Agricultural Sciences, 2026, 17(6), 546-559
https://www.scirp.org/journal/as
ISSN Online: 2156-8561
ISSN Print: 2156-8553

Living Olfactory Barrier Trials Using *Ribes odoratum* for Threatened Fauna Nest Protection in Southern Australia

Cody T. Dooley

Independent Researcher, Fältspatvagen 5A LGH 1101 167 41 Bromma, Stockholm, Sweden
Email: codydooley@codynoticed.com

How to cite this paper: Dooley, C.T. (2026) Living Olfactory Barrier Trials Using *Ribes odoratum* for Threatened Fauna Nest Protection in Southern Australia. *Agricultural Sciences*, **17**, 546-559.
https://doi.org/10.4236/as.2026.176033

Received: May 24, 2026
Accepted: June 27, 2026
Published: June 30, 2026

Abstract

Rooting and digging by invasive feral mammals—principally feral pigs (*Sus scrofa*), feral deer, and rabbits—causes severe direct predation of eggs and nest destruction across critically threatened Australian fauna, including the vulnerable malleefowl (*Leipoa ocellata*), the endangered Eastern Ground Parrot (*Pezoporus wallicus*), and multiple freshwater turtle species protected under the Environment Protection and Biodiversity Conservation Act. Current management relies on physical exclusion fencing, baiting, and lethal culling—methods that are costly and difficult to sustain at landscape scale. Here, we present a research proposal for in situ trials of *Ribes odoratum* Pursh (clove currant/buffalo currant; *Grossulariaceae*) as a living olfactory barrier planting around threatened fauna nesting sites in three geographically distinct Australian regions. The proposal draws on the established hypothesis that the genus *Ribes L.* produces a continuously emitted suite of monoterpene and sesquiterpene volatile organic compounds from glandular trichomes across all aboveground plant tissues—documented to include 19 monoterpenes and 20 sesquiterpenes in bud essential oil [1]—that may act as olfactory deterrents disrupting ground-level scent-tracking in rooting mammals. *Ribes odoratum* is selected over *R. nigrum L.* for its lower winter chilling requirement and tolerance of hot, semi-arid conditions across the priority trial sites. Three case study sites are proposed: 1) malleefowl mound complexes in the Grampians-Little Desert-Mallee corridor, targeting feral deer and feral pig mound disturbance; 2) Eastern Ground Parrot heathland nesting sites in coastal southeastern Victoria and eastern South Australia, targeting feral pig rooting; and 3) freshwater turtle nesting banks in southeastern Queensland and northeastern New South Wales, targeting feral pig egg predation. Experimental design, volatile organic compound sampling methodology, and measurable outcomes are outlined for each site. This proposal represents the first systematic investigation of *Ribes* volatile organic compound emissions as a non-lethal, habitat-integrated deterrent in a conservation context.

Keywords

Ribes odoratum, Volatile Organic Compounds, Olfactory Deterrence, Feral Pig, *Sus scrofa*, Malleefowl, *Leipoa ocellata*, Eastern Ground Parrot, *Pezoporus wallicus*, Invasive Species Management, Monoterpenes, Chemical Ecology, Conservation Biology, Australia, EPBC Act, Living Plant Defence, Non-Lethal Pest Management

1. Introduction

Australia holds the unfortunate distinction of the world's highest modern mammal extinction rate, with feral and invasive animals identified as a primary threat to more than 80% of nationally listed threatened species [2]. Among the most damaging mechanisms of this impact is the physical disturbance of ground-level nesting and incubation sites by rooting mammals—animals that use the snout, forefeet, or hooves to excavate soil in search of food. Feral pigs (*Sus scrofa* Linnaeus, 1758) are the principal offender: with an estimated population of 13 - 24 million individuals across approximately 45% of the Australian mainland, they directly consume the eggs and hatchlings of ground-nesting birds, freshwater turtles, and reptiles, while their rooting physically destroys nesting structures [3] [4]. Feral deer, feral goats, and rabbits cause complementary damage through trampling, soil compaction, and competition for nesting substrate vegetation.

Current management strategies—aerial and ground-based culling, 1080 baiting programmes, and hard exclusion fencing—are effective within limited areas but are prohibitively expensive to maintain at landscape scale, require ongoing operational commitment, and carry ecological side effects including documented increases in feral cat numbers following fox-baiting programmes [5]. There is therefore a pressing and unmet need for passive, habitat-integrated deterrent approaches that can complement existing management at reduced long-term cost.

A novel hypothesis, to date untested in the peer-reviewed literature, proposes that the genus *Ribes L.* (*Grossulariaceae*)—specifically the continuously emitted, resinous glandular-trichome volatile organic compound (VOC/VOCs) profile characteristic of all above-ground plant tissues—may function as an olfactory deterrent against rooting mammals that rely on ground-level scent detection to locate buried food resources. This hypothesis is grounded in three independent lines of evidence: 1) the documented composition of *Ribes* bud and leaf VOCs, which includes 19 monoterpenes, 20 sesquiterpenes, and numerous oxygenated derivatives continuously emitted constitutively from intact glandular trichomes [1]; 2) the well-established principle that strong-scented botanical preparations can disrupt olfactory food-location behaviour in mammals, as demonstrated by the up to

95% deterrence efficacy of castor oil and aromatic formulations against wild boar [6]; and 3) the analogous—though anecdotal and untested—field observation that wild boar populations appear to avoid foraging in the vicinity of *Ribes* plantings, forming the original impetus for this research programme.

Ribes odoratum Pursh (clove currant; buffalo currant) is proposed as the trial species in preference to *R. nigrum L.* for the Australian context. Its substantially lower winter chilling requirement (USDA hardiness Zones 3 - 9, tolerating hot summers and semi-arid conditions) renders it viable across the warm-temperate and semi-arid zones of southern Australia that harbour the priority nesting sites of concern. Its foliar and floral VOC profile includes the same principal monoterpene and sesquiterpene classes characteristic of the genus, augmented by an intense eugenol and phenylpropanoid fraction from its clove-scented flowers—a variable that will be explicitly measured and characterized during the trial.

This proposal outlines the scientific rationale, experimental design, and expected outcomes for three in situ trials across ecologically distinct Australian landscapes, each targeting a different threatened fauna guild and primary rooting pest. Together, the three trials are designed to generate replicable, publication-quality data capable of supporting or refuting the olfactory barrier hypothesis and, if supported, providing a foundation for scaled conservation deployment.

Deterrence efficacy in barrier plantings of *R. odoratum* is expected to be a function of established above-ground biomass and canopy continuity rather than planting date alone, given that constitutive VOC output scales with photosynthetically active tissue and that olfactory deterrence requires sustained supra-threshold atmospheric concentrations at the barrier perimeter [1] [7].

2. Background and Rationale

2.1. Volatile Organic Compound Emissions in *Ribes*

The genus *Ribes* is distinguished within the *Grossulariaceae* by the presence of dense glandular trichomes on all above-ground organs—leaves, stems, buds, and fruit—that constitutively secrete a complex mixture of volatile terpenoids. Gas Chromatography-Mass Spectrometry (GC-MS) analysis of *R. nigrum* bud essential oil has identified 19 monoterpenes, 20 sesquiterpenes, 12 carbonyl compounds, 11 esters, and 34 alcohols [1]. Headspace analyses of intact leaves and berries confirm that monoterpene hydrocarbons and oxygenated monoterpenes are the dominant volatile classes in constitutive emissions [8]. Critically, emission is constitutive—it does not require wounding, herbivory, or fruiting—meaning that an established *Ribes* planting generates a persistent, continuous scent field throughout the growing season. VOC emissions are modulated by temperature and radiation, suggesting that emission intensity will be elevated during the warm Australian growing season coinciding with peak nesting periods for the target fauna. The characteristic "catty" sulfurous note of *R. nigrum* stems—attributable to 4-methoxy-2-methyl-2-butanethiol—is co-emitted with the terpenoid suite, potentially broadening the olfactory signal relevant to mammalian deterrence.

It should be noted that the majority of published VOC characterization data cited above derives from *R. nigrum* and other *Ribes* species rather than from *R. odoratum* directly. The hypothesis that *R. odoratum* functions as an olfactory deterrent therefore involves a degree of genus-level inference. This inference is supported by the shared glandular trichome architecture and constitutive terpenoid emission characteristic of the genus [1] [7], and is strengthened by direct evidence specific to *R. odoratum*: its VOC profile is documented to include a prominent eugenol and phenylpropanoid fraction absent or minor in *R. nigrum* [9], and the species is recorded as deer-resistant across its native North American range [10], consistent with a functional deterrent effect on large browsing mammals. The present study is designed in part to generate the first direct field evidence for *R. odoratum* as a mammalian deterrent, replacing genus-level inference with site-specific empirical data.

2.2. Olfactory Deterrence: Mechanisms and Precedents

Rooting mammals—including *Sus scrofa*, feral deer, and rabbits—locate buried food resources primarily through olfaction, using ground-level scent detection via direct snout-soil contact. Laboratory and field studies have demonstrated that strong olfactory masking agents can significantly reduce rooting frequency and excavation success. A castor oil, ginger, and garlic mixture has been reported to achieve up to approximately 95% deterrence efficacy against wild boar in field conditions [6], establishing proof of concept for olfactory deterrence. Capsaicin-based and essential-oil-based repellents have demonstrated efficacy against white-tailed deer (*Odocoileus virginianus*) in agricultural contexts [11].

The mechanistic basis for monoterpene-mediated deterrence is not fully characterised, but proposed pathways include: 1) olfactory masking of the target food scent signature at ground surface; 2) trigeminal irritation via volatile terpenoids at ground-surface concentrations, potentially mediated by TRPA1 ion channel activation as recently described for Piperales VOCs in large herbivores [12]; and 3) conditioned aversion following repeated exposure to a novel, persistent, and non-food-associated scent landscape. These mechanisms are not mutually exclusive and may operate simultaneously at a living plant barrier.

2.3. *Ribes odoratum*: Suitability for Australian Deployment

Ribes odoratum Pursh (syn. *R. aureum var. villosum*) is a thornless, deciduous shrub native to the central-western plains of North America, growing to 2 - 2.5 m height and width. Its USDA hardiness zone range of 3 - 9 reflects tolerance of both severe cold (to −25˚C) and hot, dry summers—a combination that renders it uniquely suitable for deployment in the semi-arid mallee and warm-temperate coastal zones of southern Australia where *R. nigrum's* high chilling requirement (1200 - 2500 hours below 7˚C) makes it unviable [13]. The species produces strongly scented foliage and intensely clove-scented flowers—a VOC profile dominated by eugenol and related phenylpropanoids in addition to the terpenoid suite characteristic of the genus. It tolerates poor soils and moderate drought, spreads by root suckers to form dense thickets, and is not listed as a declared weed in any Australian jurisdiction [14]. The absence of *Pinus strobus* (white pine) populations in Australia renders the white pine blister rust (*Cronartium ribicola*) pathway—the basis for US cultivation restrictions on *Ribes*—entirely irrelevant in the Australian context.

2.4. Selection Rationale: *R. odoratum* over Other Aromatic Candidates

While aromatic shrubs such as *Lavandula spp.* and *Rosmarinus officinalis* are widely recognized as drought-tolerant and VOC-emitting, their utility as mammalian olfactory barriers at ecologically meaningful scales is constrained by growth form. Both reach maximum heights of approximately 0.5 - 1.2 m under field conditions, limiting total above-ground biomass and the vertical extent of any olfactory boundary they could sustain. By contrast, *R. odoratum* achieves a mature height and spread of approximately 1.8 - 2.4 m [9], produces a constitutive phenylpropanoid VOC load—principally eugenol—distributed across all above-ground tissues including stems, leaves, buds, and flowers [7], and is documented as deer-resistant in its native range [10], suggesting that its VOC profile already functions as a deterrent to large browsing mammals. No comparable combination of canopy height, multi-tissue constitutive emission, and confirmed large-mammal aversion is available in a single alternative aromatic species suited to the moisture-variable conditions of southern Australia.

3. Research Objectives

The primary objectives of this study are:

- Objective 1: To quantify the VOC emission profile of *R. odoratum* planted in Australian field conditions, including temporal variation across seasons and ground-level concentration gradients at varying distances from plantings.
- Objective 2: To measure the effect of *R. odoratum* olfactory barrier plantings on the frequency and intensity of rooting and digging behaviour by feral pigs, feral deer, and rabbits at and around threatened fauna nesting sites in three ecologically distinct trial landscapes.
- Objective 3: To assess nesting success (egg survival, hatching rate, mound integrity) in treatment plots with *R. odoratum* barriers versus paired control plots without plantings across all three trial sites.
- Objective 4: To determine whether any deterrent effect is attributable to olfactory masking, conditioned aversion, or physical barrier function, using camera-trap behavioural data and scent-tracking assays.
- Objective 5: To evaluate the practicality, cost-effectiveness, and scalability of *R. odoratum* barrier plantings as a passive conservation management tool for integration with existing pest management programmes.

4. Proposed Trial Sites and Case Studies

Three trial sites are proposed, selected to maximize ecological diversity of both target fauna and primary pest species, while remaining within the demonstrated climatic viability range of *R. odoratum*. Each site functions as an independent experimental replicate at landscape scale, with standardized methodology applied across all three.

The three proposed trial sites, target threatened fauna, primary pest species, and prevailing climate zones are summarised in Table 1.

Table 1. Summary of proposed *R. odoratum* olfactory barrier trial sites, target threatened fauna, primary pest species, and prevailing climate zone.

Site	Region	Target Fauna	Primary Pest	Climate Zone
1) Malleefowl mound corridor	Grampians-Little Desert-Mallee, Vic/SA	*Leipoa ocellata* (Vulnerable)	Feral deer, feral pig	Semi-arid/ warm-temperate
2) Ground Parrot heathlands	Coastal SE Victoria/ E South Australia	*Pezoporus wallicus* (Endangered)	Feral pig, rabbit	Warm-temperate/ coastal
3) Freshwater turtle nesting banks	SE Queensland/ NE New South Wales	EPBC-listed freshwater turtle spp.	Feral pig	Subtropical/ warm-temperate

4.1. Trial Site 1: Malleefowl Mound Corridor, Victoria/South Australia

4.1.1. Ecological Context

The malleefowl (*Leipoa ocellata* Gould, 1840) is listed as Vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act and Threatened under the Victorian Flora and Fauna Guarantee Act [15]. As one of only three mound-building megapodes in Australia and the sole species inhabiting arid and semi-arid zones, the malleefowl constructs large incubation mounds—up to 1 m in height and 4 m in diameter—from leaf litter and sandy substrate, within which eggs are incubated for approximately 60 days with daily male thermal regulation to within 1˚C of 33˚C - 34˚C. Feral deer have been formally identified as an emerging threat in South Australia through physical disruption of mound architecture, compromising thermal regulation essential for embryo viability. Feral pigs disturb mounds through rooting for invertebrates in the organic litter that forms the thermal core. The mallee and mulga scrublands of the Grampians-Little Desert-Mallee corridor experience hot, dry summers with cool winters accumulating moderate frost—conditions within the full viability range of *R. odoratum*.

4.1.2. Experimental Design

Twenty active malleefowl mounds will be identified in partnership with the Malleefowl Recovery Group [16] and Australian Wildlife Conservancy sanctuaries (Dakalanta, Scotia, Mt Gibson). Mounds will be paired by vegetation type, mound age, and estimated activity level, generating ten matched pairs. Within each pair, one mound will be randomly assigned to treatment (olfactory barrier planting) and one to unplanted control. Treatment mounds will receive a perimeter planting of *R. odoratum* at 5 m radius from mound centre, using established bare-root stock planted at 1 m intervals to form a continuous shrub ring (approximately 31 plants per mound). Plantings will be established 12 months prior to data collection to allow root establishment and initiation of full foliar VOC emission.

4.1.3. Outcome Measures

- Camera-trap recordings: frequency of feral deer, feral pig, and rabbit visits per 24-hour period at each mound.
- Mound structural integrity: monthly photographic assessment and volumetric measurement; all disturbance events recorded with date, estimated cause, and extent.
- Nesting success: number of incubation attempts and emergence events recorded on camera; ratio of successful to failed incubation attempts.
- VOC gradient sampling: passive SPME samplers at 0.5 m, 2 m, 5 m, and 10 m from planting edge to characterize the effective scent field radius.

4.2. Trial Site 2: Eastern Ground Parrot Heathlands, Victoria/South Australia

4.2.1. Ecological Context

The Eastern Ground Parrot (*Pezoporus wallicus wallicus* Kerr, 1792) is listed as Endangered under the EPBC Act and is one of only two fully ground-dwelling parrot species in Australia, nesting in shallow scrapes directly beneath coastal heathland vegetation. This nesting strategy renders eggs and chicks acutely vulnerable to rooting disturbance by feral pigs, which probe through heath understorey for roots, corms, and invertebrates—precisely the foraging action that would expose and destroy a ground parrot nest. Ground parrot populations are now confined to isolated heathland patches along the coast of southeastern Victoria and eastern South Australia, where mild cool winters provide adequate but not excessive chilling for *R. odoratum* establishment at heathland margins.

4.2.2. Experimental Design

In collaboration with Parks Victoria and the Department for Environment and Water (South Australia), sixteen ground parrot territories (identified by dawn call surveys) will be selected across four heathland reserves. Eight territories will receive treatment plantings of *R. odoratum* as linear barrier rows along the heathland-access track boundary—the primary pig ingress vector—planted at 2 m spacing; eight will serve as unplanted controls. Territorial boundaries will be mapped by GPS tracking of radio-tagged individuals where ethics permits.

4.2.3. Outcome Measures

- Feral pig activity index: rooting scar frequency and area within each territory per monitoring interval using standardized monthly transect surveys.

- Nest survival (secondary outcome): egg fate (survived/depredated/abandoned) will be recorded via miniaturized nest cameras only where nests can be located without disturbance; if ethical nest location is not achievable, this outcome will be excluded and territory occupancy and pig activity index will serve as the primary proxies for breeding success.
- Territory occupancy: dawn call survey counts before, during, and after breeding season as a proxy for breeding activity.
- VOC ambient concentration at heathland boundary: portable PTR-ToF-MS measurements or equivalent during peak growth.

4.3. Trial Site 3: Freshwater Turtle Nesting Banks, SE Queensland/NE New South Wales

4.3.1. Ecological Context

Multiple EPBC-listed freshwater turtle species nest along exposed riparian and lacustrine banks across southeastern Queensland and northeastern New South Wales, including the Critically Endangered Bellinger River Snapping Turtle (*Myuchelys georgesi* Wells & Wellington, 1985) and the Endangered Manning River Helmeted Turtle (*Flaviemys purvisi* Wells & Wellington, 1985). Females deposit eggs in spatially predictable sandy or loamy bank substrate, rendering nest sites highly susceptible to repeated predation by feral pigs that learn locations through olfactory detection of egg scent. Feral pig populations in this region are among the densest in eastern Australia, concentrated in the wetland and riparian habitats freshwater turtles depend on. The warm, humid winters of this region place it at the upper warm boundary of *R. odoratum's* viable range, making this the most climatically marginal trial site and the most important for testing VOC emission and plant performance under warm-winter conditions.

4.3.2. Experimental Design

Twelve known nesting bank sections (minimum 50 m length, confirmed by previous surveys or egg remains) will be identified on three river systems in collaboration with state freshwater turtle recovery teams. Sections will be stratified by river system and randomly allocated: six to treatment (linear *R. odoratum* plantings along bank crest at 1.5 m intervals, 3 m setback from active nesting substrate edge) and six to unplanted control. The crest planting position targets the primary pig approach vector while minimizing interference with nesting substrate.

4.3.3. Outcome Measures

- Pig rooting disturbance: frequency of rooting events per nesting bank section per week, from camera traps covering the full nesting zone.
- Nest fate: GPS-flagged nest locations monitored for egg survival across the full incubation period (60 - 90 days depending on species).
- Pig approach behaviour: camera-trap recordings of head-raising (scenting), direction changes, and retreat frequency at treatment versus control banks.
- Plant establishment and VOC output: quarterly plant health assessments and

SPME VOC sampling to confirm establishment success and ongoing emission under subtropical conditions.

5. Cross-Site Methodology

5.1. Plant Material and Establishment

Bare-root or container-grown *R. odoratum* stock will be sourced from certified Australian nurseries or propagated from hardwood cuttings taken from established parent plants 18 months prior to trial planting. Provenance selection will favour ecotypes originating from warm-summer continental climates (Kansas, Nebraska, Oklahoma) to maximize performance in Australian conditions. All plant material will be propagation-certified, screened for Phytophthora and blister rust compliance, and approved for planting by state biosecurity authorities prior to deployment.

5.2. VOC Sampling and Analysis

Concurrent background VOC samples will be collected at each sampling interval outside the planting boundary to establish ambient baseline concentrations independent of the *Ribes odoratum* planting. Ideally, background sampling will commence prior to planting establishment to capture pre-treatment baseline VOC conditions at each site. Wind speed, temperature, and relative humidity will be recorded at each sampling interval to account for microclimatic variation in VOC dispersal and emission rate. Foliar VOC emissions will be characterized at each site using passive SPME fibre samplers (Supelco PDMS/DVB, 65 μm film thickness) exposed for 24-hour periods at characterized heights (5 cm, 50 cm, and 100 cm above ground level) and at distances of 0.5, 2, 5, and 10 m from the planting edge. Fibres will be desorbed and analyzed by GC-MS (Shimadzu GCMS-QP2020 or equivalent) with identification against the NIST 2020 mass spectral library. Quantification will use external standard calibration for the 15 most abundant compounds identified in the pilot characterization phase.

5.3. Camera-Trap Deployment and Behavioural Coding

Reconyx HyperFire 2 (or equivalent) camera traps will be deployed at each nesting site in paired configurations: one camera oriented toward the nesting structure or substrate and one oriented to capture the approach vector from the planting edge. Cameras will be set to continuous video mode at motion trigger, 30 fps, infrared illumination. Footage will be reviewed by two independent coders blind to treatment allocation, coding: species identity, visit duration, rooting and digging events, scenting behaviour (head orientation, snout-ground contact), and approach or retreat decisions at the planting boundary.

5.4. Statistical Analysis

Primary outcomes will be analyzed separately for each site using generalized linear mixed models (GLMMs), with treatment as a fixed effect, site-specific random effects, and season and year as covariates. A secondary cross-site pooled GLMM will then be fitted incorporating site-by-treatment interaction terms to formally test whether treatment efficacy varies across the three trial landscapes. This combined approach preserves site-level interpretability—important given the ecological distinctiveness of each site—while providing a synthesized cross-site estimate of overall deterrent efficacy. All analyses will be conducted in R v.4.3+ using the lme4 and glmmTMB packages.

Sample sizes were determined based on practical and ecological constraints at each site. For Site 1, twenty malleefowl mounds in ten matched pairs provide adequate replication given the logistical constraints of locating active mounds across the Grampians-Little Desert-Mallee corridor. For Site 2, sixteen ground parrot territories across four reserves balance statistical replication with the limited availability of confirmed territories in accessible heathland. For Site 3, twelve freshwater turtle nesting bank sections across three river systems reflect the availability of confirmed nesting sites identified by recovery teams. Baseline event rates for rooting disturbance frequency, nesting success, and territory occupancy are expected to vary across sites and will be empirically established during the pre-treatment monitoring period prior to data collection, at which point power estimates will be refined accordingly.

The minimum treatment effect the study is designed to detect is a 35% reduction in rooting event frequency in treatment versus control plots, representing a conservative and ecologically meaningful threshold for a first-of-its-kind passive deterrence trial. As a secondary supporting measure, deterrent behaviour—defined as head-raising, direction change, or retreat at the planting boundary recorded by camera trap—will be reported as a qualitative indicator of olfactory deterrence independent of rooting frequency outcomes.

5.5. Operational Definition of Active Treatment Status

Ribes emits a constitutive blend of phenylpropanoid and terpenoid VOCs—principally eugenol and associated monoterpenes in *R. nigrum*—from leaves, stems, buds, and flowers across all above-ground tissues throughout the growing season [7]. Because VOC output scales with photosynthetically active biomass, and because olfactory deterrence requires sustained atmospheric concentrations above the detection threshold of the target species, planting date alone is an insufficient basis for defining treatment onset of *R. odoratum*. A planted individual was therefore classified as an active treatment unit only upon meeting all of the following conditions concurrently: completion of a minimum of two full growing seasons post-transplant, at which point *Ribes* plants will generally have achieved their first fruiting and an established multi-stem architecture [9]; attainment of sufficient foliar biomass to sustain constitutive VOC emission above local background during the foliated period [7]; and, in barrier configurations, canopy contact or near-contact with adjacent individuals. Given a growth rate of approximately 30 - 45 cm per year and a mature spread of 0.9 - 1.5 m [10], with full mature dimensions of approximately 2 m height and spread [9], a planting spacing of 1.5 - 2.0 m between centres is projected to achieve canopy continuity within three to four growing seasons under the trial conditions described below. Barrier segments in which one or more individuals had not yet reached active treatment status were excluded from deterrence assessments for that measurement period.

6. Ethical Considerations and Regulatory Compliance

All fieldwork involving threatened fauna will require and will obtain Commonwealth EPBC Act Scientific Purposes Permits and relevant state wildlife research permits (Victoria, South Australia, Queensland/New South Wales) prior to commencement. Camera trapping, nest monitoring via probing, and VOC sampling are non-lethal, minimally invasive methodologies consistent with standard threatened species research practice. No individual animals will be handled unless radio-tagging of Eastern Ground Parrots is approved under a separate ethics application. Invasive pest control will not be conducted as part of this study; where existing land managers maintain active baiting programmes, trial sites will be selected to ensure equivalent management history across treatment and control pairs. Biosecurity approval for planting *R. odoratum* in each state will be confirmed with state biosecurity authorities prior to procurement; the species is not listed as a weed in any Australian state or territory jurisdiction as of 2026.

7. Expected Outcomes and Significance

If the olfactory deterrence hypothesis is supported across one or more trial sites, this study will provide the first empirical evidence for living plant VOC emissions as a functional, deployable tool in threatened fauna nest protection—a genuinely novel contribution to both chemical ecology and applied conservation biology. A positive result would open a pathway to low-cost, self-sustaining, landscape-scale passive deterrent systems integrable with existing vegetation restoration programmes.

If results are mixed across sites, the cross-site comparative design will allow identification of the ecological or climatic conditions under which VOC-based deterrence is most effective, informing targeted future deployment. If the hypothesis is not supported, the study will contribute high-quality null-result data—increasingly valued in open-access conservation biology—and will rule out a non-invasive management option, directing resources more efficiently toward effective approaches.

In all outcome scenarios, the VOC characterization component will contribute original data on *R. odoratum* emission profiles under Southern Hemisphere growing conditions—a gap in the current chemical ecology literature—and will establish field-validated methodologies for ambient monoterpene sampling in Australian conservation landscapes.

This proposal represents the first systematic investigation of *Ribes* VOC emissions as a non-lethal, habitat-integrated mammal deterrent in a conservation context, and the first application of the living-plant olfactory deterrence concept to threatened species protection.

8. Proposed Timeline

The proposed four-year project timeline across four sequential phases is summarised in Table 2.

Table 2. Proposed four-year project timeline across four sequential phases.

Phase	Activity	Duration
I	Site identification; partner agreements; EPBC/state permits; biosecurity approvals; plant propagation; pre-registration on OSF.	Months 1 - 6
II	Planting establishment at all three sites; baseline camera-trap and VOC monitoring (pre-treatment period).	Months 7 - 18
III	Primary data collection: camera traps, rooting surveys, nesting success monitoring, VOC sampling across two full breeding seasons.	Months 19 - 42
IV	Data analysis; manuscript preparation; stakeholder reporting; open-access data deposition (Global Biodiversity Information Facility (GBIF), Dryad Digital Repository (DRYAD)).	Months 43 - 48

Limitations, Permits, and Biosecurity

R. odoratum is not listed as a declared weed in any Australian state or territory jurisdiction as of 2026. State biosecurity approval will be obtained prior to procurement and planting at each trial site.

Post-trial removal: at trial completion, *R. odoratum* individuals will be removed from treatment plots using a phased devitalization approach. During the dry season, where climatic conditions at the trial site permit a sufficiently pronounced dry period, a deburring or scoring tool will be used to abrade and expose the cambial tissue along the full length of each stem, severing phloem transport and inducing progressive desiccation until the above-ground structure is no longer viable. At sites where seasonal drought is insufficient to facilitate desiccation-based removal, alternative devitalization timing will be determined in consultation with site managers and local land management authorities. This method is preferred over mechanical excavation as it minimizes soil disturbance at sensitive nesting sites. The root system will be left in situ to decompose naturally, returning organic matter and nutrients to the soil profile. All devitalized above-ground material will be removed from the site once desiccation is complete.

[Post-trial dispersal monitoring: *R. odoratum* will be monitored for vegetative spread beyond designated planting boundaries following trial completion. As *R. odoratum* spreads primarily via root suckers, monitoring will consist of annual perimeter surveys extending 10 m beyond each planting boundary, with any volunteer shoots outside the designated zone cut at the base, then removed and recorded for ongoing monitoring, as resprouting at or near the removal site is expected. Only the above-ground shoot will be removed; the root system will remain in situ, and each removal site will be monitored until resprouting ceases and the underlying root system is considered non-viable.

Naturalization risk: the vigorous suckering habit of *R. odoratum* presents a low but non-negligible risk of naturalization in the absence of active management. This risk is acknowledged and will be actively mitigated through the perimeter monitoring and removal protocols outlined above.

Funding

This work received no external funding. The study is presented as a proposal for funding consideration by relevant conservation and research bodies.

Author Contributions

C.D.: conceptualization, hypothesis formulation, experimental design, literature review, manuscript preparation.

Data Availability

No experimental data were generated or analyzed in this study. This manuscript constitutes a research proposal; data will be deposited to GBIF and DRYAD upon study completion.

Ethics Statement

No animal or human subjects research was conducted in preparation of this manuscript. All proposed fieldwork involving threatened fauna will require Commonwealth EPBC Act Scientific Purposes Permits and relevant state wildlife research permits prior to commencement, as detailed in Section 6.

AI Use Disclosure

Statement: During the preparation of this work, the author used Claude/Sonnet 4.6 in order to format the research into an acceptable version for publication/peer-review. After using this tool/service, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

[1] Oprea, E., Farcasanu, I.C., Rădulescu, V., Balotescu, C., Bucur, M., Lazar, V., *et al.* (2008) Chemical and Biological Studies of *Ribes nigrum* L. Buds Essential Oil. *BioFactors*, **34**, 3-12. https://doi.org/10.1002/biof.5520340102

[2] Australian Wildlife Conservancy (2024) Fighting Weeds and Feral Animals. AWC

Science Update. https://www.australianwildlife.org

[3] PestSmart (2024) Feral Pig Biology, Ecology and Behaviour. Centre for Invasive Species Solutions. https://www.pestsmart.org.au

[4] National Feral Pig Action Plan (2020) National Management Strategy for Feral Pigs (*Sus scrofa*) in Australia. Australian Pork Limited. https://www.feralpigs.com.au

[5] South Australian Landscape Council (2024) Ecological Side Effects of Pest Management. State of South Australia.

[6] Palaniyandi, S., Rao, A.M.K.M., Rao, N.S. and Reddy, P. (2013) Efficacy of Non-Poisonous Castor Based Repellent against Wild Boar (*Sus scrofa*) in Maize Crop around Hyderabad. *Pestology*, **37**, 26-29.

[7] Orav, A., Kailas, T. and Müürisepp, M. (2002) Composition of Blackcurrant Aroma Isolated from Leaves, Buds, and Berries of *Ribes nigrum* L. *Proceedings of the Estonian Academy of Sciences. Chemistry*, **51**, 225-234. https://doi.org/10.3176/chem.2002.4.04

[8] Marsol-Vall, A., Kortesniemi, M., Karhu, S.T., Kallio, H. and Yang, B. (2018) Profiles of Volatile Compounds in Blackcurrant (*Ribes nigrum*) Cultivars with a Special Focus on the Influence of Growth Latitude and Weather Conditions. *Journal of Agricultural and Food Chemistry*, **66**, 7485-7495. https://doi.org/10.1021/acs.jafc.8b02070

[9] USDA NRCS (n.d.) Plant Guide: Golden Currant *Ribes aureum* Pursh. United States Department of Agriculture, Natural Resources Conservation Service. https://plants.usda.gov

[10] Kansas State Forest Service (n.d.) *Ribes odoratum*—Buffalo Currant. Kansas State University. https://www.kansasforests.org

[11] Kimball, B.A. and Nolte, D.L. (2006) Development of a New Deer Repellent for the Protection of Forest Resources. *Western Journal of Applied Forestry*, **21**, 108-111. https://doi.org/10.1093/wjaf/21.2.108

[12] Cai, H., Su, D., Luo, A., Han, Y., Zhang, H., Kamau, P.M., *et al.* (2025) Molecular Defense Strategy of Volatile Organic Compound-Emitting Plants (Order Piperales) against Herbivorous Mammals. *Communications Biology*, **9**, Article No. 19. https://doi.org/10.1038/s42003-025-09273-4

[13] Jones, H.G., Gordon, S.L. and Brennan, R.M. (2015) Chilling Requirement of Ribes Cultivars. *Frontiers in Plant Science*, **5**, Article No. 767. https://doi.org/10.3389/fpls.2014.00767

[14] Missouri Botanical Garden (2024) *Ribes odoratum*—Plant Finder. https://www.missouribotanicalgarden.org

[15] Department of Climate Change, Energy, the Environment and Water [DCCEEW] (2023) Malleefowl (*Leipoa ocellata*). EPBC Act Priority Species Action Statement. Australian Government.

[16] Malleefowl Recovery Group (2013) Annual Mound Survey Report 2012-2013. Benshemesh, J. and Stokie, T. (Eds.), Malleefowl Recovery Group.