National Environmental Research Program

LANDSCAPES & POLICY *hub*

Tools, techniques and policy pathways

In 2011, the Landscapes and Policy Research Hub set out to answer the question:

> ***'What would a whole of landscape approach to biodiversity conservation look like?'***

Focusing on two case study areas, the Tasmanian Midlands and the Australian Alps, we developed a range of tools, techniques and policy pathways to help planners and environmental managers make decisions.

These tools are designed to help managers consider the multiple impacts of human and natural influences on biodiversity over entire regions, and identify where they can most effectively intervene to protect and improve natural values.

To ensure the tools were practical and relevant, we worked closely with staff and land managers from state governments and non–government organisations in Tasmania, Victoria, NSW and the ACT.

We also travelled through the two case study areas, meeting with land managers, landholders and traditional owners to understand biodiversity values and challenges.

We believe that what we learned and developed is applicable to landscapes and regions anywhere. Find out more about our tools, techniques and policy pathways at:

www.lifeatlarge.edu.au

Life at Large

The Landscapes and Policy Research Hub explored the likely implications of changing climate, land use and other human and natural influences on ecosystem processes and the distribution of endemic and introduced plants and animals.

The result was a six–step process for assessing natural values at regional scale and a set of tools, techniques and policy pathways to assist policymakers and land managers decide where, when and how to most effectively intervene to conserve species, communities and the processes on which they depend.

Step 1. Describe the Social Context
Step 2. Consult Biodiversity Checklist
Step 3. Develop Regional Scenarios
Step 4. Map Processes and Threats
Step 5. Model Species and Communities
Step 6. Set Priorities

Step 1. Describe the Social Context

socio–economic profiling

Lead Researcher: Dr Michael Lockwood ***Michael.Lockwood@utas.edu.au***

We compiled socio–economic profiles for the Tasmanian Midlands and the Australian Alps as background to an assessment of the status and needs of biodiversity.

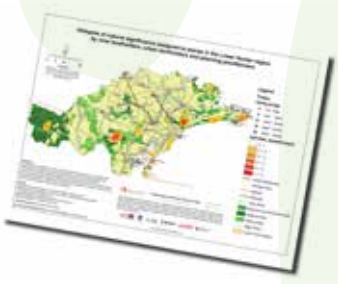
A socio–economic analysis brings together information on the social characteristics of a region. It considers the capacity of a region by assessing the human capital, the human–produced economic capital, and the social and institutional capital. A socio–economic profile informs the identification of potential futures and helps shape options for institutional, planning and management arrangements directed towards improving biodiversity outcomes. The profiles informed the development of policy reform options for biodiversity conservation.

Reference: Gadsby S, Lockwood M, Moore SA & Curtis A (2013) *Tasmanian Midlands Socio-Economic Profile*. University of Tasmania, Hobart, Tasmania.

Reference: Gadsby S, Lockwood M, Moore SA, Curtis A & Sharon Joyce (2013) *Australian Alps Socio–Economic Profile.* University of Tasmania, Hobart, Tasmania.

reflecting community values in regional planning

Lead Researcher: Dr Chris Raymond Chris.Raymond@enviroconnect.com.au



We used a map–based mail survey of rural and urban residents to identify particular places valued by each group.

Surveys in the Lower Hunter Valley were conducted to generate maps of community values to biodiversity, and preferences for conservation and development. Spatial tools for integrating social, ecological and economic values in regional planning were demonstrated to staff from the Department of the Environment, planning practitioners and researchers from the University of Melbourne, University of Tasmania, RMIT University and Charles Sturt University.

Reference: Raymond C & Curtis A (2013) *Mapping community values for regional sustainability in the Lower Hunter Region*. University of Tasmania, Hobart, Tasmania.

understanding institutions

Lead Researcher: Sarah Clement S.Clement@murdoch.edu.au

We examined the ways in which rules, regulations and other institutional arrangements influence biodiversity conservation as a guide to future reform. Using an 'institutional grammar tool', we analysed the principles and processes contained in policies, revealing how people might interpret them.

PhD student Sarah Clement developed a set of criteria for the design of institutions that can deal with the challenges of landscape–scale biodiversity conservation. Based on a review of literature of organisational theory, political science, institutional theory, resilience and adaptive governance, the framework covers four major attributes of institutions relevant to biodiversity conservation: capacity, practices, fit and politics. Using the framework and an institutional grammar tool, Sarah analysed current policies to find out if the language of legislation or a new policy matches the intention of policymakers.

Reference: Clement S (2012) *Biodiversity Governance in the Tasmanian Midlands and Australian Alps – a preliminary literature review.* Murdoch University, Perth, WA

review of biodiversity planning and assessment

Lead Researcher: Prof Sue Moore S.Moore@murdoch.edu.au

We compared the likely effectiveness of environment impact assessment, strategic assessment and bioregional planning in determining the status and planning needs of biodiversity.

We compared strategic assessment, bioregional planning and environmental impact assessment as approaches to assessing and planning of biodiversity from the perspectives of governance, ecology and implementation. A strength of bioregional planning over the other approaches was that the boundaries of the plan can be defined to ensure coherence between ecological, social and governance issues. This was identified as a means of addressing a weakness in strategic assessment which has no requirement for the area subject to the plan to have economical or social coherence.

Reference: Pope J & Moore SA (2013) *Planning and assessment for biodiversity conservation at a landscape-scale: an evaluation of current approaches and opportunities in Australia.* University of Tasmania, Hobart Tasmania.

sensitivity of market based instruments to selection criteria

Lead Researcher: Dr Sayed Iftekhar mdsayed.iftekhar@uwa.edu.au

We reviewed a decade of experience in the Tasmanian Midlands to determine which criteria in markets for conservation funding had the most influence on the outcome.

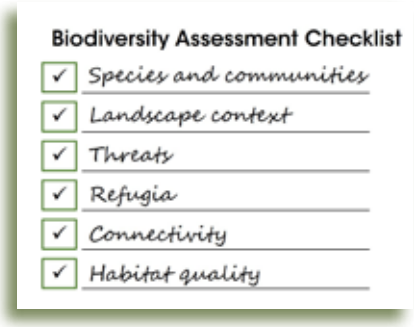
We conducted an analysis of all tenders held for conservation services on private land in the Tasmanian Midlands. Two important findings were that 1) selection criteria favoured agreements with longer durations over agreements that focused on site quality, and 2) as total available funding increases, the conservation value secured per dollar declines. While the second outcome is largely unavoidable, valuing longevity over quality may not be the most effective strategy. Where regulatory regimes are likely to change, such as species being formally listed as threatened or endangered, securing high quality sites for shorter periods is likely to provide a greater guarantee of protecting valuable habitat into the future.

Reference: Iftekhar MS, Tisdell JG & Sprod D (2013) *A review of conservation project selection criteria in the Midlands Biodiversity Hotspot Tender, Tasmania: sensitivity to project duration and auction budget.* University of Tasmania, Hobart, Tasmania.

Step 2. Consult Biodiversity checklist

biodiversity assessment checklist

Lead Researcher: Prof Brendan Mackey B.Mackey@griffith.edu.au



Before starting a regional–scale analysis of biodiversity and its conservation needs, it is first necessary to carry out a stocktake of natural values, including the biological, physical and social processes that support and threaten species and communities.

Biodiversity takes many forms and is valued for many different reasons. The biodiversity checklist is a systematic guide to identifying the attributes of biodiversity importance in any large–scale assessment. Thirty two different attributes are identified under six major categories. The six categories are the different types of species and communities that are valued in a region; the physical fabric of the landscape that supports life; those areas that serve as refuges against drought, fire, climate change and other threats; processes that threaten biodiversity such as invasive plants and animals, diseases and climate change; and areas that serve as connections between habitat patches, and the quality of habitat.

Key Collaborators: Oberon Carter (Department of Primary Industries, Parks, Water and Environment)

Step 3. Develop Regional Scenarios

using scenario planning to test biodiversity governance

Lead Researcher: Dr Michael Mitchell Michael.Mitchell@utas.edu.au

We explored the application of conceptual modelling and scenario planning as tools to assist biodiversity policy and decision–making.

In a series of workshops and focus groups involving more than 100 land managers, policymakers, landholders and interest groups, we tested a range of alternative governance options for biodiversity conservation. The governance options were developed using a combination of scenario planning, analysis of legislation, policies and plans using the Institutional Grammar Tool and key informant interviews.

The alternative governance options in both case study areas, the Australian Alps and the Tasmanian Midlands, covered the spectrum from public to private ownership. In the Australian Alps for example, the preferred options, 'One Park One Plan' and 'Development of a Transboundary Authority', both involved greater cooperation between jurisdictions and devolution of responsibility to regional managers.

Reference: Lockwood M, Mitchell M, Moore SA, Clement S (2014) Biodiversity Governance and Social–ecological System Dynamics: Transformation in the Australian Alps. *Ecology & Society.*

climate futures in the australian alps

Lead Researcher: Prof Nathan Bindoff N.Bindoff@utas.edu.au

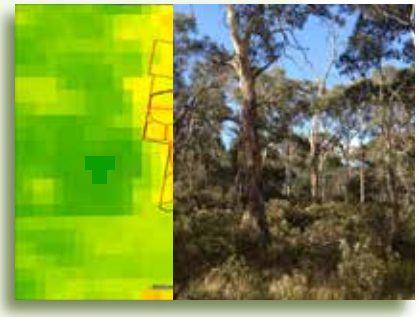
We produced fine–scale regional climate projections for the Australian Alps which enable researchers, planners and managers to explore the likely implications of climate change over the region.

By the end of the century, the projections show an increase in mean annual temperature of 4 °C – 5 °C; reductions in annual precipitation of approximately 20%; and declines in annual snow cover of up to 80%. This is likely to impact sensitive alpine and subalpine ecological communities and threatened species, increase future fire danger, and affect alpine tourism and water availability in the Murray–Darling Basin.

Key Collaborators: CSIRO

mapping vegetation productivity

Lead Researcher: Dr Sue Gould S.Gould@griffith.edu.au



Using satellite data, we tested a novel method for identifying areas likely to function as refuges against drought and climate change.

We developed an index of vegetation productivity for the Tasmanian Midlands that can be used to identify potential refuges. This assumes that locations where vegetation productivity remains relatively high and stable during drought may act as refuges, as they are likely to provide a more reliable supply of habitat resources for a wide range of species. We found a stronger relationship between remotely sensed data and ground measurements of productivity in White Gum (*Eucalyptus viminalis*) woodland than Kangaroo Grass (*Themeda triandra*) communities. The method has potential for remotely assessing the productivity of many types of land use.

Reference: Gould SF, Hugh S, Porfirio LL & Mackey BG (2015) Ecosystem greenspots pass the first test. *Landscape Ecology* 30:141-151

remote detection of habitat condition

Lead Researcher: Dr Luciana Porfirio Luciana.Porfirio@csiro.au

Wild horses have been shown to have negative impacts on the composition and structure of vegetation in the Australian Alps, and subsequently on landscape structure and ecological processes.

In the alps landscape, monitoring the impact of horses on vegetation is difficult and expensive due to remoteness, terrain and harsh weather. To assist park managers track the impacts of wild horse populations and gauge the effectiveness of management strategies, we developed a monitoring method based on freely available data from the MODIS satellite and tested it using field observations of vegetation condition at sites where horses were known to be present and absent. The method has been tested by rangers from Parks Victoria and the NSW National Parks and Wildlife Service.

Key Collaborators: Geoff Robertson (NSW National Parks and Wildlife Service), Charlie Pascoe (Parks Victoria)

temperature the big threat to freshwater biodiversity

Lead Researcher: Prof Peter Davies P.E.Davies@utas.edu.au

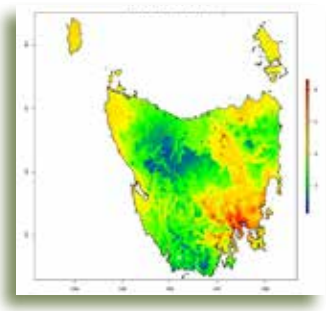
We used linked hydrologic, climate and ecological models to explore the effects of changing rainfall, temperature and water use on the state of rivers in the Tasmanian Midlands.

The health or condition of aquatic ecosystems is a combined result of processes occurring within the ecosystem and in the surrounding catchment. Making decisions about how to manage aquatic ecosystems in a changing climate is therefore challenging. The hub used climate simulations from the Australian Government funded Climate Futures for Tasmania project to project responses of invertebrates, fish and riparian vegetation using a suite of connected models. The results indicate that changes in temperature are likely to have a greater influence on the aquatic biota than changes in stream flow.

Key Collaborators: Bryce Graham (Department of Primary Industries, Parks, Water and Environment)

fire hazard mapping in real time

Lead Researcher: Dr Grant Williamson Grant.Williamson@utas.edu.au



Our online fire hazard mapping tool provides real–time maps of fire danger in Tasmania, with a version being developed for Victoria.

Hosted by the Tasmanian Fire Service on their website and also available as a smart phone app, the tool shows maps of MacArthur's Forest Fire Danger Index (FFDI) and serves as a guide to the current fire danger. The map is updated every 15 minutes using data from weather stations, including temperature, wind speed, humidity and rainfall, plus a seasonal drought factor calculated by the Bureau of Meteorology. We developed this tool and other online resources, such as regional fire histories for Tasmania, in cooperation with land management and emergency service agencies.

Weblink: https://www.fire.tas.gov.au/Show?pageId=intracolFfdiIndex

fire reshaping landscapes

Lead Researcher: Prof David Bowman David.Bowman@utas.edu.au

Fire is restructuring the Australian Alps landscape. The fires during the last decade are 'game changing' events. Forests dominated by Alpine Ash (Eucalyptus delegatensis), a species that does not re–sprout after fire but reproduces from seed, have been burnt two and three times in a decade.

After fires in 2013, areas of *Eucalyptus delegatensis* were reseeded. However, reseeding these forests may not be an option in the future if the area affected by repeat fires increases. Without re–seeding, there is likely to be a change in forest type to mixed eucalypts and acacias, as Alpine Ash takes 20 years to mature and produce seed. More frequent fires may also result in a change from snow gum woodlands to shrublands or a high–altitude form of mallee vegetation. This study considered questions faced by policymakers and managers; when to reseed and when to accept the landscape transformation?

Reference: Bowman DMJS, Murphy BP, Neyland DLJ, Williamson GJ & Prior LD (2013) Abrupt fire regime change may cause landscape-wide loss of mature obligate seeder forests. *Global Change Biology*, Vol 20, Issue 3, pp 1008–1015, March 2014.

does grazing reduce fire intensity?

Lead Researcher: Dr Grant Williamson Grant.Williamson@utas.edu.au

Grazing in the Victorian high country is commonly argued to reduce fire risk. We carried out the first landscape–wide analysis of historic data to test this claim.

A retrospective study of the impacts of grazing in the Victorian Alps found that a history of grazing did not influence fire intensity during large–scale fires. We reviewed Landsat satellite–derived data for two fires (2003/2007) to assess the impact of cattle grazing in a national park on fire severity in woodlands and forest vegetation. Our research revealed no difference in fire intensity between 5,000 randomly selected, paired sites, half located inside grazing leases and half located outside. This suggests that cattle grazing has little impact on fuel loads or fire severity in alpine forests.

Reference: Williamson GJ, Murphy BP & Bowman DMJS (2013) Cattle grazing does not reduce fire severity in eucalypt forests and woodlands of the Australian Alps. Austral Ecology

future fire danger

Lead Researcher: Paul Fox–Hughes P.Fox-Hughes@bom.gov.au

We now have fine–scale fire danger projections for Tasmania to 2100 and they indicate a steady increase in fire danger, a lengthening of fire season, at some locations, more days at the highest danger ratings.

Fire danger has increased in recent decades, and is projected to increase further with climate change. We assessed the regional changes in fire danger that are projected to occur in Tasmania through to 2100 under a high emissions scenario.

In contrast with previous continental–scale studies which show little change in Tasmanian fire danger, our results indicate an overall increase in fire danger, especially in spring, with more days per year likely to require total fire bans.

Reference: Fox-Hughes P, Harris RMB, Lee G, Grose M & Bindoff NL (2014) Future fire danger climatology for Tasmania, Australia, using dynamically downscaled regional climate model. *International Journal of Wildland Fire.* 23 (3) 309-321 <http://dx.doi.org/10.1071/WF13126>

designing corridors for threatened species

Lead Researcher: Dr Alex Lechner Alex.Lechner@uq.edu.au

We developed a modelling tool to aid large–scale planning of wildlife corridors for the Department of the Environment. The tool was developed in a pilot study in the Lower Hunter Valley in NSW and is now being rolled out in the Tasmanian Midlands.

The GIS–based decision support tool is called GAP CLoSR (General Approach to Planning Connectivity from Local Scales to Regional) and runs on a regular desk–top computer. The tool enables planners to see the landscape through the eyes of the species they are trying to conserve by simulating their patterns of movement, such as the greatest distance of open ground they will cross and the longest distance they will move between connected patches. The tool is helping planners to compare the impacts of different development plans or conservation proposals on connectivity at regional scale. This helps planners pinpoint critical bottlenecks and gaps in the corridor network under different planning proposals, and to identify where wildlife corridors would have greatest impact.

Weblink: www.nerplandscapes.edu.au/publication/GAP_CLoSR

a new tool to help manage invasive animals

Lead Researcher: Dr Nick Beeton Nicholas.Beeton@utas.edu.au

We worked with Parks Victoria, NSW National Parks and Wildlife Service and the ACT Parks and Conservation Service to develop a new tool to assist cost–effective decision–making in the management of invasive species.

The SPADE tool (Spatial Population Abundance Dynamics Engine) is a spatially–specific model that predicts the spread of invasive species based on an understanding of habitat suitability, the biology of the species, and estimates of current population size. The tool runs on a standard desk–top computer or laptop. It can incorporate different target densities in different landscape zones, and compare the costs and benefits of alternative management methods. Its ability to model the movement of animals and diseases over large areas provides managers with a powerful means of exploring the likely outcome of management interventions, decades into the future. We initially used the tool to examine the likely distribution and density of wild horses in the Australian Alps and fallow deer in Tasmania, and have explored its potential to model the invasive plant species, Hawkweed.

Key Collaborators: Dan Brown (Parks Victoria) & Rob Gibbs (NSW NPWS)

engineering bettongs

Lead Researcher: Gareth Davies Gareth.Davies@utas.edu.au

We set out to test the hypothesis that declining numbers of native animals is changing the turnover of soil and leaf litter, with implications for ecosystem processes.

This PhD study asks '*Can bettongs engineer a better future for biodiversity conservation?*' These small nocturnal marsupials turn over tonnes of soil each year in search of truffles, the fruiting bodies of native fungi. This study examines the role that digging might play in ecosystem function through improved water infiltration, incorporation of organic matter and improved seed germination. Working closely with the Tasmanian Department of Primary Industries, Parks, Water and Environment, this research is also examining planned fuel reduction burns and unplanned wildfires like those in January 2013 to understand if and how the diggings of small animals like bettongs interacts with fire and post-fire regeneration.

designing market based instruments for corridors

Lead Researcher: Prof John Tisdell John.Tisdell@utas.edu.au

We used experimental economics to find out how to achieve collaboration between landholders when establishing wildlife corridors while avoiding collusion on price.

We used economic experiments with students, policymakers and landholders to refine the design of Market Based Instruments (MBIs). The focus was on market based instruments that encourage collaboration between landholders to establish wildlife corridors, without resulting in collusion that can drive up the price. We demonstrated the application of experimental economics principles to the design of incentive schemes in a policymakers' workshop attended by staff from the Department of the Environment in Terrestrial and Marine Offsets, Water Markets, Conservation Incentives, Economic Capacity, Environmental Stewardships, Strategic Assessments and Regional Sustainability Planning teams.

bioeconomic modelling of water use

Lead Researcher: Dr Danielle Warfe Danielle.Warfe@utas.edu.au

We have developed a bioeconomic model of water use for the Tasmanian Midlands to explore the potential impacts of landuse and climate change on the regional economy.

With the commissioning of the new Midlands Water Scheme, land use is expected to change. We built a bioeconomic model to explore and compare future scenarios of water use, land use, environmental values and climate change. The model enables the user to examine how these factors influence economic returns at a sub–regional scale. We also identified the management tools most likely to promote collaboration among irrigators in meeting cease–to–take targets and sharing a common resource. Together, our findings provide a means for irrigators, water managers and policymakers to explore the economic consequences of irrigation and conservation scenarios.

Key Collaborators: Department of Primary Industries, Parks, Water and Environment & Tasmanian Irrigation

planning for an uncertain future

Lead Researcher: Dr Bec Harris R.M.B.Harris@acecrc.org.au

Climate projections are useful for assessing the likely responses of species and communities to climate change. However, the lack of integration between ecology and climate science means a limited understanding of available climate data and its appropriate use.

Three sources of uncertainty when modelling future habitat are the choice of climate model, emissions scenario, and modelling inputs such as environmental and climatic variables. Different combinations of these choices can result in a wide range in the projected fate of some species, from maintaining their current distribution to extinction. Major questions for policymakers are, 1) *have researchers clearly justified their modelling choices?* and if so, 2) *where are the priority areas for conservation when the target species are on the move?*

Reference: Harris RMB, Grose M, Lee G, Bindoff N, Porfirio L & Fox–Hughes P (2014) Climate Projections for Ecologists. *WILEY Climate Change Interdisciplinary Reviews*

Reference: Porfirio LL, Harris RMB, Hugh S , Gould SF, Lee G, Mackey B & Bindoff NL (2014) Improving the use of species distribution models in conservation planning and management under climate change. *Plos ONE*

a framework to identify future invasive plant species

Lead Researcher: Dr Bec Harris R.M.B.Harris@acecrc.org.au

The interaction between climate change and invasions is likely to present an ongoing threat to biodiversity into the future. We developed a framework to identify species likely to be invasive in the Australian Alps under future climate.

The framework includes attributes of invader species and biogeography, in combination with projections of future climate. We focused on species identified by alps managers as being of most immediate concern; broom and hawkweed. We modelled current and future climate suitability for species currently present in the alps; related species that are present in the broader region; and related species that are found in parts of the world where the current climate matches the future alps climate. Our results show that changing climatic conditions may reduce the suitability for current invasive species but improve it for other, related species. This knowledge will help prioritise management responses.

Key Collaborators *Australian Alps national park Cooperative Program*

species and communities on the move

Lead Researcher: Dr Bec Harris R.M.B.Harris@acecrc.org.au

The effective conservation of threatened ecological communities into the future requires knowledge of where climatically suitable habitat is likely to persist under changing climatic conditions.

Species distribution models for the Tasmanian Lowland Native Grassland Community suggest that very little area will remain suitable by the end of the century under a high emissions scenario. This raises fundamental questions about current approaches to biodiversity conservation, which tend to rely on a static view of ecosystems. Management options that enable the diversity, structure and function of ecosystems to be maintained will need to be identified, rather than attempting to preserve current species composition.

Key Collaborators: Louise Gilfedder & Oberon Carter (Department of Primary Industries, Parks, Water and Environment)

Step 5. Model Species and Communities

climate–niche modelling

Lead Researcher: Prof Chris Johnson C.N.Johnson@utas.edu.au

Working in collaboration with biodiversity conservation practitioners, we developed a modelling tool to aid large–scale planning of wildlife in the Tasmanian Midlands.

Over the past two centuries, habitat destruction, changed fire regimes and introduced pests have led to widespread extinctions of animal and plant species in Australia. For some species, conditions are set to worsen with climate change. We have produced climate–niche models for all the terrestrial vertebrates across Tasmania (about 230 species) and show how suitable climate–niche space may change over the next 100 years. The modelling tool can generate maps for the 230 species in any given year, from 1950–2100, in the form of shape files (or a format that can be converted to shape files). These maps can be directly used in other analyses, or intersected with other layers (for example, land cover types) for more refined estimation of realised distributions of taxa of interest.

Key Collaborators: James Cook University

Step 6. Set Priorities

combining spatial datasets to aid conservation decisions

Lead Researcher: Dr Luciana Porfirio Luciana.Porfirio@csiro.au

We pioneered the use of MCAS–S (Multi–Criteria Analysis Shell for Spatial Decision Support) to combine maps of biodiversity values and threats to help managers explore options and prioritise actions over large scales.

The MCAS–S tool helps managers pinpoint areas of highest value under different types and levels of threat, and decide where to allocate resources for greatest impact. MCAS–S can generate maps to show natural values and threats, helping people from different backgrounds, and different levels of technical and scientific expertise, to participate in conservation decisions. We have assembled a wide range of biodiversity values and threatening processes into datapacks for the case study regions, to provide examples of how the MCAS–S tool can be used in conservation planning. The maps can be generated on a laptop and projected at meetings and workshops, helping managers communicate decisions to broader audiences.

Key Collaborators: Rob Lesslie and Jasmine Rickards (ABARES)

managing threats to alpine bogs

Lead Researcher: Dr Reg Magierowski ReginaM@utas.edu.au

In collaboration with the Australian Alps national parks Cooperative Management Program, we reviewed the system used to classify bogs and developed a consistent method of identifying areas under greatest threat across the agencies that manage the alps in Victoria, NSW and the ACT.

There are more than 11,000 individual alpine bogs and wetlands. These are highly sensitive areas providing habitat for several endangered species, including the Northern and Southern Corroboree Frogs, the Baw Baw Frog, the Booroolong Frog and the Alpine Water Skink. A review of the current classification system was used to develop a series of maps that helps managers prioritise bogs according to their vulnerability to climate change, fire, weeds and the presence of feral animals. By mapping the areas where different threats coincide, managers can quickly assess which particular bogs are most vulnerable to particular threats, and which are most likely to respond to intervention.

Key Collaborators: Anita Wild (Wild Ecology) & Australian Alps national park Cooperative Management Program

taking a landscape–scale view of the alps

Lead Researcher: Sonia Hugh Sonia. Hugh@anu.edu.au

Protected area managers, policymakers and stakeholders now have a guide to management decisions that extends across landscapes and borders.

We developed an alps–wide strategic approach to understanding the natural values of the region and the threats it faces. To do this, we developed the first alps–wide vegetation classification system, and identified seven iconic landscape features and nine key threats.

We show how information about biodiversity values and threats can be combined to explore their intersection and prioritise actions over large scales. We used the MCAS–S decision–support tool to combine maps of the iconic features and their threats to pinpoint areas of high–natural value under high and low levels of threat.

Key Collaborators: Peter Jacobs (People in Nature)

river refuges

Lead Researcher: Dr Reg Magierowski ReginaM@utas.edu.au

We used the MCAS–S tool (Multi–Criteria Analysis Shell for Spatial Decision Support) to develop a model to identify potential climate refuges in the freshwater streams of the Tasmanian Midlands.

Features that act to buffer river temperature, such as shading by streamside vegetation and steep slopes, can potentially provide refuge for native fish and invertebrates during summer. We mapped the location of these different features in the Tasmanian Midlands and developed an MCAS–S datapack to integrate these maps.

Users can integrate geographic information on topographical features, groundwater, tree cover, solar radiation and enhanced flows associated with climate change or irrigation so that they can be recognised as potential refuges for aquatic species during peak summer temperatures.

Key Collaborators: Oberon Carter & Danielle Hardie (Department of Primary Industries, Parks, Water and Environment)

managing endangered species with spatial multi-criteria analysis

Lead Researcher: Dr Luciana Porfirio Luciana.Porfirio@csiro.au

We used the MCAS–S tool (Multi–Criteria Analysis Shell for Spatial Decision Support) to map potential refuges from predation and climate change.

Using the endangered swift-parrot as a case study, we considered their requirements for nesting habitat and modelled habitat suitability using future climate projections. We also modelled the likely distribution of the swift parrot's major threats, sugar gliders and habitat loss due to climate change.

By overlaying maps of suitable habitat and likely threats, we demonstrated how managers can use MCAS-S to pinpoint areas that are least-threatened and therefore may act as refuges or sanctuaries from predation, climate change and other threatening processes.

Key Collaborators: Department of Primary Industries, Parks, Water and Environment & Dejan Stojanovic (the Australian National University)

tools, techniques & policy pathways

people we worked with...

- ACT Parks and Conservation Service
- Alpine Resorts Coordinating Council
- Arthur Rylah Institute
- Australian Alps Liaison Committee (AALC)
- Australian Alps national parks Cooperative Management Program and its Reference Groups: Natural Resource Management; Feral Horse Management Group; Climate Change; Freshwater and Catchments; Australian Alps Traditional Owner (AATORG); Cultural Heritage; Visitor Experience and Marketing; Stakeholder Engagement and Communications
- Australian Bureau of Agriculture, Resource Economics and Science
- Australian National Botanical Gardens
- Bush Heritage
- Conservation Landholders Tasmania
- Department of Agriculture, Fisheries and Forestry
- Department of the Environment (federal)
- Forest Practices Authority
- Forestry Tasmania
- Greening Australia
- Hunter and Central Coast Regional Environmental Management Strategy
- National Parks Associations (NSW and Vic)
- NRM and catchment groups
- NSW Department of Planning and Infrastructure
- NSW Office of Environment and Heritage
- Parks Victoria
- State Fire Management Council (Tasmania)
- Tasmania Fire Service
- Tasmania Tourism Council
- Tasmanian Department of Primary Industries, Parks, Water and Environment
- Tasmanian Farmers and Graziers Association
- Tasmanian Irrigation
- Tasmanian Land Conservancy
- Victorian Department of Environment and Primary Industries

what they said...

"Well done NERP, LaP and the Australian Alps Liaison Committee. I know of no other place, other than perhaps Kruger National Park in South Africa, where this partnership of science and management actively working together is occurring so well."

Graeme Worboys, Protected Areas Management Specialist, Co–Vice Chair IUCN

"Great forum – well worth it for the connections and the discussions, thanks."

Alps Manager, NSW Parks and Wildlife

"Involvement with the hub has been one of the highlights of my time in the alps – a wonderful science/management collaboration; so much valuable research and sharing of knowledge. Great program for the alps."

Charlie Pascoe, Parks Victoria

"A great approach bringing researchers and management together with a focus on future use and management."

Alps Manager, Parks Victoria

"I have really grown with the hub and its researchers, they are undertaking very relevant and important work that relates directly to my area in the Australian Government."

Kåren Watson, Department of the Environment

"It was great to have an opportunity to talk to the researchers about their work."

Alps Manager, ACT Parks and Conservation

"This project has built expertise in using the tool within local government and successfully enhanced the existing corridor mapping program."

Robbie Economos, Lake Macquarie City Council

The Landscapes & Policy Research Hub was supported through funding from the Australian Government's National Environmental Research Program and involves researchers from the University of Tasmania (UTAS), The Australian National University (ANU), Murdoch University, the Antarctic Climate & Ecosystems Cooperative Research Centre (ACE CRC), Griffith University and Charles Sturt University (CSU).

University of Tasmania · ACE CRC Antarctic Climate & Ecosystems CRC · Australian National University · Murdoch University · Griffith University · Charles Sturt University