

THE NATIONAL INVASIVE SPECIES COUNCIL (NISC)



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GUIDELINES FOR RANKING INVASIVE SPECIES CONTROL PROJECTS

Version I (May 2005)

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A. INTRODUCTION:

Invasive species issues challenge all of us everyday. Whether you are formally tasked with land management or simply active in exploring and protecting ecosystems, dealing with the threats presented by the multitude of terrestrial, aquatic, or microbial invasive species is a complicated matter. The National Invasive Species Council (NISC) has been tasked, since the signing of Executive Order 13112 in 1999, with assisting in the coordination of efforts to combat invasive species. The NISC developed the National Invasive Species Management Plan (Plan) and Action Item #32 of the Plan states: *By January 2003, NISC will develop and issue guidance for ranking the priority of invasive species control projects at local, regional, and ecosystem-based levels. The guidelines will provide for consultation with expert individuals and organizations, including consultation with the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), the Aquatic Nuisance Species Task Force (ANSTF), Council on Environment and Natural Resources (CENR), and regional, State, tribal, and local agencies, affected industries, and private landowners.*

These guidelines were written by federal and non-federal members of the Control and Management Subcommittee of NISC's Invasive Species Advisory Committee (ISAC). Input was received from a broad range of experts. The intent of these guidelines is to assist in the prioritization and optimization of invasive species control and management efforts in minimally-managed or "natural areas." Land managers are encouraged to utilize these guidelines and then provide feedback to ISAC and NISC as to their usefulness and impact. Guidance is provided in accordance with the definitions and principles presented in the National Invasive Species Management Plan.

Many crops, pets, livestock, and ornamental plants are not native to the United States. Although many nonnative species are beneficial or benign, a small proportion of these species cause serious problems in their introduced ranges, and they are called invasive species collectively. Invasive species are defined in Executive Order 13112 as species that are alien to the ecosystem under consideration whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, or microorganisms, and they are found in a wide range of terrestrial, freshwater, and marine habitats. Invasive species areas can:

- Impact plant and animal communities;
- Interfere with natural resource management operations;
- Reduce threatened and endangered species populations;
- Damage cultural and historic resources;
- Reduce the value of forest and grazing lands;
- Alter fire frequency;
- Hybridize with native species;
- Lessen timber production;
- Interfere with outdoor recreation activities;
- Consume ground water,
- Increase soil erosion;
- Reduce water quality;

- Interfere with military training exercises;
- Transmit pathogens to other species;
- Clog waterways and irrigation systems;
- Exclude, parasitize, or attack other species,
- Alter nitrogen and carbon cycling;
- Impact human health; and
- Cause other environmental and economic impacts.

Adequate control methods for certain invasive species may not exist or be feasible in certain situations and/or populations may be very widespread. In such cases, eradication may not be possible and the only feasible objectives may be to slow the rate of range expansion and/or lessen the impacts of invasive species through control and management efforts. Highly complex invasive species efforts will require managers to establish long-term management objectives that may rely upon a variety of short to longer-term management tools.

Control and management of invasive species by NISC member agencies and bureaus will be accomplished using modern resource management methods, including an Integrated Pest Management (IPM) approach. The IPM approach considers the best available scientific information, updated target population monitoring information, and the effectiveness of control methods in selecting and implementing a range of complementary and environmentally sound technologies and methods to achieve desired objective(s). These methods may include:

- 1) Cultural practices (e.g., controlled grazing, controlled burns, timbering, reducing host populations, food source removal, composting, and water level manipulation);
- 2) Restraining dispersal (e.g., fencing, using invasive species resistant construction materials, avoiding the transfer and spread of additional invasive species propagules, and electric and physical aquatic dispersal barrier construction);
- 3) Mechanical removal (e.g., hand-removal, netting, trapping, culling, mechanical harvesting, and mowing);
- 4) Chemical control (e.g., use of vaccines, herbicides, insecticides, rodenticides, fungicides, bactericides, molluskicides, piscicides, and other agents);
- 5) Biological control (e.g., release of selective biological control agents such as host-specific predaceous/herbivorous/pathogenic/parasitic organisms); and
- 6) Interference with reproduction (e.g., pheromone-baited traps, release of pheromones to disrupt mating, and release of sterile males).

Several complementary actions may be taken simultaneously and over time within an overall IPM strategy, and the costs of these actions may be considered when determining overall invasive species control budgets. Examples of actions that support an IPM strategy for invasive species include:

- Monitoring, inventorying, surveying, collecting voucher specimens, and mapping;
- Planning, budgeting, prioritizing, and coordinating efforts;
- Training;
- Telecommunication;
- Travel;
- Contract management and supervision;
- Inspection and permitting;
- Law enforcement;
- Public outreach efforts;
- Signing and trail closures;
- Equipment acquisition,
- Storage, transport,
- Sanitation, and maintenance;
- Use of weed-free forage, mulches, and other materials;
- Worker safety and protection efforts;
- Closing roads and waterways;
- Restocking and replanting;
- Data analysis;
- Research;
- Conducting user surveys;
- Partner and stakeholder communication; and other actions.

Managers may utilize compensated employees, contractors, and/or volunteers to implement IPM strategies. The objectives of management practices may be complex. However, the objectives of invasive species control and management efforts need to be clearly understood, thoroughly evaluated, and periodically reevaluated. For example, certain control actions are “site-based” and focused on a location where invasive species control may be one of several objectives. Other projects may be “species-based” and focus on the control of an invasive species at several locations. Examples of control objectives include:

- Invasive species eradication within a localized area;
- Protecting uninfested areas from invasive species;
- Preventing invasive species reintroduction following localized eradication efforts;
- Invasive species population suppression;
- Limiting dispersal of invasive species through management of dispersal corridors and pathways;
- Mitigating the impacts of invasive species;
- Inhibiting the reproduction and spread of invasive species;
- Fostering the recovery of plant and animal communities;
- Gaining an improved understanding of invasive species impacts and control method efficacy.

It is a fact that resources available to control and manage invasive populations are often limited relative to the number, size, and complexity of projects. Resource managers, policy makers, and others frequently prioritize control and management projects, as well as actions

within projects. NISC has endeavored, with input from a wide range of experts, to provide this document to assist decision makers and others when allocating resources, such as time or money to invasive species projects. Resource managers and others are encouraged to more consistently and effectively evaluate the relative priority of current and proposed invasive species control projects, as well as actions within projects, and to take prioritized action. These guidelines are general rather than specific to a taxon, aquatic or terrestrial system, region, or particular geographic scale. They are not intended to supercede or substitute for experience, professional judgment, site-specific information, or established policy. These guidelines (Version I) will be revised as science, technology, and knowledge of systems and species advance.

B. CONSIDERATIONS FOR SETTING PRIORITIES:

The following are suggested factors to consider when prioritizing control projects.

1. Does the invasive species or resource have a specific statutory or policy designation? Certain invasive species have a State and/or Federal designation as “noxious” or “injurious to wildlife.” Some invasive species are pests of quarantine significance or threaten public health or safety. Additionally, species and populations may have a specific designation because of public policy, such as those identified in strategic management plans and directives. Projects directed at these species may be assigned a high priority. However, certain invasive species may exhibit a high current and/or potential impact, but they have not yet received statutory or policy recognition.

2. Is NEPA compliance and other coordination in place?

Certain actions may involve the development of National Environmental Policy Act (NEPA) documentation and consideration of the Administrative Procedures Act and provisions in the Endangered Species Act, Executive Order 13112, Endangered Species Act (ESA), State law, Local ordinances, and other statutes. Laws may require public notification, permitting, licensing, bonding, recording, and other formal steps to be taken. NEPA requires the consideration of the alternatives. In some cases, categorical NEPA exclusions may have been established and other advanced steps accomplished that allow control actions to be taken. Projects should have proper planning, notification, coordination, oversight, and review in place before proceeding, such projects may be assigned a high priority.

3. Are adequate and environmentally sound management methods and resources available?

Effective and environmentally sound management strategies and sufficient resources may be available for certain species and situations. Populations that can be controlled may receive a high priority. However, populations that do not have adequate controls may be assigned a high research priority. The environmental impacts of invasive species control efforts should be compared with the environmental impact of the invasive species when no action is taken.

4. Can target population(s) be reached and management measures deployed successfully and safely?

Certain populations may be inaccessible (e.g., invasive plants may infest steep mountain draws) or may occur in extremely sensitive areas (e.g., near those threatened and endangered species, cultural resources; or waterways), greatly restricting control options and the efficacy of certain treatments in those areas. Control methodologies, such as certain biological or chemical control

methods that can be successfully deployed and monitored may receive a higher priority for populations that cannot be reached easily.

5. Can the efficacy of control be determined? Do the selected control measures produce a consistent result? Is there a high probability of long-term success?

Although the efficacy of certain control methods may be high under some conditions, efficacy may also vary greatly as conditions change. Control methods that exhibit consistent efficacy may be assigned a higher priority than less consistent approaches. Understanding factors that influence efficacy may be a high research priority. Adaptive management of invasive species populations requires the acquisition and analysis of information concerning treatment efficacy. The efficacy of projects that can be monitored successfully may receive a higher priority than those that cannot be evaluated sufficiently. Certain management efforts may have a high probability of initial success. However, conditions such as frequent disturbance, continuing reintroduction of the target invasive species, and high likelihood of invasion by other invasive species, and other conditions may negate the benefits of control efforts. Actions that have a transitory benefit may receive a low priority until the conditions that limit the likelihood of sustained success can also be addressed. However, repeated actions within long-term IPM programs may be required to constrain certain invasive species and mitigate their impacts and by that provide a sustained benefit. Programs that provide a sustained benefit may be assigned a high priority.

6. What resources and materials are available for the restoration of plant and animal communities?

Plant and animal communities may be able to recover with little additional inputs following invasive species control efforts. However, in some cases, the impacts of the invasive species and the likelihood of reinvasion are great and restocking or replanting may be required. Projects that have sufficient restoration materials and capacities to deploy those materials may be assigned a high priority.

7. Is the scheduling of management actions optimal? During certain periods control actions may have a greater efficacy than at other times. For example, chemical and biological control agents can vary in their effectiveness over the growing season. Conducting operations before a species reproduces may prevent dispersal or over wintering of the target species. Although the availability of resources, compliance with ESA considerations, and other factors may restrict actions during the period that is biologically optimal for control, projects scheduled for implementation during periods that increase their efficacy may be assigned a high priority.

8. Are the current and potential social, economic, and/or cultural impacts of the invasive population or species significant?

Invasive species can endanger cultural, religious, medicinal, recreational, and historic resources. They can reduce fish and game populations; alter interpretative sites; reduce the aesthetic and commercial value of resources; harm livestock, forage, and timber production; and harm human health directly. The severity and likelihood of the social and/or economic impacts may increase the priority assigned to projects.

9. Does the target invasive species provide few or little economic, social or environmental benefits?

Certain invasive species may at times provide fur, food, fiber, fuel, game, or other benefits. While, others many provide little or no benefit. Species that provide significant economic benefits may receive a low control priority initially until non-invasive alternatives or other management strategies can be identified and used.

10. Is there sufficient decision-maker support for sustained action?

Invasive species projects often require a sustained commitment to planning, coordination, adequate funding, staffing, training, facility and capacity acquisition and maintenance, monitoring, data analysis, and allocation of required resources. Even brief interruptions in support can negate years of past gains. Insufficiently supported projects may fail. Support for projects may lessen over time as control efforts become successful and the impacts of invasive species diminish. Projects that do not have sufficient or sustained support from decision makers may receive a low priority until adequate support can be obtained. Information concerning the benefits of invasive species when actions are inadequate and impacts when absent or inadequate should be obtained and presented with input from stakeholders and partners.

C. PERFORMANCE EVALUATION:

Adaptive Management: The adaptive management of invasive species requires the acquisition and analysis of data (monitoring) concerning the efficacy of control actions and any impacts associated with the application of control measures. Projects should be evaluated and approaches altered, if needed, as data is gained and analyzed. Monitoring strategies need to be considered in management plans and be conducted to acquire the necessary data.

Project Objectives: Control objectives (i.e., what constitutes success) may be complex, and they should be identified clearly. Control objectives may include: invasive species eradication within a local area; limiting range expansion of invasive species populations; reductions in the impacts within infested areas; recovery of plant and animal communities; and other objectives. Identifying control objectives may require extensive consideration. For example, if the control objective is the recovery of plant and animal communities, determining what is “success” may require further definition and analysis. The process of adaptive management may include a reexamination and alteration of the control objectives and monitoring strategies as information is gained.

Types of Metrics: It is important to determine what parameters to measure and how they will be measured so that the attainment of control objectives can be evaluated. Both quantitative (e.g., percent reduction in invasive species biomass or density per hectare), and qualitative (e.g., surveys of visitor’s satisfaction with an area) assessments may be used. Metrics used to evaluate project efficacy are sometimes referred to as performance measures. Data concerning the impacts of control operations should also be collected and evaluated and used to guide the adaptive management of invasive species. Such data will also be useful in evaluating the long-term impacts of invasive species management.

The economic, social, and environmental impacts of invasive species are the impetus for control actions, and determining the effects of control actions on the impacts associated with invasive

species can provide a valuable means to evaluate actions. However, certain impacts, (e.g., increased fire frequency, declines in native plant and animal populations, and soil erosion) may be caused by a complex array of factors, only one of which is invasive species. Accurately determining the relative contribution of invasive species to a particular impact parameter may be difficult. In addition, invasive species may have impacts that have not been identified yet and/or may become quantifiable only after long periods.

Information concerning the invasive species population patterns may be more readily obtainable than data related to impacts. For example, the density of invasive species within an area; the frequency of infected host individuals; the rate of invasive species range expansion; and the change in the number of plots with a particular invasive species present are examples of the wide variety of metrics that may be used. The most appropriate and readily obtainable metric(s) may differ among taxa, regions, season, and habitat types. In addition, information concerning non-target species and initial conditions should be obtained to establish “baselines” for invasive species population trend analysis and to understand the deflection of trends following control actions.

Invasive species control efforts are often multi-disciplinary and multi-jurisdictional. Complex projects may have distinct metrics that correspond to elements within the larger project. For example, a survey and mapping efforts may be required to guide invasive species control actions as well as serve other functions. However, the performance measure(s) for the supportive mapping efforts will differ from those of the “direct” control actions. In addition, as phases of a project are completed, performance measures may change. For example, the performance measures for an initial planning and species survey effort would differ from those of subsequent control phases of a project. Therefore, a single project may have multiple performance measures that may change over time.

D. PRIORITIZATION TYPES:

Prioritization may refer to projects that are a priority in terms of timing, such as urgent projects that need to be undertaken quickly to take advantage of optimal conditions for control of a species or actions that are a priority because they need to be taken before others. In addition, prioritization may refer to the proportion of the available resources that should be devoted to a project. Prioritization documents should be clear as to whether projects or a priority in terms timing, resources, or both.

E. MANAGEMENT TOOLS:

A wide and ever-changing number of tools are available to managers. NISC’s website (www.Invasivespecies.gov) contains information and links to additional information that will be of service to managers. Managers may wish to begin with the “Managers Tool Kit” page on this site.

The Alien Plants Ranking System (APRS) is a computer-implemented system to help land managers make difficult decisions concerning invasive non-native plants and it is available at: www.npwrc.usgs.gov/resource/2000/aprs/aprs.htm. APRS provides an analytical tool to separate the innocuous species from the invasive ones (typically around 10% of the non-native species). APRS helps identify those species that currently impact a site, and those that have a high

potential do so in the future. Finally, the system addresses the feasibility of control of each species.

The Nature Conservancy (TNC) weed handbook is available at:
<http://tncweeds.ucdavis.edu/handbook.html>.

The U.S Army Corps of Engineers Aquatic Plant information System (APIS) is available at:
www.wes.army.mil/el/aqua/apis/biocontrol/html/apis_bio.html.

The Center for Invasive Plant Management's 2003 Invasive Plant Prevention Guidelines (please see www.weedcenter.org) provides information concerning invasive plant prevention on lands and water, and with livestock/wildlife and fire practices.

The publication entitled; "After The Gorse Has Bolted—Seven Habits Of Highly Effective Weed Programmes" by Ian Popay and Susan Timmins of the Department of Conservation, Private Bag 112, Hamilton, New Zealand, ipopay@doc.govt.nz; and Department of Conservation, PO Box 10420 Wellington, stimmins@doc.govt.nz, respectively contains a list of points—"essential ingredients"—to consider when ranking invasive species projects (see below). They state that, "Proactive management is the way to handle invasive plants that have bolted—escaped border controls or garden boundaries, and become established in and threaten ecosystems. Having plans and structures allows us (country, industry, or agency) to deal quickly with *new* weeds, and effectively with *widespread* weeds."

The seven essential ingredients are*:

- 1) **Be proactive.** Get ready - have strategies and tools in place *before* the next batch of invasive species turns up.
- 2) **Begin with the end in mind.** Appropriate objectives ensure we know where we are going—what we want to do to the weed and what we want to achieve in the affected environment.
- 3) **Put first things first.** We need to prioritize which invasive species are worth controlling and at which sites invasive species control is most beneficial.
- 4) **Seek to understand** the way invasive species spread and their impact on ecosystems rather than simply demonizing invasive species.
- 5) **Getting everyone involved** requires co-ordination between organizations. The public also plays its part in spotting invasive species.
- 6) **Actively control** invasive species. We can eradicate or contain invasive species, control them to protect precious sites or, occasionally, give up. The management practice we choose depends on the species and the location. It's important to get it right.
- 7) **Sharpen the saw**—assess our progress towards our set objectives using scientifically robust monitoring, evaluation, and if necessary re-jigging our future management.

*Adapted with permission from Ian Popay, Department of Conservation, Private Bag 112, Hamilton, New Zealand, ipopay@doc.govt.nz; and Susan Timmins, Department of Conservation, PO Box 10420 Wellington, stimmins@doc.govt.nz

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