NRM SOUTH
NATURAL RESOURCE MANAGEMENT

Image: Wedge-tailed eagle nest taken during ecotoxins project fieldwork (Dr Adam Cisterne)

WEDGE-TAILED EAGLE RESEARCH FUND

2024 ANNUAL REPORT

Prepared for Wild Cattle Hill Pty Ltd.

AUGUST 2024

CONTENTS

GLOSSARY

ANU	Australian National University
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
EMOP	Eagle Mortality Offset Plan
FPA	Forest Practices Authority
NRET	State Department of Natural Resources and Environment Tasmania
PGSC	Project Governance Steering Committee
TAC	Technical Advisory Committee
UTas	University of Tasmania
WTE	Wedge-tailed Eagle, *Aquila audax fleayi*

INTRODUCTION

This is the fifth Annual Report for the Wedge-tailed Eagle (WTE) Research Fund ('The Fund'). It covers the achievements since the last Annual Report in September 2023.

The Fund has been operating in accordance with requirements and is enabling the support of high-quality research on Tasmanian Wedge-tailed Eagles. It is unlikely this research would have been supported without The Fund. The projects being supported will provide valuable advances in the understanding of the WTE population in Tasmania, which will assist with achieving the conservation outcomes for the subspecies.

BACKGROUND

The Cattle Hill Wind Farm was approved by Tasmanian State Regulator in 2012 and by the Commonwealth Department of Environment and Energy (now the Department of Climate Change, Energy, the Environment and Water, DCCEEW) in December 2014. A requirement of the approval of the Cattle Hill Wind Farm (as described in the relevant permit conditions) was to develop an offset plan for wedge-tailed eagles (Aquila audax fleayi, WTE).

An Eagle Mortality Offset Management Plan (EMOP) was developed and subsequently approved to satisfy these requirements. The EMOP comprises two components, with the second component describing the Tasmanian WTE Research Fund. The EMOP required that The Fund needed to be established and administered by an independent organisation. NRM South was selected as the administering body for The Fund and a Services Agreement was signed between NRM South and Wild Cattle Hill Pty Ltd on 23rd August 2019.

OBJECTIVE OF THE FUND

The Fund is designed to offset the impact of WTE mortalities (or injured WTE that cannot be released into the wild) due to collisions with wind turbines at the Cattle Hill Wind Farm. The Fund will only support research relating to the Tasmanian sub-species of WTE and projects based in Tasmania.

The primary purpose of The Fund is to support high quality ecological or other relevant scientific research on Tasmanian WTE, the results of which will assist with the management and protection of the sub-species. The intention is that The Fund continues for the medium term (at least 10 years), hence not all funds will be expended each year. Research will be supported that is scientifically rigorous, conducted by high quality scientists, and which is in accordance with the objectives of the Threatened Tasmanian Eagles Recovery Plan 2006-2010 or any subsequent eagle Recovery Plan.

PRIORITIES FOR THE FUND

Research supported by The Fund will be consistent with the published recovery objectives of the "Threatened Tasmanian Eagles Recovery Plan 2006-2010" or a subsequently approved version of the Recovery Plan. The EMOP notes that DoEE (now DCCEEW) have indicated they require The Fund to support key scientific research on the sub-species and not other activities, although the State component of The Fund may support education activities.

Suitably qualified researchers[1] will be eligible to apply for funds to support relevant research on WTE consistent with the below priorities. Critical research that can demonstrate a sound experimental design and statistical rigour will be viewed most favourably.

The initial priorities for funding support are:

- Demography of the WTE. This could include studies into the size of the state population (such as an evidence-based population census), fecundity, survival of different age classes, and immigration and emigration intra- and inter-state. Such ecological data could be used to update a Population Viability Analysis.
- The collection of data that will allow an evaluation of the sub-species conservation status against IUCN criteria.
- Quantification of anthropogenic impacts to WTE, such as collisions with vehicles, powerlines, shooting or poisoning, and the development of mitigation measures to reduce these impacts. • Disturbance to nesting WTE. This includes studies into determining the anthropogenic factors that impact on breeding, and quantification of these such as the distance, duration and types of factors that result in impacts to breeding success.
- Strategies to monitor nesting behaviour of WTE. Nests are currently very difficult to monitor due to the need to limit disturbance to breeding birds, hence automated strategies to monitor nests without disturbing eagles will be supported.
- Studies into why WTE collide with wind turbines and strategies to reduce collision rates. Published studies indicate WTE actively respond to and avoid wind turbines, but occasionally collide. Any insights into why they occasionally collide may assist with strategies to minimise collisions.
- Other scientific studies where it can be demonstrated that the research will provide a demonstrable benefit to the sub-species.

The priorities for funding support may be revised by the panel following any reviews of the EMOP.

Studies on WTEs required for commercial developments (i.e. conditions of a permit, outside offsets) or studies that are the responsibility of Local, State (including Government Business Enterprises) or Commonwealth Government will not be supported.

GOVERNANCE OF THE FUND

The Fund is overseen by an independent Technical Advisory Committee (TAC, referred to in the EMOP as a “Panel”).

As described in the EMOP, the TAC comprises:

- A representative of the Department of NRE Tasmania.
- A representative from the administering body, NRM South.
- A representative of the DCCEEW (as an observer), and
- At least two scientists experienced in wildlife ecology, with a strong background in research and publishing These roles were filled following advertising and a competitive selection process. Both of these independent scientists are on their second term.
-

The role of the Technical Advisory Committee (TAC) is to:

- Review funding applications and select those to be supported.
- Monitor the progress of grant recipients, and
- Determine whether to accept research reports (i.e. whether they fulfill the requirements of support).

[1]Must hold a postgraduate degree in science and evidence of the successful publication of relevant, high quality research in peer-reviewed scientific journals or experience and qualifications deemed by the panel to be evidence of equivalent merit. However, proposals to support high quality Honours research will also be considered.

Individual members of the Technical Advisory Committee are expected to:

- Actively participate in the review, monitoring and reporting of the Research Fund.
- Attend, either in person or by teleconference, twice annual meetings, and additional meetings, if required.
- Provide reliable, relevant, technical and contemporary advice.
- Comply with relevant NRM South Policies and Procedures, including the Code of Conduct, and any specific requirements of The Fund including Confidentiality; and
- Be an advocate for the research Fund's outcomes.

NRM South has also now established a Project Governance Steering Committee (PGSC) to oversee externally funded projects. The PGSC serves a crucial function in overseeing projects and providing guidance on best practice project management and governance processes, with recognition of the parameters and processes required by some funding entities. It is responsible for reviewing project progress and providing advice and recommendations on:

- Project performance (e.g. delivery against milestones and budget),
- Project risk (e.g. WHS and compliance) and
- Project management processes (including change, quality and stakeholders)

The Committee is an advisory committee to the NRM South Board (does not have delegated authority) and includes Board representation (through the Committee's Chair). The WTE Research Fund is included in the remit of the PGSC.

ACHIEVEMENTS DURING 2024

The fifth year of The Fund built on the achievements of previous years.

Details of the achievements:

1. The fifth deposit (including the set-up contribution) to The Fund was received from Wild Cattle Hill Pty Ltd.
2. The project "Investigating the spatial ecology and habitat use of Tasmanian wedge-tailed eagles in the Tasmanian Midlands using high-frequency GPS telemetry" was completed and the final report received.
3. The project "Comprehensive analysis of the ecotoxin threat to Tasmanian Wedge-tailed Eagles (Aquila audax fleayi)" was completed and final report received.
4. As discussed in the September 2023 annual report, it was recognised that only some of the objectives of the Fund were not being addressed by grant applicants and that a PhD project would be developed that focussed on some of the other key objectives. The PhD project has been designed and approved by the TAC. A funding agreement has been signed with UTas for the stipend.
5. In order to accommodate the PhD stipend, a grant round was not advertised in the first part of 2024. It is intended that grants will be advertised in late 2024.

PROJECTS SUPPORTED IN 2024

The following projects were completed or due to be completed in 2024:

MIDLANDS GPS TRACKING

"Investigation the spatial ecology and habitat use of Tasmania wedge-tail eagles in the Tasmanian Midlands using high-frequency GPS telemetry".

Summary of findings

Project aims:
The aim of this research was to GPS-track five adult eagles in the Tasmanian Midlands to investigate how they use this region of Tasmania. It considered the spatial ecology of the birds at two scales. First, habitat use at the home-range scale, considering the size and characteristics of areas used. Second, modelling how Tasmanian wedge-tailed eagles select for different habitats depending on the behaviour they are exhibiting.

Data summary:
We have collected 900,698 location fixes from the five GPS-tracked eagles.

Two of the GPS-tracked eagles have not transmitted any recent data. This lack of communication could be attributed to one of four potential scenarios:

1. Signal disruption: The eagle may have ventured into a region where 3G/4G network coverage is unavailable, preventing data transmission.
2. Mortality in a no-signal zone: The eagle may have perished in an area devoid of 3G/4G connectivity, resulting in a cessation of data updates.
3. Transmitter failure: There could be a technical issue with the transmitter, leading to a malfunction that stops data relay.
4. Insufficient power: The transmitter's battery may not be receiving adequate solar energy to maintain its charge, thus hindering its operation.

Utilisation distributions:
Analysis of the utilisation distributions (UDs) showed some variation in the size of the overall areas used by the eagles. Under the UD model, we consider that the animal's use of space can be described by a bivariate probability density function, which gives the probability to relocate the animal in specific areas (Benhamou, 2011). We can then use this information to infer the home-range size of each bird. For example, the 95% UD corresponds to the smallest area in which the probability to relocate the animal is equal to 0.95 (i.e., there is a 95% chance that the bird is within this area at any given time). We can also use tighter UD thresholds to identify areas of concentrated use within the 95% UD (i.e., the 50% UD can be interpreted as the core home range of the eagle).

The 50% UD (core home range) size was similar across all the eagles (3.05 – 6.29 km^2), except for Winton who had the smallest core area (1.61 km^2). The mean 50% UD was 3.94 km^2, which is smaller than the 5.1 km^2 mean for resident birds we are tracking in other areas of Tasmania. The mean 30% UD was also smaller than the mean recorded for the five birds we are tracking on conservation land (6.7 km^2). There was greater variation in the 95% UDs. Emily recorded a small 90% UD of 13.18 km^2, which is smaller than the areas used by most of the other eagles being tracked across Tasmania. Winton and Julian recorded 95% UDs similar to the mean we have recorded for resident birds we are tracking across the state (21.8 km^2). Daisy recorded a very large 95% UD (92.32 km^2), which was driven by the large area she explored during spring 2023. The mean 95% UD for the four eagles in this project that were resident in a territory for the entire tracking period was 21.19 km^2, which is very close to the 21.8 km^2 mean for resident birds we are tracking in other areas of Tasmania.

Habitat selection:
The eagles used habitats non-randomly ($p < 0.001$) in relation to land cover categories. There was a lot of variation in how the eagles selected for different land cover categories, particularly non-native vegetation (Julian and Daisy selected strongly for this habitat type, whereas Bow strongly avoided it). Native grassland, cleared land, and dry eucalypt and non-eucalypt forests were generally used by the eagles proportional to their availability.

Extra-urban areas, including residential and commercial buildings, were strongly avoided by all eagles. There was also a slight avoidance of agricultural areas, although Daisy was an exception, using agricultural land more than would be expected based on its availability. Notably, plantations were the only land cover category with a significantly positive selection ratio, as both the upper and lower confidence intervals were above zero. However, this positive selection result is likely due to the scarcity of plantation habitats in the available areas, with data from only two eagles (Daisy and Emily) used to calculate this odds ratio.

There are some differences in how Tasmanian wedge-tailed eagles tracked in the Midlands selected habitats compared to those tracked on conservation land. All conservation eagles avoided non-native vegetation, whereas the Midlands eagles exhibited more variability in their use of this land cover type. Additionally, the conservation eagles demonstrated a stronger preference for non-eucalypt forests.

Flight behaviour:
In total the birds have completed 9,759 flights, flying for a total duration of 105,678 minutes. The mean duration of a flight was 12.04 minutes, which is almost twice the mean flight duration (6.86 minutes) recorded for five birds GPS tracked on reserved land. The mean flight duration was also longer than the mean (9.94 minutes) recorded for birds in other areas of Tasmania, suggesting that wedge-tailed eagles in the Midlands spend longer in flight when compared to other areas of the state. Most GPS fixes recorded during flights were <250 m altitude over ground level.

ECOTOXINS

"Comprehensive analysis of the ecotoxin threat to Tasmanian Wedge-Tail Eagles"

Findings

Project aims:
1. Determine how prevalent eco-toxin exposure is across the Tasmanian Wedge-tailed Eagle population.
2. Estimate how severe eco-toxin accumulation is relative to background levels in areas frequented by eagles.
3. Investigate whether eco-toxin exposure is attributable to environmental features (e.g. proximity to anthropogenic disturbance).
4. Investigate the demographic impact of ecotoxins.

Ecotoxin results:
- None of the eight anticoagulant rodenticides tested were detected within the material collected below wedge-tailed eagle nests.
- Lead concentrations were low overall but were highest in soil below wedge-tailed eagle nests.
- Zinc concentrations were lower in soil collected directly under wedge-tailed eagle nests compared to background concentrations.
- The results suggest that the method described within may be useful for detecting high lead exposure in wedge-tailed eagles.
- Given the very small differences between nest and background concentrations of lead, a larger sample size should be analysed to validate the current results.

Demographic results:

- Sensitivity analyses demonstrated that final population sizes were driven by reproductive output (brood size), juvenile and adult survival rates. Population growth, however, was driven by the survival of adults and older pre-adult birds.
- In simulations of ecotoxin exposure scenarios, Tasmanian wedge-tailed eagle population sizes were significantly decreased when both mortality of adults and sub-adults was impacted.

Conclusions and recommendations:

1. Our preliminary results that lead levels under Tasmanian wedge-tailed eagle nests are higher than background levels – these indicative results supported our expectations, but the small sample size of accessible nests necessitates cautious interpretation.
2. Confirmatory research to support our findings should be implemented, with an aim to increasing spatial coverage and the overall sample size of eagle nests.
3. Our sensitivity analysis shows that mortality rates are highly influential on population viability of Tasmanian wedge-tailed eagles, but the relationship between ecotoxin exposure and mortality remains unclear and should be a priority for further research.
4. We found no evidence of elevated zinc levels under eagle nests.
5. The source of lead under eagle nests remains unknown and should be a priority for further research.
6. Quantifying the extent to which hunting with lead bullets occurs in the vicinity of nest sites may help explain variation in lead levels among nests, but there remain serious logistical challenges of quantifying hunting rates within eagle territories.

PHD PROJECT

"How is TWTE habitat selection affected by human activities and land-use intensity?"

The project will be housed in the School of Natural Sciences at UTas. The scholarship will be paid in 4 stages, commencing upon the enrolment of the student.

Brief project outline

This PhD project will investigate how TWTEs respond to a range of human activities. The project will have a particular focus on using existing datasets (including GPS-tracking data from 41 adult and 25 pre-adult TWTEs) as well as carrying out field experiments to assess effects of disturbance on behaviour and breeding success of eagles.

The project will aim for a broad understanding of the ways in which eagles respond to human activities and a variety of land uses. In doing so it will answer several questions relating to specific disturbances that are most likely to be influential.

The list of questions the project could address includes:

1. How is TWTE habitat selection affected by human activities and land-use intensity? Including:
   - How does operation of helicopters affect the behaviour of TWTEs?
   - How is the behaviour of TWTEs, including time spent at the nest during breeding, affected by vehicle traffic?
2. What is the relationship between nest attendance, revealed by GPS tracking, and nest success?

NEXT STAGE IN THE FUND

The next round of grants is expected to be advertised in late 2024, and new projects will be identified.

APPENDIX 1

PROJECTS AWARDED BY THE FUND: COMPLETED

2020:
- Investigating the spatial ecology and habitat use of the Tasmanian wedge-tailed eagle in unmodified landscapes using high-frequency GPS telemetry.

2021:
- Estimating the population size of the Tasmanian wedge-tailed eagle (Aquila audax fleayi) using modern genetic techniques.
- Monitoring wedge-tailed eagle population trends.

2022:
- Investigation the spatial ecology and habitat use of Tasmania wedge-tail eagles in the Tasmanian Midlands using high-frequency GPS telemetry.

2023:
- Comprehensive analysis of the ecotoxin threat to Tasmanian Wedge-Tail Eagles.

PROJECTS AWARDED BY THE FUND: TO COMMENCE

PhD project