

# final report

**Project code:** B.PRS.0310 / PIRD.03.V10  
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**Date published:** January 2006  
**ISBN:** 9781741918748

**PUBLISHED BY**  
Meat & Livestock Australia Limited  
Locked Bag 991  
NORTH SYDNEY NSW 2059

## **Managing *Pastures After Wildfire***

**Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.**

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## **Abstract**

Livestock producers can be better prepared for wild fire and the recovery period after a farm is “burned out”. Risk can be managed for fire recovery and businesses can become more productive as a result of such a disastrous event. Fertile soils combined with plants and animals without trace element deficiencies can recover from a fire more efficiently and create a more productive business overall. Opportunities arise from disaster and re-evaluating how a farms’ infrastructure is used to the best advantage should be explored. The “Managing Pastures After Wild Fire Project” involved the recovery of a number of grazing properties after a majority of pastures, fences and other infrastructure were burned in the 2003 High Country bushfires.

## **Executive Summary**

When a farm is burned out – the farm manager is usually at a loss as to how to start the recovery process. The Managing Pastures After Wildfire Project was designed to test, monitor and observe the recovery process of grazing businesses burned out by 2003 High Country Bush Fires. Changes to management to facilitate business recovery principally in the areas of soil, pasture and animal production were the project objectives. The information gathered can be used not only by farms burned out in the future, but by all Australian farm managers to aid risk management and to have a better understanding of the impact trace elements have on production. Post fire the biggest issues farm managers must address are the recovery of burnt pastures, soil protection, weed germination, feed for livestock, livestock health and rebuilding infrastructure. In this project testing to establish the state of trace element levels for soils, plants and animals was needed to answer some difficult pasture recovery and animal health problems. Fencing layout was altered in an attempt to increase carrying capacity and grazing and strategic fertiliser use aimed to control the weed problem that followed the fire.

## **TEST DON'T GUESS!!!**

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When an event such as fire produces a major farm wide impact, effective, smart management decisions can literally be life or death for pastures and livestock. The money and time spent testing to draw the most accurate picture possible of animal, soil and pasture health will provide valuable time and money saving information that will get your business back on track. Expect any animal health issue experienced pre fire to be magnified post fire!

## **GROUP PARTICIPATION AND LEARNING OUTCOMES**

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In this project an improvement in skills and knowledge in relation to soil, plant tissue and animal blood testing resulted for participants. Utilising their new skills and understanding participants changed management toward more strategic fertiliser use to aid pasture recovery and increase pasture capacity for long term performance. Trace element deficiencies are now addressed much more holistically by participants with soil, plant and animal deficiencies addressed through the most economic and effective means available to their business.

## **CONSIDER AGISTEMENT**

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If you are fortunate enough to source agistment you can rest your pastures and allow them to start recovering. When stock are off the property you don't spend valuable time feeding them, they are not baring out paddocks further and soil disturbance is reduced. If all your fences are burned (as in the groups experience) you wont spend time chasing your stock all over the country side. Use stock containment and feed lotting if you can't get agistment or for economic or disease related reasons.

## BARE GROUND

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Spelling and fertility are the two key areas for addressing the bare ground – pasture recovery problem created by fire. In a risk management sense fertile soils will create the base for a business that will be back producing again sooner.

## WEEDS

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Broad leafed weeds flourish in the bare ground created by fire. Strategic grazing and fertiliser application to favour desirable grass species was used with some success over the longer term. Pastures that had chemical weed control now have the lowest rate of infestation. Grass weeds have been reduced in pastures post fire where fertiliser and grazing management have favoured the more desirable perennial species such as rye grass and cocksfoot.

## RE-EVALUATE YOUR INFRASTRUCTURE

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If yards, fences and haysheds are destroyed re-evaluate their use and layout. As demonstrated in this project the opportunity to change the fencing of one block of land doubled the carrying capacity. Haysheds burned while buried silage was safe!

## CARRYING CAPACITY

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A 600 acre block that was fenced into 4 paddocks before fire destroyed all the fences was re-fenced into 10 paddocks off a central laneway. Utilising this opportunity to alter infrastructure for improved management of grazing, the 600 acres block went from carrying 8 DSE per hectare pre fire to 15 DSE per hectare post fire. At one point the block carried 25 DSE for 8 months.

## LIVESTOCK PRODUCTION – BLOOD TEST RESULTS

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Any animal health issue particularly metabolic disease present on a property will be magnified post fire. Animal production dropped significantly due to the fire with animal death rates (not including death directly related to burns or smoke inhalation) increasing. Calf marking rates were approximately 90% post fire compared with at least 95% pre fire – directly related to calf deaths due to trace element deficiencies causing immunosuppression. Some livestock had deformed off spring, premature offspring and spontaneous abortions were observed. Fertility levels were down. Once blood tests turned up a serious selenium deficiency and management addressed the problem, production made drastic improvements. Calf marking increased to over 100% in some herds. Weaning weights increased 15kg once management addressed the deficiency with cows displaying more signs of oestrus and “cleaning up” sooner. There is an observed reduction in a “tail” amongst weaned calves. These improvements occurred despite less available feed due to low rainfall.

## FERTILE SOILS HELP MANAGE RISK

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All Australian grazing systems are exposed to risks such as fire. Fertile soils mean a faster recovery time i.e. less time needed to get the property back producing. Cash flow becomes critical in these situations so a system that has the capacity to recover quickly will reduce the risk for the business of fire.

### Background – THE HIGH COUNTRY FIRE 2003

On the 30<sup>th</sup> of January 2003 a wildfire (part of the Bogong Complex or “High Country” Fire) burned a number of farms in the Wulgulmerang area. In the immediate recovery period post fire, the pastures of the area recovered poorly. Large areas of soil remained black and devoid of any plant life. Broad leafed weeds then colonised the bare patches in many cases.

Some patches of soil are still bare to this day 3 years later. The ratio of clover to grass in the autumn – winter period post fire was 70:30. That amount of clover in the pasture was not only dangerous to stock health, but lead to bare ground in the warmer months when the clover burned off. The grass weed Brown Top Bentgrass had a strong recovery post fire in comparison to locally used preferable pasture species such as rye, cocksfoot and fescue and the native grasses such as kangaroo grass, wallaby grass and poa tussock grass. Live stock suffered unprecedented levels of metabolic disease in the post fire period. Grass Tetany a disease caused by low blood levels of magnesium was witnessed in yearling heifers (very uncommon). The local hypothesis for the increase in trace element deficiency was that the animals were digesting large amounts of the potash coating any available pasture. The increase in potassium absorbed by the animals was thought to be inhibiting absorption of other trace elements.

## **Project Objectives**

### **Strategic Objectives**

The project's overall aim is to develop knowledge and skills to facilitate:

- Pasture recovery and improvements in pasture quality.
- An improvement in carrying capacity due to improved management to reduce broad leaved weeds and undesirable grass species.
- An increase in the percentage of desirable grass species and a reduction in legume content.
- A reduction in livestock fatalities due to metabolic disease through improved understanding of the interaction of trace elements in soils, pastures and livestock.

### **Operational Objectives**

- To have 15 local landholders learn more about trace element needs for cattle and therefore reduce the number of livestock deaths related to metabolic diseases by 50% per property (Up to 50 head have been lost historically on an individual property locally).
- To trial sowing methods, seed varieties, fertilizer products and grazing methods to increase the pasture cover/production, stock health and therefore carrying capacity from current approx 7DSE/ha to 10DSE/ha.
- To trial new grazing methods to facilitate the increase of desirable grass species, bring legume % of pasture back to safe levels (30% from 70%) and decrease the dominance of undesirable grass species such as Brown Top Bentgrass.
- To have 15 local landholders learn how to take soil and plant tissue test in the best manner and how to use those soil tests to benefit pasture growth and stock health.

## **Methodology**

1. Landholders will compare past practice of livestock management with new practice suggested by animal health professionals in light of trace element changes post fire. Livestock health and death rate results will then be recorded and analysed. Various supplements will be tried and the options of soil management eg topdressing with Dolomite and Lime explored. Animal blood testing to establish general herd health and any deficiencies will be carried out
2. Approx 100ha of bare areas of burned soil will be seeded with a variety of grass mixes (cocksfoot, fescue, rye grass) using different fertilizer products (dolomite and high Mg Lime may be tried to study impact on stock health, some "starter" fertilizers will be tried) and different seeding methods (broad cast vs direct drill) as advised by an agronomist. Landholders will compare the success of each trial based on germination and seedling survival rates changes in soil will be monitored through testing. This process will be further supported by the

Department of Primary Industry who are conducting a scheme with \$60/ha support for re-sowing pasture post fire.

3. Landholders will compare set stocking with rotational grazing and record changes in legume to grass ratio, carrying capacity (kg of dm/ha), % bare ground and % weed infestation.
4. Landholders will learn new skills in soil testing and how to read a soil test result and how to use those results to make informed decisions on farm.

## **Results and Discussion**

### **GROUP PARTICIPTION AND LEARNING OUTCOMES**

Of the 19 grazing businesses effected by the fire 12 were actively involved in the project. From the 19 effected businesses over 30 people participated in some of the field days, information sessions and farm walks. All 12 businesses were involved in the testing aspects of the project, where the skills needed to soil and plant tissue test were learned. Participants were taught how to interpret their test results. (Stapleton, P. 2003-2004) Test results have since been used by all participants to devise a more strategic approach to fertiliser application. Animal blood testing results have been used by participants to address animal trace element deficiencies. Production improvements are evident and are discussed below. Participants have a greater understanding of the amounts and types of fertiliser products needed to increase plant production on property including replacing fertility lost due to fodder conservation, “starter” fertilisers for pasture establishment and transport of nutrients by livestock. (Stapleton, P. 2003). (Evans, R 2004).

All participants have a greater understanding of the interaction between trace elements, soils, plants and animals. One participating grazier has started his own trace element application to pasture trial (Hamilton, L.2005) as a result of the project. Many of the participants have sought further information about products to address the discovered deficiencies.

### **BARE GROUND**

Most of the fire effected area was spelled to some extent during the recovery period. Livestock were in some cases agisted and therefore removed from the effected pasture or hand fed in “sacrifice paddocks”. Recovery in areas where stock were still grazing slowed the recovery process and led to an increase in weed content and soil disturbance in those paddocks due to the suppression by grazing of desirable grass species. Some areas of the fire burned so hot and deep into the soil that there still remain (3 years later) patches of bare ground especially in gullies and stock camps where large amounts of flammable organic matter was present. With the exception of these small areas however much of the pasture has recovered without re-seeding, however spelling and fertility have been observed as critical to the quality of pasture now growing in paddocks that were burned.

### **WEEDS**

Broad leafed weeds flourished in the wake of the fire. In paddocks where weeds were not controlled post fire, the weeds especially spear thistle (the main thistle species in the area) are still competing well against pasture species. Although some strategic grazing to utilise shading as a management technique is being tried, chemical control has seen the best results when used in conjunction with fodder crops or strategic fertiliser application to increase pasture growth and remove the opportunity for weeds to germinate. Grass weeds such as the problematic Brown Top Bentgrass have become less prevalent in paddocks where strategic fertilizer application and rotational grazing is favouring productive species such as perennial rye and cocksfoot.

## **CARRYING CAPACITY - FENCING**

The loss of all fences on a 600 acre block allowed the design of a new fencing layout. The area was fenced into four paddocks pre fire. The area had previously carried 8 DSE to the hectare in the years before the fire. Allowing for watering points (some new dams were put in) ten paddocks were fenced on the block, around a central lane way. With just a change of fencing to increase the number of paddocks, the area is now stocked at approximately 15 DSE to the hectare throughout the year. At one point the area carried 25 DSE for eight months. Fencing and subsequently an improvement in pasture management were the only changes initially on the 600 acres.

## **LIVESTOCK PRODUCTION – BLOOD TEST RESULTS**

The impacts of the fire on livestock health (apart from the initial burns, stress and lack of feed) emerged many months after the initial blaze. Five adjoining landholders all reported serious animal health concerns that became more problematic at the beginning of calving and lambing approximately 7 months after the fire. To summarise, the animal health trouble as a result of the fire, effected landholders agree that any animal health issue that was problematic pre fire is magnified post fire. Impacts of fire on animal health and wellbeing must be managed to control the loss of production and even large numbers of livestock deaths in the months to years post fire. The calf marking percentage on properties immediately after the fire was as low as 90%. This was much lower than previous years with most properties marking at least 95%. Deaths in young calves at approximately two weeks of age were occurring - basically calves were dying of a variety of common illnesses. It appeared that their immune systems were not working effectively.

## **TESTING**

Screening was carried out across the 5 affected properties by the Department of Primary Industries. A variety of viral diseases were detected across the herds, however vaccination of the herds did not alter the health status. Two sick calves were destroyed and autopsied by the Local Snowy River Vet Clinic (Vet J. Cunningham 2003).

### **Summary of Report.**

“Female (calf 1): Inflamed bladder wall, very enlarged mesenteric lymph nodes. Otherwise no gross changes.

Male (calf 2): Inflamed bladder wall, white patches in kidney some lobules, very enlarged mesenteric lymph nodes. Otherwise grossly normal.

Minimal body fat both calves.

Lab Results:

Glutathione peroxidase levels which indicate selenium intake were-

Calf 1: 0

Calf 2: 3 (normal range 20-150).

Therefore both calves markedly selenium deficient. There were no signs of white muscle disease on the samples submitted however lesions can be patchy and it may be a possible cause. It also accounts for the ill thrift seen and it may cause increased susceptibility to other illness. As calves normally acquire selenium from their mother's milk, the mothers of these calves must also be deficient. Selenium is very important in immune function, with deficient animals often being more prone to a variety of infections. Both calves tested showed signs of immunosuppression. Calves were tested for a number of other diseases and returned no significant results.

### **Summary**

Very marked selenium deficiency is the major problem in these calves and has predisposed them to other illness. All adult stock should be assumed to be selenium deficient unless recently treated or tested otherwise.” As a result of the testing of the two calves the project participants decided to test five adult cattle from the five properties having animal health

issues (Total of 25 head tested). The trace elements tested for were copper, cobalt and selenium (as advised by local vet David Mitchell 2005).  
Snowy River Vet Clinic (Vet D. Mitchell 2005).

#### **Test Results for blood tests:**

“Copper: All the results were in the high marginal to adequate range, indicating that copper is not likely to be a production or health limiting mineral in this area. Cobalt: All the results were in the high marginal to adequate range indicating that cobalt is not likely to be a production or health limiting mineral in this area.

#### **Selenium:**

Five animals tested may have had significant feed intake from outside the area. The results of all other properties indicate that there is a significant selenium deficiency in the area with 11 animals being selenium deficient, 9 in the low marginal group and the four grazed elsewhere in the adequate group. A selenium supplement should be considered by all farmers in this area especially to young cattle and heifers prior to joining.”

Since these test results were provided to the group, animals have been treated with selenium supplements. Results in calf marking rates have drastically improved with rates in excess of 100% in some herds. Other observed changes within herds are increased calf growth rates (calves on one property weaned 15 kg heavier than previous year in spite of less available feed), decrease in “tail” or small calves in herd, cattle coats are “cleaning up” sooner after winter, female cattle are showing more signs of oestrus. Cattle are generally observed to be healthier and more productive. All these improvements have been observed in spite of less feed being available to the cattle due to lower than average rainfall.

#### **SOIL AND PLANT TISSUE TESTING**

Soil and plant tissue testing was conducted across 12 of the fire affected properties. As well as improving the groups knowledge of the fertility levels impacting upon pasture recovery, testing skills and understanding the results of tests were improved. Generally across the district advice provided by the Department of Primary Industries and Farmright Technical Services (Independent soil and plant testing) pointed to a few major factors that were limiting pasture recovery post fire.

*Information From Soil Tests (performed by D. Cook FARMRIGHT Technical Services 2003-2005):*

#### **Phosphorus:**

Paddocks across the project had naturally low phosphorus levels. Where phosphorus has been applied in most cases levels were still only returning low results. Generally pastures in paddocks with a higher phosphorus level (Olsen 14 or higher) recovered much more quickly than those more “natural paddocks” with low phosphorus levels (Olsen 9 and below). All the soils in the project area were acidic with elevated aluminium levels. Many of the paddocks were strongly acidic. Where a paddock was strongly acidic with elevated aluminium levels the cation exchange capacity was reduced. Liming was the recommended treatment provided for the highly acidic paddocks. Paddocks that were limed in the years preceding the fire were said to be more productive pre fire and recovered better post fire than those paddocks not limed by project participants. Due to the fire burning a great deal of organic matter on top of the soil, and in some areas into the top soil – organic carbon levels were expected to be low. Most test results returned a moderately high organic matter result however.

#### **Information From Plant Tissue Tests:**

Plant tissue testing was an area of testing that few participants had tried before. The test results delivered some very useful information and have lead to one participant conducting



his own fertiliser trial. Molybdenum and Boron were the two trace elements that appeared to be low to marginal (Moly around 0.18mg/kg and Boron 17mg/kg). With rye grass one of the most common pastures in the project area, this is of concern. None of the paddocks tested had satisfactory levels of these elements so it is difficult to say if they would have improved pasture recovery post fire. Advice provided suggests that these elements have impacts on pasture production therefore it is assumed that should levels be adequate then pasture recovery would be improved. Many landholders have since applied fertiliser products containing molybdenum, with one landholder conducting a trial of boron application.

## **Success in Achieving Objectives**

### **STRATEGIC OBJECTIVES**

Objective: *"To develop knowledge and skills to facilitate":*

- *Pasture Recovery and improvements to pasture quality:*

Pastures are recovering and improving due to spelling, weed control, improved grazing techniques and strategic fertilizer application.

-*An improvement in carrying capacity due to improved management to reduce broad leaved weeds and undesirable grass species.*

Carrying capacity has in one instance doubled due to a change in fencing layout. A reduction in weeds has been achieved through chemical control, improved grazing and strategic fertiliser application to favour desirable species.

- *An increase in percentage of desirable grass species and reduction in legume content.*

Desirable grass species have increased due to changes in management to favour their dominance in pasture makeup. Legumes have returned to levels lower than 30 % in pasture. In some part legume % has been influenced by management, however natural processes seem to favour the reduction in legume content.

- *A reduction in livestock fatalities due to metabolic disease through improved understanding of the interaction of trace elements in soils, pastures and livestock.*

Participants have a far greater understanding of trace element levels and their importance in a grazing system for plant growth and animal health. Livestock deaths have been greatly reduced thanks to the results of this project and on farm production has been boosted.

### **OPERATIONAL OBJECTIVES**

*To have 15 landholders learn more about trace element needs for cattle and therefore reduce the number of livestock deaths related to metabolic diseases by 50% per property.*

The percentage of deaths due to metabolic disease proved a difficult area to measure. However calf marking rates have improved significantly due to a greater understanding of trace element deficiencies.

*To trial sowing methods, seed varieties, fertiliser products and grazing methods to increase the pasture cover/production, stock health and therefore carrying capacity from the current approximate 7 DSE /ha to 10DSE/ha.*

Unfortunately the combination of low rainfall and the State Government running out of funds and not supporting re seeding of pastures prevented the sowing methods and seed variety trial. However learning how to use testing to be more strategic with fertilizer use, altering a fencing system and addressing a stock health problem has seen marked improvements in carrying capacity well beyond the 10 DSE up to 25 DSE for an eight month period on one block of land.

*To trial new grazing methods to facilitate the increase of desirable grass species, bring legume% of pasture back to safe levels (30% from 70%) and decrease the dominance of undesirable grass species such as Brown Top Bentgrass.*

An increase in the use of strategic grazing (utilising new fencing layout) and managing productive grass species through strategic fertilizer application, has lead to more productive

pastures. Desirable grass species such as perennial rye and cocksfoot are gradually dominating the pasture composition with undesirable species such as Brown Top Bentgrass and broad leafed weeds starting to decline. The large amount of clover that was present when pastures re-shot after the fire has declined. This appears to have happened with little intervention by landholders. Road sides that were clover dominant immediately after the fire have become grass dominant again with little to no management.

*To have 15 local landholders learn how to take soil and plant tissue tests in the best manner and how to use those soil tests to benefit pasture growth and stock health.*

Up to 30 landholders in the fire effected region learned more about soil and plant tissue testing. As a result production has increased on the participating properties. On one property calves weaned in autumn 2006 are an average of 15kg heavier then calves weaned in autumn 2005. 2006 calves weighed an average of 280kg vs 2005 calves at 265 despite less available feed.

### **Impact on Meat and Livestock Industry – now & in five years time**

The information gathered as a result of this project will assist graziers effected by fire in the future. It will also provide information to the grazing industry in general when risk management is considered. The time it takes from a major event such as fire until production can return to profitability or at least cash flow is critical. Knowing the impact of various trace elements and their deficiencies on production has allowed this group of producers to increase productivity. For the grazing industry now and into the future, livestock producers need to be more aware of stock health in this regard and the impact of soil fertility on the grazing business ability to recover after a major event such as fire. Testing to improve the fertility of soil and the health and production of livestock will improve the bottom line for a grazing business through improved livestock health, fertility and weight gains. Testing will help that business manage risk if they have this knowledge in the event of a wildfire burning out their property.

## **Conclusions and Recommendations**

### **TEST DON'T GUESS!!!**

When an event such as fire produces a major farm wide impact, effective, smart management decisions can literally be life or death for pastures and livestock. The money and time spent testing to draw the most accurate picture possible of animal, soil and pasture health will provide valuable time and money saving information that will get your business back on track. Expect any animal health issue experienced pre fire to be magnified post fire!

### **CONSIDER AGISTEMENT**

If you are fortunate enough to source agistment you can rest your pastures and allow them to start recovering. When stock are off the property you don't spend valuable time feeding them, they are not baring out paddocks further and soil disturbance is reduced. If all your fences are burned (as in the groups experience) you wont spend time chasing your stock all over the country side.

### **RE-EVALUATE YOUR INFRASTRUCTURE**

If yards, fences and haysheds are destroyed re-evaluate their use and layout. As demonstrated in this project the opportunity to change the fencing of one block of land doubled the carrying capacity.

### **WEED CONTROL**

Areas of burned pasture that were sprayed for broad leafed weeds now have the lowest rate of infestation.

## **FERTILE SOILS HELP MANAGE RISK**

All Australian grazing systems are exposed to risks such as fire. Fertile soils mean a faster recovery time i.e. less time needed to get the property back producing. Cash flow becomes critical in these situations so a system that has the capacity to recover quickly will reduce the risk for the business of fire.

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