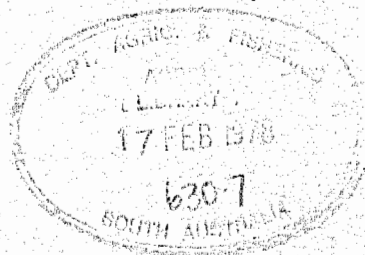


DEPARTMENT OF AGRICULTURE AND FISHERIES, SOUTH AUSTRALIA

Agronomy Branch Report



A REVIEW OF WEED CONTROL IN THE ARID ZONE OF
SOUTH AUSTRALIA OUTSIDE OF LOCAL GOVERNMENT AREAS -
1945 - 1976

Compiled by: A.W. Lewis,
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Pest Plants Commission.

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Executive Officer,
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Report No. 81

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A REVIEW OF WEED CONTROL IN THE ARID ZONE OF SOUTH AUSTRALIA

OUTSIDE OF LOCAL GOVERNMENT AREAS - 1946-1976

1. INTRODUCTION:

This report aims to document the control of a number of serious weeds in the arid zone of South Australia outside of local government areas. It broadly covers the work of the Department of Agriculture & Fisheries carried out since the War under the authority of the various Noxious Weeds Acts.

Before 1956 very little weed control work was carried out in these areas. However, when new State weed control legislation was introduced at that time, a new stimulus was provided which enabled successive weeds advisory committees to conduct a series of important programmes which aimed to control Noogoora burr, prickly pears and mesquite.

This report does not cover the continuous advisory service to pastoralists and others which many have made use of over this time. Bathurst burr, Californian burr, horehound, boxthorn, caltrop, wardsweed and three-cornered jack have been the weeds which have most often brought forward queries from landowners in these regions.

During the period under review, the Department has also conducted various research projects aimed at the control of some of those weeds in the arid zones. For example, an extensive trial carried out at Dawson in the early 1960's by Mr. Ross, established that at that time there were no economic herbicides for the control of onion weed. Other projects have screened herbicides for horehound control and for boxthorn, prickly pears and mesquite. Current knowledge would indicate that herbicides are useful in the arid zones for basal bark treatments of woody species, such as the use of 2,4,5-T on boxthorn and mesquite. Some pastoralists are using bromacil pellets for boxthorn control on flood-out areas but the long term residual effect of the chemical is cause for concern. Broad-scale spraying of other weeds, such as horehound or three-cornered jack are not economically feasible and this would indicate that any programmes aimed at controlling unwanted plants in arid zones must be first aimed at preventing their establishment. Once established, weeds in these areas can only be controlled by grazing management or, perhaps in the future, by biological control agents.

Nearly all the weed control work during this period has been aimed at noxious weed control within the dog fence. Problems outside the dog fence in the cattle country have been ignored because of the vast areas involved and the very low productivity of the country. Some work was carried out outside the dog fence late in 1976 when it was believed that large outbreaks of mesquite were developing in the north-east corner of the State. Subsequent surveys proved this to be incorrect. However, they did show that Noogoora burr is becoming established in these remote areas, but to this date no attempts have been made to bring it under control.

2. NOOGOORA BURR CONTROL:

Since 1956, Noogoora burr has been placed on Schedule I of the Noxious Weeds Act, 1956-1969. As such, it was declared a dangerous weed and it was the policy of the Department of Agriculture & Fisheries to help survey, give technical advice and spray or hand-pull outbreaks of weeds listed on that Schedule. Noogoora burr, therefore, came under this policy.

This policy has meant that for a period of nearly twenty years the Department of Agriculture & Fisheries has accepted virtually complete responsibility for the physical destruction of any Noogoora burr plants that have been found. In general, arid zone landowner participation and interest was minimal.

With the influx of a large number of Noogoora burr infested stock from New South Wales and Queensland in the early 1960's, numerous outbreaks of Noogoora burr were reported widely distributed in the pastoral areas.

Since that time at least twice yearly weed control officers from the Department have surveyed and sprayed or hand-pulled the known infested sites.

Before 1960 a serious infestation of Noogoora burr had been located on Yadlamalka Station which is about 100 km north of Port Augusta and the details of the work that has been carried out there are listed below. Besides that infestation, the most serious infestations were found along the South Australian, New South Wales border country. By persistent search and destroy campaigns and with assistance from the owners of the Mulyungarie and Mutooroo Stations, these infestations have never developed seriously and are considered to be under control.

One infestation which still persists is at the railway reserve at Mingarie where there are two dams and some channels and flood-out country. This infestation has spread along the creek and is now established on Mulyungarie Station. Sheep coming onto the railway reserve in 1958 probably caused the infestation. In 1962 railway employees removed much of the growing burr with some assistance from local landowners. By that time flood waters had carried the burr 45 km down the Mingarie Creek to a flood-out plain on the Mulyungarie Station.

As a measure of the work carried out by the Department, it is worth noting that since the discovery of burr at the Mingarie railway reserve in 1962, the area has been inspected and treated annually by the Department. This has involved on-foot inspections of many miles of creek beds and surrounding country. The burr still persists, mainly because germinations are missed following light rains. Also the dams, when they are full, flood various inaccessible areas where the burr has become entrenched.

Since rigid control of stock infested with Noogoora burr has been maintained, one of the main sources of its entry is by flood waters crossing the border from infested country. This happens on Mulyungarie Station where several water courses enter South Australia from dense burr areas interstate. Constant checking is needed to prevent the burr from getting out of hand and places a heavy burden on the property owners. Consequently the continuity of the control programmes and the continuous spraying and hand-pulling measures which have needed to be carried out have largely remained the responsibility of Departmental officers.

Since 1961 all pastoral properties within the dog fence in the north-east of South Australia have received repeated calls from the Noogoora burr inspectors and on two occasions special extension materials, involving pamphlets describing the weed and even samples of sterile burrs, have been sent to the owners.

2.1 STOCK INSPECTIONS FOR NOOGOORA BURR CONTROL:

During 1960 it became obvious from reports from stock inspectors and agricultural advisers and stock firms, that large numbers of sheep were entering South Australia from Noogoora burr infested properties in New South Wales. This movement of sheep was necessary to replenish flocks depleted by the 1959 drought in South Australia.

Once the seriousness of the situation was realised, a letter was sent to all stock firms and a large poster was prepared warning buyers of the dangers of Noogoora burr and this was distributed to stock firms and displayed at many points where stock were being bought and sold throughout the State.

Weed control officers attended stock sales as far distant as Broken Hill in New South Wales and Yelta in Victoria, to warn prospective buyers that they could bring home serious problems.

Despite all of this publicity during 1960 it was found that legislation was necessary and Executive Council proclaimed a Regulation under the Noxious Weeds Act, 1956 which gave any authorised weed control officer the powers to:-

- * Seize or take possession of anything or animal which has in or upon it any plant or part of a plant which is either generally or in any locality a proclaimed weed.
- * Detain, hold or impound such thing or animal for such time and in such manner and cleanse or otherwise treat or deal with such thing or animal in such ways as may be reasonably necessary to enable the authorised officer to destroy such proclaimed weed.

This general regulation gave sufficient powers to authorised officers to enable them to insist that sheep must be shorn before sale if burr was found. The full resources of the Department were then marshalled to stop the flood of burr entering the State.

As time went by some policy modification of these Regulations were adopted so that burry sheep found at a sale could be withdrawn and shorn or the sale could proceed subject to the potential buyer being informed that the sheep were carrying burr and that the purchaser would then be required to shear the sheep within 14 days of the sale under conditions directed by the authorised officer.

By the 19th August, 1960 every sale in South Australia was being attended by an officer from the Department and several large flocks of sheep were withdrawn. Some buyers and stock firms were involved in heavy losses caused by the need to shear sheep during that period and very quickly the enormous number of sheep entering South Australia carrying the burr dwindled to a few lines which were usually overlooked by the agents and which carried low infestations. During that month alone, 440,000 sheep were inspected and 11,300 were found to be carrying burr.

The interpretation of these Regulations in the case of cattle infested with Noogoora burr have always been very difficult. South Australian markets have generally relied heavily on supplies from interstate and if these sales are seriously restricted then the prices for cattle rise sharply. It has therefore been the policy to ignore cattle lightly infested with Noogoora burr coming into the State provided care is taken during their transport and that they are immediately slaughtered.

By July, 1961, the inspection campaign for sheep had been so successful that the New South Wales industry could see its traditional markets in southern Australia drying up and consequently, considerable pressure was brought to bear on the South Australian Government, particularly by the West Darling Pastoral Association, to lift the restrictions. They maintained that the campaign was futile and that inevitably Noogoora burr would become very widely spread throughout South Australia as it had done throughout New South

Wales during the wetter years of the 1950's. A number of face to face discussions were held between members of the Weeds Advisory Committee and various authorities in New South Wales and gradually they were convinced that South Australia was determined to maintain its pastoral areas free of this serious weed which could reduce the value of a fleece by 20%. South Australia stood to lose at least one million dollars annually if the burr was allowed to freely establish itself in the north-east pastoral regions alone and therefore the campaign, as costly as it was, was considered to be well worthwhile.

At the end of the first two years of operation of the Noogoora burr inspection work, approximately 1½ million sheep had been inspected and more than 65,000 were shorn under restriction.

During this period valuable assistance was received from many different officers within the Department. The Horticulture Branch, for example, assisted with inspection duties and the recording of stock movements at the fruit fly road blocks. All road block inspectors were gazetted as authorised weed control officers and were given full authority under the Weeds Act, 1956.

A Notice published in the Government Gazette, came into force on 1st November, 1964. It required the owners or their agents of stock entering South Australia from any part of the Commonwealth to declare that the live-stock had been inspected and were free from Noogoora and Californian burr. The Notice required that the declaration must travel with the stock unless they enter South Australia by rail. The duplicate copy of the declaration must be sent to the Director of Agriculture & Fisheries at least 24 hours before the stock commence their last journey into the State. Although the original copy of the declaration is not carried by the Railways, that Department does supply the Weeds Section of this Department with details of stock movements by rail.

To date, the campaign has been entirely successful in that there are no known outbreak of Noogoora burr in the pastoral areas of South Australia which are at all extensive or out of control. Small re-infestations are continually being found and treated. Inspections of stock are continuing but the situation is adequately handled by one inspector working about half of his time on this problem.

The records show that in the period from 1961-1976, a total of 1,228 inspections have been made at sales and on properties by our inspectors. They have examined 10.6 million sheep and detected 240,000 infested with burr.

2.2 NOOGOORA BURR CONTROL - YADLAMALKA STATION:

It is appropriate that this report should endeavour to document in some detail the efforts to initially eradicate Noogoora burr, and then when the inherent difficulties of the situation were fully appreciated, to "control" it on the Kallioota Swamp on Yadlamalka Station, which is about 100 km north of Port Augusta.

The Swamp comprises about 2,500 ha which has been formed by the Willochra Creek as it drops its detritus before entering Lake Torrens. The area is covered with dense red gums, native bush which limits visibility and a low cover of Bathurst burr, thorn apples, three-cornered jack and medics and grasses. In addition, drains and gutters and fallen timber make travelling over the area very difficult.

For eighteen years the infestation has been given close attention by the various weed advisory committees and officers of the Department of Agriculture & Fisheries. Whilst the burr has by no means been eradicated, it has been thinned out and prevented from spreading throughout the region. Unfortunately it has not been confined as originally hoped to the one paddock which encloses the Swamp. It is now established in the next paddock to the north and open to spread to wider areas. It is essential therefore that the control programme be maintained.

The history of Noogoora burr control on the Kallioota Swamp has been outlined in detail below. It shows that the various weed advisory committees guided by Departmental officers, have frequently changed policies in relation to the control measures. This has been justified in view of the change in physical conditions at the Swamp, depending upon the floods and the variable seasons.

Mr. A.J.K. Walker, then Chief Agronomist, and Mr. J.M. O'Neil made the first inspection of the infestation at the Kallioota Swamp on 28th May, 1958 and reported that the difficult terrain made it impossible to accurately define the extent of the burr.

Mr. Walker and Mr. O'Neil estimated at that time, that the burr infested an area at least 4 km long and probably 1 km wide. The Manager, Mr. Henery, believed that the infestation had been established by burrs being washed down the Willochra, but Departmental records showed that stock had been brought from the Northern Territory in 1948 and it was probably at that time that the burr became established. The manager at first welcomed discussions aimed at eradicating the burr because he thought it would ensure that the whole area would be bulldozed and developed into what he saw as a huge irrigation paddock, to be flooded from time to time from a control dam constructed across the Willochra. This plan was, of course, quite impracticable and rough estimates given by engineers at a later date indicated that probably \$2M. would be needed to change the form of the Swamp in this way.

During January, 1959, members of the Weeds Advisory Committee visited Yadlamalka to obtain first hand knowledge of the nature of the problem before future policy could be decided. Following this visit the Committee made the following recommendations and discussed them with the Manager, namely:-

- * The Committee felt that no immediate physical action should be taken but that Mr. Henery notify all stock movements so that a close watch could be kept at the point of delivery.
- * That future consideration be given to subsidising the owners towards the cost of a trial programme of clearing and pasture improvement.
- * That everything possible should be done to find if there were other areas of the burr in the State.
- * The possibility of biological control be investigated.
- * That further consideration be given to the form exemption of the area from the Weeds Act, 1956.

Immediately following the Weeds Advisory Committee's visit an approach was made to the Army Engineers to determine if flame throwers could be used to destroy the burr, but this proved to be impracticable mainly because of the lack of mobility of the equipment that the Army had at that time.

The Senior Weeds Officer, Mr. Tideman, was also detailed to survey the Willochra Creek from the Swamp to its source on the Willochra Plain to determine if there were any infestations of Noogoora burr which might be infesting the Swamp with seed. A very detailed survey lasting two weeks was undertaken but no infestations were found.

The Weeds Advisory Committee also immediately initiated feasibility studies and costs were estimated for hand-pulling, (\$2,500) burning followed by aerial spraying, (\$2,500) or bulldozing and spraying, (\$7,000). At the time this expenditure was considered to be unwarranted so that the Committee then decided to quarantine the Kallioota Swamp. Regulations were enforced from the 15th July, 1959 The notice read in part:-

"As from the 15th of July, 1959 the owner or manager of Yadlamalka Station will notify in writing the Director of Agriculture before any cattle leave the property. The Director of Agriculture may then have the cattle inspected and if the Noogoora burr are found act in any way to prevent their spread".

Subsequently cattle yards were built at the Swamp to help comply with these quarantine regulations and the inspections were mainly carried out by Mr. R. Powell, who was then District Stock Inspector at Port Augusta.

The Noogoora burr did not germinate at the Swamp in 1960 or 1961, but early in 1962 it appeared following flooding and this initiated a detailed survey. The burr was found to be infesting at that time, an estimated 250 ha, but it could not be found on the northern side of the Swamp although conditions there appeared to be ideal for it to do so. Within the infested area there was one well defined patch covering approximately 40 ha where the burr originally had become established. Here masses of mature burr stood to one metre high and the whole area had a very high density. In surrounding areas the burr was much less dense.

By this time a new technique of applying hormone herbicides had become available. A knapsack mist sprayer had been developed which was then tested for its effectiveness. A detailed trial was laid down using various rates of herbicides through this equipment, but it was found impracticable because the capacity of these machines was so small. The area of infestation could not be covered quickly enough.

In May, 1962, the Weeds Advisory Committee again inspected the area and decided that it was imperative that an eradication programme be commenced. The Committee made the following recommendations for eradication measures:-

- * The area should be initially cleared.
- * That aerial spraying should be used as the main treatment for two consecutive years.
- * Hand treatment to follow for a five year period.

This recommendation was put into effect immediately and before the end of 1962, 320 ha of the Swamp had been rolled at a cost of \$3 per ha, and 120 ha had been bulldozed and chained at a cost of \$4 per ha. The burning costs amounted to about \$100, making in all a total expenditure of about \$5,000.

In March, 1963, aerial spraying of the infestation was attempted; 450 ha were treated at \$2.50 ha, 160 ha were mist sprayed at \$2 per ha, and then the area was hand treated. The total cost of this operation was about \$4,500.

In March, 1964, the area was again aerial sprayed followed by hand treatments at a total cost of approximately \$4,000.

In March, 1965, the Swamp was very successfully burnt and surrounding areas outside the burn were mist sprayed and hand treated at a cost of \$1,600.

In April, 1966, following the issue of a notice by the Minister of Agriculture, under the terms of the Weeds Act, 1956-1963, the owners of Yadlamalka Station entered into a contract for the Noogoora burr to be sprayed on the Swamp by Chemical Applications Service S.A. Pty. Ltd. for \$1,880. Spraying commenced on 19th May, and from that date weed control officers were stationed continually at the Swamp to support the contract team by surveying, marking and mapping the area. The total Departmental expenses amounted to \$725.

It was believed that that operation effectively controlled 90% of the standing burr.

It should be pointed out that this particular operation was successful because of the burn in the previous year.

Over the past ten years no major spray programmes have been necessary. Mainly hand-pulling by Departmental officers and station hands have kept the infestation to a minimum.

However the burr has spread into another paddock north of the Swamp which adds a new dimension to the control necessary.

The actual expenditure for the control of the burr on the Swamp has exceeded \$20,000. The cost to the owners has amounted to approximately \$4,000.

3. PRICKLY PEARS:

There are at least 18 *Opuntia* species growing in the wild in the arid zones of South Australia. Some attempts have been made to control outbreaks in various situations using biological control agents for the last 40 years. However, some species are quite resistant. Chemical control is possible where outbreaks are accessible but treatments are costly.

During 1969 the Department of Agriculture & Fisheries first attempted planned control of various *Opuntia* species in areas outside of local government.

A survey at that time showed that there were large areas of three species, namely *Opuntia robusta*, *O. monacantha* and *O. rufida*, found growing profusely around Blinman and the Angorichina Hostel.

In November, 1969, control measures were taken to clear large areas of *O. robusta* and *O. monacantha* at the Angorichina Hostel and also many scattered plants in the surrounding hills and creek beds.

Several km of the Parachilna Crekk bed at Blinman were found to be heavily infested with *O. rufida*. Odd plants were found downstream for a distance of 35 km. This area was treated in February, 1970.

During this intensive control programme in the Flinders Ranges a further serious infestation was found at the Angorichina Station, about 10 km east of Blinman. O. streptacantha occurred as groups of plants close to the ruins of the original homestead and O. imbricata, commonly called Devil's rope, also formed several large infestations. The owner of the Station, Mr. K. Lord, admitted that plants could be found up to 20 km down the creek from these infestations. In November, 1970, several patches were treated to establish the effectiveness of Tordon 255 in distillate as a treatment. At the same time, follow-up treatments in the other areas were carried out. Excellent results were obtained, but although several attempts were made to convince Mr. Lord of the advisability of controlling the prickly pear on his Station, nothing was done.

In November, 1972, biological agents, Dactylopius newsteadii, commonly called cochineal and Cactoblastis cactorum, were released. The cochineal established well on O. imbricata (Devil's rope) and large areas of these outbreaks have now been reduced. The Cactoblastis failed to establish.

Various Opuntia species have become established over wide areas of the north-east pastoral country. For example, there are many clumps north of the River Murray and heavy infestations were left at Radium Hill when that town was abandoned. The infestations at Radium Hill have been treated by the Department and maintenance work in that area is still continuing.

Because the seeds of prickly pear are so readily spread by birds and animals, many scattered clumps can still be found throughout the pastoral areas, particularly in the Flinders Ranges and it will be necessary for this programme to be maintained and improved upon if we are going to avoid serious infestations becoming established.

4. MESQUITE:

Mesquite is a very vigorous leguminous tree or shrub which is often grown as an ornamental. It has proved to be a very serious problem in the range-lands of Texas and New Mexico, where at least 35 million ha have become infested. This plant is covered with long thorns and has the ability to sucker and very quickly form impenetrable thickets.

Serious infestations have occurred in Western Australia. By 1954, between Onslow and Roebourne, mesquite had spread over 10,000 ha of which 2-3,000 ha had reached thicket formation. During the following two years over \$40,000 was spent by the Western Australian authorities on trying to control the weed with tractors and chains, bulldozing, burning and mopping up with herbicides.

At a joint meeting of the weed control authorities of New South Wales, Victoria and South Australia in 1963, the South Australian Departmental officers drew attention to the clumps of mesquite which were appearing around Broken Hill.

Much of the information available to the South Australian officers at that time had been made available by the Manager of the mining company, Conzinc Riotinto of Australia. He had found that the flying doctor had obtained seeds from the Company's plantations and in good faith had distributed them from the air over quite large areas of the West Darling in the hope that this would provide fodder for sheep.

In 1969, the Weeds Advisory Committee of South Australia visited Broken Hill to examine the mesquite problem. They expressed extreme concern at the extent of the rapid spread of the infestations in New South Wales and as a result a detailed survey was arranged to see if the weed had become established in South Australia near the border.

The Broken Hill Mesquite Destruction Committee was formed and a representative from the South Australian Department of Agriculture & Fisheries, Mr. S.J. Garrick, was invited to attend the meetings and to give technical advice.

The survey along the South Australian, New South Wales border within South Australia produced only three mesquite plants. These were found at Cockburn near a large mesquite tree which was growing on the New South Wales side of the yard of the Bordergate Hotel. In subsequent years at least two hundred seedlings germinated in this area on both sides of the border and these were treated by Departmental officers following annual inspections.

There is no doubt that strong representations to the West Darling Pastoralists' Association by the South Australian Department of Agriculture to establish a control programme and obtain Government funding, contributed largely to the early success of the Broken Hill Mesquite Destruction Committee.

All the mature seed producing mesquite trees have now been removed from western New South Wales areas and efforts are now concentrating on destroying seedlings as they appear.

In South Australia mesquite has been reported over a wide area in the north-east station country, since about 1970. Reports have come from Radium Hill, northern pastoral towns and in the far west at Kingoonya. All plants have been destroyed but follow-up inspections are continuing to prevent seedlings from establishing. At Kingoonya, for example, three large trees in the railway station garden spread seed over a wide area and these had started to germinate. The seedlings have all been eradicated and subsequent inspections have kept the area free from the weed.

In October, 1970, mesquite was discovered at Wallerberdina Station near Lake Torrens. Initially several mesquite trees and a hedge of mesquite were growing at the old homestead which was swept away by flood waters in 1964. Seed, probably dispersed by the flood, was distributed over a wide area and extended to the Lake Torrens Station.

The infestation when first reported, was extensive and the Department of Agriculture & Fisheries immediately arranged to have the area surveyed and the weed treated. A field day was arranged for neighbouring property owners and other interested people, and wide publicity was given to this operation and to the dangerous potential of the weed.

The mesquite had spread up to 16 km from the original stand and had established over a wide area on sandhill country as well as flat country. The initial survey and treatment involved four men from the Department of Agriculture & Fisheries for five days. Since then six inspections have been carried out at regular intervals and during four of these inspections, wide scale treatment has been carried out by Departmental officers at a total cost of nearly \$1,300. This outbreak has now been reduced to a few widely scattered seedlings, but there is still lack of co-operation by the landowners.