

Issues & Topics raised at the

HORSES & CLIMATE IMPACTS Workshop

Adelaide Showground 14 June 2012

www.horseslandwater.com



Acknowledgements

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Introduction

Agriculture is often cited as being the industry sector to be hardest hit by climate change due to its reliance on natural resources and vulnerability to climate and weather. Horse keepers and those who manage land for horse racing, recreation, breeding or sports are no exception.

The economic impact of climate change is far-reaching. Climate change is expected to bring higher average temperatures, up to 5-10% lower rainfall in southern Australia by 2030 and 20% or worse decrease by 2070 with 1.5 degree rise in temperature. Agriculture (which includes horse keeping) is expected to be the hardest hit industry due to the reliance on weather for production and to some extent, participation. For horse keepers the quality and availability of pasture grasses, baled hay and manufactured feed, and maintenance of racetracks & sport horse grounds are major areas of impact to be considered.

Horse keeping systems in Australia are gradually undergoing change in response to greater awareness of better land management practices. For example, rotational grazing of pastures is replacing fixed grazing and water courses are being protected by fencing. Topics such as sustainable land management practices are being discussed in public forums from classrooms, through web-based forums to social sites.

Increased cost and difficulties in obtaining insurance, shifting profiles of disease, management of increased days per year where heat stress is an issue, availability of hay and even “food miles” for horse feedstuffs are an issue, with an increasing number of overseas products being sold in Australia.

However, little to no work has been undertaken to help horse owners (commercial and private) make informed decisions about how to adapt to climate change. Without investigation, development of resource tools and science-led guidance to support decision makers, decision-making support tools, the horse industry collectively stands to suffer unnecessary economic loss and miss out on market opportunities.

A risk based approach which can be integrated into normal strategic and operational decision making points needs to be developed. Effectively, climate risk and the need for adaptation needs to be considered by the horse industry in the same way other business risks are – embedded in both strategic planning and day to day operations.

Developing new or modified practices will require acknowledging and balancing innovation and tradition alongside adaptation and mitigation. Before this can be achieved, we need to understand the current knowledge base, identify gaps in knowledge and prioritise research or collaborative industry programs. These steps will provide the basis for setting a sustainable, collaborative and effective research agenda.

The **“Horses & Climate Impacts Workshop”** was the selected method chosen to engage the horse owning community and organisations in challenges for the future.

Horse owners & researchers alike are encouraged to use this report to progress actions, support research & education and most of all, to share the positive message that you can take action to adapt today.

Welcome Message

Credit: Nicole Halsey, Member of the Premier's Climate Change Council. (Excerpts from Horses & Climate Impacts Workshop Opening Statement. Full speech can be found on www.horseslandwater.com)

Most of you here today would have heard of climate change and at some level, be familiar with the general changes we are expecting in our climate into the future.

In Australia, we can expect more frequent and extreme weather events including heat waves, storms, cyclones and bushfires. We can expect a continued decline in rainfall in some parts of the country like South Australia, and higher temperatures and decreases in water supplies. We can expect sea levels to rise along our coasts.

At a high level, these changes in our climate are fairly certain. There is less certainty however, around the rate and magnitude of change we should expect.

How much our climate will change will be dependent on for example, how successful we are as a global community in reducing greenhouse emissions.

But this uncertainty is not a reason to delay thinking and planning now so we can adapt to the impacts of climate change and take advantage of any opportunities it may present.

Adapting to climate change is a shared responsibility.

Governments, businesses and the community have important, different and yet complementary roles to play in adapting to climate change.

The first step is developing an understanding of what it may all mean for you, your industry, your sector, your community or whatever.

Thinking about and planning for climate change is at its essence about understanding and managing risks.

Risks are best dealt with if they are firstly, well understood, and secondly, dealt with by those best placed to manage them.

And that brings me back to today. Today is all about identifying what climate change may mean for the horse industry, whether it be as breeders, trainers, horse owners, harness racers, pony clubbers and so on.

How might climate change impact on you and your activities in the horse keeping industry?

Think about your daily activities. When do you train your race horses? How might changes in temperature affect what you do when? How might you need to retrofit or design new stabling facilities to ensure the comfort of horses if the length and intensity of heat waves increases?

How might climate change affect the spread of equine diseases?

Think about events. Will their staging need to change? Will venues need to be upgraded or redesigned to accommodate changing climates? Will you need to change the time of day or time of year they are held?

Welcome Message

Nicole Halsey

How will the growing of feed or pasture change? Will changes in climate result in the proliferation of some types of weeds? Are there opportunities to be capitalised on by horse keepers?? For example, can you use some of your land to for carbon farming??

Today I encourage you to think about what climate change may mean for you as part of the horse industry?

I encourage you to feel empowered and inspired today.

I guarantee you that within this room, you have the information that is needed to take the first steps, whether you feel you know enough about climate change or not. You know what you do when. You know the conditions you need for your horses to be comfortable and perform at their best.

All you need to do is take this information and build on it to start thinking about what the impacts of climate change might be on your industry.

What might happen if we have more days over 35 degrees in a row?

What might happen if we don't have as much rain as we used to?

What might happen if we have more frequent and intense storms?

How can we offset carbon emissions?

Once you start to identify these risks and opportunities, you can start to strategise about ways to address them. This is what adaptation planning is all about.

Define the issues and identify what to do in response.

It is well within you reach today to start this process together.

This event today is the first of its kind for the horse industry in Australia, and the number of people in attendance from around Australia, and I acknowledge those people who have travelled from interstate to be here today. The number of people here today, is testament to the importance of starting this conversation now.

I again encourage you to feel empowered and inspired today. I encourage you all to contribute and actively participate in thinking and planning for impacts and opportunities presented by climate change for the horse industry.

On that note, I will close by saying welcome to you all and I look forward to hearing the outcomes of your discussion today. #

Yes We Can! (and probably are already)

Overview of presentation by Dr Peter Hayman, with notes provided by Leonie Kruse. PowerPoint presentation is uploaded to www.horseslandwater.com

Weather and climate are often confused.

Climate change will be delivered to us through weather. Most important part of climate change that extreme weather events will increase. Day to day weather or year to year weather is not where evidence for climate change comes from. Evidence comes from a range of sources (listed in box on this page)

There has always been natural variability in weather. Useful to think about waves and tides on the beach
“Was it the wave that destroyed the sandcastle or was it the tide?”

Also think about detection and attribution. To detect a long term trend and attribute to climate change. A long term trend is the decline in rainfall in southern Australia. We can learn from a high tide or a heat wave or a drought about what we can do in the future, whether it is attributable to climate change or not.

A lot of maps are needed to talk about the climate change message. Most of the uncertainty lies with the modelling, not the emissions. By reducing emissions now we are changing things for 2040, 2050.

Changes to the atmosphere, lead to changes in global climate, changes to the local climate and subsequently changes to local systems.

Let's make smart planning & decision to reduce our vulnerability. We can work locally. There are some things we can plan for. Farmers and land owners are good at adapting to changes. You can do it, in fact you may be doing many things needed already.

Causes of Climate Change

Ocean Circulation
Volcanic eruptions
Solar variations
Orbital variations
Greenhouse gasses

Feedback

Clouds
Aerosols
Water vapour
Ice reflectivity
Greenhouse gasses

Dr Peter Hayman



“Was it the wave that destroyed the sandcastle or was it the tide?” Photo: P Hayman

http://www.sardi.sa.gov.au/staff_profiles/climate_applications/peter_hayman

Horse Health Insights

Overview of presentation given by Dr Gary Muscatello. The PowerPoint presentation is uploaded to www.horseslandwater.com

An aim of good horse husbandry is to manipulate the Horse + Environment + Pathogen environment in favour of the horse. We need to seek ways to reduce host & pathogen interaction to create an “equine friendly ecosystem”

Factors include:

- Temperature, land and water
- Sunlight
- Atmosphere
- Feed and nutrients
- Husbandry and housing
- Other horses and other animal species
- Insects

Feed and water limitation, reduced fitness, weather stressors and changing weather patterns will see

- ↑ Encroachment of wildlife into horse paddock & housing areas (Bats, pigs, birds, kangaroos)
- ↑ Insects
- ↑ Irritants and pollutants
- ↑ Microbes

All of which increase the risk of specific infectious diseases in horses which could be

a) Opportunistic b) Insect borne c) Wildlife borne

Reduced horse fitness can lead to

- Heat stress
- Malnutrition?
- Opportunistic disease

Drought associated diseases

- *Rhodococcus equi* pneumonia
- Mare Reproductive Loss Syndrome (MRLS)
- Equine Amnionitis and Foetal Loss Syndrome (EAFL)

Warming

- Insect borne diseases e.g. Kunjin, Murray Valley Encephalitis, Ross River Virus
- Opportunistic bacteria e.g. greasy heel, rain scald
- Opportunistic fungi e.g. *Pseudomonas aeruginosa*
- Migration of bacterial disease e.g. Melioidosis

Limitation on natural resources

- Encroachment diseases e.g. Hendra

Pollutants and respiratory health

- Chronic Obstructive Pulmonary Disease (COPD)

There are five strategic areas that horse owners can consider to help reduce the risks caused by Horse + Environment + Pathogen interactions

1. Awareness of climate impact
2. Surveillance and monitoring e.g. for encroaching wildlife, mosquitoes
3. Breaking the connection e.g. breaking the life cycles of insects
4. Strategic environmental measures e.g. consider shade & shelter
5. Strategic host management measures e.g. reduce still water, conserve native habitat



Dr Gary Muscatello

<http://piarn.org.au/>

<http://sydney.edu.au/vetscience/about/staff/profiles/gary.muscatello.276.php>

Venues- RAHS Sustainability Actions

Excerpts from Horses & Climate Impacts Workshop presentation by John Rothwell. Full speech can be found on www.horseslandwater.com

The Society was established in 1839 in response to the need of immigrants to adapt to the foreign South Australian environment.

The Society's primary purpose today is still very much about promoting the importance of our regions, agriculture, horticulture and related industries so vital to our existence. This is primarily achieved through staging the Royal Show.

Our basic human needs today are still water, food, shelter and security. Many young people believe they would prefer to go without food than their phone or computer. The level of understanding the importance of our environment and food source seems to be on a continuous decline.

In 2008 the Society instigated a \$35 million exhibition development program for the Showground and it would have been easy to ignore the environment in the design, in that developments are very sensitive to cost overruns with environmental features the first to be cut.

To the Society's credit sensible environmental design was at the top of the priority list with the following features incorporated into the development:

- 95+% of materials taken off site in the building demolition phase went to recycling;
- Sky lights provided in toilets and Duncan Gallery reducing reliance on artificial lighting;
- Movement sensors in toilets to control lighting and ventilation;
- High efficiency dimmable fluorescent lighting;
- Passive relief air paths which can operate in natural ventilation mode;
- Installation of blinds to all glazed areas to reduce glare and direct sun penetration;
- Low volatile organic compound paints;
- 1 megawatt capacity solar power station; and
- 3.5 million litre underground storage of roof top water.

The water storage was knocked by some quarters as not a wise investment because the Society could buy water cheaper from the mains supplies versus the \$1.5 million required to construct 3.5 million litres of storage.

What the critics were missing was the onsite storage put back control into the Society's hands with:

- Instead of responding to the water restrictions placed on the Showground, the Society was free to manage the site's horticulture according to the environmental conditions;
- The investment provided insurance against water prices in the future increasing significantly; and
- The Showground's rainwater storage reduces impact of stormwater leaving the Showground.

The underground water storage project without doubt is one of the best decisions ever made by the Showground.

The Society's demonstrated environmental leadership resulted in the site being chosen to host the southern hemisphere's first solar generator. The one megawatt power station was erected in 2009 with the following features:

- Total Project value \$8.0M
- 12,600 roof-mounted first solar thin film 77.5W panels
- 184 Sub-system inverters
- Spread over six buildings: Jubilee, Goyder, Ridley, Wayville, Alpaca and Dairy
- Total roof area 9,200 sqm
- System's annual yield 1,400MWhours – equivalent to supplying approx. 250 houses per year
- In addition to the current gross savings of approx. \$126,000, as Accredited Power Station will receive Renewable Energy Credits (REC's) for each MWh generated equal to (traded market value) \$30K+/annum
- Annual reduction in Greenhouse gas emissions 1,400 tonnes
- Design period: 8 months
- Construction period: 3 months
- 11kV interconnection to existing high voltage ring main
- ETSA Utilities approved 'Large Embedded Generator' with own generation licence
- Provides up to 40% of the average Adelaide Showground annual power requirements
- Power purchasing agreement of exporting electricity has been negotiated with Showground's electricity retailer
- Estimated two years to pay back the energy used to manufacture the panels
- Warranty is for 25 years, but panels expected to have a life of 30 to 40 years
- Estimated cost of system will be recovered in 20 odd years, but directly linked to future cost of electricity
- All future developments will include an expansion of our generating capacity
- Recently introduced viewing platform provides educational opportunities

Showground's 2012-13 Environmental Management Plan overseen by Society's 'Green Committee' pursues the following objectives:

- Reduce energy consumption across the Showground;
- Reduce waste across all operations of business;
- Reduce water consumption across the Showground;
- Continue the expansion of green space without compromising water conservation at the Showground;
- Encourage patrons to use of public transport;
- Reduce impact of catering on our environment;
- Include sustainable initiatives into any new developments at Showground;
- Educate public on environmental initiatives;
- Ensure environmental compliance of all business activities with current legislation, policies and procedures;



www.aeec.com.au/showground/aeec.jsp

The impact of Climate Change on Horses and Horse Industries

Some gaps and opportunities identified using available literature

Excerpts from PowerPoint presentation & literature review presented by Melissa Rebbeck. The full PowerPoint & Literature Review report uploaded to www.horseslandwater.com

This literature summary is a step toward understanding the impact of climate change on horses and horse industries.

- 40 papers that related to the impact of climate change and horses in Australia were found in the time allocated
- The literature search found information relating to the following topics; land management, pasture production, weeds, pests, breeding and fertility, horse health including arboviruses and wildlife borne diseases, bacterial infection and heart disease
- Additional topics included event management, track maintenance and the carbon farming scheme

The next steps are to expand upon the gaps in knowledge and prioritise research and collaborative industry programs that work toward adaptation to climate changes for horses and horse industries as well as supporting the horse owners and industry to mitigate climate change.

Some highlights of the review included

Breeding, Stabling & Transport

- Heat stress reduces production and reproductive performance and enhancing mortality
- Mares grazing pasture have been shown to begin ovulating sooner than those being fed hay
- Reduced rainfall may decrease pasture growth with resulting adverse effects on breeding activities
- Warmer temperatures in general are suggested to enhance fertility but may also be counteracted by extreme weather stressors and potential limitations on feed and water
- Adjustment of breeding seasons may be required
- A theoretical increase of 1°C in the mean minimum temperature would advance the mean ovulation date by 9 days
- An increase in the average temperature in warmer climates may increase heat stress in stabled horses. It is possible that the effects of climate change may render existing infrastructure unsuitable in the future, and this potential impact should be considered.
- Transport and heat stress should be considered

Land Management

- Climatic changes are likely to increase major land-degradation problems such as erosion and salinisation.
- Pasture production is projected to decline by 2030 over much of southern and eastern Australia.

- A 20% reduction in rainfall is likely to reduce pasture productivity by an average of 15%. However in Tasmania for example temperature pasture production is likely to increase
- Climate change is likely to increase the potential distribution and abundance of exotic weeds and native woody species
- However, the same CO₂ and climate changes are likely to provide increased opportunities for woody weed control through increased burning opportunities
- A warming of 2.5°C is likely to lead to a 15 to 60% reduction in rabbit populations in some areas via the impact on biological control agents, e.g., myxomatosis

Horse Health

There are a number of diseases that impact upon horses. The literature suggests increased risk of the some diseases due to climate change

Climate change may impact on livestock diseases through its effect on a number of factors including the range and abundance of vectors and wildlife reservoirs, survival of pathogens in the environment, and farming practice. These factors may interact with each other and also with social and anthropogenic changes, including habitat destruction and changes in land use, which occur both globally and locally, and increased mobility of people and movement of goods including livestock (Gale et al, 2009)

An increased incidence of neurological disease in horses has been reported across a number of Australian states in 2011. Heavy summer rainfall and flooding across Queensland, New South Wales, Victoria and South Australia have increased mosquito activity and the neurological signs in horses have been linked to mosquito-borne diseases known as 'arboviruses'.

Arboviruses

- Many diseases are spread by biting insects that prefer warmer and wetter conditions
- New diseases such as bluetongue are also emerging at a greater rate since temperature has been on a sharp rise over the last 30 years
- Decreases in the transmission of some vector-borne disease may also occur if climatic change results in an environment in previously endemic areas that becomes unsuitable for vectors

African Horse Sickness

- African Horse Sickness (AHSV) is transmitted by *Culicoides* midges
- There is international concern for African Horse Sickness
- The mortalities in susceptible equidae (horses and mules) can reach 95%

Climate change does increase the predicted risk of incursion of African Horse Sickness (AHSV) through the entry of vectors (increase in the 90th percentile). All 9 serotypes of African Horse Sickness (AHSV) occur in eastern and southern Africa. However, there recently has been an increase in the number of serotypes present within the northern limits of the virus' range in sub-Saharan Africa. This spread of at least 3 different serotypes into these areas is disconcerting because recent experiences with Bluetongue Virus (BTV) indicate that once these viruses reach North Africa they can readily spread throughout the Mediterranean basin. The incursion of AHSV into countries of Europe or the Middle East that are

extensively involved in the international trade and movement of horses would be economically devastating, thus there is substantial current concern regarding potential spread of AHSV from Africa into adjacent regions [26, 29] (MacLachlan, et al 2010).

West Nile Virus

- West Nile (WN) virus is a mosquito-transmitted flavivirus. It is widely distributed in Africa, the Middle East, Asia, and southern Europe and was recently introduced to North America
- Birds are involved in the cycle of transmission as amplifying hosts
- Humans and horses are considered accidental dead-end hosts
- Outbreaks of WN virus remain unpredictable & further studies are needed

Kunjin virus

- Kunjin virus disease is a viral infection caused by a flavivirus (Kunjin virus) found in mainland Australia and Papua New Guinea
- It is closely related to West Nile virus
- It is primarily a disease of waterbirds and is carried by mosquitoes. Very occasionally the virus can be transferred from mosquitoes to horses
- It has recently been found to have mutated and infects horses by causing neurological symptoms. In some cases horses have to be euthanized
- Kunjin virus was first detected in South Australia in February, 2011

Peruvian horse sickness

- PHSV is a mosquito-transmitted Arbovirus that is the cause of outbreaks of encephalitis amongst horses in South America [8]
- A very similar, likely identical virus, Elsey virus, is present in the Northern Territory of Australia where infection can cause encephalitis like that described with PHSV
- The epidemiology of the infections caused by these viruses is poorly characterized, and it is uncertain how identical viruses came to be present in such distinct regions of the world

Wildlife-borne disease

Hendra Virus

- Hendra Virus is an emerging disease transmitted by Flying Foxes to horses.
- This is an unusual event, and the circumstances that allow the spread from flying fox to horse are not fully understood
- It has been shown that the seroprevalence for Hendra virus in the Flying Fox population is highest in animals showing evidence of nutritional stress, suggesting that climate change may increase infection and transmission
- Heat stress is thought to decrease flying fox populations

Other horse health issues

Bacterial Infection

- Infection caused by bacteria (*Corynebacterium pseudotuberculosis*) is known to increase in dryer warmer conditions. High environmental temperatures and drought conditions have preceded all reported outbreaks
- The bacterium grows in dry soil with faecal contamination. It can then be spread by insects such as the house fly and horn fly through contact on wounds, dermal abrasions or mucal membranes, and it can also spread by horse to horse contact
- It has been suggested that an observed increase in *Corynebacterium tuberculosis* infections in horses may be associated with global warming

Rhodococcus equi pneumonia

- A disease that may be influenced by climatic variation is *Rhodococcus equi* pneumonia in foals
- Lower soil moisture concentrations and lower pasture heights, changes that may occur in some regions as a result of climate change, significantly increase airborne concentrations of virulent *R. equi*

Worms and heat

- Larval populations are negatively impacted by hot weather conditions regardless of moisture level
- Free-living stages of equine strongyles are highly dependent on climatic influences. In Northern temperate climates, refugia are smallest during the winter. In contrast, refugia are lowest during the summer in warm temperate and subtropical/tropical climates
- Although adverse seasonal changes clearly have significant effects on the ability of free living stages of strongyle nematode parasites to survive and develop, available data suggest that climatic influences cannot effectively “clean” pastures from one grazing season to the next

Respiratory Disease

Chronic pulmonary disease

- Climatic changes influence the symptomatology and the course of chronic pulmonary disease in certain horses
- Viral influenza combined with bad management seems to be important in the development of chronic bronchiolitis

Event management: Training, competition and race days

In a study of wastage in South African racing stables, it was found that 11% of lost training days were due to bad weather. If the predicted increase in severe weather events occurs, there could be an adverse effect on training.

Heat recovery

There are some important differences that impact on the ability of horses to thermo regulate and to regulate fluid and electrolyte balance. The major differences are the low surface area to body mass ratio in horses compared to man; and the high metabolic capacity of equine skeletal muscle. These two factors may limit the ability of horses to dissipate heat when exercise is performed under hot conditions (Maughan and Lindinger, 1995).

- Unacclimatised, horses should not be allowed to compete in hot weather
- Following acclimatisation, care still has to be taken to avoid long periods of exercise without recourse to cooling and rehydration in order to avoid undue heat stress
- Horses transported to and from events on hot days combined with limited ventilation
- Cool down time needed after events before transporting on hotter days
- Moreover, horses are transported by humans who also have to tolerate heat. Heat affected drivers may pose road safety hazards, affecting the lives of horses and other human road users

Effects on tests of cognitive function

- Cognitive function can be affected by temperature and thus climate change. Extreme heat can cause horses to suffer from the extreme levels of water loss that accompanies severe diarrhoea or from clinical heat illness have impaired consciousness that may progress to complete loss

Track Maintenance

Turf Tracks

- In colder climates there could be an increase in the length of the growing season for turf tracks
- Increased atmospheric CO₂ levels have been predicted to improve plant growth
- However, water shortages in warmer climates may decrease the suitability of turf tracks, and encourage a shift to synthetic surfaces

Synthetic tracks

- A correlation has been found between temperature of the synthetic track and speed of horse
- Wax separated from the track showed that the temperatures experienced in the surface during normal operation exceed the temperatures at which the wax begins to experience thermal transformation

The Carbon Farming Scheme

In light of government driven climate change mitigation strategies aimed at minimising Carbon emission through carbon trading and tax schemes, it is important that the racing and other horse industries carbon footprint is evaluated promptly. For example, emissions related to stud farms, breeding and transport, racing stables and racing meetings need to be evaluated.

- Activities such as international horse travel by air for both breeding and racing purposes may be contributing significantly to the industry's carbon emission
- Industries need to be prepared to tackle, modify or justify activities which may be seen as significantly contributors to carbon emission
- Evaluating the industry's carbon footprint and the activities within that contribute to it is an important step in facilitating industry justified rather than public preserved climate change mitigation strategies

Conclusions

The horse industry is under threat by climate change. Disease seems to be the biggest threat to long term horse health. While much of the literature review relates to disease, it is difficult to predict what insect vectors will increase and decreased due to temperature and humidity changes. Furthermore cyclones and storms that carry these vectors are also difficult to predict. Other things to consider will be maintenance feeding as pasture is likely to be available for less time due to shorter growing seasons across Australia. Careful planning and track design will be important to both reduce heat stress on horses and heat impact on synthetic tracks. So while some strategic planning for the long term viability of horse industries will be important, so too will tactical responses to outbreaks of diseases, caterpillars (causing abortions), worms and more.

Recommendations

It is recommended that a peer reviewed vulnerability assessment be carried out on the horse industry . A vulnerability analyses would add to the assessment of the impact of climate change on horses and horse industries as well as look at climate stressors, adaptation and score the overall vulnerability of the horses and industry as described by Allan Consulting Group (2005). This assessment would consider in isolation specific horse industries and aspects of horses and management such as veterinary, public health, natural resources, carbon trading, events and infrastructure, occupational health, water and pasture management in peri-urban properties and more. The vulnerability assessment will help recognise sectors in the horse industry that are more vulnerable than others and will need priority support and research.

The horse industry also needs support to mitigate climate change and little work has been done as to how much carbon horses and industry are emitting into the atmosphere. There may be funding available through the carbon farming scheme funded by the Department of Agriculture Fisheries and Forestry to support the horse industry.



Melissa Rebbeck

http://www.sardi.sa.gov.au/staff_profiles/climate_applications/melissa_rebbeck

Horse Keeping Today

A combined overview of two presentations given by Jane Myers & Sandy Pate. The full presentations are uploaded to www.horseslandwater.com

What has changed about Horse Keeping?

- Modern 'improved' (introduced and selectively bred) grasses are a problem for modern 'couch potato' horses...(these grasses have been mainly developed for beef and dairy cows)
- Horses live longer
- Horses more likely to suffer from obesity
- Horse welfare concerns
- Legislative & regulatory pressures related to horse keeping
- Increased peri-urban horse keeping (small properties near cities & towns)
- Increased marketing & pressure to spend money on products & services
- Climate impacts and need to adapt

Horse Keeping Methods- International

- Conservation grazing - use of horses as a biodiversity management tool
- HIT Equine Technologies The Active Stable and Feedmaster
- Paddock Paradise – developed from the barefoot horse movement

Horse Keeping Methods – Australian emerging

- Rotational grazing
- Equicentral system developed to help horse owners
- Grazing on native pastures
- Equine Land Care groups now forming

Horse Keeping Key Land Management Messages

- ✓ Maintain groundcover
- ✓ Manage seasonal wet areas, wet seeps and drainage lines
- ✓ Manage steep slopes
- ✓ Manage fence line tracking
- ✓ Manage watercourses (including erosion gullies and dams)

Horse Owner Education

Interviewed horse owners stated

- Education opportunities need to be relevant
- Improved environmental awareness
- Importance of property planning
- Horse Psychology important
- Perennial pastures a high priority
- Water, water, water
- When new information is presented in way that results in various positive outcomes horse owners are more likely to do the right thing



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What Horse Owners Think

An overview of the survey report presented by Dr Kirrilly Thompson. The full “Climate Change for Horse Owners Horse Keeping in Our Community” report can be found on www.horseslandwater.com

Horse keepers were surveyed in an attempt to identify horse keepers’ attitudes, practices and knowledge in relation to meeting climate change challenges

1. If and how horse keepers have been impacted by any major climate/weather events in the past 10-20 years
2. What action was taken by horse keepers in response to any weather or climate events
 - a. At the time
 - b. For the longer term
3. What action horse keepers have been considering taking in the short or long term
4. What barriers have prevented those actions
5. What horse owner education, research, government policy or other help is needed by horse keepers

The survey was made available online and promoted in early 2012. It consisted of 3 demographic questions and 6 open-ended questions. The survey was completed by 69 horse-keepers. This report communicates the views, experiences, opinions and beliefs of those horse-keepers in an accessible format.

In the pages that follow, each question is presented in turn. Questions are discussed, findings are demonstrated in graphs and the scope of each category described in coding tables. The overall significance of findings is discussed in relation to the original research aims and survey questions.

Overall, the majority of participants have faced major weather and climate events in the past 10-20 years, although not all of these events have been disadvantageous. Participants have responded at the time of events and taken steps to prepare for medium and long term benefit. The major setbacks to their preparation have been the ‘usual suspects’ of time and money.

However, there is a desire for more education, research and policy to support the interconnected areas of:

1. Land care, pasture management and improvement
2. Biosecurity
3. Property maintenance
4. Water management
5. Access
6. Safety
7. Planning & development
8. Horse health & welfare

The fact that participants had already taken the initiative to seek information and take advantage of education opportunities suggests that well designed public education and behaviour change initiatives are likely to be well supported and effective.

Question 1: Please describe what, if any, major weather/climate event(s) have impacted on you, in a negative or positive way, in the last 10-20 yrs?

The aim of Question 1 was to find out what weather or climate events had affected participants in the past 10-20 years whilst allowing for the collection of positive and negative experiences.

Participants recalled the 'big four' natural disasters of fire, flood, cyclone and drought. Drought and rainfall were the most frequently cited events. 36% of respondents indicated that they had been affected by drought while 36% reported being affected by rainfall. This included too much as well as too little rainfall or unseasonable rain.

In relation to flood, both positive and negative impacts were recognised (improved pasture and erosion).

Separate from the issue of flood, the topic of water arose in relation to a reduction in quantity and quality of water supplies, especially for those using groundwater (10%). There were also sufficient responses around 'rainfall' (36%) to warrant a category separate from 'general seasonal abnormality'. Participants linked high and low rainfall with land management issues (weeds) and horse health issues (mosquitoes).

Some respondents cited erosion (4%) and weed infestation (9%) in response to this question, referring to the impact of weather and climate and an awareness of some of their associated land management implications.

Finally, 10% of participants were satisfied with that their climate and weather conditions and others answered 'none'. Whether this is an indication of 'no impacts' or a disbelief in climate change is unclear, although no extended comments were made to suggest the latter. The categories of 'none' (10%) and 'good weather' (1%) provide an important temperance to the bias towards negative impressions of climate

Question 2: Please describe what, if anything, you did to take advantage of the major weather/climate event(s) at the time it occurred?

The aim of Question 2 was to find out what action participants took at the time of the major weather or climate event that was listed in the previous question.

22% of respondents reported taking no action. Reasons outlined in the coding structure included seeing no advantage in taking action, not feeling at risk of major weather/climate events, seeing no need and being fatalistic about events occurring.

16% of responses were accorded to the category 'Land care, pasture management and improvement'. Responses coalesced around improving pasture growth and implementing land care strategies such as tree planting. This included minimising the impact of horses on land care by keeping horses away from wet paddocks.

In responses to the previous question, participants linked drought with increased feed prices. 9% of responses to Question 2 were strategies to keep feed costs down such as storing hay and pre-purchasing in

bulk. These strategies may be cost-prohibitive for many horse keepers. Some of these participants mitigated the risk of having insufficient supplies by making sure that they had multiple hay providers. Others were more frugal about using their hay by taking advantage of grass in paddocks.

Water management was also an issue to emerge from responses to Question 2, mostly in relation to water storage and sourcing, both of which can be costly (10%).

In addition to improving the quality of 'natural' areas on properties, 4% of horse keepers had reacted to weather/climate events by improving the infrastructure on their properties. This included improving or replacing fencing (in some cases with government funding) and improving the surface of yards.

Some participants took what could be seen as more drastic action, which was to reduce their numbers of horses (owned or bred) (1%) or to relocate to another property (3%).

Whilst the wording of the question was designed to elicit actions taken to take advantage of the major weather/climate events noted in the previous question, 13% of participants stated the specific advantages of those events. These advantages surrounded rain – getting more or less. Less rain was seen as an advantage in terms of providing more riding days, reducing the need for stabling and providing more firewood. More rain was seen as an advantage in terms of improving the quality and quantity of feed which offset feed bills. The explicit disadvantage of major weather or climate events mentioned in a response to Question 2 (in addition to the disadvantages implicit in the eight categories illustrated above) was the increased use of water.

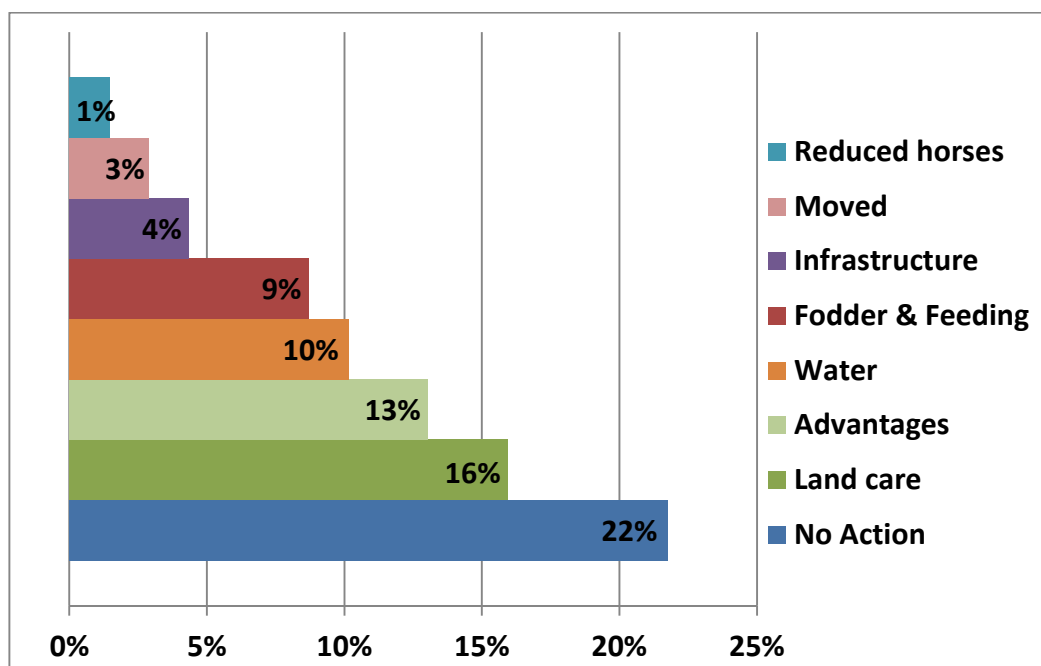


Figure 1: Please describe what, if anything, you did to take advantage of the major weather/climate event(s) at the time it occurred?

Responses to question 2 were allocated to the following 8 categories. Examples of the spread of response within each category are also provided:

1. No action <ul style="list-style-type: none"> • No advantage • Did nothing • Don't feel at risk • All negative • Fatalistic ie can't change it 	2. Land care, pasture management and improvement <ul style="list-style-type: none"> • Timing of seeding and fertilising with rain • Planted more trees • Planted native grasses • Reduced grazing by stabling • Mulched • Slashed paddocks, • Fenced off wet paddocks • Fertilised more • Paddock rotation • Hand pick
3. Advantages <ul style="list-style-type: none"> • Less rain <ul style="list-style-type: none"> ▪ More riding days ▪ Reduced need for stabling ▪ More fire wood • More rain <ul style="list-style-type: none"> ▪ Reduced feed bills ▪ Establish pasture ▪ Made hay ▪ Softer ground 	4. Water management <ul style="list-style-type: none"> • Alternative sources found • More water tanks • Bigger dams • Improved water storage • Enabled gravity feeding of tanks
5. Fodder & Feeding practices <ul style="list-style-type: none"> • Hay storage and pre-purchase • Use multiple hay providers • Less handfeeding when paddocks grassed 	6. Improve infrastructure <ul style="list-style-type: none"> • Property management <ul style="list-style-type: none"> ▪ Sand in stables to reduce wet ground • Improved fencing <ul style="list-style-type: none"> ▪ With gov't funding
7. Moved to a property in a different location	8. Reduced numbers of horses <ul style="list-style-type: none"> • Reduced breeding activity

Question 3: What did you do to take advantage of the major weather/climate event(s) for the longer term?

The aim of Question 3 was to identify the actions taken by participants in response to the major weather/climate events listed in response to Question 1. Whereas Question 2 asked about immediate action taken following an event, Question 3 sought to identify changes made for the longer term.

20% of participants reported taking no action for the longer term. Some saw no advantage in taking action and others were fatalistic about events occurring. A large number of people agisting did not feel that they had any ability to take or influence actions to take advantage of major weather/climate events for the longer term. This may represent a significant opportunity for behaviour change if agistees can be supported to effectively influence agisters to improve their planning and response to climate and weather events.

Changes made to Land care, pasture management and improvement in the longer term were similar to those reported in the previous question about reactions at the time of the weather/climate events (14%). This was the same for water management strategies, with the exception that sinking a bore was only mentioned in relation to longer term strategies (14%).

Question 3 received similar responses around fodder and feeding practices (10%). Whereas responses around immediate behaviour changes in the previous question included using more than one feed supplier, responses around longer term changes involved changing feed suppliers altogether. One addition to the scope of this category in this question was horse keepers saying that they had changed their horse's feeds to include more electrolytes.

Fencing was again mentioned in relation to infrastructure improvements (4%), together with more substantial investments including a solar powered windmill.

Two categories arose in relation to Question 3 that were not mentioned in the short-term/immediate responses elicited by Question 2. These included diversification of services (the nature of which was unspecified by the participant) (1%) and education (4%). 4% of participants had sought more education through formal information events or their own personal research. Whether or not this suggests that horse keepers did not seek information at the time of the event (ie the short term) or they saw education as being of longer term benefit remains to be discerned.

Again, some drastic responses to climate/weather events were seen in relation to reducing the number of horses on a property (3%) or relocating horses pre-emptively (3%).

Emergency planning in the form of developing a bushfire plan emerged as a response to this question (3%).

1% of participants had changed their riding practices to reduce riding in times of heat (1%).

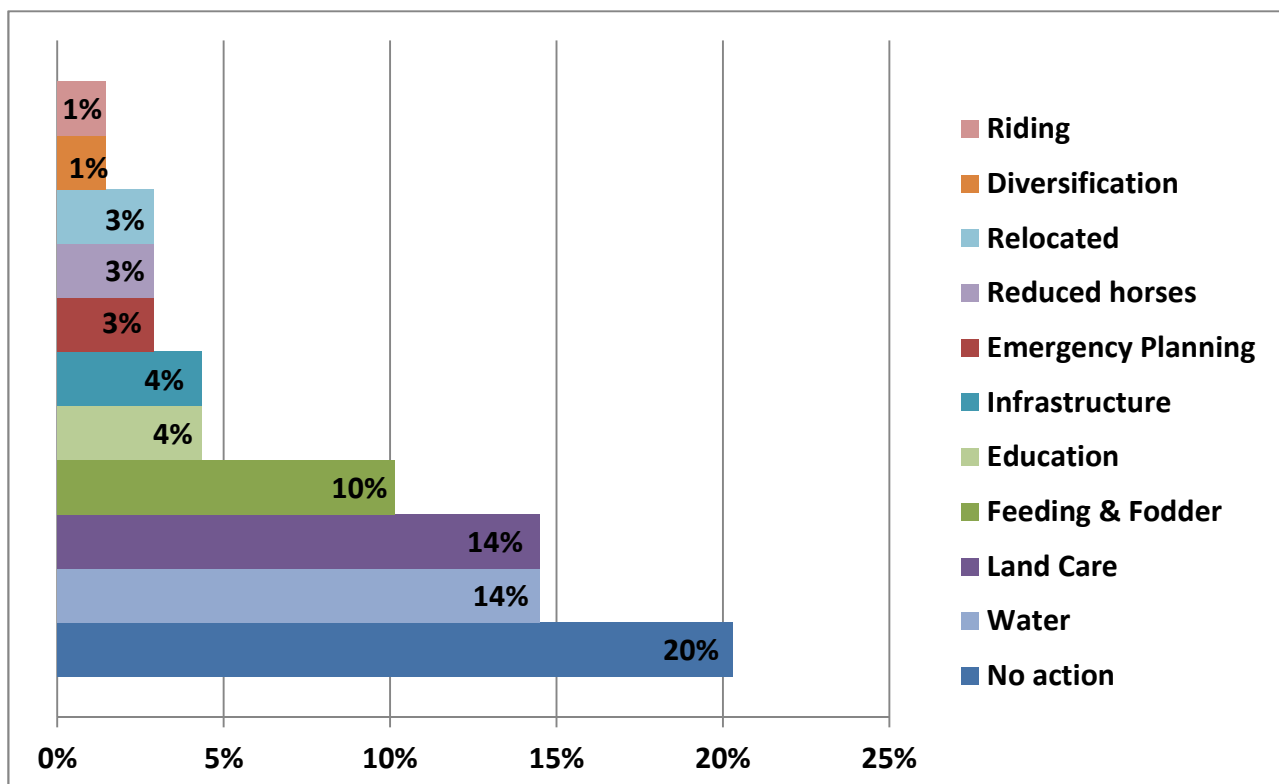


Figure 2: What did you do to take advantage of the major weather/climate event(s) for the longer term?

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Responses to Question 3 were allocated to the following 11 categories. Examples of the spread of response within each category are also provided:

None <ul style="list-style-type: none"> • No advantage/did nothing • Difficult when agisting • Fatalistic eg. Fact of life so didn't do anything 	Water management <ul style="list-style-type: none"> • Improved water storage • Increased number of rainwater tanks • Building a dam • Sinking a bore
are, pasture management and improvement <ul style="list-style-type: none"> • Cleaned paddocks • Improved paddock rotation and resting practices, restricted horse grazing • Changed pasture type Eg 'sow more perennials' • Treating weeds • Revegetation • Planted trees • Changed garden to natives • Planting windbreaks 	Fodder & Feeding practices <ul style="list-style-type: none"> • Hay storage and pre-purchase • Changed feed supplier • Feed more electrolytes
Action <ul style="list-style-type: none"> • Attended information event • Personal research 	Improve infrastructure <ul style="list-style-type: none"> • Changed fencing type • Solar powered windmill
Contingency planning <ul style="list-style-type: none"> • Developed a bushfire plan 	Reduced numbers of horses <ul style="list-style-type: none"> • Seek good doers
Moved horses in anticipation of unfavourable paddock conditions	Diversification <ul style="list-style-type: none"> • Changed services
Riding practices <ul style="list-style-type: none"> • Reduced riding during heat 	

Question 4: What are you thinking about doing to prepare for any future major weather/climate event(s) in the short or long term but have not yet done? And why?

The aim of Question 4 was to identify:

- Actions which horse keepers have contemplated or intended to take, and
- The reasons why horse keepers had not yet taken action

This question was important for understanding the barriers to change and developing effective support for change (to more sustainable behaviours, for example). Not all participants addressed parts (a) and (b) in their responses. Some participants phrased their response in terms of what they would do if something (drought, for example) occurred, rather than something they were planning to do regardless of future events.

25% of participants were thinking about preparing for future major weather/climate events in relation to land care, pasture management and improvement. 19% were thinking about improving their water management and 16% were considering improving the infrastructure on their properties, including shedding to support the storage of bulk feed.

14% of participants were not considering taking any actions. Reasons included doing everything they wanted to do already, waiting to see the impact of previous actions, not seeing a need and being a climate change sceptic.

9% of participants were considering changing their fodder and feeding practices. Additions to the category 'fodder and feeding practices' from responses to the same category in previous questions included purchasing a fodder feed solutions system, contract growers and land leasing. Additions to the category 'Land care, pasture management and improvement' included: burning, soil analysis, earthworks, ploughing and land consultation. Additions to the category 'improve infrastructure' included fixing guttering. Additions to the category 'water management' included: installing a stock water system and capturing water from horse shelters.

As with Question 3, some participants were considering changing their services through diversification (offering more inside activities in the case of a service provider) (1%) and developing plans for bushfire. In response to Question 4, participants were also considering developing plans for hazards besides bushfires.

Responses to Question 4 resulted in the formation of two categories that had not been as relevant for the previous questions. The category of horse care arose in relation to a participant wanting to purchase more waterproof rugs. Another participant reported having little success in lobbying for a hot weather policy. The participant wrote: "I have been asking our dressage club to cancel rallies/events in extreme conditions. I think travelling a horse in a hot float after workout in super heat is dangerous, the work out in the heat is unnecessary and the recovery up to 3-5 days later is too risky".

There were few reasons given for thinking about preparations for future major weather/climate events but not yet taking any action. Reasons included insufficient time, insufficient funds, shortage of suitable materials, still considering options and insufficient storage (required for buying hay in bulk, for example). Another reason relates directly to the hot weather policy mentioned above, which is having tried but having been unsuccessful.

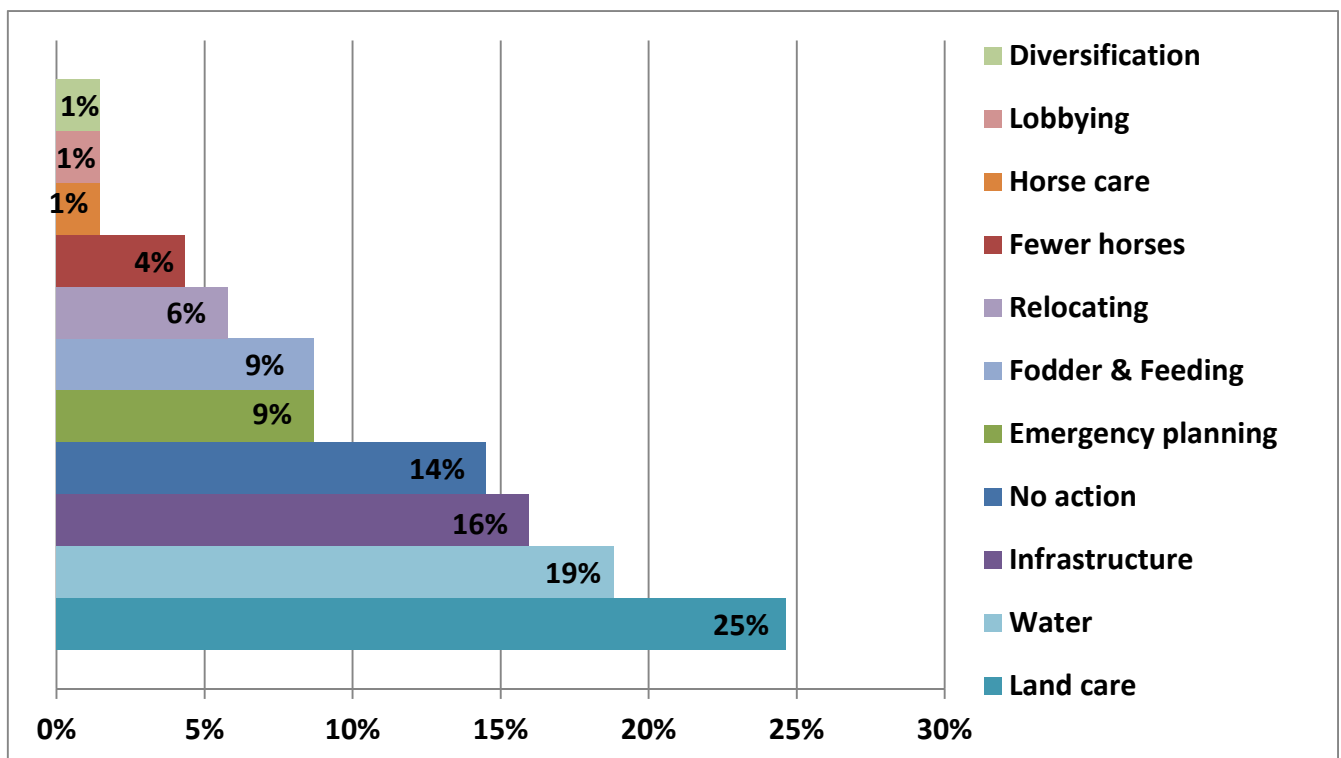


Figure 3: What are you thinking about doing to prepare for any future major weather/climate event(s) in the short or long term but have not yet done?

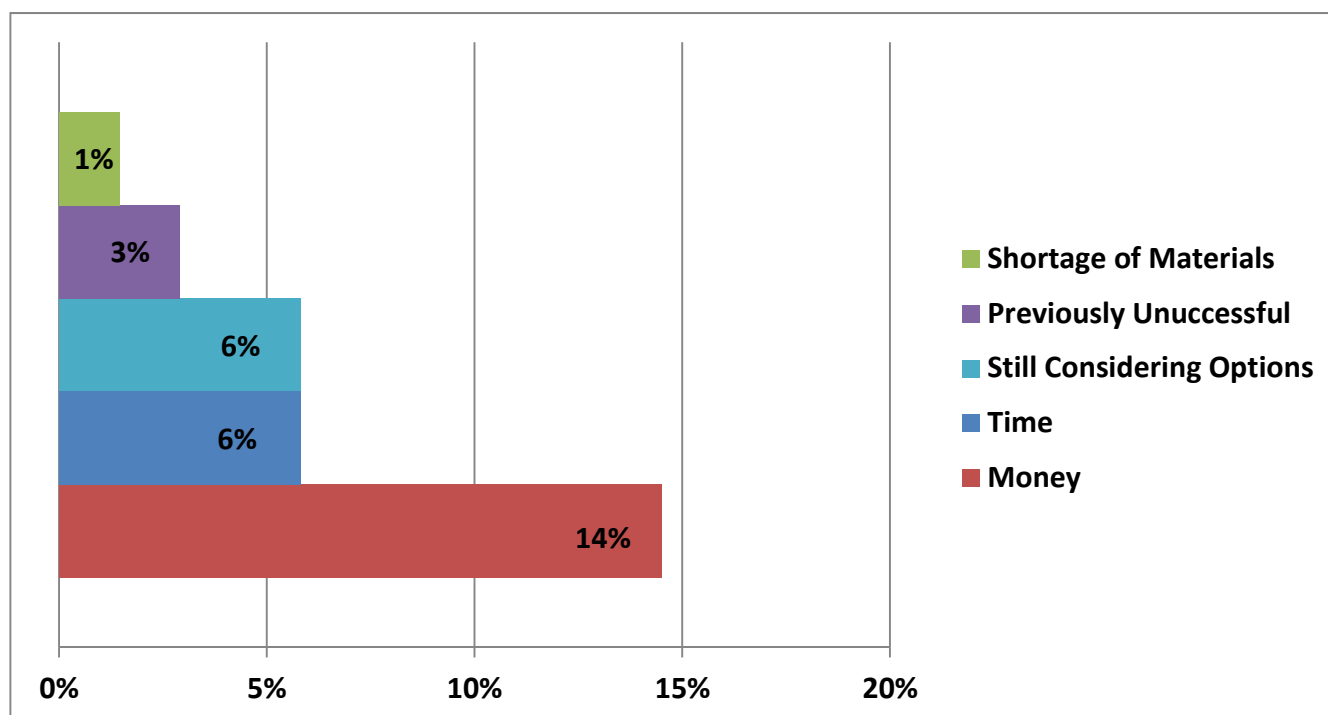


Figure 4: And why?

Responses to Question 4 were allocated to the following 11 categories. In addition, a category was created to capture the reasons given for why actions to prepare for future major weather/climate events have not yet been undertaken. Examples of the spread of response within each category are also provided:

Land care, pasture management and improvement <ul style="list-style-type: none"> • Reduce paddock sizes • Plant native grasses/pastures/alternative pastures • Plant fodder trees • Paddock management plan • Improve paddocks • Shade and shelter belts for livestock/shelter trees • Have soil analysed • Plant most suitable grasses for soil type • Earthworks • Continuous improvement of pasture • Contour ploughing • Multispecies shelter belts • Land consultation 	Water management <ul style="list-style-type: none"> • Capturing water from horse shelters • Installing more tanks • Larger water holdings on the property • Reduced irrigation area • Install stock water system
Improve infrastructure <ul style="list-style-type: none"> • New stable floors • Improving access to storage areas on property • Fence off creeks • Build more sheds and storage • More fencing • Fix guttering • Build yards 	No actions considered <ul style="list-style-type: none"> • Doing all they can do now/already • Waiting to see impact of previous actions • Don't see a need • I'm a climate change sceptic
Emergency planning <ul style="list-style-type: none"> • Bushfire action plan (for horses and people) • All hazards plan • Burning 	Fodder & Feeding practices <ul style="list-style-type: none"> • Purchasing a fodder feed solutions system • Store more feed • Contract growers

	<ul style="list-style-type: none"> • Considered leasing land in dependable rainfall climates to grow fodder and grain • More frugal use of hay • Buy in bulk
Relocating <ul style="list-style-type: none"> • Will move horses if drought in the future 	Reduce numbers of horses
Horse care <ul style="list-style-type: none"> • Buy more waterproof rugs 	Lobbying for change <ul style="list-style-type: none"> • Hot weather policy
Diversification <ul style="list-style-type: none"> • Change services • Offer more inside activities 	

Question 5: Rank the following topic areas from one to seven, in order of concern to you personally as a horse keeper. The topics relate to potential impacts from weather/climate events on horse ownership. One is most important and seven the least important.

Unfortunately, the rankings were not visible in the raw data that resulted from Question 5. However, an understanding of the topics intended to be ranked, can be gleaned from the other questions in the survey.

1. Emergency Response: e.g. Extreme weather events, major fires, major flood & cyclones

All forms of extreme weather events were raised in response to Question 1. The topic of emergency planning emerged in response to Question 3 (bushfire plans) and Question 4 (bushfire and other hazards).

2. Horse Events: e.g. heat stress in horses, biosecurity, energy, water, insurance cost & building design

The topic of biosecurity emerged in responses to question 6 (below) where a participant suggested governmental grants to give financial relief for the cost of in-forced quarantine.

3. Horse Training & Breeding: e.g. loss of training days, breeding season changes, pasture quality & availability, sourcing feed

Concerns for pasture, feed and feeding arose in responses to Questions 2, 3 and 4. In Question 6, participants called for more education, information and research on land care, pasture management and improvement. One participant also called for a tax rebate for irrigation/planting of pastures

4. Horse Health: e.g. seasonal surges in diseases, new diseases, injuries or ailments

The issue of horse health and welfare arose most clearly in response to Question 6, where participants called for:

1. Increased research on potential diseases as a result of a changing climate - including non-direct effects such as the Hendra Virus
2. Improved animal welfare legislation which actually prosecutes people for offences
3. Improved animal welfare legislation which is nationally aligned
4. Education about horse temperature and rugging practices
5. Research into horse psychology
6. National law against over-rugging

5. Human Health: e.g. heat stress, human-horse disease, volunteers & employees

Human health issues were not explicitly mentioned by participants in other question responses. However, human health contributes to the rationale of managing zoonotic diseases such as Hendra. Research on Hendra was called for in responses to Question 6 and categorised with Horse Health.

6. Environment: e.g. buying properties, land degradation, ecological footprints, biodiversity

Environmental concerns were evident in the category of responses titled 'Land care, pasture management and improvement' (Questions 2,3 and 4). In relation to biodiversity, it is interesting to note that as a response to Question 6, below, one respondent wanted the right to protect "horse pasture from other animals eg rabbits, kangaroos, feral animals (rights for landowners)".

7. Social & Cultural e.g. Cost of owning horse or providing horse events

Insufficient funds was one of the reasons given in response to Question 4 for not yet having taken action that has been considered in order to prepare for any future major weather/climate events.

Question 6: What horse owner education, research, government policy or other help do you need in relation to horse keeping and weather/climate aspects?

The aim of Question 6 was to identify assistance that participants desired in relation to horse owner education, research, government policy or other. Responses were categorised according to the topic around which they required further assistance. Where participants specifically noted 'education', their comments were coded to the category 'education' as well as the relevant topic category.

The largest response category for this question is the 26% of participants who desired support for 'land care, pasture management and improvement'. This high number is not surprising, given the prevalence of the category in response to questions about what immediate, medium and long term action that participants have taken (Questions 2 and 3), as well as something they are considering for the long term (Question 4). Participants expressed a desire for support and advice on general property management issues, as well as advice specific to their region and requirements. One participant suggested "a tax rebate for irrigation/planting of pastures", which intersects with the 'money' category above.

Horse health and welfare was discussed in 22% of responses to Question 6. Participants called for legislation to protect the welfare of horses by according increased powers to animal welfare organisations. Over-rugging was mentioned again in this question, as was knowledge around riding in heat conditions. The impact of 'equitation science' showed in calls for a greater understanding of horse psychology and further research in the topic. Participants also called for research on diseases, singling out Hendra as a priority topic. One participant articulated the link between climate change and horse health as follows: "Increased research on potential diseases as a result of a changing climate - including non-direct effects such as the Hendra Virus". The low overall reference to Hendra in the survey overall may be related to the bias of

participants from Western Australia and South Australia (total of 68%) as Hendra has only affected horses in Queensland and New South Wales.

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10% of participants called for more education. In relation to the scope examples provided below, calls for education were not always made on behalf of the participant. Often they were made by the participant on behalf of the wider community - especially where they felt there was a lack of general knowledge.

7% of participants stated that they did not require any assistance.

7% participants called for more support around emergency planning with a focus on fires. This is interesting given the relative recency of floods over fires in Australia. However, fires may be perceived as a more routine threat in Australia than floods or cyclones.

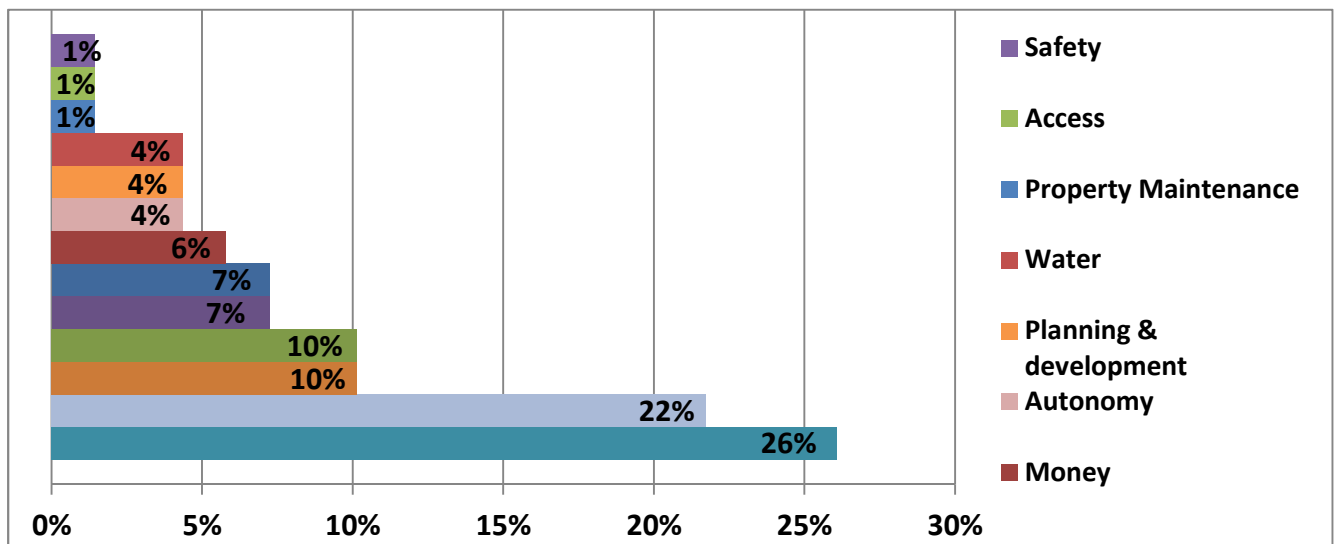
Whilst money and funding were anticipated responses only 6% of participants mentioned money as something that they needed in relation to horse keeping. This may be because the wording of the question directed participants' thoughts to other non-financial sources of help. In relation to 'biosecurity' (10%), one participant asked for 'Governmental grants to give financial relief for the cost of enforced quarantine'. As with responses to previous questions, some participants required support around 'property maintenance' (1%) and 'water management' (4%).

The issue of access to trails and parks arose in response to this question (1%). It intersected the category of 'Safety' in relation to keeping horses off of roads (1%). In the category of 'Safety', however, the issue of mixed use of trails and parks by horses and motorbikes was put forward as a safety concern. Moreover, the issue of safety overlaps with the category 'planning and development' (4%) in relation to peri-urban development. Many participants felt that local councils did not include horses in their policy and planning. Whilst some participants called for more inclusion of horses in policy and so on, 4% of respondents wanted increased autonomy from the local government.

In addition to discussing support they required, participants offered information about what they have already done. These comments were easily translated into the two categories of information and education. Education was distinguished from information as a formal course or event, whereas information was that which was accessed by the participant at their leisure. In relation to the latter, Jane Myers' publications and research on managing horse properties were mentioned twice in the survey. It is interesting to note that this kind of additional detail around information and education did not emerge from the two questions asking what action had been taken in the short and medium/long term.

There was a broad array of responses to Question 6, resulting in the following 13 categories:

Figure 5: What horse owner education, research, government policy or other help do you need in relation to horse keeping and weather/climate aspects?



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Examples of the spread of response within each category created to consider responses to Question 6 are provided below:

Land care, pasture management and improvement <ul style="list-style-type: none"> • Advice on managing properties • Assistance with revegetation • Information on different pasture species for temperate climate • General pasture advice • Information on: Weed eradication, soil and pasture preservation, soil erosion from wind & extreme heat. • Field days for information on pasture and housekeeping needs • More local information to be made available to assist in land management with horse ownership • Land degradation • A tax rebate for irrigation/planting of pastures • Research into over use of chemicals in growing feed/hay crops. • Protecting “horse pasture from other animals eg rabbits, kangaroos, feral animals” 	Horse health & welfare <ul style="list-style-type: none"> • Increased research on potential diseases as a result of a changing climate - including non-direct effects such as the Hendra Virus • Improved animal welfare legislation which actually prosecutes people for offences • Improved animal welfare legislation which is nationally aligned • Education about horse temperature and rugging practices • Research into horse psychology • Education in clubs about riding in the heat • National law against over-rugging
Biosecurity <ul style="list-style-type: none"> • Governmental grants to give financial relief for the cost of in- forced quarantine 	Education <ul style="list-style-type: none"> • Benefits of barefoot horses on equine welfare and environment/pasture/bridle trails • Effects of chemical wormers on soil microbes and dung beetles. • Increasing use of dung beetles in pasture management.
Emergency Planning <ul style="list-style-type: none"> • Advice on fires relating to design of infrastructure on horse properties • Fire prevention information 	None needed <ul style="list-style-type: none"> • Have what I need
Money	Autonomy from local gov't
Planning & development <ul style="list-style-type: none"> • Horse keeping in peri-urban areas and the impact of the encroachment of suburbs. • Protection of areas for keeping horses in the metro area • Lack of support for horses in local council planning 	Water management <ul style="list-style-type: none"> • Sustainable use of water
Property maintenance	Access <ul style="list-style-type: none"> • To national parks to keep off roads
Safety <ul style="list-style-type: none"> • Safe riding areas • Mixed use of horse and bikes 	

In addition, the following two categories were created to collect information about activities that participants noted in their responses as already undertaken:

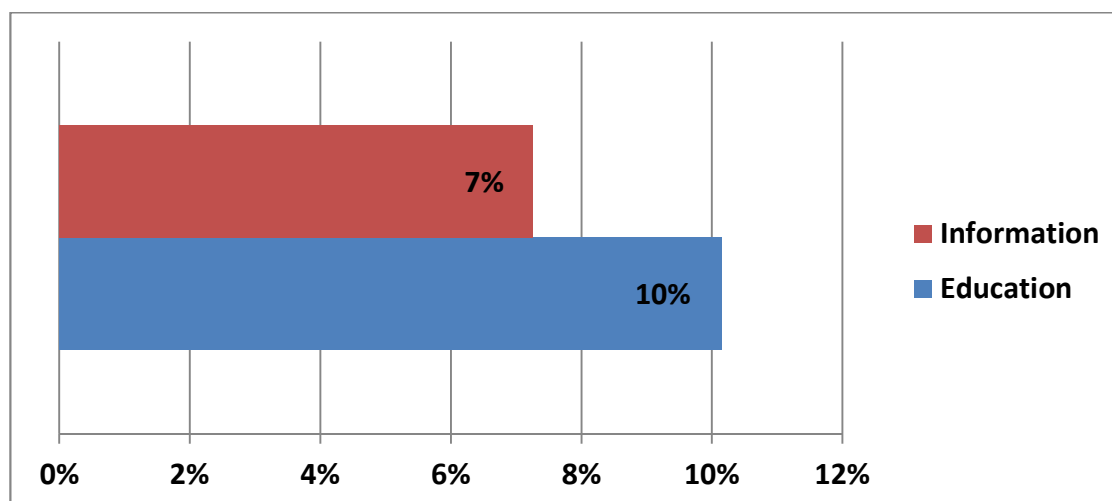


Figure 6: Activities already undertaken

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The combined percentage of 17% is an underestimate as these comments were not solicited directly from the phrasing of the question in the survey tool. Examples of the spread of response within each category of education and information are also provided below:

Things already done

Education <ul style="list-style-type: none"> • Attended landcare workshop • undertook studies through TAFE to learn more effective & efficient ways to manage property • Have had instruction in emergency procedures for fires with livestock. 	Information <ul style="list-style-type: none"> • seeking further information from NRM • Look at and learn from other states • Have read RIRDC research into best feeds and pasture options for horses. • Use BOM website • Jane Myers' Equiculture sustainable horse keeping. • Hoofbeats Green Horse does an excellent job - more of the same.
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Question 7: Any other comments?

The aim of Question 7 was to capture any other comments from participants. Many noted the difficulties they had answering Question 5 due to the ranking feature not working. Others noted where they had first seen the survey invitation. Comments that were not clearly discussed and illustrated in the preceding questions have been copied below.

1. Horse welfare is an important issue and how it is impacted by weather/climate, but also human behaviour such as over-breeding
2. Need to improve driver education with regard to horses and road use
3. I am happy for government authorities to inspect my land and they will see well pastured/looked after land. Sadly this is not always the case but each needs to be taken on their own merit, not just sweeping impractical rules for all.
4. The biggest issue is not climate or weather, but expanding human populations and increasing urbanisation. Our arable, productive land is disappearing under sub-divisions, roads and housing. Trying to keep a horse or horses at home or close to home is becoming harder and harder as a result of urban expansion.
5. Very concerned for the future as I fear our temperate climate has slipped 200kms south and we are almost experiencing wheat belt climate for which we are not prepared.
6. Have noted a lot of trees dying from lack of water in the long hard summers that we have had as opposed to normal

Together, these questions demonstrate the interdependence of multiple issues such as welfare, climate and horse management. They also show the level of concern felt by Australian horse keepers for the future.

Summary and significance

As noted above, the survey sought to determine:

1. If and how horse keepers have been impacted by any major climate/weather events in the past 10-20 years
2. What action was taken by horse keepers in response to any weather or climate events
 - a. At the time
 - b. For the longer term
3. What action horse keepers have been considering taking in the short or long term

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4. What barriers have prevented those actions

5. What horse owner education, research, government policy or other help is needed by horse keepers

As demonstrated through the reporting of individual questions above, the majority of participants had faced major weather and climate events in the past 10-20 years, although not all of these events had been disadvantageous. Participants responded at the time of events and taken steps to prepare for medium and long term benefit. The major setbacks to their preparation have been the 'usual suspects' of time and money. However, there was a desire for more education, research and policy to support the interconnected areas of:

1. Land care, pasture management and improvement
2. Biosecurity
3. Property maintenance
4. Water management
5. Access
6. Safety
7. Planning & development
8. Horse health & welfare

The fact that participants had already taken the initiative to seek information and take advantage of education opportunities suggests that well designed public education and behaviour change initiatives are likely to be well supported and effective. That is, there was a demonstrated thirst for knowledge amongst participants.

Some of the categories created to analyse the open-ended response were shared across several questions, as follows:

- **Land care, pasture management & Imp (4X)**
- **Water management (4X)**
- *Fodder and feeding (3X)*
- *Improved infrastructure (3X)*
- *Emergency planning (3X)*
- *Reducing numbers of horses (3X)*
- Changed riding practices (2X)
- Moving property (2X)
- Changing services (2X)
- Education feature (2X)

These categories provide some indication of the major areas of horse-keeping that have been impacted by major weather and climate events. They are likely to be areas in which horse-keepers are likely to continue engaging and seeking information and advice.



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Participant viewpoint

Participants at the Horses & Climate Impacts Workshop considered and explored a number of questions both in small groups and as the full group. The collective contributions have been sorted into broad categories.

What do we need to know more about?

- Knowledge of native species
- Pasture management and climate change
- Information that is relevant to Australia
- Water management and horses- “water wise on the farm” was a funded project. A series of modules and a lot of it could be adapted to horses. Some will be out-dated but can be updated
- Native pastures and hoof trample
- Saltbush and shrubs and horses
- Collect own seeds for native pastures
- Real gap around impact of horse health and climate change
- Gap around transport and knowledge of hot weather
- How the horse industry can help the other animal industries e.g. rotational grazing
- Knowledge of native species, management techniques
- Look into other grazing management systems from other org groups
- Water quality- how will this deteriorate during climate change
- Who is looking at what will happen with water quality as a part of climate adaptation
- Vegetation – some that we have now will not adapt to climate change, and will need to select something else
- Major gap is general awareness of key issues and key impacts
- Getting our industry to accept it and then act upon
- Dairy industry has invested significant funds into climate change e.g. sloped shelters. We can look at this to adapt for horses
- grazing management strategies
- Poultry and pig industries (indoors) emissions and feed work has been done
- We can learn from human – mozzie type disease profiles
- There is work done on humans and death and climate change related to heat stress
- Not a lot of tools for horse owners on grazing management strategies e.g. stocking rates like grass grow and this could be adapted for horse owners. SGS pasture growth
- Ideas from overseas for recycling to be further looked at

Education & Information

- Climate change training should be built into all levels of education from pony club to high levels
- Build education & skills into Pony Club strips
- Best practice models for different industries /equine sports sectors to aid acceptance
- Education for land management – for climate change specifically for horse owners. Under the banner comes things like fencing, water management, horse rugging etc
- Education to be aware of signs for outbreaks for disease
- Know how to pitch education to the right levels

Workshop Participant Viewpoint

- Intergenerational education and mentoring

- Biggest knowledge gap is in the education side of things
- Younger generation is the future
- Gap between the generations
- People at pony club just getting horses (new entrants)
- Pony Club – riders without horses could help

Promotion & Marketing

- Where can you go to get a list of resources and information
- Real need for support time money resources
- Knowledge gap/information gap getting info out to other horse owners
- Getting to the broader industry
- Horse health is a good way of getting to people
- Info from today needs to get out
- Focus farms, demo sites, local workshops
- Horse SA can identify key focus farms in different climatic zones
- Taps into existing groups
- Pony clubs to get info out

What Business Opportunities Might Exist?

- Horse minded agronomists
- Local knowledge respected
- Native grass production
- Local species and where to collect
- Development of horse friendly confinement systems to suit Australian conditions including shade in summer
- Experts in native pastures for horses
- Opportunity to link into corporate but ties into statistical framework
- Ethical investment
- Need for rehoming and retraining of ex harness racing horses – business opportunity
- Cost of retraining is higher /same as buying a new horse
- Analysis of materials e.g. water, soil and hay need to be easier. Batch orders can be a cheaper quote and could be some business opportunities or Horse SA to coordinate
- More advisors- specifically for weed management/toxic plants for horses/ virus and small property managers e.g. have machinery to go onto small farms and do weed control etc
- Opportunities for pest controllers to control insect spread

Workshop Participant Viewpoint

Helping Build Capacity

- Case studies
- Case studies, need to be information infused - horse owners by horse owners and applied researchers
- DAFF Action on the Ground to support producers to mitigate carbon emissions
- Community Action Grants coming out soon. State money for various projects
- Industries that use consultants go ahead quicker
- Not a lot of data in the horse industry
- Statistical data collection is required about trends
- Corporate stats – and funding to attract
- Needs facts to show trends down or any direction
- National database/ national Microchipping
- National data collection is important but everyone has to put in
- Viticulture put in crop watch/ as a model is there
- Is there scope for research in disease notification/ needs to be funded by RIRDC or collective pools of major parts of industry
- Microchipping important for life data
- Industry resistance to change to Microchipping. Hendra vaccine could be the carrot
- Alerts for other diseases along crop watch lines e.g. high sugars in grasses/health alerts
- Crop watch has predictive tool built in e.g. to ID
- A way to collect data and a way to hook horse owners in is horse health and add economic impact

Observations & General Comments

- Maybe one thing that does bring all the horse groups together is climate change as all will get higher feed prices, harder to get horses as breeding down.
- Strong industry lobbying group helps
- The fact that all are here today from different groups speaks mountains from lobbying
- Try to get out the positive messages of climate change/adaptations not negative. If we do the right things we can have a healthy and sustainable industries
- Goyder's line – the line does shift with seasonal variability related 350mm rainfall
- For horse owners by horse owners to be accepted and respected

Workshop Top Five

The Horses & Climate Impact Workshop participants were asked to prioritise the top five things to work on. This was undertaken as a group discussion.

1. Statistics: National database for the horse industry

- Useful for horse health alerts
- Develop an industry economic profile

2. Education: Information & education available in relation to Horses, Climate Change & Adaptation

- Relate it to horse health
- Intergenerational information sharing
- Mentoring

3. Promote a Holistic approach to horse care

- Tweaking training of professionals e.g. vets should also consider horse living environments horses are part of a living environment
- For horse owners – horses are part of a herd/ part of an ecosystem
- Range of iPhone Apps to calculate carbon footprint of horse transport etc.
- Research/ data and LandCare
- Demonstration properties

4. Priority research Pasture Management information

- e.g. Tools for horse owners to help manage horses (as found in other livestock industries)

5. Action Plan for horse industry to help progress climate change adaptation

Attendees

Nina	Arnott	Wirraway Homestead	www.wirraway.org
Karen	Aspery	Riding for the Disabled Assoc Australia	www.rda.org.au
		Riding for the Disabled Assoc.SA	www.rdas.org.au
Aaron	Bain	AgriFood Skills Australia Ambassador	www.agrifoodskills.net.au
Helen	Barnes	Equestrian Australia Coach	www.equestrian.org.au
Robyn	Dunstall	Alexandrina Council	www.alexandrina.sa.gov.au
Simon	Goodhand	NRM Officer Sustainable Farm Practices	www.nrm.gov.au/contact/officers.html
Ann	Grear	O Hallorhan Hill Riding for the Disabled	www.rdas.org.au
Nicole	Halsey	Premier's Climate Change Council	http://is.gd/R5eucZ
		Urban Regional Planning Solutions	www.urps.com.au
Peter	Hayman	Principal Scientist, Climate Applications	www.sardi.sa.gov.au
Liz	Holland-Clarke	Horse SA	www.horsesa.asn.au
Mary	Hovers	Equestrian Australia Coach	www.equestrian.org.au
Kim	Jamieson	Pony Club Australia	www.ponyclubaustralia.com.au
		Pony Club South Australia	www.ponyclub.asn.au
Mark	Jones	Lockleys Riding Club	http://is.gd/wmCYuo
Gary	Kairn	Harness Racing Australia	www.harness.org.au
Leonie	Kruse	Horse Property Manager	
Christine	McGuinness	Student	www.adelaide.edu.au/vetsci
Jane	Mc Nichol	Horse Property Manager	
Gary	Muscatello	Primary Industries Adaptation Research Network	http://piarn.org.au
		University of Sydney, Faculty of Vet Science	http://sydney.edu.au/vetscience
Jane	Myers	Equiculture	www.equiculture.com.au
John	Newton	Arabian Horse Society of Australia	http://ahsa.asn.au/
Lisa	Obst	Horse Property Manager	
Eloise	O Doherty	Horse Property Manager	
Sandy	Pate	WA Horse Council	http://wahorsecouncil.com.au
		National Landcare Facilitator	www.nrm.gov.au/contact/officers.html
Melissa	Rebbeck	Senior Researcher, Climate Applications	www.sardi.sa.gov.au
Nicola	Ridley	HorseSafety Australia	www.horsesafetysaustralia.com.au
Carl	Rofe	Horse Property Manager	
John	Rothwell	RAHS	www.aeec.com.au/showground/aeec.jsp
Cara	Shelly	Victorian Horse Council	www.vhc.org.au
		Racing Victoria	www.racingvictoria.net.au
Kirrilly	Thompson	Research Fellow	http://tinyurl.com/kirrilly-thompson
Natalie	Van Amstel	Horse Property Manager	
Lidwien	Verdegaal	Senior Lecturer, Equine Medicine	www.adelaide.edu.au/vetsci
Chloe	Warden-Flood	Student	www.adelaide.edu.au/vetsci
Pauline	Williams	Horse Property Manager	
Heather	Wilson	North Melbourne Institute of TAFE	www.nmit.edu.au
Julie	Fiedler	Project Manager	www.horseslandwater.com
Monica	Redden	Monica Redden Consultancy	www.monicareddenconsultancy.com.au