requirements

Bison habitat varies from open, arid plains, to open forests, grasslands and meadows, river valleys, and mountainous areas (Forsyth, 1985). Their habitat use is dependent on food availability during each season and they select habitats that provide optimal protein (Larter and Gates, 1990). Optimal habitats for food are open grasslands with high grass and sedge cover but bison use forested areas when available.

Bison are predominantly grazers and grasses and sedges are their main diet in most places, although they will also consume horsetails, rushes, lichens, shrubs and berries (Banfield, 1974). Selection of individual diet items varies among geographical areas and is mostly a function of relative forage availability (Larter and Gates, 1991). Plains bison and wood bison inhabiting Wood Buffalo National Park predominately consume grasses or a combination of grasses and sedges. Bison in Yellowstone National Park eat sedges

almost exclusively (Meagher, 1978). Plains bison inhabiting riparian willow communities use browse, mostly in an opportunistic manner and will not abandon habitats providing higher sedge and grass biomass to do so. Larter and Gates (1991) report that summer browsing included up to 33% of wood bison diet in the Mackenzie Bison Sanctuary, NWT. They also found high consumption of lichen, comprising up to 40% of their diet in fall. In all areas presently inhabited by bison, snow or open water is available at all times and apparently used daily (Meagher, 1978).

Bison diet also varies by season. In the Mackenzie Bison Sanctuary, winter diet is composed almost exclusively of sedges. In spring and early summer, their diet includes a diverse mix of sedges, grasses and shrubs. In late summer and fall, lichen and forbs become more dominant (Larter and Gates, 1990).

Bison herds that spend summers at higher elevations in the mountains often move down to river valleys in winter, although lone bulls regularly winter high in mountain passes. In November and May, the bison in Wood Buffalo National Park undertake considerable migrations from the wooded hills to the Peace River valley (Banfield, 1974).

Bison are extremely winter hardy. They can forage in several feet of loose snow (Meagher, 1978). In fact, the main factor in habitat selection in winter may be snow hardness and not snow depth. Reynolds *et al.* (1987) found that snow hardness was the principle factor influencing choice of feeding sites. Some habitats may also provide important thermal protection. Warmer areas (e.g. south aspects) with less snow provide a margin for survival for bison in the harshest wintering areas (Meagher, 1978).

Wintering bison in the Sikanni and Halfway River valleys are regularly found in subalpine and alpine habitats in winter. The low snow depths in the Muskwa Foothills allows for good access to forage at all elevations and seasons.

Primary bison habitat is in non-forested areas. Cairns and Telfer (1980) observed strong selection by bison for upland grassland areas in the boreal forest. Similarly, Hudson and Frank (1987) found bison mostly on grassy upland meadows and little use of poplar forests. Forested habitats, however, may be used extensively. During severe winter conditions, forested areas and topographical variations may provide some degree of shelter. These areas may be especially important during periods of crusted or dense, deep snow. Forested habitats are also used for shade, to escape insect pests and the trees are used for scraping. Extensive forests that provide little forage may be traversed from one foraging area to another (Meagher, 1978). In some areas, conifer forests provide the highest lichen biomass for fall feeding. Recent burns provide abundant forage for bison. Pearson *et al.*(1995) found these areas used most in mid- to late-winter.

1.3 Distribution

Two North American subspecies of modern bison are currently recognised: *Bison bison bison* (plains bison) and *B. b. athabascae* (wood bison). Detailed comparisons of wood

and plains bison are difficult to make because of the disappearance of most wild populations of both forms followed by the hybridisation of remnant populations. Historical accounts generally agree that, compared to plains bison, the wood bison was larger, darker, hardier, more fleet and wary, and lived in smaller bands (Meagher, 1978).

Plains bison occurred throughout the prairies of central North America and also occurred in the hardwood forests of eastern United States. Now they are mostly found in semi-domesticated herds in many national parks and reserves (Banfield, 1974). There has been integration of the two races but pure forms can still be seen in some areas, including the Pink Mountain area of British Columbia (Nagorsen, 1990).

1.3.1 Provincial Range

Both bison subspecies occur in northeastern British Columbia (Nagorsen, 1990). Plains bison were introduced to the Pink Mountain area in 1971 from Elk Island National Park. This is the population now present in the Halfway and Sikanni River valleys and potentially into the Nevis Creek valley to the north. Wood bison reported from various northeastern localities (e.g. Fort Nelson, Kotcho Lake) probably originated from those introduced to Nahanni Butte, Northwest Territories, in 1980.

1.3.2 Distribution in Project Study Area

Bison are resident in the Sikanni and Halfway River valleys. This population is one of the largest herds in the world and the largest herd free of problem-diseases (Shackleton, 1999). Table 37 show the expected distribution of bison according to Ecosection and BGC unit. Bison are present in PTP Area 1 only. There is apparently suitable habitat to the north of their current range and there is concern about bison range expansion and subsequent effect on other grazing ungulates.

1.3.2.1 Elevation Range

Valley bottom to alpine (420 to 2840 m ASL).

1.4 Food/Cover Life Requisites and Habitat Uses

For this project, bison habitat use has been divided into two seasons and uses: food for general living in the growing season and food for general living in the winter (Table 38).

Table 1. Distribution of bison in the project area.

Ecoprovince	Ecoregion	Ecosection	BGC Unit	PTP Area 1	PTP Area 2	PTP Area 3	PTP Area 4
Northern Boreal Mountains	Northern Canadian Rocky Mountains	EMR	AT	●			
			BWBSdk2				
			BWBSmw2				
			SWBmk	●			
			SWBmks	●			
		MUF	AT	●			
			BWBSdk2				
			BWBSmw2				
			BWBSwk2	●			
			ESSFmv4	●			
			ESSFmvp4	●			
			SWBmk	●			
			SWBmks	●			
	Hyland Highland	HYH	BEBSdk2				
Sub-Boreal Interior	Central Canadian Rocky Mountains	PEF	AT	●			
			BWBSmw1	●			
			BWBSwk2	●			
			ESSFmv4	●			
			ESSFmvp4	●			
Taiga Plains	Muskwa Plateau	MUP	BWBSmw2				
			SWBmk				

Note: Shaded cells indicate a BGC unit that is not present in a PTP Area.

Table 2. Food/cover life requisites rated for bison in the M-KMA project area.

Food/Cover Life Requisite	Habitat-Use	Months	Rating Column Title
Food	General living in the growing season	June – September	MBIBI_FDLIG
Food	General living in winter	October – May	MBIBI_FDLIW

1.4.1 General Living in Growing Season

Food

Bison are predominantly grazers and grasses and sedges are their main diet in the study area, although they will also consume horsetails, rushes, lichens, shrubs and berries. Optimal food is found in grassland and herbaceous communities. In the growing season, bison are more commonly found at higher elevations but they may found at any elevation where food is abundant. In the SWBmk, the combination of valley bottom riparian plains, open forest cover, and the herb and shrubland communities produced by massive cold-air ponding (e.g. *Betula glandulosa – Festuca altaica* association and others) combine to provide excellent bison habitat year-round. The SWBmks and AT are also used extensively in all seasons.

1.4.2 General Living in Winter

Food

Bison crater through snow to access grasses and sedges in winter. There is an increased use of forested areas where snow depth is lower, although in average snowfall years, snow depth is not likely to limit food availability in the study area. Use of lower elevation habitats is greater in winter although bison may be found at any elevation, including alpine.

1.5 Ratings

Habitat ratings were generated using the six-class rating scheme (Table 39).

Table 3. Habitat capability/suitability 6-Class rating scheme used for final bison ratings.

% of Provincial Best	Rating	Code
100% - 76%	High	1
75% - 51%	Moderately High	2
50% - 26%	Moderate	3
25% - 6%	Low	4
5% - 1%	Very Low	5
0%	Nil	6

1.5.1 Provincial Benchmark

Table 40 lists the provincial benchmarks for bison. The study area contains the provincial benchmark and therefore many habitats are rated up to high.

Table 4. Provincial benchmarks for bison.

Ecoprovince	Ecosection		BGC Subzone	Broad Ecosystem Unit Name	Rating
	Unit	Rating			
Winter					
Sub-Boreal Interior	PEF	4	BWBSmw	BA/1 - Boreal White Spruce-Trembling Aspen	**3**
Boreal Plains	HAP	3	BWBSmw	BA/1 - Boreal White Spruce-Trembling Aspen	**3**
	PEL	*B*	*BWBSmw*	*BA/1 - Boreal White Spruce-Trembling Aspen*	***1***
Taiga Plains (Preconact) [1]	ETP	3	BWBSmw	TF/1 - Tamarack Wetland	**4**
Northern Boreal Mountains (Current) [1]	**MUF**	**B**	**SWBdk**	**BA/1 - Boreal White Spruce-Trembling Aspen**	**1**
Growing Season					
Sub-Boreal Interior	PEF	4	BWBSwk	BA/1 - Boreal White Spruce-Trembling Aspen	**3**
Boreal Plains	HAP	3	BWBSwk	SM - Subalpine Meadow	**1**
	PEL	B	BWBSmw	WL – Wetland	**3**
Taiga Plains (Precontact) [1]	ETP	3	BWBSmw	WL – Wetland	**3**
Northern Boreal Mountains (Current) [1]	**MUF**	**B**	**SWBdk**	**SM - Subalpine Meadow**	**1**

Note: Only the Provincial benchmark (shaded) and those Ecosections present in the MK project area are shown.

[1] *Pre-contact*: prior to European settlement, the greatest densities of Wood Bison inhabited the Peace Lowlands; consequently, this is the historical benchmark for Wood Bison. *Current*: current bison populations in the Muskwa Foothills are comprised of populations of Wood Bison and of Plains Bison that have been introduced into Wood Bison habitat.

1.5.2 Assumptions

Table 41 lists the assumptions for habitat use by bison for each season and life requisite. For some attributes, the listed assumptions represent broad patterns only and detailed ratings are contained in the RRM.

Table 5. Assumptions for habitat use by bison in the M-KMA project area.

Ssn and Use	Attribute	Assumptions
FDLIG	BGC Unit	• Bison can be found in any BGC unit. • AT rated up to 70%. • ESSFmvp4 and SWBmks are rated up to 80%. • All other units rated up to 100%.
	Site Series	• Suitable forage is found in sites with various moisture and nutrient regimes. Wet sites (subhydric to hydric) are used less than drier sites and are rated down 30%.
	Structural Stage	• Early successional stages provide optimal food habitat for Bison. Patch forest communities are favoured because of the clear areas between stands. • Stages 02 and 3a are rated up to 100%. • Stage 3b is rated up to 70% • Stages 06 and 07 are rated up to 50%. • Stages 04 and 05 are rated up to 20%. • Stage 01 is rated 0%.
	Site Modifier	• Steep slopes limit access to food and are rated down 60%.
FDLIW	Ecosection	• High snow depths in the EMR limit access to food. EMR is rated down 80%.
	BGC Unit	• AT rated up to 60%. • ESSFmvp4 and SWBmks rated up to 70%. • All other units rated up to 100%.
	Site Series	• Suitable forage is found in sites with various moisture and nutrient regimes. Wet sites (subhydric to hydric) are used less than drier sites and are rated down 30%.
	Structural Stage	• Early successional stages provide optimal food habitat for Bison. Mature forested stands provide good snow interception because of their multilayered structure and the deep, spreading crowns of the older trees. Patch forest communities are favoured because of the clear areas between stands. • Stages 02 and 3a are rated up to 100%. • Stage 3b is rated up to 70% • Stages 06 and 07 are rated up to 50%. • Stages 04 and 05 are rated up to 20%. • Stage 01 is rated 0%.
	Site Modifier	• Early successional stages provide optimal food habitat for Bison. Mature forested stands provide good snow interception because of their multilayered structure and the deep, spreading crowns of the older trees. Patch forest communities are favoured because of the clear areas between stands. • Stages 02 and 3a are rated up to 100%. • Stage 3b is rated up to 70% • Stages 06 and 07 are rated up to 50%. • Stages 04 and 05 are rated up to 20%. • Stage 01 is rated 0%.

1.5.3 Ratings Model

The habitat ratings were generated using Resource Ratings Models (RRMs). (see Section 2.3 for a full description of the modelling approach). The variables included in the models are the ecosystem map attributes described in Table 41. The assumptions for each of the variables are more precisely defined in the accompanying MS Excel® workbook for bison.

1.6 Map Themes and Ratings Adjustments

1.6.1 Life Requisite Maps

Maps of the two seasons/uses can be produced:

- Food for general living in the growing season;
- Food for general living in the winter;

For complex polygons, the polygon rating will be the weighted average of all deciles.

1.7 References

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