Appendix A. Sample expert opinion survey on the probability of eradication of aquatic non-indigenous species.

Expert opinion on probability of eradication of aquatic non-indigenous species

Purpose of survey

Basing environmental management decisions on scientific evidence, as opposed to experiential knowledge, is expected to improve the efficiency of environmental management actions. However, before advocating the use of data-based tools, it is imperative to evaluate how they perform compared to expert knowledge. The goal of this survey is to compare the value of expert knowledge with that of a newly-developed evidence-based tool, in the field of control of aquatic non-indigenous species.

The survey has two sections. In the first section, you will be asked to evaluate the importance of various factors on the probability of eradicating a non-native population. In the second section, you will be asked to judge the probability of success of case studies coming from a bank of real eradication attempts when details are provided.

On the rest of this page, a few questions about your professional experience are asked

1. I am a/an

- Academic researcher
- Government researcher
- Environmental manager
- Other (please specify)

2. Number of years of experience working with aquatic non-indigenous species (0 if no experience)

3. Number of years working in control of aquatic non-indigenous species (0 if no experience)

4. My field of expertise is in

Section 1. Importance of various factors on the outcome of eradication operations

The goal of this section is to gather information about what factors are perceived as being influential on the outcome of eradication attempts. Expert opinion will then be compared with the results of a numerical analysis of published case studies.

1. Taxonomy. Rank the following broad taxonomic groups in order of feasibility of eradication. Perceived ties can be indicated by using the same rank more than once. The same rank can be used for all groups if taxonomy is perceived as having no effect on probability of eradication. 1=easiest, 3=hardest to eradicate

Aquatic plant/macroalgae	
Aquatic invertebrate	
Aquatic vertebrate	

2. Habitat type. Rank the following habitat types in order of feasibility of eradication operations. Perceived ties can be indicated by using the same rank more than once. The same rank can be used for all habitats if this factor is perceived as having no effect on probability of eradication. 1=easiest, 4=hardest to eradicate.

Marine intertidal	
Marine subtidal	
River/stream	
Lake/pond	

3. Spatial extent of population. A small population (in terms of spatial extent) is _____ to eradicate than a larger one of the same species

- easier
- equally hard
- harder

4. Population status. Rank the following population status in order of feasibility of eradication operations. Perceived ties can be indicated by using the same rank more than once. The same rank can be used for all status if this factor is perceived as having no effect on probability of eradication. 1=easiest, 3=hardest to eradicate

Introduced (not breeding)	
Established (breeding)	
Invasive (causing problems)	

5. Control method. Rank the following control methods in terms of efficiency in achieving eradication. Perceived ties can be indicated by using the same rank more than once. The same rank can be used for all methods if this factor is perceived as having no effect on probability of eradication. 1=most, 4=less effective

Mechanical (i.e. physical removal)	
Biological	
Chemical	
Combination of any of the above	

6. Containment. Taking actions to prevent spread of individuals from or to the target area, either with physical structures or through restrictions to human access _____ the probability of eradication.

- Increases
- Has no effect on
- Decreases

7. Duration. Eradication programs that continue for a long time (including post-treatment monitoring) have a _____ probability of success than shorter operations.

- Lower
- Similar
- Higher

8. Rank the following factors (described above), from highest to lowest, in terms of their importance on the outcome of eradication programs. Perceived ties can be indicated by using the same rank more than once. 1=most, 7=less important

Taxonomy of target species	
Habitat type	
Spatial extent of population	
Population status	
Control method	
Containment	
Duration	

Section 2. Probability of success for detailed case studies

The details of real operations attempting to control aquatic non-indigenous species are given below. With the information provided, give the perceived probability that the program will succeed at eradicating the population, both qualitatively and quantitatively. If you recognize the case study and know the outcome, check the appropriate box and do not make predictions for that case study. Note: ignore the id# code; these are used for referencing to case studies. The precision of expert opinion will be compared to that of a numerical model developed using the same case studies.

1. A population of crayfish (average 6-9 cm in carapace length), with a history of invasion elsewhere, was detected in two connected man-made ponds (total area of 7400 m2). It is believed to have been intentionally introduced. The crayfish were breeding and females of this species brood eggs and release fully-formed juveniles; it mostly spreads through movement of the benthic stages. A year and a half after first detection, an 8-month program was started; water level of the ponds was lowered and ponds were treated with a chemical known to kill crayfish. id 18

- I recognize the case study
- Eradication is very unlikely
- Eradication is unlikely
- Eradication is likely
- Eradication is very likely

Probability of eradication (from 0=impossible, to 1=certain)

2. A breeding population of a small fish (average adult length of 5 cm), with a history of invasion elsewhere, was discovered in 3.2-ha lake. The fish reached really high densities and was replacing native species. Natural dispersal occurs through movement of adults and the fish was likely introduced accidentally with sport-fish stocking. Within 3 years of first detection, a 6-month program was started; the lake was treated with a proven piscicide. id 24

- I recognize the case study
- Eradication is very unlikely
- Eradication is unlikely
- Eradication is likely
- Eradication is very likely

Probability of eradication (from 0=impossible, to 1=certain)

3. A population of a salt-tolerant plant (growing to over 1 m high), with a history of invasion elsewhere, was present in the intertidal zone around a major city. The plant spreads through asexual reproduction and by seeds carried around by currents. The plant probably arrived by natural dispersal of a nearby infested area. At the start of the operation a population was present in a 220-ha area (with ~ 1% of the area covered) out of the 165 000-ha potential habitat. The plant has had several consequences on the ecology of the intertidal zone in other infested areas. Two months after detection, a 6-year program was started; plants were hand pulled and buried manually. id 44

- I recognize the case study
- Eradication is very unlikely
- Eradication is unlikely
- Eradication is likely
- Eradication is very likely

Probability of eradication (from 0=impossible, to 1=certain)

4. A floating aquatic plant (growing to over 40 cm in height), with a history of invasion elsewhere, was discovered in a man-made ditch located in a marsh area. The plant was likely introduced through the ornamental plant trade and spreads by asexual reproduction and fragmentation. At the time of discovery, the plant was completely covering a 1-km long ditch with an average width of 2 m (total area 2000

m2). Five months after discovery, a mesh screen was placed at the outflow to prevent further dispersal, and a mechanical digger was used to remove the plants. This was followed by hand picking of fragments. The program lasted for a year. id 62

- I recognize the case study
- Eradication is very unlikely
- Eradication is unlikely
- Eradication is likely
- Eradication is very likely

Probability of eradication (from 0=impossible, to 1=certain)

5. A plant (growing to 5-6 m maximum length), with a history of invasion elsewhere, was detected in a 4-ha urban pond. This plant can completely dominate native aquatic vegetation and it disperses through asexual reproduction and fragmentation. It also produces a dormant stage lasting an estimated maximum of 4-7 years. The likely initial vector of introduction was escape from the ornamental trade. Within a month of first detection, an 18-year program, using proven herbicides and mechanical removal was started. id 80

- I recognize the case study
- Eradication is very unlikely
- Eradication is unlikely
- Eradication is likely
- Eradication is very likely

Probability of eradication (from 0=impossible, to 1=certain)

6. A growing population of a marine brown alga (growing to a few meters in length), with a history of invasion elsewhere, was found in a ~ 1000 ha bay used for bivalve aquaculture. This alga has a microscopic resting stage that lasts up to 3 years. Spores settle near parents, but adults can detach and tumble with currents. The alga was found on the structures of 3 farms covering ~23 ha. Within a month and a half of first detection, a

6-year program was started, which consisted of manual removal of algae by scuba divers and aquaculturists. id 103

- I recognize the case study
- Eradication is very unlikely
- Eradication is unlikely
- Eradication is likely
- Eradication is very likely

Probability of eradication (from 0=impossible, to 1=certain)

7. A species of semi-aquatic amphibian (10-15 cm adult length) swam across a marine channel and reached a 6.5-ha island. The species was breeding well in the only water body on the island: a 0.06-ha man-made pond. This species was thought to negatively influence species of rare birds. Approximately 18 years after the establishment of the population, a 5-year program was started. The pond was completely isolated using a physical barrier. Adults that were trying to get to the pond to breed, and juveniles trying to leave the pond after the larval stage, were collected by hand. id 120

- I recognize the case study
- Eradication is very unlikely
- Eradication is unlikely
- Eradication is likely
- Eradication is very likely

Probability of eradication (from 0=impossible, to 1=certain)

8. A floating plant (up to 20 cm high), with a history of invasion elsewhere was introduced in a slow-flowing river at an unknown time through unknown vectors. This plant can completely cover water bodies and change the ecosystem dynamics considerably. It mostly spreads with water currents as adult. The 12-km long river was infested, for a total area covered of 16-20 ha. A 6-year program was conducted. A

natural insect enemy was successfully introduced and herbicide treatments were applied. id 142

- I recognize the case study
- Eradication is very unlikely
- Eradication is unlikely
- Eradication is likely
- Eradication is very likely

Probability of eradication (from 0=impossible, to 1=certain)