Preparing for Wildland Fire:

A Step-by-Step Guide for NPS Invasive Plant Managers

Wildfires – and wildfire response – present a significant risk for the spread of invasive plants. In addition to spreading invasives already on site, firefighting personnel and equipment may introduce new invasive species. Natural resource managers can guide and influence firefighting activity in ways that greatly reduce the risk of invasive plant spread. Doing so effectively, however, requires effective preparation. This guide describes steps that can be taken by National Park Service (NPS) natural resource managers to avoid, minimize, or mitigate the introduction and spread of invasive species before and during wildland fire incidents. Although some protocols are specific to the NPS, the overall approach is generally transferable to other organizations.

When a fire starts, critical information regarding sensitive park resources must be readily available and organized in a manner which can be efficiently shared with fire operations personnel. Considerable impact often occurs within the first operational periods of wildfire response, and typically little time is available to gather plant distribution information, produce maps, procure weed wash equipment, and provide training. Such resource protection measures need to be accomplished in advance of an emergency.

Woolsey Fire, Paramount Ranch. Photo courtesy National Park Service.

Abbreviations

Note: More information on abbreviations can be found on the NWCG Glossary of Wildland Fire.

AAR	After Action Review
AIS	Aquatic Invasive Species
BAR	Burned Area Rehabilitation
BAER	Burned Area Emergency Response
BMPs	Best Management Practices
ES	Emergency Stabilization
GISS	Geographic Information System Specialist
IAP	Incident Action Plan
ICP	Incident Command Post
IMT	Incident Management Team
IPMT	Invasive Plant Management Team
IR	Incident Requirement (WFDSS)
LOGS	Logistics Section
LURG	Local Unit READ Guide
MIST	Minimum Impact Strategies & Tactics
MR	Management Requirement (WFDSS)
NRSS	Natural Resource Stewardship & Science Directorate
OPSC	Operation Section Chief
READ	Resource Advisor
REAF	Fireline Resource Advisor
RPM	Resource Protection Measure
WFDSS	Wildland Fire Decision Support System
WMA	Weed Management Area

Planning for Wildland Fire

Develop and Maintain Invasives Guidance in a Local Unit READ Guide

To effectively communicate critical resource values at risk and appropriate management actions to minimize the establishment and spread of invasives at the onset of any fire incident, ensure that all relevant invasives information is well-organized and accessible in a Local Unit READ Guide (LURG). Relative to invasives, the guidance outlined in this document should inform Resource Advisors (READs) as to the location of invasives populations, the threat-level associated with populations, and advised resource protection measures (RPMs) required to communicate minimum impact strategies and tactics to incident managers and operational personnel during a fire. It is important that both the READ Guide and accompanying geospatial datasets be updated on an annual basis prior to fire season.

READ Guide Contents:

- Identification of prioritized critical resource values – both natural and cultural.
- GIS map layers identifying known invasive populations and prioritized avoidance areas. Also include:
  - Decontamination (weed wash) locations identified at geographic and road system "chokepoints" relative to multiple scales of incidents (Type 1-Type 5). Include both primary and secondary road systems.
  - Identification of dip/no draft sites relative to Aquatic Invasive Species (AIS) infestations.
- Resource Protection Measures (RPMs) defined, vetted, and described in clear, operational language.
- The 2017 NWCG Resource Advisor Guide, READ Cohort Drive, and Resource Advisor Learning Library (RELL) provide additional guidance on the creation and maintenance of effective LURGs.

NPS Resource Advisors (READs) discuss resources at risk with fire managers. Photo courtesy National Park Service.

Build Relationships and Share Information

Effective communication with wildfire managers and operational personnel is a critical requirement to ensure successful resource protection during a wildfire incident. Communication is enhanced by intentionally building interpersonal relationships – within one's team as well as with external partners – ahead of time. Advance conversation builds trust, anticipates challenges, resolves contentious perspectives, and clarifies objectives to promote greater efficiency and understanding during the emergency response.

Communication Networks:

- Internally, foster effective communication among unit programs and divisions (e.g., Natural and Cultural Resource Management, Law Enforcement and Visitor Use Protection, Fire Management, Buildings and Utilities and Roads and Trails, and most importantly, the Park Superintendent). Relay the outcomes of these conversations with your regional NPS Invasive Plant Management Team (IPMT) Liaison.
- Work with local Fire Management staff to host an annual "preseason planning meeting" to review utilization of the LURG, priority resource concerns, advised resource protection measures, invasives avoidance areas, decontamination protocols, READ integration, SOPs for contacting resource staff, etc. Such meetings should occur annually prior to fire season as weed infestations, resource protection prioritization, and RPMs may periodically change. Encourage participation from all divisions as well as park cooperators.
- Exchange invasive population distribution maps and invasive plant priorities/control strategies with neighboring land managers (public agencies, tribes, private landowners, Weed Management Area WMA partners, etc.) and across jurisdictions.
- Communicate to US Forest Service, CAL FIRE, and other cooperating Agency Representatives (AREP) and Agency Administrators (AA) that sustainable invasive management is a top priority for the local unit.

- Ensure that Wildland Fire Decision Support System (WFDSS) Management Requirements (MRs) and Strategic Objectives (SOs) regarding invasives are up-to-date and that language is congruent with the invasives RPMs identified in the LURG. Ensure that relevant invasives geospatial data layers (e.g., no dip/no draft sites, prioritized avoidance areas, decontamination chokepoints, etc.) have been uploaded into WFDSS so that Incident Management Team (IMT) and other agencies engaged in the incident can utilize this information to direct strategies and tactics.

Distill Spatial Data

The preparation of geospatial data associated with invasive and rare plant populations is critical to inform incident decision making. Areas in which ground disturbance should be avoided by incident operations due to the presence of invasives or rare plants can be identified as avoidance areas and prioritized by importance. Such information will be useful to IMTs as they strategize the location and nature of control measures.

REAFs work closely and often directly with fire operations staff on the fireline and serve a critical educational role. Photo courtesy National Park Service.

General Questions to Consider:

- Where are your rare plant populations?
- Where are your invasive plant populations?
- Which invasive plants are the highest priority because of their ability to spread?
- What areas do you not want invasives to spread from (or to)?
- Which areas are the highest priority to avoid?

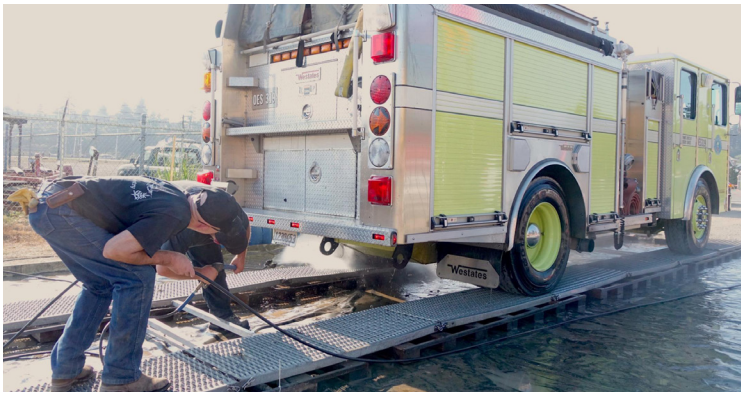
Assembling Information:

- Update invasives and rare plant geospatial demographic data annually and provide guidance for the use of this data in the LURG. Coordinate with Regional Fire Planners to determine the appropriate scope, application, and level of detail to include in WFDSS (only the most important information). Specific geospatial layers may include:
  - Known Invasive Species Populations – terrestrial, aquatic, and invasive pathogens, such as *Phytothphora*.
  - Conservation Core Areas encompassing rare species populations and their habitats.
  - Prioritized Avoidance Areas for both rare plants and invasives. These may be prioritized and labeled as appropriate to local unit objectives. Critical Avoidance Areas can be labeled as "No Go" and less critical areas of concern can be labeled "Ask a READ".
  - Pre-identified decontamination stations and "chokepoints."
- Upload synthesized data for avoidance areas and other areas of concern requiring special management attention into WFDSS prior to fire season. (Coordinate with Regional Fire Planners to determine the appropriate WFDSS data type, e.g., Other Unit Shape, Management Requirement, or simply text for Incident Objectives & Requirements).

Anticipate Fire Operations Infrastructure and Impacts

At the local unit preseason meeting, discuss anticipated locations for operational impacts and incident infrastructure such as firelines, incident command posts, fire camps, staging areas, drop points, spike camps, helispots/helibases, and weed wash stations. Develop strategies to protect disturbed and highly trafficked areas from invasive establishment and spread.

- Identify predetermined locations for weed wash stations that are both weed free and present a low likelihood for the establishment of invasives. Include these locations on a geospatial layer which can be provided to IMTs and fire managers.
- Conduct pre-season invasives surveys in areas pre-identified for fire operations and areas regularly used for fire operations.
    - Ensure that invasives treatment are conducted (mowing, herbicide application, manual removal, mulching, etc.) in these areas as part of the annual program of work.
- Integrate invasive plant mitigation requirements into land use agreements for ICPs, base camps, staging areas, etc.
- Identify waterbodies which may be utilized as potential dip/draft sites and those which should not due to the presence of aquatic invasive species (AIS).
    - Prepare 'No Dip/Draft" maps in advance of incidents and include in LURG and as a geospatial layer in WFDSS.



Proper use of weed wash stations is a critical step in preventing the spread of invasives. Photo courtesy National Park Service.

Be mindful of where all staging areas for fire operations are situated. Photo courtesy National Park Service.

- Ensure that the local unit has immediate access to equipment and supplies needed to address invasive plant establishment and spread during wildland fire incidents. Stage equipment in advance of incidents at the local level whenever possible. Such equipment may include:
    - Weedwash units and/or heated pressure washers ("Hotsies")
    - Flagging, specific to invasive plants and READ designations
    - Tarps and pins to limit contact with the ground in helicopter cargo staging areas
    - Boot brushes (handheld and heavy-duty ground versions)
    - Invasive species fact sheets and identification guides
    - READ Incident Action Plan (IAP) messaging
    - Invasives and AIS Guidance
        - Guide to Preventing Aquatic Invasive Species Transport by Wildland Fire Operations (PMS 444)
        - Decontaminating Firefighting Equipment to Reduce the Spread of Aquatic Invasive Species: How to Guide (June 2022)
        - Aquatic Invasive Species Mitigation for Ground Resources (video)
        - Planning for Invasives through Resource Advising (video)

Even prescribed fire operations benefit from establishing RPMs and LURGs for the protection of natural and cultural resources. Photo courtesy National Park Service.

Utilize WFDSS to Promote Effective Invasive Plant Management

The Wildland Fire Decision Support System (WFDSS) application documents and informs the decision making process across federal agencies (excellent video on WFDSS here). Maintaining thorough and up to date information in WFDSS will help to ensure that invasives information is readily available to fire managers as they develop strategies and tactics during wildland fire incidents. Pre-determined Management Requirements (MRs) provide management sideboards to tactical operations. Management Requirements are translated into incident-specific Incident Requirements (IRs). Invasives guidance is captured in WFDSS in the follow manner:

- Prior to an incident, local units should input MRs into WFDSS addressing operational measures to prevent (or limit) the spread of terrestrial and aquatic invasives species.
- One means of doing so is to reference the Resource Protection Measures (RPMs) identified in the Guide to Preventing Aquatic Invasive Species Transport by Wildland Fire Operations PMS 444 and the 2006 NPS Management Policies 4.4.4 Management of Exotic Species.

Identification and delineation are important tasks in preparation for and during fires. Photo courtesy National Park Service.

- MR language should be worded in a manner to foster ease of conversion to incident-specific IRs (done by fire and resource staff in WFDSS when there's an incident) which may call out specific species, geographic locations, precise protocols to be employed, etc.

Examples of Management Requirements

- "Fire operations will follow the Resource Protection Measures (RPMs) described in the Local Unit READ Guide to avoid, minimize, or mitigate adverse impacts to cultural and natural resources including threatened, endangered, and sensitive species and their habitat, as well as practices that avoid the introduction and spread of aquatic and terrestrial invasive species."
- "As determined by the Agency Administrator, Resource Advisors (READs) will be assigned to advise on resource protection measures to avoid, minimize, or mitigate detrimental impacts to sensitive natural and cultural resources."
- "Implement Resource Protection Measures for the prevention of invasive aquatic and terrestrial species spread, including but not limited to:
  - Terrestrial Fire Operations:
    - Direct fire management infrastructure/operations away from known invasive weed infestations and construct firelines away from known invasive weed infestations to the greatest extent possible. Consult with READs before initiating line construction and siting incident infrastructure.
    - During extended attack, inspect and clean equipment (hand tools, trucks, pumps, tracked equipment, tents, etc.) and personal line gear (line packs, Nomex clothing, boots, etc.) for invasive weed seeds and plant parts before (or, at minimum, upon) arrival to the incident, at periodic intervals throughout response, when there is movement of fire crews into and out of high-risk designated invasives areas, and prior to demobilization. This requirement applies to all firefighting and suppression repair equipment and personnel.
  - Aerial Fire Operations:
    - All dip/draft sites and other water sources must be approved by a READ or local resource management staff prior to use to prevent the spread of aquatic invasive species (AIS).
    - Clean and sanitize fire management air resources (helicopter buckets, tanks, pumps, etc.) upon arrival to and departure from an incident.
    - Helicopter buckets and tanks will be inspected for the presence of AIS in advance of and at the conclusion of dipping operations.
    - All water handling equipment will be inspected and decontaminated if used in an area known or suspected to have AIS.
  - Weed Wash Stations:
    - The utilization of weed wash stations will be assessed for all incident vehicles and equipment at both resource check-in and demobilization when incident complexity meets or exceeds a Type 3 incident.

Proper weed wash station usage benefits from good siting and ability to provide a rapid service without impeding the flow of fire operations. Photo courtesy National Park Service.

Understanding fire operations can benefit your ability as a land manager to anticipate tactics that might have impacts like tree felling and the ground disturbance when creating fireline. Photo courtesy National Park Service.

- Additional weed wash stations will be considered for heavy equipment and vehicles operating in known invasive plant infestation sites designated as high-priority concerns. Decontamination requirements will be considered any time vehicles and equipment pass through high-priority infestation areas.
- Weed wash stations will be sited in locations not conducive to invasive species establishment and spread and in locations which promote ease of use without hindering operations.
- The location of all weed wash stations will be documented to monitor for invasive plant establishment in subsequent years."

Guiding Response During a Wildland Fire

Utilize Resource Advising to Promote Invasives Management

Resource Advisors (READs) are formally recognized wildland fire positions tasked with identifying/communicating the presence of sensitive natural and cultural resources on wildfire incidents and collaborating with fire managers and operational personnel to explore alternative approaches to avoid, minimize, or mitigate adverse impacts to valued resources. The incident READ organization is overseen by a Lead READ who supervises a group of Fireline Resource Advisors (REAFs) and Fireline Archeologists (ARCHs).

This video—Operational Preparedness for Invasives on Wildfire Incidents: Resource Advising—explores means by which Resource Advising can address the establishment and spread of invasive species on wildland fire incidents.

Invasives managers should work with READs to promote appropriate invasives management on incidents in the following manner:

Working with Incident Leadership

- Work through the Lead READ to share invasives data, invasives guidance and spatial data with fire managers. Prioritized terrestrial avoidance areas and "No Dip/No Draft" areas relative to AIS presence should be provided immediately. The Lead READ will communicate this information to the IMT and incident REAFs.
- Work with the Lead READ to create WFDSS Incident Requirement language addressing RPMs to prevent the establishment and spread of terrestrial and aquatic invasives.
- The Lead READ will engage with the Agency Administrator (AA), Incident Commander (IC) and the IMT throughout the wildfire response to ensure congruency of understanding in the treatment and prioritization of invasives on the incident. Changing the trajectory of the operational response is difficult, so the earlier that invasives managers can provide the Lead READ with spatial data, guidance, and other resources the better.
- Recognize that the protection of life and property will always take priority over the avoidance of invasive introduction and spread, particularly during initial attack. In these cases, documentation of impacts may be the only response option available.

Even slight adjustments in equipment can have significant positive effects on mitigating invasive plant dispersal. Photo courtesy National Park Service.

Implementing Weed Wash Stations and Decontamination Protocols

- Determine how many weed wash stations are needed and where they will be best positioned. This configuration may be predetermined or calculated relative to current/anticipated fire conditions/ response relative to existing invasive plant infestations. Confirm with the Lead READ that weed wash stations are set up and operating.
- Implement appropriate check-in/demob decontamination requirements, particularly for heavy equipment and larger vehicles. Larger vehicles and heavy equipment require a pre-mobilization inspection by ground support, which provides a convenient opportunity to address decontamination.
- Explore options for mobile weed wash stations (fire engines or pressure washers) at critical choke points where vehicles and equipment are moving out of heavily infested areas in high volume. Ease of use will increase decontamination protocol compliance.
- Select areas for weed wash stations with natural containment and/or existing infestations.

Addressing High Traffic Areas

- Periodically confirm that the Lead READ is in close communication with the IMT regarding site selection for ICPs, spike camps, parking/staging areas, and other locations of concentrated use to ensure that invasives

Don't be this person. Photo courtesy National Park Service.

considerations are being factored into determinations for use.

- Mitigate invasives concerns before/as high traffic sites are being established via mowing, grading, mulching, and appropriate disposal in advance of widespread use. Utilize signage and flagging to discourage entry into infested avoidance areas. Communicate to the IMT the importance of avoidance in these areas and request that they reinforce this message with operational personnel.
- Institute invasives protocols at helibases and helispots. Provide helicopter managers with boot brushes and request that operational personnel being transported to the fireline decontaminate boots, packs, clothing, tools, and gear of weed seed before flight. Ensure that helicopter loads delivered via cargo nets are being built and staged on weed-free surfaces. Tarps firmly secured to the ground with long stakes can be utilized for this purpose.

Advising on Water Dipping and Drafting

- Develop maps and geospatial layers identifying "No Dip/No Draft Waterbodies" relative to AIS concerns.
- Consider AIS implications of transporting water between watersheds.
- Advise on appropriate drafting protocols for tenders and engines.
- Use municipal water sources whenever possible.
- Decontaminate terrestrial and aviation-based water equipment with chemical disinfectants, heated pressure washers, or complete air drying.
- Avoid delivery of water directly into waterbodies, especially transfer of water between waterbodies in different watersheds.
- Dip and draft from deeper 'bluewater' sources to the greatest extent possible. Avoid sucking organic matter and bottom material when drafting in shallow water.
- Use screens on all water intakes to filter out AIS.
- Conduct periodic inspection and removal of all plant parts and mud from operational equipment and vehicles.
- Incorporate operational standards identified in:
  - Guide to Preventing Aquatic Invasive Species Transport by Wildland Fire Operations (PMS 444)
  - Decontaminating Firefighting Equipment to Reduce the Spread of Aquatic Invasive Species: How to Guide (June 2022)

Training Firefighters

- Provide appropriate educational materials to operational personnel, such as invasive plant identification information.
- Educate crews on plant identification and reinforce the importance of:
  - Avoiding the transport of invasive propagules.
  - Recognizing key invasive species and reporting back to READs immediately if intrusion into areas bearing these species has occurred.
- Train personnel on the use of boot brushes and other techniques to decontaminate boots, clothing, equipment, and vehicles.

Invasive plants pose grave threats to native biodiversity and park resources. Photo courtesy National Park Service.

Staying Engaged During the Fire Response

- Plan proactively by overlaying maps of known invasive plants populations onto maps of anticipated operational impacts. Advise on ways to avoid these impacts before decisions are made.
- Communicate regularly with incident personnel about the importance of invasive RPMs through daily Incident Action Plan (IAP) READ Messages, Operational Briefing messages delivered by the Lead READ, and recurring Lead READ input to the incident planning process.
- Utilize REAFs to educate firefighters about invasives and monitor operational compliance with RPMs, mitigation measures, and avoidance areas. Ensure REAFs elevate invasives issues and concerns back to the Lead READ.

Documenting Known and Potential Impacts

In support of post-fire monitoring and treatment activities it is critical to identify and map locations where invasive plants may have been introduced or potentially spread during an incident. Such information is integral to the incoming Burned Area Emergency Response (BAER) Team's ability to assess invasives impacts in support of the development of Emergency Stabilization (ES) and Burned Area

NPS manages fire prone landscapes throughout the country and working together against invasives is essential to protecting these landscapes. Photo courtesy National Park Service.

Rehabilitation (BAR) plans. Monitoring and treatment of invasives resulting from both operational impacts and the direct effects from the fire may be funded in future years using the suppression account, Burned Area Emergency Response (BAER) funds, and/or Burned Area Rehabilitation (BAR) funds. It is integral that invasives knowledge acquired by incident READs be transferred to the incoming BAER Team.

- Identify and map, in the Incident READ Report and associated geospatial data, all sites where monitoring and treatment of invasive plants may be needed. Such sites may include:
  - Areas receiving concentrated operational use such as weed wash station locations, ICPs, spike camps, and staging areas.
  - Areas impacted by ground disturbing operations such as handlines, dozer lines, safety zones, parking areas, etc.
  - Areas where heavy equipment worked in or adjacent to priority infestation areas.
  - Waterbodies in which AIS may have been introduced.
  - Newly discovered invasive plant infestations.
- You will capture this information in the After Action Review (AAR).
- Ensure that new information acquired on the incident is updated in the Local Unit READ Guide, WFDSS, and invasive geospatial layers.

Thank you for your dedication in preventing the establishment and spread of invasive species within the context of wildland fire. If you have comments or recommended additions to this guide please contact Steve Buckley (steve_buckley@nps.gov), California Invasive Plant Management Team Liaison.