

## MINIMUM REQUIREMENTS ANALYSIS

# Invasive Plant Management in Designated Wilderness in Yosemite National Park

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### Step 1: Determine if administrative action is necessary.

<b>Description:</b> Briefly describe the situation that may prompt action.
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The purpose of this *programmatic minimum requirement Analysis* (PMRA) is to:

- assess the potential impacts of a program for an *Integrated Pest Management* (IPM)-based invasive plant management program upon the character of wilderness in Yosemite National Park,
- determine the minimum requirements for such a program.

The purpose of non-native invasive plant (NNIS) management in Yosemite is to protect the park's natural and cultural resources from damage or displacement by non-native species. IPM is the paradigm used by the NPS to guide invasive species management planning. It includes inventory, prioritization, prevention, treatment (including cultural, restoration, fire, manual and mechanical, chemical or other management techniques to encourage native species over non-natives), monitoring and outreach and education. Because of the vast area of Yosemite's wilderness and the limited resources available for control, this program will focus on prevention, early detection and effective eradication. This focus will maximize the benefit to wilderness character by protecting the natural quality of the Yosemite Wilderness while minimizing manipulation of natural processes.

Wilderness areas are often the last refugia for native plant communities and their dependent wildlife. NNIS can cause fundamental and irrevocable change to these iconic, natural landscapes (Temple, Cilimburg and Wright 2004). Changes can include altered fire regimes and the degradation or even complete displacement of native plant communities and the wildlife that depends upon these plant communities. NNIS have already permanently displaced much of the native vegetation across the Great Basin and Great Central Valley just east and west of Yosemite National Park, in the foothill woodland ecozone on the park's west side, and in low and mid-elevation meadows. While Yosemite's montane, subalpine and alpine plant communities are still predominately comprised of native species, the number of NNIS infestations in the park, including Wilderness areas, is growing. Recent studies have shown that even high-elevation wilderness areas such as those found in Yosemite National Park are not immune from invasion (Pauchard et al. 2009). Some such as spotted knapweed and rush skeleton weed have spread quickly even in undisturbed lands at high elevations.

Efforts to manage NNIS manually have been ongoing in the park since at least the 1930s. Herbicides, mostly 2-4,D, were used in the park from the late 1940s until the late 1960s. Herbicides were reintroduced as a management tool under the 2008 Invasive Plant Management Plan Environmental Assessment (2008 Plan). Implementation of a park Invasive Plant Management Plan has resulted in more programmatic, systematic and successful management and a better understanding of the scope of the NNIS problem. The primary changes include consistent leadership, systematic NNIS mapping, control and monitoring, and the preparation of an annual work plan, comprehensive crew training, posted online for public review, which analyzes the success of the past season's management actions and describes in detail actions proposed for the following season.

The 2008 Plan was updated in 2010 (2010 Update) to better stop the spread of invasive species by adding four additional herbicides, allowing herbicide use near water, removing minimum size and density treatment restrictions, and making other changes. The affected environment and environmental consequences of actions taken to control NNIS were described and analyzed in great detail in both the 2008 Plan and 2010 Update. A description of the park's invasive plant management program and links to the 2010 Update and annual work plans can be accessed here:

<http://www.nps.gov/yose/naturescience/invasive-plant-management>.

The intent of this programmatic MRA is to determine the minimum requirement under IPM for protecting wilderness character from NNIS. In line with this intent, most actions carried out by the Park's invasive plant management program in designated Wilderness would involve prevention, early detection and effective eradication. A programmatic MRA is needed for several reasons:

- 95% of the park's 761,266 acres is in designated or proposed wilderness,
- the serious and dynamic nature of the threat posed by NNIS,
- the limited resources available for control, and
- the need to preserve the various aspects of wilderness character necessitates that these control actions occur while populations are still small, and that these actions are regularly recurring, efficient and effective.

**Urgency:** Is the situation an emergency?

Control of NNIS infestations is not an emergency as explicitly defined by the Wilderness Act because it is not normally an "emergency involving the health and safety of persons within the area." However, some new infestations and the rapid spread of some existing infestations can be considered an ecological emergency that threatens the natural character of wilderness, and has serious and long-term consequences if the emergency is not effectively mitigated. About ten new exotic plant species are found in the park each year and serious new threats in the lands surrounding the park including perennial pepperweed, reed canary grass, rush skeleton weed, spotted knapweed and other species. These species have the potential to cause widespread damage and even permanent displacement of park natural and cultural resources in designated Wilderness. The cost of control grows exponentially with increasing infestation size and once infestations reach a certain size, control may no longer be possible. The best protection of the wilderness resources is afforded by early detection and effective eradication of newly emerging and existing threats.

**To determine if administrative action is necessary, answer the following questions:**

**A. Describe Options Outside of Wilderness**

Is action necessary within wilderness?

**Yes:** ☒ **No:** ☐ **Not Applicable:** ☐

**Explain:** NNIS prevention, containment and control activities outside the wilderness are important and ongoing. NPS currently cooperates with a variety of federal and state agencies and landowners and other stakeholders in these efforts. However, actions taken outside of wilderness are insufficient for protecting wilderness character and natural and cultural resources from impairment resulting from the spread of NNIS populations already in wilderness, or from protecting wilderness resources from the introduction of new NNIS populations.

## B. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of the Section 4(c) prohibited uses? Cite law and section.

Yes: ☐ No: ☒ Not Applicable: ☐

**Explain:** No valid existing rights or special provisions in The Wilderness Act (1964) specifically allow the consideration of any of the Section 4c prohibited uses for controlling NNIS. The following sections form the basis for analyzing such uses.

Section 2 (a) Wilderness “shall be administered ... in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas [and] the preservation of their wilderness character...”

Section 2 (c) An area of wilderness is...an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable...”

Section 4 (c) Prohibition of certain uses

“...except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act...there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.”

Herbicides, because they are a powerful tool, are considered by some to be similar to the use of motorized equipment in wilderness. However, the use of herbicides is not specifically prohibited under Section 4(c).

## C. Describe Requirements of Other Legislation or Guidance

Is action necessary to meet the requirements of other laws? Is action necessary to conform to direction contained in agency policy, unit and wilderness management plans, species recovery plans, or agreements with tribal, state and local governments or other federal agencies?

Yes: ☒ No: ☐ Not Applicable: ☐

**Explain:** The legislation and guidance for managing invasive species on NPS lands designated as Wilderness can be conflicting. However, the main goal of each of these laws, such as the founding legislation for the National Park Service mentioned above, is the protection of natural and cultural resources.

The *National Park Service Management Policies* (NPS 2006b), the agencies primary policy document, states that: “Exotic species will not be allowed to displace native species if displacement can be prevented” and “In general, new exotic species will not be introduced into parks.” Also according to NPS Management Policies 6.3.5, Minimum Requirement, all management decisions affecting wilderness must be consistent with a minimum requirement concept. “When determining minimum requirement, the potential disruption of wilderness character and resources will be considered before, and given significantly more weight than, economic efficiency and convenience. If a compromise of wilderness

resource or character is unavoidable, only those actions that preserve wilderness character and/or have local, short-term adverse impacts will be acceptable.”

Executive Order 13112 (1998) prevents the introduction and spread of invasive species. This federal directive provides overarching guidance for the management of invasive species, and requires federal agencies to act upon: leadership and coordination, prevention, early detection and rapid response, control, education, research, and restoration. Executive Order 13112 established the National Invasive Species Council to provide national leadership and ensure that “federal agency activities concerning invasive species are coordinated, complementary, cost-efficient, and effective.” Executive Order 13112 also called for the preparation of the *National Invasive Species Management Plan* (NISC 2001). The updated 2008-2012 *National Invasive Species Management Plan* was distributed for public comment from December 28, 2007 through February 11, 2008 (NISC 2008). The park’s 2008 *Plan* and this 2010 *Update* follow guidance provided by the National Park Service Director’s Order 77-7: *Integrated Pest Management*. The Executive Order of February 3, 1999 titled *Invasive Species* requires federal agencies to detect NNIS and respond quickly to infestations.

Yosemite National Park’s Resources Management Plan (NPS 1999) directs specific activities for the management of natural and cultural resources throughout the park. In 2000, the *Natural Resource Challenge Exotic Action Plan* created a funding roadmap to improve the NPS’s response to harmful plant species. In 2006, the NPS finalized the *Invasive Species Action Plan*, building on the *Natural Resource Challenge Exotic Action Plan*, further addressing the categories required under Executive Order 13112 and the *National Invasive Species Management Plan*. The action alternatives in this plan are consistent with park-wide and service-wide legislation and policy.

Section 15, of the Federal Noxious weed act of 1974 (PL 93-629) directs the management of undesirable plants on federal lands. The Carson-Foley Act of 1968 directs federal agencies to allow state officials to enter public lands to control noxious plants. Legislation and policy specific to Yosemite National Park include the enabling legislation for Yosemite National Park, the California Wilderness Act of 1984, and the *General Management Plan* (1980) for Yosemite, which provides overall management direction for Yosemite National Park. As required under the Federal Insecticide, Fungicide, and Rodenticide Act of 1978, and also Department of Interior policy, “*Federal agencies shall use Integrated Pest Management techniques in carrying out pest management activities*” (FIFRA, 7 U.S.C. 136r-1, Department of Interior Manual, Sec.517). The Plant Protection Act (2000) authorizes the United States Department of Agriculture to prohibit or restrict the importation or interstate movement of any plant, plant product, biological control organism, or plant pest.

The 2010 *Update* meets the 1980 *General Management Plan* management objectives for resource management (NPS 1980). These objectives include:

- restore and maintain natural terrestrial, aquatic, and atmospheric ecosystems so they may operate essentially unimpaired;
- conduct continuing research analysis to attain information necessary for managing natural resources;
- restore altered ecosystems as nearly as possible to conditions they would be in today had natural ecological processes not been disturbed;
- protect threatened and endangered plant and animal species, and reintroduce, where practical, those species eliminated from the natural ecosystems;
- identify and perpetuate natural processes in park ecosystems;
- limit unnatural sources of air, noise, visual, and water pollution to the greatest degree possible;
- support an integrated system of compatible regional land uses providing opportunities for recreation, community development, preservation, and economic utilization of resources;
- participate with government agencies and private interests in planning for compatible management and use of scenic, natural, cultural, and recreation resources.

Federal agencies are required by law to “use Integrated Pest Management techniques in carrying out pest management activities and shall promote Integrated Pest Management through procurement and regulatory policies” (7 U.S.C. §136r-1). The park must abide by federal regulations for herbicide use. Applicable legislation includes the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. §136 et seq.) and the Occupational Safety and Health Administration’s (OSHA’s) Hazard Communication Standard (15 U.S.C. 2601 et seq.). Under the Federal Insecticide, Fungicide, and Rodenticide Act, the U.S. Environmental Protection Agency (EPA) must evaluate herbicides for potential adverse effects on the environment. Herbicides must be tested for safety and registered with the Office of Pesticide Programs. Under OSHA standards, employers must provide workers with training, protective equipment, and information about hazardous substances. In addition, NPS *Management Policies* (NPS 2006b) requires that all park service pesticide application be supervised by individuals licensed under the procedures of a federal or state certification system.

#### D. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character including: untrammeled, undeveloped, natural, outstanding opportunities for solitude or a primitive and unconfined type of recreation, or unique components that reflect the character of this wilderness area?

**Untrammeled:**      **Yes:** ☐      **No:** ☒      **Not Applicable:** ☐

**Explain:** Trammeling is the intentional manipulation of natural processes. Any action to treat NNIS would be a trammeling of wilderness because it represents human control and manipulation of natural processes. Actions taken to detect NNIS populations while they are still small and eradicate them using tools and methods that are effective can greatly reduce the extent, intensity, and number of future management actions. Clearly, the earlier NNIS threats are analyzed and mitigated, the less manipulation of natural processes take place in the long run.

**Undeveloped:**      **Yes:** ☐      **No:** ☒      **Not Applicable:** ☐

**Explain:** No structures, motorized equipment or mechanical transport are proposed.

**Natural:**      **Yes:** ☒      **No:** ☐      **Not Applicable:** ☐

**Explain:** Action is necessary to protect the natural quality of wilderness character from damage or displacement by NNIS. NNIS, left untreated, can spread rapidly and impair park natural resources by altering fundamental ecological processes such as plant community dynamics and disturbance processes such as fire. The loss of native plant communities can result in a cascade of other changes, including the impairment or even the loss of wildlife dependent upon specific native plant species and natural habitats. Whether any action is taken or not, the natural conditions of wilderness are threatened. The spread of noxious weeds in the wilderness area is partly caused or enhanced by human actions (seed introduction, spread along trails and in campsites, etc.). To allow it to continue spreading would be a direct sign of unintentional human influence.

**Outstanding opportunities for solitude or a primitive and unconfined type of recreation:**

**Yes:** ☒      **No:** ☐      **Not Applicable:** ☐

**Explain:** The wilderness recreation experience is in part dependent on the wilderness setting representing a natural and native ecosystem. If NNIS are allowed to spread and eventually replace native vegetation the human experience in wilderness will be affected. The effects include changes in vegetation

type and also habitat for wildlife species that depend on the natural conditions. NNIS can also directly affect the recreation experience when the invasive species are spiny, sticky or poisonous, or consolidate into impenetrable thickets.

**Other unique components that reflect the character of this wilderness:**

**Yes:** ☐ **No:** ☐ **Not Applicable:** ☒

**Explain:** None identified for this area.

**Step 1 Decision:** Is any administrative action necessary in wilderness?

**Yes:** ☒ **No:** ☐ **More information needed:** ☐

**Explain:** Without control, new NNIS will continue to be introduced and existing infestations will continue to spread with the result that they will continue to degrade and displace native plant communities and the wildlife that depend upon intact native plant communities. When NNIS infestations are not effectively controlled while they are small, they can expand to the point where control is no longer feasible, as Eurasian annual grasses have in the lower elevations of Yosemite National Park. The result in the Sierra Nevada foothills has been a permanent conversion of vegetation type. This would be a significant degradation of both the natural quality of wilderness character, and the experiential quality, as visitors would no longer be able to enjoy natural vegetation and wildlife. To prevent these anthropogenic changes and impacts to wilderness character, administrative action is necessary.

**To determine if administrative action should be a Programmatic Minimum Requirements Analysis, answer the following questions:**

**A.** Will the proposed actions be routine, recurring administrative activities in Wilderness?

**Yes:** ☒ **No:** ☐

**Explain:** Because of vectors such as roads, trails, streams, wildlife and wind, NNIS propagules are continually introduced and spread throughout the park. Treatment actions and locations can vary but the methods described in this PMRA must be routine and recurring if they are to be successful. NNIS Inventory, control and monitoring are three main components that will recur in Wilderness.

**B.** Do the proposed actions involve possible Section 4 (c) exceptions, and/or have a potential to impact wilderness resources and values?

**Yes:** ☐ **No:** ☒

**Explain:** Section 4 (c) states, "... there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure

or installation...except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act...". While vehicles and motorized tools such as brush cutters are commonly used to control NNIS, the alternatives presented in this MRA do not propose the use of tools or construction of structures prohibited under Section 4(c). Should the need arise for motorized equipment (e.g. brush cutter) or mechanical transport to effectively treat NNIS to maintain Wilderness character, an additional project specific MRA would be developed.

We recognize that herbicides are powerful, sophisticated tools. Therefore, we propose using them in wilderness with due restraint, as articulated below.

## Step 2: Determine the minimum activity.

### Description of Alternatives

For each alternative, describe what methods and techniques will be used, when the activity will take place, where the activity will take place, what mitigation measures are necessary, and the general effects to the wilderness resource and character.

#### Actions Common to all Alternatives

**Summary:** Components of IPM that are common to all of the alternatives are described here. IPM outlines a comprehensive management strategy comprised of inventory; prioritization; prevention; treatment; monitoring; and research and outreach and education. This holistic approach has been shown to be the most effective way of conducting an invasive plant management plan and is required under federal law and Department of Interior policy. Prioritization, prevention and outreach and education efforts do not generally occur in wilderness.

Because of the vast area of Yosemite's wilderness and the limited resources available for control, this program will focus on prevention, early detection and effective eradication. Species are prioritized for treatment using a modified version of the USGS Alien Plants Ranking System (USGS 2000). This system prioritizes species for control based upon the threat that they pose to park natural and cultural resources, the extent of park infestations and the likelihood of control. The prioritization of NNIS drives all program activities, from detection to treatment and monitoring, and hence, the program's influence on the Wilderness character. Species priority assignments are not entirely static and can change when new information becomes available. When for instance a new NNIS is detected, the overall program focus may change. If data becomes available that identifies an existing exotic species is more invasive than was previously known (e.g. velvet grass, dandelion), the ranking has to be upgraded.

**Prioritization:** NNIS are prioritized for control because funds and staff available for control are limited and the phenological treatment windows are often very narrow. Appendix A shows prioritization for high, medium-high, and medium priority species. A well defined list of Yosemite NNIS priorities creates consistency in the management efforts, and it provides for transparency. Control efforts in wilderness are tightly focused on medium and higher priority species which have the greatest potential to harm park resources and which are most likely to be controlled, see Appendix A of the 2010 Update.

**Inventory, Monitoring, and Early Detection:** Inventory, monitoring and early detection are both like and unlike management actions such as trail construction and maintenance. NNIS can invade and spread on their own.

#### Alternative 1: Physical and Cultural Control Only

**Summary:** Under Alternative 1, the NPS would use only physical (hand pulling, shovel shearing, digging up NNIS by the roots) and cultural (altering resource management to discourage invasives; restoring native plant communities for example) control methods to control those NNIS for which physical and cultural control methods are effective. This action would protect park natural and cultural resources and wilderness character from those NNIS having a small infestation size and which respond to physical and cultural controls. The effects of Alternative 1 upon various aspects of wilderness character are compared below.

## Alternative 2: Physical, Cultural and Herbicide Control

**Summary:** Under Alternative 2, resource managers would use physical, cultural and herbicide control, methods to protect the natural and cultural resources in Yosemite's wilderness from NNIS. Control methods are selected based upon what is effective, reasonable and appropriate under NEPA and what is the minimum required to preserve wilderness character under the Wilderness Act for controlling a particular species. For example, physical and cultural methods would be used for species such as common mullein for which these methods have been shown to be effective and herbicides would be used for species such as Himalayan blackberry for which physical controls have been shown to be ineffective. Herbicides would be applied as spot applications to NNIS individuals and patches, with the minimum amount of herbicide used necessary for control. The effects of Alternative 2 upon various aspects of wilderness character are compared below.

**Sideboards:** The staff of the park's invasive plant management program uses the most effective and appropriate tools and methods to protect park resources, including the various aspects of wilderness character, from NNIS. However, NPS also recognizes that some NNIS management methods are controversial. The aim of these sideboards is to help define the minimum requirement and limit the potential for unintended impacts resulting from NNIS management, while at the same time still allowing for effective and programmatic NNIS management.

- **Special Protection Zones:** Table II-3 from page II-10 of the 2010 Update shows where special considerations will be made prior to choosing the appropriate NNIS management method or tool. These include cultural resource areas, special status plant and wildlife habitat, wetlands and riparian areas, and others. Special considerations are also considered in great detail for 13 individual impact topics in the Affected Environment/Environmental Consequences chapter of the 2010 Update.
- **Control Categories:** While they are not explicitly addressed in the Wilderness Act, the use of herbicides is considered by some to be similar in impact to the use of power tools. Invasive species were assigned control categories to help ensure that the minimum requirements for protecting the natural quality of wilderness from NNIS. The categories are described in Table 1. These species were categorized using a modified version of the USGS Alien Plants Ranking System (USGS 2000), an analytical software tool. Plants were categorized based upon impact, threat and difficulty of control and grouped as low, medium or high priority. Appendix A from the 2010 Update has been amended and appended to this PMRA. A column has been added for medium-priority species and the most appropriate control methods have been listed for each species.

These categories will be periodically updated. This is because new species continually enter the park, and certain species, particularly annuals, can become more invasive over time. Or, certain species can become so widespread that fighting them park-wide is simply not possible. Such species would become a lower priority for control such as is happening with cheatgrass. Changes in species priority will be posted online in the Invasive Plant Management Program's annual work plan.



- **Infestation Size:** This MRA covers control of infestations that have less than ten canopy acres. Control of larger infestations would require an additional MRA, see discussion below.

**Table 1: Control Categories:**

Control Category	Description
A. <u>Medium High and High Priority Species</u> Use the most appropriate manual, cultural or herbicide treatment.	Plants are too small or plants have deep roots or rhizomes for effective manual or cultural control. Or, plants pose too great a threat to park resources and wilderness character to risk using a less effective means of control. Manual and cultural methods will still be used to control these species when and where appropriate.
B. <u>Medium Priority Species</u> That can be controlled using manual or cultural treatments.	Because of limited resources, many medium-priority species are not managed. Management goals will be met using manual or cultural methods only.
C. <u>Medium Priority Species</u> For which herbicide treatment can be necessary	Herbicide use can be necessary when management goals cannot be met for these species using manual or cultural control.
D. <u>Low Priority Species</u> Use most appropriate manual or cultural control treatment.	Plants do not pose a significant threat to park resources or wilderness character, and are generally not managed. Where control actions are initiated, only manual or cultural methods will be used.

\*See Appendix A for list of medium, medium high and high priority species.

#### Sideboards Considered but Dismissed:

- **Distance from Wilderness Boundary, Roads and Trails:** Restrictions on which management method or tool to use based upon distance from the wilderness boundary and roads and trails were dismissed because the threat posed by NNIS is too grave to unnecessarily restrict the ability of resource managers to apply best professional judgment to decisions about how to manage a particular species. Such restrictions could unreasonably restrict the ability to manage NNIS where they are most likely to occur, where wilderness character is most likely to be already impacted by roads, visitors and other factors, and from which they are most likely to continue to spread into wilderness. Such restrictions away from the wilderness boundary would unnecessarily limit the ability of resource managers to protect the most pristine areas of the park.
- **Herbicide Volume Restrictions:** Herbicide volume restrictions were dismissed in favor of total infestation size, which is easier to apply in the field. However, the metric is actually derived from the total herbicide volume used for a given target species in the wilderness which field personnel are already required to track by State law. Application equipment is carefully calibrated, and field personnel can easily and accurately calculate the total area the treatment was applied to.
- **Patch Density Restrictions:** Patch density restrictions were dismissed because of the great uncertainty inherent in accurately gauging the relationship between patch density, infestation size, and likelihood of control for each individual species and management method or tool.

### Comparison of Effects of Actions Common to All and Two Alternatives:

#### Wilderness Character

**“Untrammeled”** – All impacts to the untrammeled quality are considered permanent. Inventory and monitoring would not impact the untrammeled quality as they do not involve any manipulation of natural processes. Physical, cultural and herbicide NNIS treatments would have a local, minor impact the untrammeled quality of wilderness because each of these methods represent human control and manipulation of the wilderness resource. The use of a less effective control method would result in additional trammeling when their use results in the need of additional manipulation to preserve the natural quality:

- they can result in more site visits over a greater period of time to preserve the natural quality of wilderness than would have been required had a more effective tool or method been used;

- can reduce the ability of resource managers to manage other priority NIS infestations while they are still of limited extent;
- can allow NNIS to become widespread and cause permanent damage to natural systems;
- can expose park resources to unacceptable levels of risk.

**“Undeveloped”** – There is no effect on the undeveloped quality of wilderness character because there is no use of motorized equipment, construction of structures, or placement of signs.

**“Natural”** – The introduction and spread of NNIS into wilderness areas can result in the degradation or displacement of native plant species and the wildlife that depend upon these species. Regardless of whether they are surveying for NNIS or performing manual or herbicide control, the presence of NNIS control workers in wilderness could result in minor, temporary and local trampling of vegetation and disturbance of wildlife. The introduction of synthetic herbicides into natural systems can result in a minor, temporary and negative impact to the natural quality. There is a risk of unintended consequences when using herbicides. This risk has been analyzed in detail in the 2010 Update. However, herbicides can also protect the natural quality of wilderness from species such as Himalayan blackberry and velvet grass, species for which physical and cultural control methods are not effective. If ineffective methods were used for these species, the negative impacts to the park’s natural and cultural resources would be similar to taking no action to protect the park’s natural resources from NNIS. Effective NNIS control would enhance the natural quality by reducing the negative impact of these non-native species on all components of the wilderness resource and providing habitat for reestablishment by native species.

**“Outstanding opportunities for solitude or a primitive and unconfined type of recreation”** –

The presence of inventory, monitoring and treatment crews could result in a minor and temporary adverse affect to the wilderness experience of those park visitors they encounter. Encountering staff who are actively working to protect wilderness from degradation by invasives could improve the visitor experience for some people. Encountering staff spraying herbicides in wilderness could have a negative impact on the visitor experience for others. The spread of species that are that not effectively controlled by physical or cultural methods could result in long term and wide spread impacts to opportunities for primitive recreation because visitors would not be able to experience natural environments with a full complement of native species. The need for repeated site visits over many years that is made necessary by the use of a less effective management tool could result in greater negative impacts to opportunities for solitude than an alternative that allows herbicides. In the long term, the use of more effective control methods and the protection and restoration of native plant communities will serve to enhance the wilderness recreation experience.

**Heritage and Cultural Resources:** NNIS such as Himalayan blackberry and velvet grass and many other species threaten the integrity of native plant communities that include cultural use species, see further analysis in 2010 Update, the Invasive Plant Program’s Invasive Plant Management Web page and Annual Work Plan at: <http://www.nps.gov/yose/naturescience/invasive-plant-management>. Physical, cultural and herbicide control efforts can result in local, temporary minor and negligible impacts to these resources. Some tribal members oppose the use of herbicides for control NNIS that grow among or near cultural use plant populations. There are concerns for the health of those who gather cultural use plants, and some think that the use of herbicides is not appropriate in certain culturally important areas. Conversely, while heritage and cultural resources would be protected from species such as common mullein using physical control, very intensive physical management efforts repeated over many years would be necessary to keep species such as Himalayan blackberry and velvet grass from degrading displacing the habitats which currently contain cultural use plants. The disruption to the ability for those who gather cultural use plants would be local and short term where these areas are closed to gathering following herbicide control actions. However, the disruption of the ability to gather these plants would be permanent should invasive species be allowed to displace these species. Disruptions could be mitigated through consultation and cooperative management efforts, or by only treating a portion of any particular gathering area in any particular year, and sometimes by using alternate techniques.

**Special Provisions:** None

**Safety of Visitors, Personnel, and Contractors:** The risk to crews from travelling over rugged terrain and working with stock, and manual, cultural and herbicide control methods are similar to that of other

management actions in wilderness. When properly used, the risks of herbicides to the safety of park visitors, personnel and contractors is minimal, see Appendix G in the 2010 Update. On steep slopes and in remote areas, herbicides would pose a lesser risk to workers than sharp mechanical or hand tools. Risks from the use of herbicides can be minimized by using the safest herbicide that is effective for controlling a particular target species. Any risks to visitors can be minimized by making the areas and times of treatment known. The thorns of species such as Himalayan blackberry can injure park visitors and staff. Effective treatment can limit exposure to thorns. More effective methods such as herbicide use could protect park staff, visitors, grazing stock and wildlife from the thorns and awns of species such as yellow star-thistle, Himalayan blackberry and medusa head.

**Economic and Time Constraints:** Prevention, early detection and effective eradication are the best methods to protect wilderness character from NNIS. The time and money needed to control a population rises exponentially as that population is allowed to spread, and the probability the population is controlled declines dramatically, see Figure 1. Using a less efficient or effective control method or tool could result in higher costs in terms of time, money, the need for repeated follow up control efforts, the need for additional personnel and other resources, and the increased probability of failure for control efforts.

Efforts have been made to quantify the economic value of conserving intact ecosystems and the services they provide. Almost four million visitors have come to Yosemite each year in recent years. The waterfalls and granite cliffs would still be here even if NNIS were allowed to spread. However it is appropriate to consider larger economic questions. If NNIS are allowed to continue to displace native wildflowers and plant communities, with the resulting displacement the bears and other wildlife that depend upon intact native plant communities, would the park receive as many visitors? Could this then have an economic impact upon concessionaires and the communities surrounding the park?

**Additional Wilderness-specific Comparison Criteria:** None identified.

**Cumulative Impacts:** The predominant impacts related to most NNIS management actions in Wilderness such as inventory, monitoring and manual control are similar to those from trail maintenance, firefighting, search and rescue, visitor management and other park actions taken in Wilderness. Staff will traverse, work and camp in wilderness, which could result in minor, short-term, negligible and minor negative trampling, trampling of native vegetation, disturbance of wildlife, and disruption of visitor solitude. Even wilderness areas are impacted by the atmospheric deposition of pollutants. The application of small amounts of the herbicides described in the 2010 Update will not add significantly to those impacts.

## **Step 2 Decision: What is the Minimum Activity?**

Alternative #2 meets the minimum requirements for NNIS management in designated wilderness. The program will focus on prevention, early detection and effective eradication. Most prevention, outreach and education efforts would take place outside of designated Wilderness. Manual, cultural and herbicide methods and tools would be used, as appropriate for each particular NNIS. Non-mechanical transport will be used to move herbicide, people and supplies to treatment areas. Although surveying for, controlling and monitoring NNIS populations could result in negligible to minor, temporary and local negative impacts to some aspects of wilderness character, any negative impacts would be outweighed by the long term, widespread and moderate to major benefits of preserving the natural aspect of wilderness character; the culturally significant plants and other native plant communities and their dependent wildlife, and the opportunity for visitors to experience and scientists to study intact native plant communities. While any management action to control NNIS is an impact to the untrammelled quality of wilderness character; these impacts are outweighed by the potential for much greater impacts to the natural quality. Herbicides are powerful tools that have a small risk of unintended consequences, but those risks are outweighed by the impacts to natural conditions and processes that would occur if ineffective methods result in the expansion of NNIS or less effective methods result in repeated visits and treatments to remove a given species.

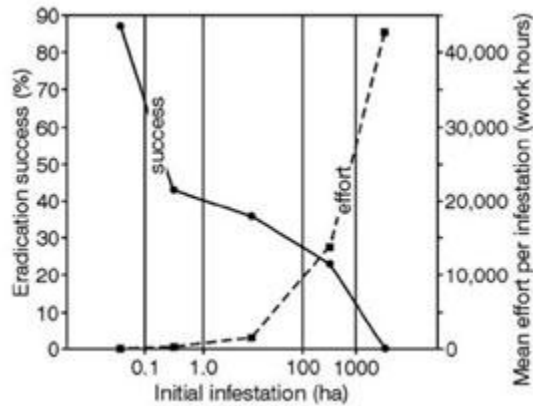


Figure 1: As infestation size increases, effort to control, measured in hours (and dollars) increases, while success of eradication decreases.

**Rationale for selecting this alternative:** The management of NNIS in natural systems is complex and invasive species management is a continuously developing science. In line with philosophy that underlies the Wilderness Act, resource managers must have the humility and restraint to understand when to act, and what level of action is appropriate. This is complicated by the facts that the resources are not available to control all species and infestations, and also some species are already too widespread to be realistically controlled. Regardless of what method is used to control a particular NNIS, prevention, early detection and effective eradication are essential. Figure 1 above shows that as an infestation increases in size, the level of effort measured in hours and dollars increases dramatically and the likelihood of successful control decreases (Rozenfelds et al 1999, Rejmanek and Pitcairn 2002, NISC 2008). In order to comply with the minimum requirements of the Wilderness Act, it is also important that infestations be found and controlled early before infestations spread and extensive, repeated and potentially high impact long-term management is required.

NNIS can differ from other natural resource challenges because some of these species can spread rapidly and can displace native plants and wildlife if control efforts are not promptly undertaken or effective. Some have deep taproots or rhizomes (underground stems). Some can produce thousands of seeds which can persist and germinate year after year for many years, even decades. A number of studies (Smith et al. 1999, Timmins and Braithwaite 2001) and Figure 1 show that using an effective early control NNIS can result in far smaller impacts to wilderness character over time than less effective control methods. Less effective methods often lead to the spread of NNIS due to:

- limited resources available for repeated or intensive control efforts,
- competing demands on crew time during narrow phenologic treatment windows,
- logistical difficulties in the wilderness

In order to be successful in the control of NNIS, the pace of the management success must be greater than the rate of spread of the target species. Because of the time lag in detecting new infestations, NNIS can quickly get the upper hand. Figure 2 shows the mapped canopy cover of Himalayan blackberry in Cathedral Meadow in the Yosemite Valley after just one herbicide treatment in 2009. The use of herbicides resulted in 96% control. Staff and volunteers had previously spent an estimated 100,000 hours, unsuccessfully attempting to control this one species using physical methods. In spite of a tremendous effort, its rate of spread far outpaced the rate of control. Management needs for other species are discussed in greater detail in the 2010 Update, in the annual work plan, and on the park's invasive species website at <http://www.nps.gov/yose/naturescience/invasive-plant-management>.

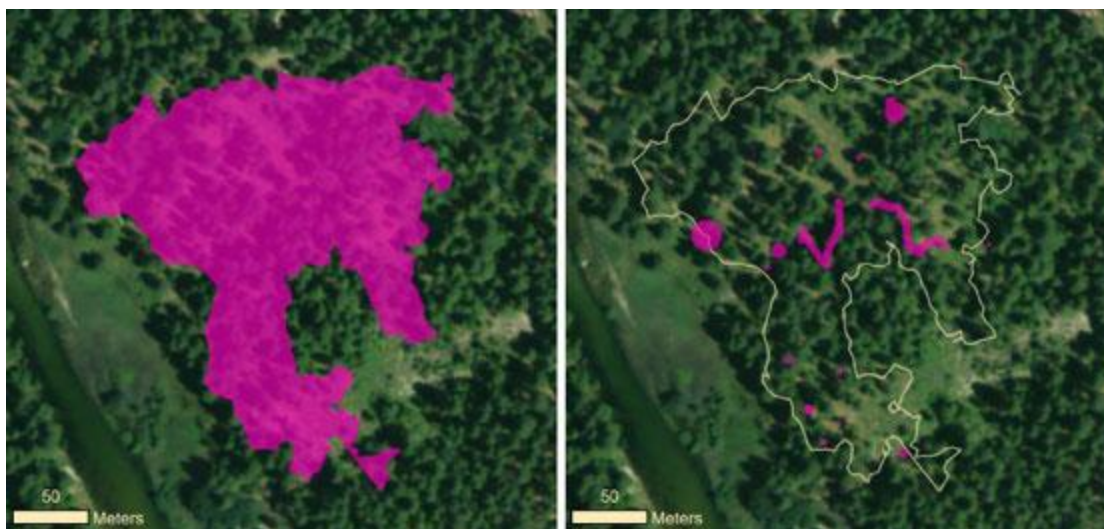


Figure 2: A large, 9.65 acre infestation of Himalayan blackberry in Cathedral meadow was reduced to 0.34 acres in 2010, after a single herbicide treatment in fall of 2009.

A programmatic approach is necessary because:

- Over 200 exotic plant species are already established in the park;
- many new species continue to enter the park, at least 10 each year in the last three years;
- more than 8000 infestations have been documented. Because more infestations are found with each survey effort, this represents only a portion of actual park infestations;
- vast areas of the park remain completely unsurveyed, including most wilderness areas within the park;
- serious threats are approaching park boundaries;
- IPM resources are acutely limited.
- 

The impacts and benefits of various treatment tools and methods were described and assessed in the 2010 Update. Each of the control methods considered under the selected alternative is appropriate as the minimum tool, depending upon the species. Physical methods such as hand-pulling, shovel shearing and digging up of plants by their roots are effective treatments for some species, provided treatments are repeated often enough and for a sufficient number of years to control the infestation. Herbicide treatment is necessary for other species. There is a risk in beginning a course of management action which requires conscientiously repeating treatments multiple times over many years. Controlling infestations early, while infestations are still small, would result in less herbicide being applied in wilderness and smaller impacts to wilderness character than if these infestations were allowed to spread.

Herbicides, while a powerful tool, are not explicitly prohibited under Section 4 (c) of the act. Were they prohibited, an exception for the use of herbicides would be similar to exceptions which allow for structures or the use of motorized tools "...as necessary to meet minimum requirements for the administration of the area for the purpose of this Act". There is a risk of unintended consequences in using herbicides. However, based upon analysis conducted for the 2010 Update, the use of herbicides would be a compromise because it would protect the natural quality of wilderness character but would have local, negligible to minor impact upon the untrammeled quality of wilderness character. The control categories, which rank NNIS depending upon their impact, threat or difficulty of control, are an additional safeguard. They show that the minimum tool will be used as appropriate to control particular NNIS. From Section 4(c), "If a compromise of wilderness resource or character is unavoidable, only those actions that preserve wilderness character and/or have local, short-term adverse impacts will be acceptable." The benefits to the natural quality of Wilderness character of treating NNIS outweigh the negative impacts of individual treatment actions.

**Rationale for not selecting the other alternatives:** Alternative 1 would not protect park natural and cultural resources or the natural quality of wilderness or opportunities for primitive recreation in wilderness from species such as yellow starthistle which cannot effectively managed using only manual and cultural control methods. If NNIS which are not effectively controlled using manual and cultural control methods were allowed to spread, this would violate the *NPS Management Policies* (NPS 2006b) which states that "Exotic species will not be allowed to displace native species *if displacement can be prevented*". It would also violate Sections 2(a) of the Wilderness Act which states that wilderness "shall be administered ... in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas [and] the preservation of their wilderness character...", and Section 2(c) which defines wilderness as "an area...retaining its primitive character and influence... which is protected and managed so as to preserve its natural conditions and which...generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable"...

**Actions Considered but Dismissed:** The following alternatives were considered but dismissed because impact to Wilderness character was too large without possibility of mitigation or because the method would not effectively treat the problem to maintain Wilderness character.

**1) No Control of NNIS:** This action was dismissed because allowing for the continued spread of NNIS which would result in impairment of the park's natural and cultural resources. Allowing impairment would violate the 1916 Organic Act and the other laws and regulations described above. Not all invasive species can be controlled. No known treatment methods are effective for park-wide control of some widespread species such as cheatgrass and wild oats. There is insufficient scientific documentation of the effectiveness of NNIS treatment across areas of such a large extent as Yosemite. Also, the resources available to control NNIS are limited, so not all species can be controlled. But, resource managers and members of the public across the world recognize the value of intact natural habitats so control actions will occur.

**2) Use of Mechanical and motorized equipment:** Mechanical methods were dismissed because other effective methods, having less impact to Wilderness character, are available. Loud machinery and the smell of fuel and exhaust can degrade the visitor experience and disturb wildlife, and mechanical cutting tools can be dangerous for workers, especially in remote areas and on rough ground. Should the need arise for such tools, additional NEPA compliance and a new MRA would be developed.

**3) Use of Domestic Herbivores:** Grazing animals are not selective and can impact non-target species. They can also trample soils, impair water quality and degrade visitor wilderness experience. Because equally effective control options are available, this option was dismissed.

**4) Use of additional Biological Controls:** Biocontrol agents can be effective for some species and several bio-controls were released into the park in the past (see 2010 Update). No NNIS currently found in wilderness require the further release of biological control agents to meet management objectives. Should the need arise, an additional MRA and additional NEPA compliance would be developed.

**5) The Use of Herbicides in Water to Control Aquatic NNIS:** This alternative was rejected because of public concerns regarding potential non-target impacts resulting from applying herbicides in water. Aquatic invasive species infestations have not yet been found in Yosemite National Park, although several species are present in streams and reservoirs just outside of the park. Should the need arise, additional NEPA compliance and an additional MRA would be developed.

**6) Aerial Spraying:** Aerial spraying of herbicides was eliminated from consideration because the extent of current wilderness infestations which would respond to such an

action do not justify the impact to the undeveloped character or non-target impacts of overspray to native plants and other resources and species. Should the need arise, additional NEPA compliance and an additional MRA would be developed.

**7) Prescribed Burning:** The park does have a prescribed fire program and prescribed fire can benefit ecosystems, reduce fuel loads and benefit native species over invasives. Prescribed burning expressly to control NNIS was eliminated because, while most western ecosystems evolved with periodic fire, fire can also allow for the establishment and spread of species such as cheatgrass. Should the need arise, additional NEPA compliance and an additional MRA would be developed.

**The following actions or situations would trigger a new MRA:**

**1) Control of Populations over 10 Canopy Acres:** Because known populations of most priority NNIS in wilderness, other than some Eurasian annual grasses are still small, the emphasis upon this MRA is prevention, early detection and effective eradication. Should there be a need to control more than 10 canopy acres of a particular priority species population in any one year, the appropriateness of control actions in wilderness and minimum tool would be assessed in a new MRA. Because control efforts are ongoing for these priority species, **Himalayan blackberry, velvet grass, and bull thistle** are exceptions to this acreage limit. The canopy acres will be calculated for each species, in and outside the wilderness boundary after each season and included in the annual summary which is posted with the annual work plan, usually in mid-December.

**2) Additional Herbicides:** Should an emergency situation arise and application of a new herbicide be considered necessary to control a species that cannot be reasonably controlled using currently approved herbicides, control would occur under an emergency CE approved by the park superintendent with treatment limited to known populations of a specific species. Should this herbicide be considered necessary for programmatic use, public notice would be given and a concurrent NEPA compliance process would be initiated. The supplemental EA would include an analysis of potential environmental impacts and a public review period.

**3) Signs:** The use of signs in wilderness would require a new MRA.

**Check any Wilderness Act Section 4(c) uses approved in this alternative:**

- |   |  |
|---|--|
| <input type="checkbox"/> mechanical transport | <input type="checkbox"/> landing of aircraft       |
| <input type="checkbox"/> motorized equipment  | <input type="checkbox"/> temporary road            |
| <input type="checkbox"/> motor vehicles       | <input type="checkbox"/> structure or installation |
| <input type="checkbox"/> motorboats           |  |

None of the above-listed 4(c) uses



## Appendix A: Management Objectives and Control Methods for Medium-Priority Species

This table shows the portion of Appendix A of the 2010 Update which shows medium-priority species. From Table 1: Control Categories, high and medium-high priority invasive species would be controlled using whatever method is most appropriate manual, cultural or herbicide treatment. Invasive species in Yosemite National Park were evaluated and prioritized using a modified version of the USGS Alien Plants Ranking System (USGS 2000), an analytical software tool. The results were grouped into high, medium, and low priorities for each of the three categories—impact, threat, and difficulty of control—and were merged to create rankings.

<b>Medium-Priority Species</b>			
<b>Priority of Control</b>	<b>Early Detection, Monitoring, and Prevention Management Objective</b>	<b>Control Management Objective</b>	<b>Control Method</b>
<b>Tree-of-heaven (<i>Ailanthus altissima</i>)</b>			
Impact: Low Threat: Medium Difficulty of Control: Medium	Document park-wide abundance and distribution.	Eradicate from El Portal and Yosemite Valley.	Herbicide is most appropriate for most situations.
<b>Foxtail chess (<i>Bromus madritensis</i> ssp. <i>rubens</i>)</b>			
Impact: Low Threat: Low Difficulty of Control: Low	Document abundance and distribution in Wilderness areas and front-country sites above 6,000 feet.	Control populations in Wilderness areas that occur above 6,000 feet.	Manual, Cultural or Herbicide
<b>Bachelor's button (<i>Centaurea cyanus</i>)</b>			
Impact: Low Threat: Medium Difficulty of Control: Medium	Document abundance and distribution in Wilderness areas. Prevent species from invading developed areas above 4,000 feet.	Eradicate all populations that occur within and above the lower montane vegetation zone. Eradicate populations within the El Portal Maintenance Complex.	Manual, Cultural or Herbicide
<b>Jerusalem oak (<i>Chenopodium botrys</i>)</b>			
Impact: Low Threat: Low Difficulty of Control: Low	Document abundance and distribution in Wilderness areas.	Control populations that remain in restoration sites for greater than four years.	Manual or Cultural
<b>Gypsyflower (<i>Cynoglossum officinale</i>)</b>			

Medium-Priority Species			
Priority of Control	Early Detection, Monitoring, and Prevention Management Objective	Control Management Objective	Control Method
Impact: Low Threat: Low Difficulty of Control: Low	Document abundance and distribution in all vegetation zones of the park.	More information is needed to develop management objectives. Objectives will be developed once the significance of the threat has been determined.	Manual, Cultural or Herbicide
<b>Lanceleaf tickseed (<i>Coreopsis lanceolata</i>)</b>			
Impact: Low Threat: Low Difficulty of Control: Low	Document abundance and distribution in all vegetation zones of the park.	More information is needed to develop management objectives. Objectives will be developed once the significance of the threat has been determined.	Manual or Cultural
<b>Tall fescue (<i>Festuca arundinacea</i>)</b>			
Impact: Low Threat: Low Difficulty of Control: Low	Document abundance and distribution in developed areas and Wilderness sites throughout the park.	More information is needed to develop management objectives. Objectives will be developed once the significance of the threat has been determined.	Manual, Cultural or Herbicide
<b>Black bindweed (<i>Polygonum convolvulus</i>)</b>			
Impact: Low Threat: Medium Difficulty of Control: Medium	Document abundance and distribution in park areas above 5,000 feet.	Control populations in restoration and construction sites. Eradicate from Wilderness areas if found.	Manual, Cultural or Herbicide
<b>Radish (<i>Raphanus sativus</i>)</b>			
Impact: Low Threat: Medium Difficulty of Control: Medium	Document abundance and distribution in Wilderness areas.	Control populations in Yosemite Valley.	Manual or Cultural
<b>Blackeyed Susan (<i>Rudbeckia hirta</i> var. <i>pulcherrima</i>)</b>			
Impact: Low Threat: Medium Difficulty of Control: Medium	Document abundance and distribution throughout the park.	Eradicate all populations found in wetlands throughout the park.	Manual or Cultural
<b>Bouncingbet (<i>Saponaria officinalis</i>)</b>			

Medium-Priority Species			
Priority of Control	Early Detection, Monitoring, and Prevention Management Objective	Control Management Objective	Control Method
Impact: Low Threat: Medium Difficulty of Control: Medium	Document abundance and distribution in Wilderness areas.	Eradicate populations within all vegetation zones that are greater than 1 square meter and have a density of greater than 10 individuals per square meter.	Manual or Cultural
<b>Charlock mustard (<i>Sinapis arvensis</i>)</b>			
Impact: Low Threat: Low Difficulty of Control: Low	Document abundance and distribution in all vegetation zones of the park.	More information is needed to develop management objectives. Objectives will be developed once the significance of the threat has been determined.	Manual or Cultural
<b>Dandelion (<i>Taraxacum officinale</i>)</b>			
Impact: Low Threat: Medium Difficulty of Control: Medium	Document abundance and distribution in Wilderness areas.	Control populations in Wilderness.	Manual, Cultural or Herbicide
<b>Yellow salsify (<i>Tragopogon dubius</i>)</b>			
Impact: Low Threat: Low Difficulty of Control: Low	Document abundance and distribution in Wilderness areas.	Control populations in Wilderness and developed areas within and above the lower montane vegetation zone. Control populations to maintenance levels in meadows and roadsides throughout the park.	Manual or Cultural
<b>Puncture vine (<i>Tribulus terrestris</i>)</b>			
Impact: Low Threat: Medium Difficulty of Control: Medium	Document abundance and distribution in Wilderness areas.	Control populations in Wilderness and developed areas.	Manual, Cultural or Herbicide
<b>Greater periwinkle (<i>Vinca major</i>)</b>			

Medium-Priority Species			
Priority of Control	Early Detection, Monitoring, and Prevention Management Objective	Control Management Objective	Control Method
Impact: Low Threat: Medium Difficulty of Control: Medium	Document abundance and distribution throughout the park. Prevent spread into meadow, riparian, and wetland areas throughout the park. Do not allow plant for landscaping in the park.	Eradicate populations found in riparian areas and wetlands throughout the park to preserve Tompkin's sedge habitat. Eradicate from construction sites.	Manual, Cultural or Herbicide

**Submitted By:**

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Project Manager Date

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(Attach any comments and conditions)

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