

Submission
No 128

INQUIRY INTO COAL SEAM GAS

Name: Ms Kira Alia Leon

Date received: 01/09/2011

A.G.L.

RECEIVED

- 1 SEP 2011

LEGISLATIVE
COUNCIL

**The True Value
Of Scenic Hills,
Campbelltown Electorate,
NSW**

Kira Alia Leon. Dip Teach., Grad Dip. EPA., MAE.

Kira Leon

August, 2011

Table of Contents

Title: The true Value of Scenic Hills

Introduction	2
Scenic Hills: A Terrestrial Ecosystem.	4
Basic Terrestrial Ecosystem Services-	
Atmospheric services	5
Biodiversity maintenance and products	6
Net gains from housing and major resource extraction will be offset	7
Maintaining Scenic Hills genetic and functional complexity	10
Changing Government Policy	11
Transition to Green Technology.	13
Creating a New workforce	15
Scenario	17
Newspaper articles- Gas Exploration Query/ Blowout not just a load of hot air	
On a personal note	19
Bibliography	21

Introduction

Our ecological footprint is the impact that everyone has on the planet as we go about our lives. It is the calculation of the amount of land required to provide water, food, energy and other resources.

Australia has the fourth largest ecological footprint in the world behind the United Arab Emirates, the US and Kuwait. It is three and a half times the global average. Australians leave some of the largest footprints on Earth because our energy providers are dominated by coal, gas and oil. Australia also ranks in the top ten for forest loss. In 2008, 30% of our forests had been cleared and converted to other land use.

As a result, current human induced greenhouse gas emissions to the atmosphere are greater than the capacity of our ecosystems to absorb them.

Consequently, extinctions of plants and animals across the planet are accelerating at unprecedented levels

Protecting the natural environment is no longer just another issue for the world- it is THE ISSUE.

"We're running on empty, Australia's natural resource consumption is one of the worst in the world. We must push forward on finding a balance between our consumption of natural resources and the Earth's ability to renew them."

WWF- Australia, past CEO, Greg Bourne.

"Native forests are now in shorter supply than our electricity." The Wilderness Society.

Human progress to date will be undermined if societies fail to halt the slide into environmental degradation.

"Any progress achieved in addressing poverty and hunger, improved health and environmental protection is unlikely to be sustained if most of the ecosystem services on which humanity relies continue to be degraded."

United Nations Millennium Ecosystem Assessment Report (MA was initiated in 2001- and its findings are the consensus of 1360 experts from approximately 100 nations; the largest body of natural and social scientists ever assembled. The assessment took 4 years).

"Human survival and progress can no longer be considered separate from protecting the environment. They are one and the same thing. By 2050, the quality of life for most people in the world will depend on how well we deal with the environment right now." WWF- Australian Director of Conservation, Dr Ray Nias. 2005

Human demands for food, fresh water, timber and fuel have resulted in the degradation of a massive 60% of the world's ecosystems.
Oceans and terrestrial ecosystems are currently absorbing only about half the carbon emissions from fossil fuel combustion.UN- MA report-2005

Scenic Hills- A Terrestrial Ecosystem

Worldwide concern in the scientific community about catastrophic climate change has led to- carbon uptake for climate regulation - being recognised as a vital ecosystem service.

Scenic Hills in the electorate of Campbelltown, NSW Australia, provides vital terrestrial ecosystem services.

In addition to its outstanding tourist value, Scenic Hills is a significant natural carbon sink in Metropolitan South West Sydney. A carbon sink is a system engaged in stabilising carbon dioxide thus carbon is kept within the ecosystem, i.e. in the biomass and bound to soil particles and not in the atmosphere.

Scenic Hills as an ecosystem does not exist in isolation. There is a recognised interconnectedness of all ecosystems, and an interconnectedness of all life within ecosystems, known as the web of life. Changes to the environmental integrity of Scenic hills will impact other ecosystems including terrestrial, freshwater and marine. What happens to Scenic Hills, whether it is housing development or major resource extraction will have environmental repercussions.

The catastrophic clear felling of Scenic Hills for housing and the damage caused to Scenic Hills by major resource exploration, expansion, and development, substantially and immediately diminishes the ecosystem service benefits for the present, the near future and further generations.

One of the major findings of the United Nations Millennium Ecosystem Assessment Report (M A) is-

Humankind is depleting Earth's natural capital to such a degree that that we are putting such pressure on the remaining natural environment that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted but environmentally ethical and appropriate action now can make a difference. Substantial changes now, in federal, state and local environmental policy and practices to protect ecosystems, are imperative.

BASIC TERRESTRIAL ECOSYSTEM SERVICES

Scenic Hills as a terrestrial ecosystem provides atmospheric services.

They are:

* warming and cooling , i.e. an intact and large vegetative canopy has greater albedo and is effective at greater capacity for trapping radiation by multiple reflection thus helping to cool surface air as opposed to bare, raw earth and dry land (or for example, housing) which has high surface air temperature. Also, water extracted from root zones increases the upward latent heat flux and cools surface air.

* the altering of atmospheric chemistry. The conversion of CO₂ and water to oxygen, i.e. the air cycle.

* atmospheric cleansing, i.e. as an intact sink it is fundamental for the removal of pollutants from the atmosphere thus preserving air quality (the air cycle).

Most of the carbon in a natural forest is stored in the woody biomass of mature, large trees, dead wood on the forest floor and in the soil- in tree roots, associated fungi micro-organisms and decomposed plant material. They represent a significant stock of carbon that is continually replenished through natural ecosystem processes.

* water recycling and regional rainfall patterns, i.e. sources of cloud condensation and evapotranspiration. The greater the surface area of vegetative canopy, the greater capacity for water recycling back into the atmosphere.

* nutrient redistribution

*a reduction of dust emissions (and prevention of localised erosion).

Scenic Hills as a Terrestrial Ecosystem provides biodiversity maintenance.

Scenic Hills-

* is an occupied, self sustaining living seed bank.

* is a source of genetic diversity of native flora. Genome revision allows populations to adapt to environmental changes. Gene pools are revised and replenished (through reproduction) which ensures pest and disease resistance and viability.

* provides established stability and structural complexity along a time scale ensuring long term survival of native plant species.

*is native wildlife habitat.

*is microbial habitat.

* is a source of genetic diversity of native fauna. Genome revision allows populations to adapt to environmental changes. Gene pools are revised and replenished (through reproduction) which ensures pest and disease resistance and viability.

* provides established stability and structural complexity along a time scale to be preferred wildlife habitat providing consistent supplies of food ,water, shelter, refuge and oxygen thus ensuring long term survival of native animal species.

* facilitates the movement of species migration from landscape to landscape thus ensuring the chance of survival.

Scenic Hills as a Terrestrial Ecosystem provides products. They are-

*fresh water

*breathable, clean air

*heating and cooling(air conditioning)

*fauna and habitat

*flora

The net gains from housing development and any major resource extraction industry will be offset by their destructive impact on the Scenic Hills terrestrial ecosystem's atmospheric and biodiversity services , which will lead to –

***its conversion from a net sink of tropospheric ozone to a net source of ozone and other pollutants.**

*** a substantial loss in its ability to function to its previous potential.**

*** a reduction in its resilience.**

*** a reduction in its biocapacity (the ability to sustain life).**

*** Habitat loss.**

*** mature big tree mortality, decomposition, erosion and the risk of fire.**

*** loss of biodiversity. All endangered, threatened and extinct plant and native animals were once common and abundant. No plant, animal or microbial species can withstand climate change and habitat loss which means the loss of shelter, clean air, food and water, thus all plant and animal species, including common, are threatened by human action.**

*** loss of established stability over a time scale leading to unreliability as preferred wildlife habitat because of intense and constant human interference, thus causing decline in wildlife numbers and/or species. Stress in native wildlife compromises immune function leading to a reduction in resistance to pests and diseases and reduction in viability.**

*** a reduction in its capacity to regulate weather: By altering its physical properties (clear felling stands of trees and understorey, cutting down individual trees, exposing roots, and disturbing surface soil, and deeper earth layers), heat and water fluxes are disturbed, negatively influencing temperature and precipitation .The change in canopy and understorey , reduces evapotranspiration, negatively impacting rainfall, leading to local warming. Within an intact ecosystem there is a relationship between trees and precipitation that forms positive feedback, i.e. more trees- more rainfall.**

Interactions between ecosystems and the atmosphere are non-linear with many feedbacks and thresholds that if exceeded may lead to abrupt changes in climate and landcover. Human induced changes to landcover may become irreversible due to the climate-ecosystem feedback, e.g. if the threshold in loss of vegetation cover that contributed to rainfall is crossed, a desert state becomes self sustaining. It is impossible to predict thresholds. Certain amount of vegetation is required to maintain rainfall.

- * a reduction in water recycling.

- *negatively impact soil quality.

- *a negative impact on the amount of water flowing up from the soil through plants to the atmosphere (evapotranspiration) where it becomes available for rainfall. There will be a substantial reduction in evapotranspiration.

- *a negative effect on the land's capacity to regulate flows of water.

- * a change in local precipitation composition with an increase in harmful compounds causing plant damage as a result of the deposition of particles on the local environment.

- * a reduction of its atmospheric cleansing capacity. Harmful concentrations of ozone already collect over urban areas.

- * carbon pollution reduces the nutritional quality of vegetation putting animal species at risk of malnutrition and starvation.

- *a change in magnitude of atmospheric pollutants will have an effect on the ecosystem's ability to maintain a breathable atmosphere.

- * further exacerbation of climate change, i.e. each hectare of ecosystem that is degraded or destroyed results in a net loss of carbon from the terrestrial carbon reservoir which leads to a net increase in the atmospheric carbon reservoir. It is this increase in the atmospheric concentrations of carbon dioxide that exacerbates global warming causing climate change.

*dust emissions entrained into the atmosphere from exposed soil have a flow-on fertilising affect on the world's oceans leading to a reduction in marine uptake of CO₂ by the ocean thus diminishing the effectiveness of marine ecosystems as a source of carbon sequestration.

*increased atmospheric CO₂ leading to increased acidity of the ocean (flow-on affect), changing carbonate chemistry, resulting in negative impacts on organisms that make their bodies from calcium carbonate including coral, foraminifera and coccolithophores (leading to bleaching and death).

* Ozone impacts pulmonary and respiratory functions causing an increase in human and animal respiratory diseases and the exacerbation of pre-existing respiratory diseases such as asthma resulting in higher mortality. It also impacts UV exposure.

Maintaining Scenic Hill's genetic and functional complexity is an essential part of maintaining a healthy environment and this involves protecting Scenic Hill's ecosystem from housing development and non green major resource extraction.

Protecting Scenic Hills ecosystem-

* will maintain its ecosystem service resilience.

* will maintain its biocapacity.

* is a cost effective way to deal with climate change.

* is a natural mechanism to build resistance to climate change. The keeping of carbon stores sequestered within Scenic Hill's terrestrial ecosystem will continue to be part of Australia's natural solution to the planetary climate change catastrophe.

* will aid Australia in naturally meeting our emissions mitigation targets.

* will aid Australia in naturally meeting our biodiversity targets.

* will mean that Australia's climate change mitigation targets will link with our biodiversity targets.

* will help to stabilise our ecological footprint so that we are living within the Earth's capacity to sustain life.

* is planetary stewardship at the local community level.

Changing Government Policy

Briefly, the NSW State Government has the power and the decision-making ability to immediately stop damage and prevent further damage caused by major resource extraction and property development, and protect (in perpetuity) conserve, restore and enhance all sites of environmental sensitivity / significance or outstanding natural beauty, including conservation sites, recreation areas, National Parks and suburban, urban and country Nature Reserves by introducing appropriate and significant changes to NSW's Environmental Protection policies. Inclusive would be the protection of Scenic Hills in the electorate of Campbelltown.

A sustainable green future with a conservation outcome for Australia will require major, vital reforms to our Environmental Protection Act.

Effective state-wide legislation would immediately-

*protect **in perpetuity** and preserve **in perpetuity** all existing 'local open spaces' including Nature Reserves, parks, and other sites of environmental sensitivity, significance or outstanding natural beauty, including National Parks and conservation sites.

* ban rezoning of 'local open space' zones into 'residential zones', including Nature Reserves, parks and other sites of environmental sensitivity, significance or outstanding beauty including National Parks and conservation sites.

*ban land releases from Nature Reserves, parks and other sites of environmental sensitivity, significance or outstanding natural beauty including National Parks and conservation sites.

*ban major resource exploration ,expansion, extraction and development (including gas and coal) in Nature Reserves, parks and other sites of environmental sensitivity, significance and beauty, including National Parks and conservation sites.

*ban property development and exploitation of Nature Reserves, parks and other sites of environmental sensitivity, significance or outstanding beauty, including National Parks and conservation sites.

* introduce a Recovery program involving reforestation, revegetation and bush regeneration of denuded Nature Reserves, parks and other sites of environmental sensitivity, significance or outstanding natural beauty including National Parks and conservation sites.

*. At the local level – Treebates (i.e. tree + rebate= treebate) financial incentives for local councils engaged in mass plantings.

* establish new environmental offences.

* introduce prosecution powers with heavy fines and severe penalties.

* act upon **I'M SORRY** to the traditional custodians by ceasing the desecration of The Land and develop co-operative arrangements and agreements with the indigenous people as primary stewards to ensure the environmental restoration and protection of The Land.

Campbelltown Council's Local Environment Plan 2002 objectives-

1.Protect areas from inappropriate development

2.Ensure environmentally sensitive areas are identified and protected.

3.Conserve the environmental heritage of Campbelltown's urban area.

4.Ensure all development satisfies the principles of sustainable development, energy conservation and efficiency / cumulative impact of development in subcatchments is considered.

5.Allow for the protection of building works, relics, trees, places and archaeological sites which have heritage significance but which are not identified as heritage items by an environmental planning instrument.

6.Conserve existing significant fabric ,settings, relics and views associated with the heritage significance of heritage items and heritage conservation areas.

Objectives 1- 6 apply to Scenic Hills and must be enacted to protect Scenic Hills.

Transition to Green Technology.

There is sunshine in abundance. There is wind in abundance.

Australia's heavy use of fossil fuels makes us the highest per capita polluter. 98% of our electricity comes from coal and gas. Using fossil fuels is the largest cause of greenhouse pollution causing global warming leading to climate change and scientists predict that with a 2-3 degree temperature rise, 97% of the Great Barrier Reef will be bleached, 80% of Kakadu wetlands will be lost (CSIRO- 2006) and 20 -30% of our species face extinction (Thomas et al 2004. Extinction risk from Climate Change, Nature 427: 145-148)

Under a climate action scenario, massively increasing renewable green energy/power would mean -we could retire then completely replace dirty power thus halting greenhouse pollution.

Australian society and our economy could be powered by renewable green, sustainable energy. Currently a range of commercial technologies are available. They are clean, safe, affordable and pollution free and would use much less of Australia's resources to sustain the Australian way of life.

Green technology includes- wind, PV, biomass, geothermal, diesel, hydro, solar thermal and ocean energy.

Political reluctance is the greatest constraint to the transition yet investing in green renewable energy will have massive economic benefits.

WWF. Australia, suggests that green, renewable technologies would-

*reduce Australia's carbon pollution and commence the transformation of our economy ,

*provide greater diversity in the power sector which would increase Australia's resilience in our power supply. There would be more choice and a healthier choice of sustainable technologies.

*protect our marine and terrestrial ecosystems including our much beloved native flora and fauna.

*grow sustainable, clean energy employment and industries that will make Australia globally competitive and by doing so quickly, would give Australia a competitive advantage as the entire world moves toward a low carbon economy, and in so doing provide export opportunities and a destination for intensive industries.

*encourage business confidence to invest in long-term electricity generation.

*be cost neutral because with the implementation of the carbon levy, the big polluters will pay to transform the economy because a percentage of the revenue generated from the scheme will be dedicated to the research, development, deployment and commercialisation of low carbon pollution technologies.

Green technology is supported by a wide range of stakeholders including business groups from the insurance and finance sectors; renewable energy and efficiency businesses; and medical, social welfare and environmental organisations.

Yet political reluctance appears to be the greatest constraint to the transition, even though investing in green renewable technologies while phasing out fossil fuel technology, will have massive economic benefits. We can recall the trepidation not too long ago that computer technology would take away jobs. Generations have now grown up not knowing life without the Internet and the virtual world and its abundant spin-offs. The trickledown effect means that even a 5 year old child knows how to use the family PC, school laptops and the classroom Smartboard.

Embracing green technology and renewable, clean energy is vital. The sooner, the better- for the world.

Creating the New Workforce: Steps to an Energy (R)evolution
(Greenpeace, 2010)

To ensure quality in the new green industry, employing the previous workforce is important because skills in operating and maintaining power stations are transferrable.

A new green technology workforce would involve-

- *redirection from existing jobs.
- *redirection from similar jobs.
- *appropriately skilled people returning to the workforce.

Qualifications could be achieved through-

- *tertiary level education.
- *on the job training.
- *traineeships and apprenticeships.

To minimise the impact on fossil fuel communities during the transition to renewable energy – a substantial package would need to be developed based on consultation with all the stakeholders.

The Institute for Sustainable Futures, University of Technology, Sydney assessment of the effect that clean, renewable technologies would have on direct employment determined that the development of jobs created in just one green technology e.g. solar thermal would be more than enough to make up for the jobs lost in domestic coal generation. Wind technology provides the most employment. Solar PV was also a major employment provider.

Consequently, the manufacturing industry would need to be scaled up to deliver renewable energy equipment constructed onshore. Components would be similar across the different technologies, i.e. geothermal, solar thermal, biomass and biogas plants are run on steam fed turbines. The manufacturing base could, given time, become export driven.

How Australia produces and uses clean energy will require-

*restructuring the power network to unlock Australia's high potential renewable energy areas and connect them to the existing grid.

*decentralising supply.

*diversifying supply.

*bringing power closer to consumers and heightening awareness of where our electricity comes from.

Finally the only way for Australia to avoid extreme weather associated with climate change and loss of species is to completely restructure the way we produce and use energy.

Scenario

The Advertiser newspaper article titled –*‘Blowout not just a load of hot air’ explodes the myth that coal-seam gas mining is entirely safe and environmentally friendly . The blowout occurred at a coal seam gas mine well near Glen Alpine. Greens MP Jeremy Buckingham shot footage of the leak at the Camden Gas Project’s Sugarloaf 3 gas well close to the water supply channel, on May 17, 2011. The blowout- a geyser like spray soared into the atmosphere sending an unknown substance over the surrounding area.*

This incident demonstrates all too clearly that no industry can guarantee 100% safety. Industrial accidents occur and are caused by human error or incompetence but unstable shifting earth sediments and changing water tables can be a cause of industrial disasters, as well.. Nature can be unpredictable.

The article states that Investigations into the incident...found there was probably no environmental damage as a result. Where is the robust science in ‘probably’? The old adage- trust me I know what I’m doing- no longer applies.

Since when does liquid soap completely destroy, by burning, an area of grassland surrounding the blowout?

The public was not informed of the effects of the geyser’s spray, on-

*soil and soil microbial health and contamination.

* foliage of nearby canopy trees.

* understorey foliage.

* native insects- particularly bees and butterflies.

* possums.

* macropods- koalas and possibly wallabies/kangaroos.

* flying birds.

* birds feeding or nesting in nearby trees and bushes.

* birds feeding or nesting in nearby woven grass nests.

* birds feeding or nesting on nearby grass mounds.

* reptiles, lizards and snakes occupying nearby grasses, bushes and rocks.

* amphibians (particularly tree frogs) sleeping in canopy trees and understorey bushes.

(Bird, macropods, reptiles and amphibians can be very inconspicuous and undetectable when humans are nearby. They can be equally as undetectable when injured by an industrial accident.)

Why was no wildlife rescue organisation contacted to investigate the welfare of affected wildlife?

How long did this blowout geyser last?

What measures were put in place to remove the offending substance from the local environment?

Why was there no loud alarm, immediately warning local residents of a possible breach before the accident?

Summer is the season of storms, intense heat and fires (and arsonists). What would happen if a single spark from a summer storm ignited a minute leak expressed from a minute crack in an underground pipe? (Gas molecules percolate between soil particles and seep up to the ground surface). The raging inferno above ground would be catastrophic but the flames igniting gas contained in pipes and the coal seam underground would cause unparalleled devastation.

Would our emergency services be prepared? Would the people of the Campbelltown electorate be prepared?

As for Scenic Hills... a coal seam gas mine in a natural environment of significant beauty *and* a residential area, beggars belief.

Was anyone prepared for the Orica contamination ? Was anyone prepared for the BP oil spill? Was Fukijima prepared? Was anyone prepared for the Chernobyl, Ukraine , catastrophe which is still in meltdown despite containment?(Ukraine is the birthplace of many of my family members.)

On a personal note

The use of fossil fuels and the resulting industrial emissions across the world have propelled the Earth's System (the atmosphere, terrestrial and marine biospheres, cryosphere, i.e. ice, snow and permafrost- and pedosphere, i.e. soils; and humans) outside the boundaries of natural system dynamics of the past Quaternary period- 2.5 million years.

As a result, the current concentration of atmospheric constituents including CO₂ and methane are unprecedented- increasing the concentration of greenhouse gases causing warming, leading to climate change and its catastrophic consequences. Climate change is the greatest environmental threat , economic challenge and humanitarian challenge that humankind has ever had to deal with. Impacts include the melting of the polar caps, widespread flooding, rising sea levels and massive population displacement . It is happening.

The Scenic Hills have a key role to play in the cycling of carbon, nutrients and water in the Earth's natural system, hence maintaining life on the planet.

Provided that housing development and major resource extraction is stopped, and revegetation and reforestation programs are implemented, then **Scenic Hills could be managed (with wise stewardship) as a significant, long term carbon sink. Realistically, the Hills could continue to offset CO₂ emissions- indefinitely.**

The other highly significant environmental value gained from the complete protection of Scenic Hills, is biodiversity maintenance.

Because a plant or animal is not seemingly valued or even considered by many of us as we go about our daily lives does not mean it is of no value to the planet. All natural components of the Earth, from the most minute, to the largest- from the smallest microbial extremophile to the largest singing mammal in the ocean- all evolved in concert with each other and are inextricably interconnected. Though species may be sentimentally missed by humans when extinction occurs, the ecosystems of the earth miss the loss in ways we don't yet fully understand. The Science of Absence is complicated and possibly tragic for all of the remaining life on Earth.

As plant life and wildlife disappear from the planet, they disappear from human consciousness and fade into insignificance. By the minute, humankind is causing species extinction.

But it is not inevitable. It is a deliberate, purposeful human choice caused by prioritising the natural environment out of the picture and always putting human wants first, to the detriment of the planet. How wrong we were to assume that we could continue plundering without consequences.

The world is not an inert rock filled with infinite riches to be pillaged. A paradigm shift is urgently needed and it is happening. We are now recognising that planet Earth is alive and our life support.

The human species is neither so intelligent nor so wise as to know everything about everything and our greed, arrogance, stubbornness and denial have led us to where we are now. Until an event directly impacts upon humankind we ignore the impact on the environment until it is almost too late. Now that First World humankind's needs and our quality of life are being negatively impacted across the planet ...now...we take notice of what we have done to the increasingly scarified Earth.

There is a plethora of scientific evidence to demonstrate that protecting and restoring our terrestrial ecosystems is a major climate change solution which offers a dual benefit of storing carbon out of the atmosphere and reducing emissions caused by environmental degradation.

Now more than ever, The Scenic Hills are urgently needed as life support.

Now more than ever in human history, we need wise stewardship of our ecosystems across NSW, and indeed Australia and the world.

Bibliography and References

Gorrey, M., Macarthur Advertiser, 17/8/ 2011, ***Blowout not just a load of hot air.***

Gorrey, M., Armstrong, K., Macarthur Advertiser, 10/8/11, ***Gas exploration query.***

Greenpeace; Making Waves

Issues: 13/ Autumn 08, Rainbow Warrior Special Tribute/Winter 2010, Global Impact/ Annual Review 2009, Positive Impact/Annual Review 2010.

Greenpeace: Steps to an Energy (R)evolution 2010.

Humane Society International Newsletter

Issues: Campaign Report 2008, Vol .16/ Issue 2 July 2010.

Living Planet, Exclusive Magazine for WWF Supporters (Australia)

Issues: 03/Summer06, 05/ spring 06, 11/Spring 08, 12/Autumn 09, 14/Spring 09, 15/Autumn 10, 16/Winter 10, 17/Spring 10, 18/ Autumn 2011, 19/Winter 2011, Annual and Sustainability Report 09.

Mackey, B., Keith, H., Berry, S. L., Lindenmayer, D. B. 2008, ***Green Carbon: The Role of Natural Forests in Carbon Storage***, ANU E Press.












Millennium Ecosystem Assessment (MEA). 2005, Island Press, Washington, USA. *Ecosystems and Human Well Being: Current States and Trends Vol 1, Climate and Air Quality, 13. Synthesis: What options exist to manage ecosystems sustainably? 8, pp. 92-100.*

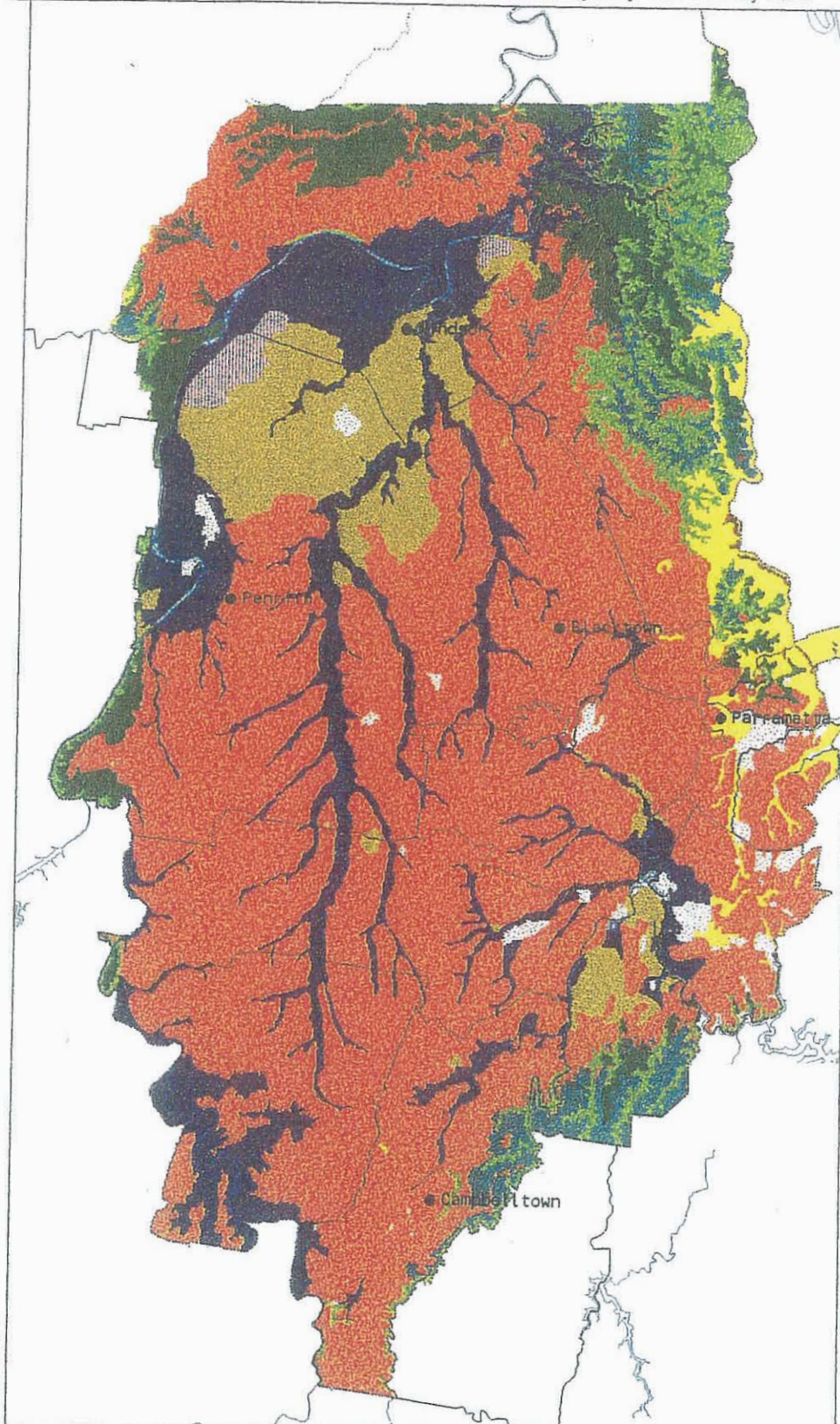
NSW Biodiversity Survey Program of Western Sydney, Overviews and Recommendations (a basis for bioregional planning). UBBS Study Area: Western Sydney,. Map- Pre 1750 Vegetation Communities. UBBS Study Area: Western Sydney Vegetation Communities and NPWS Reserves. 1997, National Parks and Wildlife Service.

Wilderness News. The Magazine of The Wilderness Society














Issues: No.169.Winter/2006, No.171.Winter /2007. No. 172. Summer/ 2008, No. 173.Winter/2008, No.174. Summer/2009, No. 176 .Summer/ 2010 No. 177 Winter /2010.

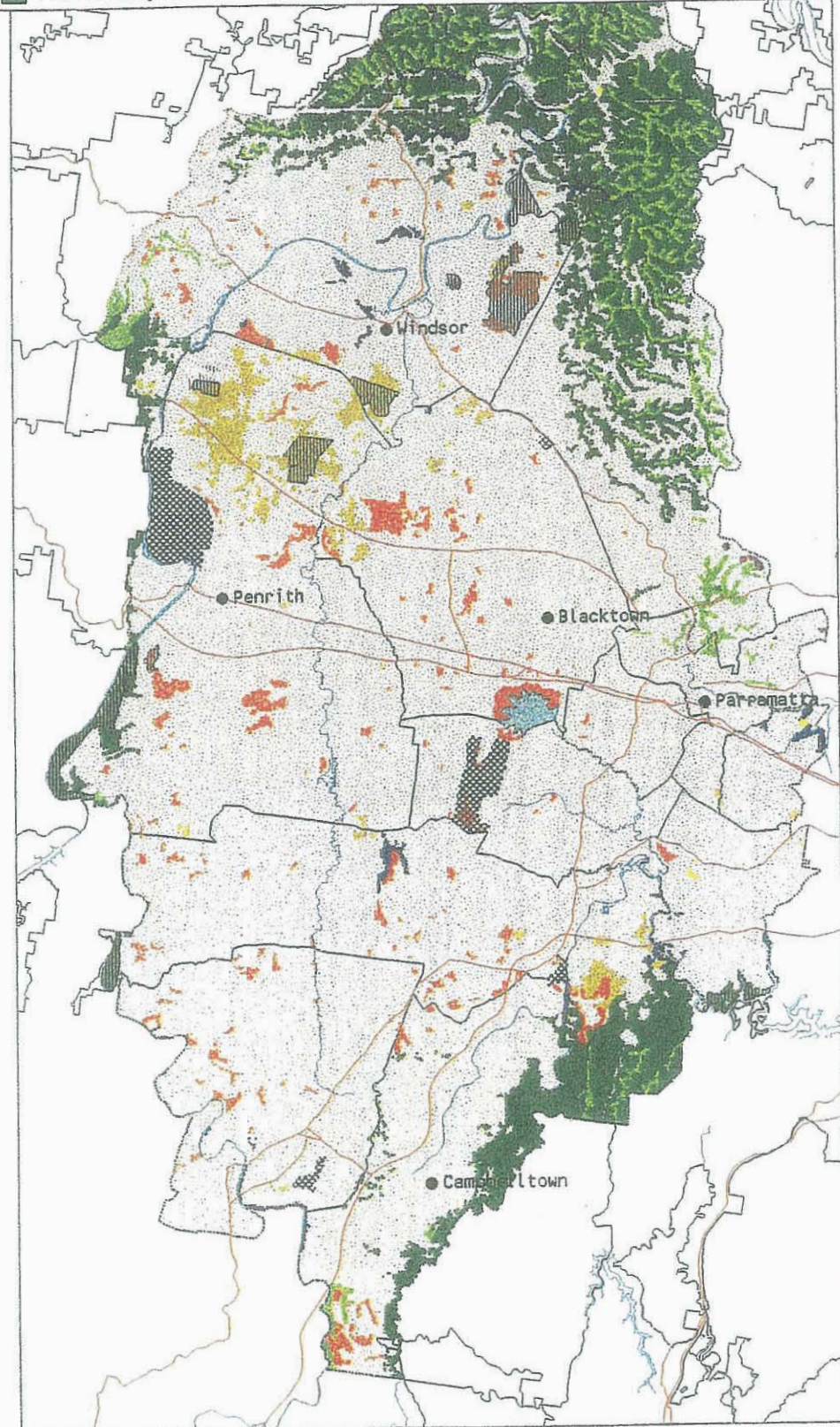
UBBS STUDY AREA: WESTERN SYDNEY
 Pre 1750 Vegetation Communities
 Scale 1:380393

- | | |
|--|--|
|  Unknown (xx) |  Hawks sstone Ridgetop Complex |
|  Water |  Hawkesbury sstone Gully Forest |
|  River Flat Forest/Wetlands |  Agnes Banks Complex |
|  Blue Gum High Forest |  Volcanic Forests and Woodlands |
|  Turp Ironbark/Shale Cap Forest |  Maroota Sands Complex |
|  Cumberland Plain Woodlands | |
|  Castlereagh Woodlands |  LGA Boundaries |
|  Narrabeen Group Gully Complex |  Major drainage (1:25K) |
|  Shale/Sandstone Transition Compl |  Western Sydney UBBS Study Area |



UBBS STUDY AREA: WESTERN SYDNEY
 Vegetation Communities and NPWS Reserves
 Scale 1:394522

- | | |
|--|---|
|  Cleared |  Agnes Banks Complex |
|  Water |  NPWS Reserves |
|  Riverflat Forest/ Wetlands |  Regional Park |
|  Blue Gum High Forest | — LGA Boundaries |
|  Turp Ironbark/Shale Cap Forest | — Highways/Major Roads 1:100k |
|  Cumberland Plain Woodlands | — Major drainage (1:25K) |
|  Castlereagh Woodlands | — Western Sydney UBBS Study Area |
|  Narrabeen Gp Gully Complex | — NPWS Estate 13/7/96 |
|  Hawkesbury sstone Ridgetop | |
|  Hawkesbury sstone Gully Forest | |



Clear evidence of unsustainable white land management.

Since white settlement,