

ROSENTHAL ESTATE, SUNBURY
CONSERVATION MANAGEMENT PLAN
YEAR 1 MONITORING

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1. INTRODUCTION AND METHODS

T.F. & A. Millett, C/- Urban Design and Management Pty. Ltd. engaged Brett Lane and Associates Pty. Ltd. (BL&A) to monitor the results of the first year of implementation of a Conservation Management Plan (CMP) for the Rosenthal Estate residential development located at 100 Vineyard Road, Sunbury (EHP 2015).

The Conservation Management Plan relates to two conservation reserves (Eastern Reserve and Western Reserve), totalling 12.64 hectares.

A site assessment of both reserves was undertaken on 8th December 2016 to:

- Assess the extent to which the year one management actions from the CMP had been implemented; and
- Implement monitoring requirements set out in the CMP.

Species records and all cover estimates were recorded for each management zone within each reserve. Cover estimates were then extrapolated for each reserve (as a whole) by weighing data by the relative areas of the management zones.

Note that very high grassy biomass reduced the ability to observe very low-lying flora during the current site monitoring. This was considered to significantly limit the ability to accurately determine indigenous and introduced species diversity and cover as smaller plants were partly covered over by taller species.

This investigation was undertaken by a team from BL&A comprising Davide Coppolino (Senior Ecologist) and Alan Brennan (Senior Ecologist & Project Manager).

2. EASTERN RESERVE

2.1. Monitoring results

Table 1 provides an assessment of the extent to which year one management actions set out in the CMP for the Eastern Reserve have been implemented. This table also references sections of this report which provide adaptive management recommendations. Table 2 details the photopoint locations, Table 3 the biomass cover, Table 4 the weed cover and Table 5 the indigenous species cover.

Key findings are listed below.

- Vegetation biomass was high
- Indigenous vegetation biomass had decreased since December 2015 while weed cover had increased significantly
- Woody weed control had been undertaken although follow-up was required to control emerging recruits
- Some Serrated Tussock control was evident,
- The following key weed species had increased in cover since December 2015, while the remainder had reduced in cover or stayed the same:
 - Bearded Oat
 - Perennial Rye-grass
 - Serrated Tussock
 - Soft Brome
- A total of 35 weed species were recorded
- A total of 18 indigenous flora species were recorded





Table 1: Eastern reserve year 1 management actions

Action	Management action	Responsible entity	Timing of action	Implementation notes and recommendations
1.2	Conduct weed control and implement revegetation plan	Landowner / Bushland Management Contractor	As per Table 2 of CMP	Initial woody weed control successfully undertaken. Some recent Serrated Tussock control also evident. An altered weed management approach is recommended (see Section 2.2.1).
1.3	Monitor populations of pest animals and conduct control works if required	Landowner / Pest Animal Contractor	Late summer / early autumn	Existing warrens under Boxthorn and Blackberry fumigated and closed. Follow up with baiting, if required.
1.4	Conduct monitoring of all vegetation and Golden Sun Moth habitat	Suitably qualified ecological specialist	One year after commencement of works	Undertaken in December 2016. No Golden Sun Moth recorded.
1.5	Monitor organic litter and biomass density and develop ecological burn or fuel reduction plan if appropriate	Landowner / Bushland Management Contractor	Outside of the GSM active season (October – January)	Monitoring undertaken in December 2016. Biomass management not recommended (see Section 2.2.2).
1.6	Contact nursery for seed collection and propagation of native species suitable for supplementary planting into Management Zone B	Landowner / Bushland Management Contractor / Local nursery	Order in Year 1 for potential supplementary planting in Year 2 or Year 3 and progressively on an annual or biennial basis.	Seed to be collected It is recommended that the area to be revegetated be expanded (see Section 2.2.3).

Table 2: Eastern Reserve photopoints

Photopoint #	December 2015	December 2016
1		
2		

Photopoint #	December 2015	December 2016
3		
4		

Photopoint #	December 2015	December 2016
5		
6		

Photopoint #	December 2015	December 2016
7		
8		



Photopoint #	December 2015	December 2016
9		

Table 3: Eastern Reserve biomass observations

Estimate	December 2015	December 2016
Total native vegetation cover (%)	40	32
Total weed cover (%)	45	74
Litter cover (%)	-	27
Biomass cover (%)	-	99
Biomass – main height range (m) (min)	-	0.3
Biomass – main height range (m) (max)	-	1.2

Table 4: Eastern Reserve weed cover observations

Common name	Scientific name	High-threat	Projective foliage cover (%)	
			December 2015	December 2016
Key weed species				
African Box-thorn	<i>Lycium ferocissimum</i>	X	<1	
Artichoke Thistle	<i>Cynara cardunculus</i>	X	<1	
Bearded Oat	<i>Avena barbata</i>		1	6
Blackberry	<i>Rubus fruticosus</i> spp. agg.	X	2	<1
Brown-top Bent	<i>Agrostis capillaris</i>		1	
Chilean Needle-grass	<i>Nassella neesiana</i>	X	1	1
Flatweed	<i>Hypochaeris radicata</i>		1	1
Perennial Rye-grass	<i>Lolium perenne</i>		10	22
Prairie Grass	<i>Bromus catharticus</i>		<1*	1
Ribwort	<i>Plantago lanceolata</i>		2	<1
Serrated Tussock	<i>Nassella trichotoma</i>	X	10	13
Sheep Sorrel	<i>Acetocella vulgaris</i>		2	
Soft Brome	<i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>		<1*	2
Spear Thistle	<i>Cirsium vulgare</i>	X	1	<1
Sweet Briar	<i>Rosa rubiginosa</i>	X	1	
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>		1	
Tall Mallow	<i>Malva sylvestris</i>		<1	<1
Toowoomba Canary-grass	<i>Phalaris aquatica</i>	X	10	1
Other weed species				
Barley Grass	<i>Hordeum</i> sp.		NA	<1
Cape Weed	<i>Arctotheca calendula</i>		NA	<1
Clustered Dock	<i>Rumex conglomeratus</i>		NA	<1
Cocksfoot	<i>Dactylis glomerata</i>	X	NA	16
Common Peppergrass	<i>Lepidium africanum</i>		NA	<1

Common name	Scientific name	High-threat	Projective foliage cover (%)	
			December 2015	December 2016
Common Sow-thistle	<i>Sonchus oleraceus</i>		NA	<1
Curled Dock	<i>Rumex crispus</i>		NA	<1
Hogweed	<i>Polygonum aviculare</i>		NA	<1
Hop Clover	<i>Trifolium campestre</i> var. <i>campestre</i>		NA	<1
Indian Mustard	<i>Brassica X juncea</i>		NA	<1
Medic	<i>Medicago</i> sp.		NA	<1
Narrow-leaf Clover	<i>Trifolium angustifolium</i> var. <i>angustifolium</i>		NA	<1
Onion Grass	<i>Romulea rosea</i>		NA	<1
Ox-tongue	<i>Helminthotheca echioides</i>		NA	<1
Panic Veldt-grass	<i>Ehrharta erecta</i> var. <i>erecta</i>	X	NA	<1
Paspalum	<i>Paspalum dilatatum</i>	X	NA	
Paterson's Curse	<i>Echium plantagineum</i>	X	NA	
Prickly lettuce	<i>Lactuca serriola</i>		NA	<1
Red-flower Mallow	<i>Modiola caroliniana</i>		NA	<1
Rough Dog's-tail	<i>Cynosurus echinatus</i>		NA	2
Squirrel-tail Fescue	<i>Vulpia bromoides</i>		NA	2
Tall Fescue	<i>Festuca arundinacea</i>	X	NA	<1
Texas Needle-grass	<i>Nassella leucotricha</i>	X	NA	<1
Total number of species				33

* = assumed to be less than one given combined cover was recorded as one under *Bromus* spp.

Table 5: Indigenous flora species recorded in the Eastern Reserve

Common name	Scientific name	Management Zone		Total
		A	B	
Blue Devil	<i>Eryngium ovinum</i>	X		X
Bristly Wallaby-grass	<i>Rytidosperma setaceum</i>	X		X
Brown-back Wallaby-grass	<i>Rytidosperma duttonianum</i>	X	X	X
Club Sedge	<i>Isolepis sp.</i>		X	X
Common Wheat-grass	<i>Anthosachne scaber</i>	X	X	X
Fibrous Spear-grass	<i>Austrostipa semibarbata</i>	X	X	X
Finger Rush	<i>Juncus subsecundus</i>	X	X	X
Grey Tussock-grass	<i>Poa sieberiana</i>	X		X
Kangaroo Grass	<i>Themeda triandra</i>	X	X	X
Knead Spear-grass	<i>Austrostipa bigeniculata</i>	X	X	X
Lemon Beauty-heads	<i>Calocephalus citreus</i>	X		X
Quizzical Spear-grass	<i>Austrostipa stuposa</i>	X		X
Rough Spear-grass	<i>Austrostipa scabra</i>	X	X	X
Sheep's Burr	<i>Acaena echinata</i>	X	X	X
Short Wallaby-grass	<i>Rytidosperma carphoides</i>	X		X
Slender Bindweed	<i>Convolvulus angustissimus subsp. omnigracilis</i>	X		X
Slender Dock	<i>Rumex brownii</i>	X	X	X
Variable Willow-herb	<i>Epilobium billardierianum</i>	X	X	X
Total Number of species		17	11	18

2.2. Adaptive management recommendations

2.2.1. Weed control

An intensive weed control effort is required for the following *Nassella* species in the Eastern Reserve:

- Serrated Tussock;
- Chilean Needle-grass; and
- Texas Needle-grass.

This effort should commence early in 2017, after the Golden Sun Moth flight season ends and the peak seeding period for the above listed weeds.

Weed control should first concentrate on the least-weedy portion of the reserve then progress through to the most-weedy portion.

Given the abundance and extent of *Nassella* weed species, access into the Eastern Reserve during summer (i.e. peak *Nassella* seeding period) is likely to significantly exacerbate the weed problem and counter any weed control effort. Until *Nassella* species have been sufficiently controlled, consideration should be given to limiting Golden Sun Moth survey transects to the reserve boundaries or areas where these weeds have been controlled. This is an acceptable change, demonstrating an adaptive management approach, that will annual enable monitoring to continue as required under the CMP (EHP 2015).

The additional species listed below should be closely monitored and controlled immediately following any works that exposes significant areas or bare earth as well as following any future ecological or biomass-reduction burning:

- Toowoomba Canary-grass
- Paspalum
- Spear Thistle
- Paterson's Curse

Although the above species are currently in relatively low abundance, they have the ability to spread rapidly.

2.2.2. Biomass management

Given the high abundance of *Nassella* weeds across the Eastern Reserve, no biomass management is recommended for 2017. Burning is likely to open up recruitment space for *Nassella* species and slashing would likely further spread these species across the reserve, countering weed control efforts.

Intensive weed control in 2017 should reduce the overall weed threat. Delaying biomass removal will then allow for seed set of indigenous species (particularly grasses). Assisting native species in this way would likely create competition for weeds, slowing their reinvasion.

Although a lack of biomass management will result in less availability of bare ground for Golden Sun Moth, implementing the above-prescribed intensive weed control is expected to open up substantial areas of bare ground.

Options for biomass management should be revisited in late 2017, for 2018 implementation, after the weed threat has been reassessed and is found to be more accommodating.

2.2.3. Revegetation

Much of the low-lying ephemeral drainage line which divides the south-eastern higher ground from the remainder of the higher ground almost exclusively supported weeds. The existing management plan prescribes revegetation for Management Zone B only. However, it is recommended that natural regeneration of native species in this low-lying weedy area be assisted by direct seeding and/or revegetation (and pre-planting weed control). This change in approach is consistent with the adaptive management approach required by the CMP (EHP 2015).

Much of the immediate management effort should be focusing upon controlling the spread of weeds to the less weedy higher ground portions of the reserve, where significant indigenous elements still exist. It is therefore recommended that revegetation be delayed until key weeds are controlled to more appropriate levels across the reserve. This will also ensure minimal revegetation failure due to weed invasion from surrounding infestations. This change in approach is consistent with the adaptive management approach required by the CMP (EHP 2015).

3. WESTERN RESERVE

3.1. Monitoring results

Table 6 provides an assessment of the extent to which year one management actions set out in the Conservation Management Plan for the Western Reserve have been implemented. This table also references sections of this report which provide adaptive management recommendations. Table 7 details the photopoint locations, Table 8 the biomass cover, table 9 the weed cover and Table 10 the indigenous species cover.

Key findings are listed below.

- Vegetation biomass was high
- Indigenous and introduced vegetation biomass had increased significantly since December 2015
- Woody weed control had been undertaken, although follow-up was required to control emerging recruits
- The following key weed species had increased in cover since December 2015, while the remainder had reduced in cover or stayed the same:
 - Bearded Oat
 - Flatweed
 - Perennial Rye-grass
 - Prairie Grass
 - Soft Brome
- A total of 37 weed species were recorded
- A total of 26 indigenous flora species were recorded

Table 6: Western Reserve year 1 management actions

Action	Management action	Responsible entity	Timing of action	Implementation notes and recommendations
1.2	Conduct weed control and implement revegetation plan	Landowner / Bushland Management Contractor	As per Table 2 of CMP	Woody weed control undertaken. Follow-up is required to remove small recruiting woody weeds. Altered weed management approach recommended (see Section 3.2.1).
1.3	Monitor populations of pest animals and conduct control works if required	Landowner / Pest Animal Contractor	Late summer / early autumn	Existing warrens under Boxthorn and Blackberry fumigated and closed. Follow up with baiting, if required.
1.4	Conduct monitoring of all vegetation and Golden Sun Moth habitat	Suitably qualified ecological specialist	One year after commencement of works	Undertaken in December 2016. No GSM was recorded
1.5	Monitor organic litter and biomass density and develop ecological burn or fuel reduction plan if appropriate	Landowner / Bushland Management Contractor	Outside of the GSM active season	Monitoring undertaken in December 2016. Delay of biomass management recommended (see Section 3.2.2).
1.6	Contact nursery for seed collection and propagation of native species suitable for supplementary planting into Management Zone B	Landowner / Bushland Management Contractor / Local nursery	Order in Year 1 for potential supplementary planting in Year 2 or Year 3 and progressively on an annual or biennial basis.	Seed to be collected Revegetation expansion and delay recommended (see Section 3.2.3).

Table 7: Western Reserve photopoints

Photopoint #	December 2015	December 2016
17		
18		

19		
20		

21		
23		

24	 A photograph showing a field of tall, dry, brown grasses, likely in late summer or autumn. The grasses are dense and cover the entire field, extending to a flat horizon under a pale sky.	 A photograph showing a field of lush, green grasses, likely in late spring or early summer. The grasses are tall and dense, with some golden-brown seed heads visible. The field is on a slight slope, and the sky is blue with scattered white clouds.
25	 A photograph showing a field of green grasses with several small, dark green shrubs scattered throughout. The field is on a slight slope, and the sky is blue with scattered white clouds.	 A photograph showing a field of lush, green grasses with several small, dark green shrubs scattered throughout. The field is on a slight slope, and the sky is blue with scattered white clouds.

26		
29		

32		
33		

34		
35		

36		
37		

38		
39		

Table 8: Western Reserve biomass observations

Observation	Dec 2015	Dec 2016
Total native vegetation cover (%)	35	50
Total weed cover (%)	50	59
Litter cover (%)	-	12
Biomass cover (%)	-	96
Biomass – main height range (m) (min)	-	0.4
Biomass – main height range (m) (max)	-	1.1

Table 9: Western Reserve weed cover observations

Common name	Scientific name	High-threat	Projective foliage cover	
			December 2015	December 2016
Key weed species				
African Box-thorn	<i>Lycium ferocissimum</i>	X	<1	<1
Artichoke Thistle	<i>Cynara cardunculus subsp. flavescens</i>	X	<1	<1
Bearded Oat	<i>Avena barbata</i>		1	4
Brown-top Bent	<i>Agrostis capillaris</i>		<1	
Chilean Needle-grass	<i>Nassella neesiana</i>	X	5	1
Drain Flat-sedge	<i>Cyperus eragrostis</i>		1	<1
Flatweed	<i>Hypochaeris radicata</i>		<1	2
Galenia	<i>Galenia pubescens var. pubescens</i>		2	<1
Narrow-leaf Clover	<i>Trifolium angustifolium var. angustifolium</i>		1	<1
Perennial Rye-grass	<i>Lolium perenne</i>		5	21
Prairie Grass	<i>Bromus catharticus</i>		<1	2
Prunus	<i>Prunus sp.</i>		<1	<1
Red-flower Mallow	<i>Modiola caroliniana</i>			<1
Ribwort	<i>Plantago lanceolata</i>		<1	1
Serrated Tussock	<i>Nassella trichotoma</i>	X	10	8
Sheep Sorrel	<i>Acetosella vulgaris</i>		2	<1
Soft Brome	<i>Bromus hordeaceus subsp. hordeaceus</i>		<1	4
Spear Thistle	<i>Cirsium vulgare</i>	X	3	<1
Sweet Briar	<i>Rosa rubiginosa</i>	X	5	<1
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>		1	
Toowoomba Canary-grass	<i>Phalaris aquatica</i>	X	10	
Yorkshire Fog	<i>Holcus lanatus</i>	X	4	3

Common name	Scientific name	High-threat	Projective foliage cover	
			December 2015	December 2016
Other weed species				
Big Heron's-bill	<i>Erodium botrys</i>		NA	<1
Cocksfoot	<i>Dactylis glomerata</i>	X	NA	10
Common Peppergrass	<i>Lepidium africanum</i>		NA	<1
Curled Dock	<i>Rumex crispus</i>		NA	<1
Fiddle Dock	<i>Rumex pulcher subsp. pulcher</i>		NA	
Garden Dandelion	<i>Taraxacum officinale spp. agg.</i>		NA	<1
Indian Mustard	<i>Brassica X juncea</i>		NA	<1
Onion Grass	<i>Romulea rosea</i>		NA	1
Ox-tongue	<i>Helminthotheca echioides</i>		NA	<1
Paterson's Curse	<i>Echium plantagineum</i>	X	NA	<1
Rough Dog's-tail	<i>Cynosurus echinatus</i>		NA	<1
Rough Sow-thistle	<i>Sonchus asper</i>		NA	<1
Squirrel-tail Fescue	<i>Vulpia bromoides</i>		NA	9
Tall Fescue	<i>Festuca arundinacea</i>	X	NA	1
Texas Needle-grass	<i>Nassella leucotricha</i>	X	NA	1
Trefoil	<i>Lotus sp.</i>		NA	1
Variegated Thistle	<i>Silybum marianum</i>	X	NA	<1
Total number of species				35

Table 10: Indigenous flora species recorded in the Western Reserve

Common name	Scientific name	Management Zone		Total
		A	B	
Blue Devil	<i>Eryngium ovinum</i>	X	X	X
Bristly Wallaby-grass	<i>Rytidosperma setaceum</i>	X		X
Brown-back Wallaby-grass	<i>Rytidosperma duttonianum</i>	X		X
Common Tussock-grass	<i>Poa labillardierei</i>		X	X
Common Wallaby-grass	<i>Rytidosperma caespitosum</i>	X		X
Common Wheat-grass	<i>Anthosachne scabra s.l.</i>	X	X	X
Fibrous Spear-grass	<i>Austrostipa semibarbata</i>	X	X	X
Fine-head Spear-grass	<i>Austrostipa oligostachya</i>	X		X
Grassland Wood-sorrel	<i>Oxalis perennans</i>	X		X
Grey Tussock-grass	<i>Poa sieberiana</i>	X		X
Kangaroo Grass	<i>Themeda triandra</i>	X	X	X
Kneed Spear-grass	<i>Austrostipa bigeniculata</i>	X	X	X
Pale Rush	<i>Juncus pallidus</i>	X	X	X
River Red-gum	<i>Eucalyptus camaldulensis</i>	X	X	X
Rough Spear-grass	<i>Austrostipa scabra</i>	X	X	X
Rush	<i>Juncus sp.</i>	X		X
Sheep's Burr	<i>Acaena echinata</i>	X		X
Short Wallaby-grass	<i>Rytidosperma carphoides</i>	X		X
Slender Bindweed	<i>Convolvulus angustissimus subsp. omnigracilis</i>	X		X
Slender Dock	<i>Rumex brownii</i>	X	X	X
Small St John's Wort	<i>Hypericum gramineum</i>	X		X
Spear Grass	<i>Austrostipa sp.</i>		X	X

Common name	Scientific name	Management Zone		Total
		A	B	
Supple Spear-grass	<i>Austrostipa mollis</i>	X		X
Variable Willow-herb	<i>Epilobium billardierianum</i>	X	X	X
Weeping Grass	<i>Microlaena stipoides var. stipoides</i>	X		X
Wiry Dock	<i>Rumex dumosus</i>	X		X
Total number of species		24	12	26

3.2. Adaptive management recommendations

3.2.1. Weed control

An intensive weed control effort is required for the following *Nassella* species in the Western Reserve:

- Serrated Tussock;
- Chilean Needle-grass; and
- Texas Needle-grass.

This effort should commence early in 2017, after the Golden Sun Moth flight season ends and the peak seeding period for the above listed weeds.

Given the abundance and extent of *Nassella* weed species, access into the Western Reserve during summer (i.e. peak seeding period) is likely to significantly exacerbate the weed problem and counter and weed control effort. Fixed internal access routes should be considered to limit personnel movement to set parts of the reserve. These routes and associated directions of travel should, as much as is practicable, reduce the movement of personnel from denser *Nassella* infestations into areas of lighter infestations or areas where these species do not yet occur.

Until *Nassella* species have been sufficiently controlled, consideration should be given to limiting Golden Sun Moth surveys transects to areas where weeds have been controlled and reserve boundaries. This is an acceptable change, demonstrating an adaptive management approach, that will annual enable monitoring to continue as required under the CMP (EHP 2015).

Nassella control in this low lying weedy area is likely to require long acting systemic herbicides. This is an acceptable change to the management prescribed by the CMP (EHP 2015) given the adaptive management approach being taken. Systemic herbicides will more effectively control weeds as required under the CMP (EHP 2015).

The spread of Serrated Tussock seed by wind is also considered likely to significantly hamper weed control success if not controlled. This species seeds poorly the year or two following fire. Frequent burns (e.g. yearly and preferably hot but not coinciding with Golden Sun Moth activity) should therefore be aimed for in areas supporting Serrated Tussock.

The additional species listed below should be closely monitored and controlled immediately following weed control which exposes significant areas or bare earth as well as following any ecological or biomass-reduction burning:

- Artichoke Thistle
- Variegated Thistle
- Sweet Briar
- Spear Thistle
- African Box-thorn
- Paterson's Curse

Although the above species are currently in relatively low abundance, they have the ability to spread rapidly.

3.2.2. Biomass management

The biomass management proposed for the Western Reserve in 2017 is provided in graphic form at Appendix 1.

The northern portion of the Western Reserve should be burnt in Autumn. This should be a hot (high intensity) burn.

The low-lying wetter ground in the southern part of the reserve currently supports extremely high weed cover. This area is mostly dominated by Cocksfoot with small clusters of Chilean and Texas Needle-grasses. Only a very small amount of indigenous flora has been observed in these areas (e.g. Weeping Grass).

Once *Nassella* species have been controlled to negligible levels, burning should be reconsidered as a biomass management option for this area.

3.2.3. Revegetation

Much of the aforementioned low-lying wetter ground in the southern part of the Western Reserve almost exclusively supported weeds. The existing management plan prescribes revegetation for Management Zone B only. However, it is recommended that natural regeneration of native species in this low-lying weedy area be assisted by direct seeding and/or revegetation (and pre-planting weed control). This change in approach is consistent with the adaptive management approach required by the CMP (EHP 2015).

Much of the immediate management effort should be focusing upon controlling the spread of weeds into sections of the study area which still support a significant indigenous element. It is therefore recommended that revegetation be delayed until key weeds are controlled to more appropriate levels across the reserve. This will also ensure minimal revegetation failure due to weed invasion from surrounding infestations.


4. REFERENCES

Ecology and Heritage Partners (EHP) 2015, Conservation Management Plan: Rosenthal Estate, 100 Vineyard Road, Sunbury, Victoria, Consultant report for Urban Design and Management Pty. Ltd.



Appendix 1: Proposed 2017 weed and biomass management for Western Reserve

Project: 100 Vineyard Road, Sunbury **Client:** TF and A Millett **Date:** 16/02/2017


 Weedy areas


Management zones

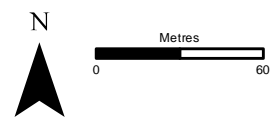
 A

 B

Management actions

 Autumn (preferably hot) burn

 Eliminate Nassella weeds then slash when soils are dry and keep cut material in place



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