Understanding pre-European Adelaide plains and foothills vegetation associations – managing remnants and recreating grasslands.

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First a look at historical records of the vegetation of the Adelaide Plains and foothills. In 1836 grassland and grassy woodland dominated.

Numerous early commentators referred to the generally open plains between Glenelg and the new site of Adelaide and the extensive areas of kangaroo grass. George Stevenson, senior colonial official in December 1836 reported

“Walked on the proposed site of the city, about 5 miles from Glenelg, over a level plain studded with trees and every here and there a rich meadow land, which only wants to be turned over to produce a heavy crop of Indian corn or wheat. It is a loam, more or less, mixed with sand, the grass in many places three or four feet high, and the whole tract evidently of the most luxuriant description.”

The area around Adelaide was described as having a fair covering of trees with grassy understorey but generally lacking density of shrubs apart from some areas (especially tea tree) near Port Adelaide and the Reedbeds. Early explorers into the Adelaide Hills noted both the extent of grassy meadows, kangaroo grass and open country with significant areas of trees.

Botanist James Backhouse visited Adelaide in December 1837 and recorded:

“After crossing the grassy plains of Adelaide, the first hills ..are grassy, with a few trees, and a variety of plants. The next hills ...have trees scattered upon them..The next hills are...abounding in gay vegetation productions, in forest .. Some of the hills, like the plains below, are covered with ...fine Kangaroo grass, that is green, notwithstanding the temperature has, several times lately, risen to 107 in the shade.” (Quote taken from Bill Gammage *The Biggest Estate on Earth*)
Henry Nixon – surveyor with William Light produced this map in 1838. It shows a general representation of trees – denser around the Black Forest and Enfield areas, along creek lines etc.

Map from the reproduction of the Royal Geographic Society of South Australia (available to purchase from RGSSA)
John Arrowsmith published this map in London in 1839 based on the Nixon 1838 map – some minor changes related to vegetation.

This map was the basis for a well researched Geography Honours Thesis in 1984 by Ann Riddle which concluded that the map was an accurate representation – copy available at the Royal Geographic Society of SA library.

Map scanned from a digital version held by State Library of South Australia – available on SLSA website
J A Thomas 1837
“View on the Glenelg plains, near the hills”

Coastal vegetation in foreground, generally open plains with copses of trees and shrubs. Foothills lightly timbered.

From National Library of Australia “Picture Australia” - check with NLA before any further publication
John Skipper 1838 “Adelaide from the Hills”.

Painting held by the Art Gallery of South Australia. Reproduced at front page in “Visions of Adelaide 1836-1886” 2005 Art Gallery of South Australia. The painting gives a very good impression of Adelaide plains as open grassy landscape with areas of trees and shrubs, foothills fairly bare of trees and the higher hills much more treed.

Light vegetation on foothills providing a clear view across the Adelaide plains. Mosaic of trees, shrubs and open country on the plains.

Martha Berkeley “Mount Lofty from the Terrace”
c.1840

Painting held by the Art Gallery of South Australia. Reproduced at page 31 in “Visions of Adelaide 1836-1886” 2005 Art Gallery of South Australia. The painting gives a very good impression of Adelaide plains as open grassy landscape with areas of trees and shrubs, foothills fairly bare of trees and the higher hills much more treed.

A picture can also be seen on the Art Gallery of South Australia website at www.artgallery.sa.gov.au/agsa/home/Collection/detail.jsp?ecatKey=468

And also see page 8 in www.artgallery.sa.gov.au/agsa/home/Learning/docs/Online_Resources/ED05VisionsOfAdelaide.pdf
The Gammage thesis


• Gammage says that the unusual landscape seen by early European settlers was a product of careful management by Aboriginal people with the purpose of creating different plant associations in close proximity to increase the productivity and availability of desired plants and animals and to make life as a hunter and gatherer more predictable and easier.

• Fire was the main tool. Fire was used to create grasslands (by regular, but not too regular burning depending on the climate of the area), and managed in a way which produced areas of grassland flanked or surrounded by trees and shrubs. This could produce ideal habitat for animals such as kangaroos, emus and wallabies as well as smaller animals. The system was rigid in some ways (especially timing of burning) but also dynamic in moving the grassland areas over time to allow soil to recuperate. Multiple areas would be created which allowed people to move around their landscape as required by cultural rules.
• The main areas of such activity could be expected to be more closely related to water supply – hence Adelaide along the Torrens would be a prime location to work on.

• I think the evidence Gammage assembles is compelling. Some of the more sweeping statements will be subject to questioning but the information presented needs to be carefully considered. The examples of connected patches of grassland in the high rainfall forests of Tasmania makes a very strong case. Gammage assembles data across Australia, including around Adelaide. The evidence also includes the changes which occurred when Aboriginal land management abruptly ceased – often an increase in trees and shrubs at the expense of grassland associations.

• If we accept that grasslands and grassy woodlands in our region in 1836 were in significant part human constructions, that has an impact on what management we should be looking at in conserving remnants and recreating landscapes. Think about it - more on that later.
“Messers. Fisher and Handcock’s Station near the Gawler Range”
Drawing/Painting by William Light January 1839

This place is/was on Gould Creek/Little Para junction where the Little Para reservoir has been constructed. The painting/drawing shows a few trees along a creekline but otherwise a landscape basically devoid of trees and shrubs. A surprising image to some but it is in an area shown on Survey plans as mainly grassland. See later map at Page 34.

The painting/drawing is reproduced in “William Light’s Brief Journal and Australian Diaries” Introduction and notes by David Elder 1984 Page 130  January 1839 Painting held by Art Gallery of South Australia. Also check Art Gallery of South Australia website.
“Mr. McLaren’s party Jany 11th 1839 about 14 miles north of the Para Pass” - painting by William Light

Near Rosedale on the North Para – scattered trees on the foothills, kangaroo grass etc grassland.

See the painting in “William Light’s Brief Journal and Australian Diaries” Introduction and notes by David Elder 1984 Page 137 Painting held by Art Gallery of South Australia. Also check Art Gallery of South Australia website.
Now some written records

John Oakden March 1838
“Notes on an excursion to the Murray” by Messers Hill, Wood, Williss and Oakden. SA Gazette and Register Facsimile 1836-1838 Page 74 c,d.

Thurs March 1. Left Adelaide at noon, passed through the pine forest, and part of the Cowandilla plains, and encamped for the night at Mr. Barnard’s station.
Friday March 2. At seven a.m. we passed over the Cowandilla plains, saw seven emus but did not succeed in pulling one. Crossed the river Para [Little Para], we then directed our course to the eastward passing over a pretty range of hilly country. At 4 p.m. arrived at a valley with plenty of kangaroo grass, a rivulet runs through it; here we encamped for the night. The valley was swarming with cockatoos, seven of which were shot; we gave it the name of Cockatoo Valley.

Saturday March 3. At 4 a.m. left the valley and passed through a thick scrub; course north-east; started a dozen kangaroos but did not kill one; the country hilly, and the land much similar to that we saw the day previously- good and indifferent by turns; at 9 a.m. we arrived at Lyndock Valley, a beautiful place, good land and plenty of grass, but no springs or running water; saw many kangaroos during the morning; at eleven a.m. we arrived at the rivulet where the expedition under Colonel Light and Mr. Fisher turned back; abundance of beautiful green kangaroo grass; course north-east; the land improving; passed over some fine cattle country well watered.
Light travelled from Adelaide to Fisher and Handcock’s station in the Gawler Hills at the junction of Little Para and Gould Creek. Painting by Light shows tall trees and reeds in creek but otherwise hills mostly bare of trees and likewise the land around the residence.

Country 5 miles north of Lyndoch described - “greater part of this country is covered by kangaroo grass and its general appearance open with here and there patches of wood”.

Reid family memoirs. The Reid family were the first colonists to live in Gawler – travelling from Adelaide in February 1839 and established a farm of about 700 acres at Clonlea. Elizabeth Reid in her memoirs records camping at Dry Creek the first night after leaving Adelaide “The grass was very high. We had been for the last 3 miles travelling through what looked like high corn, but was really kangaroo grass, now seldom seen, and when the fire was lit to show us the way to the camp the grass took fire, burning miles of the country, fortunately to the north. Even now I remember what a glorious sight it was.”

Elizabeth Reid describes her impressions of Gawler town site looking west “Looking from the hill I thought it park like and beautiful, the fork being well marked with splendid gum trees along the banks of the rivers. The kangaroo grass was as high as corn, with a few flowers among it. Then clumps of wattle, with their lovely yellow balls, which scented the air. ...On our land we never allowed a gumtree to be cut down except to build bridges.”
Elizabeth Reid’s brother Ross Reid also recorded early experiences in Gawler in an interview with the Bunyip 25 June 1909. “In Gawler itself there was very little timber, except on the banks of the rivers. …There was a fair quantity of timber east of Gawler, especially when Sandy Creek was reached. The Gawler Plains were covered with kangaroo grass, and in lighting a fire on our way up the growth caught alight and there was an immense blaze”.

Edward John Eyre Edward Eyre’s Autobiographical Narrative 1832-1839 Caliban 1984 Leaving Adelaide 1 May 1839 page 195.

“The day was fine, the road good and the country open, pretty and fertile, so that we proceeded cheerily along as far as the little Para, a distance of about 12 miles. There was no water where we crossed it but by leading the horses two miles up amongst the hills plenty was found for them and some kegs full we brought back for our own use. On the following day we advanced about thirteen miles thro’ the same kind of open plains, skirted with trees to the west and by undulating lightly timbered hills to the east. “ [Eyre travelling the usual route near what is now Main North Road]
My first trip of any length was to Gawler... At that time no habitation had been erected between North Adelaide and the town which was honoured with the name of our second Governor. It consisted of three thatched cottages, one of which was the little inn afterwards designated “The Old Spot”.

From Adelaide to Gawler, or vice versa, was at that time a disagreeable ride in extremely hot weather. The wayfarer traversed an open plain on which no human habitation had been erected between the two townships... In cool moist weather, when a grassy carpet variegated with flowers of diversified hues more gracefully distributed than could have been suggested than the most skilful designers of patterns was spread beneath you, the ride was pleasant enough. Then an emu, a kangaroo, but more frequently a bustard or two, would cross your path, and instantly retreat amid the belt of trees which continuously intervened between the apparently interminable plain and the shore of St. Vincent’s Gulf; and drinkable water could be found at convenient intervals. But when the soil was bare and dusty, an unveiled sun scorching from above, and water only obtainable at distant intervals, the ride was somewhat trying.”
“Started from Adelaide Town at 11 am. Passing over a very monotonous road reached the [Little] Para, a small stream, about 2 pm. .. again onward. Still the same monotonous country, a low range of hills to the east bounded by an immense plain, to the west a belt of trees, and Gawler. ....on crossing it [the South Para] the relief was great, arising from the picturesque appearances of the little settlement ...the respectable stream meandering between banks which were dotted with gum.”

Colonists Copper and Corn Old Colonist Page 83 25 January 1851
“The north road from this spot (Grand Junction Inn) to Gawler Town presents no attractions. It lies along an immense expanse of plains, interrupted only by a strip of vegetation of the Dry Creek and Little Para.”

Page 85 at Salisbury “the wattles and other undergrowth near the inn have disappeared, and the cuttings through the hills to and from the bed of the stream make the place, naturally desolate, look still more dreary and sterile. Below the hill on which Mr Broadbent had pitched his tent is a small wattle scrub, almost the only green object, beside a few trees in the bed of the Para.”

Page 89 28 January.1851. “From this place (Little Para Old Spot), at some distance across the plains to the west, and in a line with the Gulf, stretches what is called “Peachey Belt”, a forest belt consisting chiefly of peppermint-gum timber, extending for ten miles in length from north to south, by an average width of three miles. The importance of this vast range of material for fencing and firewood, particularly the latter, at no great distance to Adelaide, is almost incalculable. [Clearly Peachey Belt not cleared prior to 1851]
South Australian Register (Adelaide, SA Wednesday 8 April 1846)

“Some evil-disposed person or persons during the last week cut down a tree long known as "The Five-mile Tree," on the Gawler Plain. This tree, so remarkable from its isolated position, served the double purpose of a halting-place, and a visual relief to those travelling on this very monotonous portion of the North Road, where for miles around scarcely anything but the dreary plain is visible. The good folk of the North are very wrath on the subject of this vandal spoliation, and could they catch the wanton depredators would doubtless give them a severe drubbing.”
Now a look at some early survey plans of the Peachey Belt vicinity – wonderful picture below clearly showing scrub and open land.

Curtis Rd and Fradd Rd running east from Angle Vale Rd to Coventry Rd. Survey date late 1840s. Diagram Book Page 2 Hundred of Munno Para Land Title Office. Angle Vale town cNW corner.
Area of Peachey Belt Heaslip Rd Argent Rd and Short Rd Penfield Rd Rd Womma Rd Survey date 1849. Diagram Book Page 19 Hundred of Munno Para Land Title Office. Grassland patch among the trees -- think about Bill Gammage and his views about constructed landscapes?
Area of Peachey Belt. Short Rd running south from Angle Vale Rd. Survey date 1851.
Diagram Book Page 19 Hundred of Munno Para Land Title Office
Area of Peachey Belt south of Angle Vale Rd and Dalkeith Road. Survey date 1849.

Diagram Book Page 19 Hundred of Munno Para Land Title Office
Area of Peachey Belt south of Virginia – Port Wakefield Road and north to near Angle Vale Road. Survey date 1852. Diagram Book Page 19 Hundred of Munno Para Land Title Office
Land north of Gawler – as described by early travellers

Edward Eyre Edward Eyre’s Autobiographical Narrative 1832-1839 Caliban 1984 Page 195 /6

Leaving Gawler “On the 3rd May[1839] we fairly commenced our journey, leaving all tracks behind and striking out due north by compass. We passed thro’ a fine open district consisting of grassy lightly wooded country and open downs, the soil for the most part rich and good with small pieces of quartz scattered over the surface - timber box and casuarinae. To the eastward high ranges extended, a continuation of the Mt Lofty chain, skirted by open grassy hills in the front, We encamped for the night, after a stage of about fifteen miles, upon a large creek under a scrubby sandhill…. The next day, soon after starting, we came to another branch of the creek we had encamped upon which is called the Gilbert. The country extending from this to the northwards under the hills was very beautiful, lightly wooded, grassy and fertile. To the west of our route were high, bare and somewhat bleak downs, sprinkled with breccia [stone/pebbles].

E. J. Eyre Journals of Expeditions of discovery into central Australia 1840-41 London 1845 p28

June 20 1840 – from a point 5 miles from Gawler on the North Para Eyre moved “to my sheep station on the Light. We passed through some very fine country, the verdant and beautiful herbage of which, at this season of the year, formed a carpet of rich and luxuriant vegetation.” [This track would have been near Freeling ].
September 1843. Left Gawler Town for the north. I passed over some very monotonous country, very little but immense plains. Scattered here and there were wattle and peppermints trees.

Colonists Copper and Corn Old Colonist
Page 143 20 February 1851. After traveling north of Gawler Old Colonist returned and records “we left Templar’s for Gawler Town, the distance to which is nine miles, five of them over a cheerless plain with nothing to note till we looked down of the valley of the [North] Para”.

Moving forward in time to 20th century – scientists seem to have missed out on history lessons and we have the case of the missing grassland and a few other intriguing matters to look into.
Grassland on Adelaide plains ???

Light green –
E oleosa – E dumosa

Grey – E odorata

Blue – E leucoxylon

Described as savannah woodland – herbaceous rather than shrubby understorey. Brown earth soils

Green – E obliqua

Hatched – E goniocalyx

Sclerophyll forest – woody shrub understorey. Podsol soils.

Burra/north Lomandra dura /danthonia open savannah grassland.

“Sub climax .. Highlands are cold and bleak, especially in winter, and it is probably this factor which inhibits tree growth in these areas” P62.
Specht R.L. *Vegetation of South Australia* Second Edition 1972

Colouring by Adrian Shackley – no grassland on Adelaide plains – grassy woodland only??

Dark green - Open Forest, Low Open Forest, Open Scrub with heath understorey

Yellow – E. leucoxylon Woodland to Open Forest with herbaceous understorey

Red - E. odorata Woodland to Open Forest with herbaceous understorey

Blue – E. socialis, E. gracilis Open Scrub

Pink – Coastal shrubland and mangrove woodland.

Pink hatched East of Gawler – E. incrassata Melaleuca uncinata Open Scrub
Grassland rediscovered?
Smith, Derek *Land Use and Groundwater History of the Northern Adelaide Plains* 1979

Page 5 Map showing vegetation information from Land Survey Diagram Books

Yellow – “Open country” [includes both grassland and coastal chenopod shrubland – area near coast and Lewiston shown yellow was not grassland]

Dark Green - Thick Wood

Light green - Light Wood

Light brown - Part Wood

Dark brown Scrub

Purple - Saline area
Grassland back in its box. Adelaide plains as Open scrub or Woodland and Open scrub??

Boomsma C.D. & Lewis N. B. *The native forest and woodland vegetation of South Australia* 1980 Woods & Forests Dept SA.

Map reduced from the whole of State map attached to back cover.

Light blue - Open scrub 85%
Woodland 15% shrub and grassland

Dark blue - 40% woodland, 60% open scrub

Light green - 100% woodland

Dark green - 70/80% forest, 20-30% woodland/open scrub

Yellow – 100% grassland
Grassland makes a big return but not yet in the right places.

Kraehenbuehl Darrell Pre-European vegetation of Adelaide: a survey from the Gawler River to Hallett Cove NCSSA 1986

Light brown - E. porosa Woodland. Peachey Belt inside dashed line.

Dark brown - E. porosa Stipa spp, Danthonia spp. Low woodland

Yellow - Stipa spp., Danthonia spp. Grassland

Light blue/grey – Samphire, Atriplex paludosa. Low shrubland.

This map also reproduced in Daniels C.B. & Tait C.J Adelaide Nature of a City 2005 and is the basis for the pre-European vegetation maps on State Government websites – Nature Maps, Backyards for Wildlife etc.
Grassland is emphasised as widespread but detail needed.

The Native Plants of Adelaide Bagust P. & Tout-Smith L. 2005

Based on Darrell Kraehenbuehl 1996 map but combining areas of grassland and E. porosa and E. microcarpa woodlands into generic mallee woodlands (Red) and various areas of woodland into “Tall woodlands” (Green) noting that the northern Adelaide plains contained large areas of grasslands and that areas of grasslands can occur in all association types.
Grasslands and Grassy woodland on the move.

*Peppermint box (Eucalyptus odorata) grassy woodland of South Australia and iron-grass natural temperate grassland of South Australia.*


2007 Map showing approximate extent of 2 EPBC declared critically endangered associations
Grassland moving towards the northern Adelaide plains.

Iron-grass Natural Temperate Grassland - Nationally listed as Critically Endangered - prospective areas.

Map in 2009 brochure prepared by SA Department for Environment and Heritage
Grassland moving across Adelaide plains and around Gawler.

Iron-grass Natural Temperate Grassland nationally listed as Critically Endangered

Map August 2011 Commonwealth Dept of Environment etc.

Expanding Iron-grass natural temperate grassland indicative area (including after effect of EPBC issue in early 2011 with an area in Gawler Council.)
Shackley A. Constructed map.

Hundred of Munno Para – Summary of Vegetation data from Survey Diagram Books and additional data 2012

Pink Hatched Area – no vegetation data able to be located.

Yellow – Grassland

Green – Woodland

Mixed Green and yellow – open grassy Woodland

Note grassland area near Little Para reservoir
Shackley A. Hundred of Munno Para & nearby – Vegetation data from Survey Diagram Books and interpretation of other information, 2012. The “monotonous plain” along Main North Road and to the west back in view. The scale of the oval patch in the middle of the Peachey Belt woodland can be gauged. My colouring in shows no other such areas but such vegetation usually show as much variation as consistency.

Yellow – Grassland

Green – Woodland

Orange – lightly wooded areas

Mixed Orange and Yellow – open /grassy woodland

Mixed Green & Yellow – Open /grassy woodland with main trees in creeklines plus separate patches (schematic)

Blue – Chenopd Shrubland grades to samphire in low lying areas
Pre-European vegetation map (DENR) showing IBRA region boundaries for Eyre-York Block and Flinders Lofty Block produced from DENR EnvMaps Website 2012 with hand-drawn additions by A. Shackley. Map shows massive bias in vegetation in reserves & IBRA confusion on Adelaide plains.

Dashed Black line – IBRA Eyre-York Block and Flinders Lofty Block region boundary in first versions based on Specht 1972

Red line shows approx. outer boundary of Woodland/Forest associations with heath understorey, including separate Sandy Creek/Altona area.

Red X – National Parks/Reserves
Black X – Native Forest reserves

Pink highlight outside heath understorey area – other parks at Port Gawler and Torrens Island (both coastal mangrove and samphire)

Black circles - grassy woodland reserves at Cobbler Creek and Para Woodland.
My review

Survey records
The early land survey records have some gaps in vegetation descriptions in the early years especially where early Special Surveys occurred. These focused on rivers and well watered areas. Surveys of Crown land on the Adelaide plains on a large scale started in 1845 and continued for some years. Land on the Gawler Plains around Smithfield and Angle Vale was not sold until after 1847 and occupation occurred gradually over a few years.

The Land Survey Diagram Book pages recorded the foothills as generally arable land with some timber and some areas of denser scrub such as around Para Wirra/Mount Gawler/Cockatoo Valley. The main areas where no notes exist are often the areas described by early writers as the barren plains - with nothing to report (no water, timber, scrub etc as usually noted). Pressure to get surveys completed may have been a factor or the notes may have been lost.

Land use
Grazing licences were issued for some of these areas of Crown land during the 1840s but these did not allow clearing of land and who would invest in clearing land on an annual licence which had no tenure security. When sale of Crown land did occur on the Adelaide plains it is interesting to record that land in the Peachey Belt scrub area was taken up at a similar rate as land in the open plains. That makes little sense from an agricultural point of view but is consistent with a big demand for wood from places such as the steam operated flour mills which were being established at Dry Creek, Adelaide and Port Adelaide and which had big demands on wood for fuel.

Records of the District Council of Munno Para West (for rate purposes) which date from 1854 record the pattern of land use for the Adelaide Plains. By 1854 about a quarter of the 80 acre lots in the area had a residence. Much of the land is still recorded as part cleared or grazing in 1854.
District Council of Munno Para west – land use records for council rates 1854 from Smith Derek 1979 p 19.

Yellow – Cultivated land

Green – Pasture

Yellow/Green – Mixed Cultivated and Pasture

Red lined – Enclosed pasture
Where did the misunderstanding come from?

There has grown up a jointly agreed (mis)understanding between farmers and environmentalists that in the early years farmers cleared a lot of trees with a lot of hard work. Environmentalists usually want/ed the trees put back to “restore what has been cleared”. A mutually satisfying explanation.

People go on visits to the parks in the Adelaide Hills or Enfield Cemetery scrub to “see what the original vegetation looked like” and then go home and plant trees and shrubs instead of herbs and grasses. We need a different mindset. Statements like the following is what has drove “One Million Trees” and “Three Million Trees”.

“The vast mallee box (Eucalyptus porosa) woodland at Peachey Belt (near Virginia and Penfield) was cleared early by settlers eager to obtain arable land for cereal cropping. It is really an indication of the vast impact the actions of these early pioneers had, that all but a few vestiges of this once large area ... was cleared by 1848.” Darrell Kraehenbuehl at page 42 in *Adelaide Nature of a City* Daniels Christopher B and Tait Catherine J (Eds) 2005.
Now I did my share of planting Western Australian eucalypts on our farm from State Flora predecessor in the 1970s. We are all learning.

Apart from the history records, as a “farm product” I see things differently. No one cleared land in the early years of SA unless they needed wood for building or could sell the wood. Farmers went somewhere where clearing land was not necessary. It cost too much to employ people to hand clear trees. Farmers on small farms did it in their spare time. Gentlemen farmers mainly thought about in the early days.

The areas that remain largely intact are the areas farmers did not want and these are almost entirely unrepresentative of the original ecosystems. We have lots of stringy bark forests and sandy scrubs all with heathy understorey in Parks. We have virtually no grasslands and only small patches of grassy woodlands in Parks and also generally with remnants.

Any analysis that relies on recent surveys and computer databases of what is around today or even has been around in the last 100 years to plan revegetation of existing farmland is fairly likely to be a off the mark. What is needed as well as remnant data is good analysis about what is missing and why it is missing.

When travelling the countryside – if you don’t see trees or shrubs on roadsides – think of grasslands and ploughs – not trees and axes!
Threats to grasslands/grassy woodlands

Tucker Peter *Guidelines to protect and enhance Eucalyptus Porosa Grassy Woodlands* 2005
Trees for Life Page 9 has a list of “Common threats to grassy woodland ecosystems”.

- weed invasion
- further clearance, possibly due to lack of knowledge
- grazing by livestock, feral herbivores and over abundant native species
- over zealous weed control
- road construction and maintenance
- altered fire regimes
- inappropriate revegetation
- fire wood collection
- general lack of understanding from the public, and
- disease

I think we might add
- lack of disturbance, removal of disturbance factors – fire, animals and people digging.
- lack of previously present plant species
- lack of action by people with best understanding - trying to research/answer all concerns before doing something
- lack of acceptance that there are winners and losers over time in ecosystems - we probably need to reduce some species to allow others to survive/thrive
- management of small and scattered sites – wipe-out threats, reduced plant species diversity, lack of re-colonisation from adjoining land
- Gammage problem – how to replace/reinstate the missing Aboriginal management methods?
Examples of sites with grassland, grassy woodland associations or grassland species - Adelaide Plains and foothills. A Shackley map.

Yellow - grassland,
Orange – grassy woodland,
Green – grassy herb and shrubland

Dead Mans Pass Gawler <1 ha, 40 grassland sp.

Gawler East – irongrass grassland c 2ha 20 grassland species

Gawler Belt rail corridor – total 20 ha mainly woodland but some grassland areas c 2ha total of 65 grassland species, including 23 grasses and 5 Lomandra sp.

Roseworthy Freeling rail corridor – several areas c 10ha 70 grassland species, including 19 grasses, 10 daisy species and 5 Lomandra sp.

Stebonheath Rd Munno Para – <0.5ha roadside area near 20 grassland species Themeda, Bothriochloa, Digitaria brownii

Womma station area on Gawler-Adelaide rail line – Themeda, Calostemma, - about 15 species
Dead Mans Pass  Gawler grassland area  February March 2012

Themeda, danthonia, stipa, enneapogon grassland – planted eucalypts top right, South Para corridor on left

Setaria constricta – Pigeon grass, calostemma lilies

Digitaria brownii – cotton panic grass
Convolvulus remotus, Vanilla lilies

Maireana enchylaenoides, Sida corrugata

Lomandra nana (western limit of range) in Themeda.

Lomandras multiflora, effusa and densiflora (upper centre)
Dead Mans Pass  Gawler grassland area  February March 2012

Panicum effusum – Hairy panic

Leiocarpa tomentosa – woolly plover daisy

Short-beak echidna – local residents

Sida corrugata – Grassland Sida
Willaston regenerating grassland area March 2012. Council slashing only for 30 years since farming ceased – grassland returns.

Enteropogon acicularis, stipa species

Maireana enchylaenoides – Wingless fissure-plant

By-pass verge – themeda, stipas, herbs with DTEI tree planting – eucalyptus porosa and shrubs
Willaston paddock - species which have spread onto paddock after 30 years of Council slashing

- 2 Spear grass/Austrostipa species
- 2 Wallaby grass/Austrodanthonia species
- Curly Windmill grass (*Enteropogon acicularis*)
- Windmill grass (*Chloris truncata*)
- Black head grass (*Enneapogon nigricans*)
- Grassland Sida (*Sida corrugata/angustifolia*)
- Tar Vine (*Boerhavia domii*)
- Caustic euphorbia (*Euphorbia drummondii*)
- Wingless Fissure-plant (*Maireana enchylaenoides*)
- Berry Saltbush (*Atriplex semibaccata*)

Example species which are nearby on road verge that have not yet spread onto the paddock

- Kangaroo grass *Themeda australis*, other Stipas,
- Irongrass/Lomandra species effusa, multiflora/ spp dura, densiflora
- Flax lily/Dianella revoluta
- New Holland daisies (2 or 3 species)
- Sticky Sword-sedge *Lepidosperma viscidum*
- Lagoon Saltbush *Atriplex suberecta*
- Vanilla lily *Arthropodium strictum*
Willaston – missing species last 50 years. Mostly based on excellent Darrell Kraehenbuehl Herbarium collections in the area in the 1960s.

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<thead>
<tr>
<th>Willaston Cemetery</th>
<th>Willaston rail corridor &amp; roadside records</th>
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<tbody>
<tr>
<td>Beyeria lechenaultii</td>
<td>Acacia spinescens</td>
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<tr>
<td>Caesia calliantha</td>
<td>Caladenia tensa</td>
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<tr>
<td>Choretrum glomeratum var. chrysanthum</td>
<td>Calotis erinacea</td>
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<tr>
<td>Chrysocephalum apiculatum</td>
<td>Cheilanthes austrotenuifolia</td>
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<tr>
<td>Correa reflexa</td>
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<td>Crassula colorata var. acuminata</td>
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<td>Daucus glochidiatus</td>
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<td>Goodenia pinnatifida</td>
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<td>Hypoxis glabella var. glabella</td>
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<td>Panicum effusum var. effusum</td>
<td>Lepidosperma viscidum</td>
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<td>Pimelea curviflora var. sericea</td>
<td>Lomandra leucocephala ssp. robusta</td>
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<td>Pomaderris paniculosa ssp. paniculosa</td>
<td>Minuria leptophylla</td>
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<td>Sclerolaena diacantha</td>
<td>Podolepis jaceoides</td>
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<td>Senecio glossanthus</td>
<td>Podolepis rugata var. rugata</td>
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<td>Setaria constrictum</td>
<td>Rhodanthe polygalifolia</td>
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<td>Stackhousia monogyna</td>
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<td>Thysanotus patersonii</td>
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<td>Vittadinia blackii</td>
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<td>Wurmbea dioica ssp. dioica</td>
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</table>
Roseworthy to Freeling rail corridor February March 2012

Themeda, danthonia, stipa, grassland – planted old sugar gums and young eucalypts and shrubs

Podolepis jaceoides, lomandra muliflora

Pycnosorus globosus, danthorias, lomandras

Roadside weeds, some lomandras and native grasses – shows typical cracking clay soil of the area
Roseworthy to Freeling rail corridor February March 2012

Dichanthium sericeum – silky bluegrass, Aristida behriana

Themeda, stipas, native oxalis, aristida – spreading
Acacia pycnantha altering grassland

Walwhalleya proluta – Rigid panic

Themeda, stipas, native oxalis, aristida – spreading
Acacia pycnantha and pepper trees
What to do – some of my suggestions

• Change the pre-European maps on the State maps and websites

• Look at native vegetation heritage agreements to allow some scientifically based disturbance including potential for managed grazing of grasslands

• Promote grassland and understorey restoration and management projects.

• Look out for missing species - Lotus australis – “native vetch” [“weed at Virginia and Burnside – early diaries], Swainsona species – native clovers, various daisies - Yam daisy, Leptorhynchos sp., Podolepis sp., Glycine, Lomandras, missing grasses. Agree that local provenance needs to be more flexible for some species.

• Promote study of the role of grasslands in the Adelaide Hills biodiversity hot spot work/declining birds studies.
• Change the rules for Carbon contracts – what is the scientific basis for saying that contracts need to involve over-storey having a mature height of > 2 metres?

• Heresy. Agree that people/organisations promoting and planting some trees and shrubs in former grassland areas can do so on the proviso that in woodland areas they promote and plant areas of grassland?

• Have publicly available documentation for the applications and outcomes for the SA Significant Environmental Benefit similar to the EPBC process.

• Keep thinking and talking.