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Tylophora linearis Propagation and Translocation Program



Annual Report 2020

Maules Creek Coal Mine

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Glossary and abbreviations

Acronym	Description
BMP	Biodiversity Management Plan
EPBC Act	Commonwealth's <i>Environment Protect and Biodiversity Conservation Act 1999</i>
MCCM	Maules Creek Coal Mine
TFPP	Threatened Flora Project Plan
WHC	Whitehaven Coal

1 Summary

In accordance with s 4.1.2 and s 6.14 of the approved Biodiversity Management Plan (BMP) for Maules Creek Coal Mine (MCCM), a *Tylophora linearis* Propagation and Translocation Program was prepared and included as Appendix C of Maules Creek Coal Mine Biodiversity Management Plan (WHC 2017). This document was superseded by the 'Threatened Flora Project Plan' (TFPP) prepared by Ecoplaning (2020a). The TFPP describes how WHC will undertake monitoring of threatened flora species (including *T. linearis*) and implement actions to manage threatened flora species, within and adjacent to WHC mining operations and Biodiversity Offset Areas.

In 2020, ongoing monitoring and management of *T. linearis* has demonstrated that *T. linearis* individuals within WHC Offset Properties have continued to complete their life-cycle including flower and fruit production which demonstrates continued progress towards the previously stated goal of establishing self-sustaining populations of *T. linearis* from the translocated individuals. However, monitoring has identified very limited seed production which continues to limit opportunities for further germination trials and translocations.

The continuation of the growth study (WHC 2017) has identified that stem numbers within monitored sub-populations of *T. linearis* are highly variable over time. Stem numbers generally decline during dry periods and increase to their peak following wet periods.

Within the Teston South Offset, translocation of topsoil containing *T. linearis* rhizomes are yet to produce any above ground stems of the species. However, given that previous monitoring has shown that the plants may remain leafless for up to three years, these rhizomes are potentially still capable of re-sprouting when conditions are suitable. Further monitoring is required to determine the success of this technique.

2 Introduction

This report has been prepared to document the results of management actions and monitoring surveys conducted for *Tylophora linearis* in 2020 and is a summary of quarterly monitoring reports prepared by Ecoplanning (2020b, c, d, e).

Tylophora linearis is a threatened flora species listed as vulnerable under the NSW *Biodiversity Conservation Act 2016* (BC Act) and endangered under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The species is a twiner or subshrub with cylindrical stems, up to 3 mm diameter, with linear-lanceolate leaves up to 10 cm long and 4 mm wide (PlantNET 2020). The species has been recorded from Armidale to Temora, within dry scrub and open forests in association with *Eucalyptus fibrosa*, *Eucalyptus sideroxylon*, *Eucalyptus albens*, *Callitris endlicheri*, *Callitris glaucophylla* and *Allocasuarina luehmannii* (NSW Office of Environment and Heritage [OEH] 2020).

Tylophora linearis was identified at Maules Creek Coal Mine (MCCM) during pre-clearing surveys in 2014 and 2015. On 14 May 2014, the former NSW Department of Planning and Environment requested an addendum to the MCCM BMP to document a propagation and translocation program for *T. linearis*. The propagation and translocation program is made up of the following stages (MCCM BMP 2017 Appendix C):

- Stage 1 – Root Architecture (complete) and Growth Study (ongoing);
- Stage 2 – Seed Production Monitoring (complete);
- Stage 3 – Seed Collection and Storage (complete);
- Stage 4 – Seed Propagation (complete); and
- Stage 5 – Translocation Trials (ongoing).

Stages 2 – 4 of the previous *T. linearis* Propagation and Translocation Program (MCCM BMP 2017 Appendix C) have been completed and documented in previous annual reviews (WHC 2019). During 2020, WHC (through its specialist consultants) continued research into Stages 1 and 5 of the translocation program.

In 2020 an updated TFPP (Ecoplanning 2020a) and *T. linearis* Restoration and Translocation Strategy (Ecoplanning 2020f) were prepared which supersede the previous documents (WHC 2019; MCCM BMP 2017 Appendix D). Ongoing monitoring and management actions outlined within the updated TFPP (Ecoplanning 2020a) and Restoration and Translocation Strategy (Ecoplanning 2020f) for *T. linearis* are as follow:

- Ongoing monitoring of the translocated individuals for life cycle/biology analysis.
- Surveillance of natural populations of *T. linearis* to continue to monitor seed production and germination, identify any threats to threatened flora and to increase knowledge of each species' ecology and reproductive habits.
- Further translocations of *T. linearis* via multiple methods including salvage translocations of whole plants and seed collection to enable further germination trials.

3 Methods

3.1 Growth study

The growth study involved quarterly monitoring of a natural population of *Tylophora linearis* on Wollandilly Offset to count the number of stems present. The location of the natural population is shown in **Figure 3.1**.

Within Leard State Forest, three naturally growing sub-populations (sites) of *T. linearis* were monitored quarterly within three established 1 x 1 m² quadrats (one per identified sub-population; **Table 3.1**). In each quadrat the presence/absence of stems is recorded to document the growth and/or decline of individual stems over the annual reporting period. The specific location of each stem in the quadrat is triangulated to facilitate an understanding of the distribution of the underground rhizomes. On each subsequent monitoring period the presence/absence of individual stems is recorded, as well as any new stems being flagged and numbered. Additionally, the presence or absence of *T. linearis* from 1.5 metre tall wire conical frames set up to in 2018 is recorded to document whether such a structure could be used to encourage stems to climb and develop into reproductive plants.

Table 3.1: Location of monitoring plots for *T. linearis* within Leard State Forest

Site	Easting (GDA94)	Northing (GDA 94)
TL01	228740	6615698
TL02	228668	6615878
TL03	228661	6616642
TL04*	227871	6617220
TL05*	227187	6617171

* site not surveyed during 2020 due to changed access arrangements.

3.2 Translocation study

The translocation study included monitoring of *T. linearis* individuals translocated to the Wollandilly BOA in December 2015. Monitoring involved recording remaining stem numbers and stem height of the original 77 plants. Additional information recorded included vegetative condition and flowering and fruiting phenology.

Approximately 20 cm of topsoil (including shrubs and ground cover), from areas to be cleared for mining and identified during pre-clearance surveys as supporting *T. linearis* was translocated and spread within five enclosures, designated E1 – E5, located within the Teston South MCCM offset site in 2019 (**Figure 3.2**). The Teston South offset site was chosen as a recipient site based upon the following:

- having modelled suitable habitat,
- previous *T. linearis* records within the site,

- proximity to the donor sites,
- presence of natural woodland
- proximity to existing tracks for delivery, management and monitoring access.

Monitoring of the five enclosures involved recording soil moisture levels, recording the number of *T. linearis* stems present (quarterly inspections with all stems flagged, numbered, their length measured and dated) and weed monitoring.





Figure 3.1: *Tylophora linearis* monitoring locations within Wollandilly Offset.



Figure 3.2: Teston South monitoring locations.

4 Results and discussion

4.1 Rainfall

Weather and in particular drought conditions, have been identified as the primary influence on monitoring projects in previous seasons (Ecoplanning 2020f). Monthly rainfall data, as recorded at the Wollandilly Offset Property (Advitech 2020), indicates that rainfall in 2020 was above average (783 mm recorded in 2020 compared to long-term average of 615 mm). Above average rainfall was recorded from January to April and again in December (**Figure 4.1**). Drier conditions including well below average rainfall occurred in May, June and November while close to average rainfall was recorded from July to October (**Figure 4.1**). The above average rainfall recorded in 2020 is in stark contrast to conditions recorded in previous seasons including below average rainfall from 2017 to 2019 (Ecoplanning 2020f; Advitech 2020).

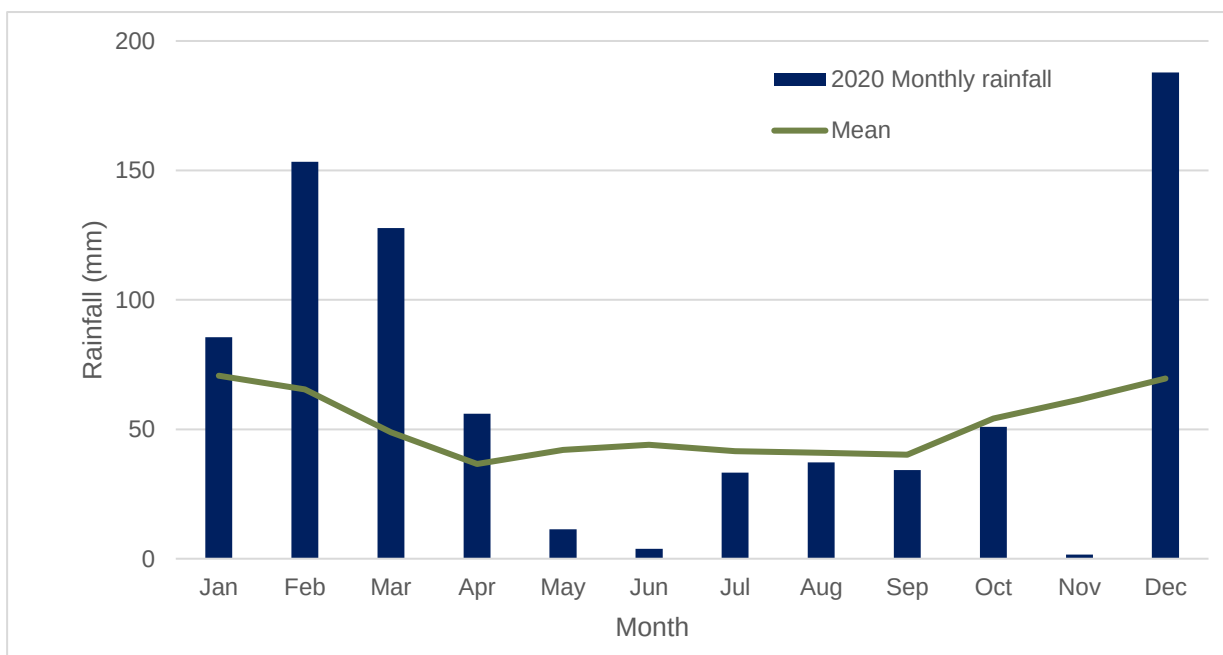


Figure 4.1: Monthly rainfall totals for 2020 and mean monthly rainfall (Gunnedah BOM)

4.2 Growth Study

4.2.1 Wollandilly Offset

The number of stems within the Wollandilly natural population of *T. linearis* is shown in **Table 4.1** and in **Figure 4.2**. Compared to previous seasons, the number of stems present in 2020 was relatively consistent, although a decline from 19 stems in March to 13 stems in November was recorded (**Table 4.1**). Previous results have identified that increased number of stems within the Wollandilly natural population are associated with periods of increased rainfall and results from 2020 appear to reflect this trend with the highest count in March occurring after above average rainfall.

Table 4.1: The number of stems of *T. linearis* within the natural population at the Wollandilly Offset site

Survey period	Number of stems	Survey period	Number of stems
Dec-16	0	Mar-18	52
Jan-17	0	Jun-18	0
Feb-17	1	Sep-18	23
Mar-17	0	Dec-18	69
Apr-17	0	Mar-19	16
May-17	0	Jun-19	64
Jun-17	23	Oct-19	11
Jul-17	30	Dec-19	9
Aug-17	15	Mar-20	19
Sep-17	5	Jul-20	16
Oct-17	24	Sep-20	16
Nov-17	6	Nov-20	13
Dec-17	15		

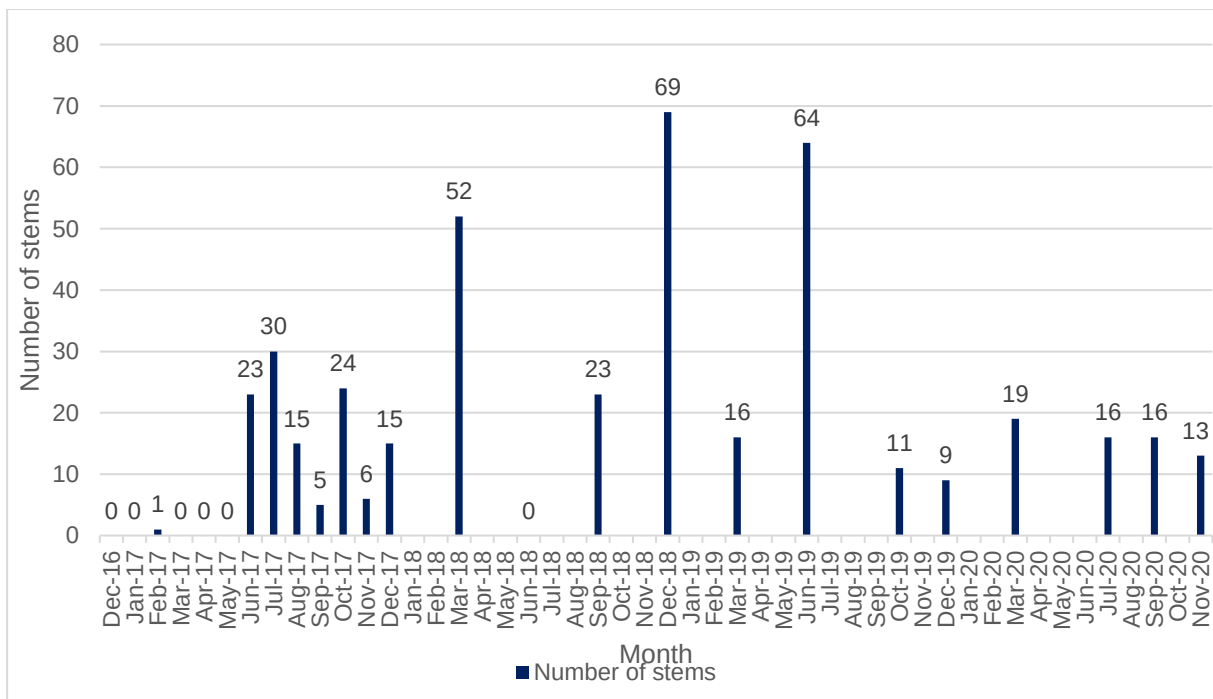


Figure 4.2: Number of stems at the Wollandilly natural population of *T. linearis*

4.2.2 Leard State Forest

The occurrence of stems of *T. linearis* within the three monitoring quadrats (TL01 – TL03) is shown in **Figure 4.3**. In 2020, as in previous seasons, the occurrence of stems within the monitoring quadrats was variable over time. The presence of stems, and the total number of stems, within the Leard State Forest monitoring sites follows a similar pattern to that at the Wollondilly natural populations with a peak in the number of stems occurring in association with periods of high rainfall. During 2020, *T. linearis* stems remained present at two of the three monitoring sites which is attributed to above average rainfall, particularly in the first half of 2020. The slight decline in the number of stems in the second half of 2020 coincides with drier conditions and increased temperatures (Advitech 2020).

Future monitoring of *T. linearis* within Leard State Forest will not include ongoing monitoring of the existing monitoring transects. Rather, monitoring will be in accordance with the TFPP (Ecoplanning 2020a) and will be limited to searches for mature healthy individuals with reproductive material, or which are likely to have reproductive material in the future.

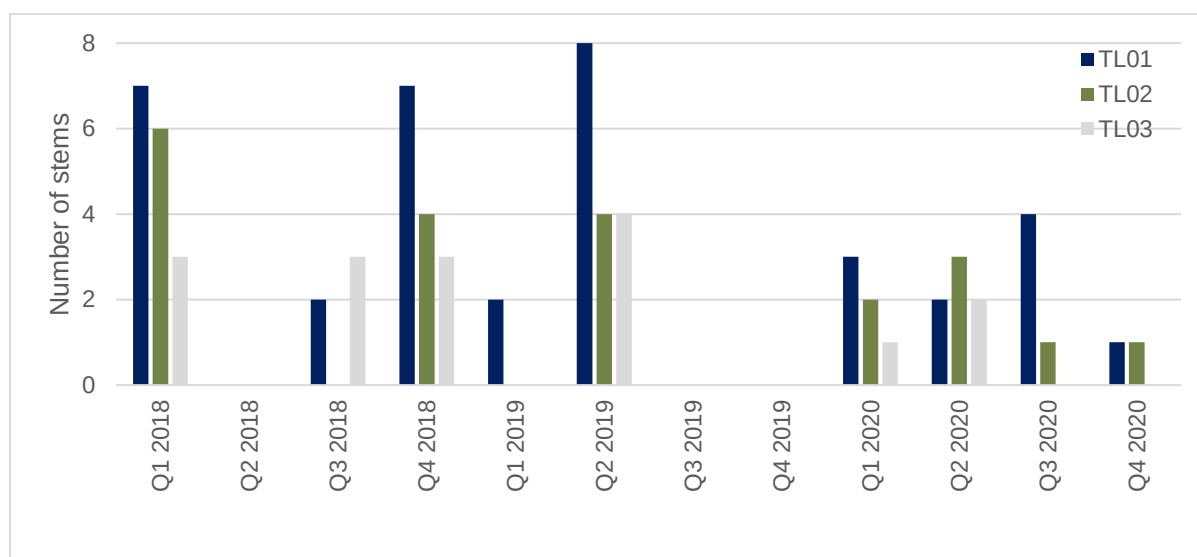


Figure 4.3: Number of *T. linearis* stems within monitoring sites in Leard State Forest since 2018

4.3 Translocation study

4.3.1 Wollondilly Offset

In 2020, monitoring continued for the 77 *Tylophora linearis* seedlings propagated from seed collected onsite and transplanted in December 2015 into the seven purpose built enclosures (A to G). Of the original 77 *T. linearis* individuals, a total of seven living plants were recorded in November 2020, although a peak of eight plants was recorded in July 2020. Results from 2020 have slightly improved compared to 2019, with only five live plants recorded in December 2019. Of particular note in 2020, was the continued seed production from the translocated plant G8. As previously documented, further seed production represents further evidence that the translocations are contributing to the establishment of a self-sustaining population of *T. linearis*.

4.3.2 Teston South

Monitoring of the five enclosures and the control site did not detect any *T. linearis* stems growing from the translocated topsoil. In early 2020 the enclosures supported a dense cover of native and exotic understorey species (Ecoplanning 2020b) which was considered likely to limit any potential *T. linearis* germination and detection. The density of the groundcover generally decreased over the course of 2020 including a moderate reduction in annual exotic groundcovers in the late spring and early summer months (Ecoplanning 2020e).

4.4 Seed collection

Including a portion of the seed produced by the translocation plant G8, a total of 25 *T. linearis* seeds were collected from WHC Offset Properties in April and July 2020. However, much of the seed collected has been found to be empty or non-viable with only one seed successfully germinated from the seed collected in 2020 and this plant died shortly after germination. It remains unclear if limited seed viability is a natural feature of the ecology of *T. linearis* or if this is related to the small number of individuals from which seed has been collected or seed collection processes (timing, storage etc.). Ongoing seed collection from multiple plants will contribute to a better understanding of the reproductive ecology of the species.

While seed collected from the translocated *T. linearis* have yet to be successfully germinated to contribute to future translocations, the fact that some seed is being produced with signs of viability (one germinant produced) suggests that the translocations are contributing to the establishment of a self-sustaining population of *T. linearis*.

References

- Advitech (2020). 21045 Bio Monthly Met202012 (For Issue) Rev1. Unpublished report for Whitehaven Coal.
- Ecoplanning (2020a). Threatened Flora Project Plan. Unpublished report prepared for Whitehaven Coal.
- Ecoplanning (2020b). Threatened Flora Monitoring – March 2020. Unpublished report prepared for Whitehaven Coal.
- Ecoplanning (2020c). Threatened Flora Monitoring – Second Quarter 2020. Unpublished report prepared for Whitehaven Coal.
- Ecoplanning (2020d). Threatened Flora Monitoring – Third Quarter 2020. Unpublished report prepared for Whitehaven Coal.
- Ecoplanning (2020e). Threatened Flora Monitoring – Fourth Quarter 2020. Unpublished report prepared for Whitehaven Coal.
- Ecoplanning (2020f). Tylophora linearis Propagation and Translocation Program Annual report 2019. Unpublished report prepared for Whitehaven Coal.
- NSW Office of Environment and Heritage (OEH) (2020). *Tylophora linearis* – profile. Available online: <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10815> [last accessed 30 March 2020].
- PlantNET (The NSW Plant Information Network System) (2020). Royal Botanic Gardens and Domain Trust, Sydney. <http://plantnet.rbgsyd.nsw.gov.au> (last accessed 30 November 2020).
- Whitehaven Coal (WHC) (2017). *Maules Creek Coal Mine Biodiversity Management Plan*. Available online: <https://whitehavencoal.com.au/our-business/our-assets/maules-creek-mine/>
- Whitehaven Coal (WHC) (2019). *Threatened Flora Project Plan v 3.2*. Unpublished Report.

