Project Plan SP 2003-004

Project Rangelands Restoration: developing sustainable management systems for the conservation of biodiversity at the landscape scale in rangelands of the Murchison and Gascoyne bioregions–managing fire and introduced predators

Ecosystem Science

Project Core Team

Supervising Scientist	Neil Burrows
Data Custodian	
Site Custodian	

Project status as of Sept. 27, 2017, 12:13 p.m.

Approved and active

Document endorsements and approvals as of Sept. 27, 2017, 12:13 p.m.

Project Team	granted
Program Leader	granted
Directorate	granted
Biometrician	required
Herbarium Curator	not required
Animal Ethics Committee	not required

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Science and Conservation Division Program

Ecosystem Science

Parks and Wildlife Service

Service 2: Conserving Habitats, Species and Ecological Communities

Project Staff

Role	Person	Time allocation (FTE)
Supervising Scientist	Neil Burrows	0.05
Technical Officer	Graeme Liddelow	0.2

Related Science Projects

SPP 1993/160 1993/092

Proposed period of the project

None – None

Relevance and Outcomes

Background

It is hypothesized that mammals, as well as being important in their own right, are also 'ecosystem engineers', aiding dispersal of plant propagules, nutrient cycling and increasing water permeability through digging and feeding activity. We have recently installed quadrats to measure any benefits to vegetation cover and plant species richness generally accruing from the presence of mammals that were extinct from these ecosystems for many decades. Murphy _et al. _(2005) have reported the benefits to sandalwood recruitment and regeneration in the presence of woylies (_Bettongia penicullata_), which dispersed and cached sandalwood seed at Dryandra woodland and Karakamia Sanctuary. Brand (1999) has also demonstrated the importance of grazing by introduced herbivores (domestic stock) on decimating sandalwood recruitment and degrading the condition of host plants in the WA rangelands. In addition to monitoring the general condition of the vegetation, I am proposing to specifically monitor a) the role of small–medium size marsupials (including Boodie - _Bettongia lesueur_ and b) the effects of excluding grazing by introduced and native herbivores in the recruitment and regeneration of WA sandalwood _Santalum spicatum_. Rather than create a new SPP for this work, I would prefer to include it as an addendum to SPP 93/004 and an extension of the monitoring protocol outlined in the SPP and the Rangelands Restoration Adaptive Management Plan.

Aims

To monitor and assess a) the role of medium size mammals and b) the effect of excluding grazing by rabbits and native herbivores (kangaroos) in the recruitment and regeneration of *S. spicatum*.

Hypothesis:

Sandalwood regeneration and recruitment will increase:

- In the presence of small-medium size native mammals due to caching and dispersal of sandalwood seeds.
- By excluding grazing by introduced and native herbivores (rabbits, kangaroos and domestic stock), which will enable the establishment and survival of sandalwood seedlings and an increase in the abundance, cover and health of potential host species.

Expected outcome

Knowledge transfer

Tasks and Milestones

Date

Comments

30/06/2003

Post-baiting surveys to assess re-invasion of feral cats and foxes following baiting with toxic feral cat baits in June 2002 in the GDNR.. Write field trip report. Locate and prepare study sites for trailing of feral cat bait (FCB) at Lorna Glen, undertake pre-bait density surveys. Open pitfall traps Lorna Glen. Carry out trial baiting with FCB on Lorna Glen. Pre- and post bait surveys. Lorna Glen longitudinal fire response study – plot establishment and pre-burn assessment. Write progress report.

30/09/2003

Run Landscope Expedition. Prof. Thomas Bragg and team – re-assess fire and vegetation plots. Open pitfall traps (vertebrate and invertebrate), re-assess GDNR feral cat re-invasion. Re-assess effects of feral cat baiting on Lorna Glen. Update fire history maps for Lorna Glen, calculate areas burned by wildfire, by landforms, analyse rainfall data. Submit paper on controlling introduced predators to Journal of Arid Environments.

31/03/2003

Post-baiting surveys to assess re-invasion of feral cats and foxes following baiting with toxic feral cat baits in June 2002 (GDNR) and June 2003 (Lorna Glen). Open vertebrate and invertebrate pitfall traps. Prepare fire management plan with Goldfields Region. Submit fire behaviour paper for publication.

30/06/2004

Broad area aerial toxic cat bait (Lorna Glen). Pre and post bait surveys, open vertebrate and invertebrate pit traps, assess fire ecology vegetation plots. Broad area Rhodamine B bait over areas with Bilby and Mulgara south of Young Range to examine non-target bait uptake. Write field trip report.

31/08/2004

Run Landscope Expedition. Open vertebrate and invertebrate pitfall traps, assess fire vegetation plots, survey relative abundance of introduced predators. Write field trip report.

30/11/2004

Post-baiting surveys to assess re-invasion of feral cats and foxes following June 2002 baiting with toxic feral cat baits. Open vertebrate and invertebrate pitfall traps, assess vegetation plots. Write field trip report.

31/12/2004

Update fire history maps, calculate areas burned by wildfire, by landforms. Prepare progress paper on effects of fire on desert ecosystems (vegetation).

31/03/2005

Post-baiting surveys to assess re-invasion of feral cats and foxes following baiting with toxic feral cat baits. Open vertebrate and invertebrate pitfall traps. Write filed trip report.

30/06/2005

Prepare paper on the efficacy and impacts of baiting introduced predators. Assess control effectiveness and if appropriate, prepare recommendation for arid zone mammal reintroductions Prepare management guidelines for fire management and feral cat control in the arid zone.

30/09/2005

Continue with assessment of vegetation plots, vertebrate and invertebrate pitfall traps and introduced predator surveys. Update fire history maps.

31/12/2005

Review project future and directions.

References

Study design

Methodology

Domestic stock and large feral herbivores have been virtually eradicated from Lorna Glen so it will not be possible to test, or monitor the role of these animals in sandalwood recruitment and regeneration. However, the impact of domestic stock has been well documented by Brand (1999) and others so these studies will be used as a comparison. Rabbits and kangaroos are present at varying densities depending on habitat and seasonal conditions (rainfall).

As part of the fauna translocation program, an 1100 ha predator-proof compound has been constructed into which species including Boodies and Golden bandicoots have already been placed as part of the Gorgon threatened fauna reintroductions. These animals are closely monitored. Other species are planned for reintroduction inside and outside the compound.

To monitor and assess the role of medium size mammals on sandalwood recruitment and regeneration, as measure of the 'ecosystem engineering' benefits of fauna reconstructions, two populations of sandalwood occurring inside the compound and two occurring outside the compound will be fenced to exclude native and introduced mammals. Each exclosure will be 1 ha (100 m x 100 m). Similarly, two unfenced plots will be established both inside and outside the compound making 4 x 1 ha monitoring sites. Plots will be N-S / E-W orientation.

The following measurements will be made in each plot and annually:

1. Adult trees: All adult sandalwood trees (>50 cm tall) will be tagged and measured for

i) stem diam at ground level
ii) stem damage (drysidng etc,)
iii) top height
iv) crown condition (modified Whitford classes)
v) reproductive condition (flowers, fruits)

2. Seedling assessment:

i) Two 50 cm x 50 cm quadrats will be placed under 20 adult trees (40 in all) and all whole seeds found within these quads will be counted (after Murphy et al 2005).

ii) The number of sandalwood seedlings (<20 cm tall) and saplings (20 cm-50 cm tall) growing under or within 1 m of the parent crown will be tagged and counted and presumed to have resulted from seeds falling from the parent tree (after Murphy et al. 2005).

iii) All other seedlings and saplings in the plot and away from parent plants will be assessed by conceptually rather than physically gridding out the plot on a 10 m x 10 m grid and numbering each grid intersection (grid point) consecutively from 1-100 commencing in the NW corner of the quad. Each year, thirty grid points will be randomly sampled using a random number generator. The grid points will be located from the plot baseline using a GPS. At each grid point, all sandalwood seedlings and saplings in a 1 m x 1 m quadrat centered over the grid point will be recorded.

3. Animal activity: Diggings & scats:

i) The above grid and 1 m x 1 m quads will be used to sample all digs and scats (and animals species responsible) which will be categorized according to age - a system for classifying the age of diggings and scats is yet to be devised.

4. Potential host plants

i) A marked 100 m continuous line transect through the middle of the plot and on a N-S orientation will be used to record all woody shrubs and low trees. A tape will be laid along the transect and all vertical plant intercepts along the tape will be recorded according to a) species and life form of plant intercepted b) height of plant intercepted and c) horizontal distance of the intercept, or of bare ground.

Data analysis:

Differences in a) the number of sandalwood seedlings, b) the amount of animal activity and c) condition (cover and diversity) of potential host species will be compared across the 4 treatments using multiple analysis of variance (MANOVA) and Duncan's Multiple Range Test.

Materials:

Fencing: 1.6 km of netting ~1.4 m high

Skirting: 1.6 km of netting ~0.5 m wide

Steel pickets: 1.8 m high @ 3 m intervals = 550.

Strainers: 16.

Costs: Materials cost (to be determined).
Construction:
DEC staff, volunteers and Wiluna Aboriginal Community.
Neil Burrows
2 May 2010
Cc Neville Hague, Ian Kealley, Keith Morris

Biometrician's Endorsement

required

Data management

No. specimens

Herbarium Curator's Endorsement

not required

Animal Ethics Committee's Endorsement

not required

Data management

Budget

Consolidated Funds

Source	Year 1	Year 2	Year 3
FTE Scientist			
FTE Technical			
Equipment			
Vehicle			
Travel			
Other			
Total			

External Funds

Source	Year 1	Year 2	Year 3
Salaries, Wages, OVertime			
Overheads			
Equipment			
Vehicle			
Travel			
Other			
Total			