



Invasive Plant Management
Decisions and
Environmental Analyses



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Process Considerations

This is the first in a series of five discussion papers on The National Environmental Policy Act of 1969 (NEPA) and invasive plant management. Nothing in this paper constitutes new direction outside of existing direction in the Code of Federal Regulations (CFR) and Forest Service Directives. The purpose of the paper is to spur thoughtful discussion and consideration in applying NEPA policies to invasive plant management.

This paper discusses several process-related considerations and strategies related to NEPA and invasive plant management: decisions and documentation.

Decisions

There are several key decision considerations that need to be made early to ensure that the responsible official's decisions will be effective in meeting program and project objectives. The questions that need to be asked are: 1) Who is responsible for making the decision? 2) What approvals and permits need to be obtained before making the decision and/or before implementation?; and 3) Is the decision to be implemented over many years or over a relatively short time frame?

- 1. Responsible Official** – Identify and clarify who will make what decisions. The responsible official is the agency employee who has the delegated authority to make and implement a decision on a proposed action, Forest Service Manual (FSM) 1950.41. This is not always an easy question to answer. Get clarification early.
- 2. Approvals, Permits, Concurrences, and Other Authorizations** – Identify any approvals, permits, concurrences, and other authorizations necessary for making the decisions and/or for implementing them. Clarify who will be making approvals, who is making the decisions, and the timing of these decisions and approvals FSM 2152 and Forest Service Handbook (FSH) 2109.14 address pesticide use approvals and concurrence. Certain activities within designated wilderness areas require Regional Forester approval (FSM 2323.04c (9), 2151.04a (1)). Concurrence from Fish and Wildlife Service, and pesticide applicator licensing are examples of other approvals and concurrences. It is important to clarify who should be involved and at what point in the analysis and decision process.

3. Implementing Decisions Over Time – What is the expected duration of the decisions?

Short-term project decisions are typically made to address a specific infestation or project. These decisions and corresponding environmental analyses address immediate problems and usually constitute limited actions over a limited time period, such as over one or two seasons. In these instances there is limited need for flexibility in the decisions or the environmental documents since they will be used only for a short time period.

Long-term project decisions are implemented over years and even decades. Thus, the decisions need to be clear, and flexible enough to be used over the long-term. They need to incorporate periodic reviews of the assumptions, data, and analyses on which the decisions were based. In such cases, the decisions being made need to be carefully and clearly presented so they can be correctly interpreted over the life of the decision and can be adjusted as necessary in the future.

A companion paper on “adaptive management” explains one strategy for making long-term decisions without having to initiate a new NEPA process every time a change is needed. Decisions will anticipate change and incorporate avenues for necessary incremental responses to change. Decision documents need to be clear about how such strategies will be achieved and how additional information, data, and analyses will be incorporated during implementation. Even with careful consideration, unforeseen events can occur that will require additional analyses. Unanticipated events can result in new NEPA documents and decisions. The Forest procedure for addressing these new analyses, documents and decision is thoroughly explained at FSH 1909.15, Section 18.

Another strategy for long-term invasive plant decisions is to incorporate weed prevention and treatment decisions as part of other site-specific project decisions. This is particularly applicable to projects such as roads, rights-of-way, utility corridors, trails, recreation and administrative facilities, and other ground disturbing activities where we anticipate invasive plant problems and expect to maintain these projects over the long term. By making invasive plant treatment and prevention decisions as part of the construction and maintenance decisions for the long-term, we will be able to respond to infestations in a timely manner.

Documentation

This section briefly covers the types of environmental documents typically used for invasive plant management decisions as well as some strategy considerations for choosing the type of documentation.

Environmental Impact Statement (EIS) -The National Environmental Policy Act of 1969 (NEPA) requires a “detailed statement by the responsible official” for “major Federal actions significantly affecting the quality of the human environment.” The Council on Environmental Quality (CEQ) regulations defines this detailed statement as an EIS and the meaning of a “major Federal action” and the term “significantly”. In addition, an EIS must be used when actions may have significant effects. The Forest Service requires an EIS for certain “classes of actions” (FSH 1909.15, §20.6). Two classes of actions are applicable to invasive plant management:

“Class 2: Proposals to carry out or to approve aerial application of chemical pesticide on an operational basis.”¹

or

“Class 4: Other proposals to take major Federal actions that may significantly affect the quality of the human environment.” The other class of actions ties back to NEPA requirements for a detailed statement:

When there are emergency circumstances with significant environmental impacts that make it necessary to take actions to control the immediate impacts of the emergency, the Forest Service can consult with the Council on Environmental Quality about alternative arrangements to the normal EIS process. In these rare situations, it is important to quickly involve the Regional and Washington Offices. To date, alternative arrangements with the Council have not been used for invasive plant situations.

Categorical Exclusions – A categorical exclusion is “a category of actions which do not individually or cumulatively have a significant effect on the human environment and which have been found to have no such effect in procedures adopted by a Federal agency and for which, therefore, neither an environmental assessment nor an environmental impact statement is required” (40 CFR 1508.4). The Department of Agriculture and the Forest Service have established categories of actions that can be excluded from documentation in an EIS or an EA (FSH 1909.15, Chapter 30). The categories can be used when there are no extraordinary circumstances related to the proposed action that are identified as potentially having effects which may significantly affect the environment. Categories that have typically been used for weed control include: “Repair and maintenance of

¹ Class 4 actions may be covered under “program environmental impact statements and tiered site-specific environmental documents or by the preparation of site-specific environmental impact statements.” (FSH 1909.15, 20.6)

administrative sites” (FSH 1909.15, Section 31.1b, 3), and “Repair and maintenance of recreation sites and facilities” (Section 31.1b, 5).

There are no categories which cover the use of herbicides or biological control agents other than those described for use in administrative and recreational sites.

Environmental Assessments - Environmental Assessments (EAs) are used “to document the results of environmental analyses and to disclose the environmental consequences for proposed actions that are not categorically excluded from documentation and for which the need for an environmental impact statement has not been determined” (FSH 1909.15, Chapter 41). The EA is intended to be a brief, concise statement that supports the findings of no significant impact.

Other Documentation – Consider inventories, assessments, analyses files, documents, maps, species lists, pesticide risk assessments, forest plans and other sources of information as an important part of an ongoing records system for long-term invasive plant management. How information is stored, updated, shared, displayed, used, and referenced can influence the agency’s ability to adapt and make timely decisions with efficient implementation. We will discuss this in the next section.

Documentation Strategies

For most short-term project decisions, a fairly simple decision with the appropriate EIS, EA, or categorical exclusion should be rather straightforward. However, strategies for long-term project decisions where a responsible official wants to make decisions that will allow for timely implementation over many years take much thought and organization to be successful. Here are some documentation considerations:

- Update inventories and conduct assessments on a regular basis (not just when engaged in the NEPA process) so information will be current and accessible at all times.
- Identify and respond to changing conditions and new information on an ongoing basis and assess the need to make changes to decisions. Document these interim analysis and assessments and include in the record.
- Construct environmental documents and decision documents in such a way that they can be easily updated by supplements to EISs and revisions to EAs, as new information and analyses is appropriate.
- Consider using an EIS for long-term project decisions that will best hold up to challenges. Decisions using adaptive management strategies that are to have a long life could benefit from having a strong defense against legal challenges. Otherwise, the efficiencies of making fewer

decisions with adaptive mechanisms built in can be diminished. It may be difficult to defend a “finding of no significant impact” (FONSI) for long-term decisions as uncertainty arises over the “significance” of effects, interested parties change, and decisions are periodically reviewed in light of new information and changed circumstances.

- When an environmental assessment is used, extensive experience with applying herbicides along with current knowledge of their effects based on updated risk assessments and monitoring can provide the evidence for findings of no significant impacts
- Consider appropriately using a categorical exclusion or EA where it is clear that the effort needed to make and implement the decision will be simplified and faster than unnecessarily using the EIS process and documentation

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Scale (scope)

This is second in a series of five discussion papers on The National Environmental Policy Act of 1969 (NEPA) and invasive plant management. Nothing in this paper constitutes new direction outside of existing direction in the Code of Federal Regulations (CFR) and Forest Service Directives. The purpose of the paper is to spur thoughtful discussion and consideration in applying NEPA policies to invasive plant mana

Environmental analyses for the control of invasive plants have been prepared over a variety of scales from a single site to programmatically for an entire region. In the 1980's the BLM prepared a Weed Control EIS for the entire western United States. Many of the same factors on scale, which apply to any analysis, also apply to NEPA and invasive plants.

What is the scale or area that can or should be covered by the analysis, including lands outside Forest Service jurisdiction? The answer to this question is best addressed by answering the following three questions:

- What is the scope of the *problem* to be solved?
- What is the scope of the *actions* to take, including alternative actions?
- What is the scope of the *environmental effects*?

The answers to these questions will identify geographic areas that the analysis will cover; however, answering each question will usually identify different, although often overlapping geographic areas.

Scope of the Problem

Defining the scope of the problem is often a difficult, yet necessary first step in any analysis. The more complex the problem, the more essential it is to spend time at this step. Invasive plant problems are typically complex. Invasive plants spread quickly along transportation corridors, waterways, roads and trails and from these vectors into adjacent landscapes, including lands outside Forest Service jurisdiction. The analysis should feature vector or pathways for the spread of invasive species such as roads and trail systems, streams, grazing allotments and recreational facilities. Weeds will be carried and spread along these vectors. Weeds spread through disturbed, low seral communities and through relatively undisturbed, high seral communities like Research Natural Areas and Wilderness Areas. Traditional ecological boundaries like ridge tops and rivers are seldom boundaries for weeds. Given that invasive plants can occur across an entire landscape, the challenge is to logically limit the scope of problems to address in one analysis to those that need to be logically addressed together.

Defining the problem/s to be solved serves as the purpose and need for proposing action under NEPA. It is important to recognize that problem assessment and definition can be done outside of the NEPA process. Clearly define the scope of the problem before proposing an action and triggering NEPA.

Scope of the Actions

Effective weed management and control requires cooperation and treatment across all ownerships. Treatment areas are often defined by road systems and property boundaries rather than ecological characteristics like watersheds. Weeds seldom occur in isolation. It is not reasonable to consider the treatment of an individual infestation when other adjacent untreated sites can reinfest the area. Developing Weed Management Areas² (WMA) can often be a useful tool for planning and prioritizing weed treatments in a geographic area. WMA often include lands across all ownerships. All connected actions must be analyzed and considered together under the same environmental analysis (40 CFR 1508.25):

Actions are connected if they:

- I. Automatically trigger other actions which may require environmental impact statements.
- II. Cannot or will not proceed unless other actions are taken previously or simultaneously.
- III. Are interdependent parts of a larger action and depend on the larger action for their justification.

Actions constitute the proposal and alternatives being considered to fix the problem. A single treatment will seldom “fix” a weed infestation. Because of the nature of invasive plant problems, actions are likely to be complex, involve multiple land ownerships and will take years to implement. Seeds can remain viable in the soil for 15 years or more. Sites, particularly along trails and roads can be reinfested. It is likely that a site will be treated in multiple times over multiple years. It is important to recognize these subsequent actions as “connected and possibly cumulative” (40CFR 1508.25(a)(1) & (2))

The range of alternative actions considered in noxious weed treatment proposals include the proposal, no action, and any number of alternatives that fix the problem and address the significant issues associated with the proposal.

An important consideration for proposed actions that may initiate or exacerbate noxious weed problems in the future is to include weed prevention practices as well as expected treatments as mitigation actions being considered under the proposal and alternatives. The Forest Service has compiled a list of potential prevention practices at website <http://fsweb.ftcol.wo.fs.fed.us/>.

² Guidelines for the Coordinated Management of Noxious Weed Management Areas.1999.

Scope of the Effects

The logical scale for an analysis should take into consideration the environmental consequences of treatment itself (proposal and alternatives) and the consequences of nontreatment (no action – what would happen if you did not meet your purpose and need). A logical boundary for the environmental consequences of pesticide use may be watersheds, but one needs to first have an understanding of the cause-effect relationships between the actions being proposed (including alternatives) and the effects. This includes both the effects on invasive plants (the intended consequences) and the side effects (unintended consequences) due to the actions. The scope of analysis for each side effect will usually vary. For example, the scope of the effect of an herbicide on an endangered plant may differ from the scope of the effect of the herbicide on human health. The scope would also be different for effects on fish vs. effects on visual quality.

Cumulative effects need to be considered for every proposed action, it is not necessary (and sometimes not advisable) to propose, analyze, and decide on all of the actions associated with those effects in the same NEPA and decision process, unless the actions are connected (see above under scope of the actions). Include consideration of the effects of both action and inaction on nonfederal lands as well. Also, when analyzing for cumulative effects, consider all actions potentially contributing to the effects of concern, not just other invasive plant related actions. For example, a water quality analysis associated with a proposed invasive weed herbicide application would include the effects of a nearby herbicide application for a reforestation project or potential chemical effects from a nearby bridge painting project.

The scope of the problem, the actions, and the effects define the total scope or scale for the analysis.

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Adaptive Management – A Strategy for Site Specific Environmental Analysis When Events and Circumstances Are Uncertain

This is third in a series of five discussion papers on The National Environmental Policy Act of 1969 (NEPA) and invasive plant management. Nothing in this paper constitutes new direction outside of existing direction in the Code of Federal Regulations (CFR) and Forest Service Directives. The purpose of the paper is to spur thoughtful discussion and consideration in applying NEPA policies to invasive plant management.

How can we satisfy the requirements of site specificity in NEPA compliance when we cannot specifically describe all of the treatment conditions necessary for invasive plants, including infestation locations, species, treatment timing, and effectiveness over an effective time frame?

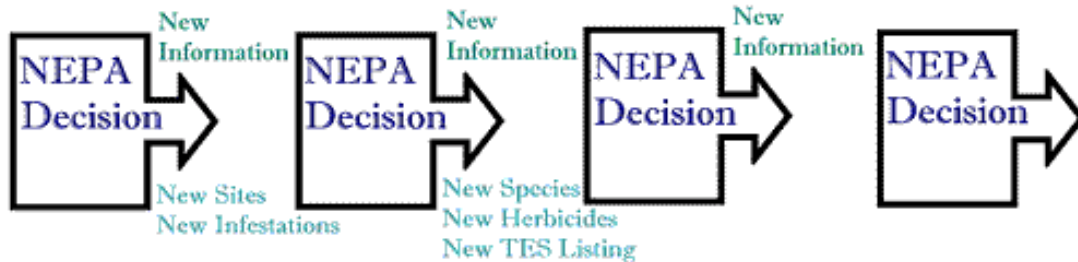
A common mantra in NEPA is to clearly define the proposed action, narrow the scope of the decision and be site specific. This is challenging for invasive plant treatment decisions. Weed Infestations constantly change and evolve, making it difficult to keep a proposal and eventual decision current. The most complete inventory will never cover the entire potentially infested area. It is certain that not all infestations can and will be mapped. Even under the assumption that an inventory is 100% complete, by the time the inventory is finished; infestation size and number will already be changing in areas inventoried early in the survey. A single plant can produce more than 100,000 seeds. In the southern latitudes, plants can produce seed three times a year. Three plants can expand to ½ an acre in a single growing season; ½ an acre can expand to ten acres during the same period. The same difficulty applies to itemizing individual weed species. The most accurate surveys will only include the species and the locations found at the time of the survey. New infestation and new species are usually the highest priority for treatment. Decisions that are specific to known locations and species do not allow for treatment of these areas that were unknown at the time of the decision. Likewise, newly approved herbicides may become available that are better suited to an application than those approved in the decision. The time necessary to complete new and or additional analysis can take six months to a year. New populations can expand during this waiting period. Treatment costs can increase or the opportunity of containing the populations can be lost.

Adaptive Management Strategy

An adaptive management strategy offers an avenue to describe and evaluate the consequences of changing invasive plant infestations and treatment. An

adaptive management strategy requires site-specific explanations of what the agency will do under various conditions and the environmental consequences of those actions. This requires more design and analyses in the NEPA process than decisions made about more definitive proposals. As conditions change, the agency monitors the situation, conducts additional analysis, and responds within the framework of the original decision (Figure 1).

Typical Model



Adaptive Model

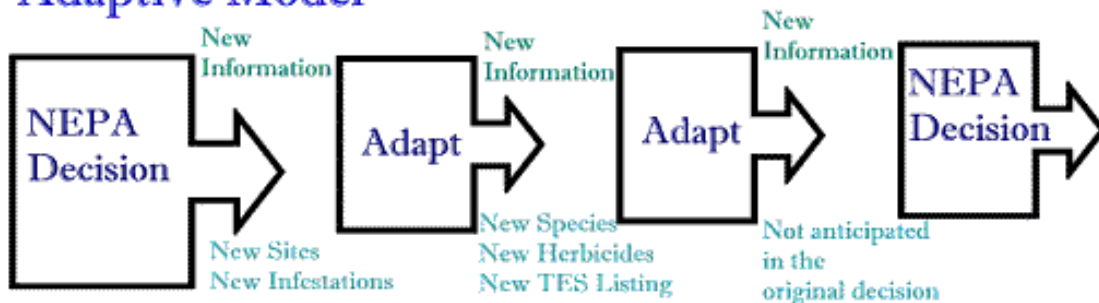


Figure 1: The NEPA Model

While the typical NEPA model returns to the NEPA process in response to new information and changed circumstances, the adaptive model accounts for anticipated changes as part of the original decision with fewer needs to revisit the NEPA process.

We will cover adaptive management as it relates to project design, environmental effects analysis, and monitoring, evaluation, and change. This paper also covers using Forest Service Handbook procedures for addressing new information and changed circumstances after decisions are made.

Project Design

An integrated weed management approach¹ for addressing invasive plant problems is particularly suited for an adaptive management strategy. The

¹ Integrated Weed Management (IWM) is defined as a system for the planning implementation of a programs, using an interdisciplinary approach, to select a method for containing or controlling and undesirable plant species or group of species using all available methods including – education;

proposed action is defined by invasive plant treatment objectives and how and when treatment will occur as shown in Figure 2.

Highest Priority for Treatment:

- New species and new infestations (Category “A” or “I”, new to the state, county or region)
- Areas of high traffic and sources of infestation, parking lots, trailheads, horse ramps, gravel pits (All weed categories)

Second Priority for Treatment

- Containment of existing infestations
- Roadsides
- Category A or I Weeds (these are from state invasive plant list, species that are required for treatment)

Third Priority for Treatment

- Control of existing infestations
- Treatment of Category “B” or “II” weeds

Fourth Priority of Treatment

- Control of Category “C” or “III” weeds
- Eradication of Category “A”

Figure 2: An example of an adaptive management

An example of an adaptive management approach showing how weeds would be treated without listing individual species or individual sites by including the most current and accurate inventories.

The adaptive management approach anticipates change in the analysis and decision-making, it does not preclude the need for information on existing infestations and the planned treatment. The most current and accurate inventories would be included along with an explanation of their accuracy. The analysis should also include the expected changes and expansion of these existing populations over time. A current invasive plant list for the area could be included as appendix material or incorporated by reference. The analysis and documentation should also include the process for incorporating new species and changes in infestations over time. A range of the treatment acres, and /or an approximation of percent land area intended for treatment (expressed as a range) across a geographic area would be included. A breakdown of the current inventory and how it fits into the priority classification would be given. This estimation would form the basis for the environmental consequences section, along with various management strategies.

It is often helpful to create analysis areas, which highlight or features areas of concern such as: herbicide applications in and around water, municipal watersheds, research natural areas and, wilderness areas. Special

[prevention; physical or mechanical methods; biological control agents; herbicide methods; cultural methods and general land management. It is a multidisciplinary, ecological approach to managing unwanted plant species – weeds.

considerations or restrictions such as herbicide application in certain soil types can also be identified. Riparian areas may be identified as a separate management area, with specific mitigation and monitoring requirements. The decision may be to treat weeds with mechanical, biological or cultural methods within a certain distance from a stream or could include specific instructions for herbicide treatments in streams and riparian areas.

Environmental Analysis

Environmental analysis for decisions using an adaptive management strategy would typically require more involved environmental effects analyses than a more traditional approach. This is because of the need to predict effects based on a range of changing conditions. Likewise, there will be different effects based on different applications for specially designated areas such as municipal watersheds and wilderness areas. Basically, the environmental effects and the interpretation of effects would need to cover the range of actions (locations, acres, species, treatments, and timing) anticipated as part of the adaptive management strategy.

An approach is to use existing invasive plant location data and the likely locations where species will spread to, based on modeling, professional judgment and knowledge of vectors and habitats. The effects analysis is then based on the likely acres that will be treated in a single year. The anticipated acres of treatment, in any given year, are based on modeling of a worst case scenario, budgets, manpower and ecological considerations. New weed species can be incorporated or anticipated in the analysis, because it is highly likely that they will appear and spread from known vectors and pathways of invasions.

Monitoring, Evaluation, and Change

Monitoring is essential to implementing a long-term adaptive management strategy from three perspectives: implementation, program treatment effectiveness, and environmental effects.

Implementation Monitoring - Adaptive management strategies require implementation monitoring to determine whether we did what we said we were going to do. This is a necessary step in order to determine whether actions are taking place as described in the environmental document. Monitoring needs to include the timing of actions and mitigation. If actions are not timely, they may not be effective and if mitigation measures are not implemented, effects may be different from what was predicted.

Treatment Effectiveness Monitoring - Long-term adaptive management approach is based on changing conditions. The invasive plant infestation conditions need to be monitored in order to know when it is appropriate for action to be taken and whether that action is effective. If treatment is not

effective, the decision maker would review the strategy outlined in the adaptive management decision to determine whether treatment actions need to be changed.

Environmental Effects Monitoring - Are the effects as predicted? The environmental effects of the implemented actions need to be monitored so we can show that our predicted effects are valid. This is critical for long-term programs such as invasive plant control because we will need to periodically address whether or not our decisions and the basis for those decisions are still valid as we continue to implement them year after year. Monitoring effects will provide us a basis for staying on course or modifying decisions in the future. Invasive plant treatment decisions can be made despite uncertainty. While we may not know everything about how an infestation will progress into the future, we have decades of experience in this field and should use our experience and expertise to plan for and decide on likely future events. An adaptive management approach requires more analysis and complexity in the decision; however, such decisions can be valid for many years because they have built-in flexibility, especially when new information and changed circumstances are assessed on a regular basis.

Addressing New Information and Changed Circumstances

Forest Service Handbook 1909.15, Section 18 addresses new information and changed circumstances. This section lays out procedures for changing documentation in environmental impact statements, environmental assessments, and categorical exclusions as well as subsequent decisions based on the new information or changed circumstances. Using this procedure under an adaptive management decision will facilitate keeping the project record current and provide a basis for defending potential legal challenges when implementing the decision.

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Analyzing the Effects of Herbicide Use

This is the fourth in a series of five discussion papers on The National Environmental Policy Act of 1969 (NEPA) and invasive plant management. Nothing in this paper constitutes new direction outside of existing direction in the Code of Federal Regulations (CFR) and Forest Service Directives. The purpose of the paper is to spur thoughtful discussion and consideration in applying NEPA policies to

There are environmental consequences for all invasive plant treatment methods. However, it is herbicide use, which emerges as the most controversial of the control methods. The effects of herbicides are raised as an issue in virtually all actions that propose their use. Pesticide effects fall into two broad categories. The first category is general direct and indirect effects of herbicide use to the environment, target and nontarget species and human organisms. Many of these effects are described in detail within the literature and risk assessments. The second category is effects to specific organisms, such as threatened and endangered plants, when herbicides are applied at label rates.

Identifying the site-specific effects of herbicide use mirrors the challenges previously described in the discussion paper on adaptive management. Herbicide use follows the dynamic weed infestation across the landscape. Analyzing the potential effect of herbicide use is further complicated by the occasional need to incorporate new chemicals and new application rates for existing chemicals. How then can we describe the effects of herbicide use in this ever-changing situation?

Components of the Proposed Action

Any site-specific proposal, including an adaptive management proposed action, should be clear and specific under what conditions herbicides will be applied, the geographic areas in which treatment will occur, and the range or an approximation of the acres that will be treated with herbicides. There must be a clear description of the decision process or criteria that will be used to assign the treatment type (rather than the individual chemical and/or rate for each site). The proposed action would include the following:

- All herbicides will be applied strictly in accordance with the label directions.
- All state and federal pesticide laws will be adhered to.
- Herbicides will be applied under the direction of a licensed applicator.
- An approximation or range of acres to be treated with herbicides, by geographic and/or analysis area
- Any mitigation measures

In a traditional NEPA approach, a specific herbicide and an application rate were assigned to each infestation. Chemical effectiveness and application rates for invasive species are continually evolving. For example, the recommended application rate for Tordon (picloram) on spotted knapweed dropped from 2 pounds to a quarter pound per acre over the last 15 years. Existing chemicals are being tested for their effectiveness on wildland weeds. New chemical rates or use of alternate chemicals could constitute an action outside the scope of a traditional analysis and trigger a new decision under NEPA. Under the adaptive management strategy additional chemicals and differing rates can be considered, as long as the effects are within the range of effects analyzed, chemicals are applied under label instructions and a risk assessment for the chemical has been prepared. New chemicals and new rates can then be analyzed and considered like any other new information (see Adaptive Management Figure 1).

Describing the Effects

The following factors may be helpful in the analysis and decision:

- Paint a clear picture for the decision maker and the public of where the invasive plants are and where treatment will occur. Include as appendix or in the project file, material the most current weed inventory; describe how and when inventories will be updated. Include the locations where these updated inventories can be viewed.
 - Include best information on location by:
 - Species
 - Percent cover
 - Area
 - Pattern on the landscape
 - Any special management concerns, such as distance to water
 - Likely changes to current infestations over time; areas where expansion of existing populations is likely
- Approximate the acres or the range of acres that will be treated annually.
 - Describe the arrangement and abundance of treatments across the landscape. These acres will form the basis of analysis of effects.
- Describe in detail the decision process or matrix that will be used to determine treatment type, at any given site, in a given year.
- Clearly state the relative abundance of each treatment type: mechanical, biological and chemical. Treating three to four thousand acres of weeds using an Integrated Pest Management (IPM) or Integrated Weed Management (IWM) leaves the reader with the impression that there will be an equitable split of treatment by mechanical, biological and chemical.

If experience and analysis indicates that it is likely that 90% of the treatment will occur with herbicide, that information should be disclosed.

- Specify measures that will minimize human exposure to chemicals. For example:
 - In high traffic areas such as: trailheads, parking lots, campgrounds, administrative sites, parking, treat:
 - Before the season
 - Before or after the peak season
 - On week days rather than weekends
 - If necessary temporarily close facilities like campgrounds to minimize exposure.
 - Consider signing in areas where human exposure is likely.
 - Work with native peoples to minimize exposure from gathering food and fiber materials.
 - Avoid treating fruiting plants when they are bearing fruit.
- For invasives the “no action” alternative is a critical component of the analysis. The no action alternative displays the expansion of weed populations across the landscape in the absence of any treatment. Expansions in weed populations can be modeled using the ecological requirements of the weed across suitable habitats on the landscape.

Table 1: An example of a decision matrix, showing priorities for treatment and the selection of treatment methods.

Priority	Description	Treatment
Highest Priority for Treatment	<p>New species and new infestations (Category “A” or “I”, new to the state, county or region, the naming of these categories vary from one state to another)</p> <ul style="list-style-type: none"> ➤ Areas of high traffic and sources of infestation, parking lots, trailheads, horse ramps, gravel pits (All weed categories) ➤ Areas of special concern; botanical areas or Research Natural Areas 	<ol style="list-style-type: none"> 1. Hand pull isolated plants 2. Herbicide treatment 3. Remove seed heads

Priority	Description	Treatment
Second Priority for Treatment	<ul style="list-style-type: none"> ➤ Containment of existing infestations ➤ Roadsides ➤ Category A or I Weeds (these are from state invasive plant list, species that are required for treatment) 	<ol style="list-style-type: none"> 1. Hand pulling isolated plants 2. Herbicide – roadsides
Third Priority for Treatment	<ul style="list-style-type: none"> ➤ Control of existing infestations ➤ Treatment of Category “B” or “II” weeds 	<ol style="list-style-type: none"> 1. Disperse biocontrol agents on large infestations 2. Livestock grazing 3. Mechanical 4. Herbicide applications
Fourth Priority of Treatment	<ul style="list-style-type: none"> ➤ Control of Category “C” or “III” weeds ➤ Eradication of Category “A” 	<ol style="list-style-type: none"> 1. Biocontrol on large infestation 2. Herbicide application along perimeters

NEPA requires an analysis of environmental effects of proposed actions, including the effects of herbicide application. The analysis needs to consider the environmental effects of herbicide use, including potential human health risks to the public and to application workers. The expected consequences of herbicide use for these situations needs to be in sufficient detail for the responsible official to make an informed decision.

The effect of pesticide use on the environmental, human and nontarget effects has in many instances been researched, reported and disclosed. The environmental and human health consequences were assessed during the chemical registration process. Recent legislations, FQPA (The Food Quality Protection Act) mandate a more rigorous analysis that considers risk not only from a specific chemical but expected cumulative exposure to groups of chemicals. All previously registered chemicals must undergo reanalysis under these stricter guidelines. The Forest Service has supplemented this registration information with a series of Risk Assessments. These assessments review available research and information on herbicides and then apply this information to conditions that will likely occur during Forest Service wildland pesticide applications. These risk assessment in concert with registration and label instructions will form the basis for the analysis of effects for all Forest Service activities that include the use of herbicides.

The decision on whether there is need for a site specific risk assessments should be based on reviewing: 1) does a risk assessment exist for the chemical in

question 2) are the site specific conditions reflected in the risk assessment, and 3) is it reasonable or possible to conduct a defensible site specific risk assessment and will this site specific assessment provide additional useful information to the decision maker and the public.

The traditional approach was to prepare a site-specific pesticide risk assessment for all areas where herbicides would be applied. Risk assessments are based on a series of assumptions on the potential dose or amount of exposure to the chemical. In most forestry applications, chemicals are spread uniformly over a large area, such as in insecticide application for gypsy moth or herbicide applications for site preparation. In weed applications seldom is a uniform area treated. Treatments are usually small and scattered across a landscape. Only a small percentage of the land area is actually treated for invasive plants. Even in the most aggressive weed programs often less than a 1/10 of one percent of a forest or watershed will be treated in a single year. A ten-acre herbicide application could be made up of 150+ spot treatments scattered over a 20,000 acre watershed. Soil type, soil pH, bulk density, texture, slope, precipitation, aspect and other essential factors can vary widely across this landscape for a site specific risk assessment. These factors contribute to a limited herbicide exposure for the environment, humans and wildlife. They also increase the number and magnitude of assumptions for any site specific risk assessments and limit the information that it can provide.

The risk assessments are based on a range of possible application rates. In all cases they include the maximum application rates allowed under the label. Many of the commonly used herbicides for control of invasive plants are applied at rates below the maximum label rate. Application of herbicides at these lower rates further reduces the potential human and environmental effects. The following is an excerpt from risk assessment for clopyralid and shows their application to invasive analyses:

The risk characterization for potential human health effects associated with the use of clopyralid in Forest Service programs is relatively unambiguous. Based on the estimated levels of exposure and the criteria for chronic exposure developed by the U.S. EPA, there is no evidence that typical or accidental exposures will lead to dose levels that exceed the level of concern. In other words, all of the anticipated exposures - most of which involve highly conservative assumptions - are at or below the reference dose (RfD). The use of the RfD - which is designed to be protective of chronic or lifetime exposures - is itself a very conservative component of this risk characterization because the duration of any plausible and substantial exposures is far less than lifetime.

These conclusions can be supported by the information in the risk assessments. The Risk Assessments should be incorporated by reference into the analysis.

They are available at the following web site:
www.fe.fed.us/foresthealth/pesticide/health.htm

Addressing Incomplete or Unavailable Information for Decisions and Environmental Analyses

The Council on Environmental Quality (40 CFR 1502.22) provides some direction for addressing incomplete or unavailable information for agencies evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement. The regulations state that agencies “shall always make clear when such information is lacking.” The Council’s direction is summarized in the following flowchart.

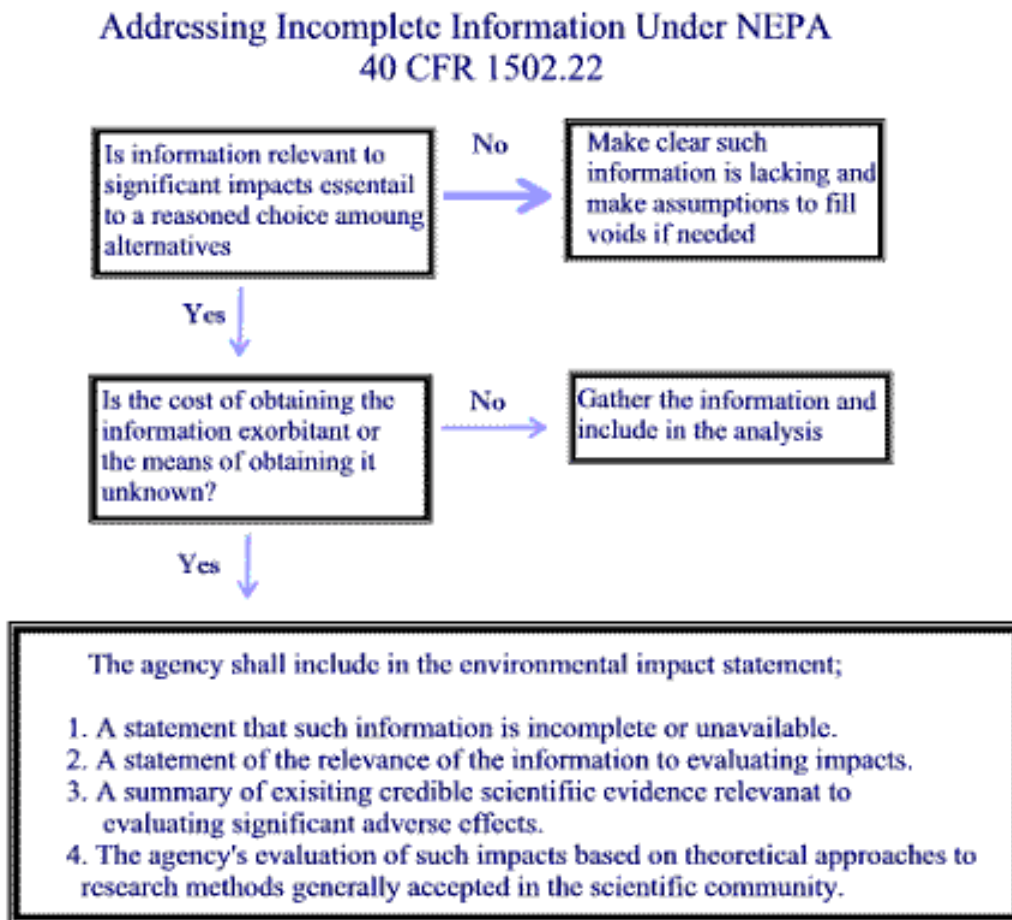


Figure 3: Addressing Incomplete Information under NEPA

This chart can also be used to document the rationale for why additional information is not needed. For example, if there is a question as to whether or

not additional risk assessments are needed for a particular decision, the questions described in the chart can be answered along with the rationale for each determination. Documentation would be a part of the project record and summarized and referenced within the environmental document.

Whether one is writing an environmental assessment or an environmental impact statement, key questions to ask in relation to information needs are:

- What information is available to help characterize and predict consequences?
- How certain (confident) are you that this information is a good basis for accurately predicting consequences?
- What are important gaps in knowledge for predicting consequences?
- What uncertain events could confound your predictions?
- What information is worth acquiring to improve your predictions? What would it cost?

Answers to these questions along with rationale provides a strong basis for identifying the information necessary for an informed decision and helps support the record for such decisions.

Wildlife; Diversity; and Threatened, Endangered, and Sensitive Species

Application of selective and non-selective herbicides can directly cause injury or death, to non-target plant species. Expected changes in plant composition at the site of herbicide application and across the broader landscape are a potential consequence of herbicide use. These effects can be discussed both in the short and long-term timeframes and include effects on TES plant species. The analysis can include the direct effects of herbicide application on individual plants, the likelihood that an individual plant or population will be treated and the likely effects on any individuals or the plant population in the area. The analysis also can display any effects to individuals or populations if the infestation is not treated. Cumulative effects will include analyzing effects of past, present, and future actions appropriate to the geographic boundaries set for the particular effects analysis.

Blowout penstemon, an endangered plant species, is known to have similar habitat requirements and is often found growing in the same area as leafy spurge. Any broadleaf herbicides that will control the spurge will also have detrimental effects on the penstemon. In this instance a specific analysis of the interaction of the herbicide use on blowout penstemon can be included. The analysis can consider the effects of not treating the spurge and the likely replacement of the penstemon by the expanding spurge population. The analysis should also consider any direct mortality or injury to penstemon plants by the application of the herbicide. Any mitigation measures, which can limit

herbicide effects to the penstemon, like changes in chemicals, rates of application and date of application can then be included.

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Biological Control

This is the fifth in a series of five discussion papers on The National Environmental Policy Act of 1969 (NEPA) and invasive plant management. Nothing in this paper constitutes new direction outside of existing direction in the Code of Federal Regulations (CFR) and Forest Service Directives. The purpose of the paper is to spur thoughtful discussion and consideration in applying NEPA policies to invasive plant management.

Does NEPA apply to the release of biological control agents?

The term biological control agent can include a number of different organisms: livestock, insects, fungus etc. This discussion focuses on such bioagents as insect and pathogens.

Background

There are two basic considerations under NEPA for biocontrol agents. The first is the initial decision on whether or not a particular agent should be released. The second is a site specific decision, whether bioagents are the appropriate tool or treatment on a particular site. There are no current categorical exclusions that are appropriate for the release of biological control agents.

Biological control agents undergo a rigorous testing procedure prior to being available for release. Initial testing occurs in quarantine laboratories abroad and in the United States. The agents are tested for their effectiveness in controlling the target organism and for their host specificity. Testing includes potential effects on economic crops, rare plants, and similar species found in North America. An agent can be released only after it has been determined that it is unlikely that the agent will feed or cause injury to any native or agronomic species. It generally takes between ten and fifteen years for an agent to be cleared for release. Prior to the release of a new agent an environmental analysis is prepared by APHIS (Agricultural Plant Health Inspection Service). The analysis assumes that agents will spread throughout North America, to wherever the target species exists. It is intended that this analysis will satisfy the intent of NEPA for the release and distribution of the agent in the United States. The question for the Forest Service is whether there is a need for further analysis of the environmental risk and non target effects of the biocontrol agent or whether the NEPA analysis should be confined to the second consideration weighing the biocontrol as one of several options available to manage a weed population.

Prior to 1994 APHIS did not complete environmental analyses for the release of agents. While all new agents are accompanied by an environmental analysis, these analyses may not be as rigorous as the Forest Service needs to make decisions. To answer the question on whether further analysis is needed it may be useful to examine what would be the *decision to be made* and *what that analysis would encompass*. The APHIS analysis must assume that the agent will spread to all habitats where the target plant exists or will exist in the future. The only action (*decision to be made*) the Forest Service is taking by releasing an agent is changing the rate of spread, not the introduction of the agent. Once the decision is reached by APHIS to release an agent, it can a will be widely distributed. The eventual result being that the agent will be present any place the target weed is located. Like the weeds that are targeted, agents do not recognize property boundaries. The Forest Service has no control over the release of agents on adjacent lands. It is highly likely, even a certainty that agents will spread onto National Forest system lands regardless of any action the Forest Service may take. In few instances will the Forest Service have any further information to add to the analysis of risk and non-target effects? With the exception of bioagents where FS research is directly involved in the testing and experimental release of agents, the analysis of effects would be primarily a reiteration of the information used by APHIS to release the agent. The appropriate place for the risk analysis, direct and indirect, non-target effects is with APHIS and prior to the decision to release the agent. Any Forest Service analysis, which considers the use of bioagents, should incorporate by reference the APHIS analyses. Copies of these analyses can be found on the APHIS web site.

Biological control can play an integral part of an invasive plant management program. If bioagents will be considered, than the description of proposed action and alternatives must identify biological control as an appropriate and potential treatment method. The alternatives must be structured to allow the comparison of the various treatment methods based on their effectiveness, cost and the environmental consequences. For example, the analysis should compare the relative cost, treatment effectiveness, and management objectives between the use of biological control agents vs. using an herbicide treatment vs. no treatment at all. The decision to be made will be whether or not biological control agents will be used, on what sites and to what extent. The decision can be more restrictive such as whether or not specific biological control agents will be used and on what sites. In this second case an additional analysis and decision will be required for use of new agents.

If an adaptive management strategy will be used a decision matrix or a description of the process that will be used to select the appropriate treatment method for a site must be included. The criteria for selecting bioagents over other treatment methods need to be identified. A list of the organisms and their target species should be included in the record or as appendix material.

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