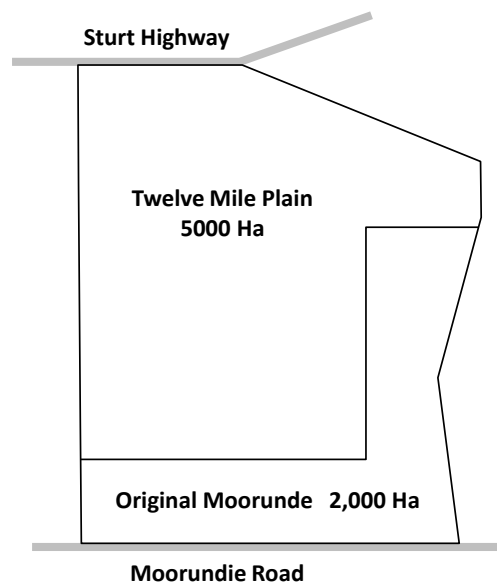


In 2007 the Natural History Society acquired an extra 5,000 hectares of land (the Twelve Mile Plain) adjoining the original 2,000 hectares of Moorunde Wildlife Reserve. Both areas were once part of Portee Station, situated in the semi-arid country (250 mm or 10 inch rainfall) of the lower North-East Pastoral District of South Australia; south-east of Blanchetown. The original Moorunde Wildlife Reserve was established in 1968, hence the Twelve Mile Plain has suffered an extra 40 years of grazing pressure from sheep (the sheep were removed in 2006). In addition to this, approximately 1,000 to 1,500 hectares of once Tall Open Shrubland on the Twelve Mile Plain was mechanically cleared in the mid 1970's. Both areas had extensive harvesting of its Mallee trees during the 1940's for charcoal production. The trees have survived this and are now regrown, but lack the hollows of more mature uncut trees!



Those factors aside, the vegetation communities, formations or habitat types of the Twelve Mile Plain in its original state were and are noticeably different to that of the original Moorunde area. Even though the collective plant species are essentially the same, their configuration or associations with each other are not. Which is the basis for this discussion – what grows where, what plants associate with others to form a community and hence a habitat type, for wildlife, and why.

In the past the semi-arid regions of Australia have been something of a “middle child” in terms of interest and study by ecologists. Rain forests and tall sclerophyll forests being seen as attractive and exciting, deserts as challenging to cross and mysterious, while agricultural areas produced a justifiable urgency to protect the last vestiges from being cleared. The pastoral semi-arid areas or station country was...well...just there! With its decline being so relatively gradual that few people noticed. Yet semi-arid country rivals and can surpass the others in terms of bio-diversity; even rain forests. A factor that at last has been recognised by ecologists. However deserts are still deserts and the remnants of rain forests are still rain forests; both in comparative terms close to being in pristine states. Although that isn't to say they are without their conservation threats and problems. While the semi-arid country has sustained continuous unprotected grazing from sheep and cattle as station or pastoral properties for a steady 150 years or more. None of it can be found in its original state prior to European settlement; and the Twelve Mile Plain is one of the earliest areas in South Australia of this type of land to be put under grazing pressure, and the last to come under a

protective conservation wing. Which makes it important by virtue of this unique aspect; and so I decided to study it, and its recovery.

Part of this process was to establish or identify the habitat types or vegetation formations, communities or associations. Which immediately presented a problem in establishing a classification base line. Should the habitat be classified and described in terms of (a) how it once was or (b) the condition it is in now or (c) the state into which it may possibly recover into? Initially I identified thirteen communities; ten of which were from (a) what their original state would have been and these are still relatively speaking in that state. Or enough so that it wasn't a problem to identify that original state.

Of the other three types this was not practical and in fact I added another two; making a total of five degraded habitat types so depleted in plant density and variety that one has to speculate as to what they once were as communities. Then, with the ten habitat types that have suffered less and hence can be allocated as a particular vegetation formation there are 15 in all, none of which will ever return to their pristine conditions. Due to the invasion of introduced weeds, rabbits and more crucially because of the recent influx of kangaroos that have now reached pest species status if not plague proportions. Although it must be said that the five degraded or drastically altered areas of plant communities would have once been one or other of the other ten types. So it is fair to say that no actual example of a vegetation community has been totally removed from the reserve.

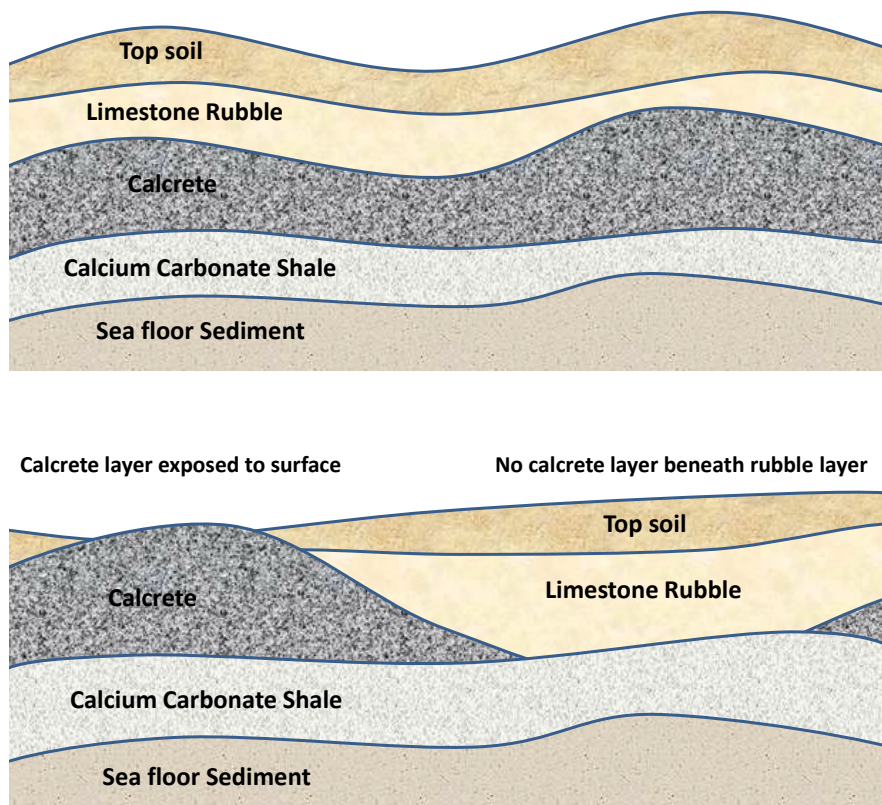
Apart from any associated human activities (either indigenous or non-indigenous) there are explainable reasons for this variation of vegetation communities into at least these ten different types. However with the five severely degraded and depleted formations, although having once been one or other of the less affected ten types, and while having the potential to return to them this is unlikely to happen. At least not without more direct human interaction in the form of pest species control and artificial replanting of depleted plant species.

These ten plant communities or vegetation formations have occurred naturally over a relatively recent past – in geological terms. Up until approximately five million years ago Moorunde and surrounding areas were covered by a shallow sea. In fact the base of Lock One at Blanchetown, on the River Murray, is currently at sea level; and the Twelve Mile Plain only varies in elevation from 65 to 95 metres above sea level. This shallow sea produced one of the most noticeable and important influencing factors in the variation of plant communities – limestone! The accumulation of dissolved exoskeletons of dead crustaceans and shellfish, gradually forming a layer above the sediment on the sea bottom.

This limestone now appears in, and as part of the soil profile in three, broadly speaking, forms. Firstly is a relatively loose conglomeration of fairly soft rocks, or rubble, of varying size and depth. Then below that a solid very hard sheet (known as calcrete that is in fact harder than concrete) that varies in thickness and undulates in depth in relation to the surface. This undulation of the calcrete in relation to the surface (and after the existence of limestone in the first place) is the most important factor in determining what plants grow and where. Although not the only one. Then, under the calcrete layer is a soft calcium carbonate shale above the original sea floor sediment).

The soil layer over the limestone profile came in the form of dust, blown in over the five million years after the seawater drained away. While the first layer of limestone rubble is attached in places to the lower calcrete, it is softer due to sun and weather exposure over that period. However there is considerable variation in sequencing of the soil and limestone layers; with for instance at times the calcrete layer being on the surface with no rubble or soil coverage at all. While other places have no calcrete layer below the rubble of rocks. And it's this variation in profile in conjunction with the

topography, steepness of the undulation gradient and soil types that causes the range of plant communities.



Simplistic Representations of the Sub-surface Profile

The soil itself comes in the forms of sandy loam, loam, clay loam and clay. With clay loam being the predominant type. All have an alkaline pH but I am unable to comment on the range and individual pH levels of each. It's important to note though that each soil type varies in water retention abilities and water release (to plant roots) qualities; and conversely different plants have differing abilities to withstand wetter or drier soils, and in their abilities to extract moisture from a particular soil type.

However the subsurface profile remains the dominant factor and in any case it can affect the soil that is likely to be above it. For example the community or vegetation formation I have classified as **(1) "Tall Open Shrubland with Scattered Myoporum Tree Canopy"** (see **Photo 4**) grows in areas where the soil layer (of clay loam) is relatively shallow to that of the areas of **(2) "Dense Mallee Scrub"**. While the Myoporum trees (Sugarwood or False Sandalwood) are of a density proportional to the abundance of more localised areas of either deeper calcrete or where the calcrete is heavily flawed with cracks. The **(3) "Open Mallee with Low Saltbush Shrubland"** (see **Photo 5**) formations are generally flat areas with more loam and less clay, or claypan fringes of relatively poor drainage, with the calcrete layer of medium depth with generally a thicker layer of the softer rubble over localised spots of flawed and cracked calcrete that allows the scattered Mallee trees to survive.

The plant communities or combinations are also influenced by other factors as well as the profile; such as the topography. Not just the undulation in the range of 30 metres or so but the degree of steepness of the undulations. Plus the moisture retention capacity of a localised area of soil, its loam to clay ratio, and its ability to "give up" that moisture to plant roots. Then whether or not an area is prone to inundation during wetter years or after thunderstorm cloud bursts. Or how long in terms of time a localised area remains water-logged and the frequency of water-logging.

For example, habitat type **(4) "Claypans"** (see **Photo 11**) are generally bare of large perennial plants due to occasional inundation and more frequently waterlogging and as a result only support annuals such as (originally) Spear Grass and Wallaby Grass [Hyde] and various annual flowering plants. These annual plants survive inundation and waterlogging largely due to their abundant yearly seeding, and the fact that their seeds have inherent dormancy periods that can last for several years; only germinating when conditions are suitable or requirements have been met. However some claypans waterlog less frequently and do support tall shrub growth for periods of some years before becoming inundated or water logged and the shrubs die off and litter the claypan with dead wood.

The claypans are depressed areas that therefore collect water as runoff when enough rain falls; and their surface profile is slightly dish shaped. They come in three forms, firstly fairly small ones that have relatively large surrounding catchment areas that drain water into them; but only have a layer of clay about 30 cm deep directly over a slightly dished calcrete layer that is free of the usual rubble layer. They waterlog easily but also dry out comparatively quickly. Then there are claypans that have a deep dish of calcrete which is fairly impervious to water and acts as a holding bowl for the water; keeping the deep clay layer of soil waterlogged for long periods. These claypans can be readily identified by the fact that they have a quite well defined perimeter of large perennial plants such as tall shrubs or Mallee trees. The third type is depressed areas that are quite large (2-3 hectares or much more) where there is either no calcrete layer or the layer is so deep in the profile that it is of little consequence in influencing surface growth.

Another (although relatively few and small) plant community is **(5) "Ephemeral Wetlands"** that support the fifth Eucalyptus species on the reserve – River Box Gums. There are three small areas of these trees that require inundation (flooding) to germinate. Although they are quite capable of growing into fairly large trees that can survive long dry spells. On the Twelve Mile Plain (and in the wider district) they grow in deep silt depressions, that are sited to collect large volumes of runoff water draining off surrounding sloping ground. The last time these small seasonal woodland "lakes" filled with water was in December 2010 after a thunderstorm cloud-burst, when over 125 mm (5 inches) of rain fell in less than one hour. Although the downpour was too heavy to measure accurately and could well have been more. This rain also flooded the claypans (of (4) above) and waterlogged several of those, that did have tall shrub growth, for long enough to cause the die-back mentioned earlier, in many of them.

One of the Ephemeral Wetlands is significantly different to the other two areas, as although in its centre it has a small collection of River Box Gums, its predominant plant community is made up almost exclusively by a **(6) "Dense Dryland Tea-tree Shrubland"** (see **Photo 6**) – some quite large but most are very stunted. It is also half surrounded and intermittently penetrated by a claypan on its eastern side; the rim of which grows the larger shrubs. There is in fact only one large and very old River Box Gum (*E. largiflorens*) in its centre, surrounded by a community of very small but old trees in a state of arrested development. While in other places there is the occasional "island" of a cluster of Mallees. The soil on the claypan side is comparatively deep, and obviously waterlogging inhibits the large perennial plants from growing. However, where the Tea-tree (*Melaleuca sp.*) grows the soil is almost none existent. It's simply a thickish film of silt over calcrete. But the area floods from time-to-time by virtue of the runoff water from the surrounding slopes. I don't know how long this particular wetland retains its surface water as it was only on the far outer fringe of the 2010 deluge; and didn't actually become inundated. I also can't say how much subterranean water is stored to support the Melaleuca shrubs given there is so little top soil. I suspect the calcrete layer here is quite porous initially, with an impervious layer deeper below that allows both roots and water to penetrate the porous layer; and water to be stored in it, that can't escape the deeper impervious layer.

Two significant locations on the Twelve Mile Plain support **(7) "Low Saltbush Shrubland"** (see **Photo 7**) that do not have a scattering of open Mallee as in (3) above. These areas are flat (which is commonly the case elsewhere too) and hence probably waterlog just long enough or just severely enough to prevent the establishment of the Tall Shrubs or Mallee trees. As indicated by the tendency of Saltbush to invade the edges of claypans and survive any waterlogging or inundation if it's not too prolonged.

I only recently learnt (December 2010) that there are people who believe that Spear Grass and Wallaby Grass cannot compete and grow amongst areas of Saltbush. This is a complete fallacy! So much so that I have difficulty believing such people exist! Had I known years ago, that this was to become a controversial issue I would have taken photographs of what was once a common sight. That being Spear Grass growing so tall and lush amongst Saltbush that once run up to seed it was difficult to see the Saltbush unless actually standing or walking amongst it! Hundreds of hectares of it; and within the wider district where farmers and graziers were able to restrain the over-population of kangaroos. On Moorunde and the Twelve Mile Plain however I found it extremely difficult to photograph the few miserable examples shown later. In fact, after Claypans, Saltbush Shrublands are the favoured areas for Spear Grass and Wallaby Grass to grow in.

However not all "Low Saltbush Shrublands" or "Open/Scattered Mallee with Low Saltbush Shrubland" formations are on flat ground; but they do exist in a natural state, without having been caused by artificial clearance. Then, just to confuse the issue many areas in the surrounding district that are now "Low Saltbush Shrublands" are "artificial" as they were once cleared for agricultural (cropping) ventures. Which ultimately failed. With the Saltbush, that would have once been understory shrubs returning but the other plants of the Mallee scrub failing to do so. However none of the Saltbush areas of Moorunde and the Twelve Mile Plain exist because of any clearing. There are though significant areas where it has been virtually eliminated through over grazing, as it is highly palatable to sheep. Which will be discussed below. Meanwhile the question is, why do some undulating areas have a predominance of saltbush and a near absence of tall shrubs?

I have (as yet) no accurate answers to this, only a few ideas and a couple of "half-formed" theories, based on observable evidence to be found over the reserve. While I am reasonably confident that soil testing and a series of comparative deep soil profile trenches would support these theories, in the absence of such the issue is probably not worth discussing here. Unless at some time the answer needs to be known – then work could be done to establish the answer.

Now we have three remaining plant communities that are still retaining their original states to a significant degree that enables them to be readily identified. They are **(8) "Open Mallee Scrub with Tall Open Shrub Understory"**, **(9) "Open Myoporum Tree Woodland with both Tall Open Shrub and Low Saltbush Shrub Understory"** and most curious of all **(10) "Open Myoporum Woodland with Dense Tall Shrub Understory and Clusters of Dense Mallee Scrub"**. These are obviously areas where the subterranean profile varies rapidly from one very localised spot to another to form a mosaic of differing profiles that changes fairly rapidly; then reflected by the constant changing plant communities immediately above ground. The soil type and pH levels probably have an influence too, given that there are also a number of micro communities within these three broader ones; that are beyond the scope of this broad sweeping assessment.

The original 2,000 hectare area of Moorunde (as opposed to the Twelve Mile Plain) only has a smattering of (8) above, "Open Mallee Scrub with Tall Open Shrub Understory"; in the form of transition phases (or ecotones) from the Tall Shrublands to its Mallee Scrub. However, on the Twelve Mile Plain this particular plant community or habitat type has areas of quite significant size and locations; that exist in their own right and eclipse those on Moorunde. While plant communities (9)

“Open Myoporum Tree Woodland with both Tall Open Shrub and Low Saltbush Shrub Understory” and (10) “Open Myoporum Woodland with Dense Tall Shrub Understory and Clusters of Dense Mallee Scrub” are non-existent on Moorunde.

In fact (to the best of my knowledge) these last two habitat types don't exist elsewhere in other districts. A larger area of (9) “Open Myoporum Tree Woodland with both Tall Open Shrub and Low Saltbush Shrub Understory” can be found on neighbouring Brookfield Conservation Park (immediately over the Sturt Highway) but I am unaware of any other location with this particular type of community. While I believe (10) “Open Myoporum Woodland with Dense Tall Shrub Understory and Clusters of Dense Mallee Scrub” is unique to the Twelve Mile Plain. My definition of “Dense Tall Shrubland” is one in which one cannot ride a motor-bike or quad-cycle through it; and in most cases this applies to the “Clusters of Mallee Scrub” too. However, at the same time, there are areas clear enough to form labyrinth path-ways that enable a standard vehicle (car) to pass through. Only to be blocked off further in. These last three plant communities and (10) in particular make Moorunde Wildlife Reserve, and Twelve Mile Plain in particular rather special.

Now we come to the remaining five habitat types. They have been drastically transformed from their original state to the extent that it is usually very difficult to classify them on what they would once have been. Or at least not with complete accuracy. What one can say is that (with the exception of (5) “Ephemeral Wetlands” and (6) “Dense Dryland Tea-tree Shrubland”) they would have been one or other of those already mentioned above – at some time in the past.

They are important because they represent large portions of the Twelve Mile Plain that have the potential to return close to their original state; but will probably remain in their degraded condition due to the recent influx and over population of (mostly) Red kangaroos. That have (after 2-3 years of respite) replaced the grazing pressure that the sheep once applied. In fact, unless the management of Moorunde Wildlife Reserve is prepared and/or permitted to control the kangaroo numbers these areas will continue to decline.

The kangaroo problem has an unusual and unprecedented compounding effect. Because they are continuing to prevent the re-establishment of the native grasses, which is (or was) the predominant food source of the Southern Hairy-nosed Wombat. This in recent years has forced the wombats to dig for Thread Iris bulbs during the summer and early autumn months, for an alternative food supply. This digging by the wombats is now on a vast and unprecedented scale; and it's worth noting that the animals also eat the plant tops during winter and early spring, and these plant tops are known to be toxic. While it appears nobody knows if the bulbs are or not. It's also worth noting that Spear Grass at least is quite capable of competing with/against the exotic plants such as Onion Weed, Wards Weed and Thread Iris that have replaced it. If! The grazing pressure from sheep or kangaroos is reduced. These other weeds only survive because they are less palatable. And there is evidence to be found to illustrate the ability of native grasses to do this.

The compounding effect on the degradation comes about with the digging (by the wombats) because the soil is being dug up (summer and autumn) while it is dry! Which results in the structure being broken down to form what is known as “hard-pan”. Vast areas (particularly claypans) have 100% of the land dug over multiple times. The digging also destroys the natural “duri-crust” – another compounding effect. As the duri-crust only requires being dug up once before it takes many years to recover. This is because this duri-crust is formed by moss and lichen species; and these are important for not only “binding” the top soil, but for providing major nutrients for the more evolved plant species.

The damaging effect of wombats digging for Thread Iris bulbs compounds even further. As any young shrub seedlings that do manage to germinate from an already depleted seed bank, are being dug up/out and killed in the process. Preventing their re-establishment, even if they could survive the hard-pan effect and reduced fertility. Vast areas of land now look like miniature versions of “no-mans-land” between the trenches in France or Belgium during the First World War; with nothing but bomb craters between the trenches.

In addition to this (the compounding effect continues) because the introduced Onion Weed is encouraged to proliferate from summer soil disturbance. So now hundreds of hectares are choked with this unpalatable weed; which coincidentally grows best on the soil types and soil profiles that the native grasses prefer.

Nobody knows quite when the wombats discovered this alternative food supply that has to be dug up to access. It was first noticed as becoming a significant factor (although not wide-spread) in the summer of 2008-2009. Then with the continued invasion of Red kangaroos in the summer of 2009-2010 it began to rapidly spread, and became a dominating factor by the summer of 2012-2013. Claypan areas have 100% of their land dug over while country that once was or is predominantly “Tall Open Shrubland” the area dug over varies from approximately 50% to 80% and increasing. These dates for the digging and coincidental kangaroo population invasion coincide with the dry years in the eastern states when the Murray-Darling River system ran dry.

Over grazing; originally by sheep and now by kangaroos (with a short respite period of three years in between one and the other) isn't the only destructive force to occur on the Twelve Mile Plain. What was once (mostly but not quite entirely) “Tall Open Shrubland with Scattered Myoporum Tree Canopy” has suffered from mechanised clearing as well. In the 1970's about 1,000 to 1,500 hectares of this type of habitat was pushed over by a bulldozer; although most of the Myoporum trees were spared; the leaves of which make excellent livestock fodder. These trees (at the time of acquiring the Twelve Mile Plain) are extremely old and many are dying. Fortunately however there was an interim period of three years (2006 to 2008-2009) between the time of removal of the sheep and the influx of large numbers of Red Kangaroos. Long enough to allow a good supply of Myoporum trees to germinate and establish themselves, and some of them are now (December 2013) five to six years old and in good health. Since about 2008-2009 onwards however no new seedlings have managed to survive; due to the fact that (as mentioned above) they are excellent fodder plants and readily eaten off by kangaroos. As they were originally by the sheep.

These new Myoporum trees owe their existence to the surviving older (dying) trees still providing a seed-bank. While the shrubs having been cleared by bulldozing had their seed-bank removed. However the old trees and their new seedlings give an indicator to the original vegetation communities that must have once existed in these areas. When one also observes and takes into account the surrounding soil types and topography. As they are generally associated with Tall Open Shrubland and to a lesser degree Low Saltbush Shrubland plus on occasions a combination of both. For example – in the scene encapsulated in **Photo 1** with the application of observational skills and some experience it is possible to determine the soil profile and soil type to a fairly accurate degree without the need to dig a series of “profile trenches”. Then by taking into account the area's former history, by way of the application of deduction, one can not only determine the original vegetation communities across this particular landscape, but also establish what happened to it. For it to have ended up looking as it does now.



Photo 1: Taken 2nd March 2013. A scene of some of the most degraded and depleted areas of the Twelve Mile Plain (part of the Moorunde Wildlife Reserve). The plant community in the foreground which also extends to the horizon is predominantly Onion Weed. The whole area is pitted with craters (to 100%) from wombats digging for Thread Iris bulbs; which has encouraged the spread of this weed. The foreground I have classified as (4) "Claypans" and the background as (15) "Grassland with Recovering Myoporum".

Firstly this particular area, which is situated in the North-East Section of Twelve Mile Plain / Moorunde Wildlife Reserve, is in a location that is the closest to the River Murray. Consequently it was exposed to sheep grazing pressure in the 19th century earlier than other areas further west on the reserve. Before modern tanks, pipes and troughs were established. So the sheep had to return to the river for water; which is still some distance away. Then later when steel "squatters tanks" were put in, this area was/is adjacent to the first tank to be installed in the area (the tank that we refer to as "the red tank" as it is now rusted out). Longer grazing by the sheep compared to the other areas of the reserve – less and older shrubs and trees surviving to 2007!

The photographer/author is standing in a claypan, which (such areas) are known to be the most favourable sites for native grasses to grow [Hyde] and in fact nothing else but native grasses (once) and other annuals grow in these locations. Now it's just a wasteland of wombat dug craters, with Onion Weed and Thread Iris – with the very occasional blade or two of Spear Grass that has been lucky enough to escape being eaten off entirely.

It's the Spear Grass that once grew in abundance on areas such as this that originally attracted the "squatters" with their sheep in the 19th century. The sheep brought the weeds.

Although it's not really noticeable in the photo at about half way towards the background there is a gradual rise that would have once supported saltbush, with good stands of native grasses growing between the shrubs. Making the second attraction for the "squatters" and their sheep; as the saltbush too is highly palatable. Then as you go further into the background (and with the ground continuing to rise slightly more again, hence reducing the waterlogging effect of the claypan even

further) one can see a few older Myoporum trees. In remarkably good health compared to most. Surrounding them is a generous smattering of very young Myoporums that look more like shrubs than trees. Paradoxically it's the former presence of the sheep tramping the area that would have initiated this spurt of germination! As was/is the case with the youngest Callitris trees in some areas of the Flinders Ranges where sheep were removed after drought years [G. Ragless pers. comm.].

Now it's here amongst the Myoporums on the relatively flat ground before the degree of slope starts to sharpen in the background that there would have been a transitional phase. As the Low Saltbush Shrubland would have gradually given way almost entirely to the Tall Shrubs; as the soil becomes less clay and more loam; and the profile has the limestone and calcrete sheet coming closer to the surface. With the crest of the rise becoming the plant community I described earlier as (1) "Tall Open Shrubland with Scattered Myoporum Tree Canopy". But now exists (as illustrated in **Photo 2** and **3**) as bare ground half of which is dug over by wombats, with old and dying Myoporum trees in the background. That I have somewhat dubiously classified as **(11) "Open Myoporum Woodland"** (see **Photo 10**). Simply so that I can attach a name to the habitat as I record the birds and other wildlife I find in it and the other four that are also degraded to being virtually beyond recognition.



Photo 2: Taken 9th April 2013. In the middle ground of Photo 2 and the background of Photo 3 the ground is dug over by wombats. With the duri-crust in the foreground of Photo 3 still intact. In both photos the Myoporum trees in the background are old and dying. Hence further degradation is still in progress. The wombats digging for Thread Iris bulbs is not only destroying the duri-crust and the moss and lichens that form it and provide nutrients (nitrogen in particular) for plant growth, but are also digging out shrub and tree seedlings and spreading Onion Weed in the process. Other areas on the Twelve Mile Plain illustrate that remarkable recovery can occur within 5 years – the rest simply needs some intervention to prevent its total collapse into wasteland.



Photo 3: Taken 9th April 2013. See caption under Photo 3.

We cannot blame the original farmers/graziers/"squatters" for much of the Twelve Mile Plain looking as it does as depicted in these three photos. Even though they left it much like this in the first place, they have done no more damage to the environment than any other industrial site or area of bushland that has been cleared for housing development. And grazing sheep for profit is a business/industry venture that was sanctioned by the community when the state of South Australia was first settled and relied upon this type of industry for its economy. No, sheep and cattle grazing is a fact of life – just as the suburb you are living in now was once bushland or drained coastal wetland.

Now the Twelve Mile Plain belongs to a conservation community; and has done so for seven years. That's long enough to have started a rehabilitation program; and money could have been raised for it, and I have expertise and experience to do or supervise the work required to achieve it. So what went wrong? It's not possible to explain without "pointing a finger" at certain people who in one form or another stood and still stand in the way of getting the required programs started. People with a firm belief in the "minimum intervention and let nature takes its own course" policy. But the problem is, much of the Twelve Mile Plain has been degraded so much, for so long that it has "past the point of no return" for this approach to work. But it doesn't matter anyway! Because outside the Natural History Society there is a powerful lobby group of conservationists that would savagely oppose the control measures on kangaroos needed to allow this degraded country to recover.

So you see conservationists are to blame, for much of Twelve Mile Plain being waste land! Conservationists are responsible for preventing Moorunde Wildlife Reserve from becoming the "beacon" and "show-case" for what the habitat and plant communities of the semi-arid lands of South Australia could look like. It has the potential; and the Natural History Society has some of the resources and could acquire the rest to "pull it off". I, and a few other people have the resolve to achieve it – but are you one of them? The remaining five habitat types would once have been one of eight of the ten plant communities mentioned earlier – (5) "Ephemeral Wetlands" and (6) "Dense

Dryland Tea-tree Shrubland” being the two exceptions. I have given them a “classification”, one, because they will probably remain that way and two, because it is necessary in my study to attach a habitat type to the birds and wildlife found in them. They are as follows – **(11) “Open Myoporum Woodland”**, **(12) “Grassland with Islands of Mallee”**, **(13) “Dense Mallee Scrub with Depleted Understory”** (see Photo 9), **(14) “Open Mallee Woodlands with Depleted Understory”** (see Photo 8) and **(15) “Grassland with Recovering Myoporum”** (see Photo 12).

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Gordon Ragless (1909-2002). Member, Vice President and President of the South Australian Ornithological Association; member, Vice President and President of the Adelaide Ornithologists Club; Branch Secretary of the Royal Australasian Ornithologists Union.



Photo 4: Taken 30th November 2011. **(1) “Tall Open Shrubland with Scattered Myoporum Tree Canopy”**. Many of the shrubs have germinated since 2006 however the native grasses (in the foreground) are absent.



Photo 5: Taken 10th December 2011. **(3)** *“Open Mallee with Low Saltbush Shrubland”*. The native grasses are almost completely absent between the saltbush shrubs due to over grazing by sheep and kangaroos. However if one looks closely the “head” of a Spear Grass can be seen almost exactly in the centre of the photo.



Photo 6: Taken 10th December 2011. **(6)** *“Dense Dryland Tea-tree Shrubland”*.



Photo 7: Taken 11th December 2011. **(7) “Low Saltbush Shrubland”.** At one time the foreground would have been covered in Spear Grass and Wallaby Grass instead of Wards Weed. In fact this type of area is the second preferred location for native grasses to grow in. With the odd exception of a few isolated trees, the boundaries of this type of plant community are almost invariably sharply defined. Giving the appearance that the Mallee trees were once cleared. Whereas in fact it's caused by a sudden change in soil type and sub-soil profile.



Photo 8: Taken 30th November 2013. **(14) “Open Mallee Woodlands with Depleted Understorey”.** Formally (in most instances) the Understorey would have been Low Saltbush with a smattering of Tall Shrubs. However this can vary depending on the topography, soil type and sub-soil profile.



Photo 9: Taken 15th January 2012. **(13) "Dense Mallee Scrub with Depleted Understorey"**. The distinction or definition separating "Open" from "Dense" is fairly subjective in this discussion. When being more precise it's taken from the amount of canopy cover which can be measured from the amount of shade on the ground at midday.



Photo 10: Taken 18th January 2012. **(11) "Open Myoporum Woodland"** that was once "Tall Open Shrubland with Scattered Myoporum Tree Canopy". In the 1970's a bulldozer was used here to push down the Tall Shrubs in an effort to increase the area for growing Spear Grass. This indicates that at the time a good bank of Spear Grass seed was still present to warrant the expense of clearing the shrub growth away. In fact in 1974, Spear Grass growth was so lush and abundant, monthly working bees at Moorunde had to be cancelled for fear of car exhausts igniting the dry heads and starting bushfires.



Photo 11: Taken 9th April 2012. **(4) "Claypans"**. This particular claypan is a good example of the type "...that have a deep dish of calcrete which is fairly impervious to water..." and "...can be readily identified by the fact that they have quite well defined perimeters of large perennial plants such as tall shrubs or Mallee trees". They were once the best locations for annual grasses [Hyde]. Now they are weed infested, dug over by wombats and have a "hard-pan" surface. Note on the far right-hand side (and not so easy to see but around the claypan perimeter) dead shrubs – due to dieback from waterlogging. This particular area would be a good place to construct an enclosure to re-establish native grasses for harvesting the seed as it is at present free of Onion Weed.



Photo 12: Taken 30th November 2013. **(15) "Grassland with Recovering Myoporum"**. One of the five badly degraded/depleted areas with a classification to match its present condition. The "grass" is Onion Weed and Wards Weed. In the past it probably would have had both tall shrubs and saltbush understorey between the Myoporum. i.e. Plant Community (9) "Open Myoporum Tree Woodland with both Tall Open Shrub and Low Saltbush Shrub Understorey".



Photo 13: Taken 22nd December 2013. Illustrations (Photos 13, 14, 15 & 16) that prove Spear Grass does grow amongst the saltbush shrubs (or did). A few years ago before I found out it was a controversial issue I could have photographed hundreds of hectares of Spear Grass almost "blotting out" the saltbush shrubs as shown in the small area in Photo 16.



Photo 14: Taken 22nd December 2013. See caption under Photo 13.



Photo 15: Taken 22nd December 2013. See caption under Photo 13.



Photo 16: Taken 22nd December 2013. See caption under Photo 13.