Department of Parks and Wildlife

Interim Recovery Plan No. **368**

Leucopogon sp. Flynn (F.Hort, J.Hort & A.Lowrie 859)

Interim Recovery Plan

2016–2021

Department of Parks and Wildlife, Western Australia

November 2016

List of Acronyms

The following acronyms are used in this plan:

BGPA	Botanic Gardens and Parks Authority
CITES	Convention on International Trade in Endangered Species
CPC	Conservation and Parks Commission
CR	Critically Endangered
DAA	Department of Aboriginal Affairs
DPaW	Department of Parks and Wildlife (Parks and Wildlife)
DRF	Declared Rare Flora
EPBC	Environment Protection and Biodiversity Conservation
IBRA	Interim Biogeographic Regionalization for Australia
IRP	Interim Recovery Plan
IUCN	International Union for Conservation of Nature
NRM	Natural Resource Management
PICA	Public Information and Corporate Affairs
PEC	Priority Ecological Community
RP	Recovery Plan
SCB	Species and Communities Branch (DPaW)
SRTFCRT	Swan Region Threatened Flora and Communities Recovery Team
SWALSC	South West Aboriginal Land and Sea Council
TEC	Threatened Ecological Community
TFSC	Parks and Wildlife Threatened Flora Seed Centre
TPFL	Threatened and Priority Flora Database
UNEP-WCMC	United Nations Environment Program World Conservation Monitoring Centre
VU	Vulnerable
WA	Western Australia

Foreword

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Parks and Wildlife Corporate Policy Statement No. 35 (DPaW 2015*a*) and Department of Parks and Wildlife Corporate Guideline No. 35 (DPaW 2015*b*). Plans outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

Parks and Wildlife are committed to ensuring that Threatened taxa (also known as Declared Rare Flora (DRF)) are conserved through the preparation and implementation of Recovery Plans (RPs) or IRPs, and by ensuring that conservation action commences as soon as possible and, in the case of Critically Endangered (CR) taxa, always within one year of endorsement of that rank by the Minister.

This plan will operate from November 2016 to October 2021 but will remain in force until withdrawn or replaced. It is intended that if *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is still listed as Threatened in Western Australia following 5 years of implementation this plan will be reviewed and the need for further recovery actions assessed.

This plan was given regional approval on 1 November 2016 and was approved by the Director of Science and Conservation on 23 November 2016. The provision of funds identified in this plan is dependent on budgetary and other constraints affecting the Department of Parks and Wildlife, as well as the need to address other priorities.

Information in this plan was accurate at November 2016.

Plan preparation. This plan was prepared by:

Robyn Luu	Project Officer, Department of Parks and Wildlife Species and Communities Branch, Locked Bag 104, Bentley Delivery Centre, Western Australia 6983.
Andrew Brown	Threatened Flora Coordinator, Parks and Wildlife Species and Communities Branch, Locked Bag 104, Bentley Delivery Centre, Western Australia, 6983.

Acknowledgments. The following people provided assistance and advice in the preparation of this plan:

Andrew Crawford	Principal Technical Officer, Threatened Flora Seed Centre (TFSC), Department of Parks and Wildlife Science and Conservation Division
Michael Hislop	Contract Consultant, Western Australian Herbarium
Fred and Jean Hort	Department of Parks and Wildlife volunteers
Marnie Mallié	Flora Conservation Officer, Department of Parks and Wildlife, Perth Hills District
Amanda Shade	Assistant Curator (Nursery), Botanic Gardens and Parks Authority (BGPA)

Thanks also to the staff of the Western Australia Herbarium for providing access to Herbarium databases and specimen information, and other Parks and Wildlife Species and Communities staff for assistance in developing this plan.

Cover photograph by Jean and Fred Hort. Taken on May 13, 2016 Ref: https://www.flickr.com/photos/jean_hort/26906565592/in/dateposted/

Citation. This plan should be cited as: Department of Parks and Wildlife (2016) *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) Interim Recovery Plan 2016–2021. Interim Recovery Plan No. 368. Department of Parks and Wildlife, Western Australia.

Summary

Scientific name:	*Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859)	**Shire:**	York
Common name:	none	**IBRA region:**	Jarrah Forest
Family:	Ericaceae	**IBRA subregion:**	Northern Jarrah Forest JAF01
Flowering period:	December–February	**NRM region:**	Swan
DPaW region:	Swan	**Recovery team:**	Swan Region Threatened Flora and Communities Recovery Team
DPaW district:	Perth Hills		

Distribution and habitat: *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is known from one population in the Perth Hills southwest of York, growing in white-grey-brown sand in sandplains and open banksia/jarrah woodland.

Habitat critical to the survival of the species, and important populations: *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is ranked as CR in Western Australia, and it is considered that all known habitat for the wild population is critical to the survival of the species, and the wild population is an important population. Habitat critical to the survival of *L.* sp. Flynn includes the area of occupancy of the population and areas of similar habitat surrounding the population (these providing potential habitat for population expansion and for pollinators). It may also include additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

Conservation status: *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) was listed as specially protected under the Western Australian *Wildlife Conservation Act 1950* on 6 November 2012. It is ranked as Critically Endangered (CR) in Western Australia under International Union for Conservation of Nature (IUCN 2001) criteria B1ab(iii,v)+B2ab(iii,v) due to its extent of occurrence estimated to be less than 100km^2; area of occupancy less than 10km^2; it being known from a single location; and there being a continuing decline in the area, extent and/or quality of habitat and the number of mature individuals. The species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threats: The main threats to the species are fire, grazing, road maintenance, recreational activities, *Phytophthora* dieback, poor recruitment, feral pigs and drought.

Existing recovery actions: The following recovery actions have been or are currently being implemented and have been considered in the preparation of this plan:

1. Land managers have been notified of the location and threatened status of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859). Notifications detail the current DRF status of the species, the associated legal obligations in regards to its protection, and contact details for management assistance.
2. Declared Rare Flora (DRF) markers have been installed.
3. *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) has been opportunistically surveyed for over 11 years in areas of suitable habitat by volunteers Fred and Jean Hort with no new populations being located.

Plan objective: The objective of this plan is to abate identified threats and maintain or enhance the extant population to ensure the long-term conservation of the species in the wild.

Recovery criteria

Criteria for recovery success: The plan will be deemed a success if one or more of the following take place over the term of the plan.

- The single known population has remained extant and the number of mature plants within the population has remained within a 10% range (559 to 683) or has increased by >10% or
- New populations have been found, increasing the number of known populations from one to two or more with no net loss of mature plants or
- The area of occupancy has increased by >10%, with no net loss of mature plants.

Criteria for recovery failure: The plan will be deemed a failure if one or more of the following occur over the term of the plan.

- The single known population has been lost or
- The number of mature plants has decreased by >10% from 621 to <559 or
- The area of occupancy has decreased by >10%.

Recovery actions

1. Coordinate recovery actions
2. Monitor population
3. Develop and implement a fire management strategy
4. Protect plants from grazing
5. Collect and store seed
6. Restrict access
7. Maintain dieback hygiene
8. Undertake surveys
9. Undertake regeneration trials
10. Obtain biological and ecological information
11. Develop and implement a translocation proposal
12. Map habitat critical to the survival of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859)
13. Liaise with Aboriginal communities
14. Promote awareness
15. Review this plan and prepare a revised plan if necessary

1. Background

History

Leucopogon sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) was discovered by Parks and Wildlife volunteers Fred and Jean Hort in December 1999 and added to the Western Australian Plant Census in June 2000. Despite further survey just one population comprising 621 plants is known.

Description

Leucopogon sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is a low, hemispherical, compact, many-branched shrub, 60−75cm high by about 1.65m wide. Its white flowers appear between December and February (Page *et al*. 2012; Western Australian Herbarium 1998−). It is one of four species (*L. flavescens, L. blepharolepis L.* sp. Lake Magenta and *L.* sp. Moore River) that are characterised by a strongly compressed, leaf-like fruit. The only other member of this group to occur in the Perth region is *L.* sp. Moore River. *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) can be distinguished from that species by its shorter leaves and filiform sepals which are as long as, or longer than, the corolla tube (Page *et al.* 2012).

Leucopogon sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is one of a number of *Leucopogon* species that will soon be transferred to the genus *Styphelia*.

Illustrations and/or further information

Western Australian Herbarium (1998−) *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/.

Distribution and habitat

Leucopogon sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is known from one population in the Perth Hills southwest of York, growing in white-grey-brown sand on sandplain and in open banksia/jarrah woodland. Associated species include *Phyllota gracilis*, *Petrophile serruriae*, *Stirlingia latifolia*, *Grevillea synapheae*, *Leucopogon obtusa*, *Conospermum stoechadis*, *Allocasuarina humilis* and *Kunzea ericifolia*. The area of occurrence is 0.296km^2 (Page *et al.* 2012; Western Australian Herbarium 1998−).

Table 1. Summary of population land vesting, purpose and manager

TPFL population number & location	Parks and Wildlife district	Shire	Vesting	Purpose	Manager
1a. Southwest of York	Perth Hills	York	CPC	National park	Parks and Wildlife
1b. Southwest of York	Perth Hills	York	CPC	National park	Parks and Wildlife

Biology and ecology

Leucopogon sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) flowers between December and February with buds, flowers and fruits often found together on the same plant. The flowers are smaller than average for the genus. The unspecialised nature of the flower structure suggests that pollination may be by a variety of small insects with bees, wasps and Mydid flies (*Miltinus minutus*) observed tending to the flowers (Jean Hort pers. obs., Page *et al*. 2012).

As with most members of the genus, *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is a re-seeder that is killed by fire, with post fire regeneration observed following a prescribed burn in 2006 (Page *et al*. 2012).

Conservation status

Leucopogon sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) was listed as specially protected under the Western Australian *Wildlife Conservation Act 1950* on 6 November 2012. It is ranked as Critically Endangered (CR) in Western Australia under International Union for Conservation of Nature (IUCN 2001) criteria B1ab(iii,v)+B2ab(iii,v) due to its extent of occurrence estimated to be less than 100km^2; area of occupancy less than 10km^2; it being known from a single location; and there being a continuing decline in the area, extent and/or quality of habitat and the number of mature individuals. The species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threats

- **Altered fire regimes.** The species is a re-seeder that is killed by fire, with 80% of mature plants dying following a prescribed burn in June 2006. It is not known how long it takes the species to reach maturity and there may not be enough time for the species to set seed and recover if the interval between fires is too short. Fire should, where possible, be prevented from occurring in the area of the population, except where it is used as a recovery action.
- **Grazing.** Grazing (kangaroos) is a major threat to the species with a number of plants severely grazed to less than 3cm tall, preventing flowering and fruiting and thereby limiting natural recruitment.
- **Road maintenance.** Threats include grading, chemical spraying, construction of drainage channels and the mowing of vegetation.
- **Recreational activities.** Trail bike riders and 4WD users are a threat to the population. The area where the population is located is next to an existing track and is low lying and easy to access, making it attractive to off-road vehicles.
- **Phytophthora dieback.** *Phytophthora cinnamomi* may kill plants or degrade associated habitat. It is not known if *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is susceptible to dieback, however, other members of the genus are known to be highly susceptible.
- **Poor recruitment.** The species is likely to require a disturbance to recruit, but if disturbance is too frequent or is followed by a drought, the population may be impacted.
- **Feral pigs.** These are a potential threat to the population as they may dig up plants when looking for food. Currently they are not prevalent in the area due to ongoing control.
- **Drought.** This is a threat to the species if it occurs over a number of years.

The intent of this plan is to identify actions that will mitigate immediate threats to *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859). Although climate change may have a long-term effect on the species, actions taken directly to prevent the impact of climate change are beyond the scope of this plan.

Table 2. Summary of population information and threats

TPFL population number & location	Land status	Year / no. of plants	Condition		Threats
			Plants	Habitat	
1*. Southwest of York	National park	2001 (3,000) 2007 600 2011 1,870 [30] 2016 621+	Healthy	Excellent	Fire, grazing (kangaroos), road maintenance, recreational activities, disease, poor recruitment, pigs

* Subpopulations 1a and 1b combined; ( ) = number of seedlings/juveniles; [ ] = number of dead; and populations in **bold text** are considered to be important populations; the 2016 population count included the total from four of five plots.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Actions for land management, land development and/or land clearing in the immediate vicinity of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) that could potentially result in any of the following, may require assessment:

- Damage or destruction of occupied or potential habitat;
- Changed fire regimes;
- Reduction of pollinator habitat;
- Alteration of the local surface hydrology or drainage;
- Reduction in population size;
- A major increase in disturbance in the vicinity of a population; and
- Spread or amplification of disease.

Habitat critical to the survival of the species, and important populations

Leucopogon sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is ranked as CR in Western Australia and it is considered that all known habitat for the wild population is critical to the survival of the species, and the wild population is an important population. Habitat critical to the survival of *L*. sp. Flynn includes the area of occupancy of the population and areas of similar habitat surrounding the population (these providing potential habitat for population expansion and for pollinators). It may also include additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) will also improve the status of two other Declared Rare Flora (DRF) and five priority flora listed in the table below.

Table 3. Conservation-listed flora species occurring within 500m of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859)

Species name	Conservation status (WA)	Conservation status (EPBC Act)
Conospermum galeatum	DRF (CR)	-
Banksia aurantia	DRF (VU)	CR
Lechenaultia hortii	Priority 2	
Synaphea sp. Darkin (F.Hort *et al.* 586)	Priority 3	-
Stylidium scabridum	Priority 4	-
Stylidium striatum	Priority 4	
Verreauxia verreauxii	Priority 4	-

For a description of conservation codes for Western Australian flora and fauna see ttps://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/conservation_code_definitions.pdf.

Leucopogon sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) does not occur within or adjacent to any known Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs).

International obligations

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993 and will assist in implementing Australia's responsibilities under that Convention. The species is not listed under Appendix II in the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES) and this plan does not affect Australia's obligations under any other international agreements.

Aboriginal consultation

A search of the Department of Aboriginal Affairs (DAA) Aboriginal Heritage Sites Register revealed one site of Aboriginal significance occurring over the population of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859), (site #3758; Helena River Site; ceremonial, mythological, repository/cache; no gender restrictions). Input and involvement has been sought through the South West Aboriginal Land and Sea Council (SWALSC) and DAA to determine if there are any issues or interests with respect to management for this species. Opportunity for future Aboriginal involvement in the implementation of the plan is included as an action in the plan. Aboriginal involvement in management of land covered by an agreement under the *Conservation and Land Management Act 1984* is also provided for under the joint management arrangements in that Act, and will apply if an agreement is established over any reserved lands on which this species occurs.

Social and economic impacts

The only known population of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is on land managed by the Department of Parks and Wildlife. The implementation of this recovery plan may therefore cause some economic impact through restrictions imposed on the management of the land and through the cost of implementing recovery actions. Social impacts may potentially occur through restrictions placed on recreation activities in the area.

Affected interests

The natural population occurs in a national park for which the Department of Parks and Wildlife has primary management responsibility.

Evaluation of the plan's performance

Parks and Wildlife with assistance from the Swan Region Threatened Flora and Communities Recovery Team (SRTFCRT), will evaluate the performance of this plan. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following five years of implementation.

2. Recovery objective and criteria

Plan objective

The objective of this plan is to abate identified threats and maintain or enhance the extant population to ensure the long-term conservation of the species in the wild.

Recovery criteria

Criteria for recovery success: The plan will be deemed a success if one or more of the following take place over the term of the plan.

- The single known population has remained extant and the number of mature plants within the population has remained within a 10% range (559 to 683) or has increased by >10% or
- New populations have been found, increasing the number of known populations from one to two or more with no net loss of mature plants or
- The area of occupancy has increased by >10%, with no net loss of mature plants.

Criteria for recovery failure: The plan will be deemed a failure if one or more of the following occur over the term of the plan.

- The single known population has been lost or
- The number of mature plants has decreased by >10% from 621 to <559 or
- The area of occupancy has decreased by >10%.

3. Recovery actions

Existing recovery actions

Land managers have been notified of the location and threatened status of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859). Notifications detail the threatened status and associated legal obligations in regards to its protection, and contact details for management assistance.

Declared rare Flora (DRF) markers have been installed at the population of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859). These serve to alert people working in the vicinity to the presence of the DRF and the need to avoid work that may damage plants or their habitat. Dashboard stickers and posters describing the significance of DRF markers have been produced and distributed.

Volunteers Fred and Jean Hort have opportunistically surveyed areas of suitable habitat for *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) over 11 years with no new populations located.

Future recovery actions

The following recovery actions are listed in approximate order of decreasing priority, influenced by their timing over the term of the plan, however, this should not constrain addressing any recovery action if funding is available and other opportunities arise. Where these recovery actions are implemented on lands other than those managed by Parks and Wildlife, permission has been or will be sought from the appropriate land managers prior to actions being undertaken.

1. Coordinate recovery actions

Parks and Wildlife with assistance from the Swan Region Threatened Flora and Communities Recovery Team (SRTFCRT) will oversee the implementation of recovery actions for *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) and will include information on progress in annual reports.

Action:	Coordinate recovery actions
Responsibility:	Parks and Wildlife (Perth Hills District), with assistance from the SRTFCRT
Cost:	$8,000 per year

2. Monitor population

Monitoring of the *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) population and its habitat should be undertaken to identify trends or potential management requirements. Population monitoring should record the health and expansion or decline in the population, and other observations such as pollinator activity or seed production. Site monitoring should include observations of grazing, feral pig activity, habitat degradation including weed invasion, and hydrological status (flooding, drought). Specific monitoring of hydrology and activities relating to research into the biology and ecology of *L.* sp. Flynn are included in other recovery actions detailed below.

Action:	Monitor population
Responsibility:	Parks and Wildlife (Perth Hills District), with assistance from the SRTFCRT
Cost:	$8,000 per year

3. Develop and implement a fire management strategy

A fire management strategy will be developed, in consultation with land managers, that recommends fire frequency, intensity and seasonality, precautions to prevent bushfire and strategies for reacting to bushfire, and the need, method of construction and maintenance of firebreaks. The risk of fire occurring in the habitat of the population will be minimised, except where it is being used to assist recovery. All data relating to fire response of the species will be entered into the Threatened Priority Flora (TPFL) fire response data base.

Action:	Develop and implement a fire management strategy
Responsibility:	Parks and Wildlife (Central Wheatbelt District) and landowners
Cost:	$10,000 in year 1, and $6,000 in years 2–5

4. Protect plants from grazing and trampling

Monitoring shows the threat to *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) from grazing (kangaroos) is high and fencing may be required. If annual monitoring also indicates the threat from feral pigs is high, further control measures such as baiting or trapping may be required.

Action:	Protect plants from grazing and trampling
Responsibility:	Parks and Wildlife (Perth Hills District)
Cost:	$15,000 in years 1, 3 and 5

5. Collect and store seed

To guard against the extinction of natural populations of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) it is recommended that seed be collected and stored at the Parks and Wildlife TFSC. Collections should aim to sample and preserve the maximum range of genetic diversity possible by collecting from the widest range of reproductive plants.

Action:	Collect and store seed
Responsibility:	Parks and Wildlife (Perth Hills District, TFSC)
Cost:	$10,000 per year

6. Restrict access

To restrict access (in particular 4WD's) to the population, barriers such as bollards should be erected. Signs indicating the significance of the area may also need to be erected.

Action:	Deter access
Responsibility:	Parks and Wildlife (Perth Hills District)
Cost:	$20,000 in year 1

7. Maintain dieback hygiene

To protect populations from *Phytophthora*, dieback hygiene measures (as outlined in Department of Parks and Wildlife 2014) will be followed during installation and maintenance of firebreaks and when walking into populations in wet soil conditions. Purpose built signs advising of the dieback risk and high conservation values of the sites will be installed if required.

Action:	Maintain dieback hygiene
Responsibility:	Parks and Wildlife (Perth Hills District)
Cost:	$4,000 per year

8. Undertake surveys

Areas of potential habitat should be surveyed with all surveyed areas recorded and the presence or absence of the species documented to increase survey efficiency and reduce unnecessary duplicate surveys. Where possible, volunteers from the local community, Landcare groups, the Wildflower Society of WA and naturalists' clubs will be encouraged to become involved.

Action:	Undertake surveys
Responsibility:	Parks and Wildlife (Perth Hills District), with assistance from the SRTFCRT and volunteers
Cost:	$10,000 per year

9. Undertake regeneration trials

Habitat disturbance (physical or fire) may promote recruitment in *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) and it is recommended that disturbance trials be undertaken. Permanent quadrats will be established to monitor the response of the species.

Action:	Undertake regeneration trials
Responsibility:	Parks and Wildlife (Science and Conservation Division, Perth Hills District)
Cost:	$10,000 in years 1 and 3, $4,000 in years 2, 4 and 5

10. Obtain biological and ecological information

It is recommended that research on the biology and ecology of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) include:

1. Identification of pollinators and their local abundance and effectiveness.
2. Seed viability.
3. Conditions necessary for natural germination.
4. Response to disturbance, competition, drought and grazing.
5. Longevity of plants, time taken to reach maturity, and minimum viable population size.

Action:	Obtain biological and ecological information
Responsibility:	Parks and Wildlife (Science and Conservation Division, Perth Hills District)
Cost:	$50,000 in years 1–3

11. Develop and implement a translocation proposal

Translocations may be required for the long term conservation of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859), if the natural population declines.

Information on the translocation of threatened plants and animals in the wild is provided in Parks and Wildlife Corporate Policy Statement No. 35 (DPaW 2015*a*), Parks and Wildlife Corporate Guideline No. 36 (DPaW 2015*c*) and the Australian Network for Plant Conservation translocation guidelines (Vallee *et al*. 2004). The 2004 guidelines state that a translocation may be needed when a species is represented by few populations and the creation of additional self-sustaining, secure populations may decrease its susceptibility to catastrophic events and environmental stochasticity. For small populations which may be declining in size or subject to high levels of inbreeding, successful population enhancement may increase population stability and hence long-term viability (Vallee *et al*. 2004).

Depending on the characteristics of the species, Vallee *et al*. (2004) suggest a minimum viable population size estimated between 50 and 2,500 individuals will be required. Suitable translocation sites may include where the taxon occurs, where it was known to have occurred historically and other areas that have similar habitat (soil, associated vegetation type and structure, aspect etc.), within the known range of the taxon (Vallee *et al*. 2004).

All translocation proposals require endorsement by the department's Director of Science and Conservation. Monitoring of translocations is essential and will be included in the timetable developed for the Translocation Proposal.

Action:	Develop and implement a translocation proposal
Responsibility:	Parks and Wildlife (Science and Conservation Division, Perth Hills District), BGPA
Cost:	$42,000 in years 1 and 2; and $26,500 in years 3–5 as required

12. Map habitat critical to the survival of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859)

Although habitat critical to the survival of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is alluded to in Section 1, it has not yet been mapped and will be addressed under this action. If additional populations are located, then habitat critical to their survival will also be determined and mapped.

Action:	Map habitat critical to the survival of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859)
Responsibility:	Parks and Wildlife (Species and Communities Branch (SCB), Perth Hills District)
Cost:	$6,000 in year 2

13. Liaise with Aboriginal communities

Consultation with the Aboriginal community will take place to determine if there are any issues or interests in areas that are habitat for the species and opportunities will be provided for Aboriginal people to be involved in implementing this plan.

Action:	Liaise with Aboriginal communities
Responsibility:	Parks and Wildlife (Perth Hills District)
Cost:	$4,000 per year

14. Promote awareness

The importance of biodiversity conservation and the protection of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) will be promoted to the public through the print and electronic media. Formal links with naturalist groups and interested individuals will also be encouraged.

Action:	Promote awareness
Responsibility:	Parks and Wildlife (Perth Hills District, SCB, Public Information and Corporate Affairs (PICA)), with assistance from the SRTFCRT
Cost:	$7,000 in years 1 and 2; $5,000 in years 3–5

15. Review this plan and prepare a revised plan if necessary

If *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is still listed as Threatened Flora at the end of the five-year term of this plan, the need for further recovery actions and/or a review of this plan will be assessed and a revised plan prepared if necessary.

Action:	Review this plan and prepare a revised plan if necessary
Responsibility:	Parks and Wildlife (SCB, Perth Hills District)
Cost:	$6,000 in year 5

Table 4. Summary of recovery actions

Recovery action	Priority	Responsibility	Completion date
Coordinate recovery actions	High	Parks and Wildlife (Perth Hills District), with assistance from the SRTFCRT	Ongoing
Monitor population	High	Parks and Wildlife (Perth Hills District), with assistance from the SRTFCRT	Ongoing
Develop and implement a fire management strategy	High	Parks and Wildlife (Perth Hills District) and landowners	Developed by 2018 with implementation ongoing
Protect plants from grazing and tranpling	High	Parks and Wildlife (Perth Hills District)	Ongoing
Collect and store seed	High	Parks and Wildlife (Perth Hills District, TFSC)	2021
Restrict access	High	Parks and Wildlife (Perth Hills District)	2017
Maintain dieback hygiene	High	Parks and Wildlife (Perth Hills District)	Ongoing
Undertake surveys	High	Parks and Wildlife (Perth Hills District) with assistance from the SRTFCRT and volunteers	Ongoing
Undertake regeneration trials	High	Parks and Wildlife (Science and Conservation Division, Perth Hills District)	2021
Obtain biological and ecological	High	Parks and Wildlife (Science and Conservation	2019

information		Division, Perth Hills District)	
Develop and implement a translocation proposal	Medium	Parks and Wildlife (Science and Conservation Division, Perth Hills District), BGPA	2021
Map habitat critical to the survival of *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859)	Medium	Parks and Wildlife (SCB, Perth Hills District)	2018
Liaise with Aboriginal communities	Medium	Parks and Wildlife (Perth Hills District)	Ongoing
Promote awareness	Medium	Parks and Wildlife (Perth Hills District, SCB, PICA), with assistance from the SRTFCRT	Ongoing
Review this plan and prepare a revised plan if necessary	Medium	Parks and Wildlife (SCB, Perth Hills District)	2021

4. Term of plan

This plan will operate from November 2016 to October 2021 but will remain in force until withdrawn or replaced. If *Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) is still listed as Threatened Flora at the end of the five year term of this plan, a review of this plan will be completed, the need for further recovery actions determined and a revised plan prepared if necessary.

5. References

Department of Parks and Wildlife (2014) Policy Statement No. 3 Management of *Phytophthora* disease. Department of Parks and Wildlife, Western Australia.

Department of Parks and Wildlife (2015*a*) Corporate Policy Statement No. 35 *Conserving Threatened Species and Ecological Communities*. Perth, Western Australia.

Department of Parks and Wildlife (2015*b*) Corporate Guideline No. 35 *Listing and Recovery of Threatened Species and Ecological Communities*. Perth, Western Australia.

Department of Parks and Wildlife (2015*c*) Corporate Guideline No. 36 *Recovery of Threatened Species through Translocation and Captive Breeding or Propagation*. Perth, Western Australia.

Government of Australia (1999) Endangered Species Protection Act 1999. Government Printer, Canberra.

International Union for Conservation of Nature (2001) *IUCN Red List Categories: Version 3.1*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

Page, C., Hort, F. and Hort J. (2012) Form to nominate a Western Australian species for listing as threatened, change of category or delisting 2012. Department of Environment and Conservation, WA.

Puente-Lelièvre, C., Hislop, M., Harrington, M., Brown, E.A., Kuzmina, M. and Crayn, D.M. (2016) A five-marker molecular phylogeny of the Styphelieae (Epacridoideae, Ericaceae) supports a broad concept of *Styphelia*. *Australian Systematic Botany* 28: 368–387.

Vallee, L., Hogbin, T., Monks, L., Makinson, B., Matthes, M. and Rossetto, M. (2004) Guidelines for the Translocation of Threatened Australian Plants. Second Edition. *The Australian Network for Plant Conservation*. Canberra, Australia.

Western Australian Herbarium (1998–) *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. http://florabase.dpaw.wa.gov.au/.

6. Taxonomic description

***Leucopogon* sp. Flynn (F.Hort, J.Hort & A.Lowrie 859)**

Description from Western Australian Herbarium (1998–) *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. http://florabase.dpaw.wa.gov.au/ and Jean and Fred Hort pers. obs.

Hemispherical, many-branched shrub, 0.6-0.75m high, to 1.65m wide. Flowers white, December or January to February.