Application to

Release a new organism without controls

That is not a genetically modified organism

Figure 1. Rust pustules on Chilean needle grass and urediniospores of *Uromyces pencanus*

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ENVIRONMENTAL RISK MANAGEMENT AUTHORITY
ERMA New Zealand
NGĀ KAIWHAKATŪPATO WHAKARARU TAIAO

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Please note

This application form covers the import for release, or release from containment any new organism that is **not a genetically modified organism** under s34 of the Hazardous Substances and New Organisms (HSNO) Act. This form may be used to seek approvals for more than one organism where the organisms are of a similar nature with similar risk profiles.

Do not use this form for genetically modified organisms. If you want to release a genetically modified organism please use the form entitled *Application to release a genetically modified organism without controls.*

This is the approved form for the purposes of the HSNO Act and replaces all other previous versions.

Any extra material that does not fit in the application form must be clearly labelled, cross-referenced and included as appendices to the application form.

Confidential information must be collated in a separate appendix. You must justify why you consider the material confidential and make sure it is clearly labelled as such.

If technical terms are used in the application form, explain these terms in plain language in the Glossary (Section 6 of this application form).

You must sign the application form and enclose the application fee (including GST). ERMA New Zealand will not process applications that are not accompanied by the correct application fee. For more information regarding fees refer to our Fees and Charges Schedule on our website at www.ermanz.govt.nz.

Unless otherwise indicated, all sections of this form must be completed to the best of your ability for the application to be processed.

Please provide an electronic version of the completed application form, as well as a signed hard copy.

All applications to release new organisms are publicly notified. A hearing may also be required.

If you need additional guidance in completing this form please contact a New Organism Advisor at ERMA New Zealand or email noinfo@ermanz.govt.nz.

This form was approved on 6 May 2010 by the Chief Executive of ERMA New Zealand acting under delegation from the Authority.

Section 1: Application details

a) Application title

Release of the rust fungus *Uromyces pencanus* as a biological control agent for the weed Chilean needle grass

b) Organisation name

Marlborough District Council

c) Postal address

Marlborough District Council
PO Box 443
Blenheim 7201

Section 2: Provide a plain language summary of the purpose (including the proposed use) of introducing the organism into New Zealand and the associated benefits and risks

Marlborough District Council, along with other regional authorities, is required under the Biosecurity Act to manage weeds within their territories. Depending on the characteristics of a pest it is managed in a number of different ways. For pests that are well established, biological control in conjunction with other technical methods provides the most effective long-term control method. In many cases the Council therefore aims to establish biological controls with the aim of achieving an environmentally acceptable and cost effective method of control.

Biological control as a method of pest management introduces and establishes natural enemies that prey on or adversely affect a pest. Biological control helps to restore the natural balance between a pest and its environment. The benefits of biological control accrue widely and it is an environmentally friendly management solution. Consequently, the Council believes that there is substantial benefit across the district by the Council investing in appropriate biological control programmes. The Council will, for the duration of its current pest management strategy, provide financial and logistical support to research agencies for a service that includes supplying biological control agents, managing release sites, collecting data and training field staff (MDC, 2009).

The weeds to be managed are detailed in the Council's *Regional Pest Management Strategy* (MDC, 2009). This application to release *Uromyces pencanus* as a biocontrol agent for Chilean needle grass, or *Nassella neesiana* is made by Marlborough District Council, representing the National Biological Control Collective; a consortium of all regional councils and the Department of Conservation. Landcare Research, and its contractors, is the science advisor to the collective.

With respect to individual pests, Marlborough District Council considers that each warrants different types and levels of regional intervention and has classified each as either 'total control', 'containment control' or 'surveillance'. Chilean needle grass has been designated a containment control pest with the Council objective *"To prevent any increase in the distribution and density of Chilean needlegrass and reduce infestation levels where possible."*

Chilean needlegrass is an erect, tufted perennial grass from South America, which can grow up to one metre high in the absence of grazing. Plants form dense clumps, which exclude pasture species and are less palatable to stock thus reducing farm productivity.

Further, Chilean needlegrass seeds have sharp tip's, which can bore into the eyes and pelts of animals, thus harming them.

Managing farms to avoid Chilean needlegrass damage (by destocking for the 3 month period when seeds are present for example) is a serious economic cost to affected farmers (Harris (2010; Canterbury), Harris and Minehan (2001; Marlborough) and Hunter (2001).

Chilean needlegrass is more prevalent in Australia than it is in New Zealand, and has been described as "*.potentially the worst environmental weed of indigenous grasslands in Victoria*" (McLaren and Anderson 2007). It reduces biodiversity in native grasslands there, outcompeting indigenous species.

In New Zealand Chilean needlegrass is highly localised but spreading. Based on climatic information Chilean needlegrass has the potential to infest 15 million hectares of New Zealand. This includes one million hectares of high-producing pasture in Canterbury alone (Bourdôt 2010). Infestations currently occur in Auckland, Hawkes Bay, Marlborough and Canterbury. In Marlborough, 101 properties (2006) are known to be infested. Less than one percent of its potential range is infested with the total area of infestation estimated to be 4,311 hectares.

Past experience shows it is important to begin control as early as possible to achieve the best outcome.

We propose the introduction of the rust fungus *Uromyces pencanus*. As a disease of Chilean needlegrass it will reduce both its productivity and its competitive abilities with other species. *Uromyces pencanus* is host specific and dies without Chilean needlegrass.

The key beneficial effects of the introduction of *Uromyces pencanus* include:

- improved animal welfare,
- improved viability and sustainability of infested farms, and
- reduced future impacts of the weed by reduction in the rate of spread and final density.

We have undertaken safety testing to ensure that the introduction poses very little risk to native species. Despite rigorous testing we have found no evidence to suggest there will be any adverse effects from the release.

Section 3: Identification of the proposed organism(s) to be released

Family:	Pucciniaceae
Genus and Species:	*Uromyces pencanus* Arth. & Holw.
Common name(s):	No common name is known
Brief description (morphological and biological):	*Life history* *Uromyces pencanus* infects the leaves of Chilean needlegrass (CNG) (*Nassella neesiana*) and forms reddish-brown pustules on the underside of the leaves (Figure 1). The erupting pustules break through the outer 'skin' of the leaf, leading to water loss and death of the leaf. The pustules are made up of hardy spores that can spread long distances in the wind which allows rapid dispersal. When these spores land on leaves of CNG and germinate, fungal hyphae invade the leaves to grow alongside and compete with leaf cells for nutrients. This debilitates CNG, reducing its growth rate, vigour and seed production. *Damage in the native range* *Uromyces pencanus* has caused severe infections and foliage death of CNG in the field in Argentina, especially under hot, dry conditions. Overall, the rust reduces seed production and plant growth rates. A full description of the organism can be found in Barton et al. (2011).

Section 4: Identification of positive and adverse effects

a) Identify any possible positive/beneficial effects of the organism(s) that you are aware of (including those that were identified during consultation).

i. On the environment:

Scenario

CNG has a limited distribution in New Zealand but continues to spread. In 1987 CNG infested approximately 1,500 ha in Marlborough, but by 2005, there were 96 properties totaling 4,300 ha (Bell 2006).

We have therefore made two assumptions in our assessment:

(1) the affected area is small but will continue to increase. We assumed this increase would reach model predictions of 15 million hectares (Bourdôt 2010) ; and

(2) the benefits stem from (a) a reduction in density of CNG and (b) CNG spreading at slower rates than would otherwise happen..

The applicant with science support from Landcare Research has undertaken a process of identifying all risks and benefits. Marlborough District Council acknowledges that over the short term the benefits will be low. However, over the long term the benefits are significant given the potential distribution of CNG. In order to ensure that any risks are acceptable we have chosen to assess the rust as establishing fully across the range. Below we have supplied all the potentially significant benefits and risks. Details of the formal risk assessment can be found in Hill (2011)

Increased native biodiversity from:

- **reduced competition with native grassland species**

CNG is an aggressive species known to outcompete other plant species. While it could potentially threaten native species at the moment the main concern is to pastoral land. It has only been found in one reserve and the threat to high country grasslands is small (Bourdôt 2010). Aside from direct benefits to the environment, biological control would decrease the adverse effects resulting from herbicide use and other weed management techniques

It is simply too hard to estimate the impact CNG could have on native biodiversity and the real case for control is based around the damage it will do to agricultural land.

We have therefore ranked this benefit as our lowest.

ii. On human health and safety:

No significant benefits were identified

iii. On the relationship of Māori and their culture and traditions with the environment :

No significant benefits were identified.

iv. On society and communities:

Improved animal welfare from:

- **reduced blindness in grazing animals, wild animals, working dogs and pets**
- **reduced skin damage to grazing animals, wild animals, working dogs and pets**

In Argentina Chilean needle grass is known as *flechilla* (little dart). This is because the sharp hard callus at the base of the seed enables the seeds to bore into the skins and eyes of grazing animals (Bourdôt, 2010). This obviously results in painful and potentially debilitating wounds particularly for lambs which can often be stabbed in the eyes.

As the biological control agent attacks and damages CNG it will reduce the number of seeds produced. Fewer seeds reduce the chance of animal injury.

Aside from the economic benefits of increased animal welfare (assessed below) there is a large social benefit. People simply do not like animals being hurt. The Marlborough District Council recognizes that measuring this effect is near impossible. We have therefore only ranked it as our second highest benefit.

v. On the market economy:

Improved farm profitability from:

- **decreasing the incidence of pelt and carcass damage by seeds**
- **reduced blindness in grazing animals, wild animals, working dogs and pets**
- **reducing the displacement of more palatable grasses**
- **increasing the value of affected land**

Farming, the backbone of New Zealand is a business devoted to (at its simplest) growing and selling animals. Therefore anything which harms these animals or reduces their food supply is obviously detrimental.

CNG does both. Animals are hurt from the sharp hard callus at the base of each seed and CNG is less palatable to animals than other forage crops. To top it off more than 70% of the known CNG incursions occur in "high producing pasture" (Bourdôt, 2010).

The rust to be introduced infects the leaves of CNG. This ruptures the outer layer of the leaf increasing water-loss (Duniway and Durbin 1971) and potentially killing it. Multiply this across a number of leaves and the plant grows slower, produces less seed and is less successful.

Any reduction in the vigour of CNG will obviously benefit farmers. The real question is how much. Quantification is difficult but anecdotal evidence suggests the benefit may be large. For example the Hawke's Bay Regional Council commented that:

"Chilean needle grass is a major problem for landowners in Hawke's Bay, not only for the harm it causes to farm animals (including dogs), but also for the decrease in productivity of infested land in the late spring/summer periods" (Darin Underhill, pers. comm. in Hill 2011).

In Australia heavy infestations can decrease agricultural productivity by as much as 50% during summer (Department of the Environment and Heritage, 2003).

Despite our inability to quantify the impact of the release, we expect this to be our largest benefit and have ranked it as our most significant.

b) Identify any possible adverse effects/risks of the organism(s) that you are aware of (including those that were identified during consultation):

i. On the environment and New Zealand's inherent genetic diversity including any displacement of native species and deterioration of natural habitats:

Reduction in indigenous biodiversity from:

- **native plants becoming infected**
- **apparent competition mediated by shared natural enemies**

The rust poses very little direct risk to native plants in New Zealand because its host range is almost certainly restricted to CNG (Barton et al, 2011). It is so specific in fact, that certain populations within the target species are not affected. This testing has been carried out by researchers in Argentina and has involved the testing of 65 closely related taxa including 12 populations of the target weed and 7 cultivars of wheat (Barton et al, 2011). During testing no spores formed on any non-target species. This suggests they were all capable of resisting the infection. There is no evidence to suggest that the rust can complete its development on non-target species.

Based on the evidence provided and following expert advice from our science partner Landcare Research we conclude that there is very little risk of native plants being infected.

Some fungi known as mycoparasites can attack rusts. These often have a wide host range and are known to occur in New Zealand. Hypothetically, the introduction of an additional species such as *U. pencanus* could increase mycoparasite spore loads, which in turn could suppress other fungi, increasing the risk to valued native species.

Given that rust fungi are common in New Zealand there would only be a small increase from the result of the introduction.

The impact on mycoparasite populations would be negligible and therefore we did not consider this a significant risk to native fungi.

ii. On human health and safety:

No significant effects have been identified.

iii. On the relationship of Māori and their culture and traditions with the environment:

No significant effects have been identified.

iv. On society and communities:

No significant effects have been identified.

v. On the market economy:

Reduction in valued biodiversity from:

- **infecting of native or valued non-target plants**
- **apparent competition mediated by shared natural enemies**

Above we assessed the impact on native biodiversity from releasing the rust species. The same risk applies to valued species which are not native. Again we would like to reiterate that there is no evidence to suggest that there will be any adverse outcomes and therefore we do not consider this significant.

d) Please answer "yes" or "no" to the following:

	Yes	No
1. Can the organism cause disease, be parasitic, or become a vector for human, animal, or plant disease, (unless this is the purpose of the application)?		✓
2. Does the organism have any inseparable organisms that cannot be managed by MAF Biosecurity New Zealand?		✓
3. Does the organism have any affinities with other organisms in New Zealand that could cause an adverse effect to either organism that you have not identified elsewhere?		✓
4. Can the population be recovered or eradicated if it forms an ***undesirable*** self-sustaining population?		✓

i. Briefly summarise the reason for each of your answers above:

1. *Uromyces pencanus* is a pathogen of plants, but it is specific to CNG. It cannot live on other hosts and will die without the presence of CNG.
2. No inseparable organisms have been recorded on *Uromyces pencanus* in its native range.
3. Known mycoparasites of rusts are present in New Zealand. It is not known whether *U. pencanus* would be susceptible to resident mycoparasites, or whether the net environmental effects of hyperparasitism would be adverse or beneficial.
4. The object of introducing *U. pencanus* to New Zealand is to establish desirable, self-sustaining populations of this rust as a biological control agent for CNG wherever it occurs. Rusts are notoriously capable of large scale dispersal and once introduced it would be extremely hard to eradicate any population.

Section 5: Is there any other relevant information that has not been mentioned earlier?

Potential for an alternate host in the life cycle Rusts have complex lifecycles that can include one to five different spore states, some of which can occur on plants other than the main host. In such cases the main and alternate hosts are usually not closely related. For example, the main host may be a grass and the alternate host might be a tree or shrub. Based on all available evidence the applicant considers that *Uromyces pencanus* has a single (main) host, and that host is CNG (Barton et al. 2011). In field and laboratory studies *U. pencanus* has produced only two spore states: urediniospores and teliospores. These have been found on CNG but on no other plant. At a site in Argentina where CNG plants were followed for a year, researchers failed to find *U. pencanus* on any plant other than CNG. Despite considerable effort in the laboratory, it was not possible to induce teliospores to germinate and/or form basidiospores. This is important because without basidiospores the rust cannot colonise an alternate host. More detailed evidence, and a discussion of life cycles and alternative hosts can be found in Barton et al. (2011).

Post release monitoring

Post-release monitoring is an issue always raised as part of releasing a new organism. It is our goal to monitor release sites for the establishment of biological control agents. The applicant has every intention of undertaking this monitoring, but without guaranteed funding we cannot guarantee that it will occur. It is for this reason we do not believe a control requiring this monitoring is justified.

Release of the entire species

The Marlborough District Council with the support of Landcare Research considered whether or not the release application should be for the single isolate UP 27 or the entire species. It was our opinion that all U. *pencanus* isolates will have essentially the same host range. The Council therefore decided to not limit the application to a single isolate.

The isolate UP 27 was selected because of the five isolates tested, it had the broadest host range. Therefore, if isolates of this rust have a spectrum of 'narrow' to 'broad' host ranges within the species *N. neesiana*, UP 27 is at the 'broad' end of it.

Evolution of host range and Hybridisation

We consider that there is no reasonable risk that *Uromyces pencanus* will evolve a wider host range in future, or that it will hybridise with rusts already present in New Zealand. The evidence for these views is presented in Barton et al. (2011).

Section 6: List of appendices and referenced material (if applicable)

a) List of appendices attached

Appendix Number	Title

b) List of references used – hard copies must be attached to the application form.

Author	Title and Journal
	Barton J, Anderson FA, and McLaren D 2011.The biology and host range of the proposed biological control Agent *Uromyces pencanus*. Unpublished report. Bell MD 2006. Spread of Chilean needle grass (*Nassella neesiana*) in Marlborough, New Zealand. New Zealand Plant Protection 59: 266-270. Bourdôt G 2010. Chilean needle grass (*Nassella neesiana*) – a review of the scientific and technical literature. Unpublished report for: Chilean Needle Grass Action Group. Department of the Environment and Heritage 2003. Chilean needle grass (*Nassella neesiana*) weed management guide Duniway, J. M. and R. D. Durbin (1971). "Some effects of *Uromyces phaseoli* on the transpiration rate and stomatal response of bean leaves." Phytopathology **61**: 114-119. Harris S 2010. Meeting the requirements of the Biosecurity Act 1993: economic evaluation of regional pest management strategy for plant pests - Report (on Chilean needle grass) prepared for Environment Canterbury. Christchurch, Harris Consulting. Pp. 16. Harris S, Minehan B 2001. Meeting the requirements of the Biosecurity Act 1993: Economic evaluation of the Regional Pest Management Strategy. A Report Prepared for Marlborough District Council Hill RL 2011. Public consultation and risk assessment for the proposed introduction of *Uromyces pencanus* as a biological control agent for Chilean Needle Grass. Unpublished report for the Marlborough District Council. Hunter R 2001. Chilean needle grass – Financial technical and social impacts of farming

	within the Marlborough District Council region. Unpublished report to Marlborough District Council. McLaren D, Anderson F 2007. Application for an agreed host specificity testing list for the rust fungi Uromyces pencanus, Puccinia nassellae and P. graminella for biological control of Chilean needle grass, Nassella neesiana in Australia. . Frankston, Victoria, Australia, Cooperative Research Centre for Australian Weed Management: 28 pp. MDC http://www.marlborough.govt.nz/Environment/Biosecurity/Regional-Pest-Management-Strategy-and-Operational-Plan.aspx MDC 2007. Containment control pests - Marlborough District Council. http://www.marlborough.govt.nz/content/docs/environmental/regulatory/RPMS_07_P32-36.pdf. 14 September. Weeds of National Significance accessed 14 December 2010: http://www.weeds.gov.au/publications/guidelines/wons/pubs/n-neesiana.pdf

Section 7: Declaration and signing the application form

In preparing this application I have:

- taken into account the ethical principles and standards described in the ERMA New Zealand Ethics Framework Protocol (http://www.ermanz.govt.nz/resources/publications/pdfs/ER-PR-05-1.pdf);
- identified any ethical considerations relevant to this application that I am aware of;
- ensured that my answers contain an appropriate level of information about any ethical considerations identified, and provided information about how these have been anticipated or might be mitigated; and
- contacted ERMA New Zealand staff for advice if in doubt about any ethical considerations.

I have completed this application to the best of my ability and, as far as I am aware, the information I have provided in this application form is correct.

Signed ________________________________ **Date** ________________

Signature of applicant or person authorised to sign on behalf of applicant

Before submitting your application you must ensure that:

- all sections are completed;
- appendices (if any) are attached;
- copies of references (if any) are attached;
- any confidential information identified and enclosed separately;
- the application is signed and dated;
- your application fee has been paid or is enclosed; and
- an electronic copy of the final application is e-mailed to ERMA New Zealand.