Potential beneficial and adverse effects to be addressed in the EPA application to introduce two insects (*Tetramesa romana* and *Rhizaspidiotus donacis*) as biological control agents for giant reed.

Richard Hill, Richard Hill & Associates, hillr@landcareresearch.co.nz, 021 1376919

The potential beneficial and adverse effects of new control agents for a range of weeds have been identified systematically over a range of projects in 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 all weed biocontrol proposals. Other effects are specific to particular agent and target weeds. Effects can result from:

- The introduction of a new elements into the New Zealand environment
- The reduction in density and biomass of the weed through 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 times 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 demonstrated) will probably not be addressed.

Giant reed is expected to be an important weed in New Zealand in the future but its distribution is still limited. Many of the projected benefits relate to future rather than current effects. Early intervention through biological control is expected to limit future adverse effects.

Please contact Richard Hill, preferably before 29 February 2016 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 of Biological Control

On the Environment

- **Reduced ability of giant reed to displace or exclude valued plants in vulnerable habitats such as wetlands and riverbanks.**
- **Reduced incidence of flooding and damage to infrastructure caused by lodging of giant reed biomass in waterways, culverts and behind bridges**
- **Reduced catastrophic erosion of stream banks**
- **Reduced competition for water in dry regions**
- **Reduced fire risk in fire-prone habitats**
- Benefits to parasitoid, predator and disease relationships in trophic webs from protection of native plants
- Partial restoration of natural vegetation, trophic webs and ecosystems
- Beneficial effects on natural nutrient cycles from increased nutrient turnover in the litter
- Introduction of new insect species increases biodiversity
- Reduced collateral damage to native plant species from spraying
- Reduced contamination of air, soil and water from reduced spraying
- Improved look and feel of native habitats for visitors
- Slowed loss of endangered species
- Improved invertebrate biodiversity in river and wetland margins

On Human Health

- Reduction in muscular strains to council and conservation staff and to volunteers caused by physical removal of giant reed
- Improved health from reduced occupational exposure of council and conservation staff and volunteers to herbicides

On the Market economy

- **Successful biological control leads to reduction in the cost of control for occupiers, regional councils, DOC, and others, including managers of transport corridors**
- Costs of controlling replacement weeds is lower than giant reed
- Management of control agents creates business opportunities for Landcare Research

On Society and Communities

- **Replacement of giant reed with other vegetation following successful biological control leads to improved public conservation values**
- **Successful biological control leads to better use of conservation volunteers and community resources**
- Landscape values improved by decline in giant reed density
- Reduction in stress in conservation workers

Potential Adverse Effects

On the Environment

- **Damage by two control agents reduces native plant populations**
- **Decline in giant reed abundance leads to invasion by worse weeds**
- **Introduction of the control agents to native habitats adversely affects native parasitoid, predator and disease relationships**
- **Food web interactions are adversely affected by the introduction of two new prey species. Indirect competition causes extinction of native insects**
- Control agents hybridise with related resident insects
- Swift evolutionary change in insect leads to unexpected non-target damage to valued plants and/or alterations to food webs
- Selecting agent populations other than those tested leads to unpredicted non-target effects
- Adult feeding on leaves reduces susceptibility of giant reed to herbicides, and application rates increase
- Successful control reduces habitat quality for native fauna
- Insect feeding changes nutrient flows in weed patches adversely affecting regeneration
- Massive stem death over a short time reduces quality of bordering streams
- Successful control leads to reduced invertebrate biodiversity in riparian margins

On Human Health

- Insects cause a nuisance indoors
- Public fearful of insects
- Control causes loss of future phytomedicines
- Control agents bite or sting
- Control agents generate allergic response
- Control agents need spraying with adverse effects to humans

On the Market economy

- **Damage on non-target plants significantly reduces the usefulness of valued ornamental species, making sale in nurseries unprofitable**
- Successful biological control leads to reduced herbicide sales significantly affecting vendors' businesses
- Adverse effects require costly agent eradication campaign
- Successful biological control reduces revenue for contractors and suppliers

On Society and Communities

- **Damage reduces the ornamental value of ornamental grass species currently growing**

- **Reduces the ability to use giant reed as a feed source for biofuel manufacture**
- Reduces the availability of giant reed as a source of fibre and framing for structures.
- Reduces the availability of giant reed as a source of woodwind reeds
- Significantly increased incidence of wasp stings by wasp populations increased by eating control agents
- Fear and distrust of exotic species and their possible non-target effects.