Botanist Brief

Fitzgerald Biosphere vegetation research for appropriate fire regimes

GOVERNMENT OF WESTERN AUSTRALIA

natural resource management program

Community Stewardship Grant 2024 - No. CSGL24013

Friends of the Fitzgerald River NATIONAL PARK

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1 PROPOSAL SCOPE

1.1 Project Summary

The Fitzgerald Biosphere is one of only five biospheres in Australia designated under the UNESCO Man and the Biosphere Programme. The Fitzgerald River National Park (FRNP) forms the 'core area' and forms a substantial component of the 'Fitz-Stirlings Priority Place', one of only three Commonwealth-recognised Priority places in Western Australia (Map 1). Here, many dominant plant species only regenerate after fire from seed stored in capsules above ground, i.e. serotinous obligate seeders. Craig (2020) observed failure of nine species to return following prescribed burning adjacent to FRNP resulting in reduced diversity and simplified structure of the vegetation. Climate change has increased the risk of adverse events - drought, heat waves, lightning strikes and rainfall intensity. Previous studies have shown that the resilience of species to short fire intervals is decreased under climate change, with longer periods required for populations to produce larger seedbanks required for population-replacing recruitment. Inappropriate fire regimes are a key threatening process under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

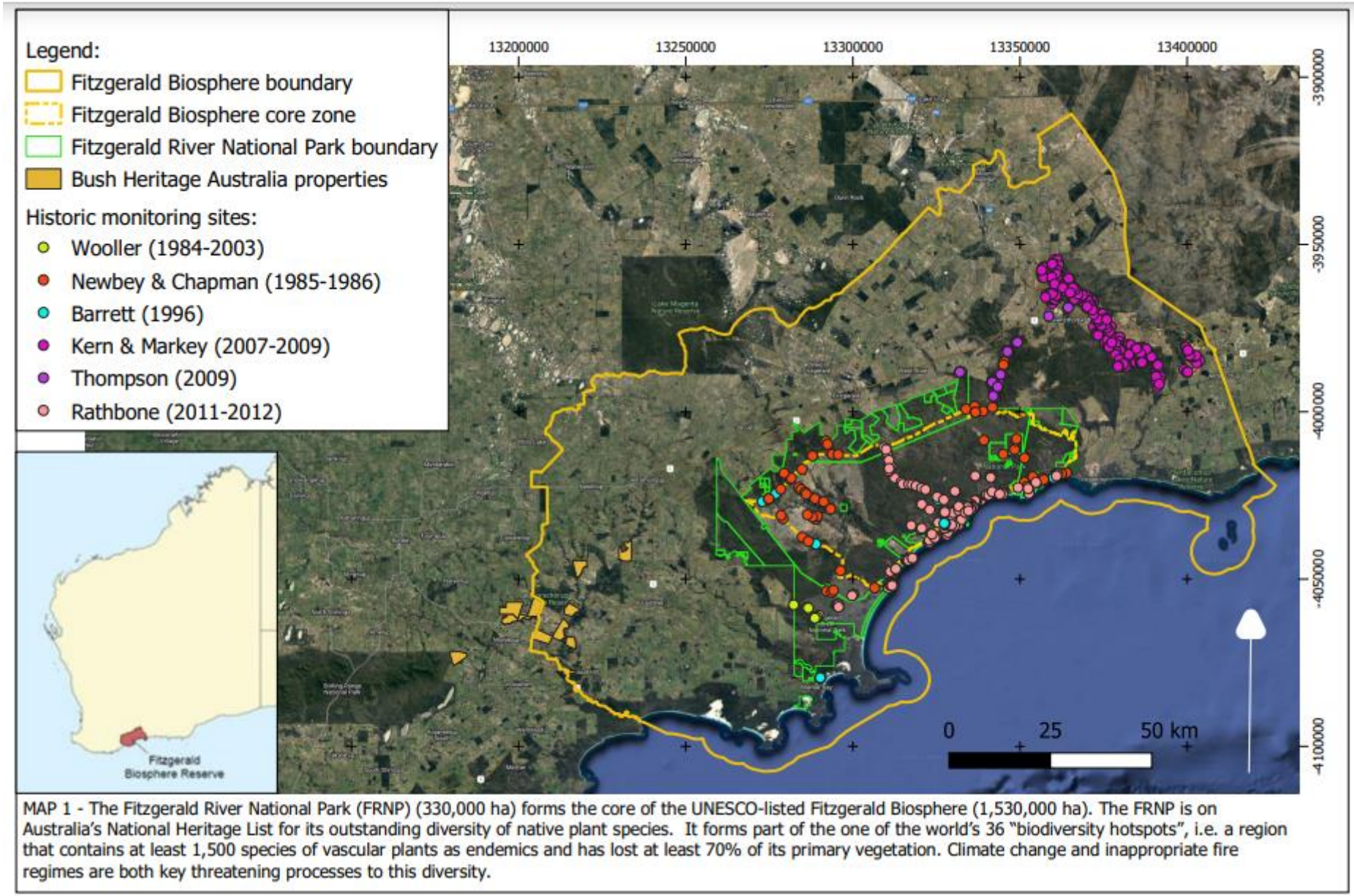
Fire frequency in the FRNP and surrounds, through wildfire and prescribed burning may have increased over the past 40 years. In the Fitzgerald Biosphere, DBCA and Shire fire managers use 30-year-old vegetation as one of the decision mechanisms for planning burns. Hassell and Dodson (2003) used estuarine sediment cores from the Gorden Inlet determined that the pre-European "catchment fire interval" for most fires was 29-58 yrs apart. Barrett et al. (2009) collated the fire ecology information for the South Coast Region and identified the fire sensitive systems in the landscape. These systems included vegetation dominated by serotinous obligate seeders (eg mallet woodlands, proteaceous shrublands and *Melaleuca* shrublands). 'Serotiny' is the retention of seeds in capsules on the plant, often for many years. Evidenced-based research is urgently needed to understand why seed banks are not producing seedlings after fire in this floristic hotspot.

Southwestern Australia is experiencing increasing temperatures and rainfall decline, which may reduce the ability of plant species to persist in the context of recurrent fires. Plant populations that only recover through seed germination are particularly vulnerable to short fire-return intervals. Quantitative data using quadrats or other suitable methods will be used to quantify recruitment after fire and seed bank development at different ages post-fire. Targeted plant species will be measured for fruit set and seedling recruitment to determine the minimum fire-return interval and climatic conditions amenable for long-term survival and abundance. The data collected will inform future landscape management by DBCA, local Shires and land managers.

To achieve this research the Friends of the Fitzgerald River National Park received a 2024 Community Stewardship Grant, which is an initiative of the Western Australian Government managed though the State Natural Resource Management (NRM) Program at the Department of Primary Industries and Regional Development (DPIRD).

1.2 Project Location

To maximise collaborative links with a diversity of land managers and the potential for limited access to the FRNP as a result of road closures in wet weather for *Phytophthora* dieback control, the project aims to include remnant vegetation in the greater Biosphere region. It is anticipated that a proportion of quadrat sites will be established close to nodes, which are readily accessible by volunteers and where accommodation is available, i.e. Ravensthorpe-Hopetoun, Twertup Field Studies Centre, Quaalup - Bremer Bay, and the Michael Tichbon Field Station at Red Moort Reserve (Bush Heritage Australia) (Map 3).



MAP 1 - The Fitzgerald River National Park (FRNP) (330,000 ha) forms the core of the UNESCO-listed Fitzgerald Biosphere (1,530,000 ha). The FRNP is on Australia's National Heritage List for its outstanding diversity of native plant species. It forms part of the one of the world's 36 "biodiversity hotspots", i.e. a region that contains at least 1,500 species of vascular plants as endemics and has lost at least 70% of its primary vegetation. Climate change and inappropriate fire regimes are both key threatening processes to this diversity.

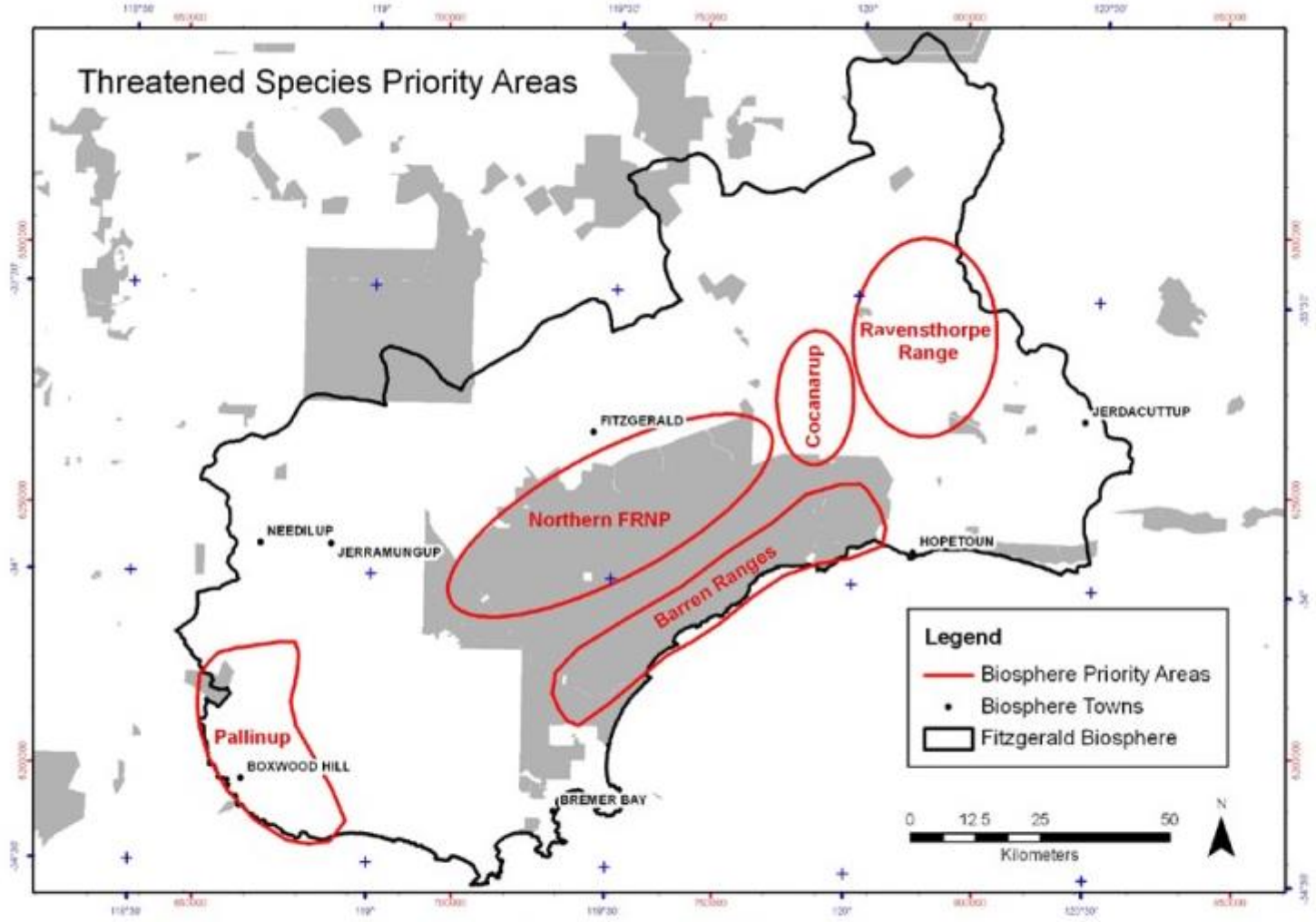
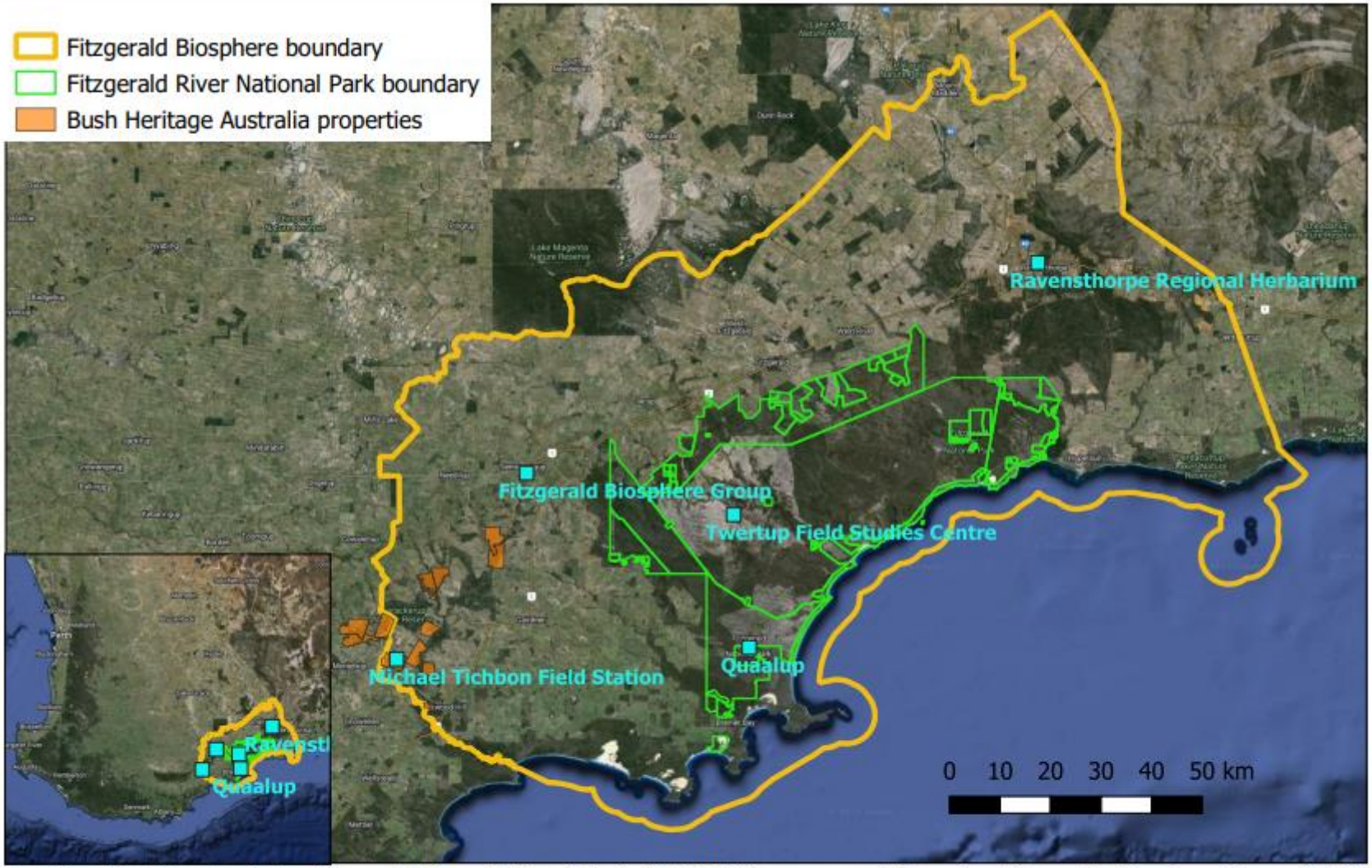


Figure 5: The five Priority Areas for threatened species in the Fitzgerald Biosphere.

MAP 2 - The Fitzgerald Biosphere Recovery Plan has identified five priority areas where there are high numbers of Threatened species. These areas with a chronosequence of fire history will be targeted for vegetation research.



Map 3 - The Friends of the Fitzgerald River National Park (FoFRNP) have support from the Fitzgerald Biosphere Group (FBG), Ravensthorpe Regiohal Herbarium and Bush Heriatage Australia. The latter own a number of reserves which are suitable for research quadrats and can provide accommodation at the Michael Tichbon Field Station. The FoFRNP and DBCA manage the Twertup Field Studies Centre in the park.

2 PROJECT OBJECTIVES, OUTCOMES AND ACTIVITIES

2.1 Project Objectives

The principal objective is to protect the flora and vegetation diversity within the Fitzgerald Biosphere through gaining a greater understanding of the impacts of fire frequency and interval on plant regeneration. The long-term aim is to prevent localised loss of plant species and deterioration in the condition of vegetation so that both flora and fauna diversity survive into the future.

Five Priority Areas for threatened species have been recognised (Fitzgerald Biosphere Recovery Plan, 2012) (see Map 2). These areas will be targeted for research and will focus on the following three major vegetation types which have a high proportion of serotinous obligate seeders:

- proteaceae dominated Kwongkan shrublands (EPBC Act listed Threatened Ecological Community);
- scrub-heath and thicket dominated by myrtaceae, eg *Melaleuca sophisma* heath (Priority 1 Ecological Community);
- *Eucalyptus* mallet-form woodlands, eg *Eucalyptus megacornuta, E. purpurata* (Priority 1 Ecological Communities), *E. astringens* subsp. *merleae* (Priority 2 species).

Few studies in WA's South Coast have addressed specific aspects of the response of vegetation types to different fire regimes. Understanding plant population dynamics with respect to fire is both scientifically interesting and a conservation management priority. Feasible outcomes include:

1. counts of obligate seeder species and their fruits in standardised quadrats in the three major vegetation types across a chronosequence of fire age;
2. documentation of fire and recruitment dynamics in targeted obligate seeding species;
3. determine risk of recruitment failure and potential biodiversity loss with known fire intervals to inform decision making in prescribed burn planning;
4. provide advice to Park managers, Shires, Bush Heritage Australia and other landholders in the biosphere region on landscape management with respect to fire.

2.2 Desktop Assessment

A desktop study will be carried out to:

1. Collate data from known vegetation monitoring sites to determine location of targeted vegetation types with a chronosequence of fire ages in the Fitzgerald Biosphere.
2. Determine the number of quadrats required for each species x fire age for a statistically valid design.
3. Choose targeted plant species for measurement of fruits pre- and post-fire.
4. Review fire related vegetation and flora studies that have been undertaken to date in the Biosphere.

The botanist will present a summary of these findings to the Steering committee for their agreement on methodology before commencement of field data collection.

2.3 Field Survey

The field component of the project will:

5. Establish quadrats or other suitable quantitative measure, to compare targeted species composition and for long-term monitoring. At suitable locations, sites are to be marked with a permanent steel dropper plus metal label in the NW corner of the quadrat, and another dropper on the SE corner.

6. Compare obligate seeder seedling density in recently burnt areas with pre-fire skeletons and count of their (open) fruits - which remain visible. An example pro-forma can be found in Barret et al (2009).
7. Record the associated flora in each quadrat to NVIS (2017) Level 4, Sub-formation level, i.e. dominant genus (or genera) plus growth form, cover and height (in the standardised notation of NVIS Table 7) for each of the three main strata. (i.e. Upper, Mid and Ground).
8. Compare plant density and seedbank size of target obligate seeder species within the same community across different times since fire, to develop a model for seed production with age and seed-seedling conversion.

2.4 Plant Specimens

At each research site, all flora identified in the NVIS (2017) description must have a specimen taken and identification confirmed by a volunteer botanist familiar with the South Coast flora. For *Eucalyptus* species, the form whether mallee, mallet, tree or moort and type of bark must be recorded at time of collection.

Representative specimens of each of the target species must be made across its distribution in the Fitzgerald Biosphere and lodged as voucher specimens with the WA Herbarium.

2.5 Seed germination trials

The Botanist will provide seed from targeted species to Notre Dame University and collaborate in:

9. Seed germination trials to test how seed viability changes with age of plant and time since fire. Seed capsules are to be collected and ranked in age cohorts (age of plant and age of seed/fruit) for the target species.

2.6 Data analysis

Data will be analysed to:

10. Test the immaturity risk hypothesis proposed by Gosper et al (2022) which suggests 10-15 years for first reproduction and 20-30 years for 2x juvenile period for the Fitzgerald Biosphere area;
11. Develop a model as per 2.3.7 above.

3 DELIVERABLES

Outputs include:

- at least 60 quadrats established and mapped in the Fitzgerald Biosphere;
- document post-fire recovery period for target obligate seeder species;
- **Draft report(s)** will be submitted to the Steering committee for comment;
- **Final report**(s) must be provided in Pdf and Word document formats, plus 20 hard copies documenting summary of findings and all research sites (location, species cover, flowering /fruiting, photo);
  Data from the results of the survey will be provided by the Botanist as ESRI shapefile(s) for the surveyed areas. Data in electronic format is to be provided in a standardised format, for example the West Australian government's *Index of Biodiversity Surveys for Assessments (IBSA) data packages* and Appendix 1. Raw data results of survey components to be provided at final report provision.
- digital datasets are to be uploaded to the Atlas of Living Australia (ALA), a collaborative, digital, open infrastructure that pulls together Australian biodiversity data, and WA's Dandjoo database;

- present advice to the Fitzgerald Fire Working Group (includes DBCA, Shires, community representatives) regarding appropriate fire regimes in the Biosphere;

The Friends of the Fitzgerald River Park will:

- deposit a copy of the report and data in Battye library, DBCA library, and National eDeposit
- provide links to the data on the Atlas of Living Australia (ALA) on the Friends of FRNP website;
- publish articles in the local newspapers and other media on the research findings.

4 CO-CONTRIBUTORS

4.1 Steering Committee

The Steering Committee includes Friends of the Fitzgerald River National Park members and DBCA representatives who have knowledge of the South Coast flora or are involved in its management. The Steering committee will review the desktop report and draft of the final report and data, prior to the Botanist continuing to the next stage of the project schedule.

Table 1 Steering committee for project

Organisation	Name	Expertise
FoFRNP	Gillian Craig	Project management, botanist, extensive knowledge of Ravensthorpe Range and east side of FRNP
FoFRNP	Nathan McQuoid	Ecologist, specialist knowledge of eucalypts and distribution in Fitzgerald Biosphere
FoFRNP	Kay Lehman	Botanist
DBCA Albany	Jeremy Friend	District Manager, fire management, fire age datasets
DBCA Albany	Sarah Barrett	Flora Conservation Officer, FRNP flora datasets
DBCA Albany	Sarah Comer	Regional Ecologist, extensive knowledge of FRNP, especially Wilderness area
DBCA Perth	Carl Gosper	Plant Science Program Leader, fire-return intervals, methodology planning for statistical rigor, FRNP flora datasets
DBCA Perth	Ben Miller	Fire Science Program Leader, fire/flora datasets

4.2 Co-Contributions

The following organisations have provided letters of commitment to the project. A list of contact persons will be provided to the Botanist.

Table 2 Co-contributors committed to the project

Co-Contributor	Description
FoFRNP	Member Senior Botanists/Consultants - management support, technical advice and guidance, linkages to past research, plant identifications (10 hrs per fortnight @ $120/hr). Twertup Field Studies Centre; acccommodation and field herbarium @$80/day. Media, promotion and communication (1 day/month).
ETNTAC	Tjaltjraak Rangers (4 pers. x 10 days inc. salary, accommodation, meals and travel)

Co-Contributor	Description
DBCA Biodiversity Conservation Science	Principal Research Scientist (Dr Carl Gosper ~0.025 FTE) and Research Scientist (~0.05 FTE), DBCA Albany Flora Conservation Officer (Dr Sarah Barrett ~0.05 FTE), DBCA South Coast Region Regional Ecologist (Dr Sarah Comer ~0.05 FTE)
Notre Dame University	Student support with field survey ($6945 pa), seed germination triails ($2450 per trial), use of equipment ($1500 pa)
Bush Heritage Australia	Ecologist support, Michael Tichbon Field Station accommodation, office space, field herbarium.
Fitzgerald Biosphere Group	NRM Project Officer/Executive Officer support ~10 days. Office space & overhead expenses.
Ravensthorpe Wildflower Show Inc	Office space, internet use, herbarium access, microscopes and reference books.
South Coast NRM	Office space 'hot desk' @$85/day. Media and e-news.
Community volunteers	Volunteers (~16 pa) sourced from, but not limited to, members of Friends of FRNP, Wildflower Society of WA, South Coast NRM and Ravensthorpe Regional herbarium. Hours, travel and accommodation.

4.2 Traditional Owner groups

Traditional Owners will be invited to participate in Steering Committee and Noongar/Nyungar Rangers in the collection of field data and skills development.

Table 3 Traditional Owner groups

Group	Contact	Plan
Esperance Tjaltjraak Native Title Aboriginal Corporation (ETNTAC)	TBA	Committed to co-contribute by providing two Rangers over two weeks for skills development in collecting data at research sites.
Wagyl Kaip Southern Noongar Aboriginal Corporation	Justin McAllister	The Workplan within State NRM grant has budgeted for two Noongar Elders to be included in the planning phase of the project and for participation by Rangers.
Fitzgerald Biosphere Community Collective (FBCC)	Annie Leitch	This collective speaks for the UNESCO status of the Fitzgerald Biosphere and the FoFRNP is a member group. FBCC has regular contact with relevant Noongar family groups that speak for country within the Biosphere.

5 SCHEDULE

The Consultant will provide a short monthly email on progress, in addition to reporting in accordance with the following schedule (Table 4):

Table 4 Indicative Reporting Schedule

Milestone	Deliverable	Timeline
1	Contract signing	March 2025
2	Desktop review of historic monitoring sites and choosing of target plant species to be researched and quadrat sites vs fire ages. Purchase of equipment for field surveys.	June 2025
	Review by Steering Committee of target species and statistical design	July 2025
3	State NRM project milestone report due with assistance from botanist	1 September 2025
4	Completion of fieldwork (minimum 30 quadrats) – year 1 Field surveys with Noongar/Tjaltjraak Rangers and community volunteers involved. Plants associated with target species in quadrats identified. Seed collected from target plant species.	December 2025
5	State NRM project milestone report due with assistance from botanist	6 July 2026
6	Completion of fieldwork (minimum 30 quadrats) – year 2 Seed germination trials carried out by Notre Dame University students.	August 2026
7	Receipt of first draft report & draft survey data for review by Steering Committee	September 2026
8	Presentation to the Fitzgerald Fire Working Group (includes DBCA, Shires, community representatives) regarding appropriate fire regimes in the Biosphere.	September/October 2026
9	Final report in .docx and .pdf format documenting research sites (location, species cover, flowering /fruiting, photo) and post-fire recovery period for target obligate seeder species. Database of survey sites completed and uploaded to Atlas of Living Australia and other suitable websites. State NRM project milestone report due with assistance from botanist.	30 December 2026

6 INFORMATION TO BE PROVIDED

Digital datasets and relevant information will be lodged in a shared folder 'Fitzgerald Biosphere Fire Research' in Google Drive at the following link:

https://drive.google.com/drive/folders/1_80GZq3QKHcpda_oFSNZj68LJodom3EW?usp=sharing

7 PROJECT CONTACTS

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M 0475 777 118
treasurer@fitzgeraldfriends.org.au

8 REFERENCES AND RELATED DOCUMENTS

Beard J.S. (1981 and various (depending on region)). *Vegetation Survey of Western Australia. Swan 1:1,000,000, Vegetation Series.* University of Western Australia Press. Nedlands, Western Australia. *(and various Beard publications relevant to Desktop Study Area)*

Barrett S, S Comer, N McQuoid, M Porter, C Tiller & D Utber (2009) *Identification and conservation of fire sensitive ecosystems and species of the South Coast natural resource management region.* Department of Environment and Conservation, and South Coast NRM.

Craig GF (2020) Plant recovery after 2012 Road Eleven prescribed burn. *Narpulungup News* Vol 2, Nov 2020.

EPA (2016). *Technical Guide - Flora and Vegetation Surveys for Environmental Impact Assessment*. EPA, Perth.

Gosper et al (2022) *Estimation of juvenile period in slow-maturing plants over space and time*. Information sheet 109 / 2022. Department of Biodiversity, Conservation and Attractions, June 2022.

Gosper CR, BP Miller, RV Gallagher, J Kinloch, R van Dongen, E Adams, S Barrett, S Cochrane, S Comer, L McCaw, RG Miller, SM Prober and CJ Yates (2022) Mapping risk to plant populations from short fire intervals via relationships between maturation period and environmental productivity. *Plant Ecology* 223, 769-787. https://doi.org/10.1007/s11258-022-01229-6

Keighery, B.J. (1994). *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc.). Nedlands, Western Australia.

NVIS Technical Working Group (2017). Australian Vegetation Attribute Manual: National Vegetation Information System, Version 7.0. Department of the Environment and Energy, Canberra. Prep by Bolton, M.P., deLacey, C. and Bossard, K.B. (Eds)

9 APPENDICES

Appendix 1: Data Standards

1.1 Raw Data

All survey data is to be provided in ESRI Shapefile format, similar to the collection template provided.
For the purpose of this document, 'raw data' means data collected as part of survey work before being entered into GIS. Often this information is collated in spreadsheet format to manipulate and validate in bulk. Raw data may also include any data that is not presented in the final report. The consultant must provide the raw data in excel.

1.2 Spatial Data

Example Templates and Standards for the provision of data can be found at the following link:
https://www.epa.wa.gov.au/forms-templates/instructions-preparing-data-packages-index-biodiversity-surveys-assessments-ibsa

1.2.1 Environmental Spatial Data

ESRI ArcGIS or QGIS is used by the contributing organisations for their standard Geographic Information System (GIS) software platform for the management, analysis and visualisation of spatial data. For this reason, spatial data should be submitted in ESRI-compatible GIS data formats (see Section 3 for specific requirements).

1.2.2 Quality Assurance/Quality Control (QA/QC)

Contractors are responsible for carrying out basic Quality Assurance/Quality Control (QA/QC) of all data prior to supplying it to the Steering committee. Quality Assurance can be described as the process of preventing errors from entering into datasets; while Quality Control can be described as the process of identifying and correcting existing errors in datasets.

All datasets should be checked for:

- Spatial errors (e.g. errors in coordinates entered in raw data tables; errors in the geometry of features in spatial datasets)
- Attribute errors (errors and inconsistencies in the data recorded in raw data table columns or in spatial data attribute fields)
- Completeness (are all the datasets present?)
- Consistency with data shown in any accompanying documents (such as reports or drawings), and
- Compliance with the Data Standards described in this document.

Once submitted, data will be reviewed by the Steering Committee. Non-compliant datasets or datasets containing errors will be returned to the contractor for modification and resubmission.

2.1 DATA STANDARDS

2.1.1 GIS Vector Data

Vector Data includes points, lines and polygons.

Each GIS vector dataset must include three key deliverables, prepared according to the specifications outlined in Table 1.

Table 1: Key Deliverables for GIS Vector Data

Key Deliverables	Requirements
Vector Dataset	**File Format**: • ESRI Shapefile (must include *.SHP, *.SHX, *.DBF and *.PRJ files as a minimum). **Datum,ProjectionandCoordinates:** • Correct datum and projections must be used and duly noted for all datasets submitted (see Section 2.1.2). **Attributes (examples in Appendix 2):** • Attribute fields must be clearly and logically named. • Attribute fields must be properly formatted for correct data type. i.e., Date or Text or Number/ Integer. **File Name:** • Alphanumeric characters, spaces, hyphens and underscores only. • Feature class names must begin with a letter- they cannot begin with a numeral or special character.
Metadata File	Please complete one metadata form to accompany the Vector data.

2.1.2 Datums and Projections

Data submitted to Main Roads will use the Geocentric Datum of Australia 1994 (GDA94) or Geocentric Datum of Australia 2020 (GDA2020) as the Horizontal Datum in Decimal Degrees (Longitude, Latitude) with values rounded to six decimal places, unless otherwise specified. WGS84 coordinates will be acceptable.

- Data must be in Latitudes and Longitudes (GDA94); units in decimal degrees.
- Vertical Datum, where applicable, will be the Australian Height Datum (AHD).
- All GIS Vector and Raster Datasets will have the coordinate system information embedded with a projection file.

For Raw Data, the coordinate system information will be noted in the metadata statement and within the column headings in the data table. For example, columns containing GDA94 geographic coordinates could be called "Lat" and "Long". Similarly, columns containing MGA Zone 50/51 projected coordinates could be called "Easting", "Northing" and a "Zone" column.

2.1.3 Digital Photography

All photos taken during the project is to be provided at the completion of the project with all other survey data. Photo locations are to be provided as per all other survey data in the template as GDA94 Longitude/Latitude in the "Photo Location" Feature Class template and the photos themselves as .jpg format. Photos can then be linked to their respective point location via the file name. Therefore, the file name in the .JPG file must match the corresponding attribute in the Photo Location Feature Class.

For all survey and sample specific photos:

- the photo to be taken from the NW corner of the quadrat/ site
- provide date of photo
- provide quadrat/site location.

3.1 NAMING CONVENTIONS

3.1.1 GIS datasets

All GIS datasets submitted is to follow standardised naming conventions, e.g IBSA data packages.

The prefix within the file names (XXXXX) is determined by the data type. Below is the list of prescribed prefixes per data type:

- 2A_Sample Sites
- 2B_Flora
- 2C_Vegetation
- Quadrat Physical
- Quadrat Floristics

Note: IBSA prefix is used for the layers and include _polygon, _point or __polyline as a suffix for any layers where there is different geometry but same title. For example, 2B_Flora_point

3.1.2 Metadata Standards

A metadata form is completed to accompany each of the datasets that is provided. The metadata form is provided as a stand-alone Microsoft Word document.

APPENDIX 2: Templates

2.1 Metadata Template

The following form is to be provided as a standalone Microsoft Word document. Please use the information below as guidance to fill in the standalone document as a metadata record.

DATASET DESCRIPTION	
Title	*Title of the dataset*
Data Created	*Date on which the dataset was created*
Date Last Updated	*Date on which the dataset was last updated*
Abstract	*A brief narrative summary about the content of the dataset*
Purpose	*Description of the specific needs the dataset was designed to meet*
Document Number	*Document Number(s) for any reports or documents that the dataset is related to or submitted with*
Contact Organisation	*Name of the organisation responsible for capture and preparation of the dataset*
Contact Name	*Contact person responsible for preparation of the dataset*
Contact Position	*Title or position of the contact person responsible for preparation of the dataset*
Contact Phone	*Phone number of the contact person responsible for preparation of the dataset*
Contact Email	*Email address of the contact person responsible for preparation of the dataset*
Lineage	*Describe how the dataset was created and the sources and processes that were used*
Datum/Coordinate System	*Name of the datum and coordinate system, if the data includes geographic or projected coordinates*
Geographic Description	*Name of the road or other location that describes the geographic extent of the dataset*
Restrictions	*Any restrictions on access to or use of the dataset*

2.2 Quadrat Physical Feature Class-Point Data

FIELD NAME	ALIAS NAME	DESCRIPTION	DATA TYPE	MANDATORY	SIZE	DOMAIN
Quadrat	Quadrat	Identifier quadrat.	Text	Yes	10	XYZ123
Quad_size	Quadrat size	Size of quadrat.	Text	Yes	10	XXm x XXm
Date	Date	Date of quadrat data collection.	Date	Yes	N/A	dd/mm/yyyy
Author	Author	The name of the person or group who authored the survey report and datasets.	Text	Yes	100	To be consistent with the survey i.e. ABC Consulting
Soil_Color	Soil Colour	Describe soil colour.	Text	No	30	References include Maunsell Soil Colour Chart and/or MacDonald Soil handbook
Soil_Type	Soil Type	Describe the soil type.	Text	No	30	Reference MacDonald e.g. Clay/loam/sandy
Rock_Type	Rock Type	Describe the type/extent and presence of rock at surface.	Text	No	30	Reference MacDonald e.g. granite
Age_fire	Age since fire	Age since last fire.	Text	Yes	20	Years or comment
Veg_Type	Vegetation Type	Broad description of vegetation type.	Text	Yes	254	NVIS
Comments	Comments	Further important details.	Text	No	254	
Citation	Citation	A full citation for the accompanying survey report.	Text	Yes	254	To be consistent with the survey i.e. ABC Consulting (2018). Detailed Flora and Vegetation Survey of Lot 123 Outback Rd. Unpublished report prepared for XYZ Developments.

2.3 Quadrat Floristics Feature Class- Point Data

FIELD NAME	DESCRIPTION	DATA TYPE	SIZE	DOMAIN
Quadrat	Identifier quadrat.	Text	10	XYZ123
Date	Date of quadrat data collection.	Date	N/A	dd/mm/yyyy
Author	The name of the person or group who authored the survey report and datasets.	Text	100	To be consistent with the survey i.e. ABC Consulting
TaxonName	The taxon name of the flora species recorded.	Text	254	Accepted name according to WA census
Height	Height of the plant.	Double	10	XX.XXm
Plant_Count	Number of plants.	Short Integer	10	
Cover	Area of plant cover.	Short Integer	10	XXXX%
Comments	Further important details.	Text	254	
Citation	A full citation for the accompanying survey report.	Text	254	To be consistent with the survey i.e. ABC Consulting (2018). Detailed Flora and Vegetation Survey of Lot 123 Outback Rd. Unpublished report prepared for XYZ Developments.