INTERNAL PROGRESS REPORT

Fire History Survey,

Plumridge Lakes Nature Reserve

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N. Burrows, B. Ward, K. Maisey & A. Robinson

Introduction

Reserves in the Great Victoria Desert have a recent history of large wildfires. For example, most of the QVSNR was burnt by wildfires sometime in 1954 and Landsat imagery shows extensive wildfires in about 1976. In one scene encompassing most of Plumridge Lakes NR and a vast area to the south, almost 85% of the total flammable vegetation was burnt by wildfire in about 1976. Therefore, the current unmanaged fire regime in Great Victoria Desert reserves is one of infrequent, large and extensive wildfires.

In terms of conservation objectives, is this good or bad? Is there any evidence that the current wildfire regime is causing a decline in conservation values? Given the remoteness of the reserves, the lack of human values at risk and the paucity of resources to manage these reserves, a "do nothing" strategy may be best?

On the other hand, large, infrequent and intense wildfires may not be desirable. There is mounting evidence that the pre-European fire regime was one of smaller fires spread over time and space. Undoubtedly there would have been occasional large fires (in excess of several thousand hectares). Also, from an ecological perspective, there is growing literature that "stability is achieved in landscapes where internal fluctuations abound in a spatial and temporal mosaic" (Saxon 1984). Saxon also maintains that, in central Australia, "when single landscape types are subjected to large uniform disturbances, they threaten the survival of wildlife species which depend on irregular boundaries of Natural fire pattern to provide a fire-join mosaic of resources."

Here in Western Australia, we have little knowledge of the response of desert wildlife to fire regimes. Presently, we are unable to make informed decisions about the desirability of the current wildfire regime. To provide some information and to compliment research being undertaken in QVSNR and the GDNR, we have established 20 permanent plots in the Plumridge Lakes NR. The aim of this project is to study plant response and recovery to fire and to examine species diversity and structure with time since fire. Plumridge was chosen as it has diverse floral assemblages and is reasonably accessible.

In addition to establishing monitoring sites, we also carried out a fire history survey of PLNR.

Methods

Initially, we carried out a rudimentary vegetation survey by driving along the access tracks and mapping the major vegetation types. Landsat imagery (mss) helped to map major landform and vegetation types.

We then decided on locations for monitoring sites in the flammable (spinifex dominated) vegetation types. Five sites were chosen (see Figure 1) and at each site, 4 plots each 50m x 50m were marked with steel droppers at each corner. Structural measures were made by running transects across the diagonals of the square plots and at 0.5m intervals, levy rods were used to measure vegetation contacts. Number of contacts and height of contacts were recorded. All species present in the plots were recorded and an abundance rating given on a 1-5 scale (modified after Havel 1975). Where plants could not be identified (which was often the case) the plant was given a number and a specimen taken for identification (specimens were prepared, described and pressed in the field.)

On-site indicators such as ring counts on *Eucalyptus sp.* coppice and stems helped to provide fire history information for that site. Each plot was then photographed.

Results

As yet, detailed vegetation maps and complete plant species lists do not exist for Plumridge lakes Nature Reserve. Generally, the western portion of the Reserve consists of sand plains and parallel sand dune system covered with spinifex, low woody shrubs, mallees and tree form eucalypts (primarily *E. gongylocarpa*). On the stony rises, mulga and black oak (*Allocasuarina cristata?*) form an overstorey to scattered low shrubs and sparse clumps of spinifex. On heavier, clayey soils, mulga forms often dense groves. The eastern portion of the Reserve is dominated by salt lakes and claypans and vegetation consists mainly of bluebush (*Kochia sedifolia*?) and myall scrub (*Acacia sowdensis?*) typical of the Bunda Plateau (Nullarbor). These broad vegetation types also reflect the flammability of the Reserve. In general, the spinifex plains and dunes are flammable and will carry fire any time providing the vegetation is older than about 15-20 years and wind speed is in excess of about 12-15 KPH. However, other vegetation types, such as the mulga/black oak woodlands and the blue-bush country, are only likely to carry fire following a succession of good seasons (above average rainfall) and consequent growth of grasses and herbs. This may occur 4-5 times every century. The location of monitoring sites is shown in Figure 1. A brief description of the age since last fire, numbers of plant species, ground cover etc. for each site is shown in Table 1. We noted evidence of old fires in the mulga, black oak and bluebush communities. At the time of this study, these periodically flammable communities would not carry fire as fuels were too sparse.

Table 1: Summary of main features of plots at monitoring sites, PLNR.

Site	Fuel Age (years)	Plant Species	Ground Cover (%)				Fuel Wt (t/ha)
			Bare	Litter	Spinifex	Other	
1 (158, 218, 148, 71)	31 ± 3	36	53.6	10.5	33.1	02.8	05.1
2 (32 ,39, 137, 219)	13 ± 1	34	69.0	13.5	15.4	01.0	02.7
3 (20, 31, 63, 135)	13 ± 1	46	70.6	03.6	19.9	06.0	02.3
4 (130, 178, 181, 187)	31 ± 3	34	47.5	06.9	45.5	00.1	06.7
5 (172, 213, 226, 133)	31 ± 3	42	46.6	11.6	41.8	01.0	05.9

Discussion

Fuel age, hence pyr:c diversity, is relatively homogenous in PLNR with two fuel ages dominating the flammable communities within the reserve. (see Table 1 and Figure 2). It is too early to compare floristic diversity (of vascular plants) as we have yet to complete identification of specimens and the sites need to be visited several more times throughout the year to obtain a complete species list (and to obtain flower material).

We made several interesting observations while assessing the study sites, particularly those sites burnt some 13 years ago.

1. *Callitris* seedlings were not uncommon and had grown to a height of up to 0.5m.

2. Even after approximately 13 years, *Callitris* seedlings had not flowered.

3. Coppice (re-sprout) mallee (except *E. youngiana*) and marble gums had flowered and fruited about 10-11 years after the fire.

4. Mulga (*Acacis aneura*) regenerated prolifically from seed following fire, but had not flowered 13 years after fire.

5. Mature marble gum showed signs of often severe, recent fire damage to boles and crowns. Frequent secondary degrade caused by termites and fungi entering fire injuries was also observed. Very poor crown recovery suggests that the 1976 fire was very intense, often defoliating the trees.

6. *Callitris* were killed outright by the 1976 fire.

7. The study sites in the 1976 fire area were burnt previously in about 1934 (± 5 years)

8. Stem sections from old, large marble gums (up to 40cm dbhob) revealed no visible signs of fire injury prior to approximately 1934. This suggests that either the area had not been burnt in the last 120 years or previous fires were of low intensity, thus not causing severe bole damage to marble gum. The latter is the most likely explanation.

9. There is little likelihood that areas burnt in 1976 would carry fire now or in the near future. Fuels are too sparse and light (see Table 1).

10. Given the above, a fire frequency of less than 20 years is likely to cause losses of sensitive, long lived species such as *Callitris* This is particularly so if fires are large and intense. Small fires (say<200ha) of low intensity may promote re-establishment of plants which utilize wind or birds for seed dispersal. Low intensity fires (< 1000 kw/m) increase the likelihood of "patchy" burns and of fire sensitive species escaping the flames. Generally, fuel loadings around fire sensitive vegetation is lighter, so often is not burnt during low-moderate intensity fires. I can see no ecological purpose for large, intense fires.

11. Some over-mature marble gum were killed outright by fire.

12. Ample marble gum seedling regeneration was observed as a result of the 1976 fire. Seedlings were only about 1-2m and carried juvenile foliage.

Conclusions

1. The monitoring sites established at PLNR will be visited 3 times per year for the next 3-5 years, then annually.

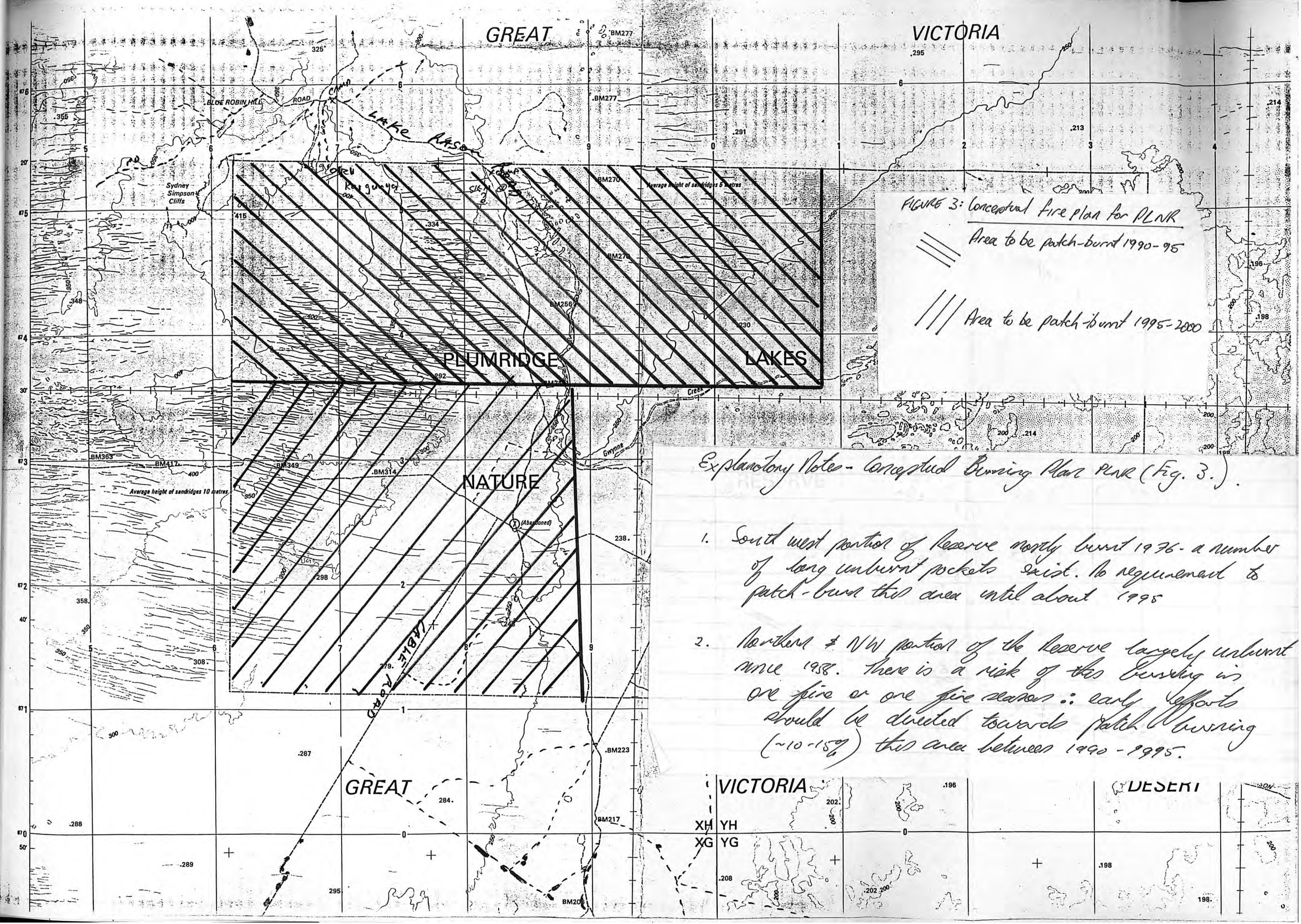
2. A substantial proportion of the flammable (spinifex) vegetation types are in an immature state, having been burnt in about 1976.

3. The remaining areas of flammable fuels are in a mature state (burnt in about 1958) and some protection burning in and around these areas, is desirable to prevent the loss of this type in one fire or fire season. Suggestions for burning buffer strips are shown in Figure 3.

4. The large area of currently immature fuel (1976) will become available for burning in about 1995. Planning prior to this date should address how this area is to be broken up using a combination of strategically placed buffers (wind driven strips) and internal patch burns in an attempt to break the fuels up and promote diversity of fuel/vegetation age.

Neil Burrows

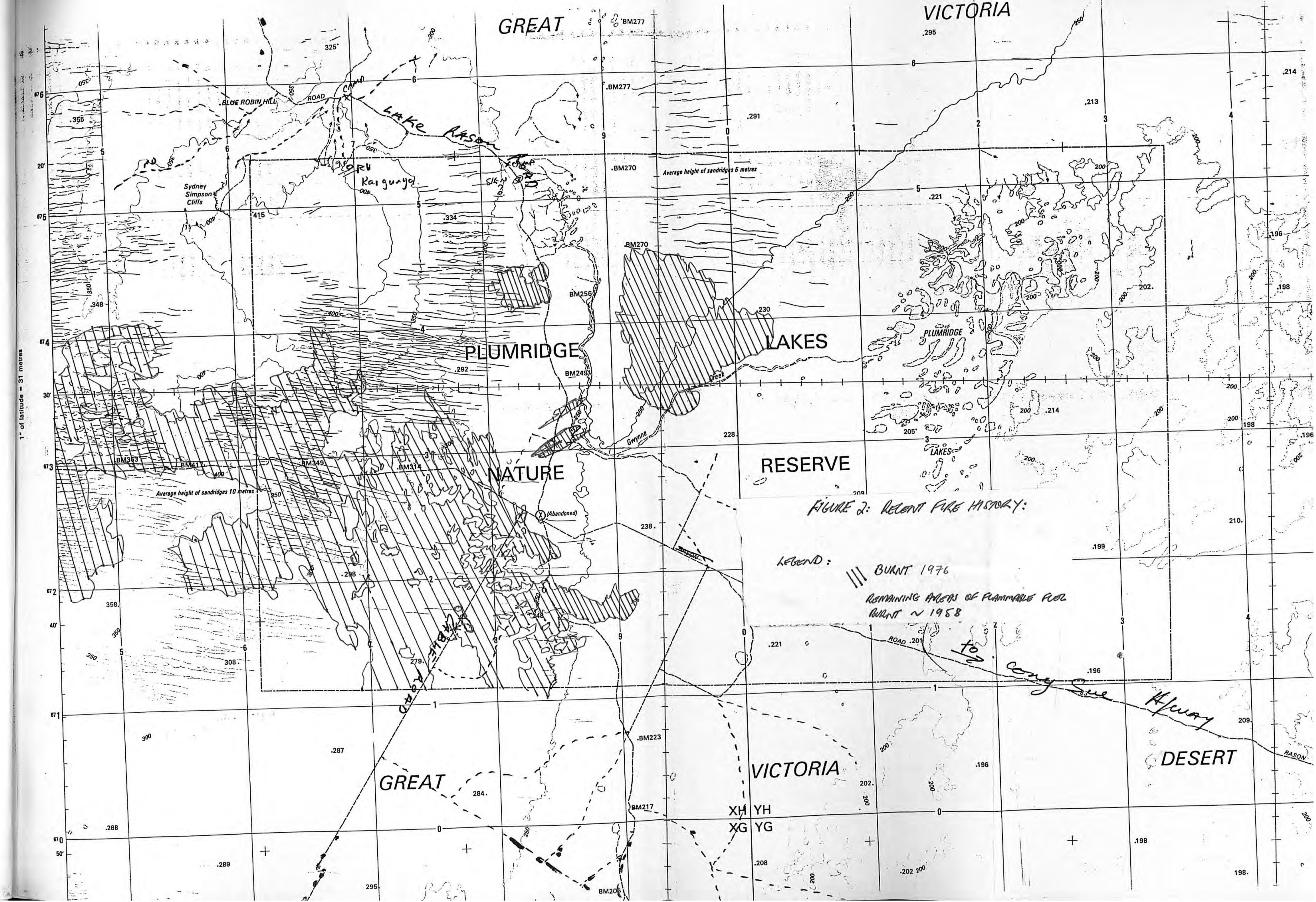
Fire Program Leader

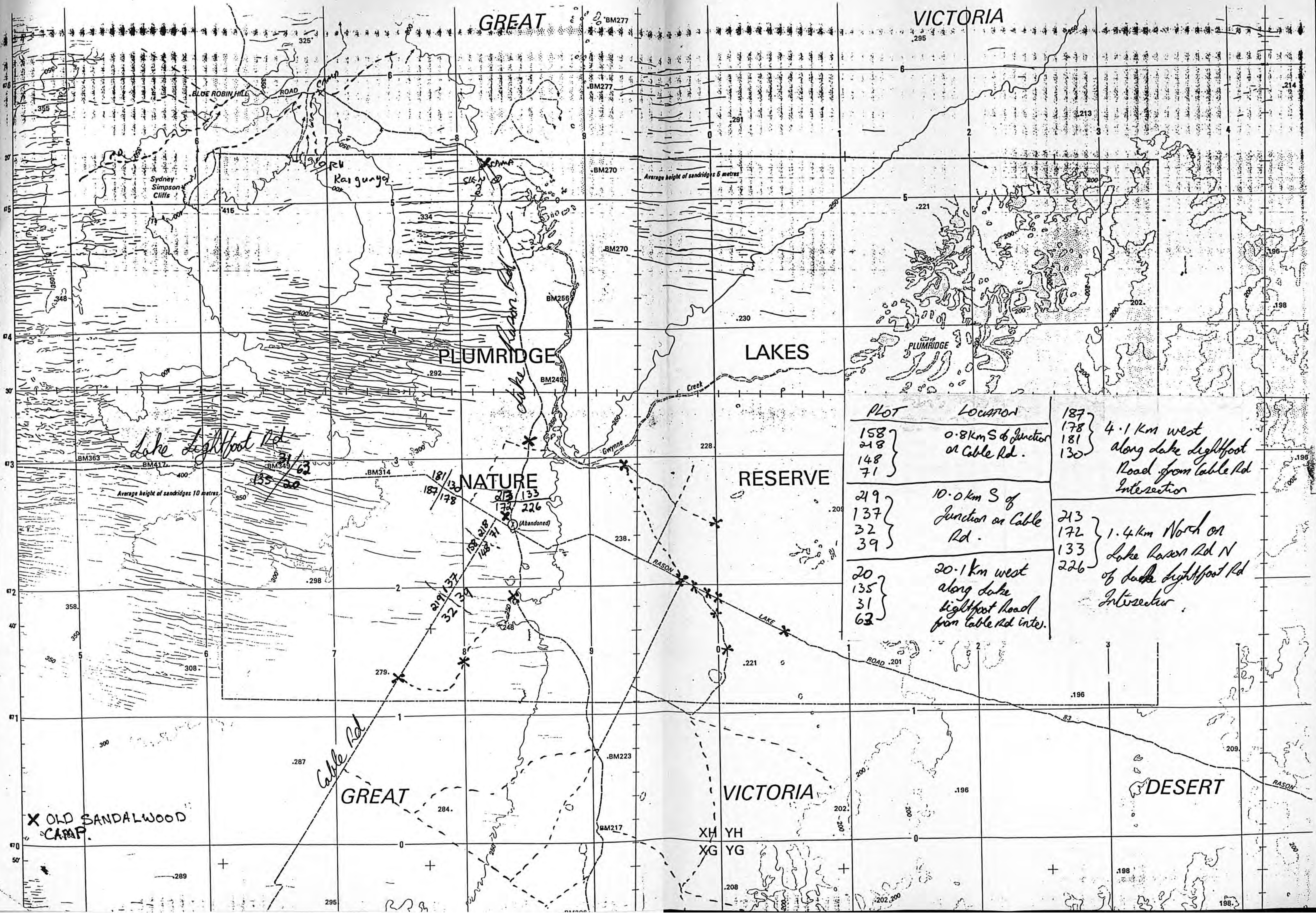


Explanatory Notes - Conceptual Burning Plan PLNR (Fig. 3.).

1. South west portion of Reserve mostly burnt 1976 - a number of long unburnt pockets exist. No requirement to patch-burn this area until about 1995

2. Northern & NW portion of the Reserve largely unburnt since 1958. There is a risk of this burning in one fire or one fire season ∴ early efforts should be directed towards patch burning (~10-15%) this area between 1990 - 1995.


GREAT
VICTORIA
DESERT
PLUMRIDGE
LAKES
NATURE
RESERVE
BLUE ROBIN HILL
Sydney Simpson Cliffs
Average height of sandridges 5 metres
Average height of sandridges 10 metres
Gwynne Creek
(Abandoned)
XH YH
XG YG
1° of latitude = 31 metres
LAKE RASON ROAD
CAMP
FIGURE 2: RECENT FIRE HISTORY:
LEGEND:
||| BURNT 1976
REMAINING AREAS OF FLAMMABLE FUEL BURNT ~ 1958
to Coney Sue H/way


GREAT VICTORIA
BLUE ROBIN HILL
ROAD
Camp
Sydney Simpson Cliffs
Kaiguaya
Average height of sandridges 5 metres
PLUMRIDGE
LAKES
PLUMRIDGE
NATURE
RESERVE
Creek
Gwynne
Lake Rason Rd
Lake Lightfoot Rd
Average height of sandridges 10 metres
(Abandoned)
RASON
LAKE
ROAD
Cable Rd
GREAT
VICTORIA
DESERT
RASON
X OLD SANDALWOOD CAMP.
PLOT
LOCATION
158, 218, 148, 71 — 0.8km S of Junction on Cable Rd.
219, 137, 32, 39 — 10.0km S of Junction on Cable Rd.
20, 135, 31, 63 — 20.1km west along Lake Lightfoot Road from Cable Rd inter.
187, 178, 181, 130 — 4.1km west along Lake Lightfoot Road from Cable Rd Intersection
213, 172, 133, 226 — 1.4km North on Lake Rason Rd N of Lake Lightfoot Rd Intersection.
XH YH
XG YG