Potential beneficial and adverse effects to be addressed in the EPA application to introduce the mite *Aceria vitalbae* (family Eriophyidae) as a biological control agent for old man's beard.

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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 element into the New Zealand fauna
- The reduction in density and biomass of the weed through biological control

Old man's beard is an important environmental weed in New Zealand, and is widespread. Here is the list of effects identified for the current proposal. 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 bolded, 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.

Please contact Richard Hill, preferably before 12 May 2017 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

- **Increased survival of valued plants in infested habitats such as forest margins and light gaps.**
- **Reduced seed production and the probability of invasion of new sites.**
- **Reduced seed production and the probability of invasion of existing sites.**
- **Reduced competition with native plants, including native vines.**
- **Partial restoration of natural vegetation, trophic webs and ecosystems**
- Benefits to parasitoid, predator and disease relationships in trophic webs
- Beneficial effects on natural nutrient cycles from increased nutrient turnover in the litter
- Introduction of new species increases overall 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 forest margins
- Reduced habitat for pests such as passion vine hopper, leafrollers and possums, but also predators in lower stature vegetation
- Resumption of regeneration in some affected forest margins and other sensitive habitats
- Improved access to underlying resources for birds

On Human Health

- Reduction in muscular strains to council and conservation staff and to members of the public caused by physical removal of old man's beard
- 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 old man's beard
- Management of control agents creates business opportunities for Landcare Research

On Society and Communities

- **Replacement of old man's beard 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 old mans' beard density
- Reduction in stress in conservation workers

Potential Adverse Effects

On the Environment

- **Leaf damage by *Aceria vitalbae* reduces native plant populations**
- **Decline in old man's beard 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 a new prey species.**
- **Indirect competition causes extinction of native species**
- Control agents hybridise with related resident species
- Swift evolutionary change in the mite 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
- Damage to foliage reduces susceptibility of old man's beard 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
- Successful control leads to reduced invertebrate biodiversity in forest margins
- Higher rates of herbicides used because sub-lethal attack reduces leaf area available for uptake.

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 species currently growing**
- 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.