

The Business Plan To Create The Australian Savanna Plant Identification System



This proposal is being submitted on behalf of the project team by the organisation listed below:



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Title of Project: Australian Savanna Plant Identification System

Country and region for implementation: Australia – Northern tropical region

Issue the project seeks to address: Access to rapid, cost effective and accurate plant species identification for natural resource management, biodiversity conservation, sustainable development, and research.

Millenium Development Goals that will be impacted

Goal 7: Ensure Environmental Sustainability

Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources.

Target 7.B: Reduce biodiversity loss, achieving a significant reduction in the rate of loss.

Project budget requested and timeline: 7 years AUD \$11,388,504 (GST inclusive)

2015	AUD \$1,341,857	2019	AUD \$1,601,507
2016	AUD \$1,518,304	2020	AUD \$1,917,964
2017	AUD \$1,453,679	2021	AUD \$1,983,068
2018	AUD \$1,572,125		

A Globally Significant, Legacy Product

The Australian Savanna Plant Identification System (ASPIS) project will produce simple and accessible online tools and apps to enable almost anybody, anywhere to accurately identify and learn about Australia's savanna plants.

Focused on Australia's north, the ASPIS project will transform existing knowledge, generate new data, and harness cutting edge technologies to deliver authoritative biodiversity knowledge to a broad stakeholder community.

ASPIS will be a globally significant, legacy project - the largest and most complete of its kind, covering all plant species (8500+) of Australia's tropical savanna.



Built By Experts, Based On A Proven, Modern Concept

A comparable product developed by members of the ASPIS team – the *Australian Tropical Rainforest Plants Key* (RFK) – took several decades supported mostly by internal institutional allocations and delivered an identification system for more than 2550 species.

The online RFK has been hugely popular with a broad range of users, consistently receiving more than 15,000 hits per month globally. Our learnings from this and similar projects, and our multi-institutional, distributed, externally-funded project model will enable the ASPIS team to deliver a larger, more accessible and feature-rich product to a broader stakeholder community within 7 years.



Delivered For Sustainable Development Of Australia's North

Improved access to biodiversity knowledge reduces investment uncertainty and underpins sustainable development and sustainable livelihoods. To achieve this, we will deliver ASPIS products across a range of current (and future) multimedia platforms, enabling all who live, run businesses, manage land, recreate, learn, or undertake research in Australia's tropical savanna to benefit from authoritative and up-to-date plant biodiversity knowledge:

- Mining, agriculture, pastoral, horticulture and tourism industries
- Traditional owners, government (e.g. parks) and private land managers
- Biosecurity sector, environmental professionals and scientists
- Students and teachers, individual tourists, interested public



The ASPIS project requires an investment of \$11.4 million over 7 years.



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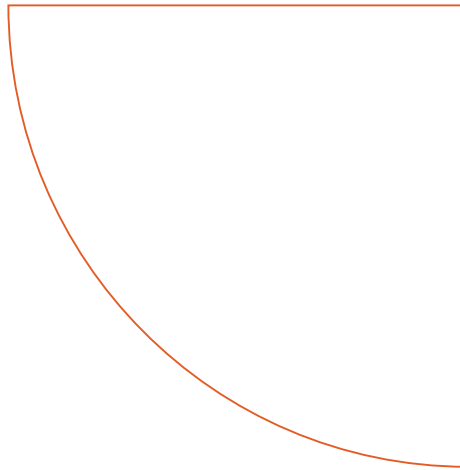
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Executive Summary

The Australian Savanna Plant Identification System (ASPIS) is a unique, ambitious and achievable proposal to develop a comprehensive and easy-to-use set of tools to enable anyone, anywhere to identify and learn about the plants of northern Australia.

Sustainable land use in the savannas of northern Australia requires accurate assessments of potentially impacted biodiversity. Vast amounts of authoritative biodiversity data are freely available through government funded portals (e.g. the Atlas of Living Australia). However to access reliable information on species, its name must be accurately known.

This project aims to address the lack of plant identification resources for the savannas of northern Australia by developing a free, simple and accessible online tool to enable almost anybody, anywhere to identify savanna plants - the Australian Savanna Plant Identification System (ASPIS).

Positioned to take maximum advantage of national broadband initiatives, this project will compile a database of over 4 million plant feature observations and thousands of images, develop the necessary bioinformatics platforms and linkages, produce web-based and portable device applications to enable plant identification in remote areas (including a standalone version not reliant on network coverage), and deliver training to increase stakeholder uptake and build community capacity.

There are over 8,500 species of native and introduced plants in the savanna region of northern Australia. A vast amount of information on these species' ecology, biology, uses and conservation status, compiled through more than 240 years of scientific endeavour is now available through the globally recognised Atlas of Living Australia portal. This wealth of

data can greatly improve our ability to sustainably manage tropical savannas, but while publicly and freely available, it **can only be utilised if the species names are accurately known.**

However, there is currently no single or easily accessible means for identifying Australian savanna plants. Existing identification resources vary in taxonomic and/or geographic scope, accuracy and currency and most are only available in specialist scientific literature. Development of a comprehensive identification and information tool such as ASPIS will enable all community sectors to access knowledge about savanna plants in order to achieve their land and environmental assessment, management, educational and recreational goals. Principal beneficiaries include the resources, agricultural, pastoral and horticultural industries, Indigenous land managers, conservation estate managers, students, tourists, and scientific researchers.

The ASPIS project builds on the success of a number of significant initiatives of Australia's leading herbaria and government organisations. Foremost among these are Australia's Virtual Herbarium (AVH) and the Atlas of Living Australia (ALA), the web-based floras of several states and territories and the web-based plant identification systems, including *Euclid*, *Wattle*, the *Pea Key*, *AusGrass* and the *Australian Tropical Rainforest Plants Key* (RFK). Risks are tightly controlled by adapting the proven and robust project model of other interactive keys (e.g. the RFK) with enhancements provided by new technology.

The Australian Tropical Herbarium will lead the project under the governance of a Steering Committee and a Project Implementation Group. The project partners include all

EXECUTIVE SUMMARY

lead agencies undertaking botanical research on behalf of, and providing savanna botanical advice to State, Territory and Federal governments (Northern Territory Herbarium, Queensland Herbarium, Western Australian Herbarium, the Australian National Herbarium).

The consortium members have individually and in combination a very strong track record of large scale collaborative research and project delivery that has tangible industry, community, conservation and scientific outcomes.

In undertaking this project, the ASPIS team will engage with a wide range of stakeholders, from local communities to national policy makers. The project design and governance models will ensure that the outcomes and products are accessible to a diverse range of users, are useful for land management, are communicated in ways that diverse

stakeholders can most readily access, and are delivered on time and on budget. User uptake and capacity building will be enhanced by delivery of training workshops in plant identification (focusing on skills development and awareness of resources) to community groups and professionals. Field activities will be undertaken to collect poorly known plant species and support the early-career researcher training necessary to identify and publish new discoveries. Citizen scientists will participate by logging sightings, photographs and specimens.

ASPIS will be funded principally by a private sector partner, with significant in-kind contributions (est. \$78 million) from the research partners. In addition to substantial improvements to environmental assessment efficiency and accuracy, the project will deliver to the funder a reduced business risk profile with respect to meeting legislative requirements and community expectations of environmental responsibility, and positive public relations through association with a major and highly visible (thousands of website views per month) public good project delivered by respected organisations.

The total project value is \$89.38 million over 7 years. The amount required from private sources is \$11.39 million.



Section 1: Introduction to Australian Tropical Savannas



Savannas are the tropical landscapes of sparse trees with a grassy understory that dominate the northern one-third of Australia, extending from Rockhampton in the east to Broome in the west (Fig. 1.1). Australia's savanna region is rich in ecological, Indigenous, community and natural resource assets. It has internationally recognised biodiversity and environmental values including iconic areas such as the Kimberley, Kakadu, the Gulf Country and Cape York Peninsula. It is home to the oldest living culture in the world. It comprises the world's largest area of high quality tropical savanna and one of the world's largest networks of free-flowing rivers.

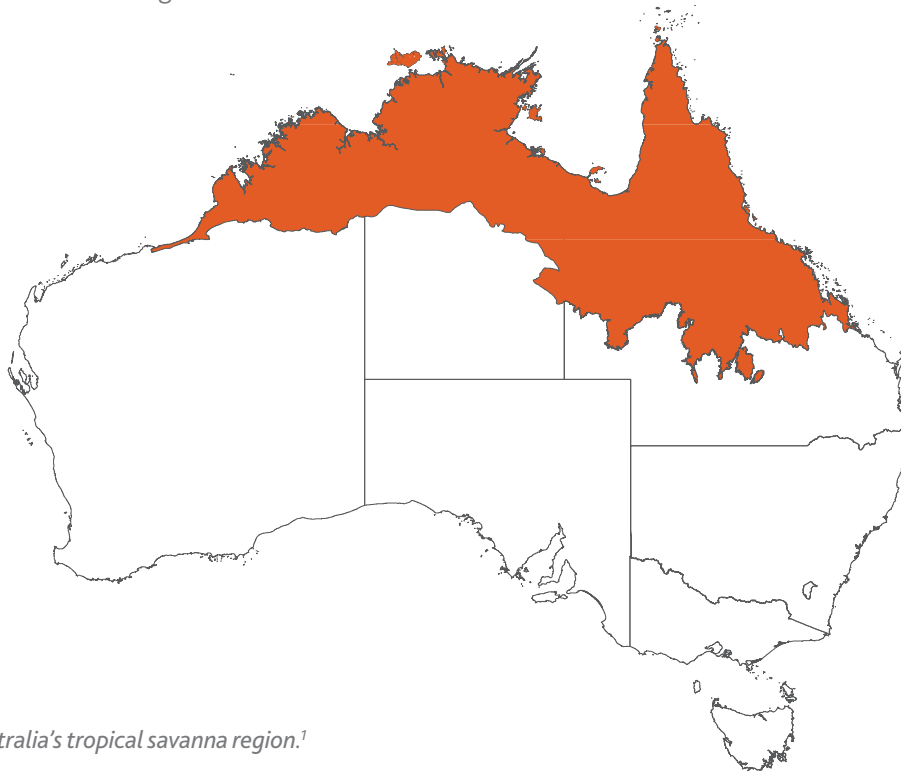


Figure 1.1: Map of Australia's tropical savanna region.¹

The flora of Australia's savanna is of great significance because of its diversity and uniqueness. Scientists have documented more than 8500 plant species in this region, nearly 40% of Australia's total plant life. Yet this biodiversity is the least well known and due to lack of appropriate tools is the most difficult to identify of Australia's major landscapes. It is widely recognised that many more savanna species remain to be discovered.

This diversity is the result of long geographical isolation, weather patterns influenced by monsoonal weather systems

with distinct wet/dry seasons, natural and anthropogenic seasonal fires, and a mixture of land forms of both great age (e.g. Kakadu, the Kimberley) and relative youth (e.g. the floodplains of Cape York). These factors combine to form a landscape like no other.

However, this region and its extraordinary biodiversity is subject to a range of challenges including habitat fragmentation, climate change, land use change, invasive species, grazing pressure, altered fire regimes, and changed hydrology.

1. Defined systematically by Fox, I.D., Neldner, V.J., Wilson, G.W. & Bannink, P.J. (2001) *The vegetation of the Australian tropical savannas*. Environmental Protection Agency, Brisbane, Queensland.

1.1: What is a tropical savanna?

“Tropical savannas are distinctive landscapes typically with a tall dense grass layer with or without trees, that occur throughout the world’s tropics. Found in parts of Australia, Africa, South and Central America, India and South-East Asia, tropical savannas can be almost treeless grasslands or denser woodlands (‘tropical savanna woodland’) – as long as the canopy cover of the trees is not so dense that it shades out the grass.”²

2. Woinarski, J., Mackey, B., Nix, H. & Traill, B. (2007) *The Nature of Northern Australia. Natural values, ecological processes and future prospects.* ANUE Press, Canberra.



Access to detailed knowledge of savanna biodiversity, and the tools to allow managers and others to identify it, are critical to achieving a whole-of-landscape approach.

Economic and Political Context

The savanna region comprises a significant proportion of northern Australia (defined broadly as the area north of the Tropic of Capricorn). It covers 69 Local Government Areas with a combined population of more than 1 million.

Land tenure across the region includes conservation reserves, Indigenous land, and leasehold and freehold properties supporting pastoral, agricultural and resource extraction businesses. These and other activities contribute significantly to the national economy.

There is a strong community and political will to further develop northern Australian economies. Planning instruments (e.g. draft Cape York Regional Plan, and the Northern Australia White Paper currently in development) by which such development will be facilitated explicitly recognise the unrivalled biodiversity assets that characterise northern Australia, and that development must not occur at their expense.

1.2: Economic consequences of incorrect plant identification.

The Class 2 pest plant *Eichhornia crassipes* (Water Hyacinth) is superficially very similar to native *Monochoria* species. Recently, a major company spent tens of thousands of dollars attempting to control a water weed identified by a consultant as Water Hyacinth in wetlands under their management near Townsville. Later investigations indicated the plant was *Monochoria*.

In 2010, misidentification of *Senegalia pennata* subspecies *kerrii* as the introduced Class 1 pest plant *Senegalia pennata* subspecies *insuavis* led to the initiation of eradication actions against this listed ‘near-threatened’ native species which is known only from a few populations on the tip of Cape York.

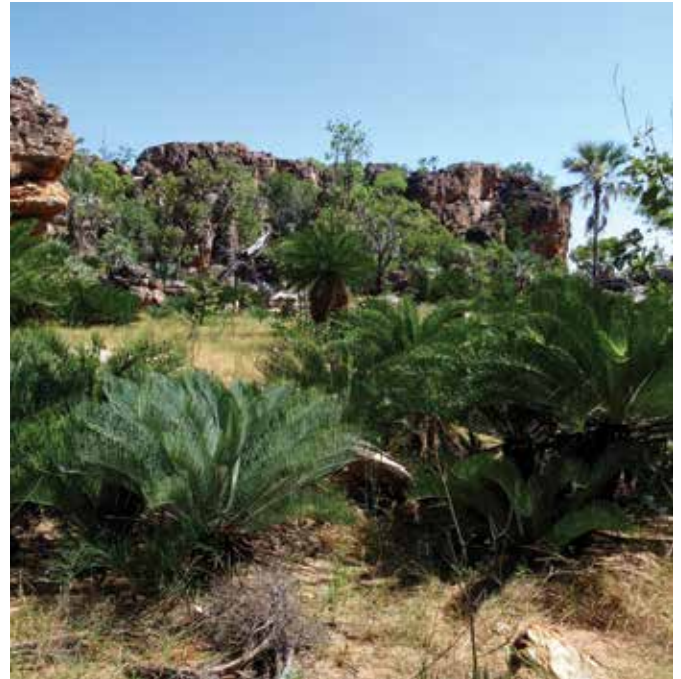
Protected areas within the savanna region conserve extensive areas of healthy ecosystems, but even these are increasingly subject to Key Threatening Processes (EPBC Act, 1999) such as invasion by gamba and other exotic grasses. The list of nationally or State/Territory threatened savanna species continues to grow, with 146 plant species listed as threatened, endangered or vulnerable (EPBC Act, 1999). Future climate change scenarios also predict significant negative impacts on savanna biodiversity.

A whole-of-landscape approach to managing biodiversity is required to meet sustainable development goals for northern Australia. This approach needs to consider ecosystems across all land tenures, and to provide land managers and community groups with the skills and resources to participate.

1.3

“Country, including all the animals and the plants, is a huge part of who we are as Traditional Owners. Preserving and reviving traditional knowledge of plants and their cultural uses is critically important to the future of Indigenous Australia. Marrying our traditional knowledge with Western knowledge about culturally important plants will help Indigenous communities to make good decisions about land use, and to develop new businesses and opportunities. What is needed, however, is a way for this information to be easily accessed and shared by the whole community from elders to the tech-savvy younger generation. This is why the savanna key project is so exciting.”³

3. Gerry Turpin, Mbabaram Elder, Ethnobotanist, and Winner of the inaugural National Deadly Award 2013 for Scientist or Science Project of the Year.



Knowledge Gaps

The development of botanical knowledge has proceeded more slowly in northern Australia than in the southern states. Although botanical exploration in northern Australia was initiated early in Australia's history, with William Dampier (1699), Joseph Banks (1770) and Ferdinand Mueller (1860-90) all making significant early collections from the region, difficulties of access and distance from southern institutions have hampered progress.

Knowledge of tropical rainforest plants expanded significantly during the 1980s with the increased interest in and access to these iconic ecosystems. Savanna plants greatly outnumber tropical rainforest plants in Australia (by at least 3 to 1) but remain poorly known. New species continue to be found especially wetland plants and those evident only in the wet season. More than 8500 species have already been described and the rate of new discoveries is not slowing.

Analyses from the least botanically known savanna areas (the Kimberley due to its isolation and Cape York Peninsula due to its great richness) show that species discovery rates are extraordinary – for example, on average one new species of plant is discovered for every eight new specimens collected from the Kimberley in the wet season. Many undiscovered plant species remain in the savanna region.

“The beginning of wisdom is calling things by their proper name.”

- Confucius

Section 2: Rationale



Poor biodiversity knowledge increases risk

Poor access to biodiversity knowledge hampers effective management for sustainable development and increases business risk with respect to meeting legislative requirements and community expectations of environmental responsibility.

Our capacity to access and utilise the great body of existing knowledge on savanna plant biodiversity is limited by the dearth of useful tools for identifying species and discovering their correct names. Only with correct plant names can biodiversity knowledge be accessed to achieve effective monitoring and management in the face of environmental and land-use change.

For the Australian savanna flora, existing identification resources vary in taxonomic and/or geographic scope, accuracy and currency. Most are available in specialist scientific literature only. Consistently, **our community and business stakeholders tell us that they urgently require useful tools to help them identify the plants they encounter.** Without the means to determine what plant species exist and where they occur the vegetation cannot be effectively documented, monitored, rehabilitated, nor deeply enjoyed. This proposal is our response to that need.

Australian Savanna Plant Identification System (ASPIS)

A consortium of State and Territory herbaria with jurisdiction in the region has developed this proposal for an Australian Savanna Plant Identification System (ASPIS).

Led by the Australian Tropical Herbarium, ASPIS is an innovative project in which **scientists and the community will work together to develop a comprehensive and easy-to-use set of tools, delivered free online and as mobile apps, for identifying, discovering and learning about plants of northern Australia.** These tools will **enable fast, reliable identification by the broadest range of users and provide accurate, plain-language and richly illustrated descriptions of all Australian savanna plant species.**

Designed to take full advantage of national broadband initiatives, ASPIS will be Australia's (and one of the world's) largest web-based identification and information system for plants. Its main feature will be an interactive key (see Box 2.2) to all the plants of the Australian tropical savannas. The project model and stakeholder value is proven by the success of a similar product (*Australian Tropical Rainforest Plants Key*) developed by members of our team for identifying plants of the Australian tropical rainforests.

2.1 Why are savanna plants so hard to identify?

The savanna flora is large (over 8500 species) and the most poorly known of all major Australian landscapes. Knowledge and tools for plant identification can be difficult to access - knowledge is based in research institutions (such as herbaria) and specialised botanical libraries, while species keys and revisions are published in scientific works that are relatively expensive, hard to acquire, and highly technical. For many savanna species there are no identification tools at all.

2.2 What is an interactive key?

Traditional identification keys most commonly use a fixed sequence of identification steps. Accurate identification is often made difficult or impossible by the absence of appropriate material (such as flowers and fruits).

Multi-access or interactive keys allow the user to choose the identification steps based on the specimen in front of them and their own confidence. It is possible to identify plants using either leaves, flowers or fruits or any combination of these, and to concentrate on readily observable features.



Proof of concept: Australian Tropical Rainforest Plants Key (RFK)

The *Australian Tropical Rainforest Plants Key* (RFK) is an award-winning³, web-based information system for identifying and learning about *Australian tropical rainforest plants*.

The RFK system is centred around an interactive key, where the user decides which characters to choose based on the specimen in hand, and includes detailed descriptions and photographs for each species of rainforest plant. Launched in December 2010 this web-based system is free for online use at: anbg.gov.au/cpbr/cd-keys/rfk

It is the most comprehensive interactive key yet produced for any group of organisms in Australia, including more than 2550 species of trees, shrubs, vines, grasses, sedges, palms, pandans and epiphytes of northern Australian rain forests.

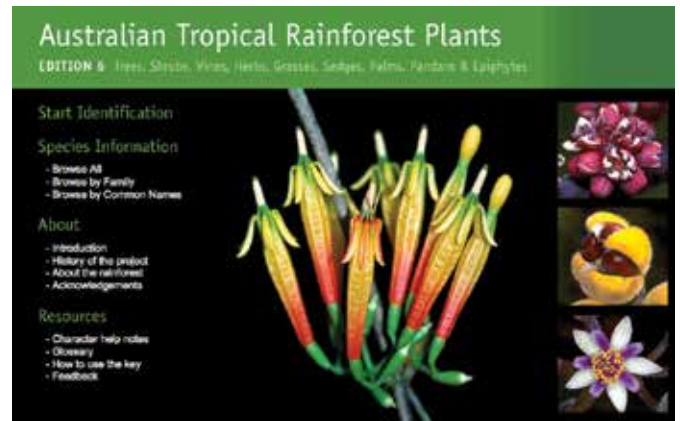
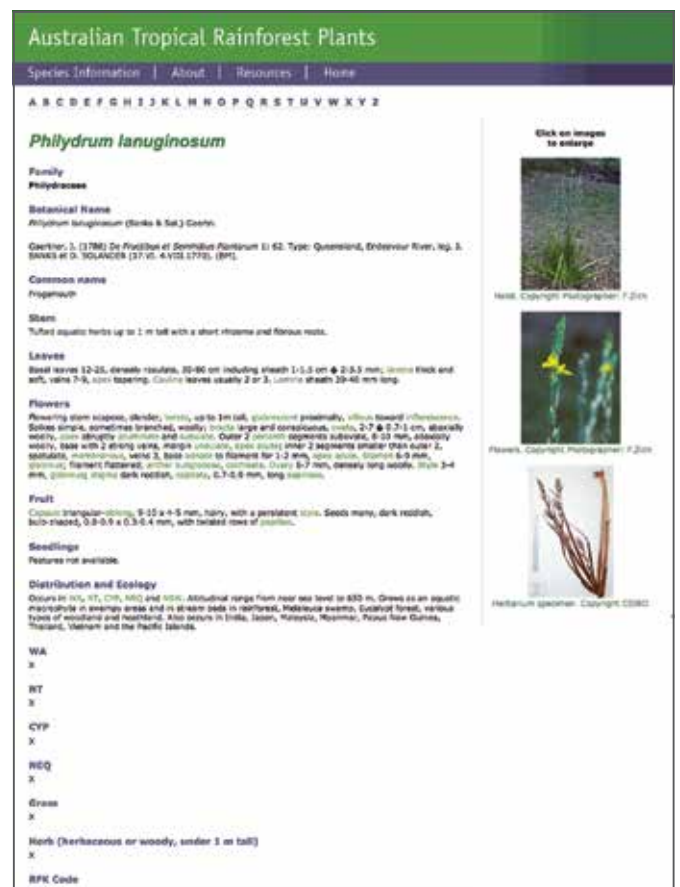
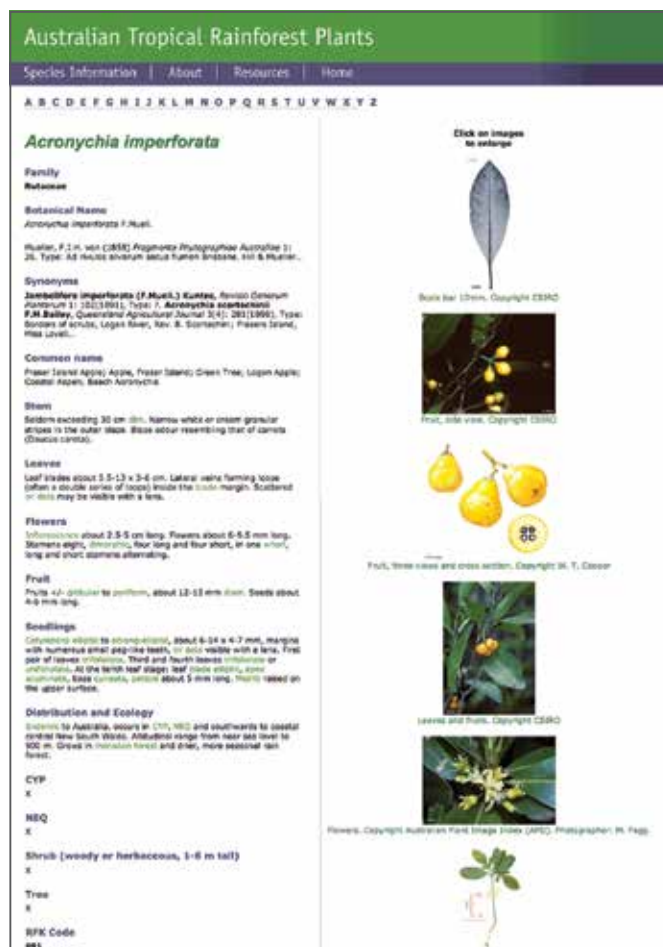


Figure 2.1. Above: Australian Tropical Rainforest Plants Key home page. Below: Species profile pages from the Australian Tropical Rainforest Plants Key (RFK).



3. Cassowary Award for Science, Wet Tropics Management Authority, 2011.

SECTION 2: RATIONALE POOR BIODIVERSITY KNOWLEDGE INCREASES RISK

The RfK is unique globally in covering all the seed plant species of a single biome in one integrated identification system. A total of 173 characters, covering features of the bark, leaves, flowers, fruits and seedlings, together with geographic and ecological information ensures that reliability and power of the key is high.

Since the launch of the free, online version the RfK has enjoyed a large and sustained uptake by users, with an average of more than 1200 visitors to the home page each month and a monthly combined visitation rate on

the species profiles of more than 15,000. Many users are residents, but the RfK also has a strong national and international presence and user base (Fig. 2.2).

The scope of the RfK covers a similar geographic area to that of the ASPIS project, from Rockhampton in Queensland to the Kimberley region of Western Australia. It is a demonstration of the project team’s ability to deliver such products, and of the popularity of this approach to a broad range of users.

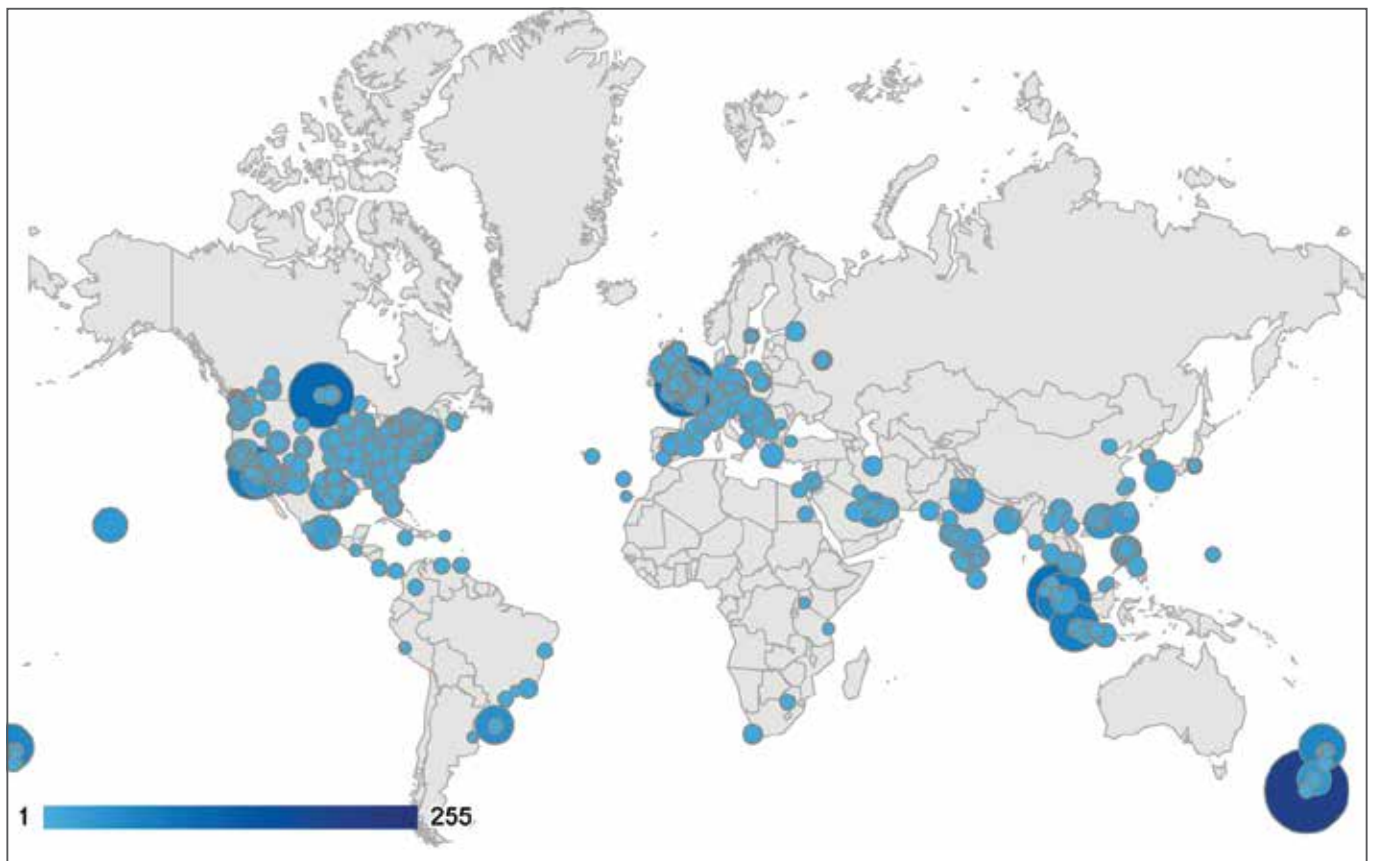
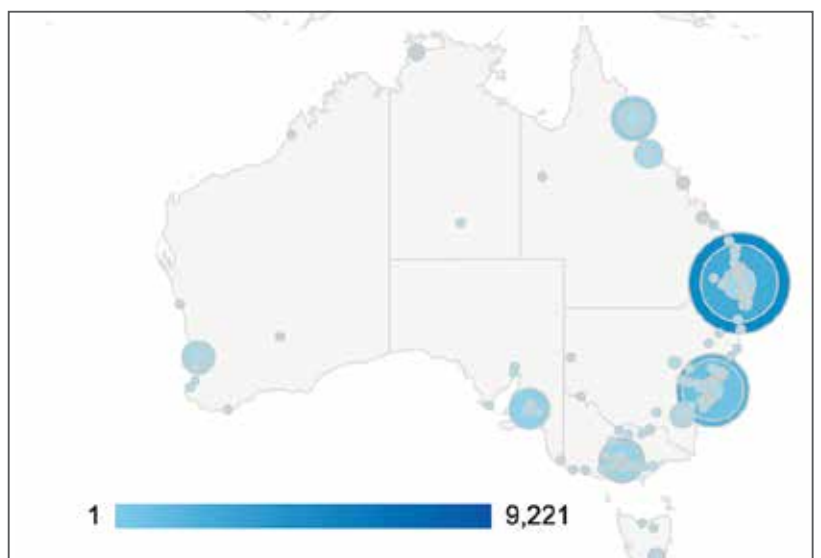


Figure 2.2: Global and national usage of the RfK (website hits per month). Source: Google Analytics.



Section 3: Project Design and Implementation Methodology

The team will collect and synthesise existing information from herbarium collections, scientific literature and data about plant species from across the Australian savanna region, and through field work will discover new information to help fill gaps in knowledge.

The design and implementation strategy for Australian Savanna Plant Identification System project is shown in Figure 3.1. Implementation of ASPIS will involve three main activities:

- Data gathering
- Data management and integration, and
- Engagement and delivery.

A Project Implementation Schedule for the ASPIS project is provided in Appendix 3.

Data Gathering

The team will precisely identify knowledge gaps, then collect and synthesise existing information, scientific literature and data about plant species from across the Australian savanna region. The transformation of existing technical knowledge, its combination with new data, and delivery through an accessible web portal and mobile app to a broad stakeholder community will be a manifestation of cutting edge knowledge capture and distribution.

In order to compile the required data on the 8500+ species of savanna plants, measurements of up to 120 plant features on each of (an average of) five specimens per species will be required to capture the natural variation among individuals (essential to produce a powerful and reliable identification tool). Thus up to 4.8 million individual observations will be made by expert botanists working in different herbaria, and the data recorded and quality checked.

Data Management and Integration

Specimen-based information collected for ASPIS will be coded into a specialist software system called *IdentifyLife* (www.identifylife.org) capable of supporting a 'cloud' data gathering model which takes advantage of the nationally distributed nature of botanical expertise and specimens.

Existing national datasets delivered through the Atlas of Living Australia (www.ala.org.au), such as environmental (climate, soil), and observational records, will be linked with herbarium specimen data captured in Australia's Virtual Herbarium (www.avh.chah.org.au) and species checklists developed through Australia's Plant Census (www.anbg.gov.au/chah/apc/) to complete an integrated information system.

3.1 What is 'IdentifyLife'

IdentifyLife is a software application that is all about bringing people and information about the world's living creatures together.

IdentifyLife is a global, collaborative project providing ways to identify the world's living organisms.



Above: *Identifylife* home page.

Engagement and Delivery

Users will interact with ASPIS through a dedicated web portal. This will have a landing page, integrated tools and links to key data, and species profile pages containing rich and accessible information and images of savanna plants.

Users may access this information via the landing page by working through the identification system, or navigate directly to the species profiles via a web search.

ASPIS will also be made available via a mobile app to provide offline access to many ASPIS features (such as the identification tools) beyond network coverage areas. The delivery model will be refined through user feedback (see Maintaining Project Relevance, page 28).

SECTION 3: PROJECT DESIGN AND IMPLEMENTATION METHODOLOGY

While specialists and experts will focus on collating and extending existing scientific datasets and information, the project will also harness the expertise of the broader community through a citizen science program designed

to encourage land managers, tourists and others with an interest in savanna plants to observe, collect, photograph and make new records of species and to report these directly into the new identification system.

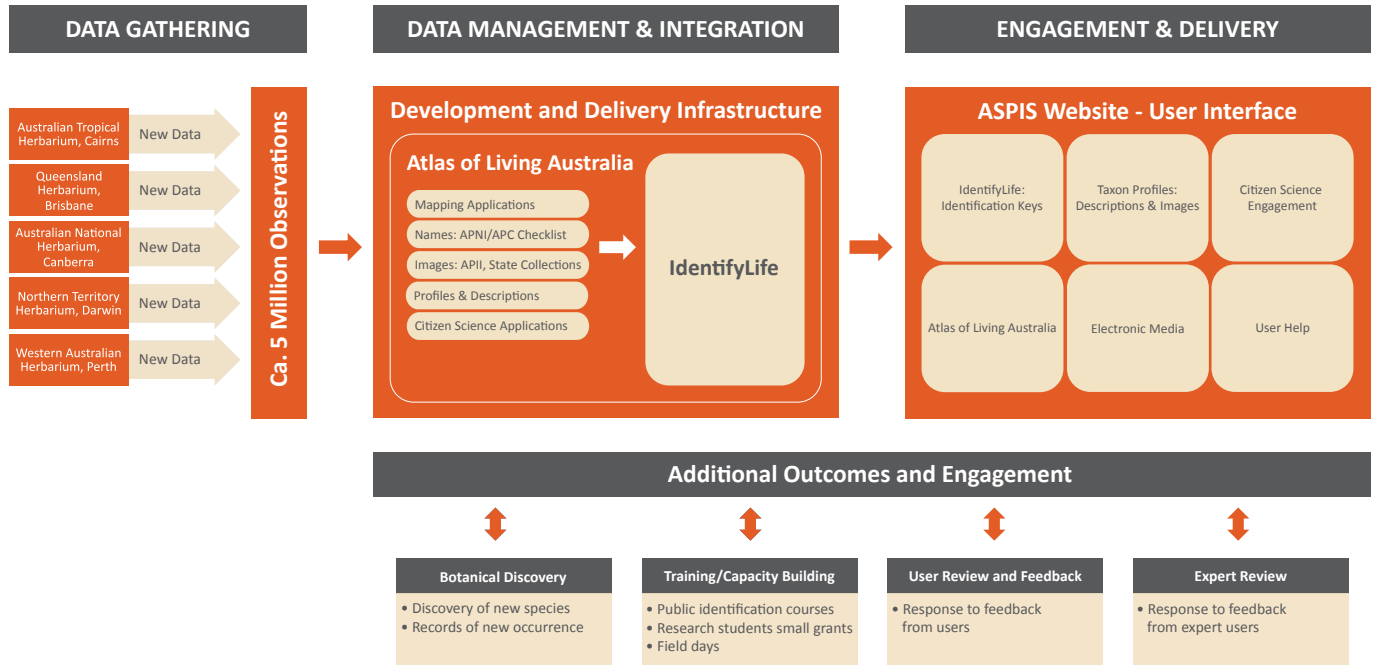


Figure 3.1: ASPIS project concept map.



Work Breakdown Structure

The ASPIS project is a complex project with multiple activity areas. Activities and the relationships between them are outlined in the work breakdown structure (Figure 3.2).



Figure 3.2: ASPIS work breakdown structure

Communication and Engagement Strategy

Communications and promotion of the project will be coordinated through the ASPIS project Implementation Group. A communications team that includes representatives of each of the project partners will liaise with the Implementation Group and the sponsor(s) to deliver the communications strategy. A communications professional will be contracted at the commencement of the project to develop and implement a detailed communications strategy.

The communication and engagement strategy will include development of materials such as:

- Standardised reporting protocols and templates suitable for all partners,
- Key messages,
- Design templates for promotion materials such as brochures, posters, etc.;

and will target media such as:

- Television (e.g. Catalyst, BTN, Totally Wild, Landline, 7.30 Report, state news),
- Print (e.g. local and state newspapers, travel and science magazines, scientific journals, museum and herbarium magazines, university press, NRM group newsletters)
- Electronic and social/online media (website, blogs, Facebook, Twitter and an ASPIS E-newsletter);
- Live exhibits (e.g. museum exhibits and displays, regional exhibit days, Bush Blitz TeachLive), and;
- Sponsors' internal and external communication devices (newsletters, reports, seminars, etc.)

Partner Organisations

This proposal is being submitted by a consortium comprising the Australian Tropical Herbarium, Northern Territory Herbarium, Queensland Herbarium, Western Australian Herbarium, Australian National Herbarium and James Cook University. The project will be administered by the Australian Tropical Herbarium through James Cook University. This consortium includes all lead agencies undertaking botanical research on behalf of, and providing botanical advice to State, Territory and Federal governments whose jurisdictions cover savanna country. These institutions have a combined scientific collection of over 0.75 million savanna plant specimens.

No other individual organisation or consortium in the world has the collections, expert scientific knowledge, databases and bioinformatics technology to achieve the project goals.

Consortium members have individually and in combination a very strong track record of large-scale collaborative research and delivery of projects that have tangible scientific, community and conservation outcomes.



3.2 What is an herbarium?

Herbaria are scientific institutions that manage and study collections of preserved plant specimens. Plant specimens represent a permanent and verifiable record of the past geographical distributions of plants and are the basis for plant biodiversity research.

Herbaria in Australia are strongly linked with each other and with international partners to form a network of agencies that gather, research, communicate and manage information on the geography, systematics and biology of our flora on behalf of all members of the community. Scientists within herbaria provide the core resources that enable many other stakeholders to identify plants and find more information on their distribution, ecology and conservation status.

These projects include Australia's Virtual Herbarium, the Flora of Australia series, the various State Floras, the RfK, the Australian Plant Census, and the Atlas of Living Australia. The Atlas of Living Australia (www.ala.org.au) is a large scale, multi-million dollar partnership involving the CSIRO, the Australian Biological Resources Study, herbaria, museums, universities and many other partners. It is a unique web-based portal linking existing data on Australia's life forms and has been operating now for 6 years. Covering 170,000 species and including over 25 million distribution records, this project is globally recognised as a success and as a world leader in its field.

Details of the partner organisations and demonstration of their capacity to deliver this project are provided in Appendix 2.

Section 4: Users, Business and Community Benefits

The ASPIS project is innovative, novel and will deliver wholly new resources for the savanna region in the form of web-based interactive identification keys and illustrated species information pages for all vascular plant species of the region. It builds on past successes and achievements of the partner institutions, their collections, databases, knowledge and other resources. It also builds on the success of the Atlas of Living Australia and Australia's Virtual Herbarium through the addition of a much needed identification system for plants in the region.

The direct beneficiaries of ASPIS will be all people and sectors of the community that benefit from being able to identify, record and catalogue savanna plant species. These beneficiaries include industry, government, environmental professionals, community groups and individuals with an interest in plant species of the savanna region and beyond. Community stakeholders will be located across the savanna region, elsewhere in Australia and throughout the world.

- **Major developers including the resources sector** will benefit from reduced business risk. ASPIS will significantly reduce business risk in two ways. Firstly it will allow potential environmental impacts to be more accurately assessed prior to investment decisions being made, reducing the likelihood of later discovery of notable (e.g. threatened) species adversely impacting business costs. Secondly, by improving understanding of the number, extent and range of species in the savanna region it will allow more effective and targeted conservation and resource planning, leading to a more stable and effective planning framework. This is a key component in determining the environmental and economic costs of assessing large developments and their potential offsets.
- **Environmental professionals** will benefit from the creation of a single, comprehensive information system that will lead to improved capacity for accurate biodiversity survey and monitoring activities.
- **Traditional owners and indigenous rangers** will benefit from training in plant identification and improved knowledge of their culturally important flora. Training courses will be developed that are culturally and pedagogically appropriate and which include assistance with the recording of traditional plant and ecological knowledge, in such a way as to facilitate a two-way exchange of information with researchers. This activity will link strongly to the Indigenous-led Tropical Indigenous Ethnobotany Centre (TIEC) at the Australian Tropical Herbarium.
- **Land managers** of all kinds (public and private managers of reserves, indigenous, agricultural or pastoral land) will

Much of Northern Australia is recognised as being of outstanding national or international significance for biodiversity.¹

1. Woinarski, J., Mackey, B., Nix, H. & Traill, B. (2007) *The Nature of Northern Australia. Natural values, ecological processes and future prospects.* ANU E Press, Canberra.

benefit from the ability to identify plants of significance, whether threatened species or environmental weeds. In particular, the many **natural resource management (NRM) groups** active across the savanna will be key beneficiaries of the collated biodiversity knowledge that ASPIS will provide.

- **The biosecurity sector** will benefit from improved ability for the early identification and notification of potential new weed species, and better knowledge of the occurrence of existing weeds, paramount in enabling successful management of these threats. New weed incursions into Australia from other countries may also harbour diseases and pests of agricultural and environmental significance. Ensuring the relevance of the ASPIS project to all stakeholders will be achieved through a Stakeholder Advisory Group.
- **The tourism industry** will benefit from an improved tourist experience through better engagement with biodiversity in the savanna region. The web-based system and the applications supported by the Atlas of Living Australia will be adaptable by users and able to produce some outputs tailored for the user's actual location, interests and skill levels.
- **Local, State and Federal governments** will benefit from improved plant biodiversity knowledge to facilitate government decision making on landscape conservation and resource management.
- **The education sector**, from primary to tertiary levels, will have access to an online, easy-to-use identification tool and information system for savanna plants and a mechanism through the Atlas of Living Australia to contribute to the ASPIS project. This will improve student engagement with and understanding of native biodiversity and lead to better trained environmental professionals.
- **The horticultural industry** will benefit from access to knowledge on the native plants of northern Australia, a critical resource for cost effective development, IP protection and marketing of new native horticultural stock.

SECTION 4: USERS, BUSINESS AND COMMUNITY BENEFITS

- **Community-based interest groups** will benefit from increased access to plant knowledge and identification tools, and their capacity to utilise these tools will be improved through the delivery of workshops throughout the region.
- **Regional communities within the savanna landscape** will benefit from plant identification workshops in the region, some of which will be targeted to particular groups eg. indigenous rangers and local government environmental officers. ASPIS will also hold scientific displays showcasing the local biodiversity and informing local communities of the importance of the project. These displays will provide local regional communities (including school groups), access to some of Australia's leading biodiversity scientists, normally only available in larger cities. The educational benefits to these regional communities will be significant; by raising awareness of the uniqueness and benefits of their local biodiversity and in improving the understanding of the importance of biodiversity science in society.
- **Taxonomists and other botanical scientists** will benefit from opportunities to collect and study specimens of rare, poorly known and new species. The ASPIS initiative will help to focus effort onto the description of as yet un-named species and improving knowledge of named, but poorly known species. This additional species information will significantly enhance the value of scientific collections to taxonomists and researchers not only in Australia but around the world.
- **Early career scientists** will benefit from engagement, through the ASPIS project, with leading scientists providing funded opportunities for knowledge transfer and mentoring. This will aid in sustaining Australia's taxonomic workforce and improving our national capability to respond to future biodiversity science needs.

Because many savanna plant species are also found in neighbouring regions, ASPIS potentially delivers benefits to the people of Timor Leste, West Papua (Indonesia) and Papua New Guinea as well as businesses operating in these countries. From this basis, ASPIS could provide the framework for future extension projects that aim to thoroughly document and provide accessible identification tools for the entire flora of these neighbouring regions where the plant life is even less well known.

The ASPIS project will reach out to many sectors of the community, involving and inspiring them. This wider engagement will be achieved through the following activity areas:

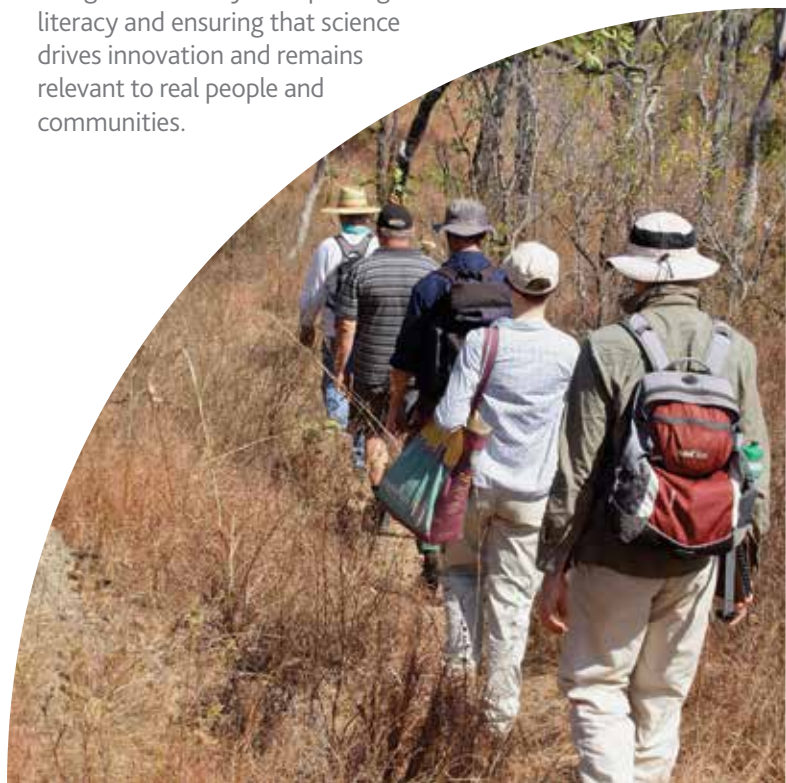
- **Plant Identification Workshops** – training programs delivered in a hands-on workshop environment and tailored to accommodate a range of user-groups, prior knowledge, education and expertise.
- **Internships** – career development opportunities for

university students to network and learn from leading scientists through field and herbarium internships.

- **ASPIS Taxonomy Research Grant Scheme** – small research grants to support the science of taxonomy and the applied use of taxonomic research, and post-graduate capacity building grants to help build a cadre of early career species discovery scientists.
- **Community Open Days** – providing the public in regional and remote areas with access to expertise and displays frequently only available in the cities. Sharing of knowledge with local communities will create social connectedness between ASPIS and the general public and generate a shared desire to protect Australia's biodiversity.
- **Citizen Science contributions** – an innovative ASPIS program utilising the capacity of the Atlas of Living Australia that will provide opportunities for enthusiastic and experienced community members living in the region, including teachers and their students to contribute observations and photographic images to the project.

ASPIS will also provide indirect benefits to all Australians, through improving our understanding of the components (i.e. habitats, communities, species, varieties and genetics) of critical ecosystems which we require to live healthy, fulfilling lives. ASPIS will:

- Directly address a key issue in science capacity and delivery in northern Australia – science partnerships that span the whole region (Queensland, Northern Territory and Western Australia). Thus it will facilitate a pan-tropical alliance for vegetation science.
- Link northern place-based institutions with southern institutions having tropical expertise.
- Engage (rather than simply communicate) through participation of citizen scientists and delivery of training workshops to communities. Science engagement is recognised as a key to improving science literacy and ensuring that science drives innovation and remains relevant to real people and communities.





Section 5: Goals, Outcomes and Sponsor Benefits

The primary goal of the ASPIS project is to develop web-based tools for identifying and learning about the flora of Australia's tropical savannas that will lead to improved knowledge of the species occurring in the region. This in turn will support sustainable development through facilitating more effective management of the region's biodiversity assets.

The identification of Australia's savanna plants is vital for effective rangeland management and planning. Taxonomic research on these groups provides the knowledge base to enable consistent and accurate species identification necessary for compliance with environmental legislation, meeting community expectations for environmental responsibility, and long-term conservation planning.

The availability of a comprehensive identification and information tool such as ASPIS will play a major role in facilitating a coordinated approach to the understanding of, research on, education, protection and management of biodiversity values by government, indigenous and community groups and by industry such as mining and farming and other land managers.

Often, environmental investigations focus on a direct area of impact by an activity. This can often result in insufficient information on which to make appropriate judgements and assessments, as there is often no data for comparison about biodiversity outside the impact zone.

The outcomes of ASPIS will help rectify this by creating a comprehensive register of the lesser known flora of the savanna region of Australia and by providing valuable information about threatened ecological communities and how to better manage them. This in turn will enable all land managers to make more informed decisions when considering ecological values and land-use aspects of potential development investments.

Such information will not only benefit land managers, but will also directly benefit the health and well-being of the community. Communities are concerned about

environmental impacts on the quality of their life. Reduced water quality, loss of native vegetation, land and water salinity and visual amenity have all been identified as key factors about which individuals are concerned.

The ASPIS project provides opportunities to address these concerns and impacts through engagement and collaboration. The outcomes of ASPIS will assist local land owners and governments in planning and generating environmental initiatives to address land use, landscape and catchment management issues enabling communities to assume greater responsibility of their own environmental status.

Specifically the project will produce the following outcomes:

- Provide web-based tools for the identification of and learning about the species of plants in the savanna regions of northern Australia;
- Expand our understanding of species occurring in the savanna region of northern Australia;
- Make new botanical discoveries (species and occurrences);
- Support critical taxonomic research on new and poorly known species in the savanna region;
- Engage Australians, especially those living in northern Australia, in scientific research and communicate the importance of biodiversity and taxonomic research to all Australians;
- Develop a national picture of the plant biodiversity of Australia's northern savanna region;
- Raise awareness of biodiversity conservation at the local, regional and national levels.
- Support sustainable development of northern Australia

These project aims are incorporated into five high level project outcomes and their associated social and environmental indicators, outlined in Table 5.1. The timeline for delivery of these outcomes is detailed in the implementation schedule (Appendix 3).

'Biodiversity and land management' and 'supporting and engaging with communities' are BHP Billiton sustainability focus areas¹. The ASPIS project helps meet performance goals in these focus areas by:

- Providing tools and access to biodiversity information that is critical to developing and implementing effective biodiversity and land management plans, and
- Providing practical and positive engagement and branding opportunities.

1. BHP Billiton Sustainability Report, 2013.



Sponsor Benefits

Significant corporate benefits may accrue to the sponsor through support of this project:

- Brand linkage with leading Australian government and university environmental research agencies.
- Enduring visibility of the brand association, through a low risk, long term, high profile project.
- Improved cost effectiveness and lower risk of non-compliance with biodiversity legislation through faster, more accurate biodiversity surveys and monitoring.
- Improved reputation as an industry leader which can successfully partner with government and research organisations to deliver projects with meaningful environmental outcomes.
- Improved understanding of the botanical research community, and their capacity to deliver programs aligned to the sponsor's mission and values.
- Increased engagement with the environmental science community and expertise upon which the sponsor's staff can draw by establishing new relationships with relevant researchers and science leaders.
- Potential research and development linked tax benefits.

Branding

The team understands that consistent and simple branding are the key to successful marketing – the use of bold colour and simple words makes our message easy to understand and remember.

The ASPIS colours complement the existing Tropical Rainforest Plant Identification Key branding enabling the branding to appear synchronized when displayed together.

The branding will run across all of the Australian Savanna Plant Identification Key collateral. The logo reflects the values of Savanna Plant Identification Key users, promoting smart, clean, green, innovative, creative and cutting edge technologies. We have drafted a logo that is instantly recognizable, highly professional and as creative as the project will be. It also clearly communicates our core business – the promotion of Australian biodiversity science expertise and the ASPIS project.



Draft ASPIS logo concept.

“...accurate identification is the critical first step in sustainable landscape use... The problem is that there is no comprehensive, accessible resource for identifying savanna plants... Poor biodiversity knowledge is a risk for sustainable development.”

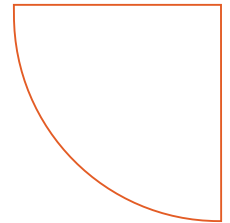
- Tim Hoogwerf, Operations Manager, Northern Gulf Resources Management Group Ltd.

Table 5.1: High level project outcomes and their associated social and environmental indicators

Project Outcome	High Level Indicator	Project Level Indicator
Web-based tools for the identification of and learning about the species of plants in the savanna regions of northern Australia developed.	Improve the general public's capacity to access knowledge on Australia's biodiversity.	Number of different users of ASPIS tools.
	Improve Australia's capacity in the area of species identification for threatened species and biosecurity assessment.	
Understanding of species occurring in the savanna region of northern Australia improved.	Safeguard biodiversity for the benefit of future generations by increasing knowledge on the species and habitats that support life.	Number of species and specimens collected and curated.
		Number of new species collected – rare and threatened, weeds and pests.
		Number and type of different ecological communities/habitats surveyed.
		Number of species range extensions recorded.
A stronger capacity to deliver taxonomic services and support taxonomic science through Australia's scientific institutions.	Improve the general public's capacity to access knowledge on Australia's biodiversity.	Number of users accessing the web-based identification key and species information profiles.
		Increase in the number of specimen records held by herbaria.
	Support career pathways for next generation of taxonomists and conservation research scientists.	Number of postgraduate student scholarships awarded.
		Number of honours students to partake in field trips.
		Increase in the number of early career scientists supported to focus on taxonomy.
	Provide financial support to the science of taxonomy and Australian taxonomists.	Number of established and early career researchers participating in the project.
		Number of researchers whose employment is supported by the project.
		Value of research and capacity building grants allocated.
	Ensure Australia's biodiversity is recognized internationally.	Number of new records entered into public biodiversity databases and available nationally and internationally.
	Industry, land managers, planning agencies, scientists/taxonomists and the community have greater access to current information on Australia's biodiversity and species inventory.	Improve Australia's capacity in the area of species identification for biosecurity risk assessment.
Number of new records on rare and threatened species available through public biodiversity databases.		
Lower the economic cost associated with assessing, reporting and offsetting large scale developments.		New bioinformatic products and applications developed.
A greater awareness of the importance of taxonomy, biodiversity and research in the Australian community.	Improve the connection and understanding between the general public, the corporate sector, government and science.	Number of community open days held.
		Number of attendees to community open days.
		Number of plant identification workshops held.
		Number of attendees to plant identification workshops.
	Increase indigenous involvement in Australia's conservation efforts.	Proportion of field trips undertaken on indigenous lands.
		Number of indigenous land owners or rangers participating on field trips.
	Improve the Australian community's knowledge of the importance of biodiversity and ecosystem services to human health and wellbeing	Number of hits on social media and website, number of app downloads.
		Number of teachers and students engaged in ALA modules.
		Number of recorded occurrences of media coverage.
	Increase the social and economic value placed on biodiversity.	Information collated from Open Days that is utilized by the community.
Increase in the number of people contributing to conservation efforts as a result of their exposure to the ASPIS project.		



Section 6: Sustainability Plan



The project team has designed ASPIS such that the benefits generated by the project will extend well beyond the life of the project itself.

ASPIS will develop an information system including web-based tools, make additional scientific specimen collections, and record field data that will provide essential base line information to assist an enormous range of stakeholders to achieve their land management, research and education objectives.

The tools and information system will remain online beyond the life of the project and the information within this system will be a catalyst for ongoing research into taxonomy and systematics (species discovery and classification), evolution, ecology, and conservation and sustainable use of biodiversity.

Sustainability of the project, its products and the community benefits are ensured through:

- **Strong partner engagement,**
- **Maintaining project relevance,**
- **A focus on capacity building, and**
- **A financial sustainability plan.**

Partner Engagement

The ASPIS project partners are the leading botanical research and information agencies for the Australian tropical savannas. These agencies are distributed across the three savanna States and Territories (Queensland, the Northern Territory and Western Australia) and also include national bodies headquartered in Canberra.

Each of the project partners (detailed in Appendix 2) has a strong stake in the project and its outcomes. This is demonstrated by:

- Very substantial in-kind commitments of nearly \$78 million (see Budget, page 42);
- A collective team record as developers of all of the major interactive plant identification products currently available for Australian flora;
- Strong alignment of the goals of ASPIS (improved understanding of and capacity to identify savanna plants) with the corporate missions of the partners.

The robust collaborative model of ASPIS will ensure that all partners are engaged fully throughout the project according to their commitments, and that the project continues to address their corporate goals. This model mitigates against the risk of the loss to the project of critical partners.

Maintaining Project Relevance

Key to the long term success of ASPIS is maintaining the relevance to its stakeholders of the content and the delivery mechanism. To ensure that the project provides authoritative botanical information and useful tools to enable ease of access by the broadest range of stakeholders, information will be gathered throughout the life of the project on the capacity of ASPIS to address the biodiversity knowledge needs of:

- Industry
- Community
- Government and non-government on-ground land managers
- Research community (museums, herbaria, universities and other research institutions)

Effective information gathering relies on a sound communication and engagement strategy and a monitoring and evaluation plan; for ASPIS these are detailed on pages 20 and 29 respectively. Through these mechanisms, ASPIS will harvest feedback throughout the life of the project. Further targeted user feedback will be obtained through online user surveys and structured feedback sessions incorporated into the plant identification courses. The process model for construction of ASPIS allows for potential adoption of user-requested content and functionality.

Capacity Building

Sustainability of the ASPIS project beyond the development phase depends upon the existence of appropriate capacity to support maintenance and further development. The ASPIS model of a private – community – government partnership provides significant opportunities to build capacity in savanna botanical science and knowledge delivery, particularly in northern Australia, through:

- Improving the skills spectrum within each organisation,
- Strengthening collaborative relationships among northern Australian organisations, and between northern and southern Australian organisations
- Improving organisational capacity to deliver similar projects in the future, and
- Improving the basis for new organisational opportunities.

These benefits will accrue to project partners, sponsors and the community.

SECTION 6: SUSTAINABILITY PLAN

For each Partner, ASPIS will:

- Improve the organisation's capacity to work in partnership to undertake large-scale, national projects which are logistically intensive and require the management of a large number and diverse range of stakeholders and delivery partners;
- Improve each partner's internal and external reputation as an organisation that can successfully partner with it's State, Territory and National counterparts and private sector to deliver projects with meaningful environmental and social outcomes;
- Demonstrate to the industry/education/government sector the herbarium community's capacity and commitment to support taxonomic research and improving our understanding of biodiversity;
- Improve each partner's ability to engage volunteers in scientific research and demonstrate the important role they can play in supporting government funded research.

For the sponsor, ASPIS will:

- Improve the sponsor's reputation as an industry leader which can successfully partner with government and research organisations to deliver projects with meaningful environmental outcomes;
- Improve the sponsor's understanding of the botanical research community, and their capacity to deliver programs aligned to the sponsor's mission and values;
- Increase the scientific network and expertise upon which the sponsor's environmental staff can draw by establishing new relationships with relevant researchers and science leaders.

For the community, ASPIS will:

- Increase local and regional communities' knowledge and appreciation of their local savanna plant biodiversity and ecosystems through web-based information system and tools, and plant identification training workshops

Increase local and regional communities' engagement with the scientific community and understanding of the science process through participation as citizen scientists in cutting edge botanical science and knowledge delivery activities.

Financial Sustainability

A legacy product of this scale and complexity requires ongoing maintenance and development to avoid degradation of the content (and thus damage to the sponsor's brand) and to incorporate new knowledge and technology. The RFK experience (see page 15) has shown that maintaining currency of content in a plant information system of this kind (containing component datasets that are distributed, interoperable and maintained by other, independently and sustainably resourced parties) requires a relatively small ongoing investment - for ASPIS, 1-2 full time positions and associated operational costs.

To help fund ASPIS-specific maintenance and development the ASPIS Steering Committee will develop, in the final year of the project, a road map for continued support. This road map may seek:

- A single block investment from an alternative sponsor or funding body;
- A number of smaller investments from a larger number of stakeholders (e.g. state governments, other not-for-profits, multiple industries and financial institutions);
- A subscription model for commercial users of the product supplemented by sponsorship and advertising revenue;
- Commitment from the five major project partners to ongoing in-kind contributions of relevant staff and infrastructure.

A directed and ongoing communications plan throughout ASPIS will promote the importance of the project outcomes to new stakeholders such as investment groups, insurance companies and other extractive industry businesses.

Finally, by demonstrating leadership through collaborative, cross-sector involvement in science, conservation and education, ASPIS will aspire to both national and international recognition. Such recognition will further promote the value of the program to potential new and existing stakeholders and to the Australian public.





Section 7: Monitoring and Evaluation

ASPIS has been developed and will be managed using a Logical Framework Approach (LFA), with SMART (specific, measurable, attainable, relevant, timely) indicators. The ASPIS team will teleconference regularly to review and plan activities. The ASPIS Steering Committee will assess progress towards these goals twice annually.

The government funding provided for this project will be monitored using the Australian government's preferred MERI (Monitoring, Evaluation, Reporting and Improvement) process. It is proposed to utilise this framework across the whole project.

Given the nature and importance of this project to each of the partners, each partner's Department/management will also provide oversight of this project by reviewing reports from the ASPIS Steering Committee. The ATH Board will also provide oversight of this project by reviewing reports from the ASPIS Steering Committee.

A comprehensive annual evaluation of ASPIS will be undertaken by the project partners in conjunction with the major sponsor. Aside from the scientific outcomes, debriefing sessions will collate feedback from staff, survey participants, training workshop participants, volunteers, and partner organisations. Evaluation will cover all aspects of the project including:

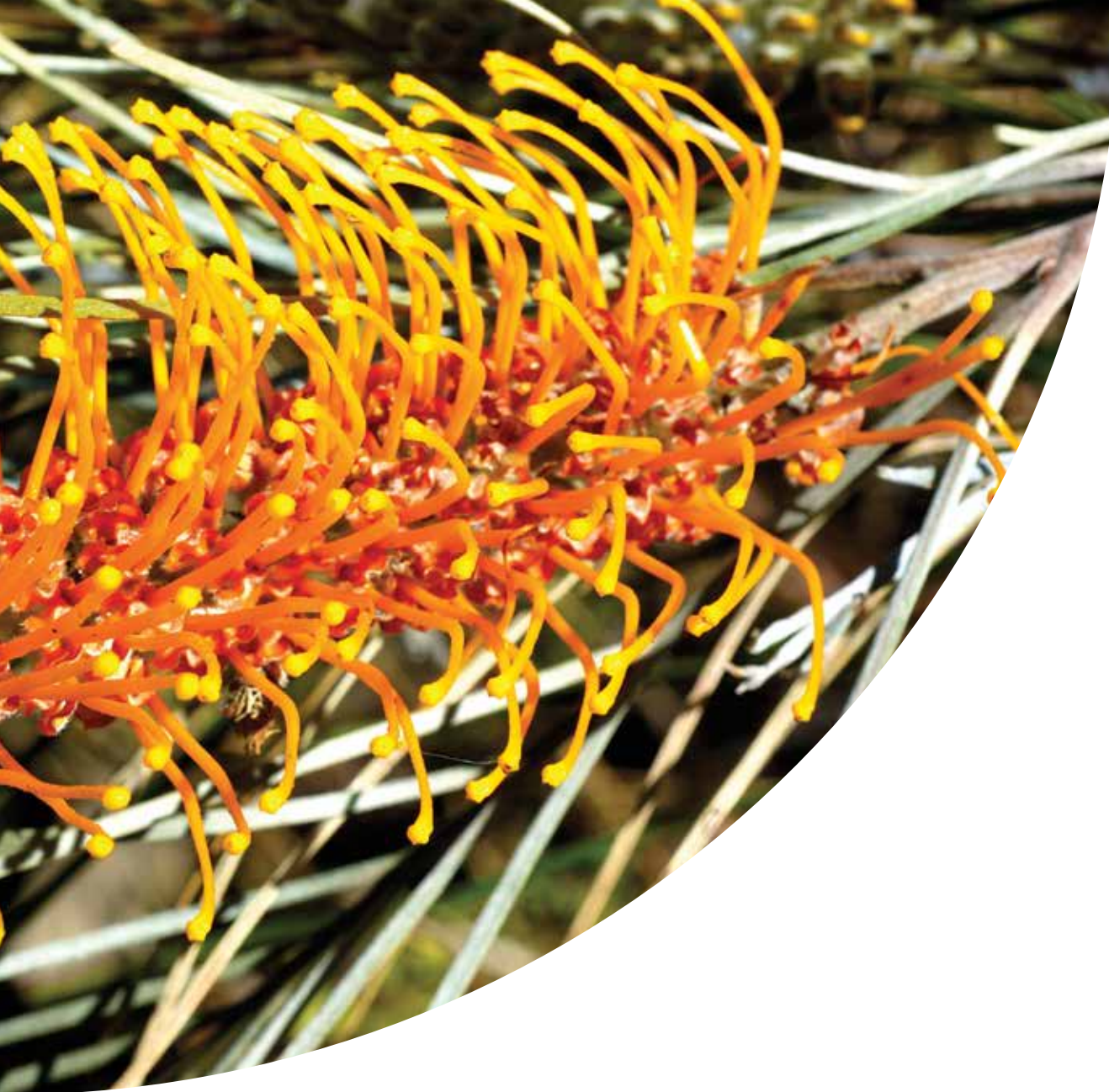
- Impact on the community's ability to identify plants
- Improvements in biodiversity knowledge delivery
- Taxonomic outcomes
- Participant and stakeholder sense of involvement
- Field logistics and safety
- Achievement of the stated outcomes (e.g. reporting) of the ASPIS project.

Focus areas and measures to be monitored as part of the Monitoring and Evaluation Plan are presented in Table 7.1.

"There is currently no comprehensive key to the flora of the savanna; this is a significant impediment to effectively identifying and understanding the biodiversity of a significant portion of the continent... Accurate naming of species and understanding their relationships is critical for biodiversity conservation, biosecurity and a range of industry uses such as agriculture, horticulture and forestry."
- Michael Preece, Director, Australian Biological Resource Study, Canberra.

7.1: ASPIS Monitoring and Evaluation Focus Areas and Measures

Evaluation Focus	Evaluation Questions	What will be measured/tested and when?	Evidence – monitoring measures and methods
Achievement / Impact	What impact has ASPIS had on the ability of the broad community to identify and learn about savanna plants?	The number of users accessing the web-based key and species information profiles determined six-monthly.	Google Analytics or equivalent.
	What impact has ASPIS had on supporting early career researchers?	The number of early career researchers that have participated in ASPIS activities will be recorded and the impact this involvement has had on future career development determined at project conclusion.	Post-participation feedback forms will be included in all funding agreements and contracts with early career researchers.
	What contribution has the project made to national species databases?	The percentage of records attributed to ASPIS in national databases will be measured annually.	The number of records added to databases will be part of the CHAH Funding Agreement reporting requirement to enable comparative analysis.
	How successful has the ASPIS communications plan been at promoting the project in particular and biodiversity science in general?	KPI's identified in the communications plan. Communications coordinating group to review communications plan mid-way and at the conclusion of the project.	Communications coordinating group to research and record what promotional activities (social media, TV, radio, print) have been undertaken by the partner organisations and other stakeholders, who the target audience is and any evidence of feedback. This information will be shared with all partner organisations.
	What impact has ASPIS Plant identification workshops had on participants' ability to identify plants, learn about plants?	Participants' learning outcomes will be measured during and immediately following workshops?	Teaching staff will conduct quizzes or other examination mechanisms as appropriate. Student experience will be evaluated by post-workshop feedback questionnaire.
Effectiveness and Appropriateness	Are ASPIS products useful to a broad range of users?	The profile (e.g. location, occupation) of users accessing the web-based key and species information profiles and the purpose for which they use them determined annually. Number of smartphone app downloads.	Google Analytics or equivalent, meetings with stakeholder advisory group, and an annual online user survey.
	Are users satisfied with ASPIS products?	User satisfaction determined annually.	Meetings with stakeholder advisory group, and an annual online user survey.
	How could ASPIS products be improved?	User priorities for additional content and functionality determined annually.	Meetings with stakeholder advisory group, and an annual online user survey.
Efficiency	To what extent has this project implemented agreed activities according to agreed schedules and budgets in the funding deed? If there have been variations – what are the reasons?	Project accounts and records of expenditure and timelines showing anticipated versus actual activity completion dates, determined at completion of project.	End-of-project review including progress reports, minutes of partner review meetings and meetings with project stakeholders.
	To what extent has this project attained the best value out of available resources?	Extent to which project activities have met anticipated achievements, determined six monthly.	Project evaluation meetings with project partners to review progress. Lessons learnt discussed and implemented in future work.



Section 8: Risk Assessment

The ASPIS project has been developed by a consortium whose institutional members collectively have over 420 years of experience in delivering savanna plant knowledge to a range of stakeholders. Furthermore, the consortium members have a long history of successful collaboration on large projects including Australia's Virtual Herbarium (AVH: www.avh.org.au), and a successful product of the kind proposed here, namely the *Australian Tropical Rainforest Plants Key* (see page 12). Therefore the risk of failing to deliver satisfactorily on the ASPIS project goals is tightly controlled by the team's experience, and the implementation of a proven, robust project model enhanced with modern technology.

Specific risks to the ASPIS project are detailed in Table 8.1 using a simple risk scale: low, medium, high. Each potential issue has been assessed and rated using a risk matrix that considers likelihood of occurrence against severity of impact.

"...is it a weed? Is it a threatened species, is it toxic, is it culturally significant? ... this project will benefit a diverse range of stakeholders including environmental professionals, landholders, school children, naturalists and tourists. It will most importantly greatly facilitate quicker, more accurate and more cost effective environmental assessments which inform land management."

*- Heather Campbell
Former CEO, Landcare Australia Ltd.*



SECTION 8: RISK ASSESSMENT

8.1: ASPIS Project Risk Assessment and Mitigation Strategies

Risk	Level	Mitigation strategy
Protection of the ASPIS brand and intellectual property.	Low	The business names and domain names for the Australian Savanna Plant Identification System in Queensland and the Northern Territory have been secured. Ownership of IP will be negotiated with the major sponsor and any future project contracts that use the ASPIS platform will include clauses that protect and maintain these IP rights. Furthermore, 'Australian Savanna Plant Identification System' is a new name created by the project team and currently has no other users, making it even more secure.
Over-complication of the project's mission and activities.	Low	An effective governance structure will be implemented comprising a Steering Committee that will be informed by Project Development and Stakeholder Advisory groups. Detailed annual plans will be developed by the Steering Committee and implemented.
Damage to reputation and image through misleading or political media activities.	Low	All media communications and promotional activities will be undertaken in accordance with a jointly developed communications plan.
Financial loss caused by one or more of the partners withdrawing from the project.	Low	The project will be covered by a legal contract between the project partners: the sponsor, the Northern Territory Government through the NT Herbarium, the Queensland Government through the Queensland Herbarium, the Western Government through the WA Herbarium and the Australian Government through the Australian National Herbarium. This contract and the dispute resolution mechanisms that it will contain will significantly reduce the risks of a partner withdrawing from the project.
Misuse or mismanagement of project funds.	Low	Financial reporting requirements and auditing requirements will be included under the contract.
Significant delays in delivery of web-based tools.	Medium	Project teams conduct work to agreed milestone dates under contract with ATH/JCU. Payments under the contract are milestone completion dependant.
Impact of a change of priorities of one or more partners.	Medium	The contract will be signed by the ATH/JCU and each of the partners for the 7 year duration of the project. Funding once approved cannot be retracted. Therefore a change in priorities will have no impact on an already established agreement.
Community dissatisfaction due to the lack of their direct involvement.	Low	ASPIS will engage the public via web-portals/ALA, plant identification workshops, scientific displays and presentations at appropriate locations. The Communication Strategy and its implementation will engage the public to embrace the benefits of the project.
Loss of core capability.	Low	<p>Personnel responsible for delivery of the project will be engaged on a permanent basis or contracted for the life of the project and in accordance with ATH/JCU / each partner's staffing policies and Enterprise Agreements, minimizing staff turnover.</p> <p>Strong relationships with partner scientific institutions and peak bodies have been developed and will be maintained to ensure engagement of key scientists.</p> <p>Oversight by the ASPIS Steering Committee and the respective governance structures in all of the partner organisations will identify any issues at an early stage so that appropriate measures can be put in place.</p>
Damage to reputation and image caused by severe injury or fatality on project.	Low	<p>Risk assessments and corresponding mitigation plans are undertaken in each workplace and prior to field expeditions. Thorough emergency response plans are developed to ensure the most appropriate procedures are followed in the case of an incident. All project staff are experienced and trained in first aid.</p> <p>A crisis management plan will be devised outlining roles of each partner.</p>
Overuse injuries from repetitive movements including keyboard and mouse use.	Medium	Provision of ergonomic furniture and supports. Staff aware of local workplace OHS policies and procedures and of prevention behaviour including regular breaks and appropriate stretching and exercises.
Personal injury, fatality or multiple fatality caused by transportation accident.	Medium	<p>Only fully licensed, project staff experienced and trained in off-road driving will operate vehicles. All vehicles are hired from off road specialists and have mine specifications, including 2 spare tyres, first aid kits, fire extinguishers, recover gear, seatbelts and UHF radios. Other communications include satellite phone, SPOT trackers and mobile phones.</p> <p>Water vessels will only be driven by licensed operators. PFD's for each individual are carried on board as well as a first aid kit. Safety orientations are given to people on boarding the vessel. Onboard communications include UHF radio, EPIRB, flares, satellite phone.</p> <p>Staff from partner organisations will only travel in transport that aligns with their organisation's OH&S practices.</p>
Personal injury caused by fatigue.	Low	Hours of work will be monitored and a suitable roster system will be implemented. Long drives will be broken by regular breaks and multiple drivers will be used.
Personal injury caused by working in the field: includes wildlife, plants, trips/slips, dehydration/hypothermia, accommodation hazards, health (disease/virus).	Medium	<p>A list of all hazards and a full risk assessment and emergency response plan (ERP) is developed for each field expedition. All project staff and participants are briefed in writing prior to going on the expedition of the risks involved. This includes a packing list of all PPE needed. Upon arrival, a verbal safety briefing is also given and a site induction.</p> <p>All project staff are trained in first aid and first aid kits are carried with every group into the field along with communications including satellite and mobile phones and SPOT trackers.</p>



Section 9: Organisational Structure and Project Governance



Australian Tropical Herbarium Governance and Corporate Structure

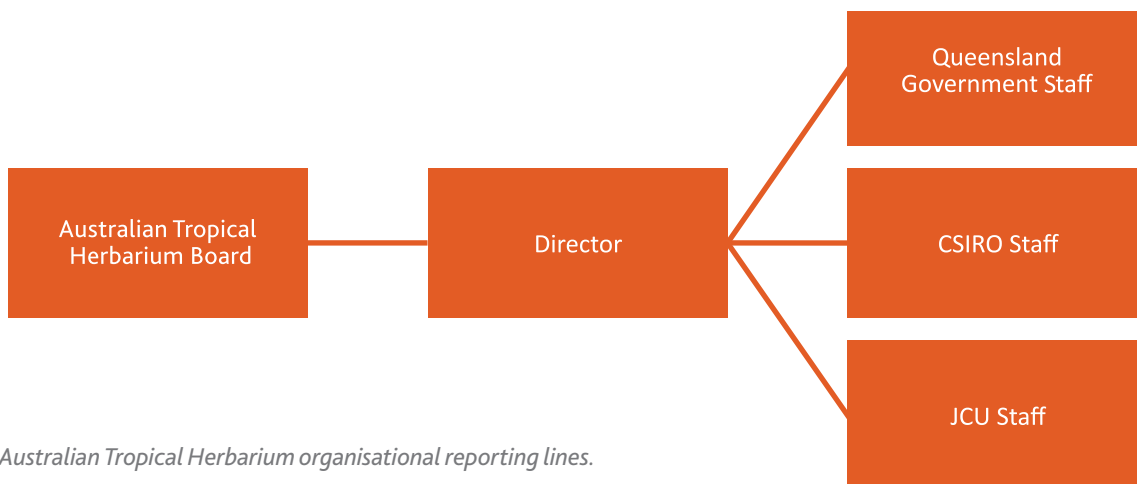


Figure 9.1: Australian Tropical Herbarium organisational reporting lines.

The ATH is an unincorporated joint venture of the CSIRO, Queensland Government, Director of National Parks and James Cook University and brings together staff and collections of those organisations in pursuit of its vision:

to be a leader in tropical plant biodiversity research, that conducts diverse, relevant and innovative research; converts that research into useful products; offers training, inspiration and engagement with the community; and, by collaborating with others, achieves a greater understanding of sustainable tropical systems.

Since its inception in 2008, the ATH has shown consistent growth in research output and quality with particular highlights being its applied research, such as the Rainforest Key, and the Tropical Indigenous Ethnobotany Centre.

The organisation's management and corporate governance structure consist of a Board, Director and attached staff of the three main joint venture partners (Figures 9.1 and 9.2). Administratively, the ATH is a part of the Faculty of Science and Engineering of James Cook University.

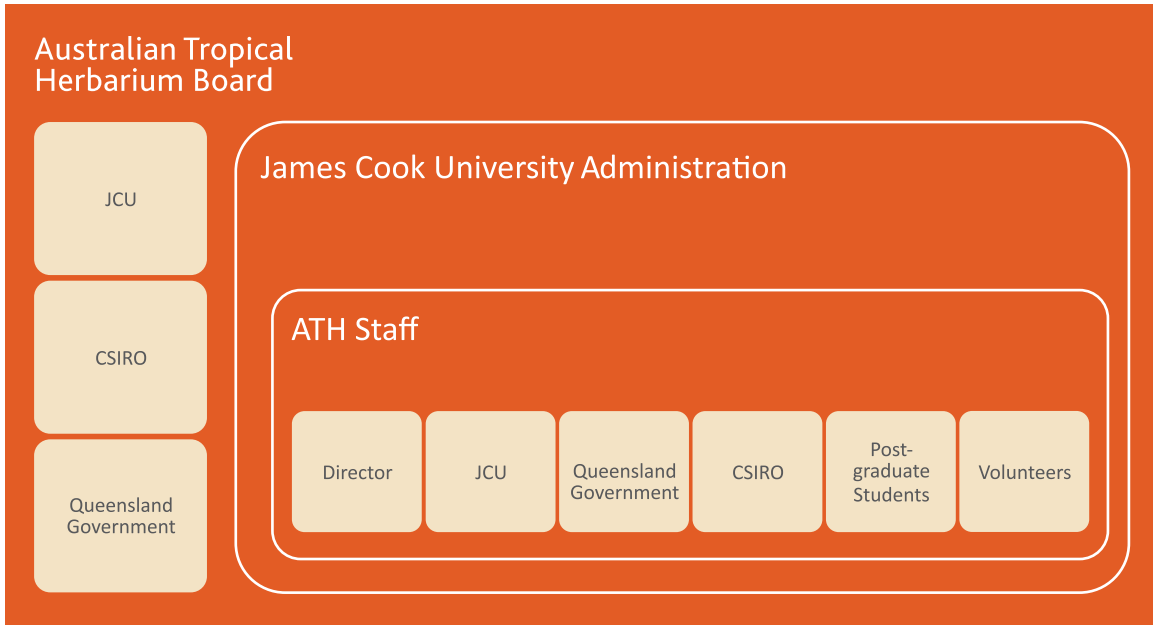


Figure 9.2: Australian Tropical Herbarium corporate structure.

ATH Board

The eight-member ATH Board comprises two representatives from each of the three main joint venture partners (CSIRO, Qld govt., JCU), the ATH Director, and an independent Chair, each highly respected scientists and science leaders in their own right. Its role is to set the overall strategic management of the ATH including setting policy and strategic focus.

The current Board members are Prof Andrew Young and Dr Judy West (CSIRO), Prof Jeffrey Loughran and Prof Paul Gadek (JCU), Dr Christine Williams and Dr Gordon Guymer (Qld Govt.), Prof Darren Crayn (ATH Director), and Dr Greg Leach (Independent Chair).

Australian Savanna Plant Identification System Governance and Management Framework

The ASPIS project will be governed and managed according to accepted best practice. A steering committee, advised by a stakeholder advisory group, will oversee a project implementation group who will be responsible for the work plan (Figure 9.3).

Financial and personnel management will be according to the standards and policies of the host institution, James Cook University.

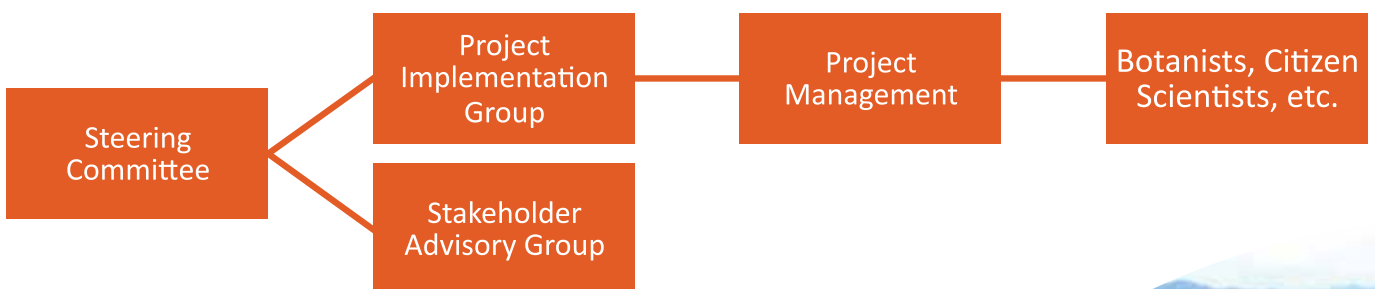


Figure 9.3: ASPIS project governance and management framework.



Personnel

Given the scale and complexity of this project, the key personnel of the study team have been specifically selected. The project team includes the chief botanists of all of the major public institutions (herbaria) responsible for the discovery, description and identification of the savanna flora of Australia.

As such this is the best possible team for the project, bringing together the world experts on this flora and harnessing the resources of these world-class institutions. All study team members have extensive experience in respect of their particular technical and specialist areas and have been involved in a range of projects that have required the completion of tasks highly relevant to the project.

Steering Committee

The project will be overseen by a Steering Committee comprising a senior representative from each of the consortium members and the major sponsor.

- Prof Darren Crayn (Director, Australian Tropical Herbarium)
- Dr Kevin Thiele (Curator, Western Australian Herbarium)
- Ailsa Holland (Science Leader, Queensland Herbarium)
- Ian Cowie (Chief Botanist, Northern Territory Herbarium)
- Jim Croft (Biodiversity Information Leader, Australian National Herbarium)
- Peter Doherty (Program Manager, Atlas of Living Australia)
- Representative of the major sponsor
- Representative of the Stakeholder Advisory Group (see below)

The role of the Steering Committee will be to provide high level governance and oversight of the ASPIS project (including setting overall strategic focus, reviewing operational reports and plans, approving communications and public relations strategies, etc.).

Implementation Group

Project implementation will be coordinated by a group comprising members of the Steering Committee and additional technical experts. Members of the project Implementation Group will be responsible either individually or jointly for delivering specific elements of the project.

Technical Experts: Ms Eda Addicott (Australian Tropical Herbarium), Prof Betsy Jackes (James Cook University), Ms Raelee Kerrigan (Ryan Surveys Pty Ltd), Dr Greg Leach (Greening Australia Northern Territory), Dr Donna Lewis (Northern Territory Herbarium), Dr Bruce Wannan (Queensland Government), Dr Paul Williams (Vegetation Management Science Pty Ltd), Mr Frank Zich (Australian Tropical Herbarium).



Profiles of members of the Steering Committee and Project Implementation Group are provided in Appendix 1.

Stakeholder Advisory Group

Upon initiation of the project the Steering Committee will establish a Stakeholder Advisory Group comprising representatives of the resources, agricultural, and biosecurity sectors (e.g. Greening Australia, Minerals Council of Australia, North Australian Indigenous Land and Sea Management Alliance, National Farmers Federation, etc.). The terms of reference will be established by the Steering Committee. The role of the group will be to communicate the needs of the project user community to the steering committee.

Project Management

A Project Manager will be appointed through JCU to manage and coordinate all aspects of this project.

Project accounts will be located within JCU and financial management will be undertaken by JCU's Finance and Business Services Directorate. Accounts will be externally audited in accordance with JCU's auditing standards.

Staff recruited to the ASPIS project will be employed by JCU. Some of these staff will be physically located in partner institutions, and will observe all policies and procedures of those institutions.





Section 10: Budget

The ASPIS project will be funded by a private sector partner. All costs shown are total project costs, so the requested contribution from a private **partner is the total as shown in the table.**

The total value of the project is c. \$89M over 7 years. Of this, c. \$11.4M is required from the funding partner. The remaining c. \$77.6M is significant in-kind support provided by the project partners comprising access to the collections, specialist staff and infrastructure of their institutions.

These are necessary to enable delivery of the various elements of the project, such as identification and curation of herbarium specimens, development of scientific publications describing new species, project management, research grants, scientific reporting, and publicity.

The project partners have a track record of outstanding delivery (RFK, ALA, AVH). Additionally the collaborative nature of this project provides value that could not be obtained from one of the partners alone. The web-based applications to be developed by this project are unique and in high demand and will have substantial community, industry and scientific benefits over time, and the identification of these achievements with the funding partner will deliver substantial corporate value.

In summary, the investment requested in this proposal is of enormous national value, will deliver world-leading outcomes, and provides an essential base to support sustainable development while maintaining the diversity and integrity of life across northern Australia.

10.1: ASPIS Project High Level Budget Table 2015-2021

	2015	2016	2017	2018	2019	2020	2021	TOTAL
Direct Salary Costs	702,496	757,584	790,808	848,260	878,900	975,325	1,010,569	5,963,942
Direct Non-salary Costs	517,374	622,693	530,718	580,945	577,015	768,278	792,220	\$4,389,243
Total (GST exclusive)	1,219,870	1,380,277	1,321,526	1,429,205	1,455,915	1,743,604	1,802,789	\$10,353,185
GST	121,987	138,028	132,152	142,920	145,591	174,360	180,279	\$1,035,319
TOTAL FUNDING PARTNER	\$1,341,857	\$1,518,304	\$1,453,679	\$1,572,125	\$1,601,507	\$1,917,964	\$1,983,068	\$11,388,504
Total Indirect Costs	10,226,571	10,640,667	10,766,618	11,089,617	11,422,306	11,764,975	12,084,815	\$77,995,569
TOTAL PROJECT COST	\$11,568,428	\$12,158,971	\$12,220,298	\$12,661,743	\$13,023,813	\$13,682,939	\$14,067,883	\$89,384,074

"The effectiveness of our members who work in / or assess savanna landscapes is often dependent on timely and accurate identification of species... it is made so much harder by the fact that there is no comprehensive, accessible resource for identifying savanna plants. The suite of tools currently available to identify plants are dispersed, in technical literature, inconsistent in format and taxonomy, and field guides (where available) are taxonomically incomplete, local in scope, and vary in quality."

- Michael Chilcott, President, Environmental Institute of Australia and New Zealand.

APPENDIX 1: Governance and Management Personnel

Given the scale and complexity of this project, the key personnel of the project team have been specifically selected and include senior scientists/managers from all of the major public institutions (herbaria) responsible for the discovery, description and identification of the tropical savanna flora of Australia. As such this is the best possible team for the project, bringing together the world experts on this flora and harnessing the resources of these world-class institutions. All project team members have extensive experience in respect to their particular technical and specialist areas and have been involved in a range of projects that have required the completion of tasks highly relevant to the project.

The members of this consortium have a long history of successful collaboration on large projects, for example, Australia's Virtual Herbarium (AVH: www.avh.org.au), and we have already delivered a successful product of the kind proposed here, namely the *Australian Tropical Rainforest Plants Key* (see page 12).

Profiles of project members involved in governance and management are provided below.



Steering Committee

Prof Darren Crayn

Director, Australian Tropical Herbarium.

Darren's research is in the field of plant systematics and evolution and deals broadly with the questions: how many plant species are there in tropical Australia and the region, how are they related and how have they evolved? Darren uses a range of traditional and cutting edge techniques, ranging from field surveys and herbarium taxonomy to scanning electron microscopy, DNA-barcoding and genomics. He has extensive experience in research management and leadership, having won and managed nearly \$3 million in external research funding in the last ten years. Darren will be Project Leader of ASPIS.

A/Prof Kevin Thiele

Director, Western Australian Herbarium.

Kevin has a strong research and development portfolio in biodiversity informatics, including development of the widely-used Lucid software package used for the Rainforest Key, extensive involvement in the Atlas of Living Australia, and development of the IdentifyLife platform that will support ASPIS. In addition, he has research interests in the systematics of the plant families *Proteaceae*, *Rhamnaceae* and *Violaceae*, and the conservation ecology of grassy woodland ecosystems. Kevin is the current Chair of the Council of Heads of Australasian Herbaria.



Mr Ian Cowie

Chief Botanist, Northern Territory Herbarium.

Ian has lived in the Top End of the Northern Territory since 1983 and has broad expertise in taxonomy, botanical survey and ecology, with an extensive knowledge and field experience of the flora of the monsoonal parts of the Northern Territory and Timor-Leste. Ian has co-authored two books on the flora of the Northern Territory, as well as many taxonomic and other scientific papers and reports. His taxonomic research interests include savanna plants such as *Tephrosia* (Fabaceae), *Helicteres*, and *Dicarpidium* (Malvaceae) and other NT 'phrase name' species. He also has a major role in maintaining the Checklist of NT Plants, curation of the NT Herbarium collection, development of databases and web services, provision of Herbarium services to the public and in the assessment of the conservation status of the northern flora against IUCN criteria, for listing under NT legislation. Ian has experience with the development of interactive LucID-based keys through the MacFlora project.

Ms Ailsa Holland

Science Leader, Queensland Herbarium.

Ailsa has 30 years' experience in plant identification, flora writing and taxonomic research, and has published more than 20 research papers including 24 new species, 16 of which occur in the savanna region. She is an expert curator of several plant families rich in savanna species, including *Goodeniaceae*, *Fabaceae* and *Asteraceae*, and has authored flora accounts and keys in these families. Ailsa is currently the collections manager at the Queensland Herbarium and is also the manager of the successful community based Weed Spotters' Network Queensland, a joint project with Qld Biosecurity. She has authored more than 40 information sheets, profiles and articles on weeds and threatened species, co-edited and published eight annual reports, the Census of the Queensland Flora and the Queensland Herbarium web pages. Ailsa is also engaged in public relations and communications, and has organised and delivered numerous public events, displays, seminars and workshops.

Mr Jim Croft

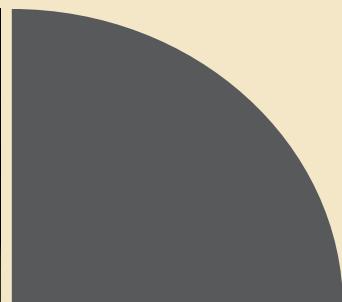
Deputy Director, Centre for Australian National Biodiversity Research; Deputy Director Science and Information, Australian National Botanic Gardens.

Jim's expertise is in biodiversity informatics, biological information systems, and standards in biological databases, in particular engaging digital technology in national and international distributed and collaborative projects to harness scientific data and information for use by the wider community. Jim has had 40 years experience in biodiversity information management, including 15 years experience in tropical botany as a botanist, and later Director, of the Papua New Guinea National Herbarium in Lae, with extensive collecting field work leadership throughout that country. He has published on PNG ferns and fern allies, and on rainforest and timber tree families; he has six PNG species named after him. He is currently working on a collaborative project with the Australian and Papua New Guinea governments to capture and repatriate data and information from PNG specimens held in Australian herbaria.

Dr Peter Doherty

Program Manager, Atlas of Living Australia.

Peter's expertise is in biodiversity informatics, biological information systems and standards. He is an experienced Program Manager with strong business development, people, technical and analysis skills. He started as analyst programmer before moving on to infrastructure design and implementation followed by project and program management. As Program Manager for the ALA he leads multiple projects with total investment over \$46m. These projects involve managing teams of staff, contractors and sub-contractors, engaging with large numbers of stakeholders, and constitute multiple interconnecting systems across a complex management environment (biodiversity science and informatics).



Project Implementation Group

Mr Frank Zich

– Project Manager

Curator, Australian Tropical Herbarium.

Frank's experience and interests are in the curation and management of herbarium collections and databases, and in taxonomic research on the tropical flora of Australasia. He is also responsible for the ongoing development and maintenance of the interactive identification key 'Australian Tropical Rainforest Plants' and is involved in the development of the new module for rainforest ferns. Frank has proven experience in developing interactive key products and in management of dispersed teams.

Ms Eda Addicott

– Technical Expert, Savanna Vegetation, North Queensland

Principal Botanist, Queensland Herbarium at the Australian Tropical Herbarium.

Eda is a plant geographer and ecologist with over 15 years of experience in the vegetation of the north eastern Australian savannas. Eda's main area of research is Regional Ecosystem mapping as part of a state wide project by the Queensland Herbarium to map Regional Ecosystems across the whole of Queensland at 1:100,000 scale. Eda's role is leading a team responsible for mapping the Einasleigh Uplands and Cape York Peninsula bioregions of Queensland.

Dr Donna Lewis

– Technical Expert, Savanna Vegetation, Northern Territory

Senior Botanist.

Donna's experience and interests span botanical and ecological surveys in the Northern Territory, particularly the Top End. The application of Geographic Information Systems and Remote Sensing technologies for vegetation community mapping and possible species modelling is an ongoing undertaking. Donna's taxonomic interests are to describe several phrase name taxa in the Northern Territory; *Thecanthes* sp. Donydji, *Urania* sp. Litchfield, *Crosslandia* sp. Wilton River, *Glycine* sp. Mt Sanford, and *Acacia* sp. laterite. The redevelopment and administration of key vegetation site and plant specimen web applications is a significant responsibility. Donna also oversees the major development of an electronic flora for the Northern Territory and coordinates the provision of plant specimen data to the Australian Virtual Herbarium and Atlas of Living Australia. She has extensive experience in savanna botany and in developing online delivery models for botanical information in the Australian tropics.

Prof Betsy Jackes

– Technical Expert, Savanna Vegetation.

Adjunct Professor, James Cook University.

Betsy is now retired but a long-term academic at James Cook University, Townsville. Her research interests include

the taxonomy and reproductive biology of various tropical plant groups. Betsy is an acknowledged authority on the flora of north Queensland having published numerous scientific papers, and technical and semi-popular books on the topics including 'Plants of the tropics: rainforest to heath (an identification guide)' and 'Plants of Magnetic Island'.

Dr Paul Williams

– Technical Expert, Savanna Vegetation and Industry Representative.

Principal Botanist, Vegetation Management Science Pty Ltd.

Paul is a botanist with extensive experience in the savanna region. He was previously employed for over 16 years as a Senior Conservation Officer for the Qld Parks and Wildlife Service, and now consults to industry (mainly in NW Qld). He has 16 years of experience undertaking vegetation surveys across Queensland, focusing on the tropics. This includes vegetation mapping, mine site rehabilitation, and assessments and planning for fire, revegetation and weed management issues, from north-west Queensland to south-east Queensland. Through his role as an Adjunct Lecturer with James Cook University, he also undertakes research into practical conservation land management issues.

Ms Raelee Kerrigan

– Technical Expert, Savanna Vegetation.

Consultant Botanist.

Raelee is a botanist with extensive experience in the savanna region having worked at the Northern Territory Herbarium for more than 7 years. She is experienced in flora surveys, plant identification, taxonomic revisions, herbarium curation and assessment of species against IUCN criteria. Her research interests include the taxonomy of *Polygala*, for which she published a revision in 2012.

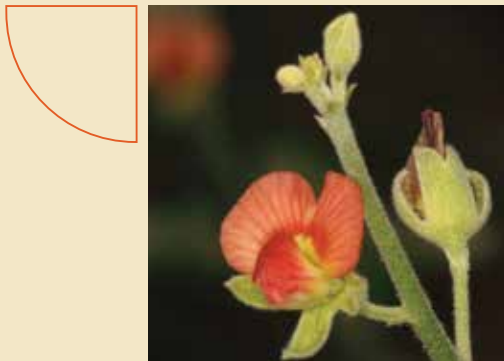
Dr Bruce Wannan

– Technical Expert, Savanna Vegetation.

Principal Biodiversity Planning Officer, Queensland Department of Environment and Heritage Protection.

Bruce is a botanist with over 30 years of experience in savanna botany. He has worked in systematic research in the plants of the northern Australia savanna including Anacardiaceae, Scrophulariaceae and Linderniaceae. During his role as a biodiversity planner over the last 20 years he has maintained a personal herbarium of over 3,000 savanna plant specimens including new species described from his collections. He continues research into the plants of the savanna currently working on the genus *Lindernia* and facilitates research into many other groups. He also has a very good working knowledge of the region's flora and the diverse user groups for the key including consultants and environmental managers. In 2013, Bruce was responsible for the development of the initial species list for the study area.

APPENDIX 2: Partner Organisations



The project consortium comprises all of the lead national and State agencies for plant biodiversity research and information across the savanna region. These agencies, the Australian Tropical Herbarium, the Australian National Herbarium, the Northern Territory Herbarium, the Queensland Herbarium, the Western Australian Herbarium, and James Cook University have the collections, facilities, and know how required to successfully complete this project. The ASPIS consortium institutional members collectively have over 420 years of experience in the provision of botanical knowledge on Australia's north. Through this work each institution has worked extensively with the community in many ways, including through providing plant identifications, training courses in plant identification techniques, checklists, and advice on vegetation management. Profiles of the ASPIS partner organisations are provided below.

Australian Tropical Herbarium



The Australian Tropical Herbarium (Herbarium code: CNS), established in 2008, is a joint venture of the CSIRO, Parks Australia, Queensland Department of Science, Information Technology, Innovation and the Arts (Queensland DSITIA), and James Cook University (JCU). The ATH is physically located on the Cairns campus of JCU.

Since establishment in 2008 the ATH has won over \$1.6 million in competitive research grants, has published over 80 scientific papers and 40 popular articles, and has built a strong workforce of staff, PhD and other students, and volunteers.

ATH's vision is to be a leader in tropical plant biodiversity research, that conducts diverse, relevant and innovative research; converts that research into useful products; offers training, inspiration and engagement with the community; and, by collaborating with others, achieves a greater understanding of sustainable tropical systems. This vision is supported by the organisation's core values of leadership, integrity, service, innovation and team-building. The ASPIS project embodies this vision.

As a tropically located, research-intensive, collections-based plant biodiversity institute with demonstrated success in delivering web based identification tools, the ATH is the most suitable organisation to lead this project. Its current research activities span the savanna region and its strong programmes in student and early-career researcher training ensure that the project will help develop the next generation of plant biodiversity scientists for the tropics. The ATH has a strong track record of project delivery of web-based plant identification tools, such as the RFK: www.anbg.gov.au/cpbr/cd-keys/rfk

Partnerships are central to the ATH's activities. The ATH is a joint venture of several prestigious organisations - CSIRO, the Queensland Herbarium (DSITIA) and JCU - and its staff are drawn from these partners. Among its achievements, ATH has established the first Indigenous-led ethnobotanical research centre - the Tropical Indigenous Ethnobotany Centre (TIEC) and ATH scientific staff and research students collaborate with colleagues from a broad range of organisations within Australia and around the world.

The ATH has the strength and resilience of its Government and University partners. This ensures that the project will be managed and administered in accordance with relevant standards and legislative frameworks covering financial management and accountability, workplace health and safety, and best practice management.

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Northern Territory Herbarium

The Northern Territory Herbarium (Herbarium code: DNA) houses a collection of more than 255,000 specimens from throughout the region and is a part of the Northern Territory Government. It has the core function of providing botanical services and advice to the NT government and wider community.

These services include maintaining an up-to-date plant taxonomic frame work and NT plant census including threatened species listings, weeds, and plant information databases; providing strategic taxonomic research and baseline flora surveys to document poorly known species and areas; the development & improvement of plant identification tools for general use; strategic survey and review of threatened and potentially threatened plants, and maintaining databases as a primary information resource for plant records.

The NT Herbarium (part of the Flora and Fauna Division) operates within the NT Department of Land Resource Management's Strategic Plan 2013-2017.

Vision: *The Northern Territory's land and water resources are used appropriately for economic development and the wellbeing of all Territorians.*

Purpose: *Provide advice and support for the sustainable development of the Northern Territory's land and water, and conservation of its unique native flora and fauna.*

The Northern Territory Herbarium has a strong track record of project completion, research, field survey and service delivery. The advice, services and research that the Herbarium provides are well respected and widely sought. The NT Herbarium is the foremost authority on the flora of the Northern Territory and has produced numerous, authoritative research and applied publications on the NT flora. Current projects include preparation of an interactive electronic key to the flora of the MacDonnell Ranges bioregion of central Australia (MacFlora), a traditional Flora of the Darwin Region and a web-based flora portal for the Northern Territory. The Herbarium's advice and knowledge is incorporated into decisions on conservation, land development and management, weed management, and other research as well as into learning and interpretative material produced by others. Staff of the Herbarium answers over 700 enquiries and makes over 3500 plant identifications per annum for a wide variety of external clients. The Herbarium's extensive knowledge of the conservation status of NT plants is gazetted under the Territory Parks and Wildlife Conservation Act and Commonwealth EPBC Act.

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Queensland Herbarium

The Queensland Herbarium (Herbarium code: BRI) is part of the Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA), located in Brisbane. The Queensland Herbarium, established in 1859, houses the State's herbarium collection, with more than 825,000 plant, fungi, algae and lichen specimens, including more than 10,000 type specimens. The specimen collection label database HERBRECS is a comprehensive summary of the changing flora of Queensland since settlement.

The Queensland Herbarium's principal focus is researching, documenting, monitoring and disseminating information on Queensland's plant and animal species and ecosystems. More than 20 new species of plants are discovered and documented for Queensland each year, published in the Queensland Herbarium's internationally recognised journal *Austrobaileya*. Queensland Herbarium botanists publish more than 30 research papers each year, along with numerous articles, reports, flora accounts and identification tools. The Queensland Herbarium's Regional Ecosystem mapping is the best of its kind in the world, with more than 90% of Queensland mapped to at least 1:100,000 scale, available online. The ecological sciences unit is currently involved in externally funded projects including large scale condition monitoring and benchmarking of vulnerable wetlands, mining areas and mangrove habitats. Herbarium species experts provide information, assessments and advice for threatened species and ecosystems for State and Commonwealth legislation.

Community partnerships include the successful Weed Spotters' Network Queensland, a joint project with Biosecurity Queensland that is aimed at early weed detection and now boasts more than 500 trained weed spotters and 20 regional coordinators. The Queensland Herbarium Information and advisory service provides identifications and advice to more than 5,000 customers each year, and an active group of volunteers contributes to the 8,000 additional specimens accessioned each year.

Queensland Herbarium botanists have won several awards, including a 2012 iAWARD (Springbrook Wireless Sensor Network) and the 2005 Eureka Prize (innovation in biodiversity and woodland dynamics).

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Western Australian Herbarium



The Western Australian Herbarium, part of the Department of Parks and Wildlife, is located in Perth and holds c. 750,000 specimens of native and naturalized plants from throughout Western Australia.

The WA Herbarium plays a key role in understanding, managing and helping to conserve Western Australia's plants, algae and fungi. The Herbarium's collection is the basis for botanical research conducted in Western Australia and elsewhere which results in the discovery, description and naming of on average around 100 new WA plant taxa per year. It is also the authoritative set of voucher specimens used to estimate the distribution and conservation status of all Western Australian plants, algae and fungi, and is a critical resource in helping to accurately identify specimens collected from throughout the State.

The Western Australian Herbarium (Herbarium code: PERTH) has a strong track record in biodiversity informatics. It was one of the first Australian herbaria to develop a web presence and to make its information available online through the award-winning FloraBase website (florabase.dpaw.wa.gov.au). In addition, the Western Australia's journal *Nuytsia* (florabase.dpaw.wa.gov.au/nuytsia/) is one of the pre-eminent journals for taxonomy, systematics and plant nomenclatural and revisionary studies in Australia.

The Herbarium maintains strong links with a wide variety of partners in community, industry and government in Western Australia and throughout the world. In particular, it hosts a number of industry-funded embedded positions, which provide critical services and liaison between industry and government relevant to conservation of biodiversity in mineral-rich areas of Western Australia.

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Australian National Herbarium



The Australian National Herbarium (ANH) is a programme of the Centre for Australian National Biodiversity Research (CANBR), a collaborative joint venture between the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Director National Parks (DNP). Physically located on the CSIRO Black Mountain campus in Canberra, the ANH has strong connections with other CSIRO biodiversity programmes and with the botanical diversity programmes of the Australian National University. The ANH in its current form was established as a collaboration and integration of two Canberra herbaria 20 years ago; the CSIRO herbarium was established in 1929, the Australian National Botanic Gardens herbarium in 1966, the two collections were combined in 1993 with the establishment of the CANBR. These combined collections number about 1.2 million specimens, well represented in savanna species.

The Australian National Herbarium (Herbarium code: CANB) has a strong track record in the science of plant collection management, taxonomy, systematics, plant identification and biodiversity information management in support of environmental understanding and management, plant industry and education in the plant sciences. Its collections are particularly well represented in large and nationally significant plant groups such as eucalypts, wattles, daisies, orchids, grevilleas, grasses and the citrus family, and their relatives, and non-vascular plant groups (mosses, liverworts and lichens). The ANH is internationally renowned for its research and publications on these plant groups.

As a Commonwealth agency, the ANH has been well-placed and well-supported to undertake and lead projects of national scope and engagement. Staff at the ANH have been particularly active in establishing and driving national collaborative plant identification projects and tools. These include interactive key to major plant groups, such as: *Euclid-Eucalypts of Australia: the PeaKey*-an interactive key for Australian pea-flowered legumes; *Families of Flowering Plants of Australia*; *Australian Tropical Rainforest Plants*; *Flora of Australia On-line* (in collaboration with the Australian Biological Resources Study); the *Interactive Key to Australian Orchid Genera*; *Australian Tropical Forest Orchids*. The ANH is the national coordinating hub for the Australian Plant Name Index and the Australian Plant Census; staff are developing the content and technical infrastructure for the ABRIS and ALA National Species List.

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www.csiro.au/Organisation-Structure/Divisions/Plant-Industry/AndrewYoung.aspx#
www.cpbr.gov.au/cpbr/

Atlas of Living Australia



The Atlas of Living Australia is funded by the Australian Government under the National Collaborative Research Infrastructure Strategy and further supported by the Super Science Initiative of the Education Investment Fund.

Its mission is to develop an authoritative, freely accessible, distributed and federated biodiversity data management system which provides an integrated picture of all of Australia's biodiversity. It contains information and tools which support taxonomy and collections management, biosecurity, conservation and land-use management, ecological and agricultural research, and education.

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"Establishing...biodiversity improvement can be very time consuming and challenging, a process made more difficult by the lack of a comprehensive, interactive key for savanna flora comparable to the excellent rainforest key."

- Brynn Mathews, CEO, Mitchell River Watershed Management Group.



James Cook University



Established in 1970 with a clear purpose to deliver education to people living in the tropics, James Cook University (JCU) is one of the world's foremost teaching and research universities. Surrounded by spectacular ecosystems including the rainforests of the wet tropics, the dry savannas, and the iconic Great Barrier Reef, the University is ideally situated to take advantage of its location in the world-class research it undertakes.

With a focus on "A brighter future for life in the tropics worldwide through graduates and discoveries that make a difference", JCU aims to deliver teaching and research in a global context, through enhancing life in tropical communities.

By adding specialised research centres and new tropical-focused courses, the University provides the necessary tools to promote a brighter future for developed nations, as well as those in the developing regions worldwide.

JCU's international impact and reach is recognised in the Academic Ranking of World Universities (ARWU) produced by the Shanghai Jiao Tong University. This respected body places JCU as one of the world's leading academic and research institutions - in the top 4% of universities in the world based on research excellence.

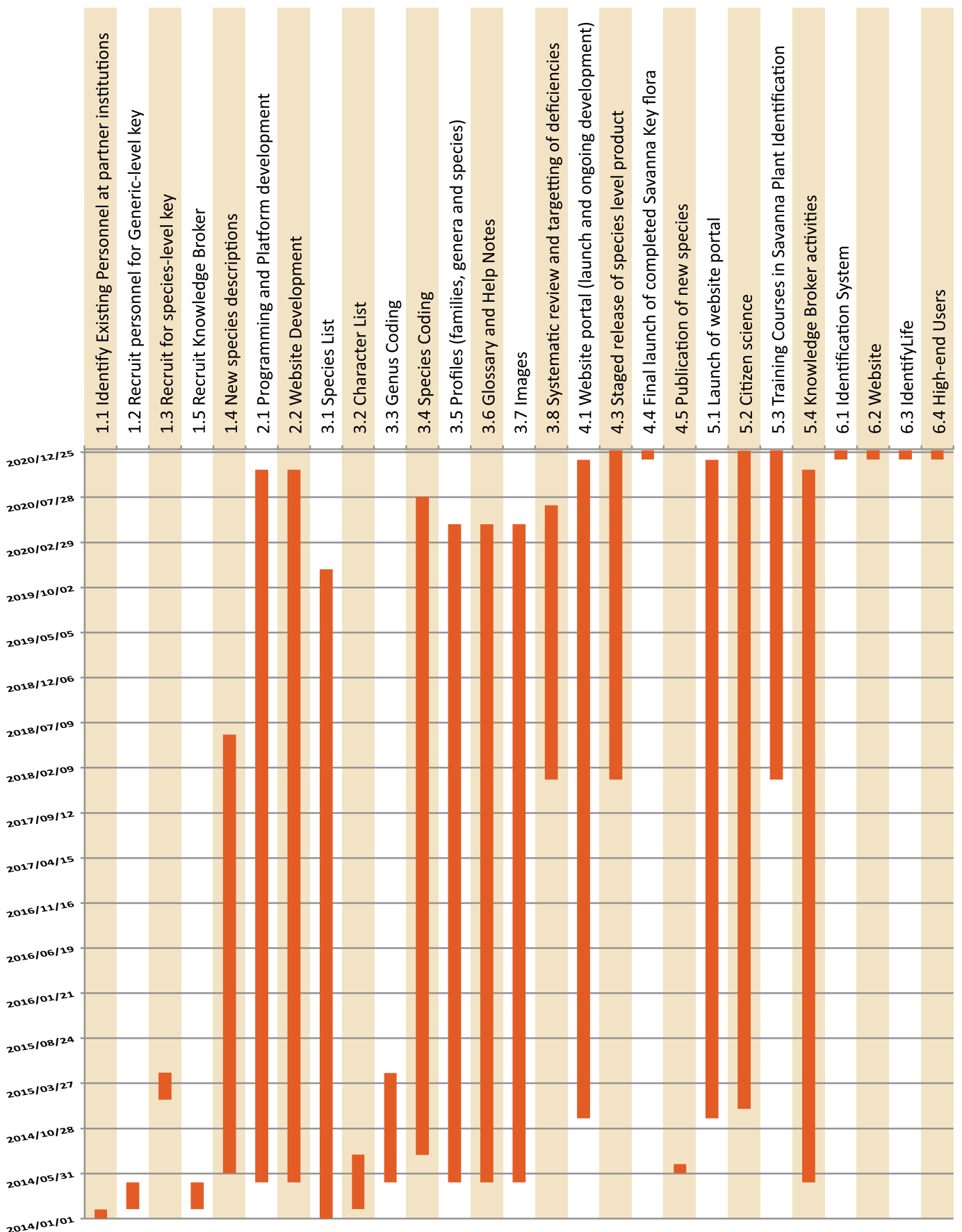
JCU is currently ranked number one in the world for coral reef ecology citations and JCU has the highest rating possible for environmental science and management, environmental applications and medical microbiology in the Australian ERA ratings. In addition, in 2012, Thomson Reuters ranked JCU in the top 50 universities in the world in ecology and environmental sciences; the 2nd highest ranked Australian university, and JCU was ranked 5th top Australian research institution and 30th in the Asia Pacific in the prestigious Nature Publishing Index.

An important feature of the University's research and teaching profile is strong partnerships with business, industry, government and the community to create lasting benefits for our region and a brighter future for the tropics generally. In 2012, JCU undertook contracts and consultancies to the value of AU\$41.8M, attesting to its strong reputation for management and delivery on contract research.

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APPENDIX 3: Project Implementation Schedule





"ASPIS will ultimately enable anyone, anywhere to identify and learn about the plants of northern Australia. Many of our stakeholders will be able to use this for land management, interpretation for visitors, linking with indigenous groups for tourism development and tour guide education. It will be a boon to the tourism industry across Australia's Tropical Savannas."

- Russell Boswell, Manager, Savannah Guides.

Photographs courtesy of Gary Wilson, Ian Cowie, Andrea Lim, Paul Williams and Bruce Wannan.

APPENDIX 4: Detailed Project Budget Year One (2015)

	Unit cost	Total
Direct Salary Costs		
Project Leader (0.3 FTE)	207,084 (incl. salary oncosts)	62,125
Project Manager (1 FTE)	121,553 (incl. salary oncosts)	121,553
Data Coder (5 x 1 FTE)	78,932 (incl. salary oncosts)	394,660
Plant ID Educator (1 FTE)	74,932 (incl. salary oncosts)	74,932
Administration Assistant (0.3 FTE)	74,932 (incl. salary oncosts)	22,480
Knowledge Broker (0.5 FTE, commence mid year)	106,986 (incl. salary oncosts)	26,746
Direct Non-Salary Costs		
Subcontracted programmer (Atlas of Living Australia)	50,000	50,000
Subcontracted programmer (IdentifyLife)	28,000	28,000
Subcontracted State/Territory Project coordinators (4 x 0.1 FTE)	15,625	62,500
Minor Equipment (computing)	20,000	20,000
Travel and facilities hire (project meetings, training)	71,000	71,000
Citizen Science and Knowledge Broking Support	20,000 (commence mid year)	10,000
Field support	20,000 (commence mid year)	10,000
MERI	20,000	20,000
Overheads (35% requested salaries)		245,874
Total Direct Costs (GST exclusive)		1,219,870
GST		121,987
TOTAL FUNDING PARTNER		\$1,341,857
Indirect Costs		
Australian Tropical Herbarium specimen provision	194,286	194,286
Queensland Herbarium specimen provision	2,285,714	2,285,714
Northern Territory Herbarium specimen provision	2,240,000	2,240,000
Australian National Herbarium specimen provision	3,428,571	3,428,571
Western Australian Herbarium specimen provision	2,000,000	2,000,000
Bioinformatics Platform Developer (Atlas of Living Australia)	78,000	78,000
TOTAL INDIRECT		\$10,226,571
TOTAL PROJECT COST		\$11,568,428



“Savanna vegetation forms the bulk of the landscape in the Top End and is recognized at a global level as being one of the most extensive and intact Savanna systems in the world...”

Greening Australia staff and other technical practitioners in vegetation management have considerable difficulty in identifying northern Australian plants that they are working with. There is no single source of information...”

- Brendan Foran, National CEO, Greening Australia.



Business Plan To Create The Australian Savanna Plant Identification System

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