

# Potential beneficial and adverse effects to be addressed in the EPA application to introduce a flower bud gall wasp, *Trichilogaster acaciaelongifoliae*, and a seed weevil, *Melanterius ventralis*, as biological control agents for Sydney golden wattle (SGW).

Richard Hill, Richard Hill & Associates, [hillr@landcareresearch.co.nz](mailto:hillr@landcareresearch.co.nz), 021 1376919

The potential beneficial and adverse effects of new control agents for a range of terrestrial weeds have been identified systematically over the last ten years through formal brainstorming and through consultation with the public and professionals. This process has shown there is a suite of possible risks, costs and benefits that are common to most weed biocontrol proposals. Other effects are specific to each agent. Effects can result from:

- Introduction of a new element into the New Zealand fauna
- Reduction in density and abundance of the weed through successful biological control

Here is the list of effects identified. Those potential risks or benefits considered to be significant (the product of the magnitude of the effect and the frequency or likelihood of the effect) have been highlighted and will be addressed fully in the application. Those not considered to be significant (because they are speculative, or because the magnitude and/or likelihood of the effect is low or cannot be clearly envisaged) will probably not be addressed.

Please contact Richard Hill, preferably before 28 February 2019 if you have any comments about the approach to be used in the application, or to report additional potential effects.

Potential impacts on Māori values are addressed in a separate consultation process

## Potential beneficial effects

### *On the Environment*

**Bud galls and seed predation by weevils reduce seed production low enough to cause long term wattle population decline** See Section 5.1.1

**Bud galls and seed predation by weevils reduce seed production low enough to reduce colonisation of new sites** See Section 5.1.1

**Wasps produce galls large enough to cause stem dieback and death of existing plants** See Section 5.1.1

**Reduced competition with native seedlings improves survival of native plants. Loss of endangered species slowed** See Section 5.1.1

**Reduced incidence of SGW partially restores former natural vegetation, trophic webs and ecosystems** See Section 5.1.1

Reduced contamination of air, soil and water from reduced spraying	Not a significant benefit because there is currently little chemical control of SGW
Reduced incidence of SGW partially restores former natural vegetation, trophic webs and ecosystems	DOC does not consider SGW to be a significant weed in the conservation estate in NZ
Nutrient cycles enhanced or restored by increased leaf fall and nutrient turnover in the litter	Wattle leaves are tough and hard to break down. Although likely, this effect could only be very local and therefore not significant
Regeneration of native species is improved by Increased/decreased nutrient flows in weed patches	Uncertain causality, and local
Habitat for pest insects is reduced with declining SGW	SGW does not harbour pest insects
Introduction of new insect species increases biodiversity	Addition of two species is not a significant effect
Reduced fire risk in fire-prone habitats	SGW provides fuel in dry habitats but is not itself a notable fire risk
Benefits to parasitoid, predator and disease relationships in trophic webs	See section 5.1.2. Beneficial effects, like adverse effects, are not expected to be significant
Improved look and feel of affected habitats for visitors	
Successful control of SGW leads to improved invertebrate biodiversity in dunes and wetlands. Loss of endangered species through SGW invasion is slowed.	Little is known about the current effect of SGW on native species. Any effects would be local to SGW infestations in affected habitats, and therefore relatively rare.
Reduced cover for pest animals as SGW size and density is decreased by biological control	Benefit uncertain. Habitats with SGW may harbour more predators than habitats without it. Rats, mice and possums sheltered by SGW may affect populations of reptiles and large invertebrates.

*On Human Health*

Health of occupiers, conservation staff and volunteers is improved by reduced occupational exposure to herbicides	Herbicides applied according to label should not pose significant environmental risk. Treatment of SGW is rare. This effect is considered negligible
Reduction in flowering by gall production and feeding on pollen by weevils of weevils reduces allergies to SGW pollen	Not significant. It is not known if SGW contributes significantly to allergy symptoms in New Zealand, but any effects would be local.
Mental health in land managers is improved	The few managers involved are not known to be affected in this way. Unlikely to be a significant effect

## *On the Market Economy*

<b>Productivity of affected land is increased as biological control reduces the density and/or size of SGW plants</b>	See Section 5.3.1
<b>Cost of control for occupiers, regional councils, DOC, is reduced when successful biological control leads to reduction in SGW</b>	See Section 5.3.1
Management of control agents creates business opportunities for Manaaki Whenua Landcare Research and other entities	Not significant. Minimal and temporary benefit to a single entity.

## *On Society and Communities*

<b>Conservation values are improved following successful biological control as SGW is replaced with native vegetation</b>	See Section 5.1.1. Although a real effect, SGW is not currently considered to be a widespread weed in natural ecosystems in NZ.
Conservation volunteers and community resources are used better as the need to manage SGW is removed by biological control	Not significant. SGW management is not a significant target for volunteer work in New Zealand.
Landscape values improved by decline in SGW density	Overall this effect is not significant nationally.
Stress in conservation workers is reduced	Not significant except locally. SGW is not considered to be a significant weed in the overall conservation estate in NZ.

## Potential Adverse Effects

### *On the Environment*

<b>Native plant populations decline because control agents attack non-target plants.</b>	See Section 5.2.1
<b>Successful control reduces habitat quality for native fauna. Worse weeds invade habitats as SGW declines</b>	See Section 5.2.1
<b>Native parasitoid, predator and disease relationships are adversely affected by the Introduction of the control agents to native habitats</b>	See Section 5.2.1
<b>Food web interactions are adversely affected by the introduction of a new prey species. Indirect competition causes extinction of native insects</b>	See Section 5.2.1

**Selecting agent populations other than those tested leads to unpredicted non-target effects** See Section 5.2.1

Swift evolutionary change in insects leads to unexpected non-target damage to valued plants and/or alterations to food webs

Not a significant risk. Rapid evolution to expand the host range of a biological control agents has never been observed

Rapid removal of plants by biological control results in erosion and other unexpected habitat disturbances

Highly unlikely. Weevils feed only on seeds and flowers and cannot cause lethal damage to plants. Heavy galling could possibly lead to tree death, but in a timeframe that allows replacement vegetation to develop beneath. See Section 5.1.1.

Control agents hybridise with related resident insects

Not significant. There is no reason to suspect that either agent is capable of hybridising with NZ species

Susceptibility of SGW to herbicides is reduced by insect feeding, and application rates increase

SGW is not the target of significant herbicide control except in northern pine forests

Habitat quality for native fauna is reduced as SGW declines. Successful control leads to reduced invertebrate biodiversity in affected land

Not significant. SGW does not appear to host native species to any significant extent in the Far North

Changes in nutrient flows in weed patches adversely affects ecosystems

Except in heavily infested areas, nutrient flows are more likely to be structured by other disturbances than SGW dynamics.

The ability of SGW to rehabilitate contaminated soils is reduced by successful biological control

SGW is not known to fulfil this purpose in NZ at present. Other plants can fulfil this role.

The future of SGW as a source of phytochemicals is reduced through successful biological control

Not significant as the primary aim of the two agents is to reduce seed production rather than kill plants. Biological control does not preclude the future cultivation of SGW as a source of active substances, but protection of plants from the biological control agents using organic treatments might add to production costs

### *On Human Health*

Insects cause a nuisance indoors, public is fearful of insects, control agents bite or sting, control agents generate allergic response

Insects are host specific and will be rare except in the immediate vicinity of large SGW infestations. Dense stands of SGW are typical in dunes and wetlands, not near dwellings. The insects will not bite or sting.

Control agents need spraying with adverse effects to humans

Extremely unlikely that the control agents will require treatment

## *On the Market Economy*

**Heavy gall formation ruins the look of valued ornamental species, making sale in nurseries unprofitable**

See Section 5.2.3

**Successful biological control negatively impacts honey production by reducing a source of nectar for honeybees**

See Section 5.2.3. The value of SGW as a nectar or pollen source is uncertain. Value will be restricted to areas where SGW is abundant. New Zealand apiculture industry does not perceive SGW as a significant resource.

Successful biological control reduces revenue for contractors

Not significant. There is currently little or no treatment of SGW is by contractors.

Successful biological control leads to reduced herbicide sales significantly affecting vendors' businesses

Not significant. There is currently little or no treatment of SGW

Costs of controlling replacement weeds is higher than SGW

No similar replacement weeds are expected.

Feeding on agents increases wasp populations and hence wasp control costs

SGW habitats are not associated with high wasp populations or with systematic wasp control. All stages of the agents are hidden from predation by wasps except adult weevils. These are likely to make up only a small proportion of the diet of wasps in this habitat.

Adverse effects require costly agent eradication campaign

Agents are not expected to have significant adverse effects

## *On Society and Communities*

**Heavy gall production ruins the look of valued ornamental plants growing in home gardens**

See Section 5.2.3

Significantly increased incidence of wasp stings by wasp populations increased by eating agents

Not expected to contribute to higher wasp populations, see above.

Fear and distrust of exotic species and their possible non-target effects.

Cannot be mitigated. These insects will be largely invisible to the public, except for the presence of galls.